Mathematics - 7
(Part–I)

1. Large Numbers Around Us

Class Work 1.1

1. No, number of days in 1 year = 365

Number of days in 100 years

= 365 × 100

= 36,500 days

Varieties eaten per day = 2

Total varieties eaten in 100 years

= 2 × 36,500 = 73,000

1 lakh = 1,00,000

Since 73,000 < 1,00,000

2. Yes, number of days in 100 years

= 365 × 100

= 36,500 days

Varieties eaten per day = 3

Total varieties eaten in 100 years

= 3 × 36,500 = 1,09,500

1 lakh = 1,00,000

Since 1,09,500 > 1,00,000

3. Number of days in 1 year = 365

Number of days in 80 years

= 365 × 80 = 29,200 days

1 lakh = 1,00,000

Since 29,200 < 1,00,000

Difference = 1,00,000 – 29,200

= 70,800

29,200 is less than one lakh by 70,800.

Class Work 1.2

1. Height of Digvijay = 1 metre

Height of each floor = 4 × 1 = 4 metres

From the picture, the building appears to have about 10 floors.

Approximate height of the building

= 10 × 4 = 40 metres

2. Height of Statue of Unity = 182 metres

Height of building = 40 metres

Difference = 182 – 40 = 142 metres

The statue of unity is 142 metres taller than Digvijay's building.

3. Height of Kunchikal Falls = 455 metres

Height of each floor = 4 metres

Number of floors required

$$= \frac{455}{4} = 113.75 \approx 114$$

Since we need whole floors, we round up 114 floors.

Class Work 1.3

1. Whether one lakh is big or small depends on the context.

One lakh is big when we talk about :

One lakh rupees as monthly salary for many people.

One lakh population of a small town.

One lakh kilometres as a distance.

One lakh is small when we talk about :

One lakh people in a stadium like Motera Stadium (capacity more than 1 lakh).

One lakh hairs on a person's head (most people have 80,000 to 1,20,000 hairs).

Some fish species lay almost one lakh eggs at once.

NCERT Exercise 1.1

1. Given, population of the town *Chintamani*

= 75,000

Difference = 1,00,000 – 75,000

= 25,000

Thus, population of Chintamani is 25,000 less than one lakh.

2. Given that,

Estimated population of Chintamani in 1 year 2024

= 1,06,000

Difference = 1,06,000 – 1,00,000

= 6,000

= 6,000

Thus, population of Chintamani is 6,000 more than One Lakh.

3. Given that, population in 2011 = 75,000

and population in the year 2024 = 1,06,000

Then change of Chintamani population
= 1,06,000 – 75,000
= 31,000

Thus, the population of Chintamani increased by 31,000 from 2011 to 2024.

Practice Exercise 1.1

1. (a) One lakh varieties of rice is a very large number.

In our daily life, we hardly taste 10-20 varieties of rice.

Even if we eat a new variety every day, it would take about 274 years to taste all varieties.

(b) 38 kilometres is not a very large distance. A car can cover it in less than an hour.

So, 1 lakh people fitting in just 38 km shows that 1 lakh is not a very large number in this context.

2. Total money = Rs 1,00,000

Money spent = Rs 20,000

Money left = 1,00,000 – 20,000
= Rs 80,000

3. Units produced per month = 1,00,000

Number of months = 6

Total units produced = 1,00,000 × 6
= 6,00,000

4. Number of shares = 1,00,000

Value of each share = ₹ 500

Total value = 1,00,000 × 500
= ₹ 5,00,00,000

NCERT Exercise 1.2

1. (a) Three lakh six hundred

(b) Five lakh four thousand eighty five

(c) Twenty seven lakh thirty thousand

(d) Seventy lakh fifty three thousand one hundred thirty eight

2. (a) 1,23,456 (b) 4,07,704

(c) 50,50,050 (d) 10,00,235

Practice Exercise 1.2

1. (a) Five crore forty-seven lakh thirty-eight thousand two hundred nineteen.

(b) Six crore eighty.

(c) Forty crore thirty-six thousand two.

(d) Seventy-three crore eighty lakh forty-four thousand five hundred fifty.

(e) Fifty-eight crore ninety-nine lakh seventy-five thousand three hundred sixty-one.

(f) Ninety crore nine.

2. (a) 80,02,019

(b) 3,09,601

(c) 20,07,005

(d) 6,05,00,048

(e) 12,12,12,012

(f) 15,60,30,078

3. (a) The digit 5 is at the Crores place.

Place value = 5 × 1,00,00,000
= 5,00,00,000

(b) The digit 2 is at the Ten Lakhs place.

Place value = 2 × 10,00,000
= 20,00,000

(c) The digit 6 is at the Ten Thousands place.

Place value = 6 × 10,000 = 60,000

(d) The digit 3 is at the Hundreds place.

Place value = 3 × 100 = 300

(e) The digit 8 is at the Ten Crores place.

Place value = 8 × 10,00,00,000
= 80,00,00,000

(f) The digit 5 is at the Ten Thousands place.

Place value = 5 × 10,000 = 50,000

4. (a) = 3,00,000 + 0 + 8,000 + 900 + 20 + 4
= 3,00,000 + 8,000 + 900 + 20 + 4

(b) = 20,00,000 + 4,00,000 + 0 + 6,000 + 500 + 0 + 9
= 20,00,000 + 4,00,000 + 6,000 + 500 + 9

(c) = 4,00,00,000 + 30,00,000 + 6,00,000 + 10,000 + 8,000 + 400 + 30 + 8
= 4,00,00,000 + 30,00,000 + 6,00,000 + 10,000 + 8,000 + 400 + 30 + 8

(d) = 6,00,00,000 + 0 + 6,00,000 + 0 + 6,000 + 0 + 0 + 6
= 6,00,00,000 + 6,00,000 + 6,000 + 6

(e) = 8,00,00,000 + 10,00,000 + 0
+ 10,000 + 0 + 600 + 10 + 0
= 8,00,00,000 + 10,00,000 + 10,000
+ 600 + 10

(f) = 70,00,00,000 + 3,00,00,000 + 0 + 0
+ 60,000 + 5,000 + 600 + 10 + 4
= 70,00,00,000 + 3,00,00,000
+ 60,000 + 5,000 + 600 + 10 + 4

5. (a) 48,27,08,023

(b) 90,63,40,708

(c) 6,50,09,020

Class Work 1.4

1. Target = 4000

$$\text{Number of presses} = \frac{4000}{1000} = 4$$

2. Target = 10,000

$$\text{Number of presses} = \frac{10,000}{1000} = 10$$

3. Target = 56,000

$$\text{Number of presses} = \frac{56,000}{1000} = 56$$

4. Target = 80,000

$$\text{Number of presses } \frac{80,000}{1000} = 80$$

5. Target = 1,00,000

$$\text{Number of presses} = \frac{1,00,000}{1000} = 100$$

6. Number of presses = 163

Target Number = 163 × 1000 = 1,63,000

7. One lakh = 1,00,000

$$\text{Number of thousands} = \frac{1,00,000}{1000}$$
$$= 100$$

Class Work 1.5

1. Target = 600

$$\text{Number of presses} = \frac{600}{10} = 60$$

2. Target = 280

$$\text{Number of presses} = \frac{280}{10} = 28$$

3. Target = 1000

$$\text{Number of presses} = \frac{1000}{10} = 100$$

4. Target = 3900

$$\text{Number of presses} = \frac{3900}{10} = 390$$

5. Target = 10,000

$$\text{Number of presses} = \frac{10,000}{10} = 1000$$

6. Target = 1,00,000

$$\text{Number of presses} = \frac{1,00,000}{10}$$
$$= 10,000$$

7. Number of presses = 485

Target Number = 485 × 10 = 4850

Class Work 1.6

1. (a) Target = 500

$$\text{Number of presses} = \frac{500}{100} = 5$$

(b) Target = 4,700

$$\text{Number of presses} = \frac{4,700}{100} = 47$$

(c) Target = 10,000

$$\text{Number of presses} = \frac{10,000}{100}$$
$$= 100$$

(d) Target = 52,000

$$\text{Number of presses} = \frac{52,000}{100}$$
$$= 520$$

(e) Target = 90,000

$$\text{Number of presses} = \frac{90,000}{100}$$
$$= 900$$

(f) Target = 87,600

$$\text{Number of presses} = \frac{87,600}{100}$$
$$= 876$$

(g) Target = 1,00,000

$$\text{Number of presses} = \frac{1,00,000}{100}$$
$$= 1000$$

(h) Number of presses = 582

Target Number = 582 × 100 = 58,200

NCERT Exercise 1.3

1. A different way to get 5072 is

Way 1 : (5 × 1000) + (0 × 100) + (7 × 10) + (2 × 1)

Way 2 : $(4 \times 1000) + (10 \times 100 + (7 \times 10)) + 2 \times 1$

2. (a) Given 8,300

$8,300 = (83 \times 100) + (0 \times 10) + (0 \times 1)$

or $8,300 = (8 \times 1000) + (3 \times 100)$

(b) $40,629 = (40 \times 1000) + (6 \times 100) + (2 \times 10) + (9 \times 1)$

or $40,629 = (4 \times 10,000) + (0 \times 1000) + 6 \times 100 + 2 \times 10 + 9 \times 1$

(c) $56,354 = (56 \times 1000) + (3 \times 100) + (54 \times 1)$

or $56,354 = (5 \times 10,000) + (6 \times 1000) + (3 \times 100) + (5 \times 10) + (4 \times 1)$

(d) $66,666 = (66 \times 1000) + (6 \times 100) + (66 \times 1)$

or $66,666 = (6 \times 10,000) + (6 \times 1000) + (6 \times 100) + 6 \times 10 + 6 \times 1$

(e) $3,67,813 = (36 \times 10,000) + (78 \times 100) + (13 \times 1)$

or $3,67,813 = (3 \times 100,000) + (6 \times 10,000) + (7 \times 1000) + (8 \times 100) + (1 \times 10) + (3 \times 1)$

3. (a) We know largest 3 digit number = 999

According to question,

To make largest 3-digit number by pressing 30 buttons Press

+ 100 button	9 times	= 900
+ 10 button	8 times	= 80
+ 1 button	13 times	= 13
	30 times	993

Similarly, we know smallest 3-digit number = 100

To make smaller 3-digit number by pressing 30 buttons

+ 10 button	8 times	= 80
+ 1 button	22 times	= 22
	30 times	102

(b) Using 25 clicks,

$997 = 9 \times 100 + 9 \times 10 + 7 \times 1$

$= 900 + 90 + 7 = 997$

Different way,

$997 = 99 \times 10 + 7 \times 1$

$= 990 + 7 = 997$

[Total clicks = 99 + 7 = 106]

Practice Exercise 1.3

1. (a) $\frac{7000}{1000} = 7$

(b) $\frac{19,000}{1000} = 19$

(c) $\frac{59,000}{1000} = 59$

(d) $\frac{1,90,000}{1000} = 190$

(e) $\frac{5,00,000}{1000} = 500$

(f) Target = $953 \times 1000 = 9,53,000$

(g) $\frac{18,00,000}{1000} = 1800$

(h) Target = $1013 \times 1000 = 10,13,000$

(i) $\frac{4,00,000}{1000} = 400$

2. (a) $\frac{800}{10} = 80$

(b) $\frac{1780}{10} = 178$

(c) $\frac{900}{10} = 90$

(d) $\frac{2700}{10} = 270$

(e) $\frac{12,000}{10} = 1200$

(f) $\frac{4,00,000}{10} = 40,000$

(g) Target = $357 \times 10 = 3570$

(h) $\frac{9000}{10} = 900$

(i) Target = $785 \times 10 = 7850$

3. (a) $\frac{900}{100} = 9$

(b) $\frac{4800}{100} = 48$

(c) $\frac{18,000}{100} = 180$

(d) $\frac{64,000}{100} = 640$

(e) $\frac{1,90,000}{100} = 1900$

(f) $\frac{77,800}{100} = 778$

(g) $\frac{60,000}{100} = 600$

(h) Target = 789 × 100 = 78,900

(i) $\frac{3,00,000}{100} = 3000$

Class Work 1.7

1. Using the standard place value method (fewest clicks) :

5072 = 5 × 1000 + 0 × 100 + 7 × 10 + 2 × 1

Number of button clicks = 5 + 0 + 7 + 2

= 14 clicks

This is the minimum number of clicks using place value.

2. 8300 = 8 × 1000 + 3 × 100

Number of button clicks = 8 + 3

= 11 clicks.

NCERT Exercise 1.4

1. (a) Expression : (8 × 1000) + (3 × 100)

= 8300

Total clicks = 8 + 3 = 11

Therefore, 8300 can be obtained in 11 button clicks.

(b) Expression : (4 × 10000) + (6 × 100) + (2 × 10) + (9 × 1)

= 40629

Total clicks = 4 + 6 + 2 + 9 = 21

Therefore, 40629 can be obtained in 21 button clicks.

(c) Expression : (5 × 10000) + (6 × 1000) + (3 × 100) + (5 × 10) + (4 × 1)

= 56354

Total clicks =5 + 6 + 3 + 5 + 4 = 23

Therefore, 56354 can be obtained in 23 button clicks.

(d) Expression : (6 × 10000) + (6 × 1000) + (6 × 100) + (6 × 10) + (6 × 1)

= 66666

Total clicks = 6 + 6 + 6 + 6 + 6 = 30

Therefore, 66666 can be obtained in 30 button clicks.

(e) Expression : (3 × 100000) + (6 × 10000) + (7 × 1000) + (8 × 100) + (1 × 10) + (3 × 1)

= 367813

Total clicks = 3 + 6 + 7 + 8 + 1 + 3

= 28

Therefore, 3,67,813 can be obtained in 28 button clicks.

2. Yes. The smallest number of button clicks for each number is equal to the sum of its digits.

This is because, to minimise clicks, we press each place value button (like +1000) a number of times equal to the digit in that place. For example :

8300 : Sum of digits = 8 + 3 + 0 + 0 = 11 (Total clicks = 11)

40629 : Sum of digits = 4 + 0 + 6 + 2 + 9 = 21 (Total clicks = 21)

56354 : Sum of digits = 5 + 6 + 3 + 5 + 4 = 23 (Total clicks = 23)

66666 : Sum of digits = 6 + 6 + 6 + 6 + 6 = 30 (Total clicks = 30)

367813 : Sum of digits = 3 + 6 + 7+ 8 +1 + 3 = 28 (Total clicks = 28)

The connection is that the smallest number of button clicks depends on the place value of each digit in the number. If the digit in a particular place is small, then fewer clicks are required, and if it is big, then more clicks are required.

3. If we press the +10,00,000 button ten times :

Number = 10 × 10,00,000 = 1,00,00,000

The number 1,00,00,000 has 7 zeroes.

This number is called "One Crore".

In the Indian Place Value System, 1 crore = 1,00,00,000 = 10 × 10,00,000 (ten times ten lakh).

Class Work 1.8

1. Ten crore = 10,00,00,000

Counting the zeroes : 10,00,00,000 has 8 zeroes.

2. Hundred thousand = 100,000

Counting the zeroes : 100,000 has 5 zeroes

NCERT Exercise 1.5

1. In Indian system,

Number		Number Name	
(i)	40,50,678	(i)	Forty lakh fifty thousand six hundred seventy eight
(ii)	4,81,21,620	(ii)	Four crore eighty one lakh twenty one thousand six hundred twenty
(iii)	2,00,22,002	(iii)	Two crore twenty two thousand two
(iv)	24,68,13,579	(iv)	Twenty-four crore sixty eight lakh thirteen thousand five hundred seventy-nine
(v)	34,50,00,543	(v)	Thirty four crore fifty lakh five hundred forty'three
(vi)	1,02,03,04,050	(vi)	One arab two crore three lakh four thousand fifty

In American System

Number		Number Name	
(i)	4,050,678	(i)	Four million fifty thousand six hundred seventy-eight
(ii)	48,121,620	(ii)	Forty-eight million one hundred twenty-one thousand six hundred twenty
(iii)	20,022,002	(iii)	Twenty million twenty two thousand two
(iv)	246,813,579	(iv)	Two hundred forty-six million eight hundred thirteen thousand five hundred seventy-nine
(v)	345,000,543	(v)	Three hundred forty-five million five hundred forty-three
(vi)	1,020,304,050	(vi)	One billion twenty million three hundred four thousand fifty

2. In Indian Place Value Notation

(a) 1,01,01,010

(b) 1,00,10,01,001

(c) 10,20,30,040

(d) 9,08,07,00,600

3. (i) 30 thousand = 30,000

and 3 Lakh = 3,00,000

Clearly, 3,00,000 > 30,000

∴ 30 thousand < 3 Lakhs

(ii) Since 1 million = 10 Lakhs

∴ 5 million = 50 Lakhs

∴ 500 Lakhs > 5 million

(iii) 1 million = 10 Lakhs

8 million = 80 Lakhs

800 Thousand = 8,00,000

= 8 Lakh

Clearly, 800 thousand < 8 million

(iv) Since 1 Billion = 100 crore

60 Billion = 6000 crores

Clearly 640 crores < 60 billion

Practice Exercise 1.4

1. (a) 86,302,600

(b) 230,611,949

(c) 307,009,003

(d) 5,409,065,428

(e) 92,066,135,777

(f) 400,300,652,236

2. (a) Nine hundred twenty-five million twelve thousand seven hundred ninety-four.

(b) One hundred three million five hundred forty thousand eight hundred sixty-five.

(c) Three hundred sixty-two million one hundred thousand forty-nine.

(d) Six billion eight hundred fourteen million one thousand six hundred eighty-three.

(e) Forty-five billion two million four hundred thirty thousand seven hundred fifty-four.

(f) One hundred thirty-four billion six hundred thirty-one million two hundred four thousand ninety-eight.

Practice Exercise 1.5

1. (a) Both are 7-digit numbers. Comparing from left : 3 = 3, 9 = 9, 4 < 5

So, 39,41,820 < 39,50,082

(b) Both are 8-digit numbers. Comparing from left : 5 < 6

So, 5,01,67,002 < 6,08,29,144

(c) Both are 8-digit numbers. Comparing from left : 7 = 7, 0 < 1

So, 7,01,43,625 < 7,19,87,838

(d) Both are 8-digit numbers. Comparing : 9 = 9, 0 = 0, 0 = 0, 9 = 9, 9 = 9, 0 = 0, 1 > 0·

So, 9,00,99,019 < 9,00,99,009

2. (a) The missing digit is at the ten lakhs place. Since 14,74,920 has 4 at the lakh place, the number 1_,26,870 must be greater.

If the digit is 5: 15,26,870> 14,74,920. This is true.

(b) Comparing : 6=6, 4=4, then _ must make 64, _93 > 64,486

The missing digit is at the hundreds place. We need _93 > 486, so _will be 4 or more.

Smallest digit = 4, giving 64,493 > 64,486. True.

(c) 1,24,56,789 is an 8-digit number.

For_,00,23,860 to be greater, the digit at crores place must be at least 2.

Smallest digit = 2, giving 2,00,23,860 > 1,24,56,789, True.

(d) Comparing : 7 = 7, then 4 must be >_ (digit at ten crores place already matched, now at crores)

Actually, comparing at the second digit : 4 >_

For 74,45,89,000 > 7_,45,89,000, we need. _< 4.

Smallest number means largest _ that still makes it true, but we want smallest number in the box.

Smallest digit = 0, giving 70,45,89,000.

Then 74,45,89,000 > 70,45,89,000. True.

3. (a) 2,79,868 is a 6-digit number (smallest)

20,03,568 is a 7-digit number

1,98,72,003 is an 8-digit number

2,00,16,930 is an 8-digit number

2,79,868 < 20,03,568 < 1,98,72,003 < 2,00,16,930

(b) 40,00,196 is a 7-digit number

50,18,960 is a 7-digit number

2,23,98,761 is an 8-digit number

3,98,76,542 is an 8-digit number

40,00,196 < 50,18,960 < 2,23,98,761 < 3,98,76,542

4. (a) 87,98,422 is a 7-digit number (smallest)

3,94,00,315; 9,01,00,510; 5,46,19,717 are 8-digit numbers.

9,01,00,510 > 5,46,19,717 > 3,94,00,315 > 87,98,422

(b) All are 7-digit numbers.

Comparing from left: 35,37,286 > 29,89,632 > 28,28,335 > 19,95,764

5. (a) For greatest: Arrange digits in descending order = 8, 7, 6, 5, 4, 1, 0

Greatest number = 87,65,410

For smallest: Arrange digits in ascending order = 0, 1, 4, 5, 6, 7, 8

But number cannot start with 0, so place 1 first.

Smallest number = 10,45,678

(b) For greatest : Arrange in descending order = 9, 8, 7, 6, 4, 3, 2, 0

Greatest number = 9,87,64,320

For smallest: Arrange in ascending order = 0, 2, 3, 4, 6, 7, 8, 9

Number cannot start with 0, so place 2 first.

Smallest number = 2,03,46,789

(c) For greatest : 9, 8, 7, 6, 4, 3, 0

Greatest number = 98,76,430

For smallest: 0, 3, 4, 6, 7, 8, 9 start with 3

Smallest number = 30,46,789

6. (a) We have 4 digits and need an 8-digit number, so digits will repeat.

For greatest: Use largest digit (7) as many times as possible.

Greatest 7,77,77,420

For smallest: Use smallest non-zero digit first, then fill with 0s.

Smallest = 2,00,00,047

(b) We have 4 digits and need an 8-digit number, so digits will repeat.

For greatest : Use largest digit (8) as many times as possible.

Greatest = 8,88,88,620

For smallest: Use smallest non-zero digit first, then fill with 0s.

Smallest = 2,00,00,068

Class Work 1.9

(a) Round up : Round up means increasing a number to the next higher value when the digit 5 or more. Example—6.16 → 6.2

(b) Round down : Round down means decreasing a number to the lower value when the digit is less than 5. Example—5.2 → 5.0

(c) Either rounding up or rounding down is okay : When estimating the population of a city for general conversation. For example, saying the population is about 17 lakh instead of the exact figure 16,96,694.

(d) When exact numbers are needed : Exact numbers are used when we need correct values. For example when making financial transactions like paying bills, depositing money in a bank, or calculating marks in an examination. Exact numbers are essential in these situations.

NCERT Exercise 1.6

1. (a) 3,87,69,957

Nearest Thousand : The hundreds digit is (9 > 5), so we round up.

3,87,69,957 rounded to nearest thousand = 3,87,70,000

Nearest Ten Thousand : The thousands digit is (9 > 5), so we round up. 3,87,69,957 rounded to nearest ten thousand = 3,87,70,000

Nearest Lakh : The ten thousands digit is (6 > 5), so we round up. 3,87,69,957 rounded to nearest lakh = 3,88,00,000

Nearest Ten Lakh : The lakhs digit is (7 > 5), so we round up.

3,87,69,957 rounded to nearest ten lakh = 3,90,00,000

Nearest Crore : The ten lakhs digit is (8 > 5), so we round up.

3,87,69,957 rounded to nearest crore = 4,00,00,000

(b) 29,05,32,481

Nearest Thousand : The hundreds digit is (4 < 5), so we round down.

29,05,32,481 rounded to nearest thousand = 29,05,32,000

Nearest Ten Thousand : The thousands digit is (2 < 5), so we round down.

29,05,32,481 rounded to nearest ten thousand = 29,05,30,000

Nearest Lakh : The ten thousands digit is (3 < 5), so we round down. 29,05,32,481 rounded to nearest lakh = 29,05,00,000

Nearest Ten Lakh : The lakhs digit is (5 = 5), so we round up.

29,05,32,481 rounded to nearest ten lakh = 29,10,00,000

Nearest Crore : The ten lakhs digit is (0 < 5), so we round down.

29,05,32,481 rounded to nearest crore = 29,00,00,000

2. For all five nearest neighbours to be 5,00,00,000, the number must round to 5,00,00,000 at every level (nearest thousand, ten thousand, lakh, ten lakh, and crore).

The most restrictive condition is rounding to the nearest thousand.

For a number to round to 5,00,00,000 at the nearest thousand, it must be in the range : 4,99,99,500 to 5,00,00,499

So, there are 1000 such number.

3. (a) 4,63,128 + 4,19,682

(i) Roxie's estimate : Rounding to nearest lakh : 5,00,000 + 4,00,000 = 9,00,000.

But Roxie says nearer to 8,00,000. Let us check.

4,63,128 is closer to 5,00,000 (difference = 36,872) than to 4,00,000 (difference = 63,128).

4,19,682 is closer to 4,00,000 (difference = 19,682) than to 5,00,000 (difference = 80,318).

So an estimate could be 5,00,000 4,00,000 = 9,00,000 (Estu's approach).

Or rounding to nearest ten thousand: 4,60,000 + 4,20,000 = 8,80,000 (closer to 9,00,000).

Both estimates are directionally correct (both say more than 8,00,000 and less than 9,00,000).

Estu's estimate is closer to the actual sum.

(ii) The sum will be greater than 8,50,000.

Reason : 4,63,128, 4,50,000 and 4,19,682 > 4,00,000

So, 4,63,128 + 4,19,682 > 4,50,000 + 4,00,000 = 8,50,000

Therefore, the sum is greater than 8,50,000.

(iii) The sum will be less than 8,83,128.
Reason : 8,83,128 = 4,63,128 + 4,20,000

But the second number is 4,19,682, which is less than 4,20,000.

So, 4,63,128 + 4,19,682 < 4,63,128 + 4,20,000 = 8,83,128

Therefore, the sum is less than 8,83,128.

(iv) 4,63,128 + 4,19,682 = 8,82,810

Exact value = 8,82,810

(b) 14,62,128 – 4,90,020

(i) Roxie's estimate : Rounding to nearest lakh : 15,00,000 – 5,00,000 10,00,000.

Roxie says the difference is nearer to 10,00,000 and less than 10,00,000. This is directionally correct.

Estu's estimate : The difference is nearer to 9,00,000 and more than 9,00,000. This is also directionally correct.

The actual difference is 9,73,108 (calculated below).

Distance from

10,00,000 = 10,00,000 – 9,73,108
= 26,892

Distance from

9,00,000 = 9,73,108 – 9,00,000
= 73,108

Since 26,892 < 73,108, the difference is closer to 10,00,000.

Roxie's estimate is closer to the actual difference.

(ii) The difference will be greater than 9,50,000.

Reason : 14,62,128 > 14,40,020 and 14,40,020 – 4,90,020 = 9,50,000

Since 14,62,128 > 14,40,020, we get 14,62,128 – 4,90,020 > 9,50,000.

Therefore, the difference is greater than 9,50,000.

(iii) The difference will be greater than 9,63,128.

Reason : 9,63,128
= 14,63,128 – 5,00,000

But 4,90,020 < 5,00,000, so subtracting a smaller number gives a larger result.

So, 14,63,128 – 4,90,020 > 14,63,128 – 5,00,000 = 9,63,128

Therefore, the difference is greater than 9,63,128.

(iv) 14,63,128 – 4,90,020 = 9,73,108

Exact value = 9,73,108

Practice Exercise 1.6

1. (a) In 7248, ones digit = 8

So, increase tens digit by 1 and replace ones digit by 0. This number is 7250.

(b) In 7248, tens digit = 4 < 5

So, replace tens and ones digits by 0.

This number is 7200.

(c) In 7248, hundreds digit = 2 < 5

So, replace hundreds, tens and ones digits by 0.

This number is 7000.

2. (a) In 69752, ones digit = 2 < 5

This number is 69750.

(b) In 69752, tens digit = 5 = 5

So, increase hundreds digit by 1 and replace digits on right by 0.

This number is 69800.

(c) In 69752, hundreds digit = 7 > 5
So, increase thousands digit by 1 and replace digits on right by 0.
This number is 70,000.

3. (a) Thousands digit = 3 < 5. Replace 3,809 by 0,000.
This number is 70,000.

(b) Thousands digit = 5 = 5. Increase ten thousands digit by 1.
This number is 3,26,000.

(c) Thousands digit = 2 < 5. Replace 2,437 by 0,000.
This number is 6,80,000.

4. (a) Ten thousands digit = 6 > 5. Increase lakhs digit by 1.
This number is 6,00,000.

(b) Ten thousands digit = 2 < 5. Keep lakhs digit same.
This number is 17,00,000.

(c) Ten thousands digit = 8 > 5. Increase lakhs digit by 1.
This number is 1,44,00,000.

5. (a) Lakhs digit = 2 < 5. Keep ten lakhs digit same.
This number is 40,00,000.

(b) Lakhs digit 9 > 5. Increase ten lakhs digit by 1.
This number is 70,00,000.

(c) Lakhs digit 1 < 5. Keep ten lakhs digit same.
This number is 52,90,00,000.

6. (a) Ten lakhs digit = 5 = 5. Increase crores digit by 1.
This number is 7,00,00,000.

(b) Ten lakhs digit = 0 < 5. Keep crores digit same.
This number is 12,00,00,000.

(c) Ten lakhs digit = 8 > 5. Increase crores digit by 1.
This number is 54,00,00,000.

7. (a) Rounding to nearest lakh (highest place value of smaller number):
1,48,935 -> 1,00,000
6,95,121 --> 7,00,000
Estimated sum = 1,00,000 + 7,00,000 = 8,00,000

(b) Rounding to nearest ten thousand :
3,24,218 --> 3,20,000
63,156 -> 60,000
Estimated difference = 3,20,000 – 60,000 = 2,60,000

(c) Rounding to nearest lakh :
5,70,051 --> 6,00,000
2,47,845 --> 2,00,000
Estimated sum = 6,00,000 + 2,00,000 = 8,00,000

(d) Rounding to nearest thousand :
65,356 -> 65,000
2,916 --> 3,000
25,782 -> 26,000
Estimated sum = 65,000 + 3,000 + 26,000 = 94,000

NCERT Exercise 1.7

1. From the table, the population of all cities has increased from 2001 to 2011. Large metropolitan cities show a higher increase compared to smaller cities.
Thus, final answer is the population of all cities increased between 2001 and 2011.

2. Suitable title : Population of Major Cities (2001 and 2011)
Thus, final answer is Population of Major Cities (2001 and 2011).

3. Population of Pune in 2001 ≈ 25 lakh
Population of Pune in 2011 ≈ 31 lakh
Increase
≈ 31 – 25 ≈ 6 lakh
Thus, final answer is about 6 lakh.

4. Bengaluru shows the largest increase in population between 2001 and 2011 (increase of 41,24,644).
Thus, final answer is Bengaluru.

5. Cities whose population has almost doubled include Bengaluru and Hyderabad.
Thus, final answer is Bengaluru and Hyderabad.

6. Population of Patna ≈ 17 lakh
Population of Mumbai ≈ 1 crore 20 lakh
Required multiplier
≈ 120 ÷ 17 ≈ 7
Thus, final answer is about 7 times.

NCERT Exercise 1.8

1. (i) $2 \times 1768 \times 50$

$= 1758 \times (2 \times 50)$

$= 1768 \times 100 = 176800$

(ii) 72×125

$= 72 \times \frac{1000}{8}$

$= 9 \times 1000$

$= 9{,}000$

(iii) $125 \times 40 \times 8 \times 25$

$= \frac{1000}{8} \times 40 \times 8 \times \frac{100}{4}$

$= 1000 \times 10 \times 100$

$= 10{,}00{,}000$

2. (a) 25×12

$= \frac{100}{4} \times 12 = 100 \times 3 = 300$

(b) 25×240

$= \frac{100}{4} \times 240 = 60 \times 100 = 6000$

(c) 250×120

$= \frac{1000}{4} \times 120 = 1000 \times 30 = 30{,}000$

(d) 2500×12

$= \frac{10{,}000}{4} \times 12$

$= 10{,}000 \times 3 = 30{,}000$

(e) $120 \times 10{,}00{,}000 = 12{,}00{,}00{,}000$

Practice Exercise 1.7

1. (a) $12 \times 768 \times 500$

$= 768 \times (12 \times 500)$

$= 768 \times 6000 = 46{,}08{,}000$

(b) 72×250

$= 72 \times \left(\frac{1000}{4}\right)$

$= \left(\frac{72}{4}\right) \times 1000$

$= 18 \times 1000 = 18{,}000$

(c) $225 \times 400 \times 80 \times 5$

$= 225 \times (400 \times 5) \times 80$

$= 225 \times 2000 \times 80$

$= 225 \times 1{,}60{,}000$

$= 3{,}60{,}00{,}000$

(d) $468 \times (22 \times 500)$

$= 468 \times 11{,}000 = 51{,}48{,}000$

(e) $48 \times \left(\frac{1000}{4}\right)$

$= \left(\frac{48}{4}\right) \times 1000$

$= 12 \times 1000 = 12{,}000$

(f) $125 \times 800 \times 20 \times 5$

$= (125 \times 8) \times 100 \times 100$

$= 1000 \times 10{,}000$

$= 1{,}00{,}00{,}000$

2. (a) $25 \times 32 = \left(\frac{100}{4}\right) \times 32$

$= \left(\frac{32}{4}\right) \times 100 = 8 \times 100 = 800$

(b) 2500×24

$= 25 \times 100 \times 24$

$= (25 \times 24) \times 100$

$= 600 \times 100 = 60{,}000$

(c) 45×12

$= 45 \times 10 + 45 \times 2 = 450 + 90 = 540$

(d) $45 \times 240 = (45 \times 24) \times 10$

$= 1080 \times 10 = 10{,}800$

(e) $450 \times 120 = 45 \times 10 \times 12 \times 10$

$= (45 \times 12) \times 10 \times 10$

$= 540 \times 100 = 54{,}000$

(f) 4500×12

$= 45 \times 100 \times 12 = 540 \times 100 = 54{,}000$

(g) $32{,}00{,}00{,}000 = 3200 \times 1{,}00{,}000$

or $32{,}000 \times 10{,}000 = 32{,}00{,}00{,}000$

(h) $5{,}76{,}00{,}000 = 576 \times 1{,}00{,}000$

or $5760 \times 10{,}000 = 5{,}76{,}00{,}000$

Class Work 1.10

1. (a) $11 \times 11 = 121$

$111 \times 111 = 12321$

$1111 \times 1111 = 1234321$

Pattern : The product forms a palindrome with digits going up to the number of 1s and then coming back down.

Extending : 11111×11111

$= 123454321$

$111111 \times 111111 = 12345654321$

(b) 66 × 61 = 4026

666 × 661 = 440226

6666 × 6661 = 44402226

Pattern : The product starts with increasing number of 4s, then 0 (or no zero), then 2s, and ends with 6.

Extending : 66666 × 66661

= 4444022226

(c) 3 × 5 = 15

33 × 35 = 1155

333 × 335 = 111555

Pattern : The product has equal number of 1s followed by equal number of 5s.

Extending : 3333 × 3335 = 11115555

33333 x 33335 = 1111155555

(d) 101 × 101 = 10201

102 × 102 = 10404

103 × 103 = 10609

Pattern : The product follows the pattern 1-ab-01, 1-ab-04, 1-ab-09 where the last two digits are perfect squares (01, 04, 09, 16, 25...) and middle digits increase.

Extending : 104 × 104 = 10816

105 × 105 = 11025

2. When we multiply a m-digit number by a n-digit number :

The product has either (m + n - 1) digits or (m + n) digits.

For example :

2-digits x 2-digits = 3-digits or 4-digits

3-digits x 3-digits = 5-digits or 6-digits

3. The smallest product of two 2-digits numbers = 10 × 10 = 100 (3 digits)

The largest product of 2-digit numbers = 99 × 99 = 9801 (4 digits)

So, the product always has 3 or 4 digits. We do not need to try all multiplications. We only need to check the smallest and largest cases.

4. The smallest product of two 3-digits numbers = 100 × 100 = 10,000 (5 digits)

Since the smallest possible product itself is a 5-digits number, so, we can never get a 4-digits number.

5. The smallest product = 1000 × 10 = 10,000 (5 digits)

Since, the smallest possible product is a 5-digits number, yes it is possible.

6. 1-digit × 1-digit = 1-digit or 2-digits

2-digit × 1-digit = 2-digits or 3-digits

2-digits × 2-digits = 3-digits or 4-digits

3-digits × 3-digits = 5-digits or 6-digits

5-digits × 5-digits = 9-digits or 10-digits

8-digits × 3-digits = 10-digits or 11-digits

12-digits × 13-digits = 24-digits or 25-digits

NCERT Exercise 1.9

1. The distance between the Earth and the Sun

= 14,70,00,000 km

Total distance covered in 1 day = 1000 km

∴ Total number of days required to reach the Sun

$= \frac{14,70,00,000}{1000}$ = 1,47,000 days

2. (a) Number of sheets = 1 lakh = 1,00,000

Weight of each sheet = 5 grams

Total weight = 1,00,000 × 5

= 5,00,000 grams

Converting to kg: $\frac{5,00,000}{1000}$ = 500 kg

A person cannot lift 500 kg. Therefore, it is not possible to lift 1 lakh sheets of paper at the same time.

(b) Babies born per minute = 250

Minutes in 1 day = 60 × 24

= 1,440 minutes

Total babies born in 1 day

= 250 × 1,440

= 3,60,000

1 million = 10,00,000

Since 3,60,000 < 10,00,000, the answer is no—a million babies will not be born in a day.

(c) Coins to count = 1 million = 10,00,000

Rate of counting 1 coin per second

Time needed = 10,00,000 seconds

Seconds in 1 day = 60 × 60 × 24

= 86,400 seconds

Since, 10,00,000 > 86,400, the answer is no - you can not count 1 million coins in a single day.

3. Do yourself.

4. (i) Largest multiple of 5, with given conditions 9876543210

(ii) Smallest even number with given conditions 1023456798

5. 77,77,777

Seventy-Seven lakh Seventy-Seven thousand Seven hundred-seventy seven.

60 letters.

6. For exchanging any two digits to result in a bigger number, the original number must already be arranged so that it is the smallest possible arrangement of those digits.

Step 1: We use digits 1 through 9 (each used exactly once).

Step 2: The number with digits arranged in descending order is 9, 8, 7, 6, 5, 4, 3, 2, 1.

Step 3: In this number, if any two digits are swapped, a smaller digit moves to a higher place value, making the number smaller.

Step 4: Therefore, the required 9-digit number is 98,76,54,321.

The number 98,76,54,321 is the only such 9-digit number.

Answer: 98,76,54,321 only such number exists.

7. The original number has 20 digits. We strike out 10 digits, leaving 10 digits.

Strategy: To get the largest possible number, we use a greedy method-select the largest digit possible for each position from left to right.

Originalnumber:12345123451234512345

We need to keep 10 digits. At each step, we choose the largest digit from the allowable window:

Position 1: Choose max from digits 1-11 (window of 11). Max = 5 (at position 5).

Crossed out: 1,2,3,4 (4 digits struck). Remaining to strike: 6

Position 2: From position 6 onward, window of 7. Digits: 1,2,3,4,5,1,2. Max = 5 (pos 10).

Crossed out: 1,2,3,4 (4 more digits struck). Remaining to strike: 2

Position 3: From position 11 onward, window of 3. Digits: 1,2,3. Max = 3 (pos 13).

Crossed out: 1,2 (2 more struck). Total struck = 10.

Remaining digits from position 13 onwards: 3,4,5,1,2,3,4,5

Full remaining number: 5, 5, 3, 4, 5, 1, 2, 3, 4, 5 = 5534512345

8. We systematically check each pair of consecutive number-words for shared letters:

Pair	Letters in First Word	Letters in Second Word	Shared Letter(s)
zero/one	z,e,r,o	o,n,e	e, o
one/two	o,n,e	t,w,o	o
two/three	t,w,o	t,h,r,e,e	t
three/four	t,h,r,e,e	f,o,u,r	r
four/five	f,o,u,r	f,i,v,e	f
five/six	f,i,v,e	s,i,x	i
six/seven	s,i,x	s,e,v,e,n	s
seven/eight	s,e,v,e,n	e.i.g.h,t	e
eight/nine	e,i,g,h,t	n,i,n,e	i, e
nine/ten	n,i,n,e	t,e,n	n, e
ten/eleven	t,e,n	e,l,e,v,e,n	e, n
...	...	...	All pairs share at least one letter

Observation: Every pair of consecutive numbers (zero-one, one-two, two-three, ...) shares at least one common English letter. This pattern continues without end.

So, there are no two consecutive numbers that do not share an English letter in common.

9. Setting up the count of digits:

1-digit numbers (1 to 9): 9 numbers × 1 digit = 9 digits total

2-digit numbers (10 to 99): 90 numbers × 2 digits = 180 digits | Running total: 189

3-digit numbers (100 to 999): 900 numbers × 3 digits = 2700 digits | Running total: 2889

4-digit numbers (1000 to 9999): 9000 numbers × 4 digits = 36000 digits | Running total: 38,889

5-digit numbers (10000 to 99999): 90000 numbers × 5 digits = 4,50,000 digits & Running total: 4,88,889

6-digit numbers (1,00,000 onwards): 6 digits each

(a) Finding the 1000th digit:

After 1-digit numbers: 9 digits used.

After 2-digit numbers: 9 + 180 = 189 digits used.

Remaining digits needed to reach 1000th: 1000-189 = 811 digits Into 3-digit numbers,

Number of complete 3-digit numbers:

$\frac{811}{3}$ = 270 with remainder 1.

So the 1000th digit falls in the 271st three-digit number.

271st three-digit number

= 100 + 271 – 1 = 370.

Since remainder = 1, the 1000th digit is the first digit of 370.

(b) Finding which number contains the millionth digit:

Digits used through 5-digit numbers = 4,88,889.

Remaining: 10,00,000 – 4,88,889 = 5,11,111 digits into 6-digit numbers.

Number of complete 6-digit numbers:

$\frac{5,11,111}{6}$ = 85,185 remainder 1.

The millionth digit falls in the 85,186th six-digit number.

85,186th six-digit number

1,00,000 + 85,186 –1 = 1,85,185.

(c) Finding when '5' is written for the 5000th time:

Count of digit '5' in 1-digit numbers (1-9): 1 occurrence (Just '5').

Count of '5' in 2-digit numbers (10-99):

Tens place: 50-59 = 10 occurrences

Units place: 15,25,35,45,55,65,75,85,95 = 9 occurrences. Total = 19. Cumulative: 20.

Count of '5' in 3-digit numbers (100 – 999):

Each place can have '5': 100 In hundreds place + 100 in tens place + 100 in units place = 280. (Note: 555 Is counted 3 times.) Cumulative: 300.

Count of '5' in 4-digit numbers (1000 – 9999): 1000 per digit place × 4 = 3400 (with overlaps). Total = 3,700. Cumulative: 4,000.

We still need 5,000 – 4,000 = 1,000 more '5's from 5-digit numbers.

In 5-digit numbers, each group of 10,000 numbers contains about 5,000 digit '5's. Working through systematically, the 5000th '5' occurs at:

So, the digit '5' in written for the 5000th time at the number 13,995.

10. (i) Given, 20,800

20,800 = 2 × (+10,000) + 8 × (+100)
= 20,000 + 800
= 20,800

(ii) Given, 92,100

92,100 = 9 × (+10,000) + 21 × (+100)
= 90,000 + 2,100
= 92,100

(iii) Given, 1,20,500

1,20,500 = 12 × (+10,000) + 5 × (+100)
1,20,000 + 500 = 1,20,500

(iv) Given, 65,30,000

65,30,000 = 653 × (+10,000)
= 65,30,000

(v) Given, 70,25,700 = 702 × (+10,000) + 57 × (+100)
= 70,20,000 + 57,000
= 70,25,700

11. 1 Lakh = 1,00,000
1 billion = 1,000,000,000

$\therefore$ No. of Lakh = $\frac{1,000,000,000}{1,00,000}$

Thus, 10,000 Lakh make a billion.

12. (a) To find the largest sum:

Fill the given blank spaces with numbers from 1 to 9 in descending order = 9 8 7 6 5 4 3

Then fill the lower blank spaces with numbers from 1 to 9 in descending order = 9 8 7 6 5

Now add them,

$$\begin{array}{r} 9\,8\,7\,6\,5\,4\,3 \\ +\quad 9\,8\,7\,6\,5 \\ \hline 9\,9\,7\,5\,3\,0\,8 \end{array}$$

(b) To find the smallest possible difference of the two resulting numbers :

Fill the given blank spaces with numbers from 1 to 9 in ascending order = 1 2 3 4 5 6 7

Then fill the lower blank spaces with numbers from 1 to 9 in descending order = 9 8 7 6 5

Now subtract them,

$$\begin{array}{r} 1\,2\,3\,4\,5\,6\,7 \\ -\quad 9\,8\,7\,6\,5 \\ \hline 1\,1\,3\,5\,8\,0\,2 \end{array}$$

13. (a) Target: 1,10,000

Expression from toxtbook: 4000 × (20 + 5) + 13000
= 4000 × 25+ 13000
= 1,00,000 + 13,000
= 1,13,000 (Closest possible to 1,10,000)

(b) Target: 2,00,000
Expression: 1,50,000 + 70,000 – 4000 × 5
= 1,50,000 + 70,000 – 20,000
= 2,20,000 – 20,000
= 2,00,000 (Exact match)

(c) Target: 5,80,000
Expression: 70,000 × 5 + 1,50,000 + 4000 × 20
= 3,50,000 + 1,50,000 + 80,000
= 5,80,000 (Exact match)

(d) Target: 12,45,000
Expression: 70,000 × 20 – 1,50,000 – 4000 – 300 × 5
= 14,00,000 – 1,50,000 – 4,000 – 1,500
= 14,00,000 – 1,55,500
= 12,44,500 (Closest possible to 12,45,000)

(e) Target: 20,90,800
Expression: 13,000 × 300 – 70,000 × (20 + 5) – 1,50,000 + 4000
= 39,00,000 – 17,50,000 – 1,50,000 + 4,000
= 39,00,000 –19,00,000 + 4,000
= 20,00,000 + 4,000
= 20,04,000 (Closest possible to 20,90,800)

14. The height of statue of unity = 180 metres
= 180 × 100 [$\because$ 1 m = 1000 mm)
= 180,000 mm

Thickness of 1 coin = 1 mm

No. of coins required = $\frac{180,000}{1}$
= 180,000 coins

15. Distance covered by albatrosses in 1 day
= 900 km/day (min.)
= 1000 km/day (max.)

Distance covered in longest single trip
= 12,000 km.

Estimated number of days at 900 km/day
= $\frac{12,000}{900}$
= 13.33 days (approx.)

Estimated number of days at 1000 km/day
= $\frac{12,000}{1000}$ = 12 days

Answer is Approximately 12-13
13 days

16. Distance covered in 11 days = 13,560 km

$\therefore$ Distance covered in 1 day
= $\frac{13,560}{11}$ km
= 1,232.73 km

In 1 day = 24 hrs.

∴ Total distance covered in 1 hr

$$= \frac{1,232.73}{24} = 51.36 \text{ km}$$

17. Bald eagles are known to fly as high as 4500 – 6000 m above the ground level.

Height of Somu's building = 40 m.

Compare = $\frac{4500}{40}$ and $\frac{6000}{40}$

= 112.5 = 150 m

Thus, bald eagles fly 112.5 to 150 times higher than Somu's building.

Again, height of Mount Everest = 8850 m

Height of Somu's building = 40 m

Compare = $\frac{8850}{40}$ = 221.25 m

∴ Mount Everest is 221.25 times taller than Somu's building.

Again, aeroplanes can fly as high as 10,000 – 12,800 m and height of Somu's building = 40 m.

Compare = $\frac{10,000}{40}$ and $\frac{12,800}{40}$

= 250 m = 320 m

∴ Aeroplanes fly 250 to 320 times higher than Somu's building.

Practice Exercise 1.8

1. (a) For a number to be a multiple of 8, the last 3 digits must be divisible by 8.

Start with the largest digits: 9, 8, 7, 6, 5, 4, 3....

We need the last 3 digits from remaining digits to form a number divisible by 8.

Number is 9876543120 → last 3 digits = 120, $\frac{120}{8}$ = 15. Divisible!

(b) For the largest even number, place the largest digits first and end with the smallest even digit.

Digits in descending order: 9, 8, 7, 6, 5, 4, 3, 2, 1, 0

End with 0 (smallest even digit) to keep the number as large as possible.

The largest even number is 9876543210.

(c) For the largest odd number, place the largest digits first and end with the smallest odd digit.

End with 1 (smallest odd digit) to keep the rest as large as possible.

The largest odd number is 9876543201

2. We need to use words with the most letters. "Seventy" (7 letters), "seven" (5 letters), "thousand" (8 letters), "hundred" (7 letters) are long words.

A good candidate: 77,77,777

= Seventy-seven lakh seventy-seven thousand seven hundred seventy-seven

This has a very high letter count.

3. If exchanging any two digits results in a bigger number, then the digits must be arranged in ascending order from left to right.

The smallest 7-digit number with digits in ascending order is: 10,23,456 (but digits must be strictly ascending for any swap to increase).

Actually, the digits must be in non-decreasing (ascending) order.

The number with digits in strictly ascending order where any swap makes it bigger :

Example : 10,23,456 -- all digits are in ascending order.

But the simplest answer : 10,00,000 (any swap would give a larger number).

4. (a) 29,200 = 2 × 10,000 + 92 × 100.

Button clicks = 2 presses of +10,000 and 92 presses of +100

(b) 72,500 = 7 × 10,000 + 25 × 100

(c) 11,28,100 = 112 × 10,000 + 81 × 100

(d) 35,80,900 = 358 × 10,000 + 9 × 100

(e) 78,35,700 = 783 × 10,000 + 57 × 100

5. 1 million = 10,00,000

1 thousand = 1,000

Number of thousands = $\frac{10,00,00}{1,000}$ = 1,000

6. (a) To get the largest sum, make both numbers as large as possible.

Arrange largest digits at the highest place values...

First number: 654 (using 6, 5, 4 from set 1) Second number: 321 (using 3, 2,

1 from set 1) - No, we have two sets.

With two sets of 1-6, for largest sum of two 6-digit numbers:

First number: 654321, Second number: 654321

Sum = 654321 + 654321 = 13,08,642

(b) To get the smallest difference, make both numbers as close as possible.

Using two identical sets 1-6 :

If both numbers are 654321, difference = 0. But if we need distinct numbers, rearrange to get closest values.

For example: 654321-123456

= 530865

Chapter Innings

A. Multiple Choice Questions

1. (a) **2.** (c) **3.** (b) **4.** (a) **5.** (d)

B. Fill in the Blanks

1. 100 **2.** 10 million **3.** 600 **4.** 1023

5. 10

C. Match the Following:

1. (b) **2.** (a) **3.** (e) **4.** (c) **5.** (d)

D. True or False

1. F **2.** T **3.** T **4.** F **5.** F

E. Very Short Answer Type Questions

1. 8,23,49,161: lakhs digit 3 < 5, so round down.

Rounded value = 8,20,00,000

2. Fifty-nine billion = 59,000,000,000·

One hundred thirty million = 130,000,000

Six hundred six thousand = 606,000

Nine hundred = 900

Total = 59,000,000,000 + 130,000,000 + 606,000 + 900 = 59,130,606,900

3. 9,00,00,000 + 40,00,000 + 20,000 + 8,000 + 600 + 7 = 9,40,28,607

4. 26,40,35,000—Place value chart:

2 - Ten Crores, 6 - Crores, 4 -Ten Lakhs, 0 - Lakhs, 3 - Ten Thousands, 5 - Thousands, 0 - Hundreds, 0 - Tens, 0 - ones

The digit 6 is at the Crores place, which belongs to the Crores period.

Answer: Crores period.

5. For a number to round to 58,200 (nearest hundred):

The number must be from 58,150 to 58,249.

Least number = 58,150

Greatest number = 58,249

F. Short Answer Type Questions

1. Total distance = 56,789 + 67,890

= 1,24,679 km

Rounding 1,24,679 to nearest thousand: hundreds digit = 6 > = 5, round up.

= 1,25,000 km

2. 3.27 crore = 3,27,00,000 rupees

In American system:

3,27,00,000 = 32,700,000

= Thirty-two million seven hundred thousand rupees

3. Days in 100 years = 365 × 100 = 36,500

Varieties tasted = 4 × 36,500 = 1,46,000

1,46,000 > 1,00,000

4. Height of monument = 150 metres = 150 × 1000 mm = 1,50,000 mm

Thickness of each coin = 2 mm

Number of coins = $\frac{1,50,000}{2}$ = 75,000

5. Height of person = 2 metres

Height of building = 4 × 2 = 8 metres

Height of waterfall = 400 metres

Difference = 400 – 8 = 392 metres

G. Long Answer Type Questions

1. Distance travelled per day = 200 km

Days in 8 years = 8 × 365

= 2,920 days

Total distance in 8 years = 200 × 2,920

= 5,84,000 km

Distance to planet = 5,00,000 km

Since 5,84,000 > 5,00,000

2. Using place value (fewest clicks):

6083 = 6 × 1000 + 0 × 100 + 8 × 10 + 3 × 1

Button clicks = 6 + 0 + 8 + 3 = 17 clicks

Expression: (6 × 1000) + (8 × 10) + (3 × 1)

Ans: Yes, (6 × 1000) + (8 × 10) + (3 + 1) = 6083, using only 17 buttons clicks.

3. Number: 59,37,02,164

(a) Nearest ten:
Ones digit = 4 < 5, round down.
Ans: 59,37,02,160

(b) Nearest hundred:
Tens digit, 6 > 5, round up.
Ans: 59,37,02,200

(c) Nearest thousand:
Hundreds digit, 1 < 5, round down.
Ans: 59,37,02,000

(d) Nearest ten thousand:
Thousands digit, 2 < 5, round down.
Ans: 59,37,00,000

(e) Nearest lakh:
Ten thousands digit = 0 < 5,
round down.
Ans: 59,37,00,000

(f) Nearest ten lakh:
Lakhs digit, 7 > 5, round up.
Ans: 59,40,00,000

(g) Nearest crore:
Ten lakhs digit = 3 < 5, round down.
Ans: 59,00,00,000

4. We have 6 digits: 1, 2, 5, 7, 8, 9 and need an 8-digit number. One digits must repeat. For smallest 8-digit number: place smallest digits at highest places, repeat smallest. Smallest number = 1,11,25,789

Standard form: 1,11,25,789

Expanded form:

1,00,00,000 + 10,00,000 + 1,00,000 + 20,000 + 5,000 + 700 + 80 + 9

In American system: 11,125,789

In words: Eleven million one hundred twenty-five thousand seven hundred eighty- nine.

5. (a) $7 \times 2 = 14$
$77 \times 2 = 154$
$777 \times 2 = 1554$
$7777 \times 2 = 15554$
$77777 \times 2 = 155554$
$777777 \times 2 = 1555554$
Pattern: The product starts with 1, followed by increasing number of 5s, ending with 4.

(b) $33 \times 31 = 1023$
$333 \times 331 = 110223$
$3333 \times 3331 = 11102223$
$33333 \times 33331 = 1111022223$
Pattern: The product has increasing 1s, then 0, then increasing 2s, ending with 3.

H. Assertion-Reason Based Questions

1. (C) **2.** (A) **3.** (A) **4.** (A) **5.** (A)

I. Case Study

1. (c) **2.** (b) **3.** (c) **4.** (a)

2. Arithmetic Expressions

Class Work 2.1

1. Let us choose the favourite number as 12. Different expressions having the value 12:

(i) $7 + 5 = 12$ (ii) $20 - 8 = 12$
(iii) $3 \times 4 = 12$ (iv) $\frac{24}{2} = 12$
(v) $6 + 6 = 12$ (vi) $2 \times 6 = 12$.
(vii) $\frac{36}{3} = 12$ (viii) $15 - 3 = 12$

NCERT Exercise 2.1

1. (i) $13 + 4 = 11 + 6$
(ii) $22 + 8 = 6 \times 5$
(iii) $8 \times 4 = 64 \div 2$
(iv) $34 - 9 = 25$

2. (a) $67 - 19 = 48$
(b) $67 - 20 = 47$
(c) $35 + 25 = 60$
(d) $5 \times 11 = 55$
(e) $120 \div 3 = 40$
From the above, ascending order (e) < (b) < (a) < (d) < (c)

3. (a) $245 + 289 = 534$
and $246 + 285 = 531$
$\because$ $534 > 531$
$\therefore$ $245 + 289 > 246 + 285$

(b) $273 - 145 = 128$
and $272 - 144 = 128$
$\because$ $128 = 128$
$\therefore$ $273 - 145 = 272 - 144$

(c) $364 + 587 = 951$
$363 + 589 = 952$
$\because$ $952 > 951$
$\therefore$ $364 + 587 < 363 + 589$

(d) $124 + 245 = 369$

$129 + 245 = 374$

$\because \quad 369 < 374$

$\therefore \quad 124 + 245 < 129 + 245$

(e) $213 - 77 = 136$

$214 - 76 = 138$

$\because \quad 136 < 138$

$\therefore \quad 213 - 77 < 214 - 76$

Practice Exercise 2.1

1. (a) LHS: $15 + 6 = 21$

RHS: ..... $+7 = 21$

So, ... $= 21 - 7 = 14$

(b) RHS: $5 \times 8 = 40$

LHS: $38 +$ ..... $= 40$

So, ... $= 40 - 38 = 2$

(c) RHS: $\frac{72}{2} = 36$

LHS: $9 \times$ ..... $= 36$

So, ... $= \frac{36}{9} = 4$

(d) $43 -$ ..... $= 29$

So, ... $= 43 - 29 = 14$

2. (a) $77 - 36 = 41$

(b) $63 - 25 = 38$

(c) $24 + 37 = 61$

(d) $6 \times 11 = 66$

(e) $\frac{140}{5} = 28$

(f) $\frac{152}{4} = 38$

Ascending order: (e) < (b) = (f) < (a) < (c) < (d)

3. (a) LHS: $212 - 23 = 189$

RHS: $314 - 201 = 113$

Since $189 > 113$

(b) LHS: $347 + 48 = 395$

RHS: $263 + 67 = 330$

Since $395 > 330$

(c) LHS: $576 + 31 = 607$

RHS: $610 - 178 = 432$

Since $607 > 432$

(d) LHS: $165 - 40 = 125$

RHS: $346 - 198 = 148$

Since $125 < 148$

Class Work 2.2

(i) Expression as sum of its terms:

$4 + 15 + (= 9)$

Terms: 4, 15, –9

Value $= 4 + 15 - 9 = 10$

(ii) First evaluate: $2 \times 4 = 8$

Expression as sum of its terms:

$23 + (-2 \times 4) + 16 = 23 + (-8) + 16$

Terms: 23, -2×4 (i.e., – 8), 16

Value $= 23 - 8 + 16 = 31$

(iii) Expression as sum of its terms:

$28 + 19 + (-8)$

Terms: 28, 19, –8

Value $= 28 + 19 - 8 = 39$

Class Work 2.3

From the example: Each dosa costs Rs 25, and the tip is Rs 5.

If 7 friends order dosas:

Cost of 7 dosas $= 7 \times 25$

Total amount with tip $= 7 \times 25 + 5$

Expression: $7 \times 25 + 5$

Terms: 7×25 and 5

Evaluating: $7 \times 25 + 5 = 175 + 5 = 180$

Class Work 2.4

For each of the cases below, write the expression and identify its terms:

1. (i) Total students playing = 33

Group size = 4

Number of complete groups $= \frac{33}{4} = 8$ groups (with 1 left over)

Expression Ruby writes: $8 \times 4 + 1$

Terms: 8×4, 1

(ii) Total students playing = 33

Group size = 7

Number of complete groups $= \frac{33}{7} = 4$ groups (with 5 left over)

Expression Ruby writes: $4 \times 7 + 5$

Terms: 4×7, 5

2. Let the class size = 40 students (example).

If the teacher calls out '6':

$\frac{40}{6} = 6$ groups with 4 left over

Expression: $6 \times 6 + 4$

Terms: 6×6, 4

Class Work 2.5

1. Expression 1: 534 = 5 × 100 + 1 × 20 + 1 × 10 + 4 × 1

Terms: 5 × 100, 1 × 20, 1 × 10, 4 × 1

Expression 2: 534 = 10 × 50 + 1 × 10 + 4 × 5 + 4 × 1

Terms: 10 × 50, 1 × 10, 4 × 5, 4 × 1

2. Way 1: 432 = 4 × 100 + 1 × 20 + 1 × 10 + 2 × 1

(4 notes of Rs 100 + 1 note of Rs 20 + 1 note of Rs 10 + 2 coins of Rs 1)

Way 2: 432 = 2 × 100 + 4 × 50 + 3 × 10 + 2 × 1

(2 notes of Rs 100 + 4 notes of Rs 50 +3 notes of Rs 10 + 2 coins of Rs 1)

Way 3: 432 = 8 × 50 + 1 × 20 + 1 × 10 + 2 × 1

(8 notes of Rs 50 + 1 note of Rs 20 + 1 note of Rs 10 + 2 coins of Rs 1)

NCERT Exercise 2.2

1. (a) Given, 28 – 7 + 8

= 28 + 1 = 29

(b) Given, 39 – 2 × 6 + 11

= 39 – 12 + 11

= 39 – 1 = 38

(c) Given, 40 – 10 + 10 + 10

= 40 + 10 = 50

(d) Given, 48 – 10 × 2 + 16 ÷ 2

= 48 – 10 × 2 + 16 ÷ 2

= 48 – 20 + 8

= 28 + 8 = 36

(e) Given, 6 × 3 – 4 × 8 × 5

= 18 – 160 = –142

2. (a) Lalit purchased a book costing ₹89 and a pen of cost ₹21.

The total cost before discount is :

89 + 21 = 110

After a discount of ₹10, the amount he paid is :

110 – 10 = 100

So, Lalit paid ₹100.

(b) Miku purchased 5 chocolates, and each chocolate costs ₹12.

The cost before the discount is :

5 × 12 = 60

After a discount of ₹5 on the purchase of 5 chocolates, the amount he paid is :

60 – 5 = 55

So, Miku paid ₹55.

(c) For the total plants in the two gardens :

In Rohit's garden, the number of plants is :

4 × 9 = 36

In Raman's garden, the number of plants is :

2 × 6 =12

The total number of plants in both gardens is :

36 + 12 = 48

So, there are 48 plants in total in two gardens.

3. (a) (i) No. of gold coins given by queen Alia to Princess Elsa = 100 according to question,

Princess Elsa doubled her coins

So now she has 2 × 100 coins

No. of gold coins given by queen Alia to Princess Anna = 100

According to question, Princess Anna spent half coins on jewellery

∴ Princess Anna has 100 ÷ 2 coins.

So, total gold coins, both princess have

(2 × 100) + (100 ÷ 2)

= 200 + 50 = 250

Thus, they together have 250 gold coins.

(ii) Cost of 1 adult ticket = ₹40

Cost of 1 child ticket = ₹20

(b) (i) Cost of 4 adult tickets ₹(4 × 40)

and Cost of 3 child tickets = ₹(3 × 20)

Total cost by mathematical expression is

(4 × 40) + (3 × 20)

= 160 + 60 = 220

(ii) Cost of 3 adults tickets = ₹(3 × 40)

There are two groups having 3 adults each.

So, total cost = ₹2 × (3 × 40)

= ₹2 × 120 = ₹240

(c) Given,

Border's height = 3 cm

Grill's height = 2 cm

Gap's height = 5 cm

The window has 6 grills and 7 gaps.

The top and bottom borders are also there

Thus, required expression is

$2 \times 3 + 6 \times 2 + 7 \times 5$

$= 6 + 12 + 35 = 53$ cm.

Hence, total length of the window = 53 cm.

Practice Exercise 2.2

1. (a) Terms: 35, 12, –19

$= 35 + 12 - 19$

$= 47 - 19 = 28$

(b) Terms: 44, –25, 8

$= 44 - 25 + 8$

$= 19 + 8 = 27$

(c) Terms: 41, $-(3 \times 7)$, 14

First, evaluate multiplication: $3 \times 7 = 21$

$= 41 - 21 + 14$

$= 20 + 14 = 34$

(d) Terms: 50, –20, 20, 2×20

First, evaluate multiplication:

$2 \times 20 = 40$

$= 50 - 20 + 20 + 40$

$= 30 + 20 + 40 = 90$

(e) Terms: $53, -(15 \times 2), \frac{18}{6}$

First, evaluate multiplication and division:

$15 \times 2 = 30$ and $\frac{18}{6} = 3$

$= 53 - 30 + 3$

$= 23 + 3 = 26$

(f) Terms: $7 \times 9, -(5 \times 4 \times 6)$

First, evaluate multiplications:

$7 \times 9 = 63$ and $5 \times 4 \times 6 = 120$

$= 63 - 120 = -57$

2. (a) Story: Ravi had 65 marbles. His friend gave him 31 more marbles. Later, Ravi gave 20 marbles to his brother. How many marbles does Ravi have now?

Value = $65 + 31 - 20 = 96 - 20 = 76$

(b) Story: A shopkeeper had 4 boxes of pencils. with 13 pencils in each box. He sold 9 pencils. How many pencils are left?

Value = $4 \times 13 - 9 = 52 - 9 = 43$

(c) Story: A bakery made 5 trays of cookies with 8 cookies on each tray, and 3 trays of biscuits with 6 biscuits on each tray. Find the total items baked.

Value = $5 \times 8 + 3 \times 6 = 40 + 18 = 58$

(d) Story: Sita already had 7 chocolates. She received a box of 36 chocolates which she shared equally among 6 friends. How many chocolates does each friend get along with Sita's share?

Value = $7 + \frac{36}{6} = 7 + 6 = 13$

3. (a) After 3 years, each kid's age increases by 3.

Since there are 3 kids, total increase = $3 \times 3 = 9$ years

Expression: $27 + 3 \times 3$

Terms: $27, 3 \times 3$

Value = $27 + 9 = 36$

(b) Number of days in two weeks = 14

Expression: 12×14

Terms: 12×14

Value = $12 \times 14 = 168$

(c) Expression: $19 + 23 - 15$

Terms: 19, 23, –15

Value = $19 + 23 - 15 = 42 - 15 = 27$

NCERT Exercise 2.3

1.

(53) + (–16) = (37)	(53) + (–16) + (37)	(–87) + (–16) = (–103)
(54) + (–16) = (38) 54 is one more than 53, so the value will be 1 more than 37.	(52) + (–16) = (36) 52 is one less than 53, so the value will be 1 less than 37.	(–88) + (–15) = (–103) (–88) is one less than (–87) and (–15) is one more than (–16). Since, (–1) + 1 = 0 the value stays the same : –103.

		(–86) + (–18) = (–104) (–86) is one more than (–87) and (–18) is two less than (-16). Since, (+1) + (–2) = (– 1) the value becomes 1 less than (–103), i.e., 104.
(53) + (–15) = (38) (-15) is one more than (-16), so the value will be 1 more than 37.	(53) + (–17) = (36) (–17) is one less than –16, so the value will be 1 less than 37.	(–97) + (–26) = (–123) (–97)is 10 less than (–87) and -26 is 10 less than (–16). Since,(–10)+(–10)=–20, the value becomes 20 less than (–103), i.e., –123.

2. (a) $24 + (6 - 4) = 24 + 6 \boxed{-} 4$

(b) $38 + (9 \boxed{-} 4) = 38 + 9 - 4$

(c) $24 - (6 + 4) = 24 \square 6 - 4$

(d) $24 - 6 - 4 = 24 - 6 \square 4$

(e) $27 - (8 + 3) = 27 \square 8 \square 3$

(f) $27 - (8 \square 3) = 27 - 8 + 3$

3. Rule applied: '+' before bracket → signs unchanged; '–' before bracket → signs of all terms inside the bracket are reversed.

(a) Bracket preceded by +, so signs stay the same.

$14 + 12 + 10$

(b) Bracket preceded by -, so signs of +12 and +10 change to –12 and –10.

$14 - 12 - 10$

(c) Bracket preceded by +, so signs stay the same.

$14 + 12 - 10$

(d) Bracket preceded by –, so signs change: + 12 becomes –12, and –10 becomes + 10.

$14 - 12 + 10$

(e) There are no brackets to remove. The expression is already in simplest form.

$-14 + 12 - 10$

(f) Bracket preceded by –, so signs change: –12 becomes +12, and –10 becomes +10.

$14 + 12 + 10$

4. (a) $(6 + 10) - 2$ and $6 + (10 - 2)$

Guess: Both expressions have the same terms 6, 10, and –2. By the associative property, grouping does not change the sum, so they should be equal.

Evaluate Expression 1: $(6 + 10) - 2 = 16 - 2 = 14$

Evaluate Expression 2: $6 + (10 - 2) = 6 + 8 = 14$

Both = 14. The two expressions are equal.

(b) $16 - (8 - 3)$ and $(16 - 8) - 3$

Guess: These may not be equal because the bracket position changes what is subtracted.

Evaluate Expression 1: $16 - (8 - 3) = 16 - 5 = 11$

Evaluate Expression 2: $(16 - 8) - 3 = 8 - 3 = 5$

$11 \neq 5$. The two expressions are not equal.

(c) $27 - (18 + 4)$ and $27 + (-18 - 4)$

Evaluate Expression 1: $27 - (18 + 4) = 27 - 22 = 5$

Evaluate Expression 2: $27 + (-18 - 4) = 27 - 18 - 4 = 5$

Both = 5. The two expressions are equal.

5. (a) $319 + 537$, $319 - 537$, $-537 + 319$, $537 - 319$

Analysis (without calculating):

$319 + 537$: terms are +319 and +537. Sum is a large positive number.

$319 - 537$: terms are +319 and –537. This is negative.

$-537 + 319$: terms are –537 and +319. Same terms as $319 - 537$ but written in a different order.

By the Commutative Property, $-537 + 319 - 319 - 537$.

$537 - 319$: terms are +537 and –319. This is positive, but different from $319 + 537$.

Answer : $319 - 537$ and $-537 + 319$ have the same value.

(b) $87 + 46 - 109$, $87 + 46 - 109$, $87 + 46 - 109$, $87 - 46 + 109$, $87 - (46 + 109)$, $(87 - 46) + 109$

Analysis (without calculating):

Group 1: The first three expressions are identical: $87 + 46 - 109$. All have the same terms (+87, + 46, –109). All three have the same value.

Group 2: $87 - 46 + 109$ has terms +87, –46, +109.

$(87 - 46) + 109 = 87 - 46 + 109$ (bracket preceded by +, so signs unchanged). Same terms → same value.

Group 3: $87 - (46 + 109) = 87 - 46 - 109$ (bracket preceded by –, signs change). Different terms, so different value.

Answer the three expressions '87 + 46 – 109' have the same value.

6. (a) $34 - 9 - 12 = 13$

Without brackets: $34 - 9 - 12 = 25 - 12 = 13$. Wait, let us check:

34 – 9 – 12 = 13. This is already 13! But that means standard evaluation gives 13.

The question requires us to add brackets. We need: 34 – (9 + 12) = 34 – 21 = 13.

Verify: 34 – (9 + 12) = 34 – 21 = 13

(b) 56 – 14 – 8 = 34

Without brackets: 56 – 14 – 8 = 42 – 8 = 34. this already gives 34.

With brackets: (56 – 14) – 8 = 42 – 8 = 34.

Verify: (56 – 14) – 8 = 34

Answer: (56 – 14) – 8 = 34.

(c) –22 – 12 – 10 + 22 = –22

Without brackets: –22 – 12 – 10 + 22 = –22 + 0 = –22.

Let us check: –22 – 12 – 10 + 22 = (–22 + 22) – 12 – 10 = 0 – 22 = –22. We get – 22, but we need brackets.

Using brackets: –22 – (12 + 10) + 22 = –22 – 22 + 22 = –22

Verify: –22 – (12 + 10) + 22 = –22 – 22 + 22 = –22

Answer: 22 – (12 + 10) + 22 = –22

7. Key Idea: If we decrease a term on one side, we must decrease the other side by the same amount to maintain equality. Similarly, if we increase one term, we must increase another term to balance it.

(a) 423 + ...= 419 + ...

Reasoning: 423 is 4 more than 419 (423 = 419 + 4).

For the equation to balance, the blank on the right must be 4 more than the blank on the left.

Let the left blank = 2.

Then the right blank = 2 + 4 = 6.

Check: 423 + 2 = 425

and 419 + 6 = 425

(b) 207 – 68 = 210

Reasoning: 210 is 3 more than 207 (210 = 207 + 3).

If the number being subtracted on the left is 68, then the right side has a number that is 3 too large on top (210 instead of 207).

To compensate, the number subtracted on the right must be 3 more: 68 + 3 = 71.

Check: 207 – 68 = 139

and 210 – 71 = 139

Answer: 207 – 68 = 210 – 71

8. We systematically arrange 2, 3, and 5 with + and – (and brackets) to find different values:

Expression	Value
2 + 3 + 5	10
2 + 3 – 5	0
2 – 3 + 5	4
2 – 3 – 5	–6
5 + 3 – 2	6
5 – 3 + 2	4
5 – 3 – 2	0
3 – 2 + 5	6
2 – (3 + 5)	–6
2 + (3 – 5)	0
5 + (3 – 2)	6
5 – (3 – 2)	4
5 – (3 + 2)	0
3 – (5 – 2)	0
3 – (5 + 2)	–4
(2 – 3) – 5	–6
(2 + 3) – 5	0

Different values obtained: –6, –4, 0, 4, 6, 10

9. (a) Jasoda's strategy: n – 9 = n – 10 + 1

Reasoning: Subtracting 9 is the same as subtracting 10 and then adding back 1, because 9 = 10 – 1.

Using bracket rule:

n – 9 = n – (10 – 1)

= n – 10 + 1

Verify with example:

36 – 9 = 36 – 10 + 1

= 26 + 1 = 27

Another example:

54 – 9 = 54 – 10 + 1

= 44 + 1 = 45

Yes, she always gets the correct answer, because 9 = 10 – 1, so subtracting 9 is always the same as subtracting 10 and adding 1.

(b) Similar Strategies:

Strategy 1: To subtract 19 from a number, subtract 20 and add 1.

Example:

54 – 19 = 54 – 20 + 1= 34 + 1 = 35

Strategy 2: To subtract 8 from a number, subtract 10 and add 2.

Example:

43 – 8 = 43 – 10 + 2 = 33 + 2 = 35

Strategy 3: To subtract 18 from a number, subtract 20 and add 2.

Example:

65 – 18 = 65 – 20 + 2 = 45 + 2 = 47

General rule: To subtract (m – k), subtract m and then add '–k'.

10. First, find the values of the two given expressions:

Expression (i): 73 – 14 + 1 = 59 + 1 = 60

Expression (ii): 73 – 14 – 1 = 59 – 1 = 58

Now evaluate each option:

(a) 73 – (14 + 1)

Expand: 73 – (14 + 1) = 73 – 14 – 1 (bracket preceded by –, signs change)

= 58 → This matches Expression (ii).

(b) 73 – (14 – 1)

Expand: 73 – (14 – 1) = 73 – 14 + 1 (bracket preceded by –, sign of –1 becomes +1)

= 60 → This matches Expression (i).

(c) 73 + (–14 + 1)

Expand: 73 + (–14 + 1) = 73 – 14 + 1 (bracket preceded by +, signs unchanged)

= 60 → This matches Expression (i).

(d) 73 + (–14 – 1)

Expand: 73 + (–14 – 1) = 73 – 14 – 1 (bracket preceded by + sign unchanged) = 58 → This matched Expression (ii)

Expression (i) is equal to (b) and (c).

Expression (ii) is equal to (a) and (b).

Practice Exercise 2.3

1. (a) LHS: 25 + (8 – 7) = 25 + 1 = 26

When brackets are preceded by a '+' sign, the sign do not change when the brackets are removed.

25 + (8 – 7) = 25 + 8 – 7

Answer: 25 + (8 – 7) = 25 + 8 $\boxed{-7}$.

(b) RHS: 43 + 6 – 5

We need to put bracket: 43 + (6 – 5)

Answer: 43 + $\boxed{(6-5)}$ = 43 + 6 – 5

(c) When brackets are preceded by '–' the signs change when the brackets are removed.

36 – (9 + 8) = 36 – 9 – 8

Answer: 36 – (9 + 8) = 36 $\boxed{-}$ 9 – 8

(d) LHS = RHS

36 – 9 – 8 = 36 – 9 ☐

36 – 17 = 36 – 9 ☐

19 = 27 (we need 19)

= 27 – 8

19 = 19

Answer: 36 – 9 – 8 = 36 – 9 $\boxed{-8}$

(e) 57 – (6 + 4) = 57 ..... 6 4

When brackets are sign preceded by '–' the signs of terms change when the brackets are removed.

57 – (6 + 4) = 57 – 6 – 4

Answer: 57 – (6 + 4) = 57 $\boxed{-6-4}$

(f) RHS: 57 – 6 – 4

Putting brackets:

57 – (6 + 4) = 57 – 6 – 4

Answer: 57 – $\boxed{(6+4)}$ = 57 – 6 – 4

2. (a) 17 + (15 +12)

Brackets preceded by '+' sign. The signs do not change when the brackets removed.

= 17 + 15 + 12

(b) 17 – (15 + 12)

Brackets preceded by '–' sign. The signs do not change when the brackets removed.

= 17 – 15 – 12

(c) 17 + (15 – 12)

Brackets preceded by '+' sign. The signs do not change when brackets are removed.

= 17 + 15 – 12

(d) 17 – (15 – 12)

When brackets are preceded by '–' sign. The signs do not change when the brackets are removed.

17 – 15 + 12

(e) –17 + 15 – 12

No brackets to remove.

= –17 + 15 – 12

(f) 17 – (– 5 – 12)

When brackets preceded by '–' sign. The signs change when brackets are removed.

= 17+ 5 + 12

3. (a) (7 + 15) – 8 and 7+ (15 – 8)

(7 + 15) – 8 = 22 – 8 = 14

7 + (15 – 8) = 7 + 7 = 14

Both are equal. Value = 14

They are equal because subtraction is from outside the bracket in both cases.

(b) 23 – (9 – 2) and (23 – 9) – 2

23 – (9 – 2) = 23 – 7 = 16

(23 – 9) – 2 = 14 – 2 = 12

Not equal. 16 is not equal to 12.

(c) 32 – (16 + 5) and 32 + (–16 – 5)

32 – (16 + 5) = 32 – 21 = 11

32 + (–16 – 5) = 32 + (–21)

= 32 – 21 = 11

Both are equal. Value = 11

4. (a) 429 – 645 and – 645 + 429 are equal,

Both have same numbers and sign, 429, –645. Just in a different order.

(b) Expressions with terms 94, 45, –108 (same terms, just swapped):

94 + 45 – 108 = 94 – 108 + 45 = –108 + 94 + 45 = –108 + 45 + 94

These four have the same value (by commutative property).

94 – (45 + 108) = 94 – 45 – 108 (different terms: 94, –45, –108) Different value.

(94 – 45) + 108 = 94 – 45 + 108 (terms: 94, –45, 108) Different value.

5. (a) 35 – 10 – 13 = 12

Without brackets: 35 – 10 – 13 = 12 (This is already 12!)

Also: 35 – (10 + 13) = 35 – 23 = 12

(b) 67 – 25 – 11 = 31

Without brackets: 67 – 25 – 11 = 31 (This is already 31!)

Also: 67 – (25 + 11) = 67 – 36 = 31

(c) –33 – 15 – 10 + 33 = –25

Without brackets: –33 – 15 – 10 + 33

= –33 + 33 – 15 – 10 = 0 – 25 = –25

Also: –33 –(15 + 10) + 33

= –33 – 25 + 33 = –25

6. (a) 743 is 4 more than 739.

So, the blank on the right must be 4 more than the blank on the left.

Example: 743 + 5 = 739 + 9 (both = 748)

Answer: Many solution possible, 743 + 5 = 739 + 9.

(b) LHS: 408 – 96 = 312

RHS: 415 – ..... = 312

..... = 415 – 312 = 103

Answer: 408 – 96 = 415 – 103

7. Given example: 3 – 4 + 6 = 5 and 4 –(6 – 3) = 1

3 + 4 + 6 = 13

3 + 4 – 6 = 1

3 – 4 + 6 = 5

3 – 4 – 6 = –7

4 + 6 – 3 = 7

6 – 3 – 4 = –1

6 + 3 – 4 = 5

6 – (3 + 4) = –1

4 – (6 – 3) = 1

(3 + 4) –6 = 1

3 –(4 + 6) = –7

(6 – 4) –3 = –1

Different values obtained: –7, –1, 1, 5, 7, 13

8. (a) Yes, Akhil always gets the correct answer. Reason: Subtracting 99 = Subtracting 100 + Adding 1

Because: a – 99a – 100 + 1

= a – (100 – 1)

Example: 254 – 99 = 254 – 100 + 1

= 154 + 1 = 155

(b) Strategy 1: To subtract 199, subtract 200 and add 1.

Example: 350 – 199 = 350 – 200 + 1
= 150 + 1 = 151.

Strategy 2: To subtract 48, subtract 50 and add 2.

Example: 275 – 48 = 275 – 50 + 2
= 225 + 2 = 227

Strategy 3: To add 98, add 100 and subtract 2.

Example: 156 + 98 = 156 + 100 – 2
= 256 – 2 = 254

9. (i) Value = 83 – 15 + 1 = 69

(a) 83 – (15 + 1) = 83 – 16 = 67
equal

(b) 83 – (15 – 1) = 83 – 14 = 69
Equal!

(c) 83 + (–15 + 1) = 83 – 14 = 69
Equal!

(d) 83 + (–15 – 1) = 83 – 16 = 67
Answer: equal

(ii) 83 – 15 – 1

Value = 83 – 15 – 1 = 67

(a) 83 – (15 + 1) = 83 – 16 = 67
Equal!

(b) 83 – (15 – 1) = 83 – 14 = 69
Not equal

(c) 83 + (–15 + 1) = 83 – 14 = 69
Not equal

(d) 83 + (–15 – 1) = 83 – 16 = 67
Equal!

Class Work 2.6

Originally, Priya and Arjun (2 friends) ordered. Now Sangmu joins, making it 3 friends.

Each friend orders 1 cheese sandwich (₹ 35) and 1 donut (₹18).

Expression for total amount = 3 × (35 +18)

= 3 × 53 = 159

This can also be written as:

3 × 35 + 3 × 18 = 105 + 54 = 159

[Using distributive property: 3 × (35 +18) = 3 × 35 + 3 × 18]

Class Work 2.7

1. LHS: 5 × 4 + 3

Here, multiplication is done first (as per order of operations):

= 20 + 3 = 23

RHS: 5 × (4 + 3)

Here, bracket is solved first:

= 5 × 7 = 35

Since 23 is not equal to 35, the two expressions are not equal.

Reason: In 5 × 4 + 3, only 4 is multiplied by 5, and 3 is added separately.

In 5 × (4 + 3), the entire sum (4 + 3) is multiplied by 5.

2. 5 × (4 + 3) = 5 × 7 = 35

5 × (3 + 4) = 5 × 7 = 35 [By commutative property of addition: 4 + 3 = 3 + 4]

(3 + 4) × 5 = 7 × 5 = 35 [By commutative property of multiplication: 5 × 7 = 7 × 5)

All three expressions give the same value = 35.

NCERT Exercise 2.4

1. (a) 95 × 8
= (100 – 5) × 8
= 800 – 40
= 760

(b) 104 × 15
=(100 + 4) × 15
= 1500 + 600
= 2100

(c) 49 × 50
= (50 – 1) × 50
= 2500 – 50
= 2450

2. (c) 3 × (5 + 8) = 3 × 5 + 3 × 8

(d) (9 + 2) × 4 = 9 × 4 + 2 × 4

(e) 3 × (7 + 4) = 30 + 3

(f) (8 + 6) × 4 = 13 × 4 + 4

(g) 3× (5 + 2) = 3 × 5 + 3 × 2

(h) (2 + 3) × 4 = 2 × 4 + 3 × 4

(i) 5 × (9 – 2) = 5 × 9 – 5 × 2

(j) (5 – 2) × 7 = 5 × 7 – 2 × 7

(k) 5 × (8 × 3) = 5 × 8 – 5 × 3

(1) (8 – 3) × 7 = 8 × 7 – 3 × 7

(m) 5 × (12 – 4) = 60 – 5 × 4

(n) (15 – 6) × 7 = 105 – 6 × 7

(0) 5 × (9 – 4) = 5 ×9 – 5 × 4

(p) (17 – 9) × 7 = 17 × 7 – 9 × 7

3. (i) In RHS, 3 – 8 = –5
In LHS, 8 – 3 = 5
∴ (8 – 3) × 29 > (3 – 8) × 29

(ii) RHS = 15 + 9 = 24
i.e. 24 times 18
LHS = 9 times 18
∴ 15 + 9 × 18 < (15 + 9) × 18

(iii) 23 × (17 – 9) ☐ 23 × 17+ 23 × 9
RHS = 23 × 17+ 23 × 9
= 23 × (17 + 9)
LHS = 23 × (17 – 9)
∴ 23 × (17 – 9) < 23 × 17+ 23 × 9

(iv) LHS = (34 – 28) × 42
= 34 × 42 – 28 × 42
= RHS
∴ (34 – 28) × 42 = 34 × 42 – 28 × 42

4. (i) 2 × (3 + 4) = 14
(ii) 7 × (2 + 0) = 14
(iii) 1 × (13 + 1) = 14
(iv) 14 × (1 + 0) = 14

5. Method 1
(i) Sum of 1st Row = 4 + 8 + 4 = 16
Sum of 2nd Row = 8 + 4 + 8 = 20
Sum of 3rd Row = 4 + 8 + 4 = 16
Required sum = 16 + 20 + 16
= 52

Method 2
In the figure, we see that 4 circles with 8 and 5 boxes with 4
∴ Required Sum = 4 × 8 + 5 × 4
= 32 + 20
= 52

(ii) Method 1
Sum of 1st Row = 5+6 +6 + 5 = 22
Sum of 2nd Row = 6 + 5 + 5 + 6 = 22
Sum of 3rd Row = 6 + 5 + 5 + 6 = 22
Sum of 4th Row = 5+ 6 + 6 + 5 = 22
∴ Required Sum = 22 + 22 + 22 + 22
= 88

Method 2
In the figure (ii) 8 circles with number 5 and 8 circles with number 6
∴ Required Sum = 8 × 5 + 8 × 6
= 40 + 48
= 88

6. Per day mangoes supply by Rahim = 9 kg
Per day mangoes supply by Shyam = 11 kg
∴ Weekly supply by Rahim = 7 × 9
[1 week = 7 days]
= 63 kg
and weekly supply by Shyam = 7 × 11
= 77 kg
∴ Mathematical expression is,
(9 × 7) + (11 × 7)
= 63 + 77 = 140 kg.

(b) Binu's total earning per month
= ₹20,000
Monthly Expenses :
on food = ₹5,000
on rent = ₹5,000
other expenses = ₹2,000
Total Expenses,
= ₹(5,000 + 5,000 + 2,000)
= ₹12,000
Monthly saving = Monthly earnings
– Monthly expenses
= ₹20,000 – ₹12,000
= ₹8,000
1 year = 12 months
Binu's saving in 1 month = ₹8000
then Binu's saving in 12 months
= ₹12 × ₹8,000
= ₹96,000

(iii) According to question,
The net neight climbed by the snail in a day = (3 – 2) cm = 1 cm.
On 7th day, the snail reaches 7 cm at the end of the day.
On 8th day, the snail reaches 7 + 3 = 10 cm, which is the top.
∴ On 8th day, the snail reaches the top and gets the treat.

7. Given, total number of weeks = 8
Since, Melvin reads two-pages story everyday in a week except on Tuesdays and Saturdays i.e. 5 days.
∴ Total no. of stories read by Melvin in 8 weeks.
= 5 × 8
= 40 stories.

(a) 5 × 2 × 8 = (5 × 2) × 8 = 80
(b) (7 – 2) × 8 = 5 × 8 = 40
(c) 8 × 7 = 56
(d) 7 × 2 × 8 = (7 × 2) × 8 = 112

(e) $7 \times 5 - 2 = 35 - 2 = 33$

(f) $(7 + 2) \times 8 = 9 \times 8 = 72$

(g) $7 \times 8 + 2 \times 8 = 56 - 16 = 40$

(h) $(7 - 5) \times 8 = 56 - 16 = 40$

$\therefore$ The expressions (f) and (g) describe this scenario correctly.

8. (i) **Method 1**

$1 - 2 + 3 - 4 + 5 - 6 + 7 - 8 + 9 - 10$

$= (1 + 3 + 5 + 7 + 9) - (2 + 4 + 6 + 8 + 10)$

$= (25) - (30)$

$= 25 - 30 = -5$

Method 2

$(1 - 2) + (3 - 4) + (5 - 6) + (7 - 8) + (9 - 10)$

$= (-1) + (-1) + (-1) + (-1) + (-1)$

$= -5$

(ii) **Method 1**

$1 - 1 + 1 - 1 + 1 - 1 + 1 - 1 + 1 - 1$

$= (1 + 1 + 1 + 1 + 1) - (1 + 1 + 1 + 1 + 1)$

$= 5 - 5 = 0$

Method 2

$(1 - 1) + (1 - 1) + (1 - 1) + (1 - 1) + (1 - 1)$

$= 0 + 0 + 0 + 0 + 0 = 0$

9. (a) LHS $= 49 - 7 + 8$

$= 49 + 1 = 50$

RHS $= 49 - 7 + 8$

$= 49 + 1 = 50$

$\therefore \quad 49 - 7 + 8 = 49 - 7 + 8$

(b) LHS $= 83 \times 42 - 18$

$= 3486 - 18$

$= 3468$

RHS $= 83 \times 40 - 18$

$= 3320 - 18 = 3302$

$\therefore \quad 83 \times 42 - 18 > 83 \times 40 - 18$

(c) LHS $= 145 - 17 \times 8$

$= 145 - 136 = 9$

RHS $= 145 - 17 \times 6$

$= 145 - 102$

$= 43$

$145 - 17 \times 8 < 145 - 17 \times 6$

(d) LHS $= 23 \times 48 - 35$

$= 1104 - 35 = 1069$

RHS $= 23 \times (48 - 35)$

$= 23 \times 13 = 299$

$\therefore \quad 23 \times 48 - 35 > 23 \times (48 - 35)$

(e) LHS $= (16 - 11) \times 12$

$= 5 \times 12 = 60$

RHS $= -11 \times 12 + 16 \times 12$

$= -132 + 192 = 60$

$\therefore \quad (16 - 11) \times 12 = -11 \times 12 + 16 \times 12$

(f) LHS $= (76 - 53) \times 88$

$= 23 \times 88$

$= 2024$

RHS $= 88 \times (53 - 76)$

$= 88 \times (-23)$

$= -2024$

$\therefore \quad (76 - 53) \times 88 > 88 \times (53 - 76)$

(g) LHS $= 25 \times (42 + 16)$

$= 25 \times 58$

$= 1450$

RHS $= 25 \times (43 + 15)$

$= 25 \times 58$

$= 1450$

$\therefore \quad 25 \times (42 + 16) = 25 \times (43 + 15)$

(h) LHS $= 36 \times (28 - 16)$

$= 36 \times 12 = 432$

RHS $= 35 \times (27 - 15)$

$= 35 \times 12 = 420$

$\therefore \quad 36 \times (28 - 16) > 35 \times (27 - 15)$

10. (a) $83 - 37 - 12$

$= 83 - (37 + 12)$

$= -37 + 83 - 12$ (rearranging the terms)

Answer: (ii) and (iv)

(b) $93 + 37 \times 44 + 76$

$= 37 \times 44 + 93 + 76$ (rearranging the terms)

Answer: (iv)

Practice Exercise 2.4

1. (a) $87 = 80 + 7$

Answer: $87 \times 19 = 19 \times (80 + 7)$

(b) $205 = 200 + 5$

$205 \times 69 = (200 + 5) \times 69 \times 200 + 69 \times 5$

Answer: 5

(c) $39 = 30 + 9$

$56 \times 39 = 56 \times (30 + 9)$

$= 56 \times 30 + 56 \times 9$

Answer: 9

(d) 19 = 10 + 5 + 4
37 × 19 = 37 × (10 + 5 + 4)
= 37 × 10 + 37 × 5 + 37 × 4
Answer: 4

(e) 47 = 50 – 3
18 × 47 = 18 × (50 – 3)
= 18 × 50 – 18 × 3
Answer: 3

(f) 88 = 90 – 2
76 × 88 = 76 × (90 – 2)
= 76 × 90 – 76 × 2
Answer: 2

2. (a) By distributive property:
3(n + 6) = 3 × n + 3 × 6
Comparing: 3 × n = 3 × 5, so n = 5
Answer: n = 5

(b) RHS: 7(4 + 3) = 7 × 4 + 7 × 3
Comparing with LHS:
n × 3 = 7 × 3, so n = 7
Answer: n = 7

(c) LHS: (9 + 8) × 8
= 17 × 8 (by distributive property)
So, (9 + 8) × n = (9 + 8) × 8,
hence n = 8
Answer: n = 8

3. (a) = 972 × (8 + 2) [Distributive property]
= 972 × 10
= 9720

(b) = 593 × 999 +593 × 1
= 593 × (999 + 1)
[Distributive property]
= 593 × 1000 = 593000

(c) = 982 × (46 + 27 – 58 – 15)
[Distributive property]
= 982 × (73 – 73)
= 982 × 0 = 0

(d) Note: 957 × 10 = 9570
= 9570 × 583 – 483 × 9570
= 9570 × (583 – 483)
[Distributive property]
= 9570 × 100 = 957000

4. (a) = 928 × (800 + 50 + 7)
= 928 × 800 + 928 × 50 + 928 × 7
= 742400 + 46400 + 6496
= 795296

(b) = 3046 × (700 + 29)
= 3046 × 700 + 3046 × 29
= 2132200 + 88334
= 2220534

(c) = 9849 × (200 + 5)
= 9849 × 200 + 9849 × 5
= 1969800 + 49245
= 2019045

(d) = 367 × (10000 + 4)
= 367 × 10000 + 367 × 4
=3670000 + 1468
= 3671468

5. Using the distributive property of multiplication over addition:
7× (4 + 5) = 7 × 4 + 7 × 5
= 28 +35
= 63

6. Total cost 18 × 65
= 18 × (60 + 5) [Distributive property]
= 18 × 60 + 18 × 5
= 1080 + 90
= Rs 1170

7. Area of rectangle = Length × Width
= 15 × 7
= 105 square units

8. (a) Commutative Property of. Addition
(b) Associative Property of Addition
(c) Distributive Property of Multiplication over Addition
(d) Distributive Property.of Multiplication over Subtraction

9. (a) = 647 × (13 + 7) = 647 × 20
= 12940

(b) = 8759 × (94 + 6) = 8759 × 100
= 875900

(c) = 7459 × 999 + 7459 × 1
= 7459 × (999 + 1) = 7459 × 1000
= 7459000

(d) = 9870 × (561 – 461) = 9870 × 100
= 987000

(e) 569 × (17 + 13 + 70) = 569 × 100
= 56900

(f) = 16825 × (16825 – 6825)
= 16825 × 10000 = 168250000

10. Let us choose the number 7.

(i) $3 + (9 - 5) = 3 + 4 = 7$

(ii) $(10 - 5) + 2 = 5 + 2 = 7$

(iii) $2 \times 3 + 1 = 6 + 1 = 7$

(iv) $(11 - 8) + (15 - 11) = 3 + 4 = 7$

(v) $8 \times 2 - 9 = 16 - 9 = 7$

(vi) $5 + (6 - 4) = 5 + 2 = 7$

(vii) $2 + (9 - 4) = 2 + 5 = 7$

(viii) $12 \times 2 - 17 = 24 - 17 = 7$

(ix) $3 + (8 - 4) = 3 + 4 = 7$

(x) $7 \times 2 - 7 = 14 - 7 = 7$

Answer: All ten expressions above have the value 7.

Chapter Innings

A. Multiple Choice Questions

1. (c) **2.** (b) **3.** (b) **4.** (c) **5.** (c)
6. (b)

B. Fill in the Blanks

1. 8 **2.** 6 **3.** 8 – 7 **4.** –4
5. 6 **6.** 40, 20 **7.** 75

C. Match the Following

1. (c) **2.** (d) **3.** (e) **4.** (a) **5.** (b)

D. True or False

1. False **2.** True **3.** False **4.** True **5.** False
6. True **7.** True **8.** False

E. Very Short Answer Type Questions

1. First, perform multiplication and division:

$2 \times 7 = 14$ and $\frac{8}{4} = 2$

$= 10 + 14 - 2$

$= 24 - 2 = 22$

2. $12 \times 8 + 4 = 96 + 4 = 100$

$12 + 4 \times 8 = 12 + 32 = 44$

$12 \times 4 \times 8 = 48 \times 8 = 384$

$12 + 4 + 8 = 24$

3. $785 \times 94 = 785 \times (100 - 6)$

$= 785 \times 100 - 785 \times 6$

$= 78500 - 4710 = 73790$

4. $= 968 \times (73 + 27)$ [Distributive property]

$= 968 \times 100 = 96800$

5. $= 8937 \times (648 + 122 + 230)$

(Distributive property]

$= 8937 \times 1000 = 8937000$

F. Short Answer Type Questions

1. (a) $= 30674 \times (10 - 1)$

$= 30674 \times 10 - 30674 \times 1$

$= 306740 - 30674 = 276066$

(b) $= 4578 \times (100 - 1)$

$= 4578 \times 100 - 4578 \times 1$

$= 457800 - 4578 = 453222$

(c) $= 23756 \times (1000 - 1)$

$= 23756 \times 1000 - 23756 \times 1$

$= 23756000 - 23756$

$= 23732244$

2. Total oranges $= 25 \times 12 = 300$

Total mangoes $= 15 \times 8 = 120$

Total fruits $= 300 + 120 = 420$ fruits

3. Total cost $= 5 \times 65 + 4 \times 65$

$= (5 + 4) \times 65$ [Distributive property]

$= 9 \times 65 =$ Rs 585

4. (a) Group in pairs: $(10 - 11) + (12 - 13) + (14 - 15) + (16 - 17) + (18 - 19) + 20$

$= (-1) + (-1) + (-1) + (-1) + (-1) + 20$

$= -5 + 20 = 15$

(b) Group in pairs: $(2 - 2) + (2 - 2) + (2 - 2) + (2 - 2) + (2 - 2)$

$= 0 + 0 + 0 + 0 + 0 = 0$

5. Eggs per day $= 8 \times 5 = 40$

Total eggs in 30 days $= 40 \times 30$

$= 1200$ eggs

G. Long Answer Type Questions

1. Total amount per student = ₹200 + ₹50 = ₹250

Total money collected $= 25 \times 250$

$= 25 \times (200 + 50)$

$25 \times 200 + 25 \times 50$ [Distributive property]

$= 5000 + 1250 =$ ₹6250

2. $(73 + 37) = 110$

$(120 - 20) = 100$

$(670 \times 2) = 1340$

$\left(\frac{150}{3}\right) = 50$

Ascending order: $\left(\frac{150}{3}\right) < (120 - 20) < (73 + 37) < (670 \times 2)$

i.e., $50 < 100 < 110 < 1340$

3. (a) Story: My mother gives me ₹ 1000 and my father gives me ₹2000. Later I give ₹ 1300 to my sister. What amount do I have now?

Value = 1000 + 2000 – 1300

= 3000 – 1300 = ₹ 1700

(b) Story: A factory produces 80 bulbs per day. for 20 days: Out of them, 1200 are defective. How many good bulbs. are produced?

Value = 80 × 20 – 1200

= 1600 – 1200

= 400 good bulbs are produced.

4. (a) LHS: 500 – 170 + 80

= 330 + 80 = 410

RHS: 400 – 70 + 80 = 330 + 80 = 410

Ans: 500 – 170 + 80 = 400 – 70 + 80

(b) Both expressions subtract 18. The difference is in 83 × 52 vs 83 × 40.

Since 52 > 40, so 83 × 52 > 83 × 40

Ans: 83 × 52 – 18 > 83 × 40 – 18

(c) Both start with 400 and subtract a multiple of 17.

17 × 20 = 340 (subtracting more)

17 × 10 = 170 (subtracting less) Subtracting more gives a smaller value.

Ans: 400 – 17 × 20 < 400 – 17 × 10

5. 40 + 23 – 12 = 51

40 – 23 +12 = 29

40 + 12 – 23 = 29

40 – 12 + 23 = 51

23 + 40 – 12 = 51

23 – 40 +12 = –5

23 + 12 – 40 = –5

23 – 12 + 40 = 51

12 + 40 – 23 = 29

12 – 40 + 23 = –5

12 + 23 – 40 = –5

12 – 23 + 40 = 29

Different values obtained: –5, 29, 51 and more with brackets like 12 – (23 + 40) = – 51, etc.

H. Assertion-Reason Questions

1. (E) **2.** (A) **3.** (E) **4.** (C) **5.** (D)

I. Case Study

1. (c) **2.** (b) **3.** (d) **4.** (c)

3. A Peek Beyond the Point

Class Work 3.1

1. (c) Because, it allows for more precise and detaild measurement.

2. Because the length of the secrews were not whole centimeter, smaller divisions like mm, were needed to measure them more precisely or accurately.

3. Do yourself.

NCERT Exercise 3.1

1. (a) $2\frac{4}{10}$ cm (b) $4\frac{5}{10}$ cm (c) $1\frac{4}{10}$ cm

2. (a) $4\frac{8}{10}$ units or $\frac{48}{10}$ units

(b) $1\frac{3}{10}$ units

(c) $10\frac{9}{10}$ units

Class Work 3.2

1. (a) $\frac{9}{10}$ (b) $\frac{17}{10}$ (c) $\frac{130}{10}$ (d) $\frac{131}{10}$ (e) $\frac{105}{10}$

(f) $\frac{76}{10}$ (g) $\frac{67}{10}$ (h) $\frac{4}{10}$

Here, $\frac{4}{10} < \frac{9}{10} < \frac{17}{10} < \frac{67}{10} < \frac{76}{10} < \frac{105}{10} < \frac{130}{10} < \frac{131}{10}$

2. $\frac{4}{10} < 4\frac{1}{10} = \frac{41}{10} < 41\frac{1}{10}$

Class Work 3.3

1. 35 one tenths + 27 one-tenths

= 62-one-tenths

2. $2\frac{1}{10} + 4\frac{3}{10} + 6\frac{4}{10} = (2 + 4 + 6)\frac{(1 + 3 + 4)}{10}$

$= 12\frac{8}{10} = 12\frac{4}{5}$ units

3. $3\frac{3}{10} - \frac{7}{10} = \frac{33}{10} - \frac{7}{10} = \frac{26}{10} = 2\frac{6}{10}$ cm

$= 2\frac{3}{5}$ cm

4. Do yourself.

5. (a) $9\frac{8}{10}$, $10\frac{9}{10}$, 12, $13\frac{1}{10}$; Whole number and numerator are increasing by one.

(b) $4\frac{9}{10}$, $4\frac{5}{10}$, $4\frac{1}{10}$, $3\frac{7}{10}$; Numerator is decreasing by 4.

(c) $8\frac{2}{10}$, $7\frac{1}{10}$, 6, $4\frac{9}{10}$; Whole number and numerator are decreasing by 1.

(d) $4\frac{9}{10}$, $5\frac{2}{10}$, $5\frac{5}{10}$, $5\frac{8}{10}$; Numerator is increasing by 3.

(e) $9\frac{7}{10}$, $10\frac{2}{10}$, $10\frac{7}{10}$, $11\frac{2}{10}$; Numerator is increasing by 5.

(f) 12, $11\frac{5}{10}$, 11, $10\frac{5}{10}$; Numerator is decreasing by 5.

Class Work 3.4

1. $\boxed{\frac{55}{100}}$ $\boxed{\frac{155}{100}}$ $\boxed{\frac{174}{100}}$ $\boxed{\frac{202}{100}}$ $\boxed{\frac{230}{100}}$

2. (a) $5\frac{3}{10}$, $\frac{7}{100}$ (Five and three tenths and seven-hundredths)

or $5\frac{37}{100}$ (Five and thirty-seven-hundredths),

or $\frac{537}{100}$ (Five hundred thirty-seven-hundredths)

(b) $15\frac{3}{100}$ (Fifteen and three-hundredths),

or $\frac{1503}{100}$ (One thousand five hundred three-hundredths)

(c) $7\frac{5}{10}$ $\frac{2}{100}$ (Seven and five-tenths and two-hundredths)

or $7\frac{52}{100}$ (Seven and fifty-two-hundredths)

or $\frac{752}{100}$ (Seven hundred fifty-two-hundredths)

NCERT Exercise 3.2

1. (i) Longest length = $\frac{33}{100}$, Shortest length = $\frac{3}{100}$

(ii) Longest length = $3\frac{1}{10}$, Shortest length = $1\frac{3}{10}$

(iii) Longest length = $\frac{54}{100}$, Shortest length = $\frac{4}{10}$

(iv) Longest length = $3\frac{6}{10}$ $\frac{6}{100}$, Shortest length = $3\frac{6}{100}$

(v) Longest length = $1\frac{8}{100}$, Shortest length = $\frac{2}{100}$

(vi) Longest length = $7\frac{5}{10}$, Shortest length = $7\frac{3}{10}$ $\frac{5}{100}$

(vii) Longest length = $\frac{65}{10}$ $\frac{15}{100}$, Shortest length = $5\frac{7}{100}$

2. (i) Sum $\frac{30}{100} + 3\frac{4}{100} = 3\frac{34}{100}$

(ii) Sum $(9 + 2)\frac{(5 + 1)}{10}\frac{(7 + 3)}{100} = 3\frac{6}{10}\frac{10}{100}$

$= 11\frac{7}{10}$

(iii) Sum $(15 + 14)\frac{(6 + 3)}{10}$ $\frac{(4 + 6)}{100}$

$= 29\frac{9}{10}$ $\frac{10}{100} = 30$

(iv) Difference $(7 - 4)\frac{(7 - 4)}{100} = 3\frac{3}{100}$

(v) Difference $(8 - 5)\frac{(6 - 3)}{100} = 3\frac{3}{100}$

(vi) Difference $12\frac{62}{100} - \frac{99}{100}$

$= 11\frac{162}{100} - \frac{99}{100} = 11\frac{162 - 99}{100}$

$= 11\frac{63}{100} = 11\frac{6}{10}\frac{3}{100} = 11\frac{63}{100}$

3. $15\frac{3}{10}\frac{4}{100} - 2\frac{6}{10}\frac{8}{100}$

$= \frac{1500}{100}\frac{30}{100}\frac{4}{100} - \frac{200}{100}\frac{60}{100}\frac{8}{100}$

$= \frac{1534}{100} - \frac{268}{100} = \frac{1266}{100} = 12\frac{6}{10}\frac{6}{100}$

$= 12\frac{66}{100}$

Practice Exercise 3.1

1. (a) $6\frac{4}{10}\frac{7}{100} + 5\frac{94}{100}$

$= \frac{647}{100} + \frac{594}{100} = \frac{1241}{100} = 12\frac{4}{10}\frac{1}{100}$

$= 12\frac{41}{100}$

(b) $\frac{9}{10} + 8\frac{3}{10}\frac{5}{100}$

$= \frac{90}{100} + \frac{835}{100} = \frac{925}{100} = 9\frac{2}{10}\frac{5}{100}$

$= 9\frac{25}{100}$

(c) $8\frac{7}{10}\frac{6}{100} + 4\frac{1}{10}\frac{3}{100}$

$= \frac{876}{100} + \frac{413}{100} = \frac{1289}{100} = 12\frac{8}{10}\frac{9}{100}$

$= 12\frac{89}{100}$

(d) $16\frac{9}{10}\frac{8}{100} + 13\frac{2}{10}\frac{1}{100}$

$= \frac{1698}{100} + \frac{1321}{100} = \frac{3019}{100} = 30\frac{1}{10}\frac{9}{100}$

$= 30\frac{19}{100}$

2. (a) $7\frac{8}{100} - 5\frac{5}{10}\frac{9}{100} = \frac{708}{100} - \frac{559}{100}$

$= \frac{149}{100} = 1\frac{49}{100}$

(b) $8\frac{7}{100} - 6\frac{5}{100}$

$= \frac{807}{100} - \frac{605}{100} = \frac{202}{100} = 2\frac{2}{100}$

(c) $9\frac{7}{100} - 5\frac{8}{100} = \frac{907}{100} - \frac{508}{100}$

$= \frac{399}{100} = 3\frac{9}{10}\frac{9}{100} = 3\frac{99}{100}$

(d) $13\frac{7}{10}\frac{1}{100} - 8\frac{5}{10}\frac{7}{100}$

$= \frac{1371}{100} - \frac{857}{100} = \frac{514}{100} = 5\frac{1}{10}\frac{4}{100}$

$= 5\frac{14}{100}$

Class Work 3.5

(a) 1000 thousandths

(b) 100 thousandths

(c) 10 thousandths

(d) 100 tenths

(e) 1000 hundredths

You can make more example on yourself.

NCERT Exercise 3.3

1.	(a)	2.35	$2 \times 1 + 3 \times \frac{1}{10} + 5 \times \frac{1}{100}$.	Two points three five
	(b)	10.5	$1 \times 10 + 0 \times 1 + 5 \times \frac{1}{10}$	Ten point five
	(c)	4.06	$4 \times 1 + 0 \times \frac{1}{10} + 6 \times \frac{1}{100}$	Four point zero six.
	(d)	101.01	$1 \times 100 + 0 \times 10 + 1 \times 1 + 0 \times \frac{1}{10} + 1 \times \frac{1}{100}$	one hundred one point zero one
	(e)	0.98	$9 \times \frac{1}{10} + 8 \times \frac{1}{100}$	Zero point nine eight

(f)	0.05	$0 \times \frac{1}{10} + 5 \times \frac{1}{100}$	zero point zero five
(g)	0.1	$1 \times \frac{1}{10}$	zero point one
(h)	0.427	$4 \times \frac{1}{10} + 2 \times \frac{1}{100} + 7 \times \frac{1}{1000}$	zero point four two seven

2. (a) 2.34 (b) 10.5

3. (a) Forty point six
(b) zero point zero three
(c) One hundred five point six five
(d) Fifty-six point two zero
(e) Six point zero zero four
(f) Twenty-eight point seven six four
(g) Zero point five nine one
(h) One point two eight nine

4.

Decimal number	Hundreds (100)	Tens (10)	One (1)	Tenths $\left(\frac{1}{10}\right)$	Hundredths $\left(\frac{1}{100}\right)$	Thousandths $\left(\frac{1}{1000}\right)$
(a) 16.4		1	6	4		
(b) 5.2			5	2		
(c) 0.34				3	4	
(d) 0.468				4	6	8
(e) 21.59		2	1	5	9	
(f) 200.793	2	0	0	7	9	3
(g) 231.10	2	3	1	1	0	
(h) 345.569	3	4	5	5	6	9

5. (a) $1 \times 100 + 2 \times 10 + 3 \times 1 + 7 \times \frac{1}{10}$

(b) $4 \times 10 + 2 \times 1 + 0 \times \frac{1}{10} + 9 \times \frac{1}{100}$

(c) $5 \times 100 + 0 \times 10 + 9 \times 1 + 3 \times \frac{1}{10} + 0 \times \frac{1}{100} + 2 \times \frac{1}{1000}$

(d) $8 \times 10 + 5 \times 1 + 3 \times \frac{1}{10} + 9 \times \frac{1}{100} + 1 \times \frac{1}{1000}$

6. (a) 385.1 (b) 60.17 (c) 84.25 (d) 709.021

Class Work 3.6

1. (a) 63.1 (b) 0.08 (c) 0.353

2. (a) $217\frac{308}{1000}$ (b) $\frac{79}{100}$ (c) $74\frac{5}{10}$

3. (a) $\frac{135}{1000} = \frac{27}{200}$ (b) $\frac{66}{1000} = \frac{33}{500}$ (c) $\frac{92}{1000} = \frac{23}{250}$

4. (a) $3\frac{75}{100} = 3\frac{3}{4}$ (b) $8\frac{25}{1000} = 8\frac{1}{40}$

(c) $95\frac{95}{1000} = 95\frac{19}{20}$

5. (a) 16.500, 3.912
(b) 5.0200, 18.1702
(c) 2.459, 3.700, 48.340
(d) 8.10, 6.7820, 37.0304

6. (4.5, 4.50, 04.50), (4.05, 4.050)

Class Work 3.7

1.

12 mm = 1.2 cm	56 mm = 5.6 cm	70 mm = 7 cm
9 mm = 0.9 cm	134 mm = 13.4 cm	2036 mm = 203.6 cm

2.

36 cm = 0.36 m	50 cm = 0.5 m	89 cm = 0.89 m
4 cm = 0.04 m	325 cm = 3.25 m	207 cm = 2.07 m

3.

465 g = 0.465 kg	68 g = 0.068 kg	1560 g = 1.56 kg
704 g = 0.704 kg	560 g = 0.56 kg	2500 g = 2.5 kg

4.

10 p = ₹0.1	5p = ₹0.05	36p = ₹0.36
50p = ₹0.50	99p = ₹0.99	250p = ₹2.5

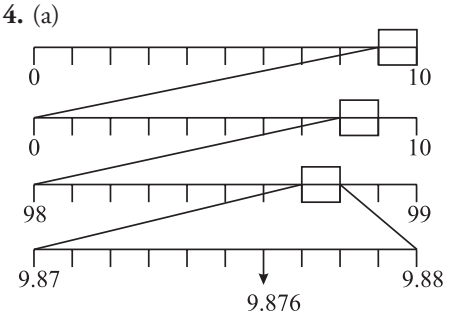
NCERT Exercise 3.4

1. 1.01, 1.02, 1.03, 1.04, 1.05, 1.06, 1.07, 1.08, 1.09

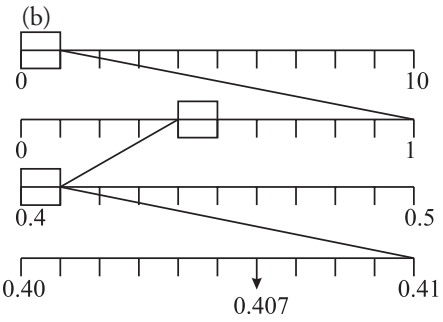
2. A = 5.09, B = 5.13, C= 5.2, D = 5.31

3. ? = 4.055

4. (a)



(b)



5. a = 6, b = 7.5, c = 9.5

6. d = 8.01, e = 8.05, f = 4.35, g = 4,50, h = 4.85

Class Work 3.8

1. (a) 1.32 (b) 1.090

2. (a) 0.099 (b) 1.431

3. (a) 0.06 < 0.6 < 6.06 < 6.6 < 66.6

(b) 6.05 < 6.4 < 6.45 < 6.5 < 6.54

4. 3.65

5. 1.09

NCERT Exercise 3.5

Follow the rule : First convert the unlike into like decimal, then add or subtract as required.

1. (a) 7.9 (b) 26.8 (c) 7.41 (d) 18.11 (e) 39.10 (f) 1.534 (g) 0.78 (h) 6.723

2. (a) 3.3 (b) 9.2 (c) 5.9 (d) 0.802 (e) 16.95 (f) 16.405 (g) 0.81 (h) 5.749

Practice Time 3.2

1. (a)
$$\begin{array}{r} 270.69 \\ 24.2 \\ +\quad 3.8 \\ \hline 298.69 \end{array}$$

(b)
$$\begin{array}{r} 35.5 \\ 0.632 \\ +\ 26.8 \\ \hline 62.932 \end{array}$$

(c)
$$\begin{array}{r} 0.85 \\ 12.425 \\ +\ 3.0 \\ \hline 16.275 \end{array}$$

(d)
$$\begin{array}{r} 290.73 \\ 33.8 \\ +\quad 9.8 \\ \hline 334.33 \end{array}$$

(e)
$$\begin{array}{r} 0.08 \\ 3.6 \\ +\ 17.32 \\ \hline 21.00 \end{array}$$

(f)
$$\begin{array}{r} 19.0 \\ 0.788 \\ +\ 49.3 \\ \hline 69.088 \end{array}$$

2. (a)
$$\begin{array}{r} 698.543 \\ -217.436 \\ \hline 481.107 \end{array}$$

(b)
$$\begin{array}{r} 653.802 \\ -476.13 \\ \hline 177.672 \end{array}$$

(c)
$$\begin{array}{r} 8.007 \\ -\ 6.132 \\ \hline 1.875 \end{array}$$

(d)
$$\begin{array}{r} 494.271 \\ -198.132 \\ \hline 296.139 \end{array}$$

3.
$$\begin{array}{r} 98.65 \\ +\ 84.75 \\ \hline 183.40 \end{array}$$

4.
$$\begin{array}{r} \text{km}\quad \text{m} \\ 4.050 \\ +\ 3.400 \\ \hline 7.450 \end{array}$$

5.
$$\begin{array}{r} \text{kg}\quad \text{g} \\ 6.300 \\ 2.450 \\ +3.050 \\ \hline 11.800 \\ \text{kg}\quad \text{g} \end{array}$$

6.
$$\begin{array}{r} 200.00 \\ +\ 78.75 \\ \hline 121.25 \\ \text{km}\quad \text{m} \end{array}$$

7.
$$\begin{array}{r} 3.375 \\ +\,2.075 \\ \hline 17.450 \end{array}$$

8.
$$\begin{array}{r} 6.850 \\ -\,1.150 \\ \hline 5.700 \end{array}$$

Now,
$$\begin{array}{r} \text{kg} \quad \text{g} \\ 12.000 \\ -\,5.450 \\ \hline 6.550 \end{array}$$

Class Work 3.9

1. 6.4, 6.8, 7.2

2. (a) 27.25, 27.75, 28.25

(b) 21.0, 23.5, 26.0

(c) 4.85, 4.80, 4.75

(d) 26.0, 22.5, 19.0

3. Do it yourself.

Class Work 3.10

1. (a)
$$\begin{array}{r} 13.090 \\ -\,10.902 \\ \hline 2.188 \end{array}$$
Round to 2

(b)
$$\begin{array}{r} 15.938 \\ -\,7.627 \\ \hline 23.565 \end{array}$$
Round to 24

(c)
$$\begin{array}{r} 3.504 \\ +\,7.118 \\ \hline 10.622 \end{array}$$
Round to 11

(d)
$$\begin{array}{r} 37.624 \\ -\,14.826 \\ \hline 22.798 \end{array}$$
Round to 23

2.
$$\begin{array}{r} 25.936032\,59 \\ 8.202 \\ \hline 34.138232\,59 \end{array}$$
Round to 34

NCERT Exercise 3.6

1. (a) 0.05 (b) 0.016 (c) 1.2 (d) 0.254

2. (a) $\frac{3}{10}+\frac{4}{100}$ (b) $\frac{100}{100}+\frac{2}{100}$ (c) $\frac{8}{10}$

(d) $\frac{3}{10}+\frac{6}{100}+\frac{2}{1000}$

3. a = 6.45, b = 6.550, c = 6.525

4. (a) 11.10 > 11.01 > 1.101 > 1.011 > 1.01

(b) 2.768 > 2.698 > 2.675 > 2.567 > 2.499

(c) 4.678 g > 4.666 g > 4.656 g> 4.600 g > 4.595 g

(d) 33.331 m > 33.313 m > 33.31 m > 33.133 m > 33.13 m

5. (a) 40.168 (b) 104.68

6. Not always as 0.9 > 0.123456789

7.
$$\begin{array}{r} 0.25 \\ 0.3 \\ 0.5 \\ 0.2 \\ 0.05 \\ \hline 1.30 \end{array}$$ kg

8.
$$\begin{array}{r} \text{L} \quad \text{ml} \\ 3.790 \\ 4.200 \\ +\,4.250 \\ \hline 12.240 \end{array}$$

Now,
$$\begin{array}{r} \text{L} \quad \text{ml} \\ 25.000 \\ -12.240 \\ \hline 12.760 \end{array}$$

9. 1.25 kg weight lost
$$\begin{array}{r} 35.75 \\ -\,34.50 \\ \hline 1.25 \end{array}$$ kg

10. 7.07, 7.06

11. 10,00,000 mm

12. 0.45 × 100000 = ₹45000

13. (a) $\frac{1}{10}$ (b) 90 thousandths

(c) 90 hundredths

14. (a) 88.10 (b) 121.2 (c) 111.1 (d) 277.75

15. 9.476 + 1.025 = 10.501

16. (a) 0.5 (b) 1.5 (c) 0.25 (d) 0.75 (e) 0.2 (f) 0.8

Practice Time 3.3

1. (a) Forty point five.

(b) Zero point zero seven.

(c) One hundred eight point six five.

(d) Thirty-seven point zero four nine.

2. (a) $1\times100+2\times10+7\times1+8\times\frac{1}{10}$

(b) $5\times10+3\times1+0\times\frac{1}{10}+4\times\frac{1}{100}$

(c) $6\times100+0\times10+9\times1+2\times\frac{1}{10}+0\times\frac{1}{100}+7\times\frac{1}{1000}$

(d) $3\times100+4\times10+5\times1+8\times\frac{1}{10}\times3\times\frac{1}{100}$

3. (a) 824.3 (b) 60.19

(c) 94.502 (d) 803.013

4. (a) 2.4 (b) 30.3

(c) 500.6 (d) 302.09

5. (a) 0.0 and 0.1 (b) 0.5 and 0.6

(c) 0.8 and 0.9 (d) 0.9 and 1.0

6. (a) 0.019 (b) 3.25 (c) 29.9 (d) 17.04

7. 2.543 < 2.7 < 27.305 < 27.35

8. 82.5 > 28.505 > 2.85 > 2.508 > 0.285

9. (a) $19.27 + 0.84 = 20.11$ and $-3.6 - 8.812 = -12.412$ $\Rightarrow$ $20.11 - 12.412 = 7.698$

(b)
$$\begin{array}{r} -2.351 \\ -1.450 \\ \hline -0.999 \\ +4.800 \\ \hline 6.4 \\ -4.8 \\ \hline 1.6 \end{array}$$

10.
$$\begin{array}{r} 500.00 \\ -343.60 \\ \hline ₹\ 156.40 \end{array}$$

11.
$$\begin{array}{rr} \text{km} & \text{m} \\ 36 & 054 \\ 108 & 865 \\ + \quad 1 & 095 \\ \hline 146 & 014 \end{array}$$

12. (a) 57, 570, 5700 (b) 36.4, 364, 3640
(c) 6.78, 67.8, 678

Chapter Innings

A. Multiple Choice Questions :

1. (b) **2.** (c) **3.** (b) **4.** (c) **5.** (b)
6. (b)

B. Fill in the Blanks :

1. tenths **2.** 3 **3.** zero eight
4. 0.037 **5.** decimal places
6. 53.409 **7.** 0.001

C. Match the Following :

1. (c) **2.** (a) **3.** (e) **4.** (b) **5.** (d)

D. True or False :

1. T **2.** T **3.** T **4.** F. **5.** F

E. Very Short Answer Type Questions :

1. $(7-3)\frac{(9-5)}{100} = 4\frac{4}{100}$

2. $6\frac{4}{10}\frac{8}{100} + 14\frac{5}{10}\frac{3}{100}$

$= \frac{648 + 1453}{100} = \frac{2101}{100} = 21\frac{1}{100}$

3. $\frac{347}{100} < \frac{394}{100} \Rightarrow 3\frac{4}{10}\frac{7}{100} < 3\frac{94}{100}$

4. (a) Three point zero one eight
(b) Ninety two point two zero five
(c) Six hundred thirty-three point one one six.

5. 2.43

(F) Short Answer Type Questions :

1. (a) Convert to like decimals (3 decimal places):

10.980, 10.089, 10.809, 10.908, 10.981 Ones digit: all are 10 (same). Compare tenths digit:

10.089 has tenths = 0 (smallest group)

10.809 has tenths = 8

10.908 has tenths = 9

10.980 has tenths = 9

10.981 has tenths = 9

For those with tenths 9: compare hundredths: 10:908 (0), 10.980 (8), 10.981 (8)

10.980 vs 10.981: thousandths: 0 < 1, so 10.981 > 10.980

So descending order: 10.981 > 10.980 > 10.908 > 10.809 > 10.089

(b) Convert to like decimals (3 decimal places):

22.310, 22.130, 22.331, 22.313, 22.133

Tens and Ones: all are 22 (same).

Compare tenths digit:

22.130 and 22.133 have tenths = 1 (smaller group)

22.310, 22.331, 22.313 have tenths = 3 (larger group)

Within tenths 3: compare hundredths:

22.310 (1), 22.331 (3), 22.313 (1)

22.331 > 22.313 > 22.310 (for 22.313 vs 22.310: thousandths: 3 > 0)

Within tenths = 1: 22.133 > 22.130

Final descending order : 22.331 > 22.313 > 22.310 > 22.133 > 22.130

2. (a) Convert to like decimals (3 decimal places):

23.710 +9.900 + 4.023 = 37.633

$$\begin{array}{r} 23.710 \\ +\ 9.900 \\ \hline 4.023 \\ \hline 37.633 \end{array}$$

(b) Convert to like decimals (3 decimal places):

8.790 + 23.001 +5.410 + 0.875

$$\begin{array}{r} 8.790 \\ 23.001 \\ 5.410 \\ +\ 0.875 \\ \hline 38.076 \end{array}$$

3. (a) Both are like decimals (2 decimal places).

$$\begin{array}{r} 5.82 \\ -\ 2.65 \\ \hline 3.17 \end{array}$$

(b) Convert to like decimals (3 decimal places):

$$\begin{array}{r} 19.010 \\ -\ 12.234 \\ \hline 6.776 \end{array}$$

4. (a) Since 1 g = $\frac{1}{1000}$ kg = 0.001 kg

39 g = $\frac{39}{1000}$ kg = 0.039 kg

(b) 100 g = $\frac{100}{1000}$ kg = $\frac{1}{10}$ kg = 0.100 kg

(c) 5 kg 8 g = 5 kg + 8 g

8 g = $\frac{8}{1000}$ kg = 0.008 kg

Total = 5 + 0.008 = 5.008 kg

5. (a) Since 1000 L = 1 kL, so 1 L = $\frac{1}{1000}$ kL = 0.001 kL

6 L = $\frac{6}{1000}$ kL = 0.006 kL

(b) 555 L = $\frac{555}{1000}$ kL = 0.555 kL

(c) 3 kL, 95 L = 3 kL + 95 L

95 L = $\frac{95}{1000}$ kL = 0.095 kL

Total = 3 + 0.095 = 3.095 kL

(G) Long Answer Type Questions

1. (a) 0.7 is greater than 0 and less than 1.

So it lies between whole numbers 0 and 1.

Distance from 0: 0.7 – 0 = 0.7

Distance from 1:1 – 0.7 = 0.3.

Since 0.3 < 0.7, the number 1 is nearer.

(b) 4.3 is greater than 4 and less than 5.

So it lies between whole numbers 4 and 5.

Distance from 4: 4.3 – 4 = 0.3

Distance from 5: 5 – 4.3 = 0.7

Since 0.3 < 0.7, the number 4 is nearer.

(c) 7.9 is greater than 7 and less than 8.

So it lies between whole numbers 7 and 8. Distance from 7: 7.9 – 7= 0.9

Distance from 8: 8 – 7.9 = 0.1

Since 0.1 < 0.9, the number 8 is nearer.

(d) 9.2 is greater than 9 and less than 10.

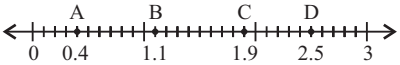
So it lies between whole numbers 9 and 10.

Distance from 9: 9.2 – 9 = 0.2

Distance from 10: 10 – 9.2 = 0.8

Since 0.2 < 0.8, the number 9 is nearer.

2.



3. P is between 0 and 1: P appears at the 8th small division from 0 – P = 0.8

Q is between 1 and 2: Q appears at the 3rd small division from 1 – Q = 1.3

R is between 2 and 3: R appears at the 2nd small division from 2 – R = 2.2

S is before 3: S appears at the 9th small division from 3 – S = 2.9

4. Total length of cloth = 20 m 5 cm

Convert to metres: 20 m + 5 cm = 20 m + $\frac{5}{100}$ m = 20 + 0.05 = 20.05 m

Length cut = 5 m 50 cm

Convert to metres: 5 m + 50 cm = 5 m + $\frac{50}{100}$ m = 5 + 0.50 = 5.50 m

Length left = 20.05 – 5.50

$$\begin{array}{r} 20.05 \\ -\ 5.65 \\ \hline 14.55 \end{array}\ \text{m}$$

Thus, length of cloth left with Pihu = 14.55m. (i.e. 14 m 55 cm)

5. Total weight of watermelon = 5 kg 300 g

Convert to kg: 5 + $\frac{300}{1000}$ = 5 + 0.300 = 5.300 kg

Weight given to brother = 2 kg 680 g

Convert to kg: $2 + \frac{680}{1000} = 2 + 0.680 =$ 2.680 kg

Weight left = 5.300 – 2.680

$$\begin{array}{r} 5.300 \\ -\ 2.680 \\ \hline 2.620 \end{array}$$

2.620 kg = 2 kg 620 g

H. Assertion-Reason Questions

1. (A) **2.** (D) **3.** (E) **4.** (D) **5.** (B)

I. Case Study

1. Money in Kapil's wallet ₹ = 256.45

Step 1: Find total money spent by Kapil. Convert to like decimals (2 decimal places):

Toothpaste = ₹ 71.75

Soap = ₹ 41.25

Shoe Polish = ₹ 52.00

Total spent:

$$\begin{array}{r} 71.75 \\ 41.25 \\ +\ 52.00 \\ \hline 165.00 \end{array}$$

Step 2: Money left = ₹ 256.45 – ₹ 165.00

$$\begin{array}{r} 256.45 \\ -\ 165.00 \\ \hline 91.45 \end{array}$$

So, money left in Kapil's wallet = ₹ 91.46

2. Money in Ankur's wallet = ₹ 1121.77

Step 1: Find total money spent by Ankur.

Notebooks = ₹ 106.50

Juice = ₹ 873.00

Total spent:

$$\begin{array}{r} 106.50 \\ +\ 873.00 \\ \hline 979.50 \end{array}$$

Step 2: Money left = ₹ 1121.77 – ₹ 979.50

$$\begin{array}{r} 1121.77 \\ +\ 979.50 \\ \hline 142.27 \end{array}$$

So, money left in Ankur's wallet = ₹142.27

3. Money left in Kapil's wallet = ₹91.45 (from Q1)

Money left in Ankur's wallet = ₹142.27 (from Q2)

Total money left:

$$\begin{array}{r} 91.45 \\ +\ 142.27 \\ \hline 233.72 \end{array}$$

4. Expressions Using Letter-Number

Class Work 4.1

1. Given, m = a – 5

Misth's age = 20

So, Ankur's age = m + 5

= 20 + 5 = 25 years

Class Work 4.2

1. Price of 1 coconut = ₹ 45

Price of 1 kg jaggery = ₹ 80

Using the expression: c × 45 + j × 80, where c = number of coconuts and j = kg of jaggery

c = 8, j = 9

Total amount = 8 × 45 + 9 × 80

= 360 + 720 = ₹1,080

So, Shabram should pay ₹1,080

2. Using the expression: c × 45 + j × 80

c = 7, j = 4

Total amount = 7 × 45 + 4 × 80

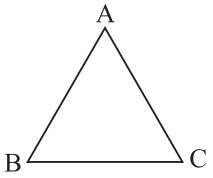
= 315 + 320

= ₹ 635

So, the total amount should be paid ₹635.

NCERT Exercise 4.1

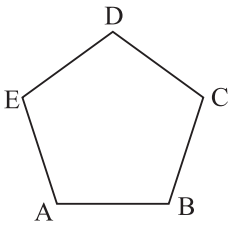
1. (a)



Let ABC is a triangle with equal sides say a unit. Then, perimeter of ΔABC = AB + BC + CA

= a + a + a = 3a units.

(b)



Let ABCDE is a regular pentagon.

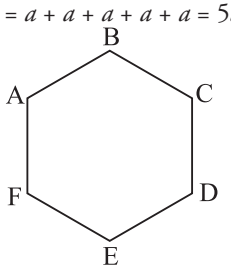
We know the regular pentagon has equal sides and equal angles.

Thus, perimeter of pentagon ABCDE (If each side is a unit)

= AB + BC + CD + DE + EA

= $a + a + a + a + a = 5a$ units

(c)



Let ABCDEF is a regular hexagon (with side a unit) We know that regular hexagon has all equal sides. Thus, perimeter of Hexagon ABCDEF

= AB + BC + CD + DE + EF + FA

= $a + a + a + a + a + a = 6a$ units

2. Initially, length of pipe = 20 m

Length of other pipe which incombined = K m

Total length of pipe = $(20 + k)\ m$

3. According to question,

If Krithika has 3 notes of ₹100, 5 notes of ₹20 and 6 notes of ₹5,

Total amount she has

= $3 \times 100 + 5 \times 20 + 6 \times 5$ = ₹430

If Krithika has 8 notes of ₹100, 4 notes of ₹20 and z notes of ₹5, then

Expression and total amount

= $8 \times 100 + 4 \times 20 + 5 \times z = 880 + 5z$

If Krithika has x notes of ₹100, y notes of ₹20, z notes of ₹5, then expression and total amount

= $100 \times x + 20 \times y + 10z$

No. of ₹100 notes	No. of ₹20 notes	No. of ₹5 notes	Expression and Total Amount
3	5	6	$3 \times 100 + 5 \times 20 + 6 \times 5 = 430$
6	4	3	$6 \times 100 + 4 \times 20 + 3 \times 5 = 695$
8	4	z	$8 \times 100 + 4 \times 20 + 5 \times z = 880 + 5z$
x	y	z	$x \times 100 + y \times 20 + z \times 5 = 100x + 20y + 5z$
			Total ₹$(100x + 20y + 10z + 2005)$

4. Given, time taken by machine to grind 1 kg of grain = 8 sec.

$\therefore$ Time taken by machine to grind y kg of grain = $8 \times y$ sec.

To start machine it takes 10 seconds initially.

So, total time to grind y kg of grain:

= $(10 + 8 \times y)$ sec.

5. Let us consider the letter a

(a) 5 more than a number = $5 + a$

(b) 4 less than a number = $a - 4$

(c) 2 less than 13 times a number = $13a - 2$

(d) 13 less than 2 times a number = $2 \times a - 13 = 2a - 13$

6. (a) If x and y are price of 1 toffee and 1 chocolate respectively then cost of 8 toffees and 3 chocolates is ₹$(8 \times x + 3 \times y)$.

(b) If Ravi and Mohit have their salary as j and k per month then find the difference between 15 times Ravi's salary and 2 times Mohit's salary is written as $15 \times j - 2 \times k$

7. Since w corresponds to 20.

So, 12 = 20 – 8 = w – 8

13 = 20 – 7 = w – 7

14 = 20 – 6 = w – 6

21 = 20 + 1 = w + 1

w – 8	w – 7	w – 6
w – 1	w	w + 1

Practice Exercise 4.1

1. An expression with numbers only contains no variables (letter-numbers).

(a) 8x-contains variable x. Not numbers only.

(b) 9-only a number. Yes, numbers only.

(c) x + 6-contains variable x. Not numbers only.

(d) 5 × 20 – 3y-contains variable y. Not numbers only.

(e) 2(15 – 11) × 5 × 8-contains only numbers: 2, 15, 11, 5, 8. Yes, numbers only.

(f) 3 × 20 – 5 × 8-z-contains variable z. Not numbers only.

2. (a) 2x + 5y – 9:

Constants: 2, 5, 9

Variables: x, y

(b) $\left(\frac{5}{3}\right)x + \frac{3y}{z} - 4(a + b + c)$:

Constants: 5, 3, –4

Variables: x, y, z, a, b, c

(c) 4m + 3n – 7x:

Constants: 4, 3, –7

Variables: m, n, x

3. (a) The sum of literal number x and a number 20:

Sum means addition.

Expression = x + 20

(b) x less than a number three times y:

Three times y = 3y

x less than 3y means 3y – x

(c) 5 times a number x:

5 times x = 5 × x = 5x

(d) One-fourth of the sum of the numbers 'a' and 'b':

Sum of a and b = a + b

One-fourth of (a + b) = $\frac{(a + b)}{4}$

(e) One-half of 'b' multiplied by the difference of 'x' and 'y':

One-half of b = $\frac{b}{2}$

Difference of x and y = (x – y)

Expression = $\left(\frac{b}{2}\right) \times (x - y) = \frac{b(x - y)}{2}$

4. (a) Perimeter of a rectangle is twice the sum of its length and breadth:

Let l = length and b = breadth of the rectangle, P = perimeter.

P = 2 × (1 + b) = 2(l + b)

(b) Profit is equal to the difference of selling price and cost price:

Let SP = selling price, CP = cost price, P = profit. P = SP – CP

(c) The radius of a circle is half of its diameter:

Let r = radius and d = diameter.

r = $\frac{d}{2}$

5. Let Rohan's age = x years

Akhil is 4 years younger than Rohan.

Akhil's age = Rohan's age – 4 = (x – 4) years

Class Work 4.3

1. 7k means 7 × k.

Substituting k = 4:

7k = 7 × 4 = 28

So, the value of 7k when k = 4 is 28.

2. 5m + 3 means 5 × m + 3.

Substituting m = 2:

5m + 3 = 5 × 2 + 3 = 10 + 3 = 13

Class Work 4.4

1. Total number of pencils sold across 3 days = 5 +3 + 10 = 18 pencils

Total amount earned from pencils = 18 × c

Substituting c = Rs 60:

Tolal amount = 18 × 60 = ₹1,080

So, the total amount earned by the sale of Pencils is ₹1080.

2. Total number of erasers sold across 3 days = 4 + 6 + 1 = 11 erasers

Total amount earned from erasers = 11 × d = 11d

3. 18c and 11d are unlike terms because they contain different variablos (c and d).

Unlike terms cannot be added together to form a single term.

4. Let c = 10 and d = 5.

Expression 1 (original expanded form): (5c + 4d) + (3c + 6d) + (10c + d)

= (5 × 10 + 4 × 5) + (3 × 10 + 6 × 5) + (10 × 10 + 1 × 5)

= (50 +20) + (30 + 30) + (100 + 5)

= 70 + 60 + 105 = 235

Expression 2 (simplified):
18c. + 11d = 18 × 10 + 11 × 5 = 180 + 55 = 235
Both expressions give the same value 235 when c = 10, d = 5.

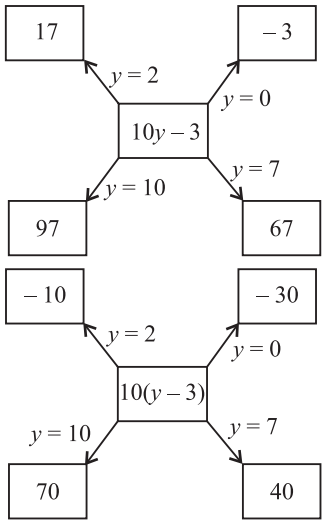
Class Work 4.5

1. We need three expressions (one per round) that add up to 23p – 7q.
One possible set of scores:
Round 1: 8p – 3q
Round 2: 7p – 2q
Round 3: 8p – 2q
Verification: (8p – 3q) + (7p – 2q) + (8p – 2q) = (8 + 7 + 8)p + (– 3 – 2 – 2)q
= 23p – 7q (Correct!)

2. Charu's total score = 21p – 9q
Krishita's total score = 23p – 7q
The values of these expressions depend on p (marks for correct answer) and q (penalty for wrong answer).
Example 1: If p = 4 and q = 1:
Charu: 21 × 4 – 9 × 1 = 84 – 9 = 75
Krishita: 23 × 4 – 7 × 1 = 92 – 7= 85.
Krishita scored more.
Example 2: If p = 1 and q = 10:
Charu: 21 × 1 – 9 × 10 = 21 – 90 = –69
Krishita: 23 × 1 – 7 × 10 = 23 – 70 = –47.
Krishita .still scored more.
In general, Krishita has 2 more correct answers and 2 fewer wrong answers, so usually Krishita scores more.

NCERT Exercise 4.2

1.



Now, two expressions are not equal.

2. (i) Row-wise Addition
5y + (–6) + x + x + 2 + 5y
= 2x + 10y – 4
Column-wise Addition
(5y + x) + (–6 + 2) + (x + 5y)
= 5y + x – 4 + x + 5y
= 2x + 10y – 4
Like terms Addition
(5y + 5y) + (–6 + 2) + (x + x)
= 10y – 4 + 2x
= 2x + 10y – 4
In each case, we get same result.

(ii) Row-wise Addition
2p + 3q + (–2) + 3 + 3q + 2p + 3 + (–2) + 2p + 3q + 3q + 2p
= (2p + 2p + 2p + 2p) + (3q + 3q + 3q + 3q) – 2 + 3 + 3 – 2
= 8p + 12q + 2
Column-wise Addition
(2p + 3q) + (3q + 2p) –2 + 3 + 2p + 3q + 3 – 2 + 3q + 2p
= 8p +12q + 2
Like-terms Addition
(4 × 2p) + (4 × 3q) + 2 × (–2) + 2 × 3
= 8p + 12q – 4 + 6
= 8p + 12q + 2
In each case, we get same result.

(iii) Row-wise Addition
–5g + 5k + 5k + (–5g) + 5k + 5k + 5k + 5k + 5k + 5k +5k + 5k + (–5g) + 5k + 5k + (–5g)
= (–10g + 10k) + 20k + 20k + (–10g + 10k)
= 60k – 20g
Like term Addition
(12 × 5k) + 4 × (–5g) = 60k – 20g
In each case, we get same result.

3. (a) p+p+p+p = 4p; p+p+p+q = 3p + q; p+q+p+q = 2p

(b) p–q+p–q = 2p–2q; p+q–p+q = 2q

(c) p+q–(p+q) =0, ; p–q–p–q = –2q

(d) 2d–d–d–d =–d, 2d–d–d–c –c

(e) 2d–d–(d–c) =c, 2d–(d–d)–c 2d–c

(f) 2d–d–c–c =d–2c

Practice Exercise 4.2

1. (a) 3x, 9x:

3x + 9x = (3 + 9)x = 12x

(b) 7y, –9y:

7y + (–9y) = (7 – 9)y = –2y

(c) 2x, 5x, –x:

2x + 5x + (–x) = (2 + 5 – 1)x = 6x

2. (a) 3a – 2b + 5c, 2a + 5b – 7c, –a – b + c:

= (3a – 2b + 5c) + (2a + 5b – 7c) + (–a – b + c)

Grouping like terms:

a terms: 3a + 2a + (–a) = 4a

b terms: –2b + 5b + (–b) = 2b

c terms: 5c – 7c + c = –c

Sum = 4a + 2b – c

(b) 5x – 2y + 6z, 4y + 3x, 9x + 2z, 2y – 2x:

= (5x – 2y + 6z) + (4y + 3x) + (9x + 2z) + (2y – 2x)

Grouping like terms:

x terms: 5x + 3x + 9x – 2x = 15x

y terms: –2y + 4y + 2y = 4y

z terms: 6z + 2z = 8z

Sum = 15x + 4y + 8z

3. (a) 5x from 2x:

2x – 5x = (2 – 5)x = –3x

(b) –x from 6x:

6x – (–x) = 6x + x = 7x

(c) 3a from 5b:

5b – 3a = 5b – 3a (unlike terms, cannot simplify further)

4. (a) 5a + 7b – 2c from 3a – 7b + 4c:

(3a –7b + 4c) – (5a + 7b – 2c)

= 3a – 7b + 4c – 5a – 7b + 2c

= (3a – 5a) + (–7b – 7b) + (4c + 2c)

= –2a – 14b + 6c

(b) a – 2b – 3c from –2a + 5b – 4c:

(–2a + 5b – 4c) – (a – 2b – 3c)

= –2a + 5b – 4c – a + 2b + 3c

= (–2a – a) + (5b + 2b) + (–4c + 3c)

= –3a +7b – c

5. To find by how much one expression exceeds another, we subtract the second from the first.

(2x – 3y + 4z) – (2x + 5y – 6z + 2)

= 2x – 3y + 4z – 2x – 5y + 6z – 2

= (2x – 2x) + (–3y – 5y) + (4z + 6z) – 2

= 0 – 8y + 10z – 2

= –8y + 10z – 2

6. (a) 3x – 2y + 4z:

= 3 × 1 – 2 × 2 + 4 × 5

= 3 – 4 + 20 = 19

(b) xy + yz - zx:

= (1 × 2) + (2 x 5) – (5 × 1)

= 2 + 10 – 5 = 7

NCERT Exercise 4.3

(i) (a) 5 + 2 – 2 (b) 81 + 1 – 2

(c) 9 + 11 – 2 (d) 10 + 10 – 2

(e) a + b – 2

(ii) (a) 4 × 1 + 1 (b) 6 × 0 + 1

(c) 3 × 2 + 1 (d) 10 × 3 + 1

(e) a × b + 1

Class Work 4.6

In a calander, moving right adds 1, moving down adds 7 (next weak, same day).

Pick any 2 × 2 square cell the top-left cell, then four cells are

$$\begin{bmatrix} n, & n+1 \\ n+7 & n+8 \end{bmatrix}$$

Diagonal sum

Main diagonal ⇒ n + (n + 8) = 2n + 8

Other diagonal ⇒ (n + 1) + (n + 7)

= 2n + 8

They are equal for even 'n'

Yes, this works for any calendar that continues beyond 30, since the +1, +7 pattern remains.

Class Work 4.7

1. In any 2 × 2 square in the calendar, If the top left number is m, then:

Top row: m, m + 1

Bottom row: m + 7, m + 8

Diagonal 1 sum: m + (m + 8) = 2m + 8

Diagonal 2 sum: (m + 1) + (m + 7) = 2m + 8

Both diagonal sums are equal to 2m + 8.

Verification with a specific example (from August 2026 calendar):

Let m = 11 (top left):

2 × 2 square: 11, 12, 18, 19

Diagonal 1: 11 + 19 = 30

Diagonal 2: 12 + 18 = 30

2m + 8 = 2 × 11 + 8 = 22 + 8 = 30 (Correct)

2. The plus-shaped set of numbers: 7, 13, 14, 15, 21 (where 14 is the centro, 7 is above, 21 is bolow, 13 is left, 15 is right)

Sum = 7 + 13 + 14 + 15 + 21 = 70

Centre number = 14

Observation: 70 = 5 × 14 = 5 times the contre number

Let us verify with another plus-shaped set. Take centre = 19;

Numbers: 12, 18, 19, 20, 26

Sum = 12 + 18 + 19 + 20 + 26 = 95 = 5 × 19 (Correct!)

Class Work 4.8

Using the formula: Number of matchsticks in nth shape = 2n + 1

For the 33rd shape:

Number of matchsticks = 2 × 33 + 1 = 66 + 1 = 67

For the 84th shape:

Number of matchsticks = 2 × 84 + 1 = 168 + 1 = 169

For the 108th shape:

Number of matchsticks = 2 × 108 + 1 = 216 + 1 = 217

NCERT Exercise 4.4

1. (a) If 1 plate of Pulao costs = ₹20

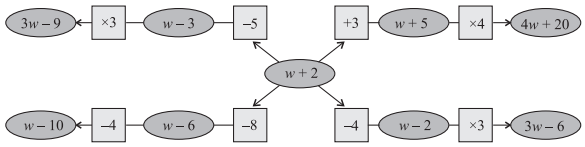
then plates of Pulao cost = 20y

If 1 plate Jowar Roti costs = ₹30

then 1 plate of Jowar Roti costs = ₹30x

∴ Total amount (₹in) = ₹(30x + 20y)

5.



6. Given, Distance between three stations are same. Time taken from one station to next station is same (t).

At each station, train stops for 2 minutes.

2. (a) Number of customers who only bought

Champak = p

It means they got p flags also

Number of customers who only bought. Marigold = q

It means they got q flags also

Again, Number of customers who bought both Champak and Marigold = r

It means they got r flags also

∴ Total Number of flags = p + q + r

3. (a) According to question, snail climb up u cm during the day and it slips down d cm during the night.

Thus, in 1 day and 1 night total climbing = (u – d) cm

So, in 10 days and 10 nights total climbing = 10 × (u × d) cm

(b) If d > u

Then, snail will be moving farther from top of the well and towards the bottom.

4. According to question,

Radha cycles 5 km per day in 1st week (i.e. 7 days)

So, Radha cycles in 7 days

= 5 × 7 = 35 km

Every week she increases the daily distance cycled by z km

So, in second week, she cycles the distance

= 7 × (5 + x) km

Similarly in third week, distance covered

= 7 × (5 + 2z) km

Thus, total distance covered in 3 weeks (in km)

= 35 + 7 × (5 + z) + 7 × (5 + 2z)

= 35 + 35 + 7z + 35 + 14z

= (35 + 35 + 35) + (7z + 14z)

(105 + 21z) km.

Time taken by train to covered the distance from Yahapur to Vahapur = t + t + t + t = 4t minutes

But train stops at each station for 2 minutes.

∴ Time taken by train to reach the destination = 4t + 3 × 2 = (4t + 6) min.

7. (a) 3a + 9b – 6 + 8a – 4b – 7a + 16
= (3a + 8a – 7a) + (9b – 4b) – 6 + 16
= 4a + 5b + 10

(b) 3(3a – 3b) – 8a – 4b – 16
= 9a – 9b – 8a – 4b – 16
= (9a – 8a) – (9b + 4b) – 16
= a – 13b – 16

(c) 2(2x – 3) + 8x + 12
= 4x – 6 + 8x + 12
= (4x + 8x) + (12 – 6)
= 12x + 6

(d) 8x – (2x – 3) + 12
= 8x – 2x + 3 + 12
= 6x + 15

(e) 8h – (5 + 7h) + 9
= 8h – 5 – 7h + 9
= h + 4

(f) 23 + 4(6m – 3n) – 8n – 3m – 18
= 23 + 24m – 12n – 8n – 3m – 18
(24m – 3m) – (12n + 8n) + 23 – 18
= 21m – 20n + 5

8. (a) (4d – 7c + 9) + (8c – 11 + 9d)
= (4d + 9d) + (8c – 7c) + 9 – 11
= 13d + c – 2

(b) –6f + 19 – 8s + (–23 + 13*f* + 12s)
= (13*f* – 6f) + (12s – 8s) + 19 – 23
= 7f + 4s – 4

(c) (8d – 14c + 9) + (16c – 11 – 9d)
= (8d – 9d) + (16c – 14c) + 9 – 11
= –d + 2c – 2

(d) 6f – 20 + 8s + 23 – 13f – 12s
= (6f – 13f) + (8s – 12s) + 23 – 20
= –7f – 4s + 3

(e) 13m – 12n + 12n – 13m
= (13m – 13m) + (12n – 12n)
= 0

(f) –26m + 24n + 26m – 24n
= (–26m + 26m) + (24n – 24n)
= 0

9. (a) (6a + 9b – 18) – (9a – 6b + 14)
= (6a – 9a) + (9b + 6b) – 18 – 14
= –3a + 15b – 32

(b) (7y – 10 + 3x) – (–15x + 13 – 9y)
= (3x + 15x) + (7y + 9y) – 10 – 13
= 18x + 16y – 23

(c) (11 – 10g + 3h) – (17g + 9 – 7h)
= (–10g – 17g) + (3h + 7h) + 11 – 9
= –27g + 10h + 2

(d) 6a – (9b +18) – (9a – 6b + 14)
= (6a – 9a) + (–9a + 6b) – 18 – 14
= –3a – 3b – 32

(e) (–3y + 8 – 3x) – (10x + 2 + 10y)
= –3y – 10y + 8 – 2 – 3x – 10x
= –13y – 13x + 6

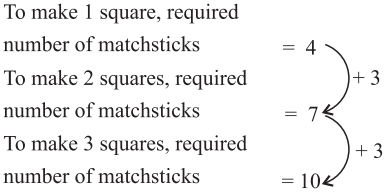
(f) 7h – 8g + 20 – (8g + 4h – 10)
= (7h – 4h) – (8g + 8g) + 20 + 10
= 3h – 16g + 30

10. (a) If cost of a toffee is ₹*x* and cost of a lollypop is ₹*y* then total cost of 8 toffees and 3 lollypop is 8*x* + 3*y*.

(b) If cost of a shirt is ₹*x*. On purchasing 15 such shirts shopkeeper gives discount of cost of two shirts. How much amount we have to paid?
Then, payable amount is 15*x* – 2*x*

11. From the given figure,
When rope is cut once, number of pieces = 2
When rope is cut after 1 fold, number of pieces = 3
When rope is cut after 2 fold, number of pieces = 4
By observing this pattern, we conclude that when the rope is folded *r* times and cut then number of pieces = *r* + 2
If rope is folded 10 times then cut, then number of pieces = 10 + 2 = 12

12. Given,



Let the number of squares be *x*
then number of matchsticks required = 3*x* + 1
where, x = 1, 2, 3, ...
If x = 10

then number of matchsticks required for 10 squares

= 3 × 10 + 1

= 30 + 1 = 31

Also, number of matchsticks required for w squares

= 3w + 1

13. Yes, we have noticed how the colours change in a traffic signal we noticed that the red signal appears at 1, 5, 9,...

yellow signal appears at 2, 4, 6, ...

and green signal appears at 3, 7, 11, 15, ...

Thus, Expression for red signal = 4k – 3

for yellow signal = 2k

for green signal = 4k – 1

where k = 1, 2, 3,...

To find colour at position 90, 190 and 343

90 = 2 × 45

i.e. of the form 2k

It means k = 45

So, at 90th position, yellow signal appeared

190 = 2 × 95

i.e., of the form 2k,

It means k = 95

So, at 190th position, yellow signal appeared

343 = 4 × 86 – 1

i.e. of the form 4k – 1

It means k = 86

So, at 343th position, green signal appeared.

14. From the given figure.

From figure (a) no. of squares used = 5 $\overset{+4}{\rightarrow}$

From figure (b) no. of squares used = 9 $\overset{+4}{\rightarrow}$

From figure (c) no. of squares used = 13

So, General expression is written as

So, General expression is written as

4k + 1, where k = 1, 2, 3,....

Using this formula,

No. of squares In Step 4 = 4 × 4 + 1 = 16 + 1 = 17

No. of squares in Step 10 = 4 × 10 + 1 = 40 + 1 = 41

No. of squares in Step 50 = 4 × 50 + 1 = 200 + 1 = 201

If we count number of vertices of all the squares then general formula be.

4 × (4k + 1)(since a square has 4 vertices)

= 16k + 4

15. (a) **In column 1**

Observations are

1	2	3	4
5	6	7	8
9	10	11	12
13	14	15	16

So general expression is 4k – 3,

where k = 1, 2, 3... (no. of rows)

In column 2

Observations are 2, 6, 10, 14

So, general expression is 4k – 2, where k = 1, 2, 3... (no. of rows)

In column 3

Observations are 3, 7, 11, 15

So, general expression is

4k – 1, k = 1, 2, 3... (no. of rows)

In column 4

Observations are 4, 8, 12, 16

So. general expression is

4k, k = 1, 2, 3... (no. of rows)

(b) (i) 124 = 4 × 31, divisible by 4

= 4k

$\Rightarrow$ k = 31

Thus, 124 will appear in 4th column and 31st row.

(ii) 147 = 37 × 4 – 1

Here, k = 37

of the form 4k – 1

Thus, 147 will appear in 3rd column and 37th row.

(iii) 201 = 51 × 4 – 3

of the form 4k – 3

Here, k = 51

Thus, 201 will appear in 1st column and 51st row.

(c) Required number = $4r$ – (4 – c)

(d) The multiples of 3 can be positioned as below.

1	2	3	4
1	2	3	4
5	6	7	8
9	10	11	12
13	14	15	16
17	18	19	20
21	22	23	24

Yes, Pattern can be seen.

Multiples of 5

1	2	3	4
1	2	3	4
5	6	7	8
9	10	11	12
13	14	15	16
17	18	19	20
21	22	23	24

NCERT Exercise 4.3

1. Let n = number of letters formed.

We count the matchsticks in one letter and multiply by n.

(a) T pattern: Each T requires 2 matchsticks (1 horizontal + 1 vertical).

(b) V pattern: Each V requires 2 matchsticks (2 diagonal sticks).

(c) Z (< shape) pattern: Each Z or < requires 3 matchsticks.

(d) U pattern: Each U requires 3 matchsticks (2 vertical + 1 horizontal base).

(e) F pattern: Each F requires 4 matchsticks (2 vertical + 2 horizontal).

(f) S pattern: Each S requires 5 matchsticks (3 horizontal + 2 short verticals).

2. Number of bags = a

Number of apples in each bag = 25

Total number of apples = 25 × a, 25a

3. Riya's age = x years

Ruby is 5 years younger than Riya,

Therefore, Ruby's age = x – 5 years

4. Number of mangoes in a small box = x

Number of small boxes filled = 3

Remaining mangoes left over = 7

Total mangoes in the larger box = (mangoes in 3 small boxes) + (mangoes left over)

= 3x × + 7 = 3x + 7

5. Let x = number of A's formed.

Observe the pattern:

For x = 1: Number of matchsticks = 6

For x = 2: Number of matchsticks = 10

For x = 3: Number of matchsticks = 14

Each new A added shares 1 matchstick with the previous A. So each new A adds 4 matchsticks. Checking with the expression 4x + 2:

When x = 1:4(1) + 2 = 6 (correct)

When x = 2: 4(2) + 2 = 10 (correct)

When x = 3: 4(3) + 2 = 14 (correct)

6. (a) Step 1: Group like terms together.

(4a + 9a – 6a) + (5b – 3b) + (–7 + 15)

Step 2: Simplify each group.

7a + 2b + 8

(b) Step 1: Expand the bracket,

= 10a – 10b – 6a – 3b – 18

Step 2: Group like terms.

= (10a – 6a) + (–10b – 3b) – 18

= 4a – 13b – 18

(c) 8(3x – 4) + 7x + 11

Step 1: Expand the bracket.

= 24x – 32 + 7x + 11

Step 2: Group like terms.

= (24x + 7x) + (–32 +11)

31x – 21

(d) 9x – (2x – 7) + 18

Step 1: Remove bracket. Since bracket is preceded by minus sign, signs of each term inside change.

= 9x – 2x + 7 + 18

Step 2: Group like terms.

= (9x – 2x) + (7 + 18)

=7x + 25

(e) 7m – (6 + 4m) + 9

Step 1: Remove bracket. Signs of each term inside change.

= 7m – 6 – 4m + 9

Step 2: Group like terms.

= (7m – 4m) + (–6 + 9)

= 3m + 3

(f) 27 + 5(6p – 2q) – 8p – 7q – 21
Step 1: Expand the bracket.
= 27 + 30p – 10q – 8p – 7q – 21
Step 2: Group like terms.
= (30p – 8p) + (– 10q – 7q) + (27 – 21)
= 22p – 17q + 6

7. (a) 5c – 8d + 7 and 9c – 15 + 4d
= (5c – 8d + 7) + (9c – 15 + 4d)
= (5c + 9c) + (–8d + 4d) + (7 – 15)
14c – 4d – 8

(b) –7f + 13 – 6s and –27 + 11f + 15s
=(–7f + 13 – 6s) + (–27 + 11f + 15s)
= (–7f +11f) + (– 6s+ 15s) + (13 – 27)
= 4f + 9s – 14

(c) 17m – 11n and 11n – 17m
= (17m – 11n) + (11n – 17m)
= (17m – 17m) + (– 11n + 11n)
= 0

(d) –25m + 22n and 25m – 22n
(–25m + 22n) + (25m – 22n)
= (–25m + 25m) + (22n – 22n)
= 0

8. (a) 8a – 5b + 13 from 5a + 8b – 17
= (5a + 8b – 17) – (8a – 5b + 13)
Change signs:
5a + 8b – 17 – 8a + 5b – 13
= (5a – 8a) + (8b + 5b) + (–17 – 13)
= –3a + 13b – 30

(b) –14x + 12 – 8y from 6y – 9 + 2x
= (6y – 9 + 2x) – (–14x + 12 – 8y)
Change signs:
= 6y – 9 + 2x + 14x – 12 + 8y
= (2x + 14x) + (6y + 8y) + (–9 – 12)
= 16x + 14y – 21

(c) 16g + 8 – 6h from 10 – 9g + 2h
= (10 – 9g + 2h) – (16g + 8 – 6h)
Change signs:
= 10 – 9g+ 2h – 16g – 8 + 6h
= (–9g – 16g) + (2h+6h) + (10 – 8)
= –25g + 8h + 2

(d) 8a – 5b + 13 from 5a – (8b + 17)
Step 1: First simplify 5a – (8b + 17)
= 5a – 8b – 17
Step 2: Now subtract (8a – 5b + 13) from (5a – 8b – 17).
= (5a – 8b – 17) – (8a – 5b + 13)
Change signs:
= 5a – 8b – 17 – 8a+ 5b – 13
= (5a – 8a) + (– 8b + 5b) + (–17 – 13)
= –3a – 3b – 30

(e) 9x + 1 + 9y from – 2y +7 – 2x
= (–2y + 7 – 2x) – (9x + 1 + 9y)
Change signs:
= – 2y + 7 – 2x – 9x – 1 – 9y
= (–2x – 9x) + (–2y – 9y) + (7 – 1)
= –11x – 11y + 6

(f) 7g + 3h – 11 from 6h – 7g + 22
= (6h – 7g + 22) – (7g + 3h – 11)
Change signs:
6h – 7g + 22 – 7g – 3h + 11
= (– 7g – 7g) + (6h – 3h) + (22 + 11)
= –14g + 3h + 33

9. (a) If the cost of 1 notebook is ₹7 and the cost of 1 pencil is ₹5, write an expression for the total cost of x notebooks and y pencils. So, $(8x + 5y)$.

(b) A shopkeeper sells x pens at ₹18 cach and gives a discount of ₹6 per pen on y of them. Write an expression for his total earnings. So, $(18x – 6y)$.

10. Let Vaishali's score in Science = x marks.
Three-fourth of her score in Science
$= \left(\frac{3}{4}\right)x$

Her score in Mathematics is 15 more than $\left(\frac{3}{4}\right)x$.

Therefore, Vaishali's in Mathematics
$= \frac{3}{4}x + 15$

Chapter Innings

A. Multiple Choice Questions :

1. (c) **2.** (b) **3.** (b) **4.** (c) **5.** (c)

B. Fill in the blanks :

1. letters **2.** variable **3.** $3x + 6$

4. $\frac{x}{25}$ **5.** ₹64 m

C. Match the Following :

1. (e) **2.** (d) **3.** (b) **4.** (a) **5.** (c)

D. True or False :

1. T **2.** T **3.** F **4.** F **5.** F

E. Very Short Answer Type Questions :

1. The pattern increases by 5 each time. First term = 6.
nth term = 6 + (n – 1) × 5
= 6 + 5n – 5 = 5n + 1
56th term = 5 × 56 + 1 = 280 + 1 = 281

2. = 2 × (2 × 6 + 4 – 3)
= 2 × (12 + 4 – 3)
= 2 × 13 = 26

3. Let the number = $n.\frac{n}{4} = 15$
So n = 15 × 4 = 60.

4. Based on the figures shown in the textbook:
Thus, (a) 4n, (b) 5n, (c) 6n, (d) 7n, (e) 4n + 1

5. Number of figures: 1, 2, 3, 4, 25, n
Pattern: each figure adds 3 matchsticks, starting from 5.
Formula: 3n + 2
For n = 1: 5, n = 2: 8, n = 3: 11, n = 4: 14, n = 25: 3(25) + 2 = 77, general: 3n + 2
Thus, 5, 8, 11, 14, 77, 3n + 2

F. Short Answer Type Questions

1. (a) Knife has a handle of x cm and blade of 4 cm (from figure). Total length = x + 4 cm
(b) From the figure, screwdriver has shaft x cm and head 3 cm. But it is x cm with a shaded part removed: total = x – 3 cm
(c) Notebook dimensions: length = 5x cm and breadth = 3y cm (from figure).
Perimeter = 2(5x + 3y) = 10x + 6y cm
= 2(5x + 3y) units
(d) Total = 10 × x + 6 × y = 10x + 6y
= ₹(10x + 6y)

2. (a) m + 7, (b) 5 – a, (c) 6x, (d) $\frac{p}{8}$, (e) –a – 9, (f) $-\frac{y}{10}$

3. Height = h cm
Length = 3 × h = 3h cm
Breadth = Length – 8 = 3h – 8 cm
But textbook answer gives: length = 3h; breadth = 3h – 8; combined = 2(6h – 8)
Thus, length = 3h cm, Breadth = 3h – 8cm, Perimeter = 2(6h – 8)cm.

4. Number of squares (n): 1, 2, 3, 4, 8, 15, 19, n
Number of matchsticks: 4, 8, 12, 16, 32, 60, 76, 4n
Number of dots: 4, 7, 10, 13, 25, 46, 58, 3n + 1
Thus, 5, 8, 11, 14, 77, 3n + 2

5. (a) General term = 3n – 1. 48th term = 3(48) – 1 = 144 – 1 = 143
(b) General term = 2n + 1. 25th term = 2(25) + 1 = 51
(c) General term = 4n – 3. 30th term = 4(30) – 3 = 120 – 3 = 117
(d) General term = 8n + 4. 18th term = 8(18) + 4 = 144 + 4 = 148

G. Long Answer Type Questions :

1. (a) = (xy + yz) + (yz + zx)
= xy + 2yz + zx
(b) = (3a – b + c) + (2b – 5c) + (3c – 4a)
a terms: 3a – 4a= –a
b terms: –b + 2b = b
c terms: c – 5c + 3c = –c
= –a + b – c
(c) = (3m – n + 5r) + (n – 2r) + (3r – 2m + 7n)
m terms: 3m – 2m = m
n terms: –n + n + 7n = 7n
r terms: 5r – 2r + 3r = 6r
= m + 7n + 6r

2. (a) (5x – y + 3z) – (7x + 8y – z)
= 5x – y + 3z – 7x – 8y + z
= –2x – 9y + 4z
(b) (c – a) – (2a – 3b)
= c – a – 2a + 3b
= c – 3a + 3b
(c) (4xy + 7x – 2y) – (3xy – 2x + y)
= 4xy + 7x – 2y – 3xy + 2x – y
= xy + 9x – 3y

(d) (15ab + b – a) – (11ab – 5b + 2a)
= 15ab + b = a –11ab + 5b – 2a
= 4ab + 6b – 3a

3. (a) If 1 metre cloth costs Rs x, what will be the cost of 8 metres of cloth?
Cost of 8 metres of cloth = 8 × x = 8x
= ₹8x

(b) Vaishali's score in Maths is 25 more than three-fourth of her English score x:

Maths score = $\left(\frac{3}{4}\right)x + 25 = \frac{3x}{4} + 25$

(c) If the length of a side of a regular hexagon is x cm, what is the perimeter?
Perimeter = 6 × x = 6x cm

4. Dots per row = 9. For n rows:
Total dots = 9 × n = 9n
For 8 rows: 9 × 8 = 72 dots
For 10 rows: 9 × 10 = 90 dots

5. Distance per minute = 400 m = $\frac{400}{1000}$ km
= $\frac{2}{5}$ km
Let flying time = t minutes
Distance in km = $\left(\frac{2}{5}\right) \times t = \frac{2t}{5}$ km

H. Assertion-Reason Questions :

1. (A) **2.** (C) **3.** (E) **4.** (A) **5.** (D)

I. Case Study :

1. (d) **2.** (b) **3.** (a)

5. Parallel and Intersecting Lines

Class Work 5.1

1. (a) To check for adjacent angles, we verify three conditions:
(i) Common vertex : O-Yes, O is the common vertex.
(ii) Common arm : OD-Yes, OD is the common arm.
(iii) Non-common arms: OB and OC must lie on opposite sides of OD.
From Fig. 5.10, ray OD lies between rays OB and OC. Rays OB and OC are on opposite sides of OD.
Therefore, angle BOD and angle DOC are adjacent angles.

(b) To check for adjacent angles, we verify three conditions:
(i) Common vertex : O-Yes, O is the common vertex.
(ii) Common arm : OD Yes, OD is the common arm.
(iii) Non-common arms: OA and OC must lie on opposite sides of OD.
From Fig. 5.10, ray OA goes to the right and ray OC goes upward-right.
Both OA and OC lie on the same side of ray OD. Therefore, the third condition is not satisfied.
Therefore, angle AOD and angle DOC are not adjacent angles.

2. (i) Two acute angles:
An acute angle measures less than 90°.
Sum of two acute angles < 90° + 90° = 180°.
For a linear pair, the sum of the two adjacent angles must be exactly 180°.
Therefore, two acute angles cannot form a linear pair.

(ii) Two right angles:
A right angle measures exactly 90°.
Sum of two right angles = 90° + 90° = 180°.
If they are adjacent and share a common arm, their non-common arms form a straight line.
Therefore, two right angles can form a linear pair.

3. Two angles are complementary if their sum = 90°.
Two adjacent angles share a common vertex and a common arm.
There is no rule that prevents adjacent angles from adding up to 90°.
Example: angle AOB = 30° and angle BOC = 60°, where OA perpendicular to OC.
Here, angle AOB + angle BOC = 30° + 60° = 90°, and they are adjacent.
Therefore, yes, two adjacent angles can be complementary.

4. Two angles are supplementary if their sum = 180°.

Two adjacent angles can certainly add up to 180°.

In fact, angles in a linear pair are adjacent and, supplementary.

Example: If angle AOB = 70° and angle BOC = 110° (where OA and OC are opposite rays), then angle AOB+ angle BOC = 70° + 110° = 180°, and they are adjacent.

Therefore, yes, two adjacent angles can be supplementary.

5. (a) We know that the sum of all angles at a point = 360°.

Therefore:

$x + 42° + 106° + 135° = 360°$

$\Rightarrow \quad x + 283° = 360°$

$\Rightarrow \quad x = 360° - 283°$

Therefore, $x = 77°$

(b) We know that the sum of angles at a point on one side of a straight line 180°.

Therefore:

$3x + x + 40° = 180°$

$4x + 40° = 180°$

$4x = 180° - 40° = 140°$

$x = \frac{140°}{4}$

Therefore, $x = 35°$

(c) We know that the sum of angles at a point on one side of a straight line = 180°

Therefore;

$(2x + 10°) + (3x - 10°) + 40° = 180°$

$\Rightarrow \quad (2x + 3x) = 180° - 40°$

$\Rightarrow \quad 5x = 140°$

$\Rightarrow \quad x = \frac{140°}{4}$

$\Rightarrow \quad x = 28°$

Therefore, $x = 28°$

NCERT Exercise 5.1

Linear pairs: ($\angle a$, $\angle b$), ($\angle b$, $\angle c$), ($\angle c$, $\angle d$), ($\angle d$, $\angle a$)

Pairs of vertically opposite angles : ($\angle b$, $\angle d$), ($\angle a$, $\angle c$)

Practice Exercise 5.1

1. Given: $\angle 1 = 30°$

Finding $\angle 2$:

$\angle 1$ and $\angle 2$ form a linear pair (non-common arms are opposite rays).

Therefore, $\angle 1 + \angle 2 = 180°$ [Linear pair]

$30 + \angle 2 = 180°$

$\angle 2 = 180 - 30 = 150°$

Finding $\angle 3$:

$\angle 3$ and $\angle 1$ are vertically opposite angles (formed by the non-common arms of the two intersecting lines, having the same vertex, on opposite sides).

Therefore, $\angle 3 = \angle 1$ [Vertically opposite angles are equal]

$\angle 3 = 30°$

$\angle 2 = 150°$ and $\angle 3 = 30°$

2. When two straight roads cross each other at an intersection (a crossroads), the angles formed at the point of crossing are vertically opposite angles.

Other examples:

(i) The blades of a pair of scissors form vertically opposite angles at the pivot.

(ii) When two wires or strings cross each other, the angles formed are vertically opposite angles.

3. (a) Given: 130°

Two straight lines intersect at a point. The four angles formed are y, x, z, and 130°.

Step 1: Find x

x and 130° are vertically opposite angles.

x = 130° [Vertically opposite angles are equal]

Step 2: Find y

y and 130° form a linear pair.

y + 130° = 180° [Linear pair]

y = 180° –130° = 50°

Step 3: Find z

z and y are vertically opposite angles.

z = y = 50° [Vertically opposite angles are equal]

(b) Given: 90° and 31°

Three rays from a point on a straight line form angles y, 90° and 31° on one side.

Step 1: Find y

Sum of angles on one side of a straight line = 180°

$$y + 90° + 31° = 180°$$
$$y + 121° = 180°$$
$$y = 180° - 121°$$
$$= 59°$$

Step 2: Find z

$$x + z = 90°$$
$$\Rightarrow \quad 31° + z = 90°$$
$$\Rightarrow \quad z = 90° - 31°$$
$$\Rightarrow \quad z = 59°$$

Step 3: Find x (vertically opposite to 31°)

x = 31° [Vertically opposite angles are equal]

(c) Given: 90° and ∠2z and z

Three rays from a point on a straight line form ∠2z, z, 90°, x and y degrees.

Step 1: Find z

$$z + 2z = 180°$$
$$\Rightarrow \quad 3z = 180° \Rightarrow z = 60°$$

Step 2: Find x

$$x + 90° + z = 180°$$
$$\Rightarrow x + 90° + 60° = 180°$$
$$\Rightarrow \quad x = 30°$$

Step 3: Find y (vertically opposite to z°)

$$y = z = 60°$$

Class Work 5.2

1. The following are examples of parallel lines that can be spotted in a classroom:

(i) The two horizontal edges (top and bottom) of the blackboard.

(ii) The two vertical edges (left and right sides) of the blackboard.

(iii) The two horizontal edges of the door.

(iv) The two opposite edges of a window frame.

(v) The ruled lines on a notebook page.

(vi) The two opposite edges of the teacher's desk.

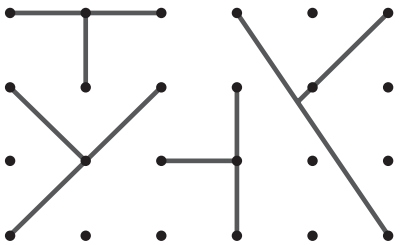
(vii) The rows of desks/benches placed in a classroom.

Note: All these lines, when extended in both directions, would never meet.

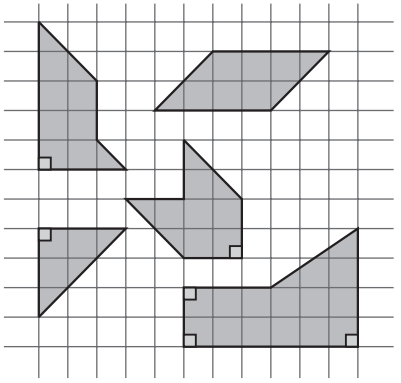
2. Lines *a*, *i* and *h* are parallel to each other; Line *c* is parallel to line *g*; Line *d* is parallel to line *f*; Line *e* is parallel to line *b*.

NCERT Exercise 5.2

1.



2.

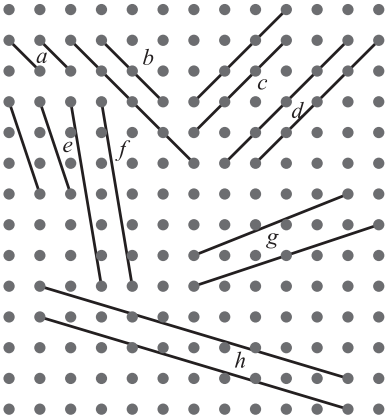


(a) Lines that intersect at a 90° angle are perpendicular.

(b) Lines that do not meet, no matter how far they are extended, are parallel.

3. Do it yourself. (Activity Based)

4.



(a) Yes

(b) e, f, h and g

(c) Parallel lines are drawn by keeping them equidistant from the given lines

5. (c) The line a is parallel to line C because these two lines are always

the same distance between them and never meet, no matter how far they extended.

Practice Exercise 5.2

1. Two lines drawn in a plane are called parallel lines if they have no common point.

The distance between two parallel lines always remains the same.

Two real life examples of parallel lines:

(i) Railway tracks: The two rails of a railway track never meet and always remain at the same distance from each other.

(ii) The two edges (long sides) of a ruler are parallel to each other.

2. The symbol used for parallel lines is || (two vertical lines).

3. Note: The concept of "slope" is introduced in higher classes. As per the Class 7 textbook, this property of parallel lines is understood through the concept of direction and angle, not slope.

As per the chapter: Parallel lines always maintain the same direction and the same distance from each other.

4. Perpendicular lines are pairs of lines that intersect each other at right angles (90°).

Real world examples of perpendicular lines:

(i) The floor and the wall of a room meet at a right angle.

(ii) The adjacent sides of a book or notebook are perpendicular to each other.

(iii) The horizontal and vertical edges of a door frame are perpendicular.

(iv) The corner of a square tile has perpendicular sides.

(v) The hands of a clock at 3 o'clock or 9 o'clock are perpendicular.

5. Given: a || b and b || c

Yes, it is possible that a is parallel to c.

Reason: If two lines are parallel to the same line, then the lines are parallel to each other.

Here, both a and c are parallel to the same line b.

Therefore, a is parallel to c, i.e., a || c.

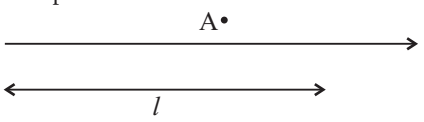
NCERT Exercise 5.3

1. Yes, we can draw a line that goes through a point A, using tools from a standard geometry box.

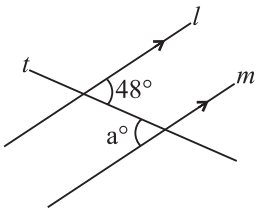
Here is a step-by-step method using a ruler and a set square.

Tools Needed Set square, ruler.

1. Place the set square along the linel Align one edge of the set square, so it sits perfectly on the line l.
2. Place the ruler along the other edge of the set square Hold the ruler steady, so it does not move.
3. Slide the set square along the ruler While keeping the ruler fixed, carefully slide the set square until one edge passes through point A.
4. Draw the line Once the set square's edge is aligned through point A, draw a line along that edge. This line will be parallel to linel and pass through point A.

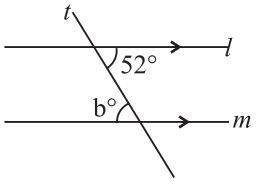


2. (i) Let *l* and *m* are parallel lines and *t* is transversal.



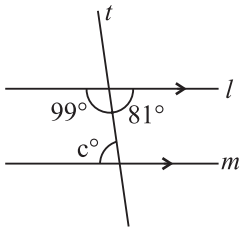
∴ ∠a = 48° [alternate interior angles]

(ii) Let *l* and *m* are parallel lines and *t* is transversal.



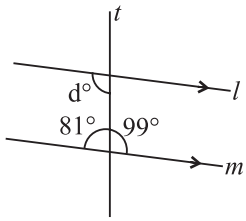
∴ ∠b = 52° [alternate interior angle]

(iii) Let l and m are parallel lines and t is transversal.



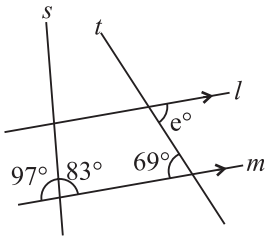
$\therefore \angle c = 81°$ [alternate interior angle]

(iv) Let l and m are parallel lines and t is transversal.



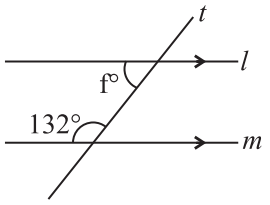
$\therefore \angle d = 99°$ [alternate interior angle]

(v) Let l and m are parallel lines and t is transversal.



$\therefore \angle e = 69°$ [alternate interior angles]

(vi) Let l and m are parallel lines and t is transversal.

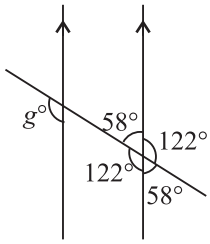


We know that the sum of pair of cointerior angles on the same side of transversal is equal to 180°.

$\therefore \angle f + 132° = 180°$.

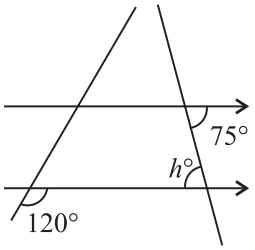
$\Rightarrow \angle f = 180° - 132° = 48°$

(vii) Let l and m are parallel lines and t is transversal.



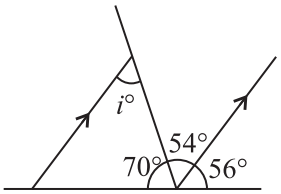
$\therefore \angle g = 122°$ [corresponding angles]

(viii) Let l and m are parallel lines and t is transversal.



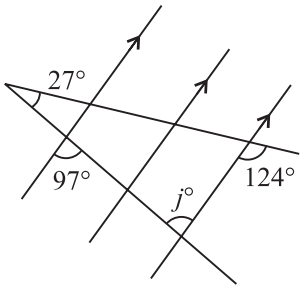
$\therefore \angle h = 75°$ [alternate interior angles]

(ix) Let l and m are parallel lines and t is transversal.



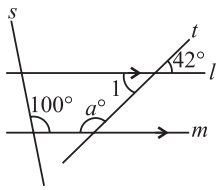
$\therefore \angle i = 54°$ [alternate interioriangles]

(x) Let l, m and n are parallel lines and t is transversal:



$\therefore \angle j = 97°$ [alternate interior angles]

3. (i) Let l and m are parallel lines and t is transversal.

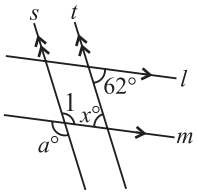


$\angle 1 = 42°$ [vertically opposite angles]

We know that the sum of pair of interior angles on the same side of transversal is equal to 180°.

$\therefore \angle a + \angle 1 = 180° \Rightarrow \angle a = 180° - 42° = 138°$

(ii) Let s and t are parallel lines l and m are transversal.



$\therefore \angle x = 62°$ [alternate interior angles]

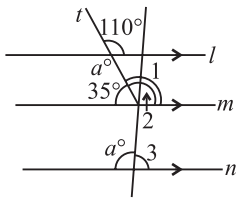
Since, $a°$ and $\angle 1$ are vertically opposite angles. We know that the sum of pair of interior angles on the same side of transversal is equal to 180°.

$\therefore \quad \angle x + \angle a = 180°$

$\Rightarrow \quad 62° + \angle a = 180°$

$\Rightarrow \quad \angle a = 180° - 62° = 118°$

(iii) Let l, m and n are parallel lines and t is transversal.



$\angle 1 = 110°$

[corresponding angles]

$\therefore \quad \angle 2 = 110° - 35° = 75°$

and $\quad \angle 2 = \angle 3$

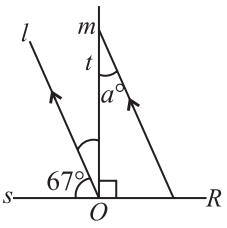
[corresponding angles]

$\therefore \quad \angle 3 + \angle a = 180°$ [linear pair]

$\therefore \quad 75° + \angle a = 180°$

$\Rightarrow \quad \angle a = 180° - 75° = 105°$

(iv) Let l and m are parallel lines and line t is perpendicular to line R.



$\therefore$ and $\quad 67° + \angle 1 = 90°$[right angle]

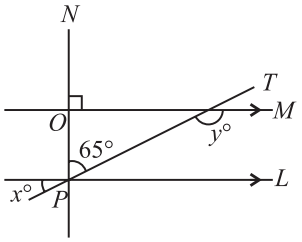
$\Rightarrow \angle 1 = 90° - 67° = 23°$

and $\quad \angle 1 = a°$

[alternate interior angles]

$\angle a = 23°$

4. (a) Let lines M and L are parallel, N is perpendicular to the lines M and L and T is transversal.



$\therefore \quad x° = \angle TPL$

[vertically opposite angles]

and $\angle TPL + \angle NPT = 90°$

$\Rightarrow \quad \angle x + 65° = 90°$

$\angle x = 90° - 65° = 25°$

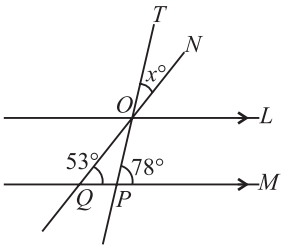
Now, $\quad \angle x + \angle y = 180°$

[cointerior angles]

$\Rightarrow \quad 25° + \angle y = 180°$

$\Rightarrow \quad \angle y = 180° - 25° = 155°$

(b) Let lines L and M are parallel and lines T and N are transversals.



$\therefore \quad \angle MPT = \angle LOT$

[corresponding angles]

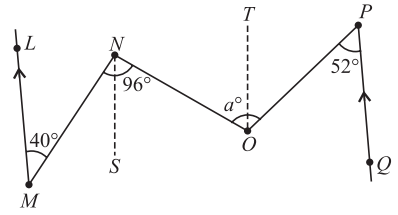
$\Rightarrow \quad \angle LOT = 78°$

and $\angle OQM = \angle NOL$
[corresponding angles]
$\Rightarrow \quad \angle NOL = 53°$
Now, $\angle NOT = \angle LOT - \angle NOL$
$\Rightarrow \quad \angle x = 78° - 53°$
$\Rightarrow \quad \angle x = 25°$

5. Given, lines IA and GD are parallels and JF and CH are transversals.
$\therefore \quad \angle CBA = \angle BED = 45°$
[corresponding angles]
and $\angle BED = \angle GEH = 45°$
[vertically opposite angles]
Now, $\angle FED = \angle IKJ$
[alternate exterior angles]
$\Rightarrow \quad \angle FED = 78° \quad [\because \angle IKJ = 78°]$
Now, $\angle FED + \angle HEF + \angle GEH$
$= 180°$ [linear pair]
$\Rightarrow 78° + \angle HEF + 45° = 180°$
$\Rightarrow \quad \angle HEF = 180° - (78° + 45°)$
$\Rightarrow \quad \angle HEF = 57°$
Hence, $\angle GEH = 45°$, $\angle HEF = 57°$ and $\angle FED = 78°$

6. Given, AB is parallel to CD and CD is parallel to EF, EA is perpendicular to AB and BE is transversal.
$\therefore \quad \angle BEF + \angle y = 180°$ [linear pair]
$\Rightarrow \quad 55° + \angle y = 180°$
$[\because \angle BEF = 55°$ (given)]
$\Rightarrow \quad \angle y = 180° - 55°$
$\Rightarrow \quad \angle y = 125°$
and $\angle x = \angle y$
[corresponding angles]
$\Rightarrow \quad \angle x = 125°$

7. Given Lines ML and QP are parallel. Also, $\angle MNO$, $\angle NMI$ and $\angle OPQ$ are 96°, 40° and 52°, respectively.
Construction Draw lines NS and OT parallel to LM and PQ through points N and O, so lines MN, NO and OP are transversals.



Here, $\angle LMN = \angle MNS = 40°$
[alternate interior angles]
and $\angle SNO = \angle MNO - \angle MNS$
$= 96° - 40° = 56°$
Now, $\angle NOT = \angle SNO = 56°$
[alternate interior angles]
and $\angle TOP = \angle OPQ = 52°$
[alternate interior angles]
So, $\angle NOT + \angle TOP$
$= 56° + 52°$
$\angle a = 108°$

Practice Exercise 5.3

1. (a) If m || n, then $\angle 1 = \angle 5$.
$\angle 1$ and $\angle 5$ are corresponding angles (they are on the same side of the transversal p and in corresponding positions at the two intersections).
Properly used: Corresponding Angles Property.
"If two parallel lines are intersected by a transversal, each pair of corresponding angles are equal in measure."

(b) If $\angle 4 = \angle 6$, then m || n.
$\angle 4$ and $\angle 6$ are alternate interior angles (they are on opposite sides of the transversal and lie between the two lines m and n).
Property used: Converse of the Alternate Interior Angles Property.
"If two lines are cut by a transversal such that a pair of alternate interior angles are equal, then the lines are parallel."

(c) If $\angle 4 + \angle 5 = 180°$, then m || n.
$\angle 4$ and $\angle 5$ are co-interior angles (also called interior angles on the same side of the transversal). They lie between m and n, on the same side of the transversal.
Property used: Converse of the Co-interior Angles Property.
"If two lines are cut by a transversal such that a pair of co-interior angles are supplementary, then the lines are parallel."

2. From Fig. 5.69, transversal p cuts two lines I and m. At line 1: $\angle 4$ (upper-left), $\angle 1$ (upper-right), $\angle 3$ (lower-left), $\angle 2$ (lower-right).

At line m: ∠8 (upper-left), ∠5 (upper-right), ∠7 (lower-left), ∠6 (lower-right).

Interior angles (between lines I and m): ∠2, ∠3 (at 1) and ∠5, ∠8 (at m).

(a) The pairs of corresponding angles:

Corresponding angles are on the same side of the transversal and in the same relative position at each intersection.

Pairs of corresponding angles:

(∠1, ∠5), (∠2, ∠6), (∠3, ∠7), (∠4, ∠8)

(b) The pairs of alternate interior angles:

Alternate interior angles have different vertices, lie between the two lines, and are on opposite sides of the transversal.

Pairs of alternate interior angles:

(∠2, ∠8) and (∠3, ∠5)

(c) The pair of interior angles on the same side of the transversal (co-interior angles):

Co-interior angles lie between the two lines and are on the same side of the transversal.

Pairs of co-interior angles:

(∠2, ∠5)—both on the right side of transversal

(∠3, ∠8)—both on the left side of transversal

(d) The vertically opposite angles:

Vertically opposite angles are formed at the same vertex (intersection point) and are are (on opposite sides of the intersection.

At line I: (∠1, ∠3) and (∠4, ∠2)

At line m: (∠5, ∠7) and (∠8, ∠6)

3. Given: m || n, and one angle = 125° (at the intersection of transversal t with line m).

Unknown angles at line m: e, f | Unknown angles at line n: a, b, c, d

Step 1: Find b (vertically opposite to 125° at line n) b = 125° [Vertically opposite angles are equal]

Step 2: Find f (linear pair with 125° at line m)

f + 125° = 180° [Linear pair]

f = 180° – 125° = 55°

Step 3: Find c (vertically opposite to f, since m || n)

c = f = 55° [Corresponding Angles Property, m || n]

Step 4: Find e (vertically opposite to f at line n)

e = f = 55° [Vertically opposite angles]

Step 5: Find a (corresponding to e, since m || n)

a = e = 55° (Corresponding Angles Property, m || n]

Step 6: Find d (vertically opposite to b at line n)

d = b = 125° [Vertically opposite angles]

4. (a) Given: 110° at line p (Fig. 5.71(a))

Transversal t cuts the parallel lines p and q.

The angle 110° (at line p) and the ∠m (at line q) are co-interior angles (they are on the same side of transversal t, between the two parallel lines).

Since p || q, co-interior angles are supplementary.

110° + m = 180° [Co-interior Angles Property]

m = 180° – 110° = 70°

⇒ $\boxed{\text{m} = 70°}$

(b) Given: 80° and 100° (Fig. 5.71(b))

Lines p and q are parallel (p || q). Transversal t cuts through both lines.

At line p: the transversal makes an angle of 100°.

At a third reference: 100° is shown.

Since p || q, by the Corresponding Angles Property:

The transversal makes equal corresponding angles with both p and q.

m = 100° [Corresponding Angles Property, p || q]

5. Given: AB || DG (arms of the two angles are parallel)

BC || EF (other arms of the two angles are parallel) ∠ABC = 70°

(a) Find angle DGC

AB is parallel to DG, and BC is a transversal cutting both. ∠ABC (at B, between ray BA and ray BC) = 70°. ∠DGC (at G, between ray GD and ray GC) is the corresponding angle to ∠ABC.

∠DGC = ∠ABC [Corresponding Angles Property, AB || DG, transversal BC]

∠DGC = 70°

(b) Find angle DEF

BC is parallel to EF, and line DGE is a transversal cutting both BC (at G) and EF (at E).

∠DGC (at G, between ray GD and ray GC) = 70° (found above).

∠DEF (at E, between ray ED and ray EF) corresponds to ∠DGC.

∠DEF = ∠DGC [Corresponding Angles Property, BC || EF, transversal DGE]

∠DEF = 70°

6. (a) Here, 126° + 44° = 170° ≠ 180°

So, l and m are not parallel.

(b) Vertically opposite angle of 75° = 75°

and 75° + 75° = 150° ≠ 180°

So, l and m are not parallel.

123° + 57° = 180°

Chapter Innings

A. Multiple Choice Questions :

1. (b) **2.** (b) **3.** (c) **4.** (a) **5.** (c)

B. Fill in the Blanks :

1. supplementary **2.** linear pair

3. vertically opposite angles

4. parallel lines **5.** arm **6.** same

7. opposite

C. Match the following :

1. (b) **2.** (d) **3.** (a) **4.** (c)

D. True or False :

1. F **2.** F **3.** F **4.** F **5.** F

E. Very Short Answer Type Questions :

1. At each vertex of an equilateral triangle, the interior angle = 60°.

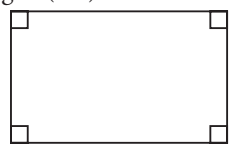
When two sides of the equilateral triangle (which are line segments extended as lines) intersect at a vertex, they form four angles.

The interior angle of the equilateral triangle at each vertex = 60°.

The angle vertically opposite to the interior angle = 60° [Vertically opposite angles]

The other two angles (forming linear pair with 60°) = 180 – 60 = 120° each.

2. In a rectangle, all four interior angles are right angles (90°).



At each vertex of the rectangle, two sides (extended as lines) intersect.

The interior angle at each vertex = 90°

The vertically opposite angle = 90°

[Vertically opposite angles are equal]

The other two angles (linear pair with 90°) = 180° – 90°= 90° each.

Therefore, at each vertex of a rectangle, all four angles formed by the intersecting lines are equal to 90°.

3. No, two lines do not always intersect at right angles.

When two lines intersect, they can form any four angles (two pairs of vertically opposite angles). The angles can be acute, obtuse, or right angles depending on how the lines are inclined to each other.

Only when the two lines are perpendicular to each other do all four angles become right angles (90° each). This is a special case.

4. From fig. 5.80: A transversal cuts line AB at E and line CD at F.

∠GEA = 65° (angle at E, between ray EG and ray EA).

∠EFD = 105° (angle at F, between ray EF and ray FD).

For AB || CD,

∠AEF + ∠EFD should equal 180°.

$\angle AEF = 180 - \angle GEA = 180 - 65 = 115°$ [Linear pair at E]

$\angle EFD = 105°$ (given).

Sum = $\angle AEF + \angle EFD = 115 + 105 = 220°$

220° is not equal to 180°.

Thus AB and CD are not parallel.

5. From Fig. 5.81: Two parallel lines are intersected by a transversal.

The two angles formed are $(2x + 6)°$ and $(3x + 54)°$.

These two angles are co-interior angles (interior angles on the same side of the transversal), since they appear to be on the same side between the parallel lines.

Since the lines are parallel, co-interior angles are supplementary.

$(2x + 6°) + (3x + 54°) = 180°$ [Co-interior Angles Property]

$\Rightarrow \quad 5x + 60° = 180°$

$\Rightarrow \quad 5x = 180° - 60°$

$\Rightarrow \quad 5x = 120°$

$\Rightarrow \quad x = \frac{120°}{5}$

$x = 24°$

Verification: $(2 \times 24° + 6°) + (3 \times 24° + 54°) = (48° + 6°) + (72° + 54°) = 54° + 126° = 180°$ Correct.

Thus, $x = 24°$

F. Short Answer Type Questions :

1. From Fig. 5.82: l_1 and l_2 are two lines. Transversal t cuts l_1 and l_1

$\angle 1$ is formed at the intersection of t with l_1.

$\angle 2$ is formed at the intersection of t with l_1

$\angle 1$ and $\angle 2$ appear to be corresponding angles OR alternate interior angles.

The question is whether $\angle 1 = \angle 2$.

Corresponding angles are equal only when $l_1 \parallel l_2$

Alternate interior angles are equal only when $l_1 \parallel l_2$

If l_1 and l_2 are not parallel, $\angle 1$ and $\angle 2$ will not be equal.

In Fig. 5.82, the lines l_1 and l_2 are shown as two separate lines with no indication that they are parallel.

Thus, No, $\angle 1$ is not necessarily equal to $\angle 2$.

2. $a + 60° = 180°$ (co-interior angles)

$\Rightarrow a = 180° - 60° = 120°$

Here, $a = d$ (vertically opposite angles)

$\Rightarrow d = 120°$

$\Rightarrow c = 60°$ (corresponding angles)

and $b = c = 60°$ (vertically opposite angles)

Thus, $a = 120°$, $b = 60°$, $c = 60°$, $d = 120°$

3. From the figure,

$840° + 55° + c = 180°$

$\Rightarrow \quad c = 180° - 139°$

$\Rightarrow \quad c = 41°$

$\because$ AB || CD

$\therefore \quad a = 55°$

and $\quad c + b + a = 180°$

$\Rightarrow \quad 41° + b + 55° = 180°$

$\Rightarrow \quad b = 180° - 96°$

$\Rightarrow \quad b = 84°$

4. (a) from the figure,

$x + y + z = 180°$ ...(1)

$y + (180° - 143°) + (180° - 60°) = 180°$ ...(2)

$x + y = 60°$ ...(3)

$y + z = 143°$ ...(4)

from eq. (2)

we get

$y + 37° + 120° = 180°$

$\Rightarrow \quad y = 180° - 157°$

$\Rightarrow \quad y = 23°$

from eq. (3)

$\Rightarrow \quad x + 23° = 60°$

$x = 60° - 23° = 37°$

$x = 37°$

from eq. (4)

$23° + z = 143°$

$\Rightarrow \quad z = 143° - 23° = 120°$

$\Rightarrow \quad z = 120°$

Thus, $x = 37°$, $y = 23°$ and $z = 120°$

(b) From the figure,

$b + c + 55° = 180°$, $a = 55°$

and $a + b + 72° = 180°$

$\therefore$ $b = 180° - 72° - 55°$

$\Rightarrow$ $b = 53°$

and $c = 180° - 55° - 53°$

$= 72°$

$\Rightarrow$ $c = 72°$

Thus, $a = 55°$, $b = 53°$ and $c = 72°$

(c) $c = 75°$ (corresponding angle)

$b = c = 75°$ (co-interior angle)

$d = b = 75°$ (corresponding angle)

$a + 75° = 180°$

$\Rightarrow a = 180° - 75°$

$\Rightarrow a = 105°$

Thus, $a = 105°$, $b = 75°$, $c = 75°$, $d = 75°$

5. (a) Here, $106 + 104 = 170° \neq 180°$

So, l and m are not parallel.

(b) $75° + 75° = 150 \neq 180°$

So, l and m are not parallel.

(c) Here $57° + 123° = 180°$

So, l and m are parallel.

G. Long Answer Type Questions :

1. (a) Angle between b and $c = 30°$

[vertically opposite angles]

(b) Angle between d and e + Angle between e and $c = 180°$ [cointerior angles]

$\therefore$ Angle between d and e

$=180° - 75° = 105°$

[$\because$ angle between c and $e = 75°$]

(c) Angle between d and f + Angle between d and $e = 180°$

[$\because$ pair of cointerior angles]

$\therefore$ Angle between d and f

$= 180° - 105° = 75°$

(d) Angle between c and f = Angle between d and f

[corresponding angles)

$\therefore$ Angle between c and $f = 75°$

2. Given, AE is parallel to GF and GF is parallel to BD, AB is parallel to CG and CG is parallel to DF.

$\angle CHE = 120°$

$\because$ AE and BD are parallel lines.

$\therefore \angle CHE + \angle HCD = 180°$

[cointerior angles]

$\Rightarrow$ $120° + \angle HCD = 180°$

$\Rightarrow$ $\angle HCD = 180° - 120° = 60°$

$\Rightarrow$ $\angle HCD = \angle ABC = 60°$

[corresponding angles]

Also, $\angle HCD + \angle CDE = 180°$

[cointerior angles]

$\Rightarrow$ $60° + \angle CDE = 180°$

$\Rightarrow$ $\angle CDE = 180° - 60°$

$\therefore$ $\angle CDE = 120°$

3. Given, $\angle PSR = 115°$; $\angle RQD = 70°$ and $\angle CPF = 65°$

(a) $\angle PQR + \angle RQD = 180°$ [linear pair]

$\Rightarrow$ $\angle PQR = 180° - 70°$

$\Rightarrow$ $\angle PQR = 110°$

$\angle CPF = \angle SPQ = 65°$

[vertically opposite angles]

If EF and GH are parallel lines then according to the definition of cointerior angles, the sum of

$\angle SPQ + \angle RQP$ should be 180°.

$\therefore$ $65° + 110° = 175° \neq 180°$

So, EF is not parallel to GH.

(b) $\angle CPF + \angle CPS = 180°$ [linear pair]

$\Rightarrow$ $65° + \angle CPS = 180°$

$\Rightarrow$ $\angle CPS = 180° - 65° = 115°$

If AB and CD are parallel lines then according to the definition of alternate angles,

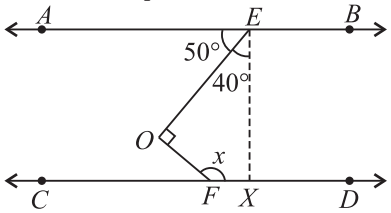
$\angle RSP = \angle CPS$

It is satisfying the condition.

[$\because \angle RSP = \angle CPS = 115°$]

So, AB is parallel to CD.

4.



From the figure, we find that

$\angle O + \angle OEX + \angle EXF + \angle XFO = 360°$

$\Rightarrow$ $90° + 40° + 90° + x = 360°$

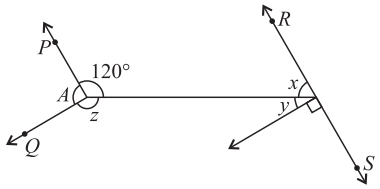
$\Rightarrow$ $220° + x = 360°$

$\Rightarrow$ $x = 360° - 220°$

$\Rightarrow$ $x = 140°$

Thus, $x = 140°$

5.



$\angle A = x + y$

$\Rightarrow$ $\angle A = 60° + 30° = 90°$

$\Rightarrow$ $\angle A = 90°$

from the figure

$x + y = 90°$

$x = 180° - 120°$

$\Rightarrow$ $x = 60°$

$y = 90° - 60° = 30°$

$\Rightarrow$ $y = 30°$

and $\angle A + z + 120° = 360°$

$\Rightarrow$ $90° + z + 120° = 360°$

$\Rightarrow$ $z = 360° - 210°$

$\Rightarrow$ $z = 150°$

H. Assertion-Reason Questions :

1. (A) **2.** (D) **3.** (C) **4.** (A) **5.** (B)

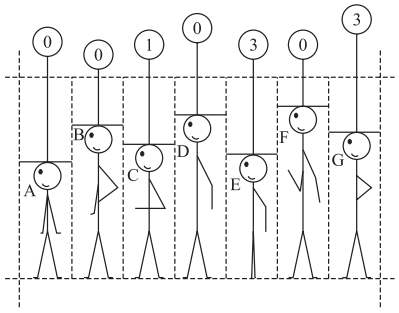
I. Case Study :

1. (b) **2.** (c) **3.** (b)

6. Number Play

NCERT Exercise 6.1

1.



2. (a) The required arrangement is FCBGADE.

(b) AECGBDF

(c) FDBGCEA

(d) EAGCDBF

(e) FAECGBD

(f) BDFAECG

3. (a) Only sometimes true

(b) Always true

(c) Always true

(d) Only sometimes true

(e) Only sometimes true

(f) 7

Practice Exercise 6.1

1. The rule: Each child calls out the number of taller children standing in front of them.

Child 1 (120 cm): No one is in front. Number = 0

Child 2 (130 cm): In front is Child 1 (120 cm). 120 < 130, so no one is taller. Number = 0

Child 3 (110 cm): In front are Child 1 (120 cm) and Child 2 (130 cm). Both are taller than 110. Number = 2

Child 4 (140 cm): In front are Child 1 (120), Child 2 (130), Child 3 (110). None is taller than 140. Number = 0

Child 5 (125 cm): In front are Child 1 (120), Child 2 (130), Child 3 (110), Child 4 (140). Child 2 (130) and Child 4 (140) are taller. Number = 2

The numbers are: 0, 0, 2, 0, 2

2. G (112 cm): No one in front. Number = 0

H (140 cm): In front is G (112 cm). 112 < 140, so no one is taller. Number = 0

I (115 cm): In front are G (112) and H (140). H (140) is taller than 115. Number = 1

J (138 cm): In front are G (112), H (140), I (115). H (140) is taller than 138, Number = 1

K (150 cm): In front are G (112), H (140), I (115), J (138). None is taller than 150. Number = 0

The numbers are: G = 0, H = 0, I = 1, J = 1, K=0

3. If the first child is the tallest, then every child after the first will have at least the first child standing in front of them who is taller.

The first child: No one in front. Number = 0

Every other child: The first child (tallest) is always in front of them, so each of them will call out at least 1.

The exact number for each subsequent child depends on how many of the other children standing between them and the front are also taller than them.

For example, if heights from front to back are: 150, 140, 130, 120, 110

Child 1 (150): 0

Child 2 (140): 1 (only Child 1 is taller)

Child 3 (130): 2 (Child 1 and Child 2 are taller)

Child 4 (120): 3 (Child 1, 2 and 3 are taller)

Child 5 (110): 4 (Child 1, 2, 3 and 4 are taller)

Numbers: 0, 1, 2, 3, 4

4. If a child says '2', it means that there are exactly 2 children standing in front of that child who are taller than that child.

Example: Heights from front to back: 140 cm, 135 cm, 120 cm, 130 cm, 110 cm Child 4 (130 cm): In front are Child 1 (140), Child 2 (135), Child 3 (120).

Child 1 (140 > 130) and Child 2 (135 > 130) are taller. Child 3 (120 < 130) is shorter. So, Child 4 says '2'.

5. Yes, two or more children can say the same number.

Example: Heights from front to back: 150 cm, 120 cm, 110 cm, 130 cm, 125 cm

Child 1 (150): 0 (no one in front)

Child 2 (120): 1 (Child 1 is taller)

Child 3 (110): 2 (Child 1 and Child 2... wait, Child 2 is 120 > 110, so yes) = wait let us recalculate.

Let us use a clearer example:

Heights from front to back: 140 cm, 130 cm, 110 cm, 120 cm, 115 cm

Child 1 (140): 0

Child 2 (130): 1 (Child 1 is taller)

Child 3 (110): 2 (Child 1 and Child 2 are taller)

Child 4 (120): 2 (Child 1 and Child 2 are taller; Child 3 is shorter)

Child 5 (115): 3 (Child 1, Child 2 and Child 4 are taller)

Numbers: 0, 1, 2, 2, 3

Here, Child 3 and Child 4 both say '2'.

Class Work 6.1

We know that:

Adding odd numbers an odd number of times gives an odd result.

Adding odd numbers an even number of times gives an even result.

(a) Sum of 4 odd numbers:

Here, 4 is an even number.

So, the sum of 4 odd numbers will be even.

Example: 1 + 3 + 5 + 7 = 16 (even)

(b) Sum of 5 odd numbers:

Here, 5 is an odd number.

So, the sum of 5 odd numbers will be odd.

Example: 1 + 3 + 5 + 7 + 9 = 25 (odd)

(c) Sum of 6 odd numbers:

Here, 6 is an even number.

So, the sum of 6 odd numbers will be even.

Example: 1 + 3 + 5 + 7 + 9 + 11 = 36 (even)

(a) Even, (b) Odd, (c) Even.

NCERT Exercise 6.2

1. (a) We know that the sum of 2 even numbers is even and the sum of 2 odd numbers is even.

Therefore, the result is even.

(b) We know that the sum of 2 odd numbers is even and the sum of 3 even numbers is even.

Therefore, the result is even.

(c) We know that the sum of 5 even numbers is even.

So, the parity is even.

(d) We know that the sum of 8 odd numbers is even.

So, the parity is even.

2. Given, Lakpa has an odd number of ₹ 1 coins, an odd number of ₹ 5 coins and an even number of ₹ 10 coins.

∵ The value of an odd number of ₹ 1 coins is odd and value of an odd number of ₹ 5 coins is odd.

So, the sum of two odd numbers is an even number.

And the value of an even number of ₹ 10 coins is an even number.

So, the sum of two even numbers is even number.

Therefore, the parity of resultant money should be even.

∵ The money calculated by Lakpa = ₹ 205 (odd parity).

∴ Ram must have made a mistake in his calculation.

It is because the money, he calculated, has an odd parity and the money, derived from the properties of parity, has an even parity.

3. (i) even – even = even
(ii) odd – odd = even
(iii) even – odd = odd
(iv) odd – even = odd

Practice Exercise 6.2

1. (a) Sum of 3 odd numbers: odd number of odd numbers = odd
Sum of 4 even numbers: any number of even numbers = even
odd + even = odd
Ans: Odd

(b) 6 is an even number.
Sum of even number of odd numbers = even
Ans: Even

(c) even – even = even
even – odd = odd
Ans: Odd

(d) Sum of 7 odd numbers: 7 is odd, so sum = odd
Sum of 2 even numbers = even
odd + even = odd
Ans: Odd

2. (a) odd × odd = odd
Example: 3 × 5 = 15 (odd)
Ans: Odd

(b) even × even = even, and
even × even = even again.
Example: 2 × 4 × 6 = 48 (even)
Ans: Even

(c) odd × even = even
Example: 3 × 4 = 12 (even)
Ans: Even

(d) Product of 4 odd numbers = odd × odd × odd × odd = odd
odd × even = even
Example: 1 × 3 × 5 × 7 × 2 = 210 (even)
Ans: Even

3. Let us find the parity of each part:
Even number of ₹ 2 coins: even × 2 = even (since 2 is even, any multiple of 2 is even)
Odd number of ₹ 3 coins: odd × 3 = odd × odd = odd
Odd number of ₹ 7 coins: odd × 7 = odd × odd = odd
Total = even + odd + even = even
But ₹ 99 is an odd number.
Since the total must be even, it cannot equal 99.

4. Sum of 10 odd numbers: 10 is even, so sum of even number of odd numbers = even
Sum of 15 even numbers: sum of any number of even numbers = even
even + even = even
Ans: Even

5. Step 1: even – odd = odd
Step 2: odd + odd = even
Ans: Even

Class Work 6.2

1. Grid (a):

7	*a*	*b*	18
c	2	*e*	14
d	*f*	3	13
24	9	12	

Given information:
Row 1: 7, ?, ? ⇒ Row sum = 18
Row 2: ?, 2, ? ⇒ Row sum = 14
Row 3: ?, ?, 3 ⇒ Row sum = 13

Column sums: 24, 9, 12

Step 1: From Row 1: 7 + a + b = 18, so a + b = 11

Step 2: From Column 1: 7 + c + d = 24, so c + d = 17

Step 3: From Row 2: c + 2 + e = 14, so c + e = 12

Step 4: From Row 3: d + f + 3 = 13, so d + f = 10

Step 5: From Column 2: a + 2 + f = 9, so a + f = 7

Step 6: From Column 3: b + e + 3 = 12, so b + e = 9

Available numbers (excluding 2, 3, 7): 1, 4, 5, 6, 8, 9

From c + d = 17 (using available numbers): c = 8, d = 9 or c = 9, d = 8

Try c = 8, d = 9:

c + e = 12 ⇒ 8 + e = 12 ⇒ e = 4

d + f = 10 ⇒ 9 + f = 10 ⇒ f = 1

a + f = 7 ⇒ a + 1 = 7 ⇒ a = 6

a + b = 11 ⇒ 6 + b = 11 ⇒ b = 5

Verification: All numbers 1-9 used once: 7, 6, 5, 8, 2, 4, 9, 1, 3

Row sums: 7 + 6 + 5 = 18, 8 + 2 + 4 = 14, 9 + 1 + 3 = 13

Column sums: 7 + 8 + 9 = 24, 6 + 2 + 1 = 9, 5 + 4 + 3 = 12

Completed Grid (a):

7	6	5	18
8	2	4	14
9	1	3	13
24	9	12	

Grid (b):

Given information:

Row 1: ?, ?, ? ⇒ Row sum = 24

Row 2: ?, ?, 4 ⇒ Row sum = 15

Row 3: 3, ?, ? ⇒ Row sum 6

Column sums: 17, 16, 12

f	*c*	*e*	24
2	*d*	4	15
3	*a*	*b*	6
17	16	12	

Step 1: From Row 3: 3 + a + b = 6, so a + b = 3

From available numbers, a + b = 3 gives a = 1, b = 2 or a = 2, b = 1

Step 2: From Column 2: c + d + a = 16

Step 3: From Column 3: e + 4 + b = 12, so e + b = 8

Try a = 2, b = 1:

e +1 = 8 ⇒ e = 7

Column 1: f + g + 3 = 17, so f + g = 14

Column 2: c + d + 2 = 16, so c + d = 14

Row 1: f + c + e = 24 ⇒ f + c + 7 = 24

⇒ f + c = 17

Row 2: g + d + 4 = 15 ⇒ g + d = 11

Available numbers (excluding 1, 2, 3, 4, 7): 5, 6, 8, 9

f + g = 14, f + c = 17, g + d = 11, c + d = 14

From f + c = 17: possible (8,9) or (9,8)

Try f = 8, c = 9: g = 14 – 86, d = 14 – 9 = 5

Check: g + d = 6 + 5 = 11

Verification: All numbers 1-9 used once: 8, 9, 7, 6, 5, 4, 3, 2, 1

Row sums: 8 + 9 + 7 = 24, 6 + 5 + 4 = 15, 3 + 2 + 1 = 6

Column sums: 8 + 6 + 3 = 17, 9 + 5 + 2 = 16, 7 + 4 + 1 = 12

Completed Grid (b):

8	9	7	24
6	5	4	15
3	2	1	6
17	16	12	

Class Work 6.3

6	7	2
8	3	4
1	5	9

8	6	1
3	7	5
4	2	9

or a 3 × 3 magic square

NCERT Exercise 6.3

1. There are 8 different magic squares that can be made using the numbers 1-9.

Here are all of them.

(i)

8	1	6
3	5	7
4	9	2

(ii)

6	1	8
5	6	3
2	9	4

(iii)

4	9	2
3	5	7
8	1	6

(iv)

2	9	4
7	5	3
6	1	8

(v)

6	7	2
1	5	9
8	3	4

(vi)

2	7	6
9	5	1
4	3	8

(vii)

8	3	4
1	5	9
6	7	2

(viii)

4	3	8
9	5	1
2	7	6

2. We know that the sum of the numbers from 2 to 10 is

$2 + 3 + 4 + 5 + 6 + 7 + 8 + 9 + 10 = 54$

The magic sum is the sum of the numbers divided by the number of rows.

$$\frac{54}{3} = 18$$

Now, place the middle number between 2 to 10 at the centre of magic square and place the smallest and largest numbers at the left and right of the middle row of square. So the magic square is.

9	4	5
2	6	10
7	8	3

For a 3 × 3 magic square using the numbers 1-9, the magic sum is 15.

3. Let a magic square using numbers 1-9 be

4	9	2
3	5	7
8	1	6

and its magic sum is 15.

(a) Increase each number by 1

4+1	9+1	2+1
3+1	5+1	7+1
8+1	1+1	6+1

=

5	10	3
4	6	8
9	2	7

(b) Double each number

2×4	2×9	2×2
2×3	2×5	2×7
2×8	2+1	2×6

=

8	18	4
6	10	14
16	2	12

Adding 1 to each number gives a new magic square whose sum increases by 3 and doubling each number gives a new magic square whose sum gets doubled.

4. Other operations that can be performed on a magic square to yield another magic square are:

- Subtraction : Subtracting the same constant from every number in the magic square will result in another magic square.
- Transposition : Transposing the magic square (swapping rows and columns) will result in another magic square.
- Rotation : Rotating the magic square by 90°, 180° and 270° will yield to another magic square.
- Reflection : Reflecting the magic square along its horizontal and vertical axis will result in another magic square.

5. There are some following points for creating a magic square.

- **Identify the number at centre** Identify the middle number of any consecutive set of nine numbers. Place that middle number at the centre of the grid. e.g. In the set of numbers 2-10, the middle number is 6. Now, place 6 at the centre of the grid.

- **Calculate the magic sum** The magic sum can be found by multiplying the middle number by 3. e.g. If the middle number is 6, the magic sum is 18.
- **Arrange the remaining number** Place the largest number and the smallest number either at the left and right or up or down of the middle row or middle column of square, respectively.

  Fill the remaining cells to make sure the sum of each row, column'and diagonal equals the magic sum.

  eg. the magic square using the set of numbers 2 to 10

9	4	5
2	6	10
7	8	3

  We can get other magic squares using the same set of numbers 2 to 10 using operations like rotation, transposition and reflection etc.

Practice Exercise 6.3

1. The recommended first step is to place the number 5 at the centre of the magic square.

We know from Observation 2 that in a 3 × 3 magic square using numbers 1-9, the centre number must always be 5.

After placing 5 at the centre, the next step is to use the known positions of 1 and 9 (which must be at edge-middle positions, not corners) and then calculate the remaining numbers using the magic sum of 15.

8	1	6
3	5	7
4	9	2

2. Numbers used: 2, 3, 4, 5, 6, 7, 8, 9, 10

Sum of all numbers = 2 + 3 + 4 + 5 + 6 + 7 + 8 + 9 + 10 = 54

In a 3 × 3 magic square, there are 3 rows.

$$\text{Magic sum} = \frac{\text{Total sum}}{3} = \frac{54}{3} = 18$$

So, the new magic sum would be 18.

3. To double the magic sum, we should double (multiply by 2) every number in the magic square.

If the original magic sum is S, then after doubling each number:

New magic sum = 2 × S

Example: Original magic square with numbers 1-9 has magic sum = 15.

Doubling each number gives: 2, 4, 6, 8, 10, 12, 14, 16, 18

New magic sum = 2 × 15 = 30

4. Let us take the set of 9 consecutive numbers: 5, 6, 7, 8, 9, 10, 11, 12, 13

Sum of these numbers = 5 + 6 + 7 + 8 + 9 + 10 + 11 + 12 + 13 = 81

$$\text{Magic sum} = \frac{81}{3} = 27$$

Centre number = middle value = 9

Using the generalised form

With m = 9 (centre number):

m+3	m–4	m+1
m–2	m	m+2
m–1	m+4	m–3

Substituting m = 9:

12	5	10
7	9	11
8	13	6

Verification:

Row 1: 12 + 5 + 10 = 27

Row 2: 7 + 9 + 11 = 27

Row 3: 8 + 13 + 6 = 27

All columns and diagonals also sum to 27.

Ans: Yes, a 3 x 3 magic square can be made with any set of 9 consecutive numbers. Example: 5 to 13, with magic sum = 27.

NCERT Exercise 6.4

Generalised Form of 3 × 3 Magic Square (from the file):

m+3	m–4	m+1
m–2	m	m+2
m–1	m+4	m–3

(where m = centre number)

1. Given: Centre number m = 25

Substitute m = 25 in each cell of the generalised form:

m + 3 = 25 + 3 = 28

m – 4 = 25 – 4 = 21

m + 1 = 25 + 1 = 26

m – 2 = 25 – 2 = 23

m = 25

m + 2 = 25 + 2 = 27

m – 1 = 25 – 1 = 24

m + 4 = 25 + 4 = 29

m – 3 = 25 – 3 = 22

The Magic Square:

28	21	26
23	25	27
24	29	22

2. Using the generalised form:

Row 1: (m + 3) + (m –4) + (m + 1) = 3m + 3 – 4 + 1 = 3m

Row 2: (m – 2) + m + (m + 2) = 3m – 2 + 0 + 2 = 3m

Row 3: (m – 1) + (m + 4) + (m – 3) = 3m – 1 + 4 – 3 = 3m

The same expression 3m is obtained for every column and both diagonals as well.

3. (a) When I is added to every term, each cell becomes:

m+4	m–3	m+2
m–1	m+1	m+3
m	m+5	m–2

m + 3 + 1 = m + 4

m – 4 + 1 = m – 3

m + 1 + 1 = m + 2

m – 2 + 1 = m – 1

m + 1 = m + 1 (new centre)

m + 2 + 1 = m + 3

m – 1 + 1 = m

m + 4 + 1 = m + 5

m – 3 + 1 = m – 2

New magic sum = 3m + 3 (because each of 3 terms in a row increased by 1, so sum increased by 3) The resulting grid is still a magic square, with the new centre = m + 1.

(b) When every term is doubled (multiplied by 2), each cell becomes:

2(m + 3) = 2m + 6

2(m – 4) = 2m – 8

2(m + 1) = 2m + 2

2(m – 2) = 2m – 4

2m = 2m (new centre)

2(m + 2) = 2m + 4

2(m – 1) = 2m – 2

2(m + 4) = 2m + 8

2(m – 3) = 2m – 6

New magic sum = 2 × 3m = 6m = 3(2m)

The resulting grid is still a magic square, with the new centre = 2m.

2m+6	2m–8	2m+2
2m–4	2m	2m+4
2m–2	2m+8	2m–6

4. The magic sum of a 3 × 3 magic square with centre m is 3m.

Step 1: Set 3m = 60

Step 2: $m = \frac{60}{3} = 20$

Step 3: Substitute m = 20 in the generalised form:

m + 3 = 23, m – 416, m + 1 = 21

m – 2 = 18, m = 20, m + 2 = 22

m – 1 = 19, m + 4 = 24, m – 3 = 17

Magic Square:

23	16	21
18	20	22
19	24	17

5. Yes, it is possible to get a magic square using nine non-consecutive numbers.

The generalised form uses offsets –4, –3, –2, –1, 0, +1, +2, +3, +4 from the centre m.

If we choose a common difference d instead of 1, the nine numbers become:

m – 4d, m – 3d, m – 2d, m – d, m, m + d, m + 2d, m + 3d, m + 4d

These nine numbers are in arithmetic progression but not consecutive integers when d > 1.

Example: Let m = 10 and d = 2. The nine numbers are:

2, 4, 6, 8, 10, 12, 14, 16, 18 (even numbers – not consecutive integers)

The magic square becomes:

16	2	12
6	10	14
8	18	4

Row 1: 16 + 2 + 12 = 30 | Row 2: 6 + 10 + 14 – 30 | Row 3: 8 + 18 + 4 = 30

All rows, columns and diagonals sum to 30. This is a valid magic square with non-consecutive integers.

Ans: Yes, it is possible to get a magic square using nine non-consecutive numbers.

By using a common difference d > 1 in the generalised form, we get nine non-consecutive numbers that still form a valid magic square.

Practice Exercise 6.4

1. In the generalised form of a 3 × 3 magic square, the centre number is m.

The sum of any row, column, or diagonal passing through the centre equals: (m – 2) + m + (m + 2) = 3m

or (m + 3) + (m – 4) + (m + 1) = 3m

Therefore, Magic sum = 3m

Example: For numbers 1 – 9, m = 5, Magic sum = 3 × 5 = 15.

For numbers 2 – 10, m = 6, Magic sum = 3 × 6 = 18.

So, the magic sum for a 3 × 3 magic square with centre number m is 3m.

2. If we subtract a constant 'c' from every term in the magic square, the resulting grid is still a magic square.

Original magic sum = S

Each row has 3 numbers. After subtracting c from each:

New row sum = (a – c) + (b – c) + (d – c) = (a + b + d) – 3c = S – 3c

Since every row, column, and diagonal will have the same new sum (S – 3c), the grid is still a magic square.

New magic sum = S – 3c

So, the resulting grid remains a magic square with a new magic sum = (original magic sum) – 3c, where c is the constant subtracted.

3. Yes, magic squares can be created for any odd order n (3 × 3, 5 × 5, 7 × 7, etc.).

For odd-order magic squares, there are systematic methods (such as the Siamese method) to construct them.

For a 3 × 3 magic square, the generalised form with centre m is:

m+3	m–4	m+1
m–2	m	m+2
m–1	m+4	m–3

Similar generalised forms can be developed for larger odd-order squares, though they become more complex.

4. We can transform one magic square into another by performing any of the following operations:

1. Adding a constant to every number in the magic square. New magic sum = original magic sum + 3 × (constant)
2. Subtracting a constant from every number.

   New magic sum = original magic sum – 3 × (constant)
3. Multiplying every number by a constant.

   New magic sum = original magic sum × (constant).
4. Rotating the magic square by 90, 180 or 270 degrees.

5. Reflecting the magic square (mirror image) along any axis.

5. Sum of numbers 1 to 9 = 1 + 2 + 3 + 4 + 5 + 6 + 7 + 8 + 9 = 45

A 3 × 3 magic square has 3 rows.

$$\text{Magic sum} = \frac{\text{Total sum}}{\text{Number of rows}} = \frac{45}{3} = 15$$

So, the magic sum is 15.

NCERT Exercise 6.5

1. (a)
$$\begin{array}{r} yy \\ +\ z \\ \hline ZOO \end{array} \quad \begin{array}{r} 99 \\ +1 \\ \hline 100 \end{array}$$

(b)
$$\begin{array}{r} B\ 5 \\ +\ 3\ D \\ \hline EDS \end{array} \quad \begin{array}{r} 7\ 5 \\ +3\ 0 \\ \hline 105 \end{array}$$

(c)
$$\begin{array}{r} K\ P \\ +\ K\ P \\ \hline PRR \end{array} \quad \begin{array}{r} 6\ 1 \\ +6\ 1 \\ \hline 122 \end{array}$$

(b)
$$\begin{array}{r} C\ 1 \\ +\ C \\ \hline 1FF \end{array} \quad \begin{array}{r} 9\ 1 \\ +\ 9 \\ \hline 100 \end{array}$$

2. Each time the switch is toggled, the state of the bulb changes (on to off or off to on).

Since, the bulb is in the on position in beginning, therefore an odd number of toggles will result in the bulb being off and an even number of toggles will result in it being on

Here, 77 is an odd number, so the bulb will be off.

3. No, the sum of the page numbers cannot be 6000.

We know that the sum of any two consecutive numbers is odd.

Hence, it is not possible for the sum of 50 pairs of consecutive numbers to be an even number.

4.

e	o	e	(o)
e	o	o	(o)
(e)	(e)	(o)	

[∵ even + even = even
odd + odd = even
and even + odd = odd]

5. Here, a 3 × 3 magic square with 0 as a magic sum is given as:

–1	4	–3
–2	0	2
3	–4	1

6. (i) Sum of an odd number of even numbers is <u>even</u>.

(ii) Sum of an even number of odd numbers is <u>even</u>.

(iii) Sum of an even number of even numbers is <u>even</u>.

(iv) Sum of an odd number of odd numbers is <u>odd</u>.

7. We know that there are 50 even numbers and 50 odd numbers between 1 and 100.

And the sum of 50 even numbers is even and sum of 50 odd numbers is also even.

So, the sum of the numbers from 1 to 100 is even. Hence, the parity of the sum of numbers from 1 to 100 is even

8. Given, two consecutive numbers in the Virahanka sequence are 987 and 1597.

We know that the Virahanka sequence is a sequence in which each number is the sum of the two preceding numbers.

So, the next numbers are

$$987 + 159 = 2584,$$
$$1597 + 2584 = 4181$$

And the previous numbers are

$$1597 - 987 = 610$$
$$987 - 610 = 377$$

Hence, the next two numbers are 2584 and 4181 and the previous two numbers are 610 and 377.

9. In order to find different ways to reach the top, Angaan will have to take help from Virahanka-Fibonacci sequence, as it corresponds to the pattern followed by the sequence.

We know that the Virahanka – Fibonacci sequence is 1, 2, 3, 5, 8, 13, 21, 34...

Now, we take the 8th element of the sequence i.e. 34.

Hence, there are 34 different ways Angaan can climb the 8-step staircase.

10. We know, the Virahanka sequence

1, 2, 3, 5, 8, 13, 21, 34, 55, 89...

Here, the parity of terms follows the pattern odd, even, odd, odd, even, odd, odd, even, odd, odd, even.... Hence, the parity of 20th term of the Virahanka sequence is even.

11. (i) The expression 4m–1 always gives odd numbers. (True)

(ii) All even numbers can be expressed as 6j – 4. (False)

(iii) Both expressions 2p + 1 and 2q – 1 describe all odd numbers. (True)

(iv) The expression 2f + 3 gives both even and odd numbers. (False)

12. We have,

$$\begin{array}{r} U\ T \\ +\ T\ A \\ \hline T\ A\ T \end{array}$$

Let T = 1 and A = 0, then U = 9

$$\text{So,}\ \begin{array}{r} 9\ 1 \\ +1\ 0 \\ \hline 1\ 0\ 1 \end{array}$$

∴ T = 1, A = 0, U = 9

Practice Exercise 6.5

1. Starting position: OFF.

Each flip changes the state: OFF to ON, or ON to OFF.

After odd number of flips: the state changes from the starting position.

After even number of flips: the state returns to the starting position.

120 is an even number.

So, after 120 flips, the switch will be back to its starting state.

So, the light will be off, because 120 is an even number and the switch returns to its starting state (off) after an even number of flips.

2. A book has 200 pages, so page numbers range from 1 to 200.

Each sheet has 2 consecutive page numbers. If one side is page n, the other side is page n + 1 (where n is odd).

Sum of page numbers on one sheet = n + (n + 1) = 2n + 1 (always odd)

If k sheets fall out, the total sum of all loose page numbers = sum of k odd numbers. (Each sheet contributes an odd sum)

If k is even: sum of even number of odd numbers = even

If k is odd: sum of odd number of odd numbers = odd

10,000 is an even number.

So, the sum can be 10,000 only if an even number of sheets fall out.

Maximum possible sum (all 100 sheets): 1 + 2 + 3 + ... + 200 = $200 \times \frac{201}{2}$ = 20,100

10,000 < 20,100, so the sum is within range.

Since 10,000 is even and can be achieved by an even number of sheets, it is possible.

Yes, it is possible. The sum of page numbers of the loose sheets can be 10,000 because 10,000 is even and lies within the achievable range.

3. The parity of the sum depends on how many odd numbers are in that row/column.

Even number of odd numbers in a row/column gives even sum.

Odd number of odd numbers in a row/column gives odd sum.

We need 3 odd numbers and 3 even numbers in the grid (as stated in the problem). We place them so that each row and column satisfies the given parity.

One possible arrangement (assuming row parities: o, e, o and column parities: e, e, o):

o	e	o
e	o	e
o	e	o

Check rows: o + e + e = odd ✓, e + e + o = odd...

(Note: The exact arrangement depends on the specific parity conditions given in the problem.)

4.

15	–11	–13	9
–7	3	5	–1
1	–5	–3	7
–9	13	11	–15

5. Sum of numbers from 1 to 50 = $50 \times \frac{51}{2}$ = 1275

Alternatively, using parity:

From 1 to 50, there are 25 odd numbers and 25 even numbers.

Sum of 25 odd numbers: 25 is odd, so sum is odd.

Sum of 25 even numbers: sum of any number of even numbers is even.

odd + even = odd

Verification: 1275 is odd.

So, the parity of the sum of numbers from 1 to 50 is odd. The sum is 1275.

6. The Virahanka-Fibonacci sequence rule: Each number = sum of the two preceding numbers.

Next two terms after 2584 and 4181:

Next term = 2584 + 4181 = 6765

Next term = 4181 +6765 = 10946

Two terms before 2584:

If the two consecutive terms are a and b, and b + a gives the next term:

We need a + b = 2584 and b + 2584 = 4181

From the second equation: b = 4181 – 2584 = 1597

From the first equation: a = 2584 – 1597 = 987

So the two terms before 2584 are 987 and 1597.

Thus, next two terms: 6765 and 10946. Previous two terms: 987 and 1597.

7. This problem follows the Virahanka-Fibonacci sequence.

The number of ways to climb n steps = nth Virahanka number.

Virahanka sequence: 1, 2, 3, 5, 8, 13, 21, 34, 55, 89, ...

n = 1:1 way

n = 2:2 ways

n = 3: 3 ways

n = 4:5 ways

n = 5:8 ways

n = 6: 13 ways

n = 7:21 ways

n = 8:34 ways

n = 9:55 ways

n = 10: 89 ways

So, there are 89 different ways to climb a 10-step staircase.

8. The parity pattern of the Virahanka-Fibonacci sequence is:

odd, even, odd, odd, even, odd, odd, even, odd, odd, even, ...

The pattern repeats every 3 terms: odd, even, odd

Term 1: 1 (odd)

Term 2: 2 (even)

Term 3: 3 (odd)

Term 4: 5 (odd)

Term 5: 8 (even)

Term 6: 13 (odd)

Term 7:21 (odd)

Term 8:34 (even)

Pattern: odd, even, odd, odd, even, odd, odd, even, ...

The cycle repeats every 3 terms: odd, even, odd (starting from term 3 onwards we see: odd, odd, even repeating)

Actually the repeating pattern starting from term 1 is: odd, even, odd, odd, even, odd, odd, even...

Every 3rd term (terms 2, 5, 8, 11, 14, 17, 20, 23, 26...) is even.

For term 25: 25 is not a multiple of 3 in the pattern (even terms are at positions 2, 5, 8, 11, 14, 17, 20, 23, 26...).

These positions follow: 2, then every 3rd: 2, 5, 8, 11, 14, 17, 20, 23, 26...

25 is not in this list (23 and 26 are, but 25 is not).

The 25th term of the Virahanka sequence has odd parity. The pattern of parities (odd, even, odd, odd, even, odd, ...) repeats with even terms at positions 2, 5, 8, 11, ... and 25 is not among these positions.

9. (a) 3^n is always odd (since 3 is odd and odd^n = odd for any n).

odd + 1 = even

Ans: True.

(b) When any integer is divided by 4, the remainder is 0, 1, 2, or 3.

4K + 0 = even, 4K + 1 = odd, 4K + 2 = even, 4K + 3 = odd

So, every odd number is either of the form 4K + 1 or 4K + 3.

Ans: True.

(c) 2n is always even (for any integer n).

even + 3 = even + odd = odd

So 2n + 3 always gives odd numbers.

Ans: True.

(d) If m is odd: 5 × odd = odd, odd – 1 = even

If m is even: 5 × even even, even – 1 = odd

So, 5m – 1 gives different parity depending on m.

Ans: True.

10. ABC is a 3-digit number = 100A + 10B + C

CBA is a 3-digit number = 100C + 10B + A

DDD is a 3-digit number = 100D + 10D + D= 111D

ABC + CBA = (100A + 10B + C) + (100C + 10B + A)

= 101A + 20B + 101C

= 101(A + C) + 20B

This must equal 111D.

So, 101(A + C) + 20B = 111D

Since DDD is a 3-digit number, D ranges from 1 to 9.

Also, A and C are non-zero digits (leading digits of 3-digit numbers).

Let us try different values:

If D = 1: 111 = 101 (A + C) + 20B. A + C = 1 gives 101 + 20B = 111, so 20B = 10, B = 0.5 (not integer)

If D = 2: 222 = 101 (A + C) + 20B. A + C = 2: 202 + 20B = 222, 20B = 20, B = 1.

So A + C = 2, B = 1. Since A and C are non-zero: A = 1, C = 1. But A = C = 1, check: 111 + 111 = 222.

But if each letter must represent a unique digit: A = C is not allowed.

If D = 4: 444 = 101(A + C) + 20B. A + C = 4: 404 + 20B = 444, 20B = 40, B = 2.

A + C = 4, B = 2. Possible: A = 1, C = 3 (all different, D = 4). Check: 123 + 321 = 444.

Verification: A = 1, B = 2, C = 3, D=4

123 + 321 = 444

All letters represent unique digits.

$$\begin{array}{r} 1\ 2\ 3 \\ +\ 3\ 2\ 1 \\ \hline 4\ 4\ 4 \end{array}$$

Ans: A = 1, B = 2, C = 3, D = 4. That is, 123 + 321 = 444.

Chapter Innings

A. Multiple Choice Questions

1. (a) **2.** (b) **3.** (a) **4.** (c) **5.** (a)

B. Fill in the Blanks

1. even **2.** odd **3.** even **4.** odd **5.** even

6. 15 **7.** magic **8.** 5,1

C. Match the Following

1. (c) **2.** (e) **3.** (d) **4.** (a) **5.** (b)

D. True or False

1. F **2.** F **3.** F **4.** T **5.** F

E. Very Short Answer Type Questions

1. The rule is: each child calls out the number of taller children standing in front of them.

If everyone has the same height, no one is taller than anyone else.

So, no child has any taller person in front of them.

So, each child says 0.

2. Number of small squares = 19 × 22

19 is odd, 22 is even.

odd × even = even

Ans: Even.

3. A number is odd if its units digit is odd.

Units digit of 5053 = 3, which is odd.

Ans: Odd.

4. The Virahanka-Fibonacci sequence: 1, 2, 3, 5, 8, 13, 21, 34, ...

Term 1 = 1, Term 2 = 2, Term 3 = 3, Term 4 = 5, Term 5 = 8, Term 6 = 13 Term 7 = 21

Ans: The 7th term is 21.

5. The number of rhythms having n beats = nth term of the Virahanka-Fibonacci sequence.

Virahanka sequence: 1, 2, 3, 5, 8, 13, 21, 34, 55, ...

The 9th term = 55.

Ans: There are 55 rhythms having 9 beats.

F. Short Answer Type Questions

1. (a) 23 × 19

23 is odd, 19 is odd.

odd × odd = odd

Ans: Odd.

(b) 72 × 27

72 is even, 27 is odd.

even × odd = even

Ans: Even.

(c) 126 × 281

126 is even (units digit 6), 281 is odd (units digit 1).

even × odd = even

Ans: Even.

2. Given cells: Position (1,1) = 2, Position (2,2) = 4, Position (3,3) = 6

Used numbers so far: (2, 4, 6). Available: {1, 3, 5, 7, 8, 9}

Let the grid be:

2	a	b	15
c	4	d	14
e	f	6	16
14	16	15	

Row 1: 2, a, b → R1 = 15, so a + b = 13

Row 2: c, 4, d → R2 = 14, so c + d = 10

Row 3: e, f, 6 → R3 = 16, so e + f = 10

Col 1: 2 + c + e = 14, so c + e = 12

Col 2: a + 4 + f = 16, so a + f = 12

Col 3: b + d + 6 = 15, so b + d = 9

From c + d = 10 and c + e = 12; e = d + 2

From e + f = 10; f = 10 – e = 8 – d

From b + d = 9: b = 9 – d

From a + b = 13: a = 13 – (9 – d) = 4 + d

From a + f = 12: (4 + d) + (8 – d) = 12 (Always true)

From c + d = 10: c = 10 – d

Try d = 1: a = 5, b = 8, c = 9, e = 3, f = 7

All values {1, 3, 5, 7, 8, 9} from available set ✓, all distinct ✓

2	5	8
9	4	1
3	7	6

Similarly, solve (b) and (c)

correct answer for (b) and (c)

(b)

7	8	12	(27)
9	14	10	(33)
11	15	13	(39)
(27)	(37)	(35)	

(c)

4	8	2	15
3	5	7	15
8	1	6	15
15	15	15	

3. Sum = $200 \times \frac{201}{2} = 20100$

Using parity reasoning:

From 1 to 200, there are 100 odd numbers and 100 even numbers.

Sum of 100 odd numbers: 100 is even → sum is even.

Sum of 100 even numbers: always even.

even + even = even.

Verification: 20100 is even.

Ans: Even.

4. AB = 10A + B, CB = 10C + B, BBA = 100B + 10B + A = 110B + A

(10A + B) + (10C + B)= 110B + A

10A + 10C + 2B = 110B + A

9A+ 10C = 108B

Since B must be small (108B ≤ 9 × 9 + 10 × 9 = 171):

Try B = 1: 9A + 10C = 108

Try A = 2: 18 + 10C = 108 → C = 9

Check: AB = 21, CB = 91, BBA = 112

21 +91 = 112

(a)

$$\begin{array}{r} 2\ 1 \\ +\ 9\ 1 \\ \hline 1\ 1\ 2 \end{array}$$

All digits different: A = 2, B = 1, C = 9

Ans: A = 2, B = 1, C = 9. That is, 21 + 91 = 112.

Similary, solve (b) and (c)

Correct answers are following:

(b)
$$\begin{array}{r} A\ B \\ B\ C \\ +\ C\ A \\ \hline 1\ 0\ 1 \end{array} \quad \Rightarrow \quad \begin{array}{r} 1\ 9 \\ 9\ 8 \\ +\ 8\ 1 \\ \hline 1\ 9\ 8 \end{array}$$

(c)
$$\begin{array}{r} P\ 2 \\ +\ P\ 2 \\ \hline 8\ 4\ 4 \end{array} \quad \Rightarrow \quad \begin{array}{r} 7\ 2 \\ +\ 7\ 2 \\ \hline 1\ 4\ 4 \end{array}$$

5. Let the four consecutive numbers be: 5, 6, 7, 8

Sum = 5 + 6 + 7 + 8 = 26 (even)

Reasoning:

Four consecutive numbers always contain 2 odd and 2 even numbers.

Sum of 2 odd numbers = even.

Sum of 2 even numbers = even.

even + even = even.

Another example: 10 + 11 + 12 + 13 = 46 (even).

Ans: The sum of any four consecutive numbers is always even. Exampl: + 5 + 6 + 7 + 8 = 26 (even parity).

6. Rule: Each number = sum of the two preceding numbers.

Next term = 610 + 987 = 1597

Next term = 987 + 1597 = 2584

Next term = 1597 + 2584 = 4181

Ans: The next 3 numbers are 1597, 2584 and 4181.

7. Numbers: 3, 4, 5, 6, 7, 8, 9, 10, 11

Sum = 3 + 4 + 5 + 6 + 7 + 8 + 9 + 10 + 11 = 63

Magic sum = $\frac{63}{3}$ = 21

In a 3 × 3 magic square with consecutive numbers, the centre = middle (median) value.

Middle value of {3, 4, 5, 6, 7, 8, 9, 10, 11} = 7

Verification: Magic sum = 3 × centre = 3 × 7 = 21

Ans: The centre number is 7.

8. Yes, the resulting grid is also a magic square.

If the original magic sum = S, then each row has 3 numbers.

After adding 5 to each number:

New row sum = (a + 5) + (b + 5) + (c + 5) = (a + b + c) + 15 = S + 15

Since every row, column and diagonal gets the same increase of 15, the grid remains a magic square.

Example: Original (1–9), magic sum = 15.

After adding 5: numbers become 6 to 14, new magic sum = 15 + 15 = 30.

Ans: Yes, it is still a magic square. The new magic sum = original magic sum + 15 (i.e., original sum + 3 × 5).

G. Long Answer Type Questions

1. Let us analyse the parity of each part:

Part 1: Odd number of ₹5 coins

Value = odd × 5 = odd × odd = odd

Part 2: Odd number of ₹10 coins

Value = odd × 10 = odd × even = even

Part 3: Even number of ₹1 coins

Value = even × 1 = even × odd = even

Total = odd + even + even

= odd + even

= odd

The total must always be an odd number.

But ₹110 is an even number.

Since the total is always odd and 110 is even, the total cannot be ₹110.

Ans: Yes, Surbhi made a mistake. The total of an odd number of ₹5 coins, an odd number of ₹10 coins, and an even number of 1 coins is always odd. Since 110 is even, the calculation must be incorrect.

2.

Number/ Expression	Odd Parity	Even Parity
(a) 3n + 12	✓ (when n is odd)	✓ (when n is even)
(b) 2n + 8		✓ (Always even)
(c) 300120		✓ (Even)
(d) 12n – 24		✓ (Always even)
(e) 6n + 18		✓ (Always even)
(f) 501	✓ (Odd)	

Explanation:

(a) 3n + 12: If n is odd → 3(odd) + 12 = odd + even = odd.

If n is even → 3(even) + 12 = even + even = even.

So, parity depends on n (can be odd or even).

(b) 2n + 8: 2n is always even. even + even even. Always ever.

(c) 300120: Units digit = 0 (even). Even.

(d) 12n – 24: 12n is always even. even – even = even. Always even.

(e) 6n + 18: 6n is always even. even + even even. Always even.

(f) 501: Units digit = 1 (odd). Odd.

3. Magic sum = 3m, where m is the centre number.

3m = 45, so m = 15.

We use 9 consecutive numbers centred at 15: {11, 12, 13, 14, 15, 16, 17, 18, 19} Sum = 11 + 12 + ... + 19135. Magic sum = 135/3 = 45✓

Using the generalised form with centre m = 15:

m+3	m–4	m+1
m–2	m	m+2
m–1	m+4	m–3

Substituting m = 15:

18	11	16
13	15	17
14	19	12

4. Numbers: 3, 4, 5, 6, 7, 8, 9, 10, 11

Sum = 63, Magic sum = $\frac{63}{3}$ = 21, Centre = 7

Using the generalised form with m = 7:

Base magic square:

10	3	8
5	7	9
6	11	4

By applying rotations (90°, 180°, 270°) and reflections (horizontal, vertical, both diagonals), we get 8 distinct arrangements:

Magic Square 1 (Base):

10	3	8
5	7	9
6	11	4

Magic Square 2 (Rotate 90° clockwise):

6	5	10
11	7	3
4	9	8

Magic Square 3 (Rotate 180°):

4	11	6
9	7	5
8	3	10

Magic Square 4 (Rotate 270° clockwise):

8	9	4
3	7	11
10	5	6

Magic Square 5 (Reflect horizontally):

8	3	10
9	7	5
4	11	6

Magic Square 6 (Reflect vertically):

6	11	4
5	7	9
10	3	8

Magic Square 7 (Reflect along main diagonal):

10	5	6
3	7	11
8	9	4

Magic Square 8 (Reflect along anti-diagonal):

4	9	8
11	7	3
6	5	10

All 8 squares have magic sum = 21 and use numbers 3 to 11 exactly once.

H. Assertion-Reason Questions

1. (A) **2.** (D) **3.** (C) **4.** (c) **5.** (A)

I. Case Study

1. (b) **2.** (c) **3.** (a) **4.** (c) **5.** (b)

7. A Tale of Three Intersecting Lines

Class Work 7.1

1. (a) The vertex opposite to side AB is C.

(b) The side opposite to vertex B is AC.

(c) The angle opposite to side BC is ∠A.

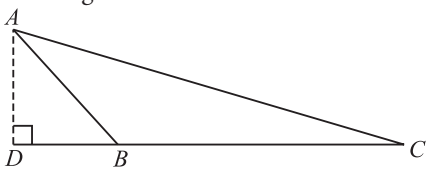
(d) The side opposite to ∠C is AB.

2. (a) PM is an altitude because it is perpendicular from vertex P to side QR.

(b) PD is a median because it joins vertex P to midpoint D of QR.

(c) QM = MR is not necessarily true because D is the midpoint of QR, not M.

3. No, an altitude does not always lie inside a triangle.



In an obtuse-angled triangle, the altitude from an acute vertex falls outside the triangle when the opposite side is extended.

Class Work 7.2

Condition for Existence of a Triangle

For any triangle:

Sum of any two sides must be greater than the third side.

Given sides: 3 cm, 3 cm, 7 cm

Now check: 3 + 3 = 6

Compare with third side: 6 < 7

Since: Sum of two sides (6 cm) is less than the third side (7 cm),

The triangle cannot be formed.

Verification by Construction

1. Draw a line segment AB = 7 cm.
2. With centre A and radius 3 cm, draw an arc.
3. With centre B and radius 3 cm, draw another arc.

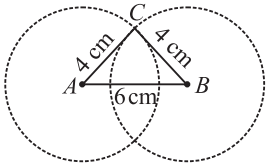
Since 3 cm + 3 cm = 6 cm, the arcs will not intersect, because the circles do not reach each other.

Hence, no third point C can be formed.

Therefore, triangle cannot be constructed.

NCERT Exercise 7.1

1. (a) Steps of construction of a triangle with side 4cm, 4cm, 6cm.



(i) Draw AB = 6 cm.

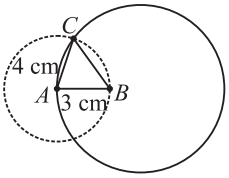
(ii) With the help of compass draw a circle with radius, AC = 4 cm

(iii) From point B draw another circle of radius 4 cm

(iv) C is point of intersection, join AC and BC.

(v) ΔABC is required triangle.

(b) Steps of construction of a triangle having side 3 cm, 4 cm, 5 cm.



(i) Draw AB = 3 cm.

(ii) From point A draw a circle of radius 4 cm.

(iii) From point B draw a circle of radius 5 cm.

(iv) C be the point of intersection of two circles.

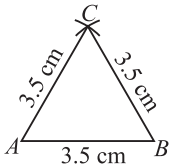
(v) Join AC and BC.

(vi) ΔABC is required of a triangle.

(c) Do same as part (a).

(d) Do same as part (b).

(e) Steps of construction of a triangle having equal sides 3.5 cm.



(i) Draw AB = 3.5 cm.

(ii) From point A draw an arc of 3.5cm and from B draw an arc of 3.5cm.

(iii) Two arcs cut each other at point C.

(iv) join AC and BC.

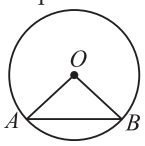
(v) ABC is required triangle.

2. (i) Draw a circle of any radius with centre O.

(ii) Take any two points on the circle and join AO and BO.

(iii) Join AB.

(iv) ΔAOB is required isosceles triangle.

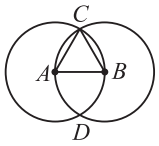


3. (i) Join AB, AC and BC

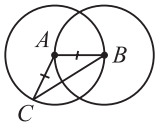
AB = AC = BC

(Radii of both the circles are same)

Thus, ΔABC is the required equilateral triangle.



Again,



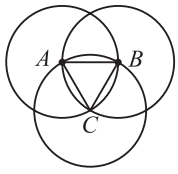
Take any point C on circle with centre A.

AB = AC (radii of circle)

Thus, ΔABC is an isosceles triangle.

(ii) Join points A, B and C

AB = BC= CA (radii of circles)



Thus, ΔABC is an equilateral triangle.

Similarly, we can construct an isosceles triangle as above.

4. If sum of length of two sides of a triangle is greater than the third side than triangle exist. This is inequality of triangle.

(a) 2, 2, 5

2 + 2 < 5 (Inequality fails)

triangle does not exist.

(b) 3, 4, 6

3 + 4 > 6, 4 + 6 > 3, 3 + 6 > 4

So, triangle exist.

(c) 2, 4, 8

2 + 4 < 8 (Inequality fails)

So, triangle does not exist.

(d) 5, 5, 8

5 + 5 > 8, 5 + 8 > 5, 8 + 5 > 5

So, triangle exists.

(e) 10, 20, 25

10 + 20 > 25, 20 + 25 > 10, 10 + 25 > 20

So, triangle exists.

(f) 10, 20, 35

10 + 20 < 35 (Inequality fails)

So, triangle exists.

(g) 24, 26, 28

24 + 26 > 28, 26 + 28 > 24, 24 + 28 > 26

So, triangle exists

5. We know that sum of two sides of a triangle must be greater than its third side, then triangle exist. This is inequality of triangles.

(a) 1, 100, 100

1 + 100 > 100, 100 + 100 > 1

So, triangle exists.

(b) 3, 6, 9

3 + 6 = 9 (Inequality fails)

So, triangle does not exist.

(c) 1, 1, 5

1 + 1 < 5

(Inequality fails)

So, triangle does not exist.

(d) 5, 10, 12

5 + 10 > 12, 10 + 12 > 5, 5 + 12 > 10

So, triangle exists.

6. Without construction, we can check existence of triangle. By using inequality of triangles.

$3 + 4 < 8$ (Inequality fails)

$2 + 3 < 6$ (Inequality fails)

Thus, both the triangles do not exist.

7. (a) $10 + 10 < 25$

(Inequality of triangle fails)

So, triangle does not exist.

(b) $5 + 10 < 20$

(Inequality of triangle fails)

So, triangle does not exist

(c) $12 + 20 < 40$

(Inequality of triangle fails)

So, triangle does not exist.

8. Yes, for any set of lengths, at least two comparisons will always have the direct length less than the sum of the other two.

Example 1: 5, 7, 9

$5 < 7 + 9$—True

$7 < 5 + 9$—True

$9 < 5 + 7$—True

All three satisfied. Triangle exists.

Example 2: 2, 3, 6

$2 < 3 + 6$—True

$3 < 2 + 6$—True

$6 > 2 + 3$—False

Only two satisfied. Triangle does not exist.

Conclusion: At least two comparisons are always satisfied for any set of lengths. If all three are satisfied, triangle exists. If only two are satisfied, triangle does not exist.

9. Given, sides of triangle 50, 50, 50.

we know that an equilateral triangle has all sides of equal length.

So, yes, possible.

10. We know that sum of length of two sides of a triangle must be greater than its third side. Also if x be the length of its third side.

(a) Then $100 - 1 < x < 100 + 1$

i.e. $99 < x < 101$

So, required five values of x for third length of triangle are

99.5, 100, 100.2 100.5, 100.9

(b) 5,5

$5 - 5 < x < 5 + 5$

i.e. $0 < x < 10$

So, required five values of x are 1, 3, 5, 7, 9.

(c) 3, 7

$7 - 3 < x < 7 + 3$

i.e. $4 < x < 10$

Practice Exercise 7.1

1. (a) 2 cm, 3 cm, 5 cm: Sum of two smaller $= 2 + 3 = 5$.

Is $5 > 5$? No (equal, not greater).

Ans: (a) Triangle is not possible.

(b) 3.5 cm, 4.5 cm, 9 cm: Sum of two smaller $= 3.5 + 4.5 = 8$. Is $8 > 9$? No.

Ans: (b) Triangle is not possible.

(c) 10.3 cm, 5.7 cm, 4.5 cm: The largest side is 10.3 cm. Sum of other two $= 5.7 + 4.5 = 10.2$. is $10.2 > 10.3$? No.

Ans: (c) Triangle is not possible.

(d) 3.6 cm, 4.7 cm, 6.2 cm. The largest side in 6.2 cm. Sum of other two $= 3.6 + 4.7 = 8.3 > 6.27$

Yes, triangle is possible.

2. We know that the sum of any two sides of a triangle must be greater than the third side.

Let the third side be x cm.

Condition 1. The third side must be less than the sum of the given sides.

$x < 7 + 10$

$x < 17$ cm

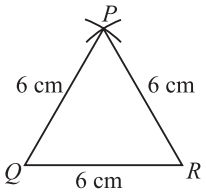
Condition 2: The third side must be greater than the difference of the given sides.

$x > 10 - 7$

$x > 3$ cm

Ans: The length of the third side must be greater than 3 cm and less than 17 cm. That is: 3 cm $< x <$ 17 cm.

3. Check: $6 + 6 = 12 > 6$. Triangle is possible. This is an equilateral triangle.



Steps of Construction:

Step 1: Draw a line segment QR = 6 cm.

Step 2: With Q as centre and radius 6 cm, draw an arc.

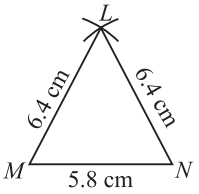
Step 3: With R as centre and same radius 6 draw cm, another arc cutting the previous arc.

Step 4: Mark the point of intersection as P.

Step 5: Join PQ and PR.

Ans: Triangle PQR is the required equilateral triangle with all sides = 6 cm.

4. Check 5.8 + 6.4 = 12.2 > 6.4. Triangle is possible. This is an isosceles triangle (LM = NL = 6.4 cm).



Steps of Construction:

Step 1: Draw a line segment MN = 5.8 cm.

Step 2: With M as centre and radius 6.4 cm, draw an arc.

Step 3: With N as centre and radius 6.4 cm, draw another arc cutting the previous arc.

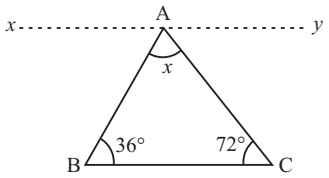
Step 4: Mark the point of intersection as L.

Step 5: Join LM and LN.

Ans: Triangle LMN is the required Isosceles triangle with LM = NL = 6.4 cm and MN = 5.8 cm.

NCERT Exercise 7.2

1. We know that sum of three angles of a triangle is 180°.



(a) Let third angle of triangle be x and xy || BC then < XAB = ∠ABC = 36° (alternate angles) ∠YAC = ∠ACB = 72° (alternate angles)

XAY is a straight line.

$\therefore \angle XAB + \angle A + \angle YAC = 180°$

$36° + \angle A + 72° = 180°$

$\Rightarrow \angle A = 180° - 108° = 72° = x$

(b) Let third angle of triangle be x then,

$150° + x + 15° = 180°$

$150° + x + 15° = 180°$

$\Rightarrow \quad x = 180° - 165° = 15°$

(c) Let third angle of triangle be x then,

$90° + 30° + x = 180°$

$x = 180° - 120°$

$x = 60°$

(d) Let third angle of the triangle be x,

$\angle XAB + \angle A + \angle YAC = 180°$

$75° + x + 45° = 180°$

$\Rightarrow \quad x = 180° - 120 = 60°$

2. If all angles of a triangle are 70° then

Sum of angles = 70° + 70° + 70°

= 210° > 180°

So, triangle does not exist.

If two angles of triangle are 70°, 70°, then their

sum = 70° + 70°

= 140°

So third angle = 180° – 140°

(sum of all the angles of triangle is 180°)

= 40°

If all the angles of a triangle are equal say x then their sum = x + x + x = 180°

$\Rightarrow \quad 3x = 180°$

$\Rightarrow \quad x = \frac{180°}{3} = 60°$

Thus, each angle of this triangle is a measure 60° and it is called an equilateral triangle.

3. Let $\angle B = \angle C = x$

then sum of angles of triangle = $\angle A + \angle B + \angle C = 180°$

$\Rightarrow \quad 50° + x + x = 180°$

$\Rightarrow \quad 2x = 180° - 50° = 130°$

$\Rightarrow \quad x = \frac{130°}{2} = 65°$

Thus, $\angle B = \angle C = 65°$.

4. We know that sum of three angles of a triangle is 180° and sum of two angles of a triangle must be less than 180° then triangle exists.

(a) If one angle is 30°, then two possible angles are 70° and 80° and two not possible angles are 150° and 50°

(b) If one angle is 70° then two possible angles are 70° and 40° two not possible angles are 110° and 50°.

(c) If one angle is 54° then two possible angles are 46° and 80°. and two not possible angles are 120° and 60°.

(d) If one angle is 144°. then two possible angles are 20° and 16° and two not possible angles are 50° and 110°.

5. We know that in a triangle, sum of two angles is not greater than 180°.

(a) $35° + 150° = 185° > 180°$

Thus, triangle is not possible.

(b) $70° + 30° = 100° < 180°$

Thus, triangle is possible.

(c) $90° + 85° = 175° < 180°$

Thus, triangle is possible.

(d) $50° + 150° = 200° > 180°$

Thus, triangle is not possible.

Practice Exercise 7.2

1. In ΔABC

$\angle A = 35°, \angle B = 65°$

$\angle C = 180° - (35° + 65°)$

$= 180° - 100°$

$= 80°$

Tentative answer: 80°

2. In ΔLMN

$\angle M = 105°, \angle N = 40°$

$\angle L = 180° - (105° + 40°)$

$= 180° - 145°$

$= 35°$

Tentative answer: 35°

3. In ΔPQR

$\angle P = 90°, \angle R = 48°$

$\angle Q = 180° - (90° + 48°)$

$= 180° - 138°$

$= 42°$

Tentative answer: 42°

4. Find x

(a) Exterior angle = 105°

Interior angle at base

$= 180° - 105°$

$= 75°$

So triangle angles are:

x, 2x, 75°

$x + 2x + 75° = 180°$

$3x + 75° = 180°$

$3x = 105°, x = 35°$

Tentative answer: 35°

(b) Exterior angle = 125°

Interior angle = $180° - 125° = 55°$

Angles are: 2x, x, 55°

$2x + x + 55° = 180°$

$3x + 55° = 180°$

$3x = 125°$

$x = 125° \div 3$

$x = 41\frac{2°}{3}$

Tentative answer: $41\frac{2°}{3}$

(c) Angles are 60°, 50°, x

$x = 180° - (60° + 50°)$

$= 180° - 110°$

$= 70°$

Tentative answer: 70°

5. Find x and y

(a) Exterior angle = 120°

Interior angle = $180° - 120° = 60°$

Angles: 50°, 60°, x

$x = 180° - (50° + 60°)$

$= 70°$

So $y = 60°$

Tentative: $x = 70°, y = 60°$

(b) According to figure,

$3x = 60°$. Vertically opposite angle

$x = 20°$

Now,

$40° + 60° + y = 180°$

$y = 180° - 100°$

$y = 80°$

Tentative: $x = 60°$, $y = 80°$

(c) Top vertical angle = 90°

So interior angle y = 90° (vertically opposite angles)

Triangle has angles x, x, 90°

$x + x + 90° = 180°$

$2x = 90°$

$x = 45°$

Tentative: $x = 45°$, $y = 90°$

6. Check possibility

(a) 65°, 74°, 39°

Sum = 65° + 74° + 39°

= 178°

178° ≠ 180°

Not possible

(b) $\frac{1}{3}$ right angle = 30°

So angles are 30°, 90°, 60°

Sum = 30° +90° + 60°

= 180°

Possible

NCERT Exercise 7.3

1. (a) 3 cm, 75°, 7 cm

Steps of Construction

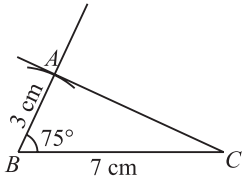
(1) Draw BC = 7 cm

(2) At point B draw an angle of 75°

(3) Mark an arc with protector such that AB = 3 cm.

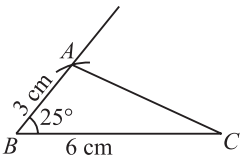
(4) Join AC.

(5) ΔABC is the required triangle.



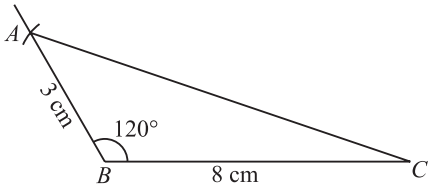
(b) **Steps of Construction**

Do same as above part (a) and change angle 75° to 25°.



(c) **Steps of Construction**

Do same as part (a) and change angle 75° to 120°.



2. (a) 75°, 5 cm, 75°

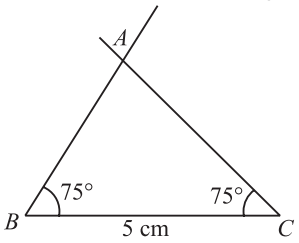
Steps of Construction

(1) Draw BC = 5 cm.

(2) Draw angles of 75° and 75° at point B and C using protector.

(3) These two lines cut each other at point A.

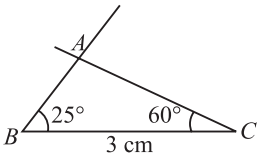
(4) ΔABC is the required triangle.



(b) 25°, 3 cm, 60°

Steps of Construction

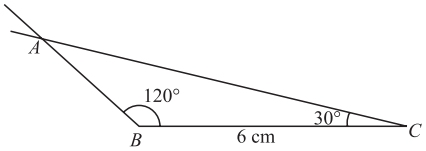
Do same as part (a).



(c) 120°, 6 cm, 30°

Steps of Construction

Do same as part (a)



3. Steps of Construction

(1) Draw AB = 6 cm.

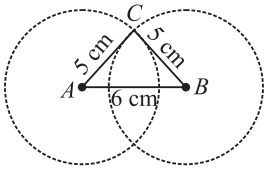
(2) From point A draw a circle of radius 5 cm.

(3) From point B draw another circle of radius 5 cm.

(4) C is the point of intersection of two circles.

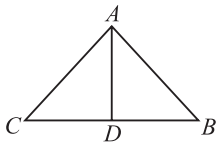
(5) Join AC and BC.

(6) ΔABC is the required triangle.

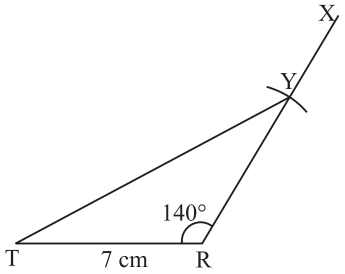


Again

(7) With the help of ruler and set square draw AD ⊥ BC.



4. Steps of Construction



(1) Draw TR = 7 cm.

(2) At point R, draw an angle of 140°, using protector.

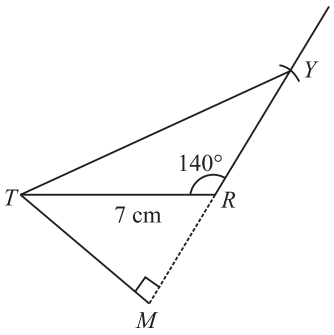
(3) Cut RY = 4 cm, then join YT.

(4) ΔTRY is the required triangle.

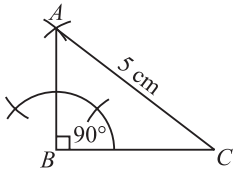
Again,

(5) Keep the ruler aligned to RY and place the set square, we get altitude TM on extended RY.

Thus, TM is the required altitude.



5. By angle sum property:



$\angle A + \angle B + \angle C = 180°$

$\angle A + 90° + \angle C = 180°$

$\angle A + \angle C = 90°$

Since angle A and angle C can take any pair of positive values adding up to 90 degrees (e.g., 30 + 60, 45 + 45, 50 + 40, etc.), infinitely many different triangles are possible.

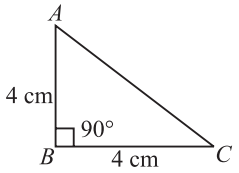
Figure: Right-angled triangle ABC with ∠B = 90°, AC = 5 cm as hypotenuse, B at top, A and C at base.

Conclusion: Infinitely many different right-angled triangles exist with these measurements.

6. Construction of an equilateral triangle

(a) Here, we see that AC ≠ 4 cm.

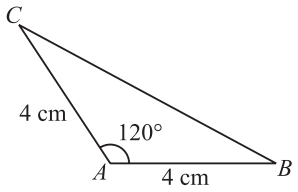
(not possible)



(b) Here, we can see that BC ≠ 4 cm

(not possible)

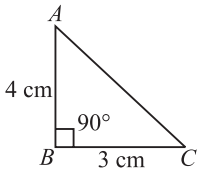
Isosceles Triangle



(a) right angled

Here, AC ≠ 3 or AC ≠ 4.

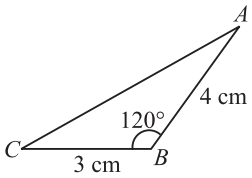
(not possible)



(b) Obtuse angled

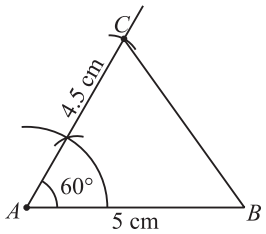
Here, AC ≠ 4 cm or AC ≠ 3 cm

(not possible)



Practice Exercise 7.3

1. Construct a ΔABC in which AB = 5 cm, AC = 4.5 cm and ∠A = 60°



(a) Draw AB = 5 cm.

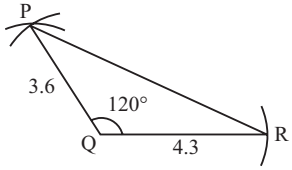
(b) At A, construct an angle of 60°.

(c) On this ray, mark point C such that AC = 4.5 cm.

(d) Join BC.

ΔABC is constructed.

2. Construct a ΔPQR in which QR = 4.3 cm, ∠Q = 120° and PQ = 3.6 cm



(a) Draw QR = 4.3 cm.

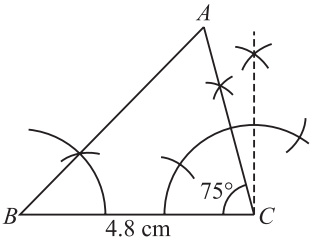
(b) At Q, construct ∠PQR = 120°.

(c) On this ray, mark point P such that PQ = 3.6 cm.

(d) Join PR.

ΔPQR is constructed.

3. Construct a ΔABC in which BC= 4.8 cm, ∠B = 60° and ∠C = 75°



(a) Draw BC = 4.8 cm.

(b) At B, construct ∠ABC= 60°.

(c) At C, construct ∠ACB = 75°.

(d) The two rays meet at A.

(e) Join AB and AC.

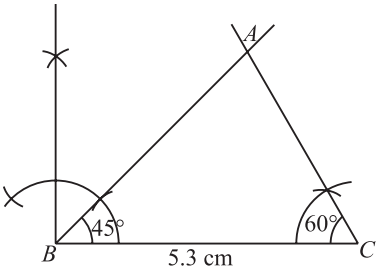
ΔABC is constructed.

4. Construct a ΔABC in which BC = 5.3 cm, ∠B = 45° and ∠A = 75°

First find ∠C.

∠C = 180° – (45° + 75°)

180° – 120° = 60°



(a) Draw BC = 5.3 cm.

(b) At B, construct ∠ABC = 45°.

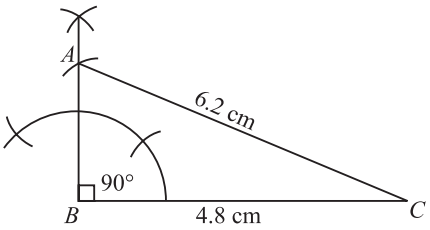
(c) At C, construct ∠ACB = 60°.

(d) The two rays meet at A.

(e) Join AB and AC.

ΔABC is constructed.

5. Construct a ΔABC in which BC= 4.8 cm, ∠B = 90° and hypotenuse AC = 6.2 cm



Steps of construction:

(a) Draw BC = 4.8 cm.

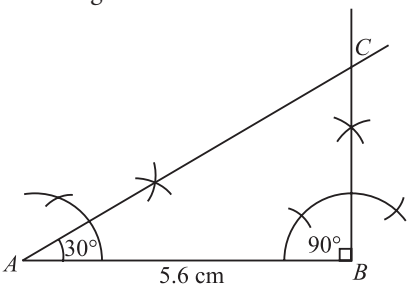
(b) At B, construct a right angle (90°).

(c) With C as centre and radius 6.2 cm, draw an arc cutting the perpendicular at A.

(d) Join AC and AB.

ΔABC is constructed.

6. Construct a right-angled triangle whose hypotenuse measures 5.6 cm and one acute angle measures 30°



Steps of construction:

(a) Draw AB = 5.6 cm (hypotenuse).

(b) At A, construct an angle of 30°.

(c) At B, construct an angle of 90°.

(d) The two rays meet at C.

(e) Join AC and BC.

Right-angled triangle is constructed.

Chapter Innings

A. Multiple Choice Questions

1. (b) **2.** (c) **3.** (c) **4.** (a) **5.** (b)
6. (c)

B. Fill in the Blanks

1. obtuse **2.** complementary
3. 60° **4.** hypotenuse **5.** 90° **6.** 55°

C. Match the Following

1. (d) **2.** (c) **3.** (a) **4.** (b)

D. True or False

1. F **2.** F **3.** T **4.** T **5.** F
6. F

E. Very Short Answer Type Questions

1. Check whether triangle is possible with sides 11 cm, 4 cm, 6 cm

Triangle Inequality Rule:

Sum of any two sides must be greater than the third side.

4 + 6 = 10

10 is not greater than 11

Condition fails.

Tentative Answer: **Not possible.**

2. Angles are 3x°, (2x + 15)°, (4x + 12)°

Using angle sum property:

$3x + (2x + 15) + (4x + 12) = 180°$

$3x + 2x + 4x + 15 + 12 = 180$

$9x + 27 = 180$

$9x = 180 - 27$

$9x = 153$

$x = 153 \div 9$

$x = 17$

Tentative Answer: x = 17

3. One acute angle of right triangle = 38°

In a right triangle, one angle = 90°

Sum of angles = 180°

Other acute angle = 180° (90° + 38°)

= 180° – 128°

= 52°

Tentative Answer: 52°.

4. Angles in ratio 3 : 4 : 5

Let angles be 3x, 4x, 5x

$3x + 4x + 5x = 180°$

$12x = 180°$

$x = 180 \div 12$

$x = 15°$

Angles:

3x = 45°

4x = 60°

5x = 75°

Tentative Answer: 45°, 60°, 75°

5. In isosceles triangle

Let third angle = x

Each equal angle = 2x

Sum of angles:

$2x + 2x + x = 180°$

$5x = 180°$

$x = 36°$

Equal angles = $2x = 72°$

Angles are: 72°, 72°, 36°

Tentative Answer: 72°, 72°, 36°

F. Short Answer Type Questions

1. Exterior angle = 120°. Interior opposite angles are in ratio 3 : 5.

Exterior angle property:

Exterior angle = sum of interior opposite angles.

Let interior opposite angles be 3x and 5x.

$3x + 5x = 120°$

$8x = 120°$

$x = 15°$

So angles are: $3x = 45°$

$5x = 75°$

Third angle = $180° - (45° + 75°)$

$= 180° - 120°$

$= 60°$

Tentative Answer: 45°, 75°, 60°

2. Two sides are 5 cm and 9 cm.

Triangle inequality:

$5 + 9 > x$

$14 > x$

$5 + x > 9$

$x > 4$

Therefore:

$4 < x < 14$

Tentative Answer: Greater than 4 cm but less than 14 cm

3. Ratio of vertical angle and base angle in isosceles triangle = 4 : 3

Let vertical angle = 4x

Each base angle = 3x

Sum of angles:

$4x + 3x + 3x = 180°$

$10x = 180°$

$x = 18°$

Angles:

Vertical angle = $4x = 72°$

Base angles = $3x = 54°, 54°$

Tentative Answer: 72°, 54°, 54°

4. In isosceles triangle, base angle is four times vertical angle.

Let vertical angle = x

Each base angle = 4x

Sum of angles:

$x + 4x + 4x = 180°$

$9x = 180°$

$x = 20°$

Vertical angle = 20°

Base angles = 80°, 80°

Tentative Answer: 20°, 80°, 80°

5. Two acute angles of right triangle are in ratio 7 : 8

Sum of acute angles in right triangle = 90°

Let angles be 7x and 8x

$7x + 8x = 90°$

$15x = 90°$

$x = 6°$

Angles:

$7x = 42°$

$8x = 48°$

Thus,

Thus, Answer: 42°, 48°

G. Long Answer Type Questions

1. In ΔADC

AD = DC (given)

$\Rightarrow \angle DAC = \angle DCA$ [angles opp to equal sides are equal]

$\angle DAC = \angle DCA = 35°$

By using angle sum property,

$\angle DAC + \angle DCA + \angle ADC = 180°$

$35° + 35° + x = 180°$

$x = 180° - 70°$

$\boxed{x = 110°}$

Now, DC || AB

and AC is transversal.

$\Rightarrow \angle DCA = \angle CAB.$

$\Rightarrow 35° = y$

$\Rightarrow \boxed{y = 35°}$

In ΔABC,

By using angle sum property,

$y + z + 68° = 180°$

$35° + 2 + 68° = 180°$

$z = 180° - 103°$

$\boxed{x = 77°}$

2. In triangle ABC:

$\angle B = 54°$

$\angle C = 73°$

So,

$x + 54° + 73° = 180°$

$x + 127° = 180°$

$x = 53°$

Now consider triangle ADE.

$\angle E = 90°$ (right angle shown)

Angle at A in small triangle = $x = 53°$

So,

$53° + y + 90° = 180°$

$143° + y = 180°$

$y = 37°$

Tentative answers: $x = 53°$, $y = 37°$

3. From the figure,

$x = 80°$ [vertically opposite angle]

$2y + 110° = 180°$ [linear pair]

$2y = 70°$

$\boxed{y = 35°}$

$3x + 2y + x = 180°$ [angle sum property]

$3z + 2(35) + 80 = 180°$

$3z + 70 + 80 = 180°$

$3z = 180° - 150°$

$z = \frac{30}{3}$

$\boxed{z = 10°}$

4. In ΔALB,

$\angle LAB + \angle ABL + \angle ALB = 180°$ [angle sum property]

$90° + 20° + \angle ALB = 180°$

(a) $\boxed{\angle ALB = 70°}$

$\angle DLM + \angle MLB + \angle ALB = 180°$ [linear pair]

$35° + \angle MLB + 70° = 180°$

$\angle MLB = 180° - 105°$

(b) $\boxed{\angle MLB = 75°}$

$\angle DLM + \angle DML + \angle LDM = 180°$ [angle sum property]

$35° + \angle DML + 90° = 180°$

$\angle DML = 180° - 125°$

(c) $\boxed{\angle DML = 55°}$

$\angle DML + \angle LMB + \angle CMB = 180°$ [linear pair]

$55° + 60° + \angle LMB = 180°$

$\angle LMB = 180° - 115°$

(d) $\boxed{\angle LMB = 65°}$

In ΔLMB,

$\angle LMB + \angle MCB + \angle CBM = 180°$

$65° + 90° + \angle LMB = 180°$

$\angle LMB = 180° - 155°$

(e) $\boxed{\angle LBM = 25°}$

$\angle ABL + \angle LBM + \angle MBL = 90°$ [given that $\angle B = 90°$]

$20° + \angle LBM + 25° = 90°$

$\angle LBM = 90° - 45°$

(f) $\boxed{\angle LBM = 45°}$

5. PQ || SR,

$\angle PSQ = \angle SQR$ [allernate interior angle]

$\Rightarrow$ $\boxed{\angle SQR = 85°}$ (a)

$\angle R + \angle PSQ + \angle QSR = 180°$ [sum of adjacent angle of a || sm is 180°]

$50° + 85° + \angle QSR = 180°$

$\boxed{\angle QSR = 45°}$ (b)

PQ || SR,

$\angle QSR = \angle SQP$ [Alternate interior angle]

$\Rightarrow$ $\boxed{\angle SQP = 45°}$ (c)

$\angle R = \angle P = 50°$ [opp angles of parallogram gm are equal]

$\Rightarrow$ $\boxed{\angle P = 50°}$ (d)

6. In ΔMNR, by using angle sum property,

$\angle RMN + \angle MRN + \angle MNR = 180°$

$\angle M + 100 + 25° = 180°$

$\boxed{\angle M = 55°}$ (a)

RS || MN, $\Rightarrow \angle SRN = \angle MNR$ [Alternate interior angle]

$\Rightarrow$ $\boxed{\angle SRN = 25°}$ (b)

$\angle LRS + \angle SRN + \angle MRN = 180°$ [Linear pair]

$\angle LRS + 25° + 100° = 180°$

$\boxed{\angle LRS = 55°}$ (c)

In ΔLSR, by using angle sum property,

$\angle LRS + \angle RLS + \angle RSL = 180°$

$55° + 55° + \angle RSL = 180°$

$\Rightarrow$ $\boxed{\angle LSR = 70°}$ (d)

$\angle LSR + \angle RSN = 180°$ (linear pair)

$70° + \angle RSN = 180°$

$\boxed{\angle RSN = 110°}$ (e)

In ΔRSN, by using angle sum property,

$\angle SRN + \angle RNS + \angle NSR = 180°$

$25° + \angle RNS + 110° = 180°$

$\boxed{\angle RNS = 45°}$ (f)

H. Assertion Reason Questions

1. (D) **2.** (B) **3.** (A) **4.** (B) **5.** (C)

I. Case Study

1. (d) **2.** (a) **3.** (b) **4.** (c)

8. Working With Fractions

NCERT Exercise 8.1

1. Glasses of milk drunk in a week:

Number of days in a week = 7

Glasses in 1 week = $7 \times \frac{1}{2} = \frac{7}{2} = 3\frac{1}{2}$ glasses

Glasses of milk in the month of January:

Number of days in January = 31

Glasses in January $31 \times \frac{1}{2} = \frac{31}{2} = 15\frac{1}{2}$ glasses

Ans: Tenzin drinks $3\frac{1}{2}$ glasses in a week and $15\frac{1}{2}$ glasses in January.

2. Distance in 1 day = $\frac{1}{8} = \frac{1}{8}$ km

Distance in 5 days (1 week) = $5 \times \frac{1}{8} = \frac{5}{8}$ km

Ans: In one day, the team can make $\frac{1}{8}$ km. If they work 5 days a week, they can make $\frac{5}{8}$ km in a week.

3. Oil per family per week = $\frac{5}{3} = \frac{5}{3} = 1\frac{2}{3}$ litres

Oil per family in 4 weeks = $4 \times \frac{5}{3} = \frac{20}{3} = 6\frac{2}{3}$ littes

Ans: Each family gets $1\frac{2}{3}$ litres per week and $6\frac{2}{3}$ litres in 4 weeks.

4. Thursday is 3 days after Monday.

Extra time = $3 \times \frac{5}{6} = \frac{15}{6} = \frac{5}{2} = 2\frac{1}{2}$ hours

Ans: The Moon will set $2\frac{1}{2}$ hours after 10 pm on Thursday.

5. (a) $7 \times \frac{3}{5} = \frac{21}{5} = 4\frac{1}{5}$

(b) $4 \times \frac{1}{3} = \frac{4}{3} = 1\frac{1}{3}$

(c) $\frac{9}{7} \times 6 = \frac{54}{7} = 7\frac{5}{7}$

(d) $\frac{13}{11} \times 6 = \frac{78}{11} = 7\frac{1}{11}$

Practice Exercise 8.1

1. (a) $8 \times \frac{5}{6} = \frac{40}{6} = \frac{20}{3} = 6\frac{2}{3}$

(b) $4 \times \frac{1}{4} = \frac{4}{4} = 1$

(c) $6 \times \frac{3}{5} = \frac{18}{5} = 3\frac{3}{5}$

(d) $\frac{3}{4} \times 40 = \frac{120}{4} = 30$

(e) $\frac{6}{7} \times 60 = \frac{360}{7} = 51\frac{3}{7}$

(f) $34 \times \frac{5}{51} = \frac{170}{51} = \frac{10}{3} = 3\frac{1}{3}$

(g) $22 \times \frac{13}{33} = \frac{286}{33} = \frac{26}{3} = 8\frac{2}{3}$

(h) $75 \times \frac{19}{100} = \frac{1425}{100} = \frac{57}{4} = 14\frac{1}{4}$

2. (a) $6 \times 1\frac{7}{8} = 6 \times \frac{15}{8} = \frac{90}{8} = \frac{45}{4} = 11\frac{1}{4}$

(b) $10 \times 1\frac{2}{15} = 10 \times \frac{17}{15} = \frac{170}{15} = \frac{34}{3} = 11\frac{1}{3}$

(c) $1\frac{5}{7} \times 3 = \frac{12}{7} \times 3 = \frac{36}{7} = 5\frac{1}{7}$

(d) $2\frac{3}{5} \times 2 = \frac{13}{5} \times 2 = \frac{26}{5} = 5\frac{1}{5}$

(e) $3\frac{1}{2} \times 5 = \frac{7}{2} \times 5 = \frac{35}{2} = 17\frac{1}{2}$

(f) $3\frac{2}{5} \times 8 = \frac{17}{5} \times 8 = \frac{136}{5} = 27\frac{1}{5}$

(g) $5 \times \frac{6}{3} = 5 \times 2 = 10$

(h) $5 \times 3\frac{2}{7} = 5 \times \frac{23}{7} = \frac{115}{7} = 16\frac{3}{7}$

3. (a) $\frac{2}{5}$ of 2 kg $= \frac{2}{5} \times 2 = \frac{4}{5}$ kg = 800 kg

(b) $\frac{1}{3}$ of Rs 48 $= \frac{1}{3} \times 48 =$ ₹ 16

(c) $\frac{7}{8}$ of 96 mL $= \frac{7}{8} \times 96 = 7 \times 12 = 84$ mL

4. Cost of dress $= \frac{5}{9}$ of ₹ 540

$= \frac{5}{9} \times 540$

$= 5 \times 60$

= ₹ 300

5. Story books $= \frac{7}{8} \times 136 = 7 \times 17 = 119$

Other books = 136 – 119 = 17

NCERT Exercise 8.2

1. (a) $\frac{1}{3} \times \frac{1}{5} = \frac{(1 \times 1)}{(3 \times 5)} = \frac{1}{15}$

(b) $\frac{1}{4} \times \frac{1}{3} = \frac{(1 \times 1)}{(4 \times 3)} = \frac{1}{12}$

(c) $\frac{1}{5} \times \frac{1}{2} = \frac{(1 \times 1)}{(5 \times 2)} = \frac{1}{10}$

(d) $\frac{1}{6} \times \frac{1}{5} = \frac{(1 \times 1)}{(6 \times 5)} = \frac{1}{30}$

(e) $\frac{1}{12} \times \frac{1}{18} = \frac{(1 \times 1)}{(12 \times 18)} = \frac{1}{216}$

2. (a) $\frac{2}{3} \times \frac{4}{5} = \frac{(2 \times 4)}{(3 \times 5)} = \frac{8}{15}$

(b) $\frac{1}{4} \times \frac{2}{3} = \frac{(1 \times 2)}{(4 \times 3)} = \frac{2}{12} = \frac{1}{6}$

(c) $\frac{3}{5} \times \frac{1}{2} = \frac{(3 \times 1)}{(5 \times 2)} = \frac{3}{10}$

(d) $\frac{4}{6} \times \frac{3}{5} = \frac{(4 \times 3)}{(6 \times 5)} = \frac{12}{30} = \frac{2}{5}$

3. Rate of filling = $\frac{7}{10}$ of the tank per hour

(a) $\frac{1}{3}$ hour : Amount filled = $\frac{7}{10} \times \frac{1}{3} = \frac{7}{30}$ of the tank

(b) $\frac{2}{3}$ hour : Amount filled = $\frac{7}{10} \times \frac{2}{3} = \frac{14}{30} = \frac{7}{15}$ of the tank

(c) $\frac{3}{4}$ hour : Amount filled = $\frac{7}{10} \times \frac{3}{4} = \frac{21}{40}$ of the tank

(d) $\frac{7}{10}$ hour : Amount filled = $\frac{7}{10} \times \frac{7}{10} = \frac{49}{100}$ of the tank

(e) For the tank to be full $\frac{10}{7}$ = (since the tap fills $\frac{7}{10}$ in 1 hour)

4. Land taken by government = $\frac{1}{6}$

Land remaining with Somu = $1\frac{1}{6} = \frac{5}{6}$ of original

(a) Krishna gets = $\frac{1}{2}$ of $\frac{5}{6} = \frac{1}{2} \times \frac{5}{6} = \frac{5}{12}$ of original land

(b) Bora gets = $\frac{1}{3}$ of $\frac{5}{6} = \frac{1}{3} \times \frac{5}{6} = \frac{5}{18}$ of original land

(c) Somu's share:

Land given away from remaining = $\frac{1}{2} + \frac{1}{3} = \frac{3}{6} + \frac{2}{6} = \frac{5}{6}$ of remaining Somu keeps = $\frac{1}{6}$ of remaining = $\frac{1}{6} \times \frac{5}{6} = \frac{5}{36}$ of original land

5. Length = $3\frac{3}{4} = \frac{15}{4}$ feet

Breadth = $9\frac{3}{5} = \frac{48}{5}$ feet

Area = Length × Breadth = $\frac{15}{4} \times \frac{48}{5}$

$= \frac{(15 \times 48)}{(4 \times 5)} = \frac{720}{20} = 36$ sq feet

6. Number of gaps between 4 saplings = 3

Distance between first and last = $3 \times \frac{3}{4} = \frac{9}{4} = 2\frac{1}{4}$ m

7. $\frac{12}{15}$ of 500 g = $\frac{4}{5} \times 500 = 400$ g

$\frac{3}{20}$ of 4 kg = $\frac{3}{20} \times 4000$ g = $\frac{12000}{20}$

= 600 g

Since 600 g > 400 g,

8. When one of the numbers being multiplied is between 0 and 1, the product is less than the other number.

When one of the numbers being multiplied is greater than 1, the product is greater than the other number.

Practice Exercise 8.2

1. (a) $\frac{3}{8} \times \frac{4}{5} = \frac{(3 \times 4)}{(8 \times 5)} = \frac{12}{40} = \frac{3}{10}$

(b) $\frac{8}{15} \times \frac{3}{4} = \frac{(8 \times 3)}{(15 \times 4)} = \frac{24}{60} = \frac{2}{5}$

(c) $\frac{9}{30} \times \frac{2}{7} = \frac{(9 \times 2)}{(30 \times 7)} = \frac{18}{210} = \frac{3}{35}$

(d) $\frac{3}{7} \times \frac{5}{9} = \frac{(3 \times 5)}{(7 \times 9)} = \frac{15}{63} = \frac{5}{21}$

2. (a) $\frac{2}{5} \times 5\frac{1}{4} = \frac{2}{5} \times \frac{21}{4} = \frac{(2 \times 21)}{(5 \times 4)} = \frac{42}{20} = \frac{21}{10}$

$= 2\frac{1}{10}$

(b) $2\frac{1}{3} \times 5\frac{4}{21} = \frac{7}{3} \times \frac{109}{21} = \frac{763}{63} = \frac{109}{9}$

$= 12\frac{1}{9}$

(c) $3\frac{1}{6} \times 7\frac{4}{23} = \frac{19}{6} \times \frac{165}{23} = \frac{3135}{138} = \frac{1045}{46}$

$= 22\frac{33}{46}$

(d) $2\frac{2}{3} \times 3\frac{1}{4} = \frac{8}{3} \times \frac{13}{4} = \frac{104}{12} = \frac{26}{3} = 8\frac{2}{3}$

3. (a) $\frac{4}{9} \times \frac{1}{8} \times \frac{3}{5} = \frac{(4 \times 1 \times 3)}{(9 \times 8 \times 5)} = \frac{12}{360} = \frac{1}{30}$

(b) $\frac{1}{2} \times \frac{2}{3} \times \frac{3}{4} = \frac{(1 \times 2 \times 3)}{(2 \times 3 \times 4)} = \frac{6}{24} = \frac{1}{4}$

(c) $1 \times 1\frac{1}{2} \times 1\frac{1}{3} = 1 \times \frac{3}{2} \times \frac{4}{3} = \frac{12}{6} = 2$

4. (a) $\frac{2}{7}$ of $\frac{3}{4} = \frac{2}{7} \times \frac{3}{4} = \frac{6}{28} = \frac{3}{14}$

$\frac{3}{5}$ of $\frac{5}{8} = \frac{3}{5} \times \frac{5}{8} = \frac{15}{40} = \frac{3}{8}$

Comparing $\frac{3}{14}$ and $\frac{3}{8}$: Since denominators differ (14 > 8), $\frac{3}{8} > \frac{3}{14}$

(b) $\frac{1}{2}$ of $\frac{6}{7} = \frac{1}{2} \times \frac{6}{7} = \frac{6}{14} = \frac{3}{7}$

$\frac{2}{3}$ of $\frac{3}{7} = \frac{2}{3} \times \frac{3}{7} = \frac{6}{21} = \frac{2}{7}$

Comparing $\frac{3}{7}$ and $\frac{2}{7}$: Since numerators 3 > 2, $\frac{3}{7} > \frac{2}{7}$

5. Price per kg = $48\frac{4}{5} = \frac{244}{5}$

Quantity $3\frac{3}{4} = \frac{15}{4}$ kg

Cost = $\frac{15}{4} \times \frac{244}{5} = \frac{(15 \times 244)}{(4 \times 5)} = \frac{3660}{20}$

= ₹183

6. Price per metre = $42\frac{1}{2} = \frac{85}{2}$

Length = $5\frac{3}{5} = \frac{28}{5}$ metres

Cost = $\frac{28}{5} \times \frac{85}{2} = \frac{(28 \times 85)}{(5 \times 2)} = \frac{2380}{10} = 238$

7. Length = $41\frac{2}{3} = \frac{125}{3}$ m

Breadth = $18\frac{3}{5} = \frac{93}{5}$ m

Area = $\frac{125}{3} \times \frac{93}{5} = \frac{(125 \times 93)}{(3 \times 5)} = \frac{11625}{15}$

= 775 sq m

8. Part read in 1 hour = $\frac{1}{3}$

Time $2\frac{1}{5} = \frac{11}{5}$ hours

Part read in $\frac{11}{5}$ hours = $\frac{1}{3} \times \frac{11}{5} = \frac{11}{15}$

NCERT Exercise 8.3

1. $\frac{3}{\left(\frac{7}{9}\right)} = 3 \times \frac{9}{7} = \frac{27}{7} = 3\frac{6}{7}$

$\frac{\left(\frac{14}{4}\right)}{2} = \frac{14}{4} \times \frac{1}{2} = \frac{14}{8} = \frac{7}{4} = 1\frac{3}{4}$

$\frac{\left(\frac{2}{3}\right)}{\left(\frac{2}{3}\right)} = \frac{2}{3} \times \frac{3}{2} = \frac{6}{6} = 1$

$\frac{\left(\frac{14}{6}\right)}{\left(\frac{7}{3}\right)} = \frac{14}{6} \times \frac{3}{7} = \frac{42}{42} = 1$

$\frac{\left(\frac{4}{3}\right)}{\left(\frac{3}{4}\right)} = \frac{4}{3} \times \frac{4}{3} = \frac{16}{9} = 1\frac{7}{9}$

$\frac{\left(\frac{7}{4}\right)}{\left(\frac{1}{7}\right)} = \frac{7}{4} \times \frac{7}{1} = \frac{49}{4} = 12\frac{1}{4}$

$\frac{\left(\frac{8}{2}\right)}{\left(\frac{4}{15}\right)} = 4 \times \frac{15}{4} = 15$

$\frac{\left(\frac{1}{5}\right)}{\left(\frac{1}{9}\right)} = \frac{1}{5} \times \frac{9}{1} = \frac{9}{5} = 1\frac{4}{5}$

$\frac{\left(\frac{1}{6}\right)}{\left(\frac{11}{12}\right)} = \frac{1}{6} \times \frac{12}{11} = \frac{12}{66} = \frac{2}{11}$

$\frac{3\frac{2}{3}}{1\frac{3}{8}} = \frac{\frac{11}{3}}{\frac{11}{8}} = \frac{11}{3} \times \frac{8}{11} = \frac{8}{3} = 2\frac{2}{3}$

2. (a) (iii) $\frac{8}{\left(\frac{1}{4}\right)} = 8 \times 4 = 32$ bags

(b) (iv) $\frac{\frac{1}{2}}{8} = \frac{1}{2} \times \frac{1}{8} = \frac{1}{16}$ m

(c) (iii) $\frac{5}{\left(\frac{1}{6}\right)} = 5 \times 6 = 30$ loaves

3. Flour per roti = $\frac{\frac{1}{4}}{12} \times \frac{1}{4} \times \frac{1}{12} = \frac{1}{48}$ kg

Flour for 6 rotis = $6 \times \frac{1}{48} = \frac{6}{48} = \frac{1}{8}$ kg

4. $\frac{1}{\left(\frac{1}{6}\right)} = 1 \times 6 = 6$

$\frac{1}{\left(\frac{1}{10}\right)} = 1 \times 10 = 10$

$\frac{1}{\left(\frac{1}{13}\right)} = 1 \times 13 = 13$

$\frac{1}{\left(\frac{1}{9}\right)} = 1 \times 9 = 9$

$\frac{1}{\left(\frac{1}{2}\right)} = 1 \times 2 = 2$

Sum = 6 + 10 + 13 + 9 + 2 = 40

5. Pages read yesterday = $\frac{1}{5} \times 400 = 80$ pages

Pages read today = $\frac{3}{10} \times 400 = 120$ pages

Total pages read = 80 + 120 = 200 pages
Pages remaining = 400 – 200 = 200 pages

6. Petrol used = $2\frac{3}{4} = \frac{11}{4}$ litres

Distance = $16 \times \frac{11}{4} = \frac{176}{4} = 44$ km

7. Train time $5\frac{1}{6} = \frac{31}{6}$ hours

Plane time = $\frac{1}{2} = \frac{3}{6}$ hours

Time saved = $\frac{31}{6} - \frac{3}{6} = \frac{28}{6} = \frac{14}{3} = 4\frac{2}{3}$ hours

8. Remaining cake = $1 - \frac{4}{5} = \frac{1}{5}$ of the cake

Each friend's share = $\frac{\frac{1}{5}}{3} = \frac{1}{5} \times \frac{1}{3} = \frac{1}{15}$ of the cake

9. $\frac{565}{465} > 1$ (improper fraction since 565 > 465)

$\frac{707}{676} > 1$ (improper fraction since 707 > 676)

Product of two improper fractions is greater than each of the fractions.

Therefore the product is: $> \frac{565}{465}$, $> \frac{707}{676}$

$\frac{707}{676}$, and > 1

10. The square is divided into 8 equal triangular regions.

The shaded region is 1 out of 8 equal parts.

11. The ants split equally at each junction. Since the group always divides into 2 equal parts at each split, and there are 2 food destinations by symmetry:

Fraction reaching each food source = $\frac{1}{2}$ of the original group.

12. (a) $1 - \frac{1}{2} = \frac{1}{2}$

(b) $(1 - \frac{1}{2}) \times (1 - \frac{1}{3}) = \frac{1}{2} \times \frac{2}{3} = \frac{2}{6} = \frac{1}{3}$

(c) $(1 - \frac{1}{2}) \times (1 - \frac{1}{3}) \times (1 - \frac{1}{4}) \times (1 - \frac{1}{5})$

$= \frac{1}{2} \times \frac{2}{3} \times \frac{3}{4} \times \frac{4}{5} = \frac{24}{120} = \frac{1}{5}$

(d) $(1 - \frac{1}{2}) \times (1 - \frac{1}{3}) \times (1 - \frac{1}{4}) \times \ldots \times (1 - \frac{1}{10})$

$= \frac{1}{2} \times \frac{2}{3} \times \frac{3}{4} \times \ldots \times \frac{9}{10} = \frac{1}{10}$

General Statement: The product $(1 - \frac{1}{2})(1 - \frac{1}{3})\ldots(1 - \frac{1}{n}) = \frac{1}{n}$

This is because consecutive fractions cancel: $\frac{1}{2} \times \frac{2}{3} \times \frac{3}{4} \times \ldots \times \frac{(n-1)}{n} = \frac{1}{n}$

Practice Exercise 8.3

1. (a) $8 = \frac{8}{1}$; Reciprocal = $\frac{1}{8}$

(b) $\frac{4}{5}$; Reciprocal = $\frac{5}{4}$

(c) $12 = \frac{12}{1}$; Reciprocal = $\frac{1}{12}$

(d) $35 = \frac{35}{1}$; Reciprocal = $\frac{1}{35}$

(e) $\frac{2}{7}$; Reciprocal = $\frac{7}{2}$

(f) $\frac{18}{20} = \frac{9}{10}$; Reciprocal = $\frac{20}{18}$

(g) $\frac{3}{6} = \frac{1}{2}$; Reciprocal = $\frac{6}{3}$

(h) $\frac{22}{16} = \frac{11}{8}$; Reciprocal = $\frac{16}{22}$

(i) $\frac{34}{12} = \frac{17}{6}$; Reciprocal = $\frac{12}{34}$

(j) $\frac{27}{9} = 3$; Reciprocal = $\frac{9}{27}$

2. (a) $\frac{\frac{2}{5}}{5} = \frac{2}{5} \times \frac{1}{5} = \frac{2}{25}$

(b) $\frac{\frac{5}{6}}{9} = \frac{5}{6} \times \frac{1}{9} = \frac{5}{54}$

(c) $\frac{\frac{6}{10}}{8} = \frac{6}{10} \times \frac{1}{8} = \frac{6}{80} = \frac{3}{40}$

(d) $\frac{4\frac{1}{2}}{6} = \frac{9}{2}\times\frac{1}{6} = \frac{9}{12} = \frac{3}{4}$

(e) $\frac{14}{\left(\frac{5}{6}\right)} = 14\times\frac{6}{5} = \frac{84}{5} = 16\frac{4}{5}$

(f) $\frac{16}{\left(\frac{9}{12}\right)} = 16\times\frac{12}{9} = \frac{192}{9} = \frac{64}{3}$

(g) $\frac{5}{\left(3\frac{4}{7}\right)} = \frac{5}{\left(\frac{25}{7}\right)} = 5\times\frac{7}{25} = \frac{35}{25}$

$= \frac{7}{5} = 1\frac{2}{5}$

(h) $\frac{10}{\left(3\frac{1}{3}\right)} = \frac{10}{\left(\frac{10}{3}\right)} = 10\times\frac{3}{10} = 3$

3. (a) $\frac{\frac{2}{8}}{\left(\frac{4}{9}\right)} = \frac{1}{4}\times\frac{9}{4} = \frac{9}{16}$

(b) $\frac{\frac{7}{8}}{\left(\frac{1}{2}\right)} = \frac{7}{8}\times\frac{2}{1} = \frac{14}{8} = \frac{7}{14}$

(c) $\frac{\frac{9}{12}}{\left(\frac{3}{7}\right)} = \frac{3}{4}\times\frac{7}{3} = \frac{21}{12} = \frac{7}{4}$

(d) $\frac{\frac{9}{28}}{\left(\frac{14}{3}\right)} = \frac{9}{28}\times\frac{3}{4} = \frac{27}{392}$

(e) $\frac{\frac{8}{15}}{\left(\frac{4}{3}\right)} = \frac{8}{15}\times\frac{3}{4} = \frac{24}{60} = \frac{2}{5}$

(f) $\frac{3\frac{1}{5}}{4\frac{2}{6}} = \frac{\frac{16}{5}}{\left(\frac{26}{6}\right)} = \frac{16}{5}\times\frac{6}{26} = \frac{96}{130}$

$= \frac{48}{65}$

(g) $\frac{11\frac{1}{2}}{10\frac{3}{4}} = \frac{\frac{23}{2}}{\left(\frac{43}{4}\right)} = \frac{23}{2}\times\frac{4}{43} = \frac{92}{86}$

$= \frac{46}{43}$

(h) $\frac{8\frac{11}{12}}{4\frac{5}{6}} = \frac{\frac{107}{12}}{\left(\frac{29}{6}\right)} = \frac{107}{12}\times\frac{6}{29} = \frac{642}{348}$

$= \frac{107}{58}$

4. Length of each piece $= 1\frac{3}{4} = \frac{7}{4}$ m

Number of pieces $= \frac{42}{\left(\frac{7}{4}\right)} = 42\times\frac{4}{7}$

$= \frac{168}{7} = 24$

5. Length of each piece $2\frac{1}{2} = \frac{5}{2}$ m

Number of pieces $= \frac{20}{\left(\frac{5}{2}\right)} = 20\times\frac{2}{5} = \frac{40}{5}$

$= 8$

6. Area $= 68\frac{3}{4} = \frac{275}{4}$ sq m

Length $= 12\frac{1}{2} = \frac{25}{2}$ m

Width $= \frac{\text{Area}}{\text{Length}} = \frac{\frac{275}{4}}{\left(\frac{25}{2}\right)} = \frac{275}{4}\times\frac{2}{25}$

$= \frac{550}{100} = \frac{11}{2} = 5\frac{1}{2}$ m

7. Cost of $5\frac{1}{2}$ kg $= ₹\,206\frac{1}{4} = ₹\frac{825}{4}$

$5\frac{1}{2} = 1\frac{1}{2}$ kg

Cost per kg = $\frac{\frac{825}{4}}{\left(\frac{11}{2}\right)} = \frac{825}{4} \times \frac{2}{11} = \frac{1650}{44}$

$= \frac{75}{2} = ₹ 37\frac{1}{2}$

Cost of $8\frac{1}{4} = \frac{33}{4}$ kg:

$= \frac{33}{4} \times \frac{75}{2} = \frac{2475}{8} = 309\frac{3}{8}$

8. Part completed in 2 hours = $\frac{2}{3}$

Part completed per hour = $\frac{\frac{2}{3}}{2} = \frac{1}{3}$

Time = $1\frac{1}{4} = \frac{5}{4}$

Part completed in $\frac{5}{4}$ hours = $\frac{1}{3} \times \frac{5}{4} = \frac{5}{12}$

Chapter Innings

A. Multiple Choice Questions

1. (d) **2.** (c) **3.** (d) **4.** (d) **5.** (a)
6. (c)

B. Fill in the Blanks

1. $\frac{8}{19}$ **2.** less than **3.** $1\frac{8}{9}$ **4.** $\frac{1}{7}$

5. $\frac{1}{10}$ of the whole cake

C. Match the Following

1. (d) **2.** (e) **3.** (a) **4.** (b) **5.** (c)

D. True or False

1. F **2.** F **3.** F **4.** F **5.** F

E. Very Short Answer Type Questions

1. (a) $9\frac{3}{8}$ by 12

$9\frac{3}{8} = \frac{75}{8}$

$\frac{75}{8} \times 12 = \frac{900}{8} = \frac{225}{2} = 112\frac{1}{2}$

(b) $6\frac{11}{14}$ by $3\frac{1}{2}$

$6\frac{11}{14} = \frac{95}{14}, 3\frac{1}{2} = \frac{7}{2}$

$\frac{95}{14} \times \frac{7}{2} = \frac{665}{28} = \frac{95}{4} = 23\frac{3}{4}$

2. (a) $\frac{14}{25} \times \frac{35}{51} \times \frac{34}{49}$

$= \frac{(14 \times 35 \times 34)}{(25 \times 51 \times 49)}$

Cancelling: $\frac{14}{49} = \frac{2}{7}, \frac{35}{25}$

$= \frac{7}{5}, \frac{34}{51} = \frac{2}{3}$

$= \frac{(2 \times 7 \times 2)}{(7 \times 5 \times 3)} = \frac{28}{105} = \frac{4}{15}$

(b) $3\frac{4}{7} \times 2\frac{2}{5} \times 1\frac{3}{4}$

$= \frac{25}{7} \times \frac{12}{5} \times \frac{7}{4}$

$= \frac{(25 \times 12 \times 7)}{(7 \times 5 \times 4)}$

Cancelling: $\frac{25}{5} = 5, \frac{7}{7} = 1$

$= \frac{(5 \times 12 \times 1)}{(1 \times 4)} = \frac{60}{4} = 15$

3. (a) $\frac{5}{9}$ of $48 = \frac{5}{9} \times 48 = \frac{240}{9} = \frac{80}{3} = 26\frac{2}{3}$

(b) $\frac{11}{14}$ of $63 = \frac{11}{14} \times 63 = \frac{693}{14} = \frac{99}{2} = 49\frac{1}{2}$

4. (a) $6 = \frac{6}{1}$ Reciprocal = $\frac{1}{6}$

(b) $3\frac{5}{8} = \frac{29}{8}$; Reciprocal = $\frac{8}{29}$

5. (a) $\frac{\frac{4}{9}}{\left(\frac{5}{6}\right)} = \frac{4}{9} \times \frac{6}{5} = \frac{24}{45} = \frac{8}{15}$

(b) $\frac{5\frac{3}{5}}{2\frac{1}{10}} = \frac{\frac{28}{5}}{\left(\frac{21}{10}\right)} = \frac{28}{5} \times \frac{10}{21} = \frac{280}{105}$

$= \frac{8}{3} = 2\frac{2}{3}$

F. Short Answer Type Questions

1. (a) $1\frac{4}{7} \times 1\frac{13}{22} \times 1\frac{1}{15}$

$= \frac{11}{7} \times \frac{35}{22} \times \frac{16}{15}$

Cancelling: $\frac{11}{22} = \frac{1}{2}$, $\frac{35}{7} = 5$, $\frac{16}{15}$ stays

$= \frac{(1 \times 5 \times 16)}{(1 \times 2 \times 15)} = \frac{80}{30} = \frac{8}{3} = 2\frac{2}{3}$

(b) $2\frac{2}{17} \times 7\frac{2}{9} \times 1\frac{33}{52}$

$= \frac{36}{17} \times \frac{65}{9} \times \frac{85}{52}$

Cancelling: $\frac{36}{9} = 4$, $\frac{65}{52} = \frac{5}{4}$, $\frac{85}{17} = 5$

$= 4 \times \frac{5}{4} \times 5 = 4 \times 5 \times \frac{5}{4} = 25$

(c) $3\frac{1}{16} \times 7\frac{3}{7} \times 1\frac{25}{39}$

$= \frac{49}{16} \times \frac{52}{7} \times \frac{64}{39}$

Cancelling: $\frac{49}{7} = 7$, $\frac{52}{39} = \frac{4}{3}$, $\frac{64}{16} = 4$

$= 7 \times \frac{4}{3} \times 4 = \frac{112}{3} = 37\frac{1}{3}$

2. $6\frac{2}{9} = \frac{56}{9}$

Let the number be x

$\frac{56}{9} \times x = 40$

$x = 40 \times \frac{9}{56} = \frac{360}{56} = \frac{45}{7} = 6\frac{3}{7}$

3. $\frac{\frac{56}{9}}{x} = \frac{14}{3}$

$x = \frac{\frac{56}{9}}{\left(\frac{14}{3}\right)} = \frac{56}{9} \times \frac{3}{14} = \frac{168}{126} = \frac{4}{3} = \quad -$

4. $5\frac{2}{5} = \frac{27}{5}$ litres

Rs $236\frac{1}{4} = ₹\ \frac{945}{4}$

Cost per litre $= \frac{\frac{945}{4}}{\left(\frac{27}{5}\right)} = \frac{945}{4} \times \frac{5}{27}$

$= \frac{4725}{108} = \frac{175}{4} = ₹\ 43\frac{3}{4}$

5. $9\frac{3}{4} = \frac{39}{4}$ m

Length of each piece $= \frac{\frac{39}{4}}{6} = \frac{39}{4} \times \frac{1}{6}$

$= \frac{39}{24} = \frac{13}{8} = 1\frac{5}{8}$ m

G. Long Answer Type Questions

1. (a) $\left(\frac{\frac{1}{2}}{\left(\frac{4}{5}\right)}\right) \times \frac{4}{7}$

Step 1: $\frac{\frac{1}{2}}{\left(\frac{4}{5}\right)} = \frac{1}{2} \times \frac{5}{4} = \frac{5}{8}$

Step 2: $\frac{5}{8} \times \frac{4}{7} = \frac{20}{56} = \frac{5}{14}$

(b) $\frac{2}{3}$ of $\left(5\frac{1}{6} - 4\frac{3}{8}\right)$

Step 1: $5\frac{1}{6} = \frac{31}{6}$, $4\frac{3}{8} = \frac{35}{8}$

Step 2: $\frac{31}{16} - \frac{35}{8}$ (LCM = 24)

$= \frac{124}{24} - \frac{105}{24} = \frac{19}{24}$

Step 3: $\frac{2}{3} \times \frac{19}{24} = \frac{38}{72} = \frac{19}{36}$

2. (a) $\frac{3}{5}$ of $1\frac{1}{9} + 3\frac{1}{2}$

Step 1: $\frac{3}{5} \times \frac{10}{9} = \frac{30}{45} = \frac{2}{3}$

Step 2: $\frac{2}{3}+\frac{7}{2}$ (LCM = 6) = $\frac{4}{6}+\frac{21}{6}$

= $\frac{25}{6}$ = $4\frac{1}{6}$

(b) $\frac{\left(\frac{1}{4}\text{ of }2\frac{2}{7}\right)}{\left(\frac{3}{5}\right)}$

Step 1: $2\frac{2}{7}=\frac{16}{7}$

Step 2: $\frac{1}{4}\times\frac{16}{7}=\frac{16}{28}=\frac{4}{7}$

Step 3: $\frac{\frac{4}{7}}{\left(\frac{3}{5}\right)}$ = $\frac{4}{7}\times\frac{5}{3}=\frac{20}{21}$

3. Total salary = Rs 24000

Food = $\frac{1}{4}$ × 24000 = Rs 6000

Remaining after food = 24000 – 6000
= ₹ 18000

Rent = $\frac{1}{5}$ × 18000 = ₹ 3600

Education = $\frac{1}{6}$ × 18000 = ₹ 3000

(a) Food: ₹ 6000, Rent: ₹ 3600, Education: ₹ 3000

(b) Money left = 18000 – 3600 – 3000 = ₹ 11400

4. Shikha bought $3\frac{3}{4}=\frac{15}{4}$ m for ₹ 84

Rate per metre = $\frac{84}{\left(\frac{15}{4}\right)}$ = $84\times\frac{4}{15}$

= $\frac{336}{15}$ = $\frac{112}{5}$ = ₹ $22\frac{2}{5}$

Ruby bought $4\frac{1}{2}$ = $\frac{9}{2}$ m

Cost for Ruby = $\frac{9}{2}\times\frac{112}{5}$ = $\frac{1008}{10}$ = $\frac{504}{5}$

= ₹ $100\frac{4}{5}$

5. Each contribution = ₹ $261\frac{1}{2}$ = ₹ $\frac{523}{2}$

Total = ₹ $2876\frac{1}{2}$ = ₹ $\frac{5753}{2}$

Number of students = $\frac{\frac{5753}{2}}{\left(\frac{523}{2}\right)}$ = $\frac{5753}{523}$

= 11

H. Assertion-Reason Based Questions

1. (A) **2.** (A) **3.** (A) **4.** (B) **5.** (D)

I. Case Study

1. (c) **2.** (a) **3.** (d) **4.** (a) **5.** (b)

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