Mathematics - 7
(Part–I)

1. Large Bynverse Ariybd Us

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Try Yourself !

1. **Given :** Number of years = 80
   Varieties per day = 2
   Formula used :
   Total varieties eaten
   = Varieties per day
   × Number of days
   Number of days = 80 × 365
   = 29200
   Total varieties eaten
   = 2 × 29200
   = 58400
   So, 58400 varieties you could eat in 80 years.
2. **Given :**
   Total varieties = 100000
   Varieties per day = 5
   Formula used :
   Number of years
   = Total varieties
   ÷ (Varieties per day × 365)
   Varieties eaten in one year
   = 5 × 365 = 1825
   Number of years
   = 100000 ÷ 1825
   = 54.79
   So, 54.79 years it would take to eat all one lakh varieties.

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Think and Discuss

1. Farmers depend on markets because modern hybrid seeds give higher yield and cannot be reused for the next crop, so they have to buy new seeds each time.
2. Yes, seed banks protect biodiversity by storing different varieties of seeds safely for future use.

Assess Yourself-1

1. Smallest 4-digit number = 1000
   Largest 4-digit number = 9999
   So, 1000 and 9999 are the smallest and largest 4-digit numbers.
2. **Given :** Number of years = 50
   Formula used :
   Number of days = Years × 365
   Number of days = 50 × 365
   = 18250
   So, 18250 days are there in 50 years.
3. **Given :** Varieties per day = 4,
   Years = 25
   Formula used :
   Total varieties
   = Varieties per day
   × (Years × 365)
   Total varieties = 4 × (25 × 365)
   = 4 × 9125 = 36500
   So, 36500 varieties you will taste in 25 years.
4. **Given :** Years = 90,
   Varieties per day = 2
   Formula used :
   Total varieties
   = Varieties per day
   × (Years × 365)
   Total varieties = 2 × (90 × 365)
   = 2 × 32850 = 65700

Since 65700 < 100000
So, 65700 varieties can be tasted in 90 years, which is less than 1 lakh varieties.

Asscess Yourself-2

1. **Given :**
Height of Eiffel Tower = 330 m,
Height of one floor = 4.5 m,
Number of floors = 73
Formula used :
Height = Number of floors × Height of one floor
Height of building = 73 × 4.5
= 328.5 m
Difference = 330 − 328.5
= 1.5 m
So, 328.5 m is the height of the 73-floor building and 1.5 m taller is the Eiffel Tower.

2. **Given :** Length of one cricket pitch = 20 m,
Height of Kunchikal Falls ≈ 460 m
Formula used :
Number = Total height ÷ Length of one pitch
Number of pitches = 460 ÷ 20
= 23
Distance between wickets once = 20 m
Total distance = 20 × 10
= 200 m
So, 23 pitches are needed and 200 m total distance would be covered.

3. **Given :** Length of one bus = 12 m,
Height of Statue of Unity = 180 m,
Students per bus = 40
Formula used : Number = Total height ÷ Length of one bus
Number of buses = 180 ÷ 12
= 15
Formula used :
Total students = Number of buses × Students per bus
Total students = 15 × 40
= 600
So, 15 buses are needed and 600 students would be in the vertical bus line.

4. **Given :**
Step length = 0.6 m,
Height of Statue of Unity = 180 m
Formula used :
Number of steps = Total height ÷ Step length
Number of steps = 180 ÷ 0.6
= 300
Formula used :
Time = Steps ÷ Steps per second
Time = 300 ÷ 2 = 150 seconds
So, 300 steps are needed and 150 seconds would be required.

Asscess Yourself-3

1. **Given :**
Total downloads = 100000,
Time per download = 2 minutes
Formula used :
Total time = Number of downloads × Time per download
Total time = 100000 × 2
= 200000 minutes
Formula used :
Days = Total minutes ÷ (60 × 24)

Days = 200000 ÷ 1440
≈ 138.89
So, 138.89 days would be required for total installation time.

2. **Given :** Saving per day = ₹ 50,
Total amount = ₹ 100000
Formula used :
Days = Total amount
÷ Saving per day
Days = ₹ 100000 ÷ ₹ 50
= 2000 days
Formula used :
Years = Days ÷ 365
Years = 2000 ÷ 365 ≈ 5.48
So, 5.48 full years and 2000 days are required to save 1 lakh.

3. **Given :**
Top player points = 23,78,945,
Dev's points = 15,42,300
23,78,945 in words = twenty three lakh seventy eight thousand nine hundred forty five
Formula used :
Difference = Larger number
− Smaller number
Difference
= 23,78,945 − 15,42,300
= 8,36,645
So, 23,78,945 is Twenty three lakh seventy eight thousand nine hundred forty five and 8,36,645 more points are needed.

4. **Given :** Subscribers = 45,27,819,
Increase = 2,00,000
45,27,819 in words = Forty five lakh twenty seven thousand eight hundred nineteen
Formula used :
New count = Old count
+ Increase
New count = 45,27,819
+ 2,00,000
= 47,27,819
So, 45,27,819 is Forty five lakh twenty seven thousand eight hundred nineteen and new subscriber count is 47,27,819.

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Think and Discuss

(i) Given : 1 hundred = 100,
Ten thousand = 10000
Formula used :
Number of hundreds
= Total number ÷ 100
Number of hundreds
= 10000 ÷ 100 = 100
So, 100 hundreds make ten thousand.

(ii) Given :
1 hundred = 100, One lakh = 100000
Formula used :
Number of hundreds
= Total number ÷ 100
Number of hundreds
= 100000 ÷ 100
= 1000
So, 1000 hundreds make one lakh.

(iii) Given : +100 calculator increases numbers by 100 each time +10 calculator increases by 10 and +1000 increases by 1000.
Since 100 is a multiple of 10, all numbers shown by +100 can also be shown by repeated +10.
But numbers like 100, 200, 300 cannot be shown exactly by only +1000.

So, the claim is false because +100 calculator cannot show numbers that +10 cannot show.

Asscess Yourself-4

1. **Given :**
Required points = 25000,
Points per level = 1000,
Points per power-up = 100
Formula used :
Number = Total points ÷ Points per level
Levels = 25000 ÷ 1000 = 25
Formula used :
Number = Total points ÷ Points per power-up
Power-ups = 25000 ÷ 100 = 250
So, 25 levels and 250 power-ups are required.

2. **Given :** Cost = ₹ 8500,
Saving per week = ₹ 100
Formula used :
Weeks = Total amount ÷ Saving per week
Weeks = ₹ 8500 ÷ ₹ 100 = 85
Given : Saving per week = 1000
Weeks = ₹ 8500 ÷ ₹ 1000
= 8.5
Difference = 85 − 8.5 = 76.5
So, 85 weeks at ₹ 100 per week and 8.5 weeks at ₹ 1000 per week, 76.5 weeks faster.

3. **Given :**
Present subscribers = 73400,
Target = 100000
Formula used :
Remaining = Target − Present
Remaining = 100000 − 73400
= 26600
Formula used :
Days = Remaining ÷ Daily gain
Days at 100 per day
= 26600 ÷ 100
= 266
Days at 1000 per day
= 26600 ÷ 1000
= 26.6
So, 266 days at 100 per day and 26.6 days at 1000 per day.

4. **Given :**
Required number = 12345
Using +1000, +100, +10, +1 buttons
Combination 1 :
(1 × 10,000) + (2 × 1,000) + (3 × 100) + (4 × 10) + (5 × 1)
Combination 2 :
(12 × 1,000) + (3 × 100) + (45 × 1)
So, 12345 can be formed in two different combinations as shown above.

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Yes, A home or shop calculator performs +, −, ×, ÷ operations. Formulas only tell us which operation to use.
So, the same formulas are applicable for a normal calculator.

Asscess Yourself-5

1. **Given :** Total coins = 7850,
Bundles = 1000, 100, 10, 1
Formula used : Minimum bundles
= Sum of place value digits
7850 = 7 × 1000 + 8 × 100 + 5 × 10 + 0 × 1

Minimum bundles
$= 7 + 8 + 5 + 0 = 20$
So, 20 bundles are needed to collect exactly 7850 coins.

2. **Given :** Total books = 23450,
Boxes = 10000, 1000, 100, 10
Formula used : Minimum boxes = Sum of place value digits except ones
$23450 = 2 \times 10000 + 3 \times 1000 + 4 \times 100 + 5 \times 10$
Minimum boxes $= 2 + 3 + 4 + 5 = 14$
So, 14 boxes are needed to pack exactly 23450 books.

3. **Given :** Amount = ₹ 5279,
Notes = ₹ 1000, ₹ 100, ₹ 10, ₹ 1
Formula used :
Minimum notes = Sum of place value digits
₹ 5279 = 5 × ₹ 1000 + 2 × ₹ 100 + 7 × ₹ 10 + 9 × ₹ 1
Minimum notes $= 5 + 2 + 7 + 9 = 23$
So, 23 notes are needed to pay exactly 5279.

4. **Given :** Minimum clicks = 15, 5-digit number
Formula used :
Sum of digits = 15
Example :
$60009 \rightarrow 6 + 0 + 0 + 0 + 9 = 15$
Many numbers like 60009, 51009, 42009 satisfy this condition
So, many 5-digit numbers can be formed whose sum of digits is 15.

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1. **(a) Given :** 238 people
Formula used : Rounding to nearest hundred 238 is closer to 200 than 300.
So, 200 people.
(b) Given : ₹ 478
Formula used : Rounding to nearest hundred ₹ 478 is closer to ₹ 500 than ₹ 400
So, ₹ 500.
(c) Given : 19.8 kg
Formula used : Rounding to nearest whole number 19.8 is closer to 20 than 19
So, 20 kg.

2. **Given :** All five nearest neighbours = 5,00,00,000
Formula used : Rounding to nearest crore
Numbers from 4,99,50,000 to 5,00,49,999 round to 5,00,00,000
Total numbers
$= 5,00,49,999 - 4,99,50,000 + 1$
$= 1,00,000$
So, any number between 4,99,50,000 and 5,00,49,999 and total 1,00,000 such numbers exist.

Asscess Yourself-6

1. **Given :** Total students = 1237, Capacity of one bus = 50
Formula used :
Number of buses = Total students ÷ Capacity
Number of buses $= 1237 \div 50 = 24.74$
Since students cannot be left, round up to 25
So, 25 buses should be booked and rounding up is needed because all students must travel.

2. **Given :** Total runs = 23487
Formula used : Rounding to nearest thousand 23487 is closer

to 23000 than 24000

So, it is rounding down and 23000 is a better approximation.

3. **Given :** Views = 178952

Formula used : Rounding to nearest lakh

Nearest lakh = 200000

More views needed

= 200000 − 178952

= 21048

So, nearest lakh is 200000 and 21048 more views are needed.

4. **Given :**

Actual salary = ₹ 875430,

Approximated salary

= ₹ 900000

Formula used :

Difference

= Approximated − Actual

Difference

= ₹ 900000 − ₹ 875430

= ₹ 24570

So, it is rounding up and the difference is ₹ 24570.

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1. **Given :** 2011 and 2001 populations of cities

Most cities show increase from 2001 to 2011

Hyderabad increased from 36,37,483 to 68,09,970

So, most exciting pattern is that almost all cities show rapid population growth.

2. **Given :** Population data of major cities (2001–2011)

So, a catchy title is Growth of Major Indian Cities 2001–2011.

3. **Given :** Pune 2011 population = 31,15,431, 2001 population = 25,38,473

Formula used :

Increase = 2011 − 2001

Increase = 31,15,431 − 25,38,473

= 5,76,958

Approximate 2011 population

≈ 31,00,000

Approximate increase

≈ 6,00,000

So, 31,00,000 and 6,00,000.

4. **Given :**

Hyderabad 68,09,970 − 36,37,483

= 31,72,487

Bengaluru 84,25,970 − 43,01,326

= 41,24,644

Surat 44,67,797 − 24,33,835

= 20,33,962

Formula used : Increase

= 2011 − 2001

So, Bengaluru had biggest jump

≈ 41,00,000.

5. **Given :**

Surat 44,67,797 and 24,33,835

24,33,835 × 2 = 48,67,670 which is close to 44,67,797

Hyderabad 36,37,483 × 2

= 72,74,966 close to 68,09,970

So, Surat and Hyderabad almost doubled their population.

6. **Given :**

Patna 2011 population

= 16,84,222,

Mumbai = 1,24,42,373

Formula used :

Multiplier ≈ Mumbai ÷ Patna

1,24,42,373 ÷ 16,84,222 ≈ 7.39

So, about 7 times Patna's population is close to Mumbai's population.

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1. **Given :** Chennai = 46,81,087 and Kolkata = 44,86,679 (2011 population)

Formula used :

Difference = Larger − Smaller

Difference = 46,81,087 − 44,86,679

= 1,94,408

So, Chennai and Kolkata have nearly the same population in 2011.

2. **Given :** Pune = 31,15,431 and Nagpur = 24,05,665

Formula used :

Combined population = Pune + Nagpur

Combined = 31,15,431 + 24,05,665

= 55,21,096

Ahmedabad = 55,70,585

Formula used :

Difference = 55,70,585 − 55,21,096

= 49,489

So, Pune and Nagpur together are close to Ahmedabad.

3. Do yourself.

Asscess Yourself-7

1. **Given :** Surat 2001 ≈ 24,33,835 and 2011 = 44,67,797

Formula used :

Increase = 2011 − 2001

Increase ≈ 44,67,797 − 24,33,835

= 20,33,962 ≈ 20 lakh

Estimated 2021 population

= 44,67,797 + 20,33,962

= 65,01,759

So, Surat's estimated population in 2021 ≈ 65,00,000.

2. **Given :**

Top city population ≈ 1,24,42,373

Since values range in lakhs and crores

So, scale in lakhs or crores is most appropriate for vertical axis.

3. **Given :** Bengaluru 2011 = 84,25,970 and 2001 = 43,01,326

Formula used :

Families = Population ÷ 4

Families in 2011 = 84,25,970 ÷ 4

≈ 21,06,493

Families in 2001 = 43,01,326 ÷ 4

≈ 10,75,332

Increase = 21,06,493 − 10,75,332

= 10,31,161

So, about 21,06,493 families in 2011 and 10,31,161 more families than 2001.

4. **Given :** Hyderabad 2011 = 68,09,970 and 2001 = 36,37,483

Formula used :

Increase = 2011 − 2001

Increase = 68,09,970 − 36,37,483

= 31,72,487

Children = 25% of 31,72,487

= 31,72,487 × 25 ÷ 100

≈ 7,93,122

Formula used :

Schools = Children ÷ 5000

Schools = 7,93,122 ÷ 5000 ≈ 160

So, about 160 new schools should have been built.

Asscess Yourself-8

1. **Given :** First number has m digits and second number has n digits

Formula used : Number of digits in product

= $m + n$ or $m + n - 1$

So, the number of digits in multiplication is $m + n$ or $m + n - 1$ digits.

2. **Given :** 4-digit × 2-digit

Formula used :

Digits in product

= $m + n$ or $m + n - 1$

= 4 + 2 = 6 or 6 − 1 = 5

So, 4-digit × 2-digit = 6 or 5 digits.

Given : 5-digit × 5-digit

Formula used :

Digits in product

= m + n or m + n − 1

= 5 + 5 = 10 or 10 − 1 = 9

So, 5-digit × 5-digit = 10 or 9 digits.

Figure it Out Exerise

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1. Given :

Population in 2011 = 75,000

1 lakh = 1,00,000

Formula used :

Difference = Larger number − Smaller number

Required difference

= 1,00,000 − 75,000

= 25,000

So, 75,000 is 25,000 less than one lakh.

2. Given :

Population in 2024 = 1,06,000

1 lakh = 1,00,000

Formula used :

Difference = Larger number − Smaller number

Required difference

= 1,06,000 − 1,00,000

= 6,000

So, 1,06,000 is 6,000 more than one lakh.

3. Given :

Population in 2011 = 75,000

Given :

Population in 2024 = 1,06,000

Formula used :

Increase = Final value − Initial value

Increase = 1,06,000 − 75,000 = 31,000

So, the population increased by 31,000.

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(a) 8300

Given expression :

(8 × 1000) + (3 × 100) = 8300

80 × 100 + 30 × 10 = 8000 + 300

= 8300

(b) 40629

Given expression :

$(40 \times 1000) + (6 \times 100) + (2 \times 10) + (9 \times 1)$

= 40629

400 × 100 + 60 × 10 + 2 × 10 + 9

= 40000 + 600 + 20 + 9

= 40629

(c) 56354

Given expression :

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

= 56354

500 × 100 + 60 × 100 + 30 × 10 + 5 × 10 + 4 × 1

= 56354

(d) 66666

Given expression :

$(66 \times 1000) + (6 \times 100) + (6 \times 10) + (6 \times 1)$

= 66666

660 × 100 + 60 × 10 + 6 × 10 + 6 × 1

= 66666

(e) 367813

Given expression :

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

= 367813

30 × 10000 + 60 × 1000 + 70 × 100 + 80 × 10 + 1 × 10 + 3 × 1

= 367813

2. (a) Given :

Buttons = +1, +10, +100, +1000

Given total button presses = 30

Formula used : Number formed
$= (a \times 100) + (b \times 10) + (c \times 1)$, where $a + b + c = 30$
For largest 3-digit number, use maximum +100 and adjust with +10 and +1
$9 \times 100 + 9 \times 10 + 3 \times 1$
$= 900 + 90 + 3$
$= 993$
Total presses $= 9 + 9 + 3 = 21$, remaining 9 presses adjusted by replacing 1×10 with 10×1 to keep total 30 presses.
So, the largest 3-digit number is 993.
For smallest 3-digit number, use minimum +100 and more +1
$1 \times 100 + 0 \times 10 + 2 \times 1 = 102$
Total presses $= 1 + 0 + 2 = 3$, remaining 27 presses adjusted by replacing 1×100 with 10×10 and then with +1 to keep total 30 presses
So, the smallest 3-digit number is 102.

(b) Given number = 997
Formula used :
Number $= (a \times 100) + (b \times 10) + (c \times 1)$
$997 = 9 \times 100 + 9 \times 10 + 7 \times 1$
Total presses $= 9 + 9 + 7 = 25$
Replacing 1×100 by 10×10 increases presses by 9.
$997 = 8 \times 100 + 19 \times 10 + 7 \times 1$
Total presses $= 8 + 19 + 7 = 34$
So, 997 can also be made using 34 clicks.

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1. Given buttons = +1, +10, +100, +1000

(a) Given number = 8300
Formula used :
Number = Digit × Place value
$8300 = 8 \times 1000 + 3 \times 100$
Total clicks $= 8 + 3 = 11$
So, the smallest number of clicks is 11.

(b) Given number = 40629
Formula used :
Number = Digit × Place value
$40629 = 4 \times 10000 + 0 \times 1000 + 6 \times 100 + 2 \times 10 + 9 \times 1$
Total clicks $= 4 + 0 + 6 + 2 + 9 = 21$
So, the smallest number of clicks is 21.

(c) Given number = 56354
Formula used :
Number = Digit × Place value
$56354 = 5 \times 10000 + 6 \times 1000 + 3 \times 100 + 5 \times 10 + 4 \times 1$
Total clicks $= 5 + 6 + 3 + 5 + 4 = 23$
So, the smallest number of clicks is 23.

(d) Given number = 66666
Formula used :
Number = Digit × Place value
$66666 = 6 \times 10000 + 6 \times 1000 + 6 \times 100 + 6 \times 10 + 6 \times 1$
Total clicks $= 6 + 6 + 6 + 6 + 6 = 30$
So, the smallest number of clicks is 30.

(e) Given number = 367813
Formula used :
Number = Digit × Place value
$367813 = 3 \times 100000 + 6 \times 10000 + 7 \times 1000 + 8 \times 100 + 1 \times 10 + 3 \times 1$
Total clicks $= 3 + 6 + 7 + 8 + 1 + 3 = 28$
So, the smallest number of clicks is 28.

2. Given total clicks found
= Sum of digits of the number
Formula used :
Total clicks = Sum of digits in place value form
So, the smallest number of button clicks is equal to the sum of the digits of the number.

3. Given expression
= Digit × Place value
Formula used : Indian place value system
Each digit shows how many times a place value is added, so minimum clicks occur when each digit is pressed according to its place value.
So, the least button clicks follow the indian place value notation of the number.

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1. **(a)** Given number = 4050678
Formula used : Indian place value system and International place value system
Indian system : 40,50,678 = Forty lakh fifty thousand six hundred seventy eight
American system : 4,050,678 = Four million fifty thousand six hundred seventy eight

(b) Given number = 48121620
Indian system : 4,81,21,620 = Four crore eighty one lakh twenty one thousand six hundred twenty
American system : 48,121,620 = Forty eight million one hundred twenty one thousand six hundred twenty

(c) Given number = 20022002
Indian system : 2,00,22,002 = Two crore twenty two thousand two
American system : 20,022,002 = Twenty million twenty two thousand two

(d) Given number = 246813579
Indian system : 24,68,13,579 = Twenty four crore sixty eight lakh thirteen thousand five hundred seventy nine
American system : 246,813,579 = Two hundred forty six million eight hundred thirteen thousand five hundred seventy nine

(e) Given number = 345000543
Indian system : 34,50,00,543 = Thirty four crore fifty lakh five hundred forty three
American system : 345,000,543 = Three hundred forty five million five hundred forty three.

(f) Given number = 1020304050
Indian system : 1,02,03,04,050 = One arab two crore three lakh four thousand fifty
American system : 1,020,304,050 = One billion twenty million three hundred four thousand fifty

2. **(a)** Given number name = One crore one lakh one thousand ten
Formula used : Place value addition
1 crore + 1 lakh + 1 thousand + 10
= 1,00,00,000 + 1,00,000 + 1,000 + 10
= 1,01,01,010
So, the number is 1,01,01,010.

(b) Given number name = One billion one million one thousand one

Formula used : Place value addition

1,000,000,000 + 1,000,000 + 1,000 + 1
= 1,001,001,001

Indian notation = 1,00,10,01,001

So, the number in Indian place value notation is 1,00,10,01,001.

(c) Given number name = Ten crore twenty lakh thirty thousand forty

Formula used : Place value addition

10,00,00,000 + 20,00,000 + 30,000 + 40
= 10,20,30,040

So, the number is 10,20,30,040.

(d) Given number name = Nine billion eighty million seven hundred thousand six hundred

Formula used : Place value addition

9,000,000,000 + 80,000,000
+ 700,000 + 600
= 9,080,700,600

Indian notation = 9,08,07,00,600

So, the number in Indian place value notation is 9,08,07,00,600.

3. (a) Given numbers = 30 thousand and 3 lakhs

Formula used : Conversion to same place value

30 thousand = 30,000
3 lakh = 3,00,000

Since 30,000 < 3,00,000

So, 30 thousand < 3 lakhs.

(b) Given numbers = 500 lakh and 5 million

Formula used : Conversion to same place value

1 lakh = 1,00,000

500 lakh = 500 × 1,00,000
= 5,00,00,000
= 50,000,000

5 million = 5 × 10,00,000
= 50,00,000
= 5,000,000

Since 50,000,000 > 5,000,000

So, 500 lakh > 5 million.

(c) Given numbers = 800 thousand and 8 million

Formula used : Conversion to same place value

800 thousand = 800 × 1000
= 8,00,000

8 million = 8 × 10,00,000
= 80,00,000

Since 8,00,000 < 80,00,000

So, 800 thousand < 8 million.

(d) Given numbers = 640 crore and 60 billion

Formula used : Conversion to same place value

1 crore = 1,00,00,000

640 crore = 640 × 1,00,00,000
= 6,40,00,00,000
= 6,400,000,000

60 billion = 60 × 1,000,000,000
= 60,000,000,000

Since 6,400,000,000 < 60,000,000,000

So, 640 crore < 60 billion.

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1. (a) 2 × 1768 × 50
= 1768 × (2 × 50)
= 1768 × 100
= 176800

(b) 72 × 125

125 = 1000 ÷ 8

72 × 125 = 72 × (1000 ÷ 8)
= (72 ÷ 8) × 1000
= 9 × 1000
= 9000

(c) 125 × 40 × 8 × 25
= (125 × 8) × (40 × 25)
= 1000 × 1000
= 1000000

2. (a) $25 \times 12 = 25 \times (10 + 2)$
$= 250 + 50$
$= 300$

(b) $25 \times 240 = 25 \times (24 \times 10)$
$= (25 \times 24) \times 10$
$= 600 \times 10$
$= 6000$

(c) $250 \times 120 = (25 \times 10) \times (12 \times 10)$
$= (25 \times 12) \times 100$
$= 300 \times 100$
$= 30000$

(d) $2500 \times 12 = (2500 \times 10) + (2500 \times 2)$
$= 25000 + 5000$
$= 30000$

(e) One possible answer :
$300 \times 400000 = 120000000$

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1. (a) Digits arranged in descending order
$= 9, 8, 7, 6, 5, 4, 3, 2, 1, 0$
A number divisible by 5 must end in 0 or 5.
So, the greatest possible multiple of 5 using all digits once is 9876543210.

(b) Digits arranged in ascending order
$= 0, 1, 2, 3, 4, 5, 6, 7, 8, 9$
Since a number cannot begin with 0, the smallest arrangement is 1023456789.
To make it even, interchange the last two digits.
So, the smallest even number formed is 1023456798.

2. To get the maximum number of letters, we use digits like 7 and 8 because their names are longer.

77,77,777 = Seventy-seven lakh seventy-seven thousand seven hundred seventy-seven.This name contains 60 letters.

88,88,888 = Eighty-eight lakh eighty-eight thousand eight hundred eighty-eight.

This name contains 57 letters.

Hence, 77,77,777 has more letters in its number name.

3. For the number to become larger after exchanging any two digits, its digits must be in strictly decreasing order.
Such a number is 987654321. Only one number satisfies this condition.

4. To obtain the greatest possible number after removing 10 digits, remove the smaller digits (1, 2, 3, 4) as much as possible.
The remaining largest number is 5534512345.

5. Let us observe consecutive number names carefully :
one and two have the letter *o* in common.
two and three share letters *t*.
three and four share *r* and *e*.
four and five share *f*.
five and six share *i*.
six and seven share *s*.
seven and eight share e.
eight and nine share *e, i*.
nine and ten share *n* and *e*.
From this pattern, every pair of consecutive numbers has at least one common letter.
Therefore, there is no pair of consecutive numbers without a common English letter.

6. Numbers 1–9 give 9 digits because each number has 1 digit.

Numbers 10–99 give $90 \times 2 = 180$ digits.

Numbers 100–999 give $900 \times 3 = 2700$ digits.

(a) Total digits till $99 = 9 + 180 = 189$.

Since $1000 > 189$, the 1000th digit lies among 3-digit numbers.

Remaining digits $= 1000 - 189 = 811$.

$811 \div 3 = 270$ remainder 1.

So after writing 270 three-digit numbers starting from 100, we reach 369.

The next number is 370.

The 1000th digit is the first digit of 370, which is 3.

(b) Digits from 1000–9999

$= 9000 \times 4$

$= 36,000$.

Digits from 10,000–99,999

$= 90,000 \times 5$

$= 4,50,000$.

Digits from 1,00,000 – 9,99,999

$= 9,00,000 \times 6 = 54,00,000$.

Total digits till 5-digit numbers

$= 9 + 180 + 2700 + 36,000 + 4,50,000$

$= 4,88,889$.

Remaining digits to reach 10,00,000

$= 10,00,000 - 4,88,889 = 5,11,111$.

$5,11,111 \div 6 = 85,185$ remainder 1.

So we move 85,185 numbers ahead from 1,00,000.

$1,00,000 + 85,185 - 1 = 1,85,184$.

The next number is 1,85,185.

Hence, the millionth digit lies in 1,85,185.

(c) From 1–9, digit 5 appears once.

From 10–99, it appears 19 times (in 15, 25, …, 95 and in 50–59).

Total so far = 20.

From 100–999 :

Units place gives 90 times.

Tens place gives 90 times.

Hundreds place gives 100 times.

Total = 280.

Cumulative total = 300.

From 1000–9999 :

Each of the four places (units, tens, hundreds) contributes 900 times.

Thousands place contributes 1000 times.

Total = 3700.

Cumulative total = 4000.

Now we need $5000 - 4000 = 1000$ more occurrences.

From 10000–10999, digit 5 appears 300 times.

Total = 4300.

From 11000–11999, again 300 times.

Total = 4600.

From 12000–12999, again 300 times.

Total = 4900.

From 13000–13999, 100 more occurrences at unit place complete 5000.

The 5000th occurrence happens at 13495.

7. (a) 20,800 can be written as $2 \times 10,000 + 8 \times 100$.

Total button presses $= 2 + 8 = 10$ clicks.

(b) 92,100 can be expressed as $9 \times 10,000 + 21 \times 100$.

Total button presses $= 9 + 21 = 30$ clicks.

(c) 1,20,500 can be written as
$12 \times 10{,}000 + 5 \times 100$.
Total button presses = 12 + 5
= 17 clicks.

(d) 65,30,000 can be written as
$653 \times 10{,}000 + 0 \times 100$.
Total button presses = 653 + 0
= 653 clicks.

(e) 70,25,700 can be written as
$702 \times 10{,}000 + 57 \times 100$.
Total button presses = 702 + 57
= 759 clicks.

8. 1 lakh = 1,00,000
1 billion = 1,000,000,000
Number of lakhs in a billion
= 1,000,000,000 ÷ 1,00,000
= 10,000.
Hence, 10,000 lakhs are equal to one billion.

9. (a)

9	8	7	6	5	4	3

9	8	7	6	5

To get the largest possible sum, both the 7-digit and 5-digit numbers need to be the largest.
7-digit number = 98,76,543
5-digit number = 98,765
Sum = 98,76,543 + 98,765
= 99,75,308.

(b)

1	2	3	4	5	6	7

9	8	7	6	5

To get the smallest possible difference, the 7-digit number needs to be the smallest, and the 5-digit number needs to be the largest.
7-digit number = 12,34,567
5-digit number = 98,765
Difference = 12,34,567 – 98,765
= 11,35,802

10. (a) 1,10,000 :
Given value : Number cards
= 4000, 13000, 300, 70000, 150000, 20, 5
Closest value = 70,000 + (4,000 × 5)
+ 13,000
= 70,000 + 20,000 + 13,000
= 1,03,000

(b) 2,00,000 :
Given value : Number cards
= 4000, 13000, 300, 70000, 150000, 20, 5
Closest value
= 1,50,000 + 70,000 − (4,000 × 5)
= 1,50,000 + 70,000 − 20,000
= 2,00,000

(c) 5,80,000 :
Given value : Number cards
= 4000, 13000, 300, 70000, 150000, 20, 5
Closest value
= (1,50,000 × 4) − (4,000 × 5)
= 6,00,000 − 20,000
= 5,80,000

(d) 12,45,000 :
Closest value
= (1,50,000 × 8) + (13,000 × 4)
− 4,000
= 12,00,000 + 52,000 − 4,000
= 12,48,000

(e) 20,90,800 :
Given value :
Number cards
= 4000, 13000, 300, 70000, 150000, 20, 5
Closest value
= (1,50,000 × 14) + 4,000 − 13,000
= 21,00,000 + 4,000 − 13,000
= 20,91,000

11. Given value :
Thickness of one coin = 1 mm
Height of Statue of Unity
≈ 180 m
Formula used : 1 m = 1000 mm
Height in millimetres
= 180 × 1000= 1,80,000 mm
Number of coins required
= Total height ÷ thickness of one coin
= 1,80,000 ÷ 1 = 1,80,000
So, the number of coins needed to reach the height of the Statue of Unity is 1,80,000 coins.

12. Given value :
Total distance of trip
= 12,000 km
Distance travelled in one day
= 900 – 1000 km
Formula used :
Number of days
= Total distance
÷ distance travelled per day
If distance per day = 900 km
Number of days = 12,000 ÷ 900
= 13.3 days
If distance per day = 1000 km
Number of days = 12,000 ÷ 1000
= 12 days
Thus, the journey would take nearly 12–14 days to cover 12,000 km.
So, the approximate time required to complete the trip is about 12 to 14 days.

13. Given value :
Total distance travelled
= 13,560 km
Total time taken = 11 days
1 day = 24 hours
Formula used :
Distance per day = Total distance
÷ number of days
Distance per hour = Total distance
÷ total hours
Total time in hours = 11 × 24
= 264 hours
Distance covered in one day
= 13,560 ÷ 11
= 1232.73 km ≈ 1233 km
Distance covered in one hour
= 13,560 ÷ 264
= 51.36 km ≈ 51 km
So, the bird travelled about 1233 km per day and about 51 km per hour.

14. Given value : Height of Somu's building = 40 m
Formula used :
Number of times bigger
= Height of object ÷ height of building
Bald eagle flying height
= 4500 – 6000 m
Lower value = 4500 ÷ 40
= 112.5
Higher value = 6000 ÷ 40
= 150
So, bald eagles can fly about 112.5 to 150 times higher than Somu's building
Mount Everest height = 8850 m
8850 ÷ 40 = 221.25
So, Mount Everest is about 221.25 times taller than Somu's building.
Aeroplane flying height
= 10,000 – 12,800 m
Lower value = 10,000 ÷ 40 = 250
Higher value = 12,800 ÷ 40 = 320
So, aeroplanes can fly about 250 to 320 times higher than Somu's building.

Practice Time

Multiple Choice Questions :

1. (b) 99992 **2.** (c) 7-digit number
3. (a) 10 **4.** (b) One million
5. (c) Six

Fill in the Blanks :

1. Commas **2.** 8 **3.** 25 **4.** 1000

True/False :

1. False **2.** True **3.** False **4.** True

Subjective Questions :

1. Given value : Digits = 0, 2, 4, 6, 7 and one digit can be repeated once.
Formula used : Largest number is formed by arranging digits in descending order.
Largest six-digit number
= 7, 7, 6, 4, 2, 0
= 776420.
So, the largest six-digit number is 776420.

2. Given value :
1 billion = 1,000,000,000 and 1 lakh = 100,000.
Formula used : Number of lakhs = Total number ÷ value of one lakh.
Number of lakhs
= 1,000,000,000 ÷ 100,000
= 10,000.
So, 1 billion is equal to 10,000 lakh.

3. Given value : Digits available = 0–9 and all digits must be different.
Formula used : Largest number is obtained by arranging digits in descending order.
Largest 7-digit number
= 9, 8, 7, 6, 5, 4, 3 = 9876543.
So, the largest 7-digit number using different digits is 9876543.

4. Given value :
A 9-digit number = 123456789.
Maximum number = 987654321.
Minimum number = 123456789.
Difference = 987654321 – 123456789
= 864197532.
So, the difference between the maximum and minimum numbers is 864197532.

5. Given value : Ravi's money = 99,76,835 and Mani's money = 12,622.
Formula used : Number of times
= Ravi's money ÷ Mani's money.
Number of times
= 9,976,835 ÷ 12,622 ≈ 790.4.
So, Ravi has about 790 times more money than Mani.

6. Given value : Total money = 7,62,76,922 and daily spending = 562.
Formula used : Number of days = Total money ÷ money spent per day.
Number of days
= 76,276,922 ÷ 562
≈ 135724 days (Aprox.)
Years ≈ 135724 ÷ 365
≈ 371 years (Aprox.)
So, he will not be able to spend all his money in his lifetime because it would take about 135723 days.

7. Given value : Height of Mansi = 1.55 m and height of Statue of Unity = 182 m.
Formula used : Number of times

= Height of statue
÷ height of Mansi.
Number of times = 182 ÷ 1.55
≈ 117.42.
So, the Statue of Unity is about 117 times taller than Mansi.

8. **(a)** Given value :
Number = 63,24,139.
63,24,139 = Sixty three lakh twenty four thousand one hundred thirty nine.

(b) Given value : Number = 84,49,912.
84,49,912 = Eighty four lakh forty nine thousand nine hundred twelve.

2. Aithmetic Expressions

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Think and Discuss

1. **Given value :** Required number = 20
Formula used :
Product = number × number
$10 \times 2 = 20$
$5 \times 4 = 20$
$25 - 5 = 20$
$30 - 10 = 20$
So, different expressions such as $10 \times 2, 5 \times 4, 25 - 5$, and $30 - 10$ all have the same value 20.
2. **Given value :**
(10 × 2) and (5 × 4)
Formula used :
Product = number × number
$10 \times 2 = 20$
$5 \times 4 = 20$
Since both expressions have the same value 20, they are equal.
So, (10 × 2) is the same as (5 × 4) because both are equal to 20.

Asscess Yourself-1

1. **Given value :** 345 + 210 and 346 + 208
Formula used :
Sum = first number + second number
$345 + 210 = 555$
$346 + 208 = 554$
$555 > 554$
So, $345 + 210 > 346 + 208$.
2. **Given value :**
245 + 289 and 246 + 285
$245 + 289 = 534$
$246 + 285 = 531$
$534 > 531$
So, $245 + 289 > 246 + 285$.
3. **Given value :**
480 – 155 and 479 – 154
Formula used :
Difference = first number − second number
$480 - 155 = 325$
$479 - 154 = 325$
$325 = 325$
So, $480 - 155 = 479 - 154$.
4. **Given value :**
273 – 145 and 272 – 144
$273 - 145 = 128$
$272 - 144 = 128$
$128 = 128$
So, $273 - 145 = 272 - 144$.
5. **Given value :** 625 + 315 and 624 + 317
$625 + 315 = 940$
$624 + 317 = 941$
$940 < 941$
So, $625 + 315 < 624 + 317$.

6. **Given value :** 364 + 587 and 363 + 589

$364 + 587 = 951$

$363 + 589 = 952$

$951 < 952$

So, $364 + 587 < 363 + 589$.

7. **Given value :** 150 + 440 and 155 + 440

$150 + 440 = 590$

$155 + 440 = 595$

$590 < 595$

So, $150 + 440 < 155 + 440$.

8. **Given value :** 124 + 245 and 129 + 245

$124 + 245 = 369$

$129 + 245 = 374$

$369 < 374$

So, $124 + 245 < 129 + 245$.

9. **Given value :**

375 – 120 and 376 – 119

$375 - 120 = 255$

$376 - 119 = 257$

$255 < 257$

So, $375 - 120 < 376 - 119$.

10. **Given value :**

213 – 77 and 214 – 76

$213 - 77 = 136$

$214 - 76 = 138$

$136 < 138$

So, $213 - 77 < 214 - 76$.

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Think and Discuss

1. **Given value :** Expression with different operations such as +, −, ×, ÷

Formula used : BODMAS rule = Brackets → Orders → Division → Multiplication → Addition → Subtraction

Example : $20 - 10 \div 5$

According to BODMAS, division is done before subtraction.

$10 \div 5 = 2$

$20 - 2 = 18$

If different people solve the same expression in different orders, they may get different answers such as 2 or 18.

BODMAS gives one fixed order of operations so that everyone gets the same correct answer.

So, it is important to follow BODMAS because it ensures everyone gets the same correct result while solving mathematical expressions.

2. **Given value :** Expression = $20 - 10 \div 5$

Formula used : BODMAS rule = Division before subtraction

Suppose a teacher has 20 chocolates and gives 10 chocolates to 5 students equally.

$10 \div 5 = 2$ chocolates per student

Total chocolates used = 2

Chocolates left = $20 - 2 = 18$

If someone does subtraction first and thinks $20 - 10 = 10$ and then divides $10 \div 5 = 2$, the answer becomes wrong.

So, the correct result of the expression $20 - 10 \div 5$ is 18 chocolates.

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Think and Discuss

1. **Given value :**

$10 - 3$ and $10 + (-3)$

Formula used :

Subtraction rule = $a - b = a + (-b)$

$10 - 3 = 10 + (-3)$

On a number line, start at 10.
Subtracting 3 means moving 3 steps to the left from 10, reaching 7.
Adding −3 also means moving 3 steps to the left from 10, reaching 7.
Thus both operations lead to the same point 7 on the number line.
So, 10 − 3 and 10 + (−3) are equal and both give the result 7.

2. **Given value :**
Expression = 7 × 3 + 5
Formula used : BODMAS rule = Multiplication before addition

$$7 \times 3 = 21$$
$$21 + 5 = 26$$

Since multiplication must be done before addition, 7 × 3 is calculated first and acts as one combined value.
So, 7 × 3 is considered a single term and the value of the expression is 26.

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Think and Discuss

1. **Given value :** Movement on number line = (−3) + 8 and 8 + (−3)
Formula used : Commutative property of addition

$$= a + b = b + a$$
$$(-3) + 8 = 5$$
$$8 + (-3) = 5$$

On a number line, starting from 0 and moving 3 steps left gives −3, then moving 8 steps right reaches 5.
Starting from 0 and moving 8 steps right gives 8, then moving 3 steps left also reaches 5.
So, the final position is the same and the value is 5.

2. **Given value :** Two tasks = putting on socks and shoes
Formula used : Order of actions affects the final result
First wearing socks and then shoes gives a correct result.
First wearing shoes and then socks is not possible because socks cannot be worn over shoes properly.
So, swapping the order of these tasks changes the final outcome.

Asscess Yourself-2

1. **Given value :** 18 − 6 + 4 × 3
Formula used : BODMAS rule = Brackets → Orders → Division → Multiplication → Addition → Subtraction

$$18 - 6 + 4 \times 3$$
$$4 \times 3 = 12$$
$$18 - 6 + 12 = 12 + 12 = 24$$

Multiplication is done first because according to BODMAS, × comes before + and −.
So, the value of the expression 18 − 6 + 4 × 3 is 24.

2. **Given value :**
Expression = 30 ÷ 5 + 7
Formula used : BODMAS rule = Division before addition

$$30 \div 5 + 7$$
$$30 \div 5 = 6$$
$$6 + 7 = 13$$

Student A solved the expression correctly because division is done before addition.

Student B changed the expression by adding brackets as $30 \div (5 + 7)$, which changes the meaning of the expression. So, Student A is correct and the value of the expression is 13.

3. **Given value :**
Expression = $50 - 3 \times 4 + 6$
Formula used : BODMAS rule = Multiplication before addition and subtraction
Terms in the expression are 50, -3×4, and $+6$.
$$50 - 3 \times 4 + 6$$
$$3 \times 4 = 12$$
$$50 - 12 + 6 = 38 + 6 = 44$$
So, the value of the expression $50 - 3 \times 4 + 6$ is 44.

4. **Given value :** $(-7) + 15 + (-3)$
Formula used : Commutative property $a + b = b + a$ and associative property
$$(a + b) + c = a + (b + c)$$
$$(-7) + 15 + (-3)$$
$$= 15 + (-7) + (-3)$$
$$= 15 - 7 - 3$$
$$= 8 - 3 = 5$$
$$(-7) + 15 + (-3)$$
$$= (-7) + (-3) + 15$$
$$= -10 + 15 = 5$$
Both groupings give the same result.
So, the value of $(-7) + 15 + (-3)$ is 5.

Asscess Yourself-3

1. **Given expression :**
$48 + 9 \times 2 - 30 \div 5$
The terms are 48, (9×2), and $(30 \div 5)$.
$$= 48 + 18 - 6$$
$$= 66 - 6 = 60$$
The value of each term must be found first because multiplication and division have higher priority than addition and subtraction according to the BODMAS rule.
So, the value of the expression is 60.

2. **(a) Given values :**
Cost of one notebook = ₹ 27,
Number of notebooks = 3,
Delivery charge = ₹ 12
Expression : $27 \times 3 + 12$
(b) The terms are (27×3) and 12.
$$= 81 + 12 = 93$$
So, the total amount is 93 rupees.

3. **(a) Given values :** Total students = 50, Students per group = 8
Expression for complete groups :
$$50 \div 8$$
Expression for students left :
$$50 - (8 \times 6)$$
Full expression : $50 \div 8 = 6$ with a remainder of 2
Expression : $8 \times 6 + 2$

(b) The terms in the division are the dividend 50 and the divisor 8.
So, the number of complete groups is 6 and the number of students left is 2.
Terms : $(8 \times 6).2$

4. (a) Given values :
Total flour = 72 kg, Weight per packet = 4 kg, Packets already at home = 3
Expression : $72 \div 4 + 3$

(b) The terms are $(72 \div 4)$ and 3.
Formula used : Total packets
= (Total weight ÷ Weight per packet) + Existing packets
= 18 + 3= 21

So, the total number of packets she has now is 21.

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Think and Discuss

1. **Given value :** Expression with minus sign before bracket = $a - (b + c)$

   Formula used : Sign change rule

   $= a - (b + c) = a - b - c$

   Example : $20 - (5 + 3)$

   $5 + 3 = 8$

   $20 - 8 = 12$

   Using sign change rule :

   $20 - (5 + 3) = 20 - 5 - 3$

   $= 15 - 3 = 12$

   When a minus sign is placed before a bracket, it means the whole bracketed solution is being subtracted, so the signs of all terms inside the bracket change.

   So, removing a bracket with a minus sign changes the signs of all terms inside the bracket.

2. **Given value :**

   Expression = $80 - (30 + 15)$

   Formula used : Sign change rule

   $= a - (b + c) = a - b - c$

   $80 - (30 + 15)$

   $30 + 15 = 45$

   $80 - 45 = 35$

   Using sign change rule :

   $80 - (30 + 15) = 80 - 30 - 15$

   $= 50 - 15 = 35$

   Story : A shopkeeper has 80 rupees and spends 30 rupees on books and 15 rupees on pens, so total money spent is $30 + 15 = 45$.

   Money left $= 80 - 45 = 35$.

   So, the value of the expression $80 - (30 + 15)$ is 35.

Asscess Yourself-4

1. **Given value :** $80 - (25 + 7)$

   Formula used : Sign change rule

   $= a - (b + c) = a - b - c$

   $80 - (25 + 7) = 80 - 25 - 7$

   $80 - 25 = 55$

   $55 - 7 = 48$

   The signs inside the bracket change because a minus sign before a bracket means the whole bracketed quantity is being subtracted.

   So, the value of the expression $80 - (25 + 7)$ is 48.

2. **Given value :** $600 - (350 - 40)$

   Formula used : Sign change rule

   $= a - (b - c) = a - b + c$

   $600 - (350 - 40) = 600 - 350 + 40$

   $600 - 350 = 250$

   $250 + 40 = 290$

   We cannot write it as $600 - 350 - 40$ because the minus sign before the bracket changes the sign of -40 to $+40$.

   So, the value of the expression $600 - (350 - 40)$ is 290.

3. **Given value :** $45 + (32 - 12)$

   Formula used : Bracket rule

   $= a + (b - c) = a + b - c$

   $45 + (32 - 12) = 45 + 32 - 12$

   $45 + 32 = 77$

   $77 - 12 = 65$

   So, the value of the expression $45 + (32 - 12)$ is 65.

4. **Given value :** Base expression $64 + (-20) = 44$ and new expression $63 + (-20)$
Formula used : Property of integers = if one number decreases by 1, the sum also decreases by 1
$63 + (-20) = 43$
Since 63 is 1 less than 64, the final value will also be 1 less than 44.
So, the value of the expression $63 + (-20)$ is 43.

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Think and Discuss

1. **Given value :**
$4 \times (5 + 2)$ and $4 \times 5 + 2$
Formula used : Distributive property
$= a \times (b + c) = a \times b + a \times c$
$4 \times (5 + 2) = 4 \times 7 = 28$
$4 \times 5 + 2 = 20 + 2 = 22$
Since $28 \neq 22$, both expressions are not equal because in the first expression 4 is multiplied by both numbers inside the bracket, while in the second expression 4 is multiplied only by 5.
So, $4 \times (5 + 2) = 28$ and $4 \times 5 + 2 = 22$, therefore they are not the same.
2. **Given value :** 6×105
Formula used : Distributive property
$= a \times (b + c) = a \times b + a \times c$
$6 \times 105 = 6 \times (100 + 5)$
$= 6 \times 100 + 6 \times 5$
$= 600 + 30 = 630$
So, the value of 6×105 is 630.

Asscess Yourself-5

1. **Given value :** $4 \times (60 + 5)$
Formula used : Distributive property
$= a \times (b + c) = a \times b + a \times c$
$4 \times (60 + 5) = 4 \times 60 + 4 \times 5$
$4 \times 60 = 240$ and $4 \times 5 = 20$
$240 + 20 = 260$
This method is easier because the number inside the bracket is split into simpler numbers before multiplying.
So, the value of the expression $4 \times (60 + 5)$ is 260.
2. **Given value :**
$A = 3 \times (20 - 4)$,
$B = 3 \times 20 - 3 \times 4$,
$C = 3 \times 20 - 4$
Formula used : Distributive property $= a \times (b - c)$
$= a \times b - a \times c$
$A = 3 \times (20 - 4) = 3 \times 16 = 48$
$B = 3 \times 20 - 3 \times 4$
$= 60 - 12 = 48$
$C = 3 \times 20 - 4 = 60 - 4 = 56$
A and B follow the distributive property and give the same value, while C does not multiply 4 by 3.
So, A and B are equal and their value is 48.
3. **Given value :** 97×12
Formula used : Distributive property
$= (a - b) \times c = a \times c - b \times c$
$97 \times 12 = (100 - 3) \times 12$
$= 100 \times 12 - 3 \times 12$
$= 1200 - 36 = 1164$
So, the value of 97×12 is 1164.
4. **Given value :** $45 \times 14 = 630$ and required value 55×14

Formula used : Distributive property

$= (a + b) \times c = a \times c + b \times c$

$55 \times 14 = (45 + 10) \times 14$

$= 45 \times 14 + 10 \times 14$

$= 630 + 140 = 770$

So, the value of 55×14 is 770.

5. **Given value :**

Number of bats = 4, cost of one bat = 250 rupees, number of footballs = 4, cost of one football = 150 rupees

Formula used : Distributive property $= a \times (b + c)$

$= a \times b + a \times c$

Expression :

(a) $4 \times 250 + 4 \times 150$

$= 4 \times (250 + 150)$

$4 \times (250 + 150)$

$= 4 \times 400 = 1600$

(b) So, the total cost of 4 cricket bats and 4 footballs is 1600 rupees.

'Figure it Out' Exercise

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Think and Discuss

1. **(a) Given value :**

$13 + 4 = \_\_\_\_ + 6$

Formula used :

Equality rule = value on left side = value on right side

$13 + 4 = 17$

So $\_\_\_\_ + 6 = 17$

$\_\_\_\_ = 17 - 6 = 11$

So, $13 + 4 = \underline{11} + 6$.

(b) Given value :

$22 + \_\_\_\_ = 6 \times 5$

Formula used : Equality rule = value on left side = value on right side

$6 \times 5 = 30$

$22 + \_\_\_\_ = 30$

$\_\_\_\_\_ = 30 - 22 = 8$

So, $22 + \underline{8} = 6 \times 5$.

(c) Given value :

$8 \times \_\_\_\_ = 64 \div 2$

Formula used : Equality rule = value on left side = value on right side

$64 \div 2 = 32$

$8 \times \_\_\_\_\_ = 32$

$\_\_\_\_\_ = 32 \div 8 = 4$

So, $8 \times \underline{4} = 64 \div 2$.

(d) Given value : $34 - \_\_\_\_ = 25$

Formula used : Subtraction rule

$= a - b = c$

$34 - \_\_\_\_\_ = 25$

$\_\_\_\_\_ = 34 - 25 = 9$

So, $34 - \underline{9} = 25$.

2. **Given value :**

$67 - 19, 67 - 20, 35 + 25, 5 \times 11, 120 \div 3$

Formula used : BODMAS rule = Division and multiplication before addition and subtraction

$67 - 19 = 48$

$67 - 20 = 47$

$35 + 25 = 60$

$5 \times 11 = 55$

$120 \div 3 = 40$

Ascending order means arranging from smallest value to greatest value.

$40 < 47 < 48 < 55 < 60$

So, the ascending order is $120 \div 3$, $67 - 20 < 67 - 19 < 5 \times 11 < 35 + 25$.

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1. **(a) Given value :** $28 - 7 + 8$

Formula used : BODMAS rule = Addition and subtraction are solved from left to right

Terms are 28, −7, +8

$28 - 7 + 8 = 21 + 8 = 29$

So, the value of the expression $28 - 7 + 8$ is 29.

(b) Given value : $39 - 2 \times 6 + 11$

Formula used : BODMAS rule = Multiplication before addition and subtraction

Terms are 39, -2×6, +11

$39 - 2 \times 6 + 11$

$2 \times 6 = 12$

$39 - 12 + 11 = 27 + 11 = 38$

So, the value of the expression $39 - 2 \times 6 + 11$ is 38.

(c) Given value :

$40 - 10 + 10 + 10$

Terms are 40, −10, +10, +10

$40 - 10 + 10 + 10 = 30 + 10 + 10 = 50$

So, the value of the expression $40 - 10 + 10 + 10$ is 50.

(d) Given value :

$48 - 10 \times 2 + 16 \div 2$

Terms are 48, -10×2, $+16 \div 2$

$48 - 10 \times 2 + 16 \div 2$

$10 \times 2 = 20$ and $16 \div 2 = 8$

$48 - 20 + 8 = 28 + 8 = 36$

So, the value of the expression $48 - 10 \times 2 + 16 \div 2$ is 36.

(e) Given value : $6 \times 3 - 4 \times 8 \times 5$

Terms are 6×3 and $-4 \times 8 \times 5$

$6 \times 3 = 18$

$4 \times 8 \times 5 = 160$

$18 - 160 = -142$

So, the value of the expression $6 \times 3 - 4 \times 8 \times 5$ is −142.

2. (a) Given value : $89 + 21 - 10$

Formula used : BODMAS rule = Addition and subtraction from left to right

Story : A shopkeeper has 89 apples, buys 21 more apples, and then sells 10 apples.

$89 + 21 - 10 = 110 - 10 = 100$

So, the number of apples left is 100.

(b) Given value : $5 \times 12 - 6$

Formula used : BODMAS rule = Multiplication before subtraction

Story : A teacher buys 5 boxes of pencils with 12 pencils in each box and gives 6 pencils to students.

$5 \times 12 - 6 = 60 - 6 = 54$

So, the number of pencils left is 54.

(c) Given value : $4 \times 9 \times 2 \times 6$

Formula used : Multiplication rule = number × number

Story : A store has 4 shelves, each shelf has 9 boxes, each box has 2 packets, and each packet has 6 chocolates.

$4 \times 9 \times 2 \times 6 = 432$

So, the total number of chocolates is 432.

3. (a) Given : Elsa gets 100 coins, Anna gets 100 coins

Expression used :

Total coins = (Elsa's coins after change)

+ (Anna's coins after change)

Elsa's coins = $100 \times 2 = 200$

Anna's coins = $100 \div 2 = 50$

Expression : $100 \times 2 + 100 \div 2$

Terms : 100×2 and $100 \div 2$

Value = 200 + 50 = 250

So, the total number of coins with Elsa and Anna is 250.

(b) Given : Adult ticket = ₹ 40,
Child ticket = ₹ 20
Expression used :
Total cost = (Number × Cost) + (Number × Cost)
(i) For 4 adults and 3 children
Expression : $4 \times ₹\ 40 + 3 \times 20$
Terms : 4×40 and 3×20
Value = 160 + 60 = ₹ 220
So, the total cost of tickets is 220.
(ii) For two groups having 3 adults each
Total adults = $2 \times 3 = 6$
Expression : 6×40
Term : 6×40
Value = 240
So, the total cost of tickets is 240.

(c) Given :
Height of top border = 3 cm
Height of bottom border = 3 cm
Number of grills = 6
Height of each grill = 2 cm
Number of gaps = 7
Height of each gap = 5 cm
Formula used :
Total Height = (2 × Border) + (Number of grills × Height of grill) + (Number of gaps × Height of gap)
Total Height = $(2 \times 3) + (6 \times 2) + (7 \times 5)$
Total Height = 6 + 12 + 35
Total Height = 53 cm
So, the total height of the window is 53 cm.

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1. (a) Given :
$24 + (6 - 4) = 24 + 6$ ___
Expression used :
$a + (b - c) = a + b - c$
So, _____ $= -4$
So, the required sign is – 4.

(b) Given :
$38 + (\_\square\_) = 38 + 9 - 4$
Expression used :
$a + (b - c) = a + b - c$
So, $\_\square\_ = 9 - 4$
So, the required expression is $9 - 4$.

(c) Given :
$24 - (6 + 4) = 24$ ___ $6 - 4$
Expression used :
$a - (b + c) = a - b - c$
So, _____ = –
$24 - 6 - 4$
So, the required sign is –.

(d) Given : $24 - 6 - 4 = 24 - 6$ ___
Expression used :
$a - b - c = a - (b + c)$
So, _____ $= -4$
So, the required sign is – 4.
$24 - 6 - 4$

(e) Given :
$27 - (8 + 3) = 27$ ___ 8 ___ 3
Expression used :
$a - (b + c) = a - b - c$
So, _____ = – , –
So, the required signs are – , –.
$27 - 8 - 3$

(f) Given :
$27 - (\_\square\_) = 27 - 8 + 3$
Expression used :
$a - (b - c) = a - b + c$
So, _____ $= 8 - 3$
So, the required expression is $8 - 3$.

2. (a) Given : $14 + (12 + 10)$
Expression used :
$a + (b + c) = a + b + c$
$= 14 + 12 + 10$
So , the expression is $14 + 12 + 10$.

(b) Given : $14 - (12 + 10)$

Expression used :

$a - (b + c) = a - b - c$

$= 14 - 12 - 10$

So, the expression is $14 - 12 - 10$.

(c) Given : $14 + (12 - 10)$

Expression used :

$a + (b - c) = a + b - c$

$= 14 + 12 - 10$

So, the expression is $14 + 12 - 10$.

(d) Given : $14 - (12 - 10)$

Expression used :

$a - (b - c) = a - b + c$

$= 14 - 12 + 10$

So, the expression is $14 - 12 + 10$.

(e) Given : $-14 + 12 - 10$

No brackets

So, the expression remains

$-14 + 12 - 10$.

(f) Given : $14 - (-12 - 10)$

Expression used :

$a - (-b - c) = a + b + c$

$= 14 + 12 + 10$

So, the expression is $14 + 12 + 10$.

3. (a) $(6 + 10) - 2 = 16 - 2 = 14$

$6 + (10 - 2) = 6 + 8 = 14$

So, both expressions are equal and value is 14.

(b) $16 - (8 - 3) = 16 - 5 = 11$

$(16 - 8) - 3 = 8 - 3 = 5$

So, both expressions are not equal.

(c) $27 - (18 + 4) = 27 - 22 = 5$

$27 + (-18 - 4) = 27 - 22 = 5$

So, both expressions are equal and value is 5.

4. (a) Given expressions :

$319 + 537, 319 - 537, -537 + 319, 537 - 319$

Using property : $a + b = b + a$

Same value expressions :

$319 - 537$ and $-537 + 319$

(both represent addition of same numbers)

So, the expressions with same value are

$319 - 537$ and $-537 + 319$.

(b) Given expressions :

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

Using properties of addition and subtraction

Same value expressions :

$(87 - 46) + 109$ and $87 - 46 + 109$

So, the expressions with same values are :

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

5. (a) Given : $34 - 9 + 12 = 13$

Expression used : $a - (b + c)$

$34 - (9 + 12) = 34 - 21 = 13$

So, the required expression is $34 - (9 + 12)$.

(b) Given : $56 - 14 - 8 = 34$

Expression used : $(a - b) - c$

$(56 - 14) - 8 = 42 - 8 = 34$

So, the required expression is

$(56 - 14) - 8$.

(c) Given :

$-22 - 12 + 10 + 22 = -22$

Expression used : $a - (b - c - d)$

$-22 - (12 - 10 - 22) = -22 - (-20)$

$= -22 + 20$

$= -2$

Correct grouping :

$-22 - (12 + 10 - 22) = -22 - 0$

$= -22$

So, the required expression is

$-22 - (12 + 10 - 22)$.

6. (a) Given :

$423 + \_\_\_ = 419 + \_\_\_$

Expression used : $a + b = c + d$

Difference $= 423 - 419 = 4$

So, $423 + 0 = 419 + 4$

So, the blanks are 0 and 4.

(b) Given : $207 - 68 = 210 - \_\_\_$

Expression used : balancing numbers

Increase 207 by 3 $\rightarrow$ 210, so increase 68 by 3 $\rightarrow$ 71

So, blank = 71

So, the required number is 71.

7. Given : Numbers 2, 3, 5

Possible expressions :

$$2 + 3 + 5 = 10$$
$$2 + 3 - 5 = 0$$
$$2 - 3 + 5 = 4$$
$$2 - (3 + 5) = -6$$
$$(2 + 3) - 5 = 0$$
$$3 + 5 - 2 = 6$$
$$3 - 5 + 2 = 0$$
$$3 - (5 - 2) = 0$$
$$5 + 2 - 3 = 4$$
$$5 - 2 + 3 = 6$$
$$5 - (2 + 3) = 0$$

So, the different values obtained are 10, 6, 4, 0, – 6.

8. (a) Given :

Subtract 9 $\rightarrow$ subtract 10 + add 1

Expression used :

$$a - 9 = a - 10 + 1$$

This is correct because

$$-9 = -10 + 1$$

So, she always gets the correct answer.

(b) Similar strategies :

$$a - 8 = a - 10 + 2$$

Example : $25 - 8 = 15 + 2 = 17$

$$a - 7 = a - 10 + 3$$

Example : $30 - 7 = 20 + 3 = 23$

So, similar strategies can be used correctly.

9. (a) Given : $73 - 14 + 1$

Expression used :

$$a - b + c = a + (-b + c)$$

Matching expression :

$$73 + (-14 + 1)$$

So, the correct expression is

$$73 + (-14 + 1).$$

(b) Given : $73 - 14 - 1$

Expression used :

$$a - b - c = a + (-b - c)$$

Matching expressions :

(a) $73 - (14 + 1)$ and (d) $73 + (-14 - 1)$

So, the correct expressions are $73 - (14 + 1)$ and $73 + (-14 - 1)$.

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1. (c) $3 \times (5 + 8) = 3 \times \underline{5 + 3} \times 8$

(d) $(9 + 2) \times 4 = 9 \times \underline{4 + 2} \times 4$

(e) $3 \times (\underline{3} + 4) = 3 \times \underline{3} + \underline{3} \times \underline{4}$

(f) $(\underline{13} + 6) \times 4 = 13 \times 4 + 6 \times \underline{4}$

(g) $3 \times (\underline{5} + \underline{2}) = 3 \times 5 + 3 \times 2$

(h) $(\underline{2} + \underline{3}) \times \underline{4} = 2 \times 4 + 3 \times 4$

(i) $5 \times (9 - 2) = 5 \times 9 - 5 \times \underline{2}$

(j) $(5 - 2) \times 7 = 5 \times 7 - 2 \times \underline{7}$

(k) $5 \times (8 - 3) = 5 \times \underline{8 - 5} \times \underline{3}$

(l) $(8 - 3) \times 7 = 8 \times \underline{7 - 3} \times 7$

(m) $5 \times (12 - \underline{3}) = \underline{5 \times 12} - 5 \times \underline{3}$

(n) $(15 - \underline{6}) \times 7 = \underline{15 \times 7 - 6} \times 7$

(o) $5 \times (\underline{9 - 4}) = 5 \times 9 - 5 \times 4$

(p) $(\underline{17 - 9}) \times \underline{7} = 17 \times 7 - 9 \times 7$

2. (a) $(8 - 3)$ is positive while $(3 - 8)$ is negative, so LHS > RHS.

(b) LHS only multiplies 9 by 18, but RHS multiplies the sum $(15 + 9)$ by 18, so LHS < RHS.

(c) LHS subtracts 9 from 17 before multiplying, while RHS adds the products, so LHS < RHS.

(d) Both sides represent the distributive property of multiplication over subtraction, so LHS = RHS.

3. **(a)** $2 \times (1 + 6) = 14$

(b) $7 \times (1 + 1) = 14$

(c) $1 \times (2 + 12) = 14$

(d) $14 \times (1 + 0) = 14$

4. Given values are numbers arranged in two pictures.

First picture :

Using formula :

Sum = (number × count) + (number × count)

Sum = $5 \times 4 + 4 \times 8$

Sum = $20 + 32 = 52$

Another way :

$(4 + 8 + 4) + (8 + 4 + 8) + (4 + 8 + 4)$

$= 16 + 20 + 16 = 52$

Second picture :

Using formula :

Sum = (number × count) + (number × count)

Sum = $8 \times 5 + 8 \times 6$

Sum = $40 + 48 = 88$

Another way :

$(5 + 6 + 6 + 5) + (6 + 5 + 5 + 6) + (6 + 5 + 5 + 6) + (5 + 6 + 6 + 5)$

$= 22 + 22 + 22 + 22 = 88$

So, the sum of the first picture is 52 and the sum of the second picture is 88.

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1. **(a)** Mangoes supplied in a week

Expression :

$(9 + 11) \times 7 = 20 \times 7 = 140$ kg

(b) Binu's yearly savings

Monthly savings

$= 20{,}000 - 5{,}000 - 5{,}000 - 2{,}000$

$= ₹\ 8{,}000$

Expression :

$(20{,}000 - 5{,}000 - 5{,}000 - 2{,}000) \times 12$

$= 8{,}000 \times 12 = ₹\ 96{,}000$

(c) Snail climbing the post

Net gain per day = 3 – 2 = 1 cm. But on the day the snail reaches 10 cm during daytime, it doesn't slip back.

End of Day (daytime)	Height
Day 1	3 cm
Day 2	4 cm (slipped to 2, climbed 3 → wait, let's be careful)

After night of Day 1 : 3 – 2 = 1 cm. After daytime Day 2 : 1 + 3 = 4 cm... continuing :

After night : 4–2=2. Day 3 daytime : 2+3=5.

Night : 3. Day 4 : 6. Night : 4. Day 5 : 7. Night : 5. Day 6 : 8. Night : 6. Day 7 daytime : 6 + 3 = 9. Night : 7. Day 8 daytime :

$7 + 3 = 10$ cm ✓

Expression : The snail needs

$(10 - 3) \div 1 + 1 = 8$ days

The snail gets the treat on Day 8.

2. Days he reads per week = 7 – 2 = 5 days (not Tuesday, not Saturday)

Pages per story = 2, so stories per week = $(5 \times 2) \div 2 = 5$...

But he reads a two-page story each day, so he reads 1 story per reading day. Stories in 8 weeks = $5 \times 8 = 40$ stories

Matching expression :

$(7 - 2) \times 8 \rightarrow$ option (b) ✓

Also (g) $7 \times 8 - 2 - 8 = 56 - 10 = 46 \times$ ...

let's verify all :

Option	Value	Match?
(a) $5 \times 2 \times 8$	80	×
(b) $(7 - 2) \times 8$	40	✓
(c) 8×7	56	×
(d) $7 \times 2 \times 8$	112	×
(e) $7 \times 5 - 2$	33	×
(f) $(7 + 2) \times 8$	72	×
(g) $7 \times 8 - 2 \times 8$	40 (if read as $7\times8 - 2\times8$)	✓
(h) $(7 - 5) \times 8$	16	×]

(b) and (g) (noting (g) works as written since $56 - 2 - 8 = 46$, but if interpreted as $(7–2)\times8$ expanded it equals 40; (b) is the clearest match).

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

Way 1 – Group consecutive pairs :

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

$= (–1) + (–1) + (–1) + (–1) + (–1)$

$= –5$

Way 2 – Add all positives, subtract all negatives :

$= (1+3+5+7+9) – (2+4+6+8+10)$

$= 25 – 30 = –5$

Way 3 – Left to right :

$1 – 2 = – 1, + 3 = 2, – 4 = – 2, + 5 = 3, – 6 = – 3, + 7 = 4, – 8 = – 4, + 9 = 5, –10 = –5$

(b) $1 – 1 + 1 – 1 + 1 – 1 + 1 – 1 + 1 – 1$

Way 1 – Pair them :

$= (1–1) + (1–1) + (1–1) + (1–1) + (1–1) = 0+0+0+0+0 = 0$

Way 2 – Count : five +1s and five –1s = 5 – 5 = 0

Way 3 – Left to right alternates between 1 and 0, ending on 10 terms (even) = 0

4. (a) $49 – 7 + 8$ __ $49 – 7 + 8$ Same expression → =

(b) $83 \times 42 – 18$ __ $83 \times 40 – 18$ Left has 83×42, right has 83×40. Since $42 > 40$: >

(c) $145 – 17 \times 8$ __ $145 – 17 \times 6 =$ 145–136 vs 145–102 = 9 vs 43 → < (Subtracting a larger number makes left smaller)

(d) $23 \times 48 – 35$ __ $23 \times (48 – 35)$ Left = $23\times48 – 35 = 1104 – 35 = 1069$ Right $= 23 \times 13 = 299$ → >

(e) $(16 – 11) \times 12 – 11 \times 12 + 16 \times 12$

$= 5\times12 – 11\times12 + 16\times12$

$= 12\times(5 – 11 + 16)$

$= 12 \times 10 = 120$

Compare with what? (The problem seems to compare this with itself as written.) Both sides = 120, so =

(f) $(76 – 53) \times 88$ __ $88 \times (53 – 76)$ Left = 23×88 = positive Right = $88 \times (–23)$ = negative → >

(g) $25 \times (42 + 16)$ __ $25 \times (43 + 15)$ = 25×58 vs 25×58 → =

(h) $36 \times (28 – 16)$ __ $35 \times (27 – 15)$ = 36×12 vs $35 \times 12 = 432$ vs 420 → >

5. (a) $83 – 37 – 12$

Rewrite as : $83 – 37 – 12$

(i) $84 – 38 – 12 = (83+1) – (37+1) – 12 = 83 – 37 – 12$ ✓ Equal

(ii) $84 – (37 + 12) = 84 – 37 – 12$

$= (83+1) – 37 – 12$

$\neq 83 – 37 – 12$ ×

(iii) $83 - 38 - 13 = 83 - (37+1) - (12+1)$
$\neq$ original ×

(iv) $-37 - 83 - 12$
= completely different (negative) ×

(b) $93 + 37 \times 44 + 76$
Terms are : 93, (37×44), 76 — addition is commutative for terms.

(i) $37 + 93 \times 44 + 76$ — here 93×44 is the product term, not 37×44 ×

(ii) $93 + 37 \times 76 + 44$ — product term is 37×76, not 37×44 ×

(iii) $(93 + 37) \times (44 + 76)$ — changes structure entirely ×

(iv) $37 \times 44 + 93 + 76$ — same three terms, just reordered ✓ Equal

6. Ten Expressions for the Number 36

Chosen number : 36

	Expression	Value
1	30 + 6	36
2	40 – 4	36
3	6 × 6	36
4	72 ÷ 2	36
5	(10 – 4) × 6	36
6	100 – 64	36
7	4 × 9	36
8	3 × (7 + 5)	36
9	50 – 7 – 7	36
10	(20 + 16) ÷ 1	36

Practice Time

Objective Questions

Multiple Choice Questions :

1. (b), 2. (b), 3. (b), 4. (b), 5. (c)

Fill in the Blanks :

1. 50 2. 14 3. 53 4. 10 5. 5

True/False :

1. True 2. False 3. True 4. False 5. True

Subjective Questions :

1. Amount given = ₹ 100,
cost = ₹ 15 + ₹ 56
Expression = 100 – (15 + 56)
So, the required expression is
₹ 100 – ₹ (15 + 56).

2. Given value = Two numbers a and b
Formula used = Commutative property of addition →
$a + b = b + a$
So, the commutative property of addition is $a + b = b + a$.

3. Given expression = 4 + 15 – 9
Terms are separated by + or –
So, the terms are 4, 15 and – 9.

4. Given expression = $6 \times 3 - 4 \times 2$
= 18 – 8 = 10
So, the value is 10.

5. Cost of 1 dosa = ₹ 23, number = 7, tip = ₹ 5
Formula used = Total cost
= (number × cost per item) + tip
= 7 × ₹ 23 + 5
= ₹ 161 + 5 = ₹ 166
So, the total cost is 166 rupees.

6. Sunday earning = ₹ 500, other days = ₹ 400, days in week = 7
Formula used = Total earning
= Sunday earning + 6 × daily earning
1 week earning = ₹ 500 + 6 × ₹ 400
= ₹ 500 + ₹ 2400 = ₹ 2900
7 weeks earning = ₹ 2900 × 7
= ₹ 20300
So, the total earning is 20300 rupees.

7. Required number = 72

Five expressions :

$8 \times 9 = 72$

$6 \times 12 = 72$

$80 - 8 = 72$

$9 \times 8 = 72$

$144 \div 2 = 72$

So, five arithmetic expressions giving 72 are written.

8. Given equations

(a) (___ + ___) × 2 = 12

Formula used = Multiplication

$(3 + 3) \times 2 = 6 \times 2 = 12$

(b) 3 × (___ + 3) = 27

$3 \times (6 + 3) = 3 \times 9 = 27$

So, the blanks are (3, 3) and 6.

9. Given expressions :

(a) 24 – 12 – 6 = 18

Adding brackets → 24 – (12 – 6)

= 24 – 6 = 18

(b) 27 ÷ 3 × 2 + 2 = 20

Adding brackets → 27 ÷ 3 × (2 + 2)

= 9 × 4 = 36 (not correct)

Correct → (27 ÷ 3) × 2 + 2 = 9 × 2 + 2

= 20

So, required forms are 24 – (12 – 6) and (27 ÷ 3) × 2 + 2.

10. Given expression = A – (B – C)

Formula used

= Removing brackets → A – B + C

So, it can be written as A – B + C.

3. A Peek Beyond the Point

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Think and Discuss

1. **Given two scales :** One with only cm marks and one with smaller divisions (mm).

Reason : A scale with smaller divisions gives more precise and accurate measurements because it can measure even very small lengths.Thus, the scale with smaller divisions is more accurate for measuring screw lengths.

So, the scale with smaller divisions gives more accurate measurement.

2. Given that precise measurement means exact and accurate measurement.

Examples : Measuring medicine dose, measuring length while stitching clothes, measuring ingredients in cooking or baking. These situations need accuracy to avoid errors.

So, precise measurements are needed in medicine, stitching, and cooking.

Asscess Yourself-1

1. Do yourself.

2. Measurement of the eraser starts from 0 and ends at 2.4 units on the scale.

Measurement of the pencil starts from 0 and ends at 4.5 units on the scale.

Measurement of the small cap starts from 0 and ends at 1.4 units on the scale.

So, 2.4, 4.5, 1.4

Asscess Yourself-2

(a) $\frac{9}{10} = 0.9$

(b) $1\frac{7}{10} = 1.7$

(c) $\frac{130}{10} = 13$

(d) $30\frac{1}{10} = 13.1$

(e) $10\frac{5}{10} = 10.5$

(f) $7\frac{6}{10} = 7.6$

(g) $6\frac{7}{10} = 6.7$

(h) $\frac{4}{10} = 0.4$

So, the decreasing order is :
(d) > (c) > (e) > (f) > (g) > (b) > (a) > (h)

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Think and Discuss

1. Converting mixed numbers to improper fractions makes addition and subtraction easier because all numbers become a single fraction form.

Formula used : Mixed number to improper fraction

$$= \frac{\left(\text{Whole} \times \text{Denominator} + \text{Numerator}\right)}{\text{Denominator}}$$

So, it is useful because calculations become simple and uniform.

2. In subtraction, we need to borrow from the whole number when the numerator of the first number is smaller than the numerator of the second number.

Formula used : Borrowing $\rightarrow$

$$1 \text{ whole} = \frac{\text{Denominator}}{\text{Denominator}}$$

So, borrowing is needed when the top numerator is smaller than the bottom numerator.

Asscess Yourself-3

1. Given sequence is

$$4,\ 4\frac{3}{10},\ 4\frac{6}{10}.$$

$$\text{Difference} = 4\frac{3}{10} - 4\frac{6}{10}$$

$$= \frac{3}{10}$$

The change is an increase of $\frac{3}{10}$ after each term.

Pattern follows the formula :

$$\text{Next term} = \text{Previous term} + \frac{3}{10}.$$

$$\text{Next term} = 4\frac{6}{10} + \frac{3}{10} = 4\frac{6}{10}.$$

So, $4\frac{9}{10}$.

2. Given sequence is

$$8\frac{2}{10},\ 8\frac{7}{10},\ 9\frac{2}{10}.$$

$$\text{Difference} = 8\frac{7}{10} - 8\frac{7}{10} = \frac{5}{10}$$

The change is an increase of $\frac{5}{10}$ after each term.

$$\text{Next term} = 9\frac{2}{10} + \frac{5}{10} = 9\frac{7}{10}.$$

So, $9\frac{7}{10}$.

3. Given sequence is $7\frac{6}{10}, 8\frac{7}{10}$.

Difference $= 8\frac{7}{10} - 7\frac{6}{10} = 1\frac{1}{10}$

The change is an increase of $1\frac{1}{10}$ after each term.

Next term $= 8\frac{7}{10} + 1\frac{1}{10} = 9\frac{8}{10}$.

So, $9\frac{8}{10}$.

4. Given sequence is $5\frac{7}{10}, 5\frac{3}{10}$.

Difference $= 5\frac{3}{10} - 5\frac{7}{10}$

$= -\frac{4}{10}$

The change is a decrease of $\frac{4}{10}$ after each term.

Pattern follows the formula :

Next term = Previous term $-\frac{4}{10}$.

Next term $= 5\frac{3}{10} - \frac{5}{10} = 4\frac{9}{10}$.

So, $4\frac{9}{10}$.

5. Given sequence is

$13\frac{5}{10}, 13, 12\frac{5}{10}$.

Difference $= 13 - 13\frac{5}{10}$

The change is a decrease of $\frac{5}{10}$ after each term.

Next term $= 12\frac{5}{10} - \frac{5}{10} = 12$.

So, 12.

6. Given sequence is

$11\frac{5}{10}, 10\frac{4}{10}, 9\frac{3}{10}$.

Difference $= 13 - 10\frac{4}{10} - 11\frac{5}{10}$

$= 1\frac{1}{10}$

The change is a decrease of 1 $\frac{1}{10}$ after each term.

Next term $= 9\frac{3}{10} - 1\frac{1}{10} = 8\frac{2}{10}$.

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Think and Discuss

1. Given that tenths represent parts up to $\frac{1}{10}$.

Tenths $= \frac{1}{10} = 0.1$

Hundredths $= \frac{1}{100} = 0.01$

Since $\frac{1}{100} < \frac{1}{10}$, hundredths help to show smaller and more accurate values.

So, we need hundredths to represent smaller parts more precisely.

So, hundredths are needed to show smaller and more accurate values than tenths.

2. Given that we need examples measured in hundredths.

Length of a pencil (in cm up to 0.01), Height of a person (in metres like 1.75 m)

Money (like ₹ 10.25), Weight (like 2.35 kg), Temperature (like 36.75°C)

So, these objects are commonly measured in hundredths.

So, five objects are pencil length, height, money, weight, and temperature.

Asscess Yourself-4

1. Given values : $\frac{3}{10}$, $\frac{3}{100}$, $\frac{33}{100}$

$\frac{3}{10} = 0.3$, $\frac{3}{100} = 0.03$, $\frac{33}{100} = 0.33$

Comparing decimals :

$0.33 > 0.3 > 0.03$

So, longest length is $\frac{33}{100}$ and shortest length is $\frac{3}{100}$.

2. Given values : $3\frac{1}{10}$, $\frac{30}{10}$, $1\frac{3}{10}$

$3\frac{1}{10} = 3.1$, $\frac{30}{10} = 3$, $1\frac{3}{10} = 1.3$

Comparing decimals :

$3.1 > 3 > 1.3$

So, longest length is $3\ \frac{1}{10}$ and shortest length is $1\frac{3}{10}$.

3. Given values :

$\frac{45}{100}$, $\frac{54}{100}$, $\frac{5}{10}$, $\frac{4}{10}$

$\frac{45}{100} = 0.45$, $\frac{54}{100} = 0.54$, $\frac{5}{10} = 0.5$,

$\frac{4}{10} = 0.4$

Comparing decimals :

$0.54 > 0.5 > 0.45 > 0.4$

So, longest length is $\frac{54}{100}$ and shortest length is $\frac{4}{10}$.

4. Given values :

$3\frac{6}{10}$, $3\frac{6}{100}$, $3\frac{6}{10}$, $\frac{6}{100}$

3. $3\frac{6}{10} = 3.6$, $3\frac{6}{100} = 3.06$,

$3\frac{6}{10}\ \frac{6}{100} = 3.66$

Comparing decimals :

$3.66 > 3.6 > 3.06$

So, longest length is $3\frac{6}{10}\ \frac{6}{100}$ and shortest length is $3\frac{6}{100}$.

5. Given values :

$\frac{8}{10}\ \frac{2}{100}$, $\frac{9}{100}$, $1\frac{8}{100}$

$\frac{8}{10}\ \frac{2}{100} = 0.82$, $\frac{9}{100} = 0.09$,

$1\frac{8}{100} = 1.08$

Comparing decimals :

$1.08 > 0.8 > 0.09 > 0.02$

So, longest length is $1\frac{8}{100}$ and shortest length is $\frac{9}{100}$.

6. Given value :

$$7\frac{3}{10}\frac{5}{100},\ 7\frac{5}{10},\ 7\frac{41}{100}$$

$7\frac{3}{10}\frac{5}{100} = 7.35,\quad 7\frac{5}{10} = 0.75,$

$7\frac{41}{100} = 7.41$

Comparing decimals :

$7.41 > 7.35 > 0.75$

So, longest length is and $7\frac{41}{100}$ shortest length is $7\frac{5}{10}$.

7. Given values :

$$\frac{65}{10}\frac{15}{100},\ 5\frac{87}{100},\ 5\frac{7}{100}$$

$\frac{65}{10}\frac{15}{100} = 6.65,\ 5\frac{87}{100} = 5.87,$

$5\frac{7}{100} = 5.07$

Comparing decimals :

$6.65 > 5.87 > 5.07$

So, longest length is $\frac{65}{10}\frac{15}{100}$ and shortest length is $5\frac{7}{100}$.

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Think and Discuss

1. Given that a unit can be divided into equal parts.

Using formula : Fraction = number of equal parts of a whole.

If a unit is divided into 4 equal parts, each part $= \frac{1}{4}$

So division into 4 equal parts is possible.

So, a unit can be divided into 4 equal parts and each part is $\frac{1}{4}$.

2. Given that a unit can be divided into any number of equal parts.

If divided into 5 equal parts, each part $= \frac{1}{5}$

If divided into 8 equal parts, each part $= \frac{1}{8}$

So division into 5 or 8 equal parts is also possible.

So, a unit can be divided into 5 or 8 equal parts and each part is $\frac{1}{5}$ and $\frac{1}{8}$.

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Think and Discuss

1. The decimal system is more convenient because it is based on powers of ten, making multiplication and division as simple as moving the decimal point. It provides a uniform way to represent both very large whole numbers and very small fractions using the same set of ten digits.

2. Our place value system helps because each position to the left is ten times greater than the one to its right, allowing us to use a

small set of digits to represent any value. By grouping digits into periods like thousands or millions, we can organize and communicate massive quantities systematically.

Given the decimal system is based on the base-10 number system.

We use the formula :

Value = Digit × Place Value.

Calculations are simplified because every step is a multiple of 10.

Reading large numbers is easier because place names repeat in a consistent pattern.

So, 10.

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Think and Discuss

1. Given that place value system is based on base 10.

   Using formula :

   Place value = digit × 10^n

   Each place is multiplied by 10 when moving left, so tens

   = 10 × ones, hundreds

   = 10 × tens.

   Thus each place value is 10 times the one to its right.

   So, each place value is 10 times the one to its right because the system is based on powers of 10.

2. Given that unit conversion follows powers of 10.

   Using formula :

   Conversion using ×10 or ÷10

   For example, 1 m = 100 cm = 10 × 10 cm, so shifting decimal helps convert units easily.

   This pattern makes conversion quick and accurate.

   So, the pattern helps in converting units by using multiplication or division by 10.

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Think and Discuss

1. The decimal point is called a "point" because it acts as a specific marker or separator that distinguishes the whole number part from the fractional part. It marks the exact position where the place values change from ones to tenths.
2. Without decimal points, we would struggle to represent and calculate values between whole numbers accurately. We would have to rely on complex fractions for every small measurement, making everyday tasks like pricing, engineering, and scientific recording much more difficult and prone to error.

Asscess Yourself-5

1. Given values are quantities to be written in decimal form using place values.

   Using formula :

   Decimal = (Hundreds × 100)
   + (Tens × 10) + (Ones × 1)
   + (Tenths × 0.1)
   + (Hundredths × 0.01)
   + (Thousandths × 0.001)

(a) 2 ones, 3 tenths, and 5 hundredths
$= 2 + 0.3 + 0.05 = 2.35$

(b) 1 ten and 5 tenths
$= 10 + 0.5 = 10.5$

(c) 4 ones and 6 hundredths
$= 4 + 0.06 = 4.06$

(d) 1 hundred, 1 one, and 1 hundredth $= 100 + 1 + 0.01$
$= 101.01$

(e) $\frac{8}{100}$ and $\frac{9}{10} = 0.08 + 0.9 = 0.98$

(f) $\frac{5}{10} = 0.05$

(g) $\frac{1}{10} = 0.1$

(h) $2\frac{1}{100} = 2.01$, $4\frac{1}{10} = 4.1$,
and $7\frac{7}{1000} = 7.007$

2. (a) 234 hundredths $= \frac{234}{100}$
$= 2.34$

(b) 105 tenths $= \frac{105}{10} = 10.5$

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Think and Discuss

1. Different units for length are necessary because the objects we measure vary greatly in size, from tiny insects to entire planets. Using a single unit would lead to numbers that are either too large or too small to read or understand easily, so we choose units like millimeters, centimeters, or kilometers to keep measurements practical and manageable.

2. We use millimeters instead of centimeters when we need extreme precision or when measuring very small items where a tenth of a centimeter makes a significant difference. Common examples include measuring the thickness of a credit card, the size of a small screw, or the lead in a mechanical pencil.

Asscess Yourself-6

Given values are measurements in mm, cm, m, g, kg, and paise.
We use the formula :
1 cm = 10 mm, 1 m = 100 cm, 1 kg = 1000 g, and ₹ 1 = 100 p.

1. (a) 18 mm = 1.8 cm
(b) 64 mm = 6.4 cm
(c) 85 mm = 8.5 cm
(d) 7 mm = 0.7 cm
(e) 32 mm = 3.2 cm
(f) 245 mm = 24.5 cm.

2. (a) 42 cm = 0.42 m
(b) 75 cm = 0.75 m
(c) 63 cm = 0.63 m
(d) 8 cm = 0.08 m
(e) 285 cm = 2.85 m
(f) 345 cm = 3.45 m.

3. (a) 528 g = 0.528 kg
(b) 74 g = 0.074 kg
(c) 1825 g = 1.825 kg
(d) 609 g = 0.609 kg
(e) 840 g = 0.84 kg
(f) 1600 g = 1.6 kg.

4. (a) 25 p = ₹ 0.25 (b) 8 p = ₹ 0.08
(c) 42 p = ₹ 0.42 (d) 50 p = ₹ 0.50
(e) 88 p = ₹ 0.88 (f) 375 p = ₹ 3.75.

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Think and Discuss

1. Using a magnifying glass is similar to the decimal system because it allows us to look "inside" a unit to see smaller details that were previously hidden. Just as a lens zooms in on a small object to show its parts, adding decimal places like tenths and hundredths zooms in on a whole number to show its fractional parts.
2. Real-life situations involving the "zooming" concept include using Google Maps to see streets within a city, zooming into a digital photo to see individual pixels, or using a microscope to observe cells within a leaf.

Asscess Yourself-7

1. Given 1.1, 0.97, and 1.069 to compare with 1.07.
   We use the formula :
   Difference = $|\text{Value}_1 - \text{Value}_2|$.
   Differences are $|1.1 - 1.07| = 0.03$,
   $|0.97 - 1.07| = 0.1$,
   and $|1.069 - 1.07| = 0.001$.
   The smallest difference 0.001 identifies the closest number.
   So, 1.069.
2. Given values are 4.67, 4.76, and 4.099 to compare with 5.
   Differences are $|4.67 - 5| = 0.33$, $|4.76 - 5| = 0.24$, and $|4.099 - 5| = 0.901$.
   The smallest difference 0.24 identifies the closest number.
   So, 4.76.
3. Given values are 1.9, 1.79, and 2.09 to compare with 2.
   Differences are $|1.9 - 2| = 0.1$, $|1.79 - 2| = 0.21$, and $|2.09 - 2| = 0.09$.
   The smallest difference 0.09 identifies the closest number.
   So, 2.09.
4. Given digits are 3, 1, 7, 2, and 6 to form a number close to 35.
   To be closest to 35, the whole number should be 36 or 32, and 36.127 is closer to 35 than 32.761.
   The difference $|36.127 - 35| = 1.127$ is the smallest possible gap using these digits.
   So, 36.127.

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Think and Discuss

1. It is important to align decimal points to ensure that digits with the same place value are added or subtracted together, such as tenths with tenths and ones with ones. Aligning the points prevents errors where a tenth might be incorrectly subtracted from a hundredth, maintaining the mathematical integrity of the base-10 system.
2. Borrowing in decimal subtraction is exactly like whole number subtraction because each place value is ten times smaller than the one to its left. When we "borrow" from the tenths place to help the hundredths place, we are

simply taking one group of ten smaller parts, just as we take one ten to help the ones place in whole numbers.

Asscess Yourself-8

1. Given values are 24.36 and 15.79.

Formula : Sum = $a + b$.

The addition of 24.36 + 15.79 results is 40.15.

So, the sum is 40.15.

2. Given values are 8.456 and 3.789.

Formula : Sum = $a + b$.

The addition of 8.456 + 3.789 results is 12.245.

So, the sum is 12.245.

3. Given values are 125.80 and 89.65.

Formula : Sum = $a + b$.

The addition of 125.80 + 89.65 results is 215.45.

So, the sum is 215.45.

4. Given values are 45.82 and 23.47.

Formula : Difference = $a - b$.

The subtraction of 45.82 - 23.47 results in 22.35.

So, the difference is 22.35.

5. Given values are 9.635 and 4.788.

Formula : Difference = $a - b$.

The subtraction of 9.635 – 4.788 results in 4.847.

So, the difference is 4.847.

6. Given values are 156.40 and 89.75.

Formula : Difference = $a - b$.

The subtraction of 156.40 – 89.75 results in 66.65.

So, the difference is 66.65.

7. Given values are 235.75 and 28.50.

Formula :

Total Spend = Price of book + price of Pen.

The calculation 235.75 + 28.50 results in 264.25.

So, the total amount spent is 264.25.

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Think and Discuss

1. Given value : Recognizing patterns in numbers.

Recognizing patterns helps us to quickly understand how numbers change, so we can do calculations faster without writing everything.

For example :

2, 4, 6, 8, 10 → pattern is +2

So next number = 10 + 2 = 12

By seeing the pattern, we can mentally add, subtract, or multiply easily without long calculations.

So, recognizing patterns helps to do calculations quickly and easily in mental math.

2. Given value : Sequence increases by 0.25 each time.

Start with any number, for example 1

1 + 0.25 = 1.25

1.25 + 0.25 = 1.50

1.50 + 0.25 = 1.75

1.75 + 0.25 = 2.00

Sequence : 1, 1.25, 1.50, 1.75, 2.00

Formula used :

Next term = Previous term + 0.25

So, the required sequence is 1, 1.25, 1.50, 1.75, 2.00.

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Think and Discuss

1. Estimation is more useful than exact calculation when shopping to stay within a budget or when checking if a total amount is reasonable.

   It allows for quick decision-making in real-life situations where precise accuracy is not required.

   Recognizing approximate values helps in verifying that a final answer is in the correct range.

2. Given values = two decimal numbers

   Round each decimal number to the nearest whole number or compatible number.

   Multiply the rounded whole numbers to find the estimated product.

   Formula used :

   Estimated Product

   = Rounded Number 1

   × Rounded Number 2.

   So, if the numbers are 4.8 and 3.2, the estimated product is $5 \times 3 = 15$.

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Think and Discuss

1. Given : Decimal errors in calculations.

Decimal errors are common because we sometimes forget the correct place value of digits.

For example : 3.5 + 2.45

If decimals are not aligned properly, we may get wrong answer.

Also, confusion in placing decimal point after multiplication or division causes mistakes.

So, decimal errors are common due to confusion in place value and incorrect placement of decimal point.

2. Given value : Precautions to avoid decimal mistakes.

Write numbers in proper place value form and align decimal points correctly.

Example : 3.50 + 2.45= 5.95

Check decimal position after multiplication and division carefully.

Recheck the answer to ensure decimal point is in correct place.

So, by aligning decimals properly and checking place value, we can avoid decimal mistakes.

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Think and Discuss

1. Different fields use decimal-like notations differently because they represent different meanings.

For example : In mathematics, 2.5 means a number between 2 and 3

In money, 2.50 means 2 rupees and 50 paise

In measurement, 2.5 m means length

So, the same decimal form is used for different purposes in different fields.

So, different fields use decimal-like notations differently because their meanings and uses are different.

2. Always check the unit or context before using decimals.

For example : 2.5 can mean number, rupees, or meters depending on situation

Write units clearly like ₹, m, kg, etc.

Follow proper place value and write decimals carefully

So, by checking units and context, we can avoid confusion in decimal notation.

'Figue it Out' Exercise

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1. **(a)** Given value : $\frac{3}{10}+3\frac{4}{100}$

$$\frac{3}{10}=\frac{30}{100}=3+\frac{30}{100}+\frac{4}{100}$$

$$=3+\frac{34}{100}=3\frac{34}{100}$$

So, the sum is $3\frac{34}{100}$.

(b) Given value :

$9\frac{5}{10}\frac{7}{100}+2\frac{1}{10}\frac{3}{100}$

$\frac{5}{10}=\frac{50}{100}$ and $\frac{1}{10}=\frac{10}{100}$

$= (9 + 2)$

$$+\left(\frac{50}{100}+\frac{10}{100}\right)+\left(\frac{7}{100}+\frac{3}{100}\right)$$

$$=11+\frac{60}{100}+\frac{10}{100}$$

$$=11+\frac{70}{100}=11\frac{70}{100}.$$

So, the sum is $11\frac{70}{100}$.

(c) Given value :

$15\frac{6}{10}\frac{4}{100}+14\frac{3}{10}\frac{6}{100}$

$\frac{6}{10}=\frac{60}{100}$ and $\frac{3}{10}=\frac{30}{100}$

$= (15 + 14)$

$$+\left(\frac{60}{100}+\frac{30}{100}\right)+\left(\frac{4}{100}+\frac{6}{100}\right)$$

$$=29+\frac{90}{100}+\frac{10}{100}$$

$$=29+\frac{100}{100}=30$$

So, the sum is 30.

(d) Given value : $7\frac{7}{100}-4\frac{4}{100}$

$$=(7-4)+\left(\frac{7}{100}-\frac{4}{100}\right)$$

$$=3+\frac{3}{100}=3\frac{3}{100}$$

So, the difference is $3\frac{3}{100}$.

(e) Given value : $8\frac{6}{100}-5\frac{3}{100}$

$$=(8-5)+\left(\frac{6}{100}-\frac{3}{100}\right)$$

$$=3+\frac{3}{100}=3\frac{3}{100}$$

So, the difference is $3\frac{3}{100}$.

(f) Given value :

$$12\frac{6}{100}\frac{2}{100}-\frac{9}{10}\frac{9}{100}$$

$$\frac{6}{100}+\frac{2}{100}=\frac{8}{100}$$

and $\frac{9}{10}=\frac{90}{100}=12\frac{8}{100}-\frac{99}{100}$

$$=11\frac{108}{100}-\frac{99}{100}=\left(\frac{108}{100}-\frac{99}{100}\right)$$

$$=11+\frac{9}{100}=11\frac{9}{100}$$

So, the difference is $11\frac{9}{100}$.

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1. Given values are decimals to be added or subtracted.

We use the formula :

Sum = First number + Second number,

Difference = First number – Second number

(a) 5.3 + 2.6 = 7.9

(b) 18 + 8.8 = 26.8

(c) 2.15 + 5.26 = 7.41

(d) 9.01 + 9.10 = 18.11

(e) 29.19 + 9.91 = 39.10

(f) 0.934 + 0.6 = 1.534

(g) 0.75 + 0.03 = 0.78

(h) 6.236 + 0.487 = 6.723

2. Given values are decimals to be subtracted.

We use the formula :

Difference = First number – Second number

(a) 5.6 – 2.3 = 3.3

(b) 18 – 8.8 = 9.2

(c) 10.4 – 4.5 = 5.9

(d) 17 – 16.198 = 0.802

(e) 17 – 0.05 = 16.95

(f) 34.505 – 18.1 = 16.405

(g) 9.9 – 9.09 = 0.81

(h) 6.236 – 0.487 = 5.749

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1. Given values are fractions to be converted into decimals.

We use the formula : Decimal = Numerator ÷ Denominator

(a) 5 ÷ 100 = 0.05

(b) 16 ÷ 1000 = 0.016

(c) 12 ÷ 10 = 1.2

(d) 254 ÷ 1000 = 0.254

2. Given values are decimals to be written as sum of tenths, hundredths and thousandths.

We use the formula : Decimal = Tenths + Hundredths + Thousandths

(a) 0.34 = 3 tenths + 4 hundredths

So, the answer is 0.34.

(b) 1.02 = 1 + 2 hundredths

So, the answer is 1.02.

(c) 0.8 = 8 tenths

So, the answer is 0.8.

(d) 0.362 = 3 tenths + 6 hundredths + 2 thousandths

So, the answer is 0.362.

3. Given values 6.4, 6.5, and 6.6 on the number line.

Formula :

Interval = (Value 2 – Value 1) ÷ Number of divisions.

Each large interval (0.1) is divided into 4 small parts, so each mark represents

$0.1 \div 4 = 0.025$.

$a = 6.4 + (2 \times 0.025)$

$= 6.4 + 0.05 = 6.45$.

$b = 6.5 + (1 \times 0.025) = 6.525$.

$c = 6.5 + (2 \times 0.025) = 6.55$.

So, $a = 6.45$, $b = 6.525$, and $c = 6.55$.

4. Given values are decimals to be arranged.

We use the formula : Compare whole part first, then decimal part

(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) Given digits 1, 4, 0, 8, 6.

Formula : Closest to 30 = Find number with minimum difference from 30.

Using digits for closest value : 41.086 is too high, 18.640 is too low. The closest is 40.168.

(b) Given digits 1, 4, 0, 8, 6.

Formula : Smallest decimal between 100 and 1000 = Start with smallest non-zero digit. Smallest number : 104.68.

6. Given statement about decimals

Formula : Value depends on place value, not number of digits

So, the answer is no, a decimal with more digits is not always greater

7. Given weights in kg

Formula :

Total weight = Sum of all weights

$0.25 + 0.3 + 0.5 + 0.2 + 0.05 = 1.30$ kg

So, the answer is 1.30 kg

8. Given milk in litres

We use the formula :

Remaining = Total − First three days

$3.79 + 4.2 + 4.25 = 12.24$ L

$25 - 12.24 = 12.76$ L

So, the answer is 12.76 L

9. Given weights = 35.75 kg

Height of January to Febuary = 34.50 kg

We use the formula :

Change = First − Second

$35.75 - 34.50 = 1.25$ kg

So, the answer is Lost 1.25 kg

10. Given pattern

We use the idea : +0.9, then -0.01 alternately after jumps

Next terms : 7.0, 7.3, 7.6

11. Given conversion

We use the formula :

1 km = 1000 m and 1 m = 1000 mm

1 km = 1000000 mm

So, the answer is 1000000 mm

12. Given cost per person = ₹ 0.45

We use the formula :

Total = Number × Cost

45 paise × 100000 = 4500000 paise
= 45000 rupees

So, the answer is 45000 rupees

13. Given fractions

We use the formula : Convert to decimal

(a) $\frac{1}{10} = 0.1$ and $\frac{10}{100} = 0.10$

So, the answer is $\frac{1}{10}$

(b) $\frac{1}{100} = 0.01$ and $\frac{90}{1000} = 0.090$

So, the answer is 90 thousandths

(c) $\frac{1}{1000} = 0.001$ and $\frac{90}{100} = 0.90$

So, the answer is 90 hundredths

14. Given values are place values to be written in decimal form.

We use the formula :

(a) Decimal = (Tens × 10) + (Ones × 1) + (Tenths × 0.1) + (Hundredths × 0.01)

(b) 12 tens + 12 tenths
= (12 × 10) + (12 × 0.1)
= 120 + 1.2 = 121.2

(c) 10 tens + 10 ones + 10 tenths + 10 hundredths
= (10 × 10) + (10 × 1) + (10 × 0.1) + (10 × 0.01)
= 100 + 10 + 1 + 0.10 = 111.10

(d) 25 tens + 25 ones + 25 tenths + 25 hundredths
= (25 × 10) + (25 × 1) + (25 × 0.1) + (25 × 0.01)
= 250 + 25 + 2.5 + 0.25
= 277.75

15. Given digits 0–9 to be used once to form decimals whose sum is closest to 10.5

$$\begin{array}{r} 6.920 \\ +\ 3.581 \\ \hline 10.50 \end{array}$$

16. Given values are fractions to be converted into decimals.

We use the formula :

Decimal = Numerator ÷ Denominator

(a) $\frac{1}{2} = 0.5$

(b) $\frac{3}{2} = 1.5$

(c) $\frac{1}{4} = 0.25$

(d) $\frac{3}{4} = 0.75$

(e) $\frac{1}{5} = 0.2$

(f) $\frac{4}{5} = 0.8$

Pactice Time

Objective Questions

Multiple Choice Questions

1. (b), 2. (b), 3. (c), 4. (c), 5. (b)

Fill in the Blanks

1. 0.1 cm
2. zero point thee zero five.
3. 1 rupee **4.** 6.0 m **5.** 8 tenths

True/False

1. True **2.** False **3.** True **4.** False **5.** True

Subjective Questions :

1. Given value = 45 paise

Formula used :

1 rupee = 100 paise

45 paise = 45 ÷ 100 = 0.45 rupees

So, the value is 0.45 rupees.

2. Given values = 0.4 and 0.35

Formula used :

Compare decimals by equal places

0.4 = 0.40 and 0.35 = 0.35

0.40 > 0.35

So, 0.4 is greater.

3. Given value = 234 tenths

Formula used :

Tenths = number ÷ 10

234 ÷ 10 = 23.4

So, the decimal form is 23.4.

4. Given values = 12.5 and 8.75

Formula used :

Difference = larger − smaller

12.50 − 8.75 = 3.75

So, the difference is 3.75.

5. Given numbers = 3.01, 3.1, 3.001

Formula used :

Compare decimals place-wise

3.001 < 3.01 < 3.1

So, ascending order is 3.001, 3.01, 3.1.

6. (a) Given $= \frac{45}{100}$

Formula used : Fraction to decimal

= numerator ÷ denominator

45 ÷ 100 = 0.45

So, the decimal is 0.45.

(b) Given $= \frac{308}{1000}$

308 ÷ 1000 = 0.308

So, the decimal is 0.308.

(c) Given $= \frac{87}{10}$

87 ÷ 10 = 8.7

So, the decimal is 8.7.

(d) Given $= \frac{605}{1000}$

605 ÷ 1000 = 0.605

So, the decimal is 0.605.

7. (a) Given = 0.56

Formula used : Place value expansion

$$0.56 = \frac{5}{10} + \frac{6}{100}$$

So, the sum is $\frac{5}{10} + \frac{6}{100}$.

(b) Given = 2.307

$$2.307 = 2 + \frac{3}{10} + \frac{0}{100} + \frac{7}{1000}$$

So, the sum is $2 + \frac{3}{10} + \frac{7}{1000}$.

(c) Given = 1.8

$$1.8 = 1 + \frac{8}{10}$$

So, the sum is $1 + \frac{8}{10}$.

(d) Given = 4.025

$$4.025 = 4 + \frac{0}{10} + \frac{2}{100} + \frac{5}{1000}.$$

So, the sum is $4 + \frac{2}{100} + \frac{5}{1000}$.

8. **(a)** Given numbers

= 7.302, 7.320, 7.023, 7.203, 7.032

Formula used : Compare decimals by equal number of decimal places (add zeros if needed) and compare digit by digit from left

All have same whole part 7, so compare decimal parts :

So, ascending order is

7.023 < 7.032 < 7.203 < 7.302 < 7.320

(b) Given numbers

= 14.591, 14.095, 14.519, 14.509, 14.159

Same as (a) : 14.095 < 14.159 < 14.509 < 14.519 < 14.591

9. (a) Using digits 2, 9, 7, 1, 5

Number closest to 50 = 49.75

So, the number is 49.75.

(b) Smallest number between 10 and 100

Using smallest digits first

= 12.579

So, the number is 12.579.

10. Given values

= 0.65 + 1.25 + 0.8 + 0.15

Formula used : Addition of decimals

0.65 + 1.25 = 1.90

1.90 + 0.8 = 2.70

2.70 + 0.15 = 2.85

So, total weight is 2.85 kg.

11. Given first three days

= 4.35 + 5.4 + 3.8

= 13.55 L

Total in 6 days = 30 L

Formula used :

Remaining = total − first three days

30 − 13.55 = 16.45 L

So, milk supplied in last three days is 16.45 L.

12. Given pattern = 6.05, 6.5, 6.95, 7.4

Difference = +0.45 each time

Next terms :

7.4 + 0.45 = 7.85, 7.85 + 0.45

= 8.30, 8.30 + 0.45

= 8.75

So, the next terms are 7.85, 8.30, 8.75.

4. Expression Using Letter Number

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Think and Discuss

1. Variables make expressions short and easy instead of long sentences. They help in solving problems quickly and clearly. So, using variables is better because they make expressions simple and easy to understand.

2. Let number of students = n

So, the letter used to represent the number of students is n.

Asscess Yourself-1

1. Let Meera's presentage = m years

Formula used :

Younger age = older age − difference

Raj's age = $m - 7$

So, Raj's age is $(m - 7)$ years.

2. Given value : 1 packet = 12 biscuits, number of packets = p

Formula used :

Total = number × quantity in one packet × number of packets

Total biscuits = $12 \times p = 12p$

So, total biscuits are $12p$.

3. Given values = length = l cm, width = w cm

Formula used :

Perimeter of rectangle = $2(l + w)$

Perimeter = $2 \times (l + w)$

Formula used :

Area of rectangle = $l \times w$

Area = $l \times w$

So, perimeter is $2(l + w)$ and area is $l \times w$.

4. Given expression = $6 \times t$, number of triangles = 9

Formula used : Substitute value

$6 \times 9 = 54$

So, number of matchsticks needed is 54.

5. Given values = apples = a kg, oranges = o kg

Cost of apples = $25 \times a = 25a$

Cost of oranges = $40 \times o = 40o$

Formula used : Total cost = sum of costs

Total cost = $25a + 40o$

So, total cost is $25a + 40o$.

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Think and Discuss

1. Following order gives the correct value of an expression

Formula used : BODMAS (Bracket, Order, Division, Multiplication, Addition, Subtraction)

Without order, same numbers can give different answers

So, it is important because it ensures the correct answer every time.

2. We have to find the order of operations matters in real life.

Example : Total cost = $5 + 3 \times 10$

Correct = $5 + 30 = 35$, wrong if done $(5 + 3) \times 10 = 80$

So, order of operations matters in real life like calculating total cost in shopping.

Asscess Yourself-2

1. **(a)** Given expression

$= 32 - 15 \times 2$

Formula used : BODMAS

$= 32 - (15 \times 2) = 32 - 30 = 2$

So, the value is 2.

(b) Given expression

$= 94 + 35 - 24 + 28$

Formula used : Left to right for + and −

$= 94 + 35 = 129$

$129 - 24 = 105$

$105 + 28 = 133$

So, the value is 133.

(c) Given expression = $45 - 25 + 30$

$= 45 + 30 = 75$

$75 - 25 = 50$

So, the value is 50.

(d) Given expression

$= 38 + 22 - (12 - 9)$

$= 38 + 22 - 3$

$= 60 - 3 = 57$

So, the value is 57.

(e) Given expression

$= 75 - (25 + 17)$

$= 75 - 42 = 33$

So, the value is 33.

(f) Given expression

$= 8 \times 5 + 6 \times 7$

$= 40 + 42 = 82$

So, the value is 82.

2. Given values $= m = 6, n = 4, p = 3$

(a) $5 \times m + 2 \times n = 5 \times 6 + 2 \times 4$

$= 30 + 8 = 38$

So, the value is 38.

(b) $m \times (n + p) = 6 \times (4 + 3)$

$= 6 \times 7 = 42$

So, the value is 42.

(c) $3 \times p - n + m = 3 \times 3 - 4 + 6$

$= 9 - 4 + 6 = 11$

So, the value is 11.

(d) $(m + n) \times p = (6 + 4) \times 3$

$= 10 \times 3 = 30$

So, the value is 30.

(e) $4 \times m - 3 \times n + 2 \times p$

$= 4 \times 6 - 3 \times 4 + 2 \times 3$

$= 4 \times 6 - 3 \times 4 + 2 \times 3$

$= 24 - 12 + 6$

$= 18$

So, the value is 18.

3. The cost of 4 pens at 12 each, 3 pencils at 8 each

Formula used :

Total cost = (quantity × cost) + (quantity × cost)

Expression $= 4 \times 12 + 3 \times 8$

$= 48 + 24 = 72$

So, total cost is ₹ 72.

4. Given sides : (5 + 2), 8, (10 − 3)

Formula used :

Perimeter = sum of all sides

$= 7 + 8 + 7 = 22$

So, the perimeter is 22 cm.

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Think and Discuss

1. We have to use multiplication sign omission which is $a \times b = ab$.

Writing $2 \times x$ as $2x$ makes expressions shorter and avoids unnecessary symbols.

It helps in writing long algebraic expressions quickly so mathematicians omitted the multiplication sign to make expressions shorter and simpler.

2. It is same as above question.

Example : $5 \times x + 3 \times y$ becomes $5x + 3y$, which is easier to read so this makes algebraic expressions clear and easy to read.

Asscess Yourself-3

1. Given expression $= 8 \times x$

Formula used : $a \times b = ab$

$8 \times x = 8x$

So, the expression is $8x$.

2. Given expression $= 5 \times y + 3 \times z$

$5 \times y + 3 \times z = 5y + 3z$

So, the expression is $5y + 3z$.

3. Given expression $= 2 \times (a + b)$

$2 \times (a + b) = 2(a + b)$

So, the expression is $2(a + b)$.

4. Given expression $= m \times 4 \times n$

$m \times 4 \times n = 4mn$

So, the expression is $4mn$.

5. Given value : $p = 3$

Expression : $5p = 5 \times 3 = 15$

So, the value is 15.

6. Given values = $q = 2, r = 4$
Expression :
$3q + 2r = 3\times2 + 2\times4$
$= 6 + 8 = 14$
So, the value is 14.

7. Given values = $p = 3, q = 2$
Expression = 2(p + q)
$= 2 \times (3 + 2)$
$= 2 \times 5 = 10$
So, the value is 10.

8. Given values = $r = 4, p = 3$
Expression : $4r - p = 4\times4 - 3$
$= 16 - 3 = 13$
So, the value is 13.

9. Given value : $x = 6$
Given statement : $4x = 46$
Correct calculation :
$4x = 4 \times 6 = 24$
So, the correct value is 24.

10. Given value : $y = -2$
Given statement = $3 - y = 1$
Correct calculation :
$3 - (-2) = 3 + 2 = 5$
So, the correct value is 5.

11. Given values : $a = 3, b = 2$
Given statement = $2a + b = 8$
Correct calculation :
$2\times3 + 2 = 6 + 2 = 8$
So, the correct value is 8.

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Think and Discuss

1. Given expression = $18p + 15n$
Formula used : Like terms have same variables with same powers
$18p$ and $15n$ have different variables. (p and n), so they are unlike terms.
Unlike terms cannot be added or combined.
So, $18p + 15n$ cannot be combined into one term.

2. Given concept = Like and unlike terms
Formula used : Like terms → same variables, unlike terms → different variables.
Example : $5x + 3x + 2y$
$5x$ and $3x$ are like terms → $5x + 3x = 8x$
$2y$ is unlike term and cannot be combined with x terms.
So, the expression becomes $8x + 2y$.

Asscess Yourself-4

1. Given expression = $3x + 5x + 2x$
$= (3 + 5 + 2)x$
$= 10x$
So, the simplified expression is $10x$.

2. Given expression
$= 4a + 3b + 2a - b$
$= (4a + 2a) + (3b - b)$
$= 6a + 2b$
So, the simplified expression is $6a + 2b$.

3. Given expression = $5(2x + 3)$
Formula used : Distributive property
$a(b + c) = ab + ac$
$= 5\times2x + 5\times3 = 10x + 15$
So, the simplified expression is $10x + 15$.

4. Given expression
$= (3m + 4n) - (m + 2n)$
Formula used : Remove bracket and combine like terms
$= 3m + 4n - m - 2n$
$= (3m - m) + (4n - 2n)$
$= 2m + 2n$

So, the simplified expression is $2m + 2n$.

5. Given expression

$= 2x + 3y + 4x - y + 5$

$= (2x + 4x) + (3y - y) + 5$

$= 6x + 2y + 5$

So, the simplified expression is $6x + 2y + 5$.

6. Given expression

$= 3(p + 2q) + 2(2p - q)$

Formula used : Distributive property

$= 3p + 6q + 4p - 2q$

$= (3p + 4p) + (6q - 2q)$

$= 7p + 4q$

So, the simplified expression is $7p + 4q$.

7. Given length = $(3x + 4)$, width = 2

Formula used :

Perimeter = $2(l + w)$

Perimeter = $2[(3x + 4) + 2]$

$= 2(3x + 6) = 6x + 12$

Second method :

Perimeter = $2l + 2w$

$= 2(3x + 4) + 2 \times 2$

$= 6x + 8 + 4 = 6x + 12$

So, the simplified perimeter is 6x + 12.

8. Given cost of apple = a, orange = b

Formula used :

Total cost = sum of costs

Cost of 4 apples and 3 oranges

$= 4a + 3b$

Cost of 2 more apples and 1 more orange = $2a + b$

Total cost = $4a + 3b + 2a + b = 6a + 4b$

So, the total cost is ₹ 6a + 4b.

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Think and Discuss

Do Yourself

Asscess Yourself-5

1. Given expression = $4(x + 3)$

$= 4x + 7$

Formula used :

Distributive property

$a(b + c) = ab + ac$

$4(x + 3) = 4x + 12$

So, the correct expression is $4x + 12$.

2. Given expression = $2a + 3b$

$= 5ab$

Formula used : Like terms can be added, unlike terms cannot $2a$ and $3b$ are unlike terms, so cannot be combined

So, the correct expression is $2a + 3b$.

3. Given expression = $5 - (x - 2)$

$= 3 - x$

$5 - x + 2 = 7 - x$

So, the correct expression is $7 - x$.

4. Given expression = $3y + 2y - y$

$= 4y$

$3y + 2y - y = (3 + 2 - 1)$

$y = 4y$

So, the correct expression is $4y$.

5. Given expression

$= 2(3p + 4) - p$

$= 6p + 8 - p = 7p + 8$

$6p + 8 - p = (6p - p) + 8$

$= 5p + 8$

So, the correct expression is $5p + 8$.

6. Given expression $= x + x + x$

$= 3 + x$

$x + x + x = 3x$

So, the correct expression is $3x$.

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Think and Discuss

1. Given concept = Remainders in division

Formula used :

Remainder = number ÷ divisor

Remainders repeat after a fixed interval when dividing by the same number

This repetition helps to identify patterns in numbers.

Example : When dividing numbers by 2, remainders are 0, 1, 0, 1,… (repeating pattern)

So, remainders help us identify repeating patterns in numbers.

2. Given concept = Creating a pattern

Formula used : Pattern rule using n (term number)

Example pattern = 3, 6, 9, 12, 15,…

Rule = multiply term number by 3

Formula = $3n$

Check : $n = 1 \rightarrow 3$, $n = 2 \rightarrow 6$, $n = 3 \rightarrow 9$

So, the formula for the pattern is $3n$.

Asscess Yourself-6

1. The cost of millet paratha = 25, cost of biryani = ₹ 35, plates = p and q

Formula used :

Total amount = (cost × quantity) + (cost × quantity)

Total $= 25p + 35q$

So, the correct expression is

(a) $25p + 35q$.

2. Customers purchased $= a$ (roses), b (tulips), c (both)

Formula used :

Total customers = sum of all

Total badges $= a + b + c$

So, the correct expression is $a + b + c$.

3. **(a)** A sanial climbs upward = m, downward = n, days = 8

Formula used :

Net climb per day $= m - n$

Total climb $= 8 \times (m - n)$

So, the expression is $8(m - n)$.

(b) Given condition $= n > m$

Formula used : If downward > upward, net movement is negative

So, the snail moves downward overall.

4. She cycles in first week = 6 km, increase distance = r km per week, weeks = 4

Distances = $6, 6 + r, 6 + 2r, 6 + 3r$

Formula used : Total = sum of all weeks

Total $= 6 + (6 + r) + (6 + 2r) + (6 + 3r)$

$= 24 + 6r$

So, the total distance is $24 + 6r$ km.

'Figure it Out' Exercise

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1. **(a)** Given value :

Let each side of triangle $= a$

Formula used :

Perimeter = sum of all sides

Perimeter $= a + a + a$

$= 3 \times a = 3a$

(b) Given value : Let each side of regular pentagon = a

Perimeter = $5 \times a = 5a$

(c) Given value : Let each side of regular hexagon = a

Formula used :

Perimeter = number of sides × side length

Perimeter = $6 \times a = 6a$

2. Given value : Length of first pipe = 20 m, let the length of second pipe = k m

Formula used :

Total length = sum of lengths

Total length = $20 + k$

So, the combined length of the pipe is $(20 + k)$ m.

3. Given value : ₹ 100 notes = 3, ₹ 20 notes = 5, ₹ 5 notes = 6

Formula used :

Total amount = (number × value) + (number × value) + (number × value)

Total amount = $3 \times 100 + 5 \times 20 + 6 \times 5$

$= 300 + 100 + 30 = 430$

So, the total amount is 430 rupees.

Given value : Total expression $= 6 \times 100 + 4 \times 20 + 3 \times 5 = 695$

Find numbers of notes

$6 \times 100 = 600$, $4 \times 20 = 80$, $3 \times 5 = 15$

Total = $600 + 80 + 15 = 695$

So, ₹ 100 notes = 6, ₹ 20 notes = 4, ₹ 5 notes = 3

So, the numbers of notes are 6, 4 and 3.

Given value : ₹ 100 notes = 8, ₹ 20 notes = 4, ₹ 5 notes = z

Formula used :

Total amount

$= 8 \times 100 + 4 \times 20 + z \times 5$

$= 800 + 80 + 5z$

$= 880 + 5z$

So, the total amount is $(880 + 5z)$ rupees.

Given value : ₹ 100 notes = x, ₹ 20 notes = y, ₹ 5 notes = z

Formula used :

Total amount = $x \times 100 + y \times 20 + z \times 5$

$= 100x + 20y + 5z$

4. Given : Starting time = 10 seconds, grinding time per kg = 8 seconds, quantity = y kg

Formula used : Total time = fixed time + (time per kg × quantity)

Total time = $10 + 8 \times y$

So, the correct expression is (d) $10 + 8 \times y$.

5. Given value :

Let the number = n

(a) Expression = $n + 5$

So, the expression is $n + 5$.

(b) Expression = $n - 4$

So, the expression is $n - 4$.

(c) Expression = $13 \times n - 2$

So, the expression is $13n - 2$.

(d) Expression = $2 \times n - 13$

So, the expression is $2n - 13$.

6. (a) Given value :

Expression = $8 \times x + 3 \times y$

Situation : Cost of 8 items each costing x rupees and 3 items each costing y rupees

So, the situation is total cost of two types of items.

(b) Given value :

Expression = $15 \times j - 2 \times k$

Situation : Money earned from selling 15 items at j rupees each and spending on 2 items at k rupees each

So, the situation is total money left after spending.

7. Given value : Bottom middle cell = w

In a calendar, numbers increase by +1 horizontally and +7 vertically

Top left = (w-15)

Top middle = (w-14)

Top right = (w-13)

middle = $w - 7$

Middle left = $(w - 7) - 1 = w - 8$

Middle right = $(w - 7) + 1$
$= w - 6$

Bottom left = $w - 1$

Bottom right = $w + 1$

So, the expressions are $w-8, w-7, w - 6, w - 15, w - 14, w - 13, w - 1, w, w + 1$.

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(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

$(4 \times 2p) + (4 \times 3q) + 2 \times (-2) + 2 \times 3$
$= 8p + 12q - 4 + 6$
$= 8p + 12q + 2$

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

$(12 \times 5k) + 4 \times (-5g) = 60k - 20g$

In each case, we get same result.

2. (a) Given value : $p + p + p + p$

Formula used : Combine like terms = $4p$

So, the simplified expression is $4p$.

Given value :

$p + p + p + q = 3p + q$

So, the simplified expression is $3p + q$.

Given value : $p + q + p - q$
$= p + p + q - q = 2p$

So, the simplified expression is $2p$.

(b) Given value : $p - q + p - q$

$= p + p - q - q = 2p - 2q$

So, the simplified expression is $2p - 2q$.

Given value :

$p + q - p + q = p - p + q + q$

$= 2q$

So, the simplified expression is $2q$.

(c) Given value : $p + q - (p + q)$

Formula used : Remove bracket and combine like terms

$= p + q - p - q = 0$

So, the simplified expression is 0.

Given value :

$p - q - p - q = p - p - q - q = -2q$

So, the simplified expression is $-2q$.

(d) Given value :

$2d - d - d - d = 2d - 3d = -d$

So, the simplified expression is $-d$.

Given value :

$2d - d - d - c = 2d - 2d - c = -c$

So, the simplified expression is $-c$.

(e) Given value : $2d - d - (d - c)$

Formula used : Remove bracket and combine like terms

$= 2d - d - d + c = c$

So, the simplified expression is c.

Given value :

$2d - (d - d) - c = 2d - 0 - c$

$= 2d - c$

So, the simplified expression is $2d - c$.

(f) Given value :

$2d - d - c - c = d - 2c$

So, the simplified expression is $d - 2c$.

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1. Given value :Cost of 1 Jowar roti = ₹ 30, cost of 1 plate of Pulao = 20, number of plates = x and y

Formula used :

Total amount = (cost × quantity) + (cost × quantity)

Total amount = $30 \times x + 20 \times y$

$= 30x + 20y$

So, the correct expression is $30x + 20y$.

2. Given value : Customers = p (champak), q (marigold), r (both)

Formula used :

Total customers = sum of all customers

Total customers = $p + q + r$

So, the number of flags given away is $p + q + r$.

3. (a) Given value :

Upward movement = u cm,

Downward movement = d cm,

days = 10

Formula used :

Net movement per day = $u - d$

Total movement = $10 \times (u - d)$

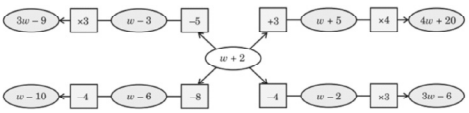
So, the expression is $10(u - d)$.

(b) Given value : $d > u$

If downward movement is greater than upward movement, then net movement is negative. So, the snail goes downward and cannot climb up.

4. Given value : First week distance per day = 5 km, increase per week = z km, total weeks = 3
Week 1 daily = 5, Week 2 daily = $5 + z$, Week 3 daily = $5 + 2z$
Formula used :
Total distance = 7 × (sum of daily distances of each week)
Total distance
$= 7 \times (5 + (5 + z) + (5 + 2z))$
$= 7 \times (15 + 3z) = 105 + 21z$
So, the total distance cycled is $105 + 21z$ km.

5.



6. (a) Given value : $t = 4$ minutes, 4 intervals between stations, 3 stops of 2 minutes each
Formula used :
Total time = travel time + stopping time
Total time $= 4 \times t + 3 \times 2$
$= 4 \times 4 + 6$
$= 16 + 6 = 22$
So, the time taken is 22 minutes.

(b) Given value : Time between stations = t, total intervals = 4, stops = 3
Total time $= 4t + 3 \times 2$
$= 4t + 6$
So, the expression is $4t + 6$.

7. (a) Given value :
$3a + 9b - 6 + 8a - 4b - 7a + 16$
$= (3a + 8a - 7a) + (9b - 4b) + (-6 + 16)$
$= 4a + 5b + 10$
So, the simplified expression is $4a + 5b + 10$.

(b) Given value :
$3(3a - 3b) - 8a - 4b - 16$
Formula used : Distributive property and combine like terms
$= 9a - 9b - 8a - 4b - 16$
$= a - 13b - 16$
So, the simplified expression is $a - 13b - 16$.

(c) Given value :
$2(2x - 3) + 8x + 12$
$= 4x - 6 + 8x + 12$
$= 12x + 6$
So, the simplified expression is $12x + 6$.

(d) Given value : $8x - (2x - 3) + 12$
$= 8x - 2x + 3 + 12 = 6x + 15$
So, the simplified expression is $6x + 15$.

(e) Given value : $8h - (5 + 7h) + 9$
$= 8h - 5 - 7h + 9$
$= h + 4$
So, the simplified expression is $h + 4$.

(f) Given value :
$23 + 4(6m - 3n) - 8n - 3m - 18$
$= 23 + 24m - 12n - 8n - 3m - 18$
$= 21m - 20n + 5$
So, the simplified expression is $21m - 20n + 5$.

8. (a) Given value :
$(4d - 7c + 9) + (8c - 11 + 9d)$
$= 4d + 9d - 7c + 8c + 9 - 11$
$= 13d + c - 2$
So, the result is $13d + c - 2$.

(b) Given value :
$(-6f + 19 - 8s) + (-23 + 13f + 12s)$
$= -6f + 13f - 8s + 12s + 19 - 23$
$= 7f + 4s - 4$
So, the result is 7f + 4s - 4.

(c) Given value :

$(8d - 14c + 9) + (6c - (11 + 9d))$

$= 8d - 14c + 9 + 6c - 11 - 9d$

$= -d - 8c - 2$

So, the result is $-d - 8c - 2$.

(d) Given value :

$(6f - 20 + 8s) + (23 - 13f - 12s)$

$= 6f - 13f + 8s - 12s - 20 + 23$

$= -7f - 4s + 3$

So, the result is $-7f - 4s + 3$.

(e) Given value :

$(13m - 12n) + (12n - 13m)$

$= 13m - 13m - 12n + 12n = 0$

So, the result is 0.

(f) Given value :

$(-26m + 24n) + (26m - 24n)$

$= -26m + 26m + 24n - 24n = 0$

So, the result is 0.

9. (a) Given value :

$(6a + 9b - 18) - (9a - 6b + 14)$

$= 6a + 9b - 18 - 9a + 6b - 14$

$= -3a + 15b - 32$

So, the result is $-3a + 15b - 32$.

(b) Given value :

$(7y - 10 + 3x) - (-15x - 13 - 9y)$

$= 7y - 10 + 3x + 15x + 13 + 9y$

$= 18x + 16y + 3$

So, the result is $18x + 16y + 3$.

(c) Given value :

$(11 - 10g + 3h) - (17g + 9 - 7h)$

$= 11 - 10g + 3h - 17g - 9 + 7h$

$= -27g + 10h + 2$

So, the result is $-27g + 10h + 2$.

(d) Given value :

$(6a - (9b + 18)) - (9a - 6b + 14)$

$= 6a - 9b - 18 - 9a + 6b - 14$

$= -3a - 3b - 32$

So, the result is $-3a - 3b - 32$.

(e) Given value :

$(-3y + 8 - 3x) - (10x + 2 + 10y)$

$= -3y + 8 - 3x - 10x - 2 - 10y$

$= -13x - 13y + 6$

So, the result is $-13x - 13y + 6$.

(f) Given value :

$(7h - 8g + 20) - (8g + 4h - 10)$

$= 7h - 8g + 20 - 8g - 4h + 10$

$= 3h - 16g + 30$

So, the result is $3h - 16g + 30$.

10. (a) Given value : $8x + 3y$

Situation : Cost of 8 items each costing x rupees and 3 items each costing y rupees

So, the situation is total cost of two types of items.

(b) Given value : $15x - 2x = 13x$

Situation : Total items $15x$ and $2x$ items removed

So, the $13x$ is remaining quantity after removing $2x$ items.

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

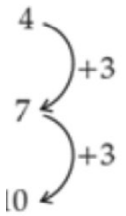
$= 10 + 2 = 12$

So, 12

12. Give,

To make 1 square, required number of matchsticks

= To make 2 squares, required number of matchsticks



= To make 3 squares, required number of matchsticks

= Let the number of squares be x the number of matchsticks required

$= 3x + 1$

where $x = 1, 2, 3, \ldots\ldots$.

If $x = 10$ then umber of matchsticks required for 10 squares $= 3 \times 10 + 1$

$= 30 + 1 = 31$

Also, number of matchsticks require for w squares $= 3w + 1$

13. Given value : Colour pattern = Red, Yellow, Green, Yellow (repeats every 4)

Positions : 1 → Red, 2 → Yellow, 3 → Green, 4 → Yellow

Formula used : Position ÷ 4 and check remainder

Position 90 : 90 ÷ 4 leaves remainder 2 → Yellow

So, the colour at position 90 is Yellow.

Position 190 :190 ÷ 4 leaves remainder 2 → Yellow

So, the colour at position 190 is Yellow.

Position 343 :343 ÷ 4 leaves remainder 3 → Green

So, the colour at position 343 is Green.

Expressions : Red occurs at positions

$= 4n + 1$

Yellow occurs at positions

$= 4n + 2$ and $4n$

Green occurs at positions

$= 4n + 3$

So, the expressions are Red → $4n + 1$, Yellow → $4n + 2$ or $4n$, Green → $4n + 3$.

14. Given value : Step 1 = 5 squares, Step 2 = 9 squares, Step 3 = 13 squares

Formula used : Pattern increases by 4 each step (Arithmetic sequence)

General formula

$= 5 + (n - 1) \times 4$

$= 5 + 4n - 4 = 4n + 1$

Step 4 : Number of squares

$= 4 \times 4 + 1 = 17$

So, the number of squares in Step 4 is 17.

Step 10 : Number of squares

$= 4 \times 10 + 1 = 41$

So, the number of squares in Step 10 is 41.

Step 50 : Number of squares

$= 4 \times 50 + 1 = 201$

So, the number of squares in Step 50 is 201.

Vertices : Given value : Each square has 4 vertices

Formula used : Total vertices

= number of squares × 4

Total vertices $= (4n + 1) \times 4$

$= 16n + 4$

So, the formula for number of vertices is $16n + 4$.

15. (a) Given value : Numbers increase by 4 in each column

Formula used : Column number = starting value + $4(n - 1)$

Column 1 :

1, 5, 9, 13 … $\rightarrow 1 + 4(n - 1) = 4n - 3$

So, the expression is $4n - 3$.

Column 2 :

2, 6, 10, 14 … $\rightarrow 2 + 4(n - 1) = 4n - 2$

So, the expression is $4n - 2$.

Column 3 :

3, 7, 11, 15 … $\rightarrow 3 + 4(n - 1) = 4n - 1$

So, the expression is $4n - 1$.

Column 4 :

4, 8, 12, 16 … $\rightarrow 4 + 4(n - 1) = 4n$

So, the expression is $4n$.

(b) Given value :

Row = number ÷ 4 (ceiling value),

Column = remainder

(i) 124

124 ÷ 4 = 31 remainder 0 → row = 31, column = 4

So, 124 appears in row 31 and column 4.

(ii) 147

147 ÷ 4 = 36 remainder 3 → row = 37, column = 3

So, 147 appears in row 37 and column 3.

(iii) 201

201 ÷ 4 = 50 remainder 1 → row = 51, column = 1

So, 201 appears in row 51 and column 1.

(c) Given value : Row = r, Column = c

Formula used :

Number = $4(r - 1) + c$

So, the number is $4(r - 1) + c$.

(d) Given value :

Multiples of 3 = 3, 6, 9, 12, 15 …

Observation : They appear in columns 3, 2, 1, 4 repeatedly

So, multiples of 3 shift columns in a pattern ($3 \rightarrow 2 \rightarrow 1 \rightarrow 4$).

Other patterns : Numbers in same column differ by 4

Numbers in same row increase by 1

So, columns increase by 4 and rows increase by 1.

Practice Time

Objective Questions

Multiple Choice Questions :

1. (b), 2. (c), 3. (a), 4. (c), 5. (a)

Fill in the Blanks :

1. $6n$, 2. $3a + 11b$, 3. $4S$, 4. cp,
5. $4n + 1$

True/False :

1. False, 2. True, 3. True, 4. True,
5. False

Subjective Questions :

1. Given : $9m + 4n - 5m + 6n$

Combine like terms :

$(9m - 5m) + (4n + 6n) = 4m + 10n$

So, the simplified form is $4m + 10n$.

2. Given : $p = 4$, $q = 3$, expression $7p - 2q$

Substitute :

$7 \times 4 - 2 \times 3 = 28 - 6 = 22$

So, the value is 22.

3. Cost of 12 notebooks if each costs

$x = 12 \times x = 12x$

So, the expression is $12x$.

4. "10 less than thrice a number y" means $3y - 10$

So, the expression is $3y - 10$.

5. When a rope is folded r times and cut, formula : number of pieces $= 2^r$

So, the general expression is 2^r.

6. **(a)** Cost of x apples at 65 each = $65x$, cost of y oranges at 45 each $= 45y$, total cost $= 65x + 45y$

(b) For $x = 6, y = 8 : 65 \times 6 + 45 \times 8$

$= 390 + 360 = 750$

So, the expression is $65x + 45y$ and the total cost is 750 rupees.

7. **(a)** Base fare 50, per km 12, for d km : total fare $= 50 + 12d$

(b) For $d = 18 : 50 + 12 \times 18$

$= 50 + 216 = 266$

So, the expression is $50 + 12d$ and the total fare is 266 rupees.

8. **(a)** Travel between stations : 5 stations means 4 gaps between them, so travel time = 4t minutes.

Halts : stops at 5 stations, halt time $= 5 \times 3 = 15$ minutes.

Total time $= 4t + 15$

(b) For $t = 7$:

$4 \times 7 + 15 = 28 + 15 = 43$

So, the expression is $4t + 15$ and total travel time is 43 minutes.

9. **(a) Step 1 :** 6 matchsticks, each next step adds 3 : formula $= 6 + (n-1) \times 3 = 6 + 3n - 3 = 3n + 3$

(b) For $n = 12 : 3 \times 12 + 3$

$= 36 + 3 = 39$

So, the formula is $3n + 3$ and matchsticks at step 12 is 39.

10. Area of rectangle

= length × breadth

$= l \times b$

For $l = 15, b = 9$: area $= 15 \times 9 = 135$

So, the expression is $l \times b$ and area is 135 sq. m.

11. (a) Score = points for correct – points deducted $= 12p - 5q$

(b) For $p = 4, q = 1 : 12 \times 4 - 5 \times 1$

$= 48 - 5 = 43$

So, the expression is $12p - 5q$ and total score is 43.

12. Given : folded 6 times gives pieces

$= 6 + 2 = 8$, general rule : pieces $= r + 2$

(a) For r folds : pieces $= r + 2$

(b) For $r = 12$: pieces $= 12 + 2 = 14$

So, the expression is $r + 2$ and pieces for 12 folds is 14.

13. **(a)** Step 1 area = 12, increases by 5 each step :

area $= 12 + (n-1) \times 5$

$= 12 + 5n - 5 = 5n + 7$

(b) For n $= 15 : 5 \times 15 + 7$

$= 75 + 7 = 82$

(c) Area $= 87 : 5n + 7 = 87 \rightarrow 5n = 80 \rightarrow n = 16$

So, the formula is 5n + 7, area at step 15 is 82 sq. units, and step number for area 87 is 16.

5. Parallel and Itersecting Lines

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Think and Discuss

1. Two straight lines can intersect at most at one point.

If they intersect at more than one point, they must be the same line, known as coincident lines.

By definition, a straight line is uniquely determined by two points.

So, the maximum number of intersection points for two distinct straight lines is 1.

2. Do yourself.

Asscess Yourself-1

1. Given $\angle 1$, $\angle 2$, $\angle 3$, $\angle 4$ formed by two intersecting lines.

(a) Using the property of vertically opposite angles : Vertically opposite angles are equal and lie opposite each other.

$\angle 1$ is vertically opposite to $\angle 2$.

So, $\angle 2$ is vertically opposite to $\angle 1$.

(b) Using the property of linear pair : Angles forming a straight line sum to 180°.

$\angle 2$ forms a linear pair with $\angle 3$ and $\angle 4$.

So, $\angle 3$ and $\angle 4$ forms a linear pair with $\angle 2$.

(c) Given $\angle 1 = 40°$.

Using vertically opposite angle property : $\angle 1 = \angle 2 = 40°$.

Using linear pair formula :

$$\angle 2 + \angle 3 = 180°$$
$$40° + \angle 3 = 180°$$
$$\angle 3 = 180° - 40° = 140°.$$

So, $\angle 3 = 140°$.

(d) Given $\angle 2 = 140°$.

Using vertically opposite angle property : $\angle 2 = \angle 1$

$$\angle 1 = 140°.$$

So, $\angle 1 = 140°$.

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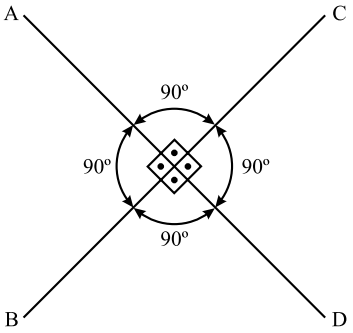
Think and Discus

1. Do yourself

2.



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Think and Discus

1. Do yourself

2. Given lines *a, b, c, d, e, f, g, h, i* in the figure.

Using the property of parallel lines: Lines that never meet and remain equidistant are parallel.

Lines *a, h, i* are all vertical and never meet, so they are parallel.

Line *c* and g are horizontal and never meet, so they are parallel.

Diagonal lines *b, d, e, f* are slanting in different directions, so they are not parallel to each other.

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Think and Discus

1. Given parallel and perpendicular lines.

Using the concept of notation : Symbols help to represent ideas clearly and quickly in mathematics.

Parallel lines are shown by symbol $\parallel$ and perpendicular lines by symbol $\perp$.

These symbols make it easy to identify relationships without long explanations.

They help in solving problems faster and avoid confusion.

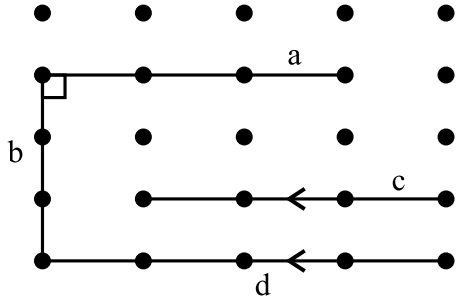
So, special notations make mathematical work clear, quick, and easy to understand.

2. Do yourself

Asscess Yourself-2

1. (a) line a ad line b is pependicular

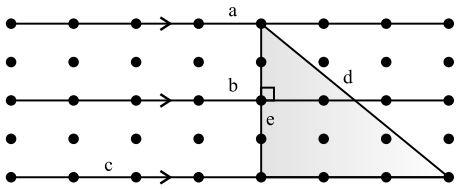
(b) line c is parallel with line a and d



2. (a) line a, b, c are parallel.

(b) line e is perpendiular to all three of them.

(c) line d intersects all of them.



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Think and Discus

1. A transversal intersecting two lines creates four pairs of vertically opposite angles. Vertically opposite angles are always equal by geometric definition. Since eight angles are made of four equal pairs, each intersection provides only two possible measures. So, no, because vertically opposite angles must be equal.

2. A transversal intersecting two lines forms four pairs of equal vertically opposite angles. The maximum number of distinct angle measures possible in this configuration is 4. Even if the lines are not parallel, the equality of opposite angles prevents a fifth measure from existing. So, no, the maximum possible distinct measures is 4.

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Think and Discus

1. One corresponding angle is 45° and the other is 50° as given.

   For two lines to be parallel, the corresponding angles must be equal.

   Since 45° is not equal to 50°, the lines do not satisfy the condition for parallelism.

   So, the lines are not parallel and will eventually intersect.

2. Corresponding angles are given to be supplementary, meaning their sum is 180°.

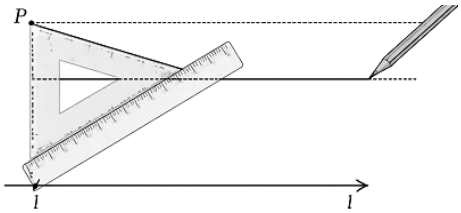
For lines to be parallel, corresponding angles must be equal, so each angle must be $180° \div 2 = 90°$.

This occurs when the transversal is perpendicular to both parallel lines.

So, yes, if the transversal is perpendicular to the parallel lines.

Asscess Yourself-3

1.



Given a line l and a point P not on the line l.

Using the property of parallel lines: Lines which remain at the same distance and never meet are parallel.

Place the ruler along line l.

Keep one side of the set square along the ruler.

Slide the set square along the ruler until its edge passes through point P.

Draw a line along the edge of the set square through point P.

This new line will be parallel to line l.

So, a line through point P parallel to line l is constructed.

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Think and Discus

1. Given a line l and a point P.

A line perpendicular to a perpendicular line becomes parallel to the original line.

Draw a perpendicular from point P to line l using a compass.

At point P, draw another perpendicular to this new line.

The second line will be parallel to line l.

So, parallel lines can be drawn using the perpendicular method.

2. Given two lines perpendicular to the same line.

If two lines are perpendicular to the same line, they never meet and remain at equal distance.

Thus, they have the same direction and are parallel.

So, both lines are parallel because they are perpendicular to the same line.

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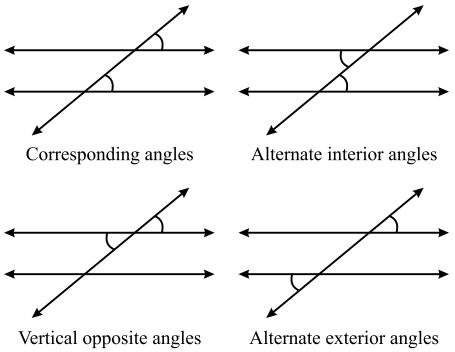
Think and Discus

1. A transversal intersecting two lines creates alternate angles on opposite sides of the transversal.

The converse of the Alternate Interior angles theorem states that if alternate interior angles are equal, the lines being intersected must be parallel.



This property is a fundamental way to prove that two lines will never meet.

So, the lines are parallel.

2. Alternate angles are given as supplementary, meaning their sum is 180°.

For lines to be parallel, alternate angles must also be equal to each other.

When alternate angles are both equal and supplementary, each angle must measure $180° \div 2 = 90°$.

This specific condition occurs when the transversal is perpendicular to the two lines.

So, yes, when the transversal is perpendicular to the parallel lines.

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Think and Discus

1. Railway tracks are physically parallel to maintain a constant gauge for the train wheels.

   In a photograph, they appear to meet at a vanishing point because of linear perspective.

   So, they are parallel, but perspective makes them appear to converge.
2. Straight roads or long hallways often look like they high ways down to a single point in the distance.

   The Cafe Wall illusion is a famous example where parallel lines look slanted due to alternating tile patterns.

   So, highways and patterned walls are common examples of these illusions.
3. Architects use knowledge of illusions to prevent buildings from looking distorted or leaning to the human eye.

   They can also use "forced perspective" to make small spaces feel much larger or more impressive.

   So, they must account for how the brain interprets lines to ensure visual stability and desired aesthetics.

Asscess Yourself-4

1. Given parallel lines cut by a transversal.

   Using the property of alternate interior angles : Alternate angles are equal.

   $x = 40°$, (alternate angle)

   So, $x = 40°$.

   Given : parallel lines and angles 135° and z°.

   Using the property of co-interior angles : Sum of co-interior angles = 180°.

   $z + 135° = 180°$

   $z = 180° - 135° = 45°$.

   So, $z = 45°$.
2. A transversal cuts a parallel line forming a corresponding angle to 38°.

   The interior angle of the triangle formed at the bottom line is 38° due to corresponding angles being equal.

   $x° + 38° = 180°$

   (because they form a linear pair)

   $x° = 180° - 38° = 142°$
3. $\angle y + 105° = 180°$ (co-interior angles)

   $y = 180° - 105°$

   $y = 75°$

   So, $y = 75°$.

The second diagram shows a triangle where two sides are indicated as parallel by arrows. The angle at the bottom vertex is part of a straight line, so

$a = 54°$

4. Interior angle between first and second parallel line = 100° – 30° = 70° (alternate interior angles)

$\angle x + 70° = 180°$ (co-interior angles)

$x = 180° - 70°$

$x = 110°$

So, $x = 110°$.

5. $\angle OLN = \angle XYZ = 50°$ (corresponding angles)

$\angle MLA = \angle PQR = 60°$ (corresponding angles)

$\angle OLN + \angle NLM + \angle MLA = 180°$ (angles on a straight line)

$50° + \angle NLM + 60° = 180°$

$110° + \angle NLM = 180°$

$\angle NLM = 180° - 110° = 70°$

So, $\angle OLN = 50°$, $\angle NLM = 70°$, and $\angle MLA = 60°$.

6. Give : Line segment AB and EF ae parallel (AB || EF), as idicate by the arows on the lines.

$\angle ABC = 50°$

$\angle BCD = 100°$

$\angle DEF = 60°$

$\angle CDE = x°$

Draw horizotal paralle lines though the vertices C and D that are parallel to both AB and EF.

Let's call the line through vertex C lin L_1 and the line through vertex D lie L_2, such that AB || L_1 || L_2 || EF.

Break down ∠BCD at vertex C :

The line 4 divides ∠BCD into two parts : $\angle BCL_1$ and $\angle DCL_1$

Since the AB || L1, the alterate interior angles are equal :

$\angle BCL_1 = \angle ABC = 50°$

Relate vertex C to vertex D :

Since the total angle ∠BCD = 100°, we can find the remaining part :

$\angle DCL_1 = 100° - 50° = 50°$

Relate vertex C to vertex is :

Subce K1 || EF, alternate interior angles fomed by the tansversal DE are equal

$\angle EDL_2 = \angle DEF = 60°$

Combine the parts to find x° :

The total angle $x°$ (∠CDE) is the sum of the two component angles at vertiex D :

$x° = \angle CDL_2 + \angle EDL_2$

$x° = 50° + 60° = 110°$

So, the measure of ∠CDE is 110°.

'Figure it Out' Exercise

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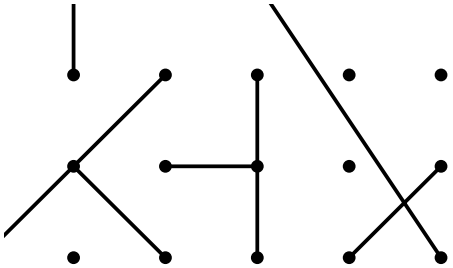
1. From the given figure,

Linear Pairs	$\angle a$ and $\angle b$, $\angle c$ and $\angle d$, $\angle a$ and $\angle d$, $\angle b$, $\angle a$ and $\angle c$
Pairs of vertically opposite angles	$\angle b$ and $\angle d$, $\angle a$ and $\angle c$

2.



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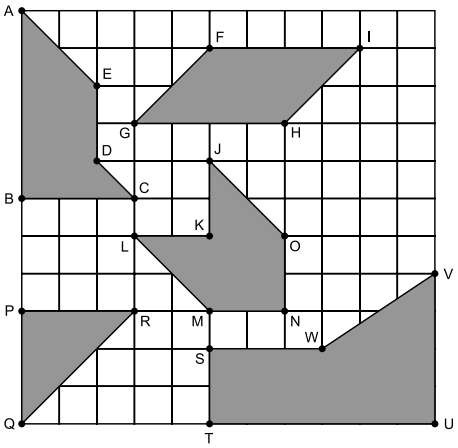


1. AB anc ED are parallel lines.

FG and IH, FI and GH are parallel lines.

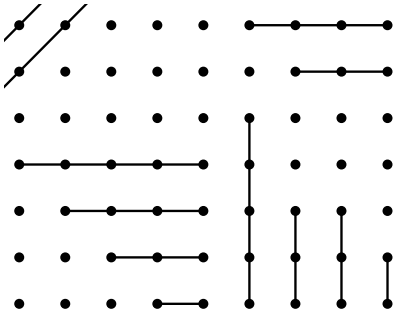
LM and JO, JK ad ON are parallel lines.

ST and VU, SW and TU are parallel lines.

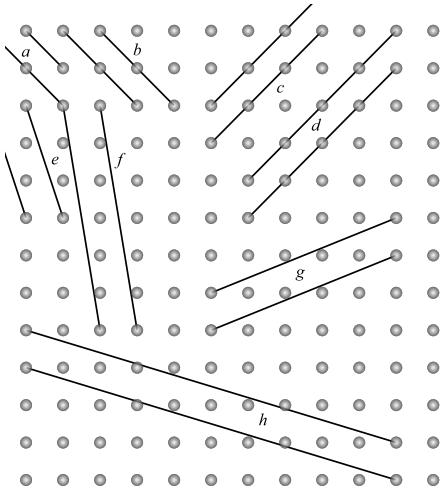
(a) We know pendicular line cut each other at 90°.

(b) We know parallel lines nevers intersect on a plane.

3.



4.



(a) Yes (b) Lines *e*, *f*, *g* and *h*

(c) By kept equal distance betwee two lines.

5. From figure, Clearly line a is parallel to line b. Because these two lines do not intersect each other and are situated at a constant distance.

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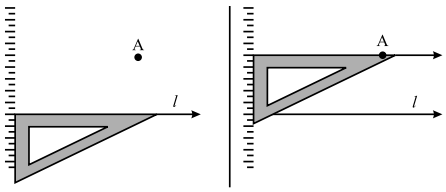
Yes, we ca draw a line parallel to 1.



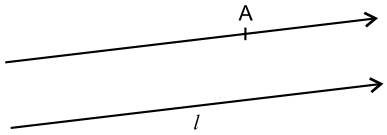
Steps of Construction :

(1) Place the set square along the line *l* perfectly.

(2) Place the ruler alog the other edge of set square.

(3) Slide the set square along the ruler until one edge passes though point A.

(4) Once the set squares edge is aligned through point A, draw a line along the edge. This is the required line.



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1. (a) $\angle a = 48°$ (alternate angles)

(b) $\angle b = 52°$ (alternate angles)

(c) $\angle c = 81°$ (alternate angles)

(d) $\angle d = 99°$ (alternate angles)

(e) $\angle e = 69°$ (alternate angles)

(f) sing sum of pair of co-interior angles on the same side of trasversal is equal to 180°

$\therefore \quad 132° + f° = 180°$

$\Rightarrow \quad f = 180° - 132° = 48°$

(g) $\angle g = 122°$ (corressponding angles)

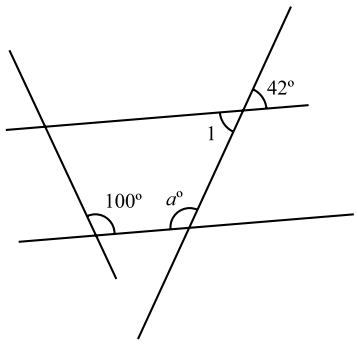
(h) $\angle n = 75°$

(alternate interior angles)

(i) $\angle i = 54°$ (alternate interior angles)

(j) $\angle j = 97°$ (alternate interior angles)

2. (a)



From figure, $\angle 1 = 42°$ (vercically opposite angles)

Also, $a° + \angle 1 = 180°$

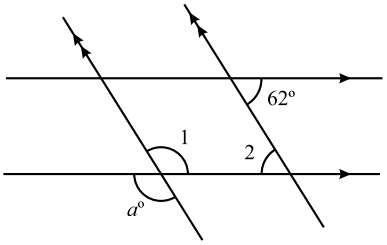
$a° = 180° - 61$

$= 180 - 42$

$= 138°$

(Sum of pair of interior angles on the same of transversal is equal to 180°)

(ii) (b)



From, figure $\angle 2 = 62°$

(alternative angles)

$\angle 1 = \angle 2 = 180°$

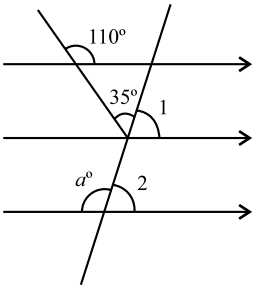
(sum of pair of interior angles on same side of transversal)

$\therefore \quad \angle 1 = 180° - 62° = 118°$

$a° = \angle 1 = 118°$

(since, vertically opposite angles are equal)

(iii) (c)



$\therefore \quad 110° = 35° + \angle 1$

$\Rightarrow \quad \angle 1 = 110° - 35° = 75°$

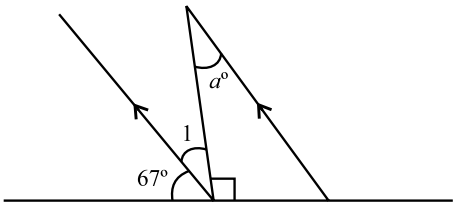
$\angle 1 = \angle 2$

(corresponding angles)

$\therefore \quad a° + 75° = 180°$ (Linear pair)

$\Rightarrow \quad a° = 180° - 75° = 105°$

(iv) (d)



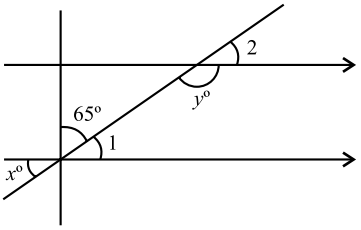
$67° + \angle 1 + 90° = 180°$

$\Rightarrow \angle 1 = 180° - 90° - 67° = 23°$

$\angle a = \angle 1 = 23°$

(alternative interior angles)

3. (a)



From figure, $65° + \angle 1 = 90°$

$\Rightarrow \angle 1 = 90° - 65° = 25°$

But $x° = \angle 1 = 25°$

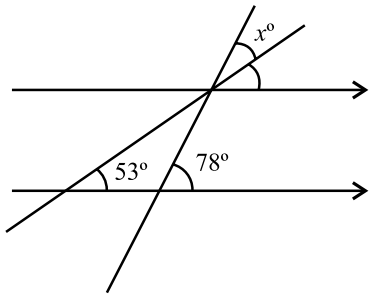
(vertically opposite angles)

$y° + \angle 2 = 180°$; $y° + 25° = 155°$

($\angle 1 = \angle 2$, corresponding angles)

$\therefore \quad y° = 180° - 25° = 155°$

(b)



From figure, $\angle 1 = 53°$

(corresponding angles)

$x° + \angle 1 = 78°$

(corresponding angles)

$x° = 78° - 53° = 25°$. **Ans.**

4. IA || GD and IF and CH are transversals

$\angle GEH = \angle BED$

(vertically opposite angles)

$\angle BED = \angle CBA = 45°$

(corresponding angles)

$\therefore \quad \angle GEH = 45°$

$\angle BKE = 78°, \angle KBE = 45°$

(vertically opposite angles)

In ΔBKE,

$\angle BKE + \angle KBE + \angle KEB = 180°$

(angle sum property of triangle)

$78° + 45° + \angle KEB = 180°$

$\therefore \angle KEB = 180° - (78° + 45°) = 57°$

$\angle HEF = \angle KEB = 57°$

(vertically opposite angles)

$\angle FED = \angle BKE = 78°$

(corresponding angles)

5. Given, AB || CD || EF

$\angle BEF = 55°$

$\angle y° = 180° - \angle BEF$

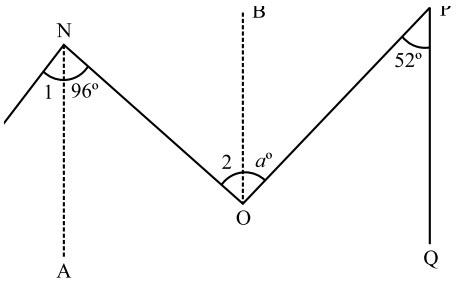
(Sum of interior angles is 180°)

$y = 180° - 55° = 125°$

(Sum of interior angles is 180°)

$\therefore \quad \angle x° = 125°$.

6.



$\angle 1 = 40° = \angle NML$

(alternate angles)

$\therefore \angle MNO = \angle 1 + \angle ONA$

$96° = 40° + \angle ONA$

$\Rightarrow \angle ONA = 96° - 40° = 56°$

$\therefore \quad \angle 2 = 56° = \angle ONA$
(alternate angles)
$\angle BOP = \angle OPQ = 52°$
(alternate angles)
Thus $\angle OP = \angle 2 + \angle BOP$
$= 56° + 52° = 108°$

Practice Time

Objective Questions

Multiple Choice Questions :

1. (b), 2. (d), 3. (c), 4. (c), 5. (b)

Fill in the Blanks :

1. Vertically opposite angles 2. vertex 3. adjacent 4. parallel line 5. linear pair

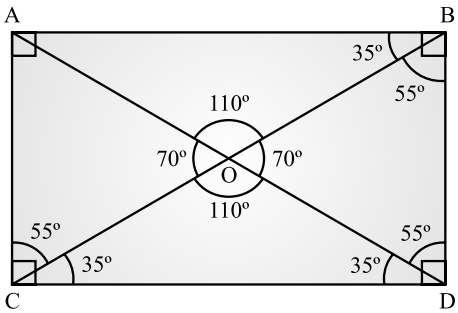
True/False :

1. False 2. True 3. False 4. False 5. True

Subjective Questions :

1. In an equilateral triangle, each interior angle = 60°. When lines intersect at a vertex, vertically opposite angles are equal and adjacent angles form a linear pair (sum = 180°), so angles formed are 60° and 120°.So, the angles formed are 60° and 120°.

2. In rectangle ABCD, diagonals AC and BD intersect at O.



The angles at each vertex are
$\angle A = \angle B = \angle C = \angle D = 90°$.
Let $\angle COD = 110°$.
$\angle COD + \angle AOD = 180°$
(linear pair)
$\angle AOD = 180° - 110° = 70°$
So, the angles at the intersection are
70°, 110°, 70°, 110°.
Now consider triangle BOC.
$OB = OC$
(diagonals of a rectangle are equal and bisect each other).
$\angle OBC = \angle OCB$
(angles opposite to equal sides)
$\angle OBC + \angle OCB + \angle BOC = 180°$
(angle sum property)
$2 \times \angle OBC + 70° = 180°$
$2 \times \angle OBC = 110°$
$\angle OBC = 55°$
So, $\angle OCB = 55°$
Since
$\angle B = 90°, \angle OBA = 90° - 55° = 35°$.
By symmetry, other angles at vertices are also 35° or 55°.
The angles formed by diagonals at vertex B are 35° and 55°.
So, the angles at the vertex B are 35° and 55°.

3. No, two intersecting lines do not always intersect at right angles; they can form any angle depending on their inclination. So, intersecting lines do not always meet at 90°.

4. Given $\angle E = 65°$ and $\angle F = 105°$.
For parallel lines, interior angles on the same side of a transversal satisfy
$\angle E + \angle F = 180°$.
Here $65° + 105° = 170° \neq 180°$, so the condition is not satisfied.
So, AB and CD are not parallel.

5. The two angles are on the same side of the transversal and inside the parallel lines.

$(2x - 6°) + (3x - 54°) = 180°$

(co-interior angles)

$2x + 3x - 6° - 54° = 180°$

$5x - 60° = 180°$

$5x = 180° + 60°$

$5x = 240°$

$x = 240 \div 5°$

$x = 48°$

6. $\angle 1$ and $\angle 2$ are alternate interior angles.

$\angle 1 = \angle 2$ only if the lines l_1 and l_2 are parallel.

The question does not state that l_1 and l_2 are parallel.

So, the answer is no, we cannot say $\angle 1 = \angle 2$ without knowing if the lines are parallel.

7. $a + 60° = 180°$

(co-interior angles as $l \parallel m$)

$a = 180° - 60°$

$a = 120°$

$b = 60°$

(alternate exterior angles as $l \parallel m$ and $p \parallel q$)

$b + d = 180°$ (linear pair)

$60° + d = 180°$

$d = 120°$

$c + d = 180°$

(vertically opposite angles)

$c = 180° - 120° = 60°$

So, $a = 120°$, $b = 60°$, $c = 60°$, $d = 120°$.

8. $\angle ABC = a = 55°$

(alternate interior angles as BA $\parallel$ CD)

$\angle BAC + \angle ABC + \angle ACB = 180°$

(angle sum property of triangle)

$72° + 55° + b = 180°$

$127° + b = 180°$

$b = 180° - 127°$

$b = 53°$

$b + c + 55° = 180°$

(angles on a straight line)

$53° + c + 55° = 180°$

$108° + c = 180°$

$c = 180° - 108°$

$c = 72°$

So, $a = 55°$, $b = 53°$, $c = 72°$.

9. $x + 143° = 180°$

(linear pair)

$x = 180° - 143°$

$x = 37°$

$x + y = 60°$

(alternate interior angles)

$y = 60° - 37° = 23°$

$z + y + x = 180°$

(angles on a straight line)

$z + 23° + 37° = 180°$

$z + 60° = 180°$

$z = 180° - 60°$

$z = 120°$

So, $x = 37°$, $y = 23°$, $z = 120°$.

10. $\angle GHE + 120° = 180°$

(linear pair)

$\angle GHE = 60°$

$\angle ABC = \angle GHE = 60°$

(corresponding angles as AB $\parallel$ CG)

$\angle CDE + \angle BCH = 180°$

(co-interior angles as CG $\parallel$ DF)

Since AE $\parallel$ BD and AB $\parallel$ CH,

ABCH is a parallelogram, so $\angle HCD = \angle ABC = 60°$

$\angle CDE + \angle HCD = 180°$

$\angle CDE + 60° = 180°$

$\angle CDE = 120°$

So, $\angle ABC = 60°$ and $\angle CDE = 120°$.

11. **(a)** Give : $\angle OSR = 115°$

$\angle ASE = \angle PSR$

(Vertically opp. angle)

$\angle ASE = 115°$

and $\angle PSR + \angle SRQ = 180°$

(Co-interior angle)

$\angle SRQ = 180° - 115° = 65°$

Since $\angle ASE$ and $\angle SRQ$ (Corresponding angles) are not equal

So, EF and GH not parallel.

(b) Given :

$\angle CPF = 65°$

$\angle DQR = 70°$

$\angle CPS = 115°$

$\angle CPF + \angle CPS = 180°$

(Liear angle)

$65° + \angle CPS = 180°$

$\angle CPS = 180° - 65°$

$= 115°$

And $\angle CPS = \angle PSR$

(alterate opp. angle)

Since $\angle CPS$ and $\angle PSR$ (alternate opp. angle) are equal.

So, AB and CD are parallel.

12. $x + 120° = 180°$

(co-interior pair)

$x = 180° - 120° = 60°$

$x + y + 90° = 180°$

(angles on a straight line)

$60° + y + 90° = 180°$

$y = 180° - 150° = 30°$

$y + \angle QAB = 180°$

(co-interior pair)

$30° + \angle QAB = 180°$

$\angle QAB = 180° - 30° = 150°$

So, $x = 60°$, $y = 30°$, $z = 150°$.

6. Number Play

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Think and Discus

1. These numbers represent the count of children standing in front of a specific child who are taller than that child. It is a way of using numbers to describe relative height and position in a sequence.

2. Do yourself.

3. Yes. Since the rule depends on who is standing in front of whom, changing the order changes the "taller" count for each position.

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Think and Discus

1. No. All the cards provided (1, 3, 5, 7, 9, 11, 13) are odd numbers.

2. Yes, by using Parity Rules. The sum of an odd number of odd numbers is always odd. Since 5 is an odd count and 30 is an even number, it is mathematically impossible.

Asscess Yourself-1

1.

Problem	Calculation Logic	Result
(a) Sum of 3 even + 1 odd	Even + Odd = Odd	Odd
(b) Sum of 4 odd numbers	(Odd+Odd) + (Odd+Odd) = Even + Even = Even	Even
(c) Sum of 6 even + 1 odd	Even + Odd = Odd	Odd
(d) Sum of 3 odd + 3 even	Odd + Even = Odd	Odd
(e) Sum of 7 odd numbers	Odd count of odd numbers = Odd	Odd

2. Asha has :

(i) Even number of ₹ 2 coins : (Even × Even) = Even sum

(ii) Odd number of ₹ 5 coins : (Odd × Odd) = Odd sum

(iii) Odd number of ₹ 10 coins : (Odd × Even) = Even sum

Total Parity Check :

Even + Odd + Even = Odd

Analysis :

Asha calculated a total of ₹ 137. Since 137 is an odd number, and our parity check results in an odd sum, her calculation is consistent with parity rules. She did not necessarily make a mistake.

One possible combination :

(i) 6 coins of ₹ 2 = ₹ 12 (Even count)

(ii) 3 coins of ₹ 5 = ₹ 15 (Odd count)

(iii) 11 coins of ₹ 10 = ₹ 110 (Odd count)

Total : 8 + 15 + 110 = 137

3. (a) even + odd = even is **False** because according to the parity rule even + odd always equals an odd number.

(b) odd + odd + odd = odd is **True** because the sum of an odd number of odd terms (3 terms) always results in an odd number.

(c) even × odd = odd is **False** because according to the parity rule any number multiplied by an even number results in an even product.

(d) odd × odd = odd is **True** because the product of two odd numbers is always odd.

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Think and Discus

1. The sum of two consecutive numbers is always odd because consecutive numbers always consist of one even number and one odd number. According to the parity rule even + odd = odd, adding these two different types of numbers results in an odd sum. For example, 4 + 5 = 9 or 10 + 11 = 21.

2. No, the product of two odd numbers can never be even. The parity rule for multiplication

states that odd × odd = odd. This is because an odd number does not contain 2 as a factor; since neither number in the pair has a factor of 2, their product cannot be divisible by 2, making it impossible for the result to be even.

3. To explain parity to a younger student, you can describe it as the "Partner Rule." Even numbers are "friendly" numbers where every single dot has a partner to hold hands with. Odd numbers are "lonely" numbers because, after everyone tries to find a partner, there is always one dot left over standing all by itself. Parity is simply checking if everyone has a partner (even) or if someone is left out (odd).

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Think and Discus

1. The circled numbers represent the sum of the numbers in the corresponding row or column. For example, the circled "16" next to the first row is the total you get when you add the numbers in that horizontal line. Similarly, the circled "13" at the bottom of the first column is the total of the numbers in that vertical line.
2. The pattern is a summation grid where each outer circled value acts as a check for the internal numbers. You can verify this by performing the following calculations :

The core of this pattern is a 3×3 grid of numbers. The "outer circled values" you mentioned are the sums of each individual row and column.

Asscess Yourself-2

1. The magic sum is 36. In a 3x3 magic square, the magic sum is always 3 times the centre number because the middle row, middle column, and both diagonals pass through the centre; here, 12 × 3 = 36.
2. To create a magic square with 5 through 13, first find the middle number, which is 9. Place 9 in the centre. Arrange the remaining numbers so that each row, column, and diagonal adds up to 27 :

10	5	12
11	9	7
6	13	8

(Note : For numbers 5-13, the grid is : 10 5 12, 11 9 7, 6 13 8)

The strategy is the Siamese method : place the smallest number in the middle of the top row and move diagonally up and right to fill consecutive numbers.

3. **(a)** If you subtract 2 from every number in a 3x3 square, the new grid remains a magic square, but the magic sum decreases by 6 (3 numbers per row × 2).

(b) If you multiply only the even numbers by 3, the grid does

not remain a magic square because the addition property is broken; the sums of the rows and columns will no longer be equal.

4. Constructing a 3x3 square with consecutive odd numbers (e.g., 11, 13, 15, 17, 19, 21, 23, 25, 27) follows the same pattern as any other set of consecutive numbers. The middle number is always the average of the sequence, and the magic sum is 3 times that middle number. The structural pattern remains identical, regardless of whether you use all integers, even numbers, or odd numbers.

   The set of consecutive odd numbers from 11 to 27 is 11, 13, 15, 17, 19, 21, 23, 25, and 27. To construct the magic square, we place the middle number, 19, in the centre of the 3 x 3 grid. We then arrange the remaining numbers so that every row, column, and diagonal adds up to the magic sum of 57, which is calculated using the formula : Magic Sum = 3 × centre number.

21	11	25
23	19	15
13	27	17

   So, the magic square is constructed with 21, 11, 25 in the first row, 23, 19, 15 in the second row, and 13, 27, 17 in the third row.

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Think and Discus

1. The centre number in a 3 × 3 magic square must be 5 only if you are using the specific set of numbers from 1 to 9. In any 3 × 3 magic square, the centre number is always exactly one-third of the magic sum. Because the sum of numbers 1 through 9 is 45, the magic sum must be 45 ÷ 3 = 15. Since the centre number is the magic sum divided by 3, the calculation is 15 ÷ 3 = 5.
2. A magic square is a grid of numbers where every horizontal row, every vertical column, and both main diagonals add up to the exact same total. You can explain it as a perfectly balanced numerical puzzle where no matter which direction you travel across the square, the "weight" or sum of the numbers remains identical.
3. Symmetric number patterns are useful in cryptography for encoding secure messages, in computer science for organizing data in matrices, and in Sudoku or other logic puzzles. They are also used in architectural design to create balanced proportions and in electrical engineering to ensure equal distribution of power across a circuit grid.

   So, the centre number is determined by the total sum of the set divided by 9, then

multiplied by 3 for the row sum, or simply by finding the median of the sequence.

Asscess Yourself-3

1. The centre number 40 is the middle term of the sequence. To find a magic square, we use nine consecutive numbers where 40 is the median : 36, 37, 38, 39, 40, 41, 42, 43, 44. Using the standard arrangement for these values :

39	44	37
38	40	42
43	36	41

Sum = 39 + 44 + 37 = 120.

2. The magic sum when the centre number is m is 3m. Since the centre number is always the average of the three numbers in its row, column, or diagonal, the expression for any row, column, or diagonal is simply $m + m + m$, or $3 \times m$.

3. (a) Subtracting 1 from every term in the generalized form ($m - 4$, $m - 3$... $m + 4$) results in a new grid where the centre becomes $m - 1$. The new magic sum expression is $3(m - 1)$ or $3m - 3$.

(b) Multiplying every term by 5 results in a new grid where the centre becomes 5m. The new magic sum expression is $3(5m)$ or $15m$.

4. To create a magic square with a magic sum of 90, the centre number is selected by dividing the magic sum by 3, using the formula centre = Magic Sum ÷ 3. Therefore, 90 ÷ 3 = 30. Using the centre 30 and numbers 26-34 :

29 34 27
28 30 32
33 26 31

5. Yes, it is possible to form a 3 x 3 magic square with even numbers that are not consecutive, provided they form an arithmetic progression. As long as the "distance" between each chosen number is constant (for example : 2, 6, 10, 14, 18, 22, 26, 30, 34), the symmetry of the addition remains intact. This is because the magic square property depends on the balance of values around the mean, not strictly on them being consecutive.

So, the centre number is always the key variable m, and the magic sum is always 3m.

22	2	30
26	18	10
6	34	14

Asscess Yourself-4

1.
$1 + 1 + 1 + 1 + 1 = 5$
$2 + 1 + 1 + 1 = 5$
$1 + 2 + 1 + 1 = 5$
$1 + 1 + 2 + 1 = 5$
$1 + 1 + 1 + 2 = 5$
$2 + 2 + 1 = 5$
$2 + 1 + 2 = 5$
$1 + 2 + 2 = 5$

2. There are 8 different combinations when considering the specific order of the numbers.
3. The answer can be found without listing by using the Fibonacci sequence, where each term is the sum of the two preceding terms. For a sum of n, the number of ways to write it using only 1s and 2s is the (n+1)th Fibonacci number. Since we are finding the ways for 5, we look at the 6th number in the sequence (1, 1, 2, 3, 5, 8), which is 8.

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Think and Discus

1. 14,70,369 is an odd number.

   Since every marriage involves a pair of people, the total number of people who got married must be a multiple of 2. According to the rule of divisibility by 2, any number multiplied by 2 results in an even number. Therefore, the reported figure is mathematically impossible because 14,70,369 is not divisible by 2.
2. Using the formula : Total People = 2 × Number of Marriages, the result must always end in 0, 2, 4, 6, or 8. This logical check allows us to identify that the data provided is incorrect or contains a typo.

   So, the total number of people getting married must always be an even number.

Asscess Yourself-5

1. Initial state ON, each pull changes state, total pulls = 58 (even), even number of changes keeps state same.

   So, the fan will be ON.
2. Total sum of 1 to 80 = 80×81÷2 = 3240, removing 30 sheets removes 60 numbers, maximum removed sum < total, so missing sum cannot be 5000.

   So, the sum of missing page numbers cannot be 5000.
3. Odd + odd + odd = odd, even + even = even, arrange so each row/column has required parity. One example :

1	3	5
7	2	4

   So, the grid can be filled as 1, 3, 5, 7, 2, 4.
4. Magic sum = −12, each row sum = −12, total = −36.

   One example :

– 5	– 4	– 3
– 2	– 1	– 9
– 5	– 7	0

   (adjusted to keep sum −12 each row properly)

   So, one possible magic square has each row, column and diagonal sum −12.
5. Sum of first n natural numbers $= n(n + 1) \div 2$, for n
   $= 75 \rightarrow 75 \times 76 \div 2$
   $= 2850$ (even).

   So, the sum is even.

6. Ways to climb n steps = Fibonacci rule :

$$f(n) = f(n-1)+f(n-2),$$
$$f(7) = 13 + 8$$
$$f(7) = 21.$$

So, Nawang can climb in 21 ways.

7. Virahanka sequence follows Fibonacci pattern : odd, odd, even repeat every 3 terms,
$25 \div 3$ leaves remainder $1 \rightarrow$ odd.
So, the 25th term is odd.

8. (a) Not possible.

(b) KP + KP = PRR $\rightarrow$ possible K = 6, P = 1, R = 2 $\rightarrow$ 61 + 61 = 122
So, the result is 122.

(c) C1 + C = 1FF $\rightarrow$ possible C = 9, F = 5 $\rightarrow$ 91 + 9 = 100
So, the result is 100.

'Figure it Out' Exercise

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1. The required arrangement is
(a) FCBGADE (b) AECGBDF
(c) FDBGCEA (d) EAGCDBF
(e) FAECGBD (f) BDFAECG

2. (a) Only Sometimes True : A person says '0' when they see no one taller than themselves. The tallest person will always say '0', but a shorter person can also say '0' if they are at the front or in a position where no one taller is ahead of them. Thus, the given statement is only sometimes true.

(b) Always True : If a person is the tallest, then no one is taller than them, so they will always say '0'. So, the given statement is always true.

(c) Always True : Each person is assigned a number that represents how many taller people are ahead of them. Since there is no one ahead of the first person, their number will always be '0'. Hence, the given statement is always true.

(d) Only Sometimes True : The statement is only sometimes true. A person standing in between can still be assigned '0' if there are no taller people ahead of them.

(e) Only Sometimes True : The statement is only sometimes true. A person who calls out the largest number has many taller people in front but may not be the shortest overall. For example, if the shortest person is standing at the front, they will call out '0'. Meanwhile, the second shortest person could be at the back and might call out the largest number.

(f) If there are 8 people, then the shortest person will see 7 taller people. So the maximum number someone can say is 7.

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1. (a) Sum of 2 even numbers and 2 odd numbers
e.g., 2 + 4 + 1 + 3 = 10
Even numbers are pairs, so their sum is even. Two odd numbers each have one leftover unit; when added together, those two units form a new pair.
So, the parity is even.

(b) Sum of 2 odd numbers and 3 even numbers

e.g., 1 + 3 + 2 + 4 + 6 = 16

The two odd numbers combine their leftover units to form a pair (even). The three even numbers are already made of pairs. Adding an even result to another even result maintains the balance.

So, the parity is even.

(c) Sum of 5 even numbers

e.g., 2 + 4 + 6 + 8 + 10 = 30

Since every even number consists of perfect pairs, adding any amount of even numbers together will never result in a leftover unit.

So, the parity is even.

(d) Sum of 8 odd numbers

e.g., 1 + 3 + 5 + 7 + 9 + 11 + 13 + 15 = 64

Each of the 8 odd numbers has one leftover unit. Since there are 8 of these leftover units, they can be grouped into 4 complete pairs (8 ÷ 2 = 4). Because all leftovers are paired up, no unit is left alone. So, the parity is even.

2. Lakpa made a mistake in his calculation.

To find the total value, we examine the parity (odd or even) of each coin type :

(i) The total value of an odd number of ₹ 1 coins is always odd (odd × 1 = odd).

(ii) The total value of an odd number of ₹ 5 coins is always odd (odd × 5 = odd).

(iii) The total value of an even number of ₹ 10 coins is always even (even × 10 = even).

Using the formula total sum = Value 1 + Value 2 + Value 3, we add these parities together :

Odd + Odd + Even = Even + Even = Even.

Because the sum of two odd values is always even, and adding an even number to that result remains even, the final total must be an even number. Since `205 is an odd number, it is mathematically impossible for that specific combination of coins to equal that amount.

So, Lakpa made a mistake because the total value of his coins must be even.

3. (d) even - even = even

When you subtract an even number from an even number, you are removing a set of pairs from another set of pairs, which leaves only complete pairs behind.

(e) odd - odd = even

Both odd numbers have one leftover unit. When you subtract one from the other, the two leftover units cancel each other out, leaving only complete pairs.

(f) even - odd = odd

An even number is made of pairs. If you subtract an odd number (which includes one leftover unit), you must "break" one of the even pairs to provide

that unit, leaving one unit without a partner.

(g) odd - even = odd

An odd number has one leftover unit. Subtracting an even number only removes complete pairs, so that single leftover unit remains.

So, the parities for subtraction are (d) even, (e) even, (f) odd, and (g) odd.

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1. 8 magic squares can be formed.

4	3	8
9	5	1
2	7	6

1

6	7	2
1	5	9
8	3	4

2

6	1	8
7	5	3
2	9	4

3

8	3	4
1	5	9
6	7	2

4

4	9	2
3	5	7
8	1	6

5

2	7	6
9	5	1
4	6	8

6

8	1	6
3	5	7
4	9	2

7

2	9	4
7	5	3
6	1	8

8

2. The middle number of the sequence 2, 3, 4, 5, 6, 7, 8, 9, 10 is 6. Placing this centre value into the formula Magic Sum = 3 × centre number gives a total of 18 for every row, column, and diagonal.

9	2	7
4	6	8
5	10	3

When comparing this to a magic square made using 1–9, every individual number in the grid has simply been increased by 1. Because each row contains 3 numbers, the magic sum increases by exactly 3 (from 15 to 18). The relative positions of the numbers and the structural pattern remain identical.

So, the magic square using 2–10 is created by shifting every value of the 1–9 square up by one unit.

3. The starting magic square uses numbers 1 through 9 with a middle number of 5 and a magic sum of 15.

(a) If each number is increased by 1, the new numbers are 2 through 10 with a middle number of 6. The resulting grid remains a magic square because adding the same value to every cell maintains the equality of all row, column, and diagonal sums.

The new magic sum is calculated using the formula New Sum = Original Sum + (3 × Increase), which is

$$15 + (3 \times 1) = 18.$$

8	1	6
3	5	7
4	9	2

→

9	2	7
4	6	8
5	10	3

(b) If each number is doubled, the new numbers are 2, 4, 6, 8, 10, 12, 14, 16, and 18 with a middle number of 10. The resulting grid is still a magic square because multiplying every cell by the same factor scales all sums equally. The new magic

sum is found using the formula New Sum = Original Sum × Multiplier, which is 15 × 2 = 30.

16	2	12
6	10	14
8	18	4

So, both resulting grids are magic squares, with the magic sum increasing by 3 in the first case and doubling to 30 in the second case.

4. Operations like Addition, subtraction, multiplication and division can be performed on a magic square to yield another magic square.

5. To create a magic square using any 9 consecutive numbers, identify the middle number of the set and place it in the centre cell.

The magic sum is found using the formula Magic Sum = 3 × Middle Number.

You can arrange the numbers by placing the middle value at the centre and then positioning the remaining numbers in pairs that sum to twice the middle value on opposite sides of the centre. For any set starting with n, the sequence is n, n+1, n+2, n+3, n+4, n+5, n+6, n+7, n+8, where n+4 is the middle number. By following the same pattern as the standard 1-9 square, you ensure all rows, columns, and diagonals remain balanced.

8	1	6
3	5	7
4	9	2

So, the simplest way is to place the middle number in the centre and use the magic sum formula of 3 times that middle number.

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1. The centre number is 25, which represents $n + 4$ in the sequence, so $n = 21$. The 9 consecutive numbers are 21, 22, 23, 24, 25, 26, 27, 28, and 29. Using the formula Magic Sum = 3 × 25, the sum for each row, column, and diagonal is 75. Arranging these numbers in the standard pattern results in :

28	21	26
23	25	27
24	29	22

2. In the generalised form where the middle term is m, every row, column, and diagonal consists of three terms that average to the centre value. The expression is obtained by the formula Sum = 3 × m. If using n as the first term, the centre is $n + 4$, making the expression $3(n + 4)$, which simplifies to $3n + 12$.

So, the expression obtained is $3n + 12$.

(a) Let us consider a magic number using numbers 1 – 9 be

2	7	6
9	5	1
4	3	8

and its magic sum is 15

(i) Increase each number by 1

2+1	7+1	6+1
9+1	5+1	1+1
4+1	3+1	8+1

3	8	7
10	6	2
5	4	9

(ii) Double each number

2×2	2×7	2×6
2×9	2×5	2×1
2×4	2×3	2×8

4	14	12
18	10	2
8	6	16

Yes, in each case, the resulting is also a magic square.

When 1 is added to each number of magic square, sum increases by 3 and when we double each umber then sum of new magic square numbers gets doubled.

Rotation, reflection, subtraction or transpotion operation can be performed on a magic square to yied another magic square.

3. **(a)** To find the centre number for a magic sum of 60, use the formula Middle Number = Magic Sum ÷ 3, which is 60 ÷ 3 = 20. Since the middle number is 20, the 9 consecutive numbers are 16, 17, 18, 19, 20, 21, 22, 23, and 24. Arranging them gives :

23	16	21
18	20	22
19	24	17

(b) Do yourself.

5. It is possible to create a magic square with non-consecutive numbers as long as the numbers form an arithmetic progression, meaning they have a constant difference between them. For example, using the multiples of 5 (5, 10, 15, 20, 25, 30, 35, 40, 45) with 25 at the centre :

40	5	30
15	25	35
20	45	10

So, yes, it is possible using any 9 numbers in an arithmetic progression.

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1. Initial state = ON.

Number of toggles = 77.

State after 1 toggle = OFF.

State after 2 toggles = ON.

This shows that an even number of toggles returns the bulb to ON, while an odd number of toggles leaves the bulb OFF.

Since 77 is an odd number, the state changes from the initial ON to OFF.

So, the bulb will be OFF.

2. No, because 6000 is an even numbers.

We know that, sum of two consecutive numbers is odd.

$\therefore$ Sum of 50 pairs of consecutive numbers cannot be an even number.

3.

o	*e*	*e*	(*o*)
o	*e*	*o*	(*e*)
(*e*)	(*e*)	(*o*)	

even + even = even
odd + odd = even
and even + odd = odd

4. Magic Sum = 0.

Middle Number = Magic Sum ÷ 3
= 0 ÷ 3 = 0.

The nine numbers used are – 4, – 3, – 2, – 1, 0, 1, 2, 3, and 4.

Using the pattern for a 3 × 3 magic square, place the middle number 0 in the centre and arrange the pairs around it.

– 3	2	1
4	0	– 4
– 1	– 2	3

Checking the sums :

Row 1 : – 3 + 2 + 1 = 0.

Row 2 : 4 + 0 + (– 4) = 0.

Row 3 : – 1 + (– 2) + 3 = 0.

Column 1 : –3 + 2 + 1 = 0.

Diagonal : –3 + 0 + 3 = 0.

5. (a) Sum of an odd number of even numbers is even.

(b) Sum of an even number of odd numbers is even.

(c) Sum of an even number of even numbers is even.

(d) Sum of an odd number of odd numbers is odd.

6. Total numbers = 100.

Formula for sum
= (n × (n + 1)) ÷ 2.

Sum = (100 × 101) ÷ 2
= 50 × 101 = 5050.

The number 5050 is divisible by 2.

So, the parity of the sum of numbers from 1 to 100 is even.

7. The Virahanka sequence is an additive sequence where each term is the sum of the two preceding terms.

Given consecutive numbers = 987, 1597.

Next number 1 = 987 + 1597
= 2584.

Next number 2 = 1597 + 2584
= 4181.

Previous number 1 = 1597 - 987
= 610.

Previous number 2 = 987 – 610
= 377.

So, the next two numbers are 2584 and 4181, and the previous two numbers are 610 and 377.

8. The total number of steps is 8.

The possible steps per move are 1 or 2.

This problem follows the Virahanka sequence, where the number of ways to reach step n is the sum of the ways to reach the two previous steps (n – 1 and n – 2).

So, there are 34 different ways to reach the top.

Step	Different ways			Number of ways
	No 2s	1 + 1 + 1 + 1 + 1 + 1 + 1 + 1	1	
	One 2s	2 + 1 + 1 + 1 + 1 + 1 + 1 1 + 2 + 1 + 1 + 1 + 1 + 1 1 + 1 + 2 + 1 + 1 + 1 + 1 1 + 1 + 1 + 2 + 1 + 1 + 1 1 + 1 + 1 + 1 + 2 + 1 + 1 1 + 1 + 1 + 1 + 1 + 2 + 1 1 + 1 + 1 + 1 + 1 + 1 + 2	7	
n = 8	Two 2s	2 + 2 + 1 + 1 + 1 + 1 2 + 1 + 2 + 1 + 1 + 1 2 + 1 + 1 + 2 + 1 + 1 2 + 1 + 1 + 1 + 2 + 1 2 + 1 + 1 + 1 + 1 + 2 1 + 2 + 2 + 1 + 1 + 1 1 + 2 + 1 + 2 + 1 + 1 1 + 2 + 1 + 1 + 2 + 1 1 + 2 + 1 + 1 + 1 + 2 1 + 1 + 2 + 2 + 1 + 1 1 + 1 + 2 + 1 + 2 + 1 1 + 1 + 2 + 1 + 1 + 2 1 + 1 + 1 + 2 + 2 + 1 1 + 1 + 1 + 2 + 1 + 2 1 + 1 + 1 + 1 + 2 + 2	15	1 + 7 + 15 + 10 + 1 = 34
	Three 2s	2 + 2 + 2 + 1 + 1 2 + 2 + 1 + 2 + 1 2 + 2 + 1 + 1 + 2 2 + 1 + 2 + 2 + 1 2 + 1 + 2 + 1 + 2 2 + 1 + 1 + 2 + 2 1 + 2 + 2 + 2 + 1 1 + 2 + 2 + 1 + 2 1 + 2 + 1 + 2 + 2 1 + 1 + 2 + 2 + 2	10	
	Four 2s	2 + 2 + 2 + 2	1	

9. We know that Virahanka sequence is 1, 2, 5, 8, 13, 21, 34,....

Parity follows the pattern as odd even odd odd even.....

Virahanka sequence

0, 1, 1, 2, 3, 5, 8, 13, 21, 34, 55 and son on 20th term is even.

10. (a) True (b) False (c) True (d) False

11. Given,

$$\begin{array}{r} UT \\ +\ TA \\ \hline TAT \end{array}$$

Let A = 0, T = 1, U = 9

Practice Time

Objective Questions

Multiple Choice Questions :

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

Fill in the Blanks :

1. odd 2. odd 3. even 4. even 5. even

True/False :

1. False 2. True 3. False 4. False 5. False

Subjective Questions :

1. The dimensions of the grid are 19 × 22, so the number of small squares is 19 × 22 = 418. Since 418 is divisible by 2, its parity is even. So, the parity is even.

2. If every child in a line has the same height, then for any child, there are zero children in front who are taller than them. The number assigned to each child is the count of people in front

who are strictly taller. So, each child says 0.

3. To create a 3 × 3 magic square with a magic sum of 45, we use the formula Middle Term = Magic Sum ÷ 3, which is 45 ÷ 3 = 15.

   Placing 15 in the center and using a common difference of 1 for the sequence 11 to 19, the grid is :

18	11	16
13	15	17
14	19	12

4. The number of rhythms for n beats follows the Virahanka-Fibonacci sequence where

   $V(n) = V(n-1) + V(n-2)$.

   For 9 beats, we calculate the sequence: V(1)=1, V(2)=2, V(3)=3, V(4)=5, V(5)=8, V(6)=13, V(7)=21, V(8)=34, V(9)=55. So, the number of rhythms is 55.

5. The Virahanka-Fibonacci sequence starts with 1 and 2, where each subsequent term is the sum of the previous two : 1, 2, 3, 5, 8, 13, 21. The 7th term in this sequence is 21. So, the 7th term is 21.

6. **(a)** 23 is odd and 19 is odd, odd × odd = odd. So, the parity is odd.

   (b) 72 is even and 27 is odd, even × odd = even. So, the parity is even.

   (c) 126 is even and 281 is odd, even × odd = even. So, the parity is even.

7. Using sum = $n \times (n + 1) \div 2$, sum = 200 × 201 ÷ 2 = 100 × 201 = 20100, which is even. So, the parity is even.

8. Take 1, 2, 3, 4, sum = 1 + 2 + 3 + 4 = 10, which is even. So, the sum is even and its parity is even.

9. Virahanka sequence rule : next term = sum of previous two, so 610 + 987 = 1597, 987 + 1597 = 2584, 1597 + 2584 = 4181. So, the next three numbers are 1597, 2584, 4181.

10. Numbers from 3 to 11, middle number = (3 + 11) ÷ 2 = 7. So, the centre number is 7.

11. If each number increases by 5, then magic sum increases by 3 × 5 = 15. So, the new magic sum increases by 15.

7. A Tale of Three Intersecting Lines

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Think and Discuss

If the three vertices lie on the same straight line, using area of triangle formula = 1 ÷ 2 × base × height, here height = 0, so area = 1 ÷ 2 × base × 0 = 0. So, the area is 0.

Asscess Yourself-1

1. The centres of the two circles and one intersection point form a triangle where two sides are the radii of the circles. Since both

circles have the same radius, these two sides are equal, and because there are two distinct intersection points, each point forms one such triangle. So, the number of different isosceles triangles is 2.

2. A triangle formed by the centre and two points on the circle is always isosceles because two sides are radii, and it becomes equilateral if the distance between the two points on the circumference is also equal to the radius. This occurs when the angle at the centre is exactly 60 degrees. So, yes, it can be an equilateral triangle if the chord length equals the radius.

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Think and Discuss

Do Yourself

Asscess Yourself-2

1. For side lengths 4 cm, 5 cm, and 10 cm, $4 + 5 = 9 < 10$. For side lengths 3 cm, 4 cm, and 9 cm, $3 + 4 = 7 < 9$.

   The Triangle Inequality Theorem states that $a + b > c$ must be true for all sides, but here the sum of the two shorter sides is less than the longest side. So, the sides cannot meet to form a triangle.

2. **(a)** $12 + 12 = 24$. Since $24 < 28$, the condition $a + b > c$ is not met.

(b) $6 + 11 = 17$. Since $17 < 21$, the condition $a + b > c$ is not met.

(c) $12 + 25 = 37$. Since $37 < 45$, the condition $a + b > c$ is not met.

So, a triangle cannot exist in any of these cases.

3. In a triangle with sides a, b, and c, the inequality $a + b > c$ must always hold true.

   If $5 + 7 = 12$, then the sum is equal to the third side, which results in a straight line rather than a triangle. So, a triangle only exists when the sum is strictly greater than the third side.

Asscess Yourself-3

1. **(a)** $5 + 5 = 10, 5 + 9 = 14, 5 + 9 = 14$. Since $10 > 9, 14 > 5$, and $14 > 5$, the sum of any two sides is greater than the third side. So, a triangle can be formed.

(b) $2 + 7 = 9, 2 + 10 = 12, 7 + 10 = 17$. Since $9 < 10$, the sum of the two smaller sides is not greater than the third side. So, a triangle cannot be formed.

(c) $6 + 8 = 14, 6 + 14 = 20, 8 + 14 = 22$. Since 14 is not greater than 14 ($14 = 14$), it does not satisfy the triangle inequality. So, a triangle cannot be formed.

(d) $12 + 15 = 27, 12 + 20 = 32, 15 + 20 = 35$. Since $27 > 20, 32 > 15$, and $35 > 12$, all conditions are met. So, a triangle can be formed.

2. In an equilateral triangle with side s, the condition $s + s > s$ simplifies to $2s > s$.

   For $s = 45$, $90 > 45$; for $s = 12.5$, $25 > 12.5$; for $s = 99$, $198 > 99$.

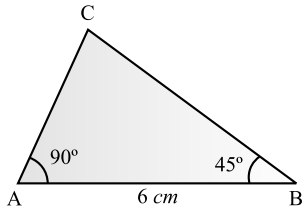
Since 2s is always greater than s for any positive value, the inequality holds true. So, an equilateral triangle is possible for any positive side length.

3. **(a)** Given sides are 3 cm and 160 cm. The third side x must be greater than 160 - 3 = 157 cm and less than 160 + 3 = 163 cm. So, 158 cm and 161.5 cm are two possible lengths.

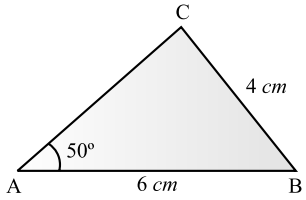
(b) Given sides are 6 cm and 9 cm. The third side x must be greater than 9 - 6 = 3 cm and less than 9 + 6 = 15 cm. So, 4 cm and 10.5 cm are two possible lengths.

Asscess Yourself-4

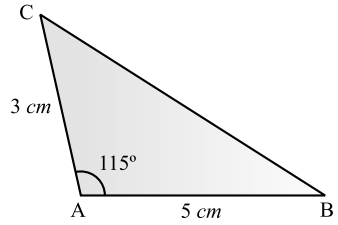
1. (a)



(b)



(c)



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Think and Discuss

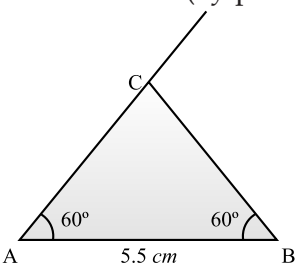
1. The angle must be between the two given sides (Side-Angle-Side or SAS) because this specific arrangement fixes the exact position of the third side, ensuring that only one unique triangle can be formed. In the provided construction examples, having the angle at the shared vertex A allows the lengths of the two connecting rays to determine the final vertices and the exact length of the closing side.

(c) Draw base line xy = 3.5 cm
From $\angle x = 160°$
From $\angle y = 90°$

2. If the angle is not between the two sides (Side-Side-Angle or SSA), the construction might result in two different possible triangles, one triangle, or no triangle at all. This is known as the ambiguous case because the unattached side can often swing to two different points on the base line, meaning the triangle's shape is not strictly defined. So, the construction would not result in a single, unique triangle.

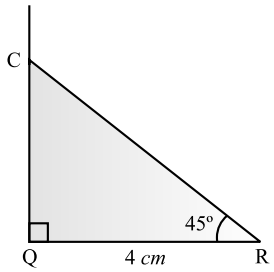
Asscess Yourself-5

1. (a) Draw base line AB = 5.5 cm (by protecctor)



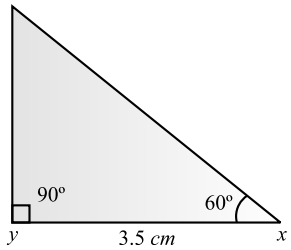
Form ∠A = 60°
Form ∠B = 60°
Complete Triagle C

(b) Base line PQ = 4 cm



Form ∠Q = 90° using protector
Form ∠P = 45° and complete traingle

(c) Given : $\angle x = 120°$, $\angle y = 90$

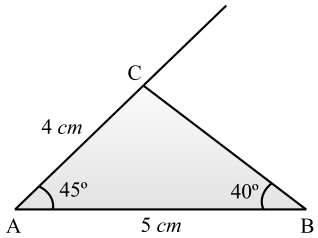


According to angle su properly.

$120° + 90° > 180°$

This is not possible

2. Given : AB = 5 cm
AC = 4 cm
∠A = 45°
∠B = 40°

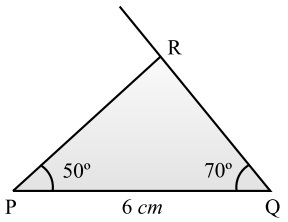


(1) Daw AB = 5 cm.

(2) At point A draw or construct angle 45°, cut AG 4 cm.

(3) Join BC, ABC reuireds.

3. Given : PQ = 6 cm
∠P = 50°
∠Q = 70°



Steps :

(1) Draw PQ = 6 cm.

(2) Draw 50° angle at point P.

(3) Draw 70° angle at point Q both angle line intersect PQR is required.

4. No, if we take sum of the two given angles :

$90° + 100° = 190°$

Since 190° > 180°, it is impossible to include a third angle with a measure greater than zero.

Therefore, a triangle with these two angles cannot be formed.

5. Given : ∠X = 65° and ∠Y = 85°

XY = 6 cm

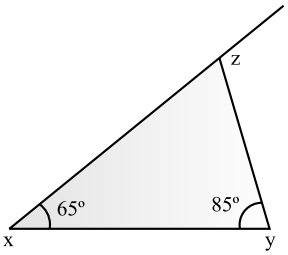
$\angle X + \angle Y + \angle Z = 180°$

$65° + 85° + \angle Z = 180°$

$\angle Z = 180° - 150°$

$\angle Z = 30°$

Steps :



(1) Daw *xy* = 6 cm.

(2) Draw 65° angle at *x*.

(3) Draw 85° angle of *y*.

both itersect at point *z*, *xyz* is required Δ.

Asscess Yourself-6

1. **(a)** Given : Angles are 50° and 70°.

Sum of given angles

$= 50° + 70° = 120°$.

Using the angle sum property of a triangle, the sum of all angles is 180°.

Third angle = 180° – 120° = 60°.

So, the third angle is 60°.

(b) Given : Angles are 100° and 25°.

Sum of given angles

$= 100° + 25°$

$= 125°$.

Using the angle sum property of a triangle, the sum of all angles is 180°.

Third angle = 180° – 125° = 55°.

So, the third angle is 55°.

(c) Given : Angles are 90° and 45°.

Sum of given angles

$= 90° + 45° = 135°$.

Using the angle sum property of a triangle, the sum of all angles is 180°.

Third angle = 180° - 135° = 45°.

So, the third angle is 45°.

(d) Given : Angles are 35° and 65°.

Sum of given angles

$= 35° + 65° = 100°$.

Using the angle sum property of a triangle, the sum of all angles is 180°.

Third angle = 180° – 100° = 80°.

So, the third angle is 80°.

2. Given : Three angles are 65°, 65°, and 65°.

Sum of angles

$= 65° + 65° + 65° = 195°$.

According to the angle sum property, the sum of angles in a triangle must be exactly 180°.

Since 195° is not equal to 180°, this triangle cannot be drawn.

To find the measure of equal angles, we use the formula :

$3 \times \text{angle} = 180°$.

Angle = 180° ÷ 3 = 60°.

So, the sum is 195°, the triangle cannot be drawn, and equal angles must each measure 60°.

3. Given : $\angle A = 80°$ and $\angle B = \angle C$.

Let $\angle B$ and $\angle C$ be x.

Using the angle sum property,

$\angle A + \angle B + \angle C = 180°$.

$80° + x + x = 180°$.

$80° + 2x = 180°$.

$2x = 180° - 80° = 100°$.

$x = 100° \div 2 = 50°$.

So, the measure of $\angle B$ and $\angle C$ is 50° each.

Asscess Yourself-7

1. Given : $\angle XMY = 90°$ and XM is the altitude to base YZ.

The length of XM represents the vertical distance from vertex X to the opposite side YZ.

In geometry, this length is specifically referred to as the height of the triangle.

So, the length of XM is called the height.

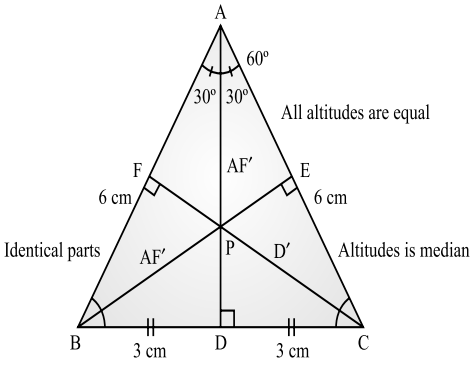
2. Given : An equilateral triangle with side 6 cm.

When all three altitudes are drawn, they all meet at a single point inside the triangle.

In an equilateral triangle, each altitude also acts as a median and an angle bisector.

All three altitudes are equal in length and divide the triangle into identical parts.

So, the special pattern is that all altitudes are equal and intersect at a single point.



3. Given sides of a right-angled triangle are 3 cm, 4 cm, and 5 cm.

In a right-angled triangle, the two sides that form the 90° angle are perpendicular to each other.

The side of 3 cm is the altitude to the base of 4 cm.

The side of 4 cm is the altitude to the base of 3 cm.

So, the sides measuring 3 cm and 4 cm serve as altitudes to each other.

4. Given that an altitude of a triangle is also its median.

An altitude is perpendicular to the base, and a median divides the base into two equal parts.

When these two lines coincide, it implies that the two remaining sides of the triangle are equal in length.

This property is a characteristic of triangles where at least two sides are of equal measure.

So, the triangle is an isosceles triangle or an equilateral triangle.

Asscess Yourself-8

1. Given : sides PQ = 7 cm, QR = 6 cm, and RP = 5 cm.

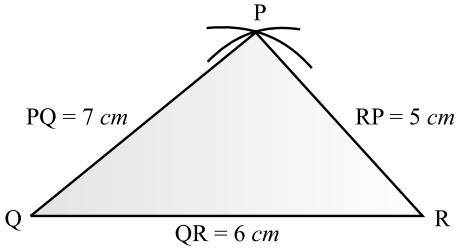
To construct this triangle, first draw the base QR measuring 6 cm.

Using a compass, draw an arc of 7 cm from Q and another arc of 5 cm from R.

The intersection of these arcs is point P.

The altitude from P to QR is a perpendicular line segment drawn from vertex P meeting the base QR at a 90° angle.

So, the altitude is the perpendicular distance from P to the line segment QR.



2. Given : LN = 5 cm, LM = 8 cm, and ∠LNM = 120°.

First, draw the line segment LN measuring 5 cm and construct an angle of 120° at point N.

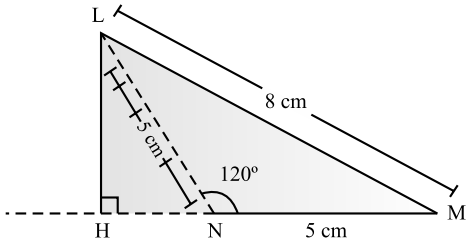
Measure 8 cm from L to find point M along the constructed line.

Since ∠LNM is an obtuse angle, the altitude from L to

the base MN will fall outside the triangle.

To draw this altitude, extend the line segment MN and drop a perpendicular from point L to this extension.

So, the altitude from L meets the extended base MN at a 90° angle.



3. Given : $\angle Y = 90°$, XY = 4 cm, and YZ = 6 cm.

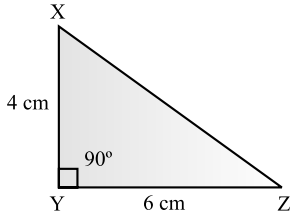
Start by drawing the base YZ of 6 cm and construct a 90° angle at vertex Y.

Measure 4 cm along the perpendicular line to find vertex X and join X to Z.

According to the given measurements of two sides and the included angle, only one unique triangle can be constructed.

Any other triangle drawn with these exact side lengths and the 90° angle will be congruent to the first one.

So, only 1 unique triangle can be drawn with these measurements.



4. (a) In an equilateral triangle, all three angles must be equal to 60° to satisfy the angle sum property of 180°.

A right-angled triangle must have one angle equal to 90°.

So, it is not possible to draw an equilateral triangle that is right-angled.

(b) An obtuse-angled triangle requires one angle to be greater than 90°.

Since all angles in an equilateral triangle are strictly 60°, none can be obtuse.

So, it is not possible to draw an equilateral triangle that is obtuse-angled.

(c) An isosceles triangle has two equal sides and two equal angles.

In a right-angled isosceles triangle, the angles are 90°, 45°, and 45°.

So, an isosceles triangle that is right-angled can be drawn with angles 90°, 45°, and 45°.

(d) An isosceles triangle can have one obtuse angle as long as the sum of all angles is 180°.

For example, if the obtuse angle is 120°, the other two equal angles would be 30° each.

So, an isosceles triangle that is obtuse-angled can be drawn with angles such as 120°, 30°, and 30°.

'Figure it Out' Exercise

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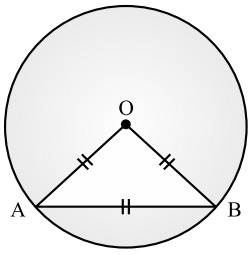
1. (i) Draw a circle of any radius with centre O.

(ii) Take any two points on the circle and join AO and BO.

(iii) Join AB.

(iv) ΔAOB is required isosceles triangle.

Let the intersection point of two circles be C.



2. (i) Join AB, AC and BC

AC = BC (radii)

(Radii of both the circles are same)

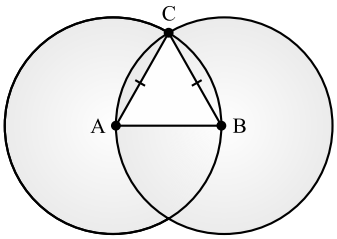
Thus, ΔABC is the required isocles.

Thus, ΔABC is an isoceles triangle.

(ii) Join points A, B and C

Thus, ΔABC is an equilateral triangle.

Similarly, we can construct an isosceles triangle as above.



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1. 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.

2. (a) $10 + 10 < 25$

(Inequality of triangle fails)

So, triangle does not exist.

(b) $5 + 10 < 20$

(Inequality of triangle fails)

(c) $12 + 20 < 40$

(Inequality of triangle fails)

So, triangle does not exist.

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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)

So, triangle exists.

(b) 3, 4, 6

$3 + 4 > 6, 4 > 3, 3 + 6 > 4$

So, triangle exists.

(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 does not exist.

(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 does not exists.

(g) 24, 26, 28

$24 + 26 > 28, 26 + 28 > 24 + 28 > 26$

So, triangle exists.

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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.

2. Given, sides of triangle 50, 50, 50.

We know that an equilateral triangle has all sides of equal length.

So, yes, possible.

3. We know that sum of length of two sides of a triangle must be greater than its thrid 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.*, $4 < x < 10$

So, required five values of x are

5, 6, 7, 8, 9

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1. (a) 3 Steps of Construction :

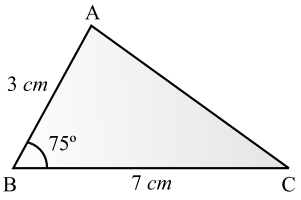
(1) Draw BC = 7 cm

(2) At point B draw an angle of 75°

(3) Mark an arc with protector such that AB = 3 cm.

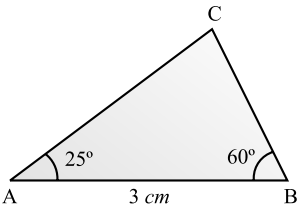
(4) Join AC.

(5) ΔABC is the required triangle.



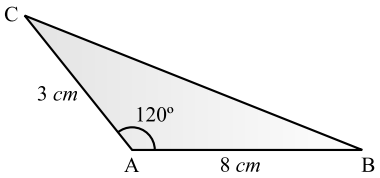
(b) Steps of Construction

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°.



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1. (a) 75°, 5 cm, 75°

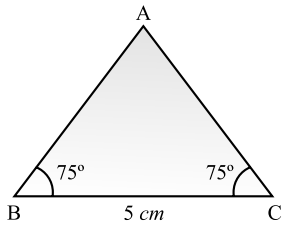
Steps of Construction

(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.

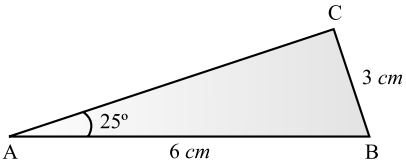
(4) ΔABC is the required triangle.



(b) 25°, 3 cm, 60°

Steps of Construction

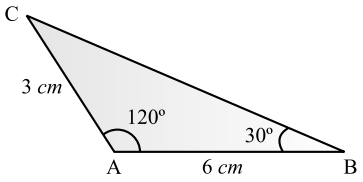
Do same as part (a).



(c) 120°, 6 cm, 30°

Steps of Construction

Do same as part (a)



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1. 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°.

2. 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.

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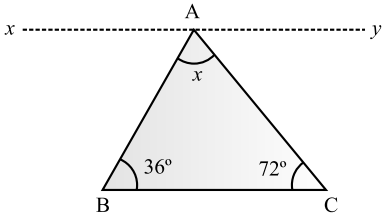
1. We know that sum of three angles of a triangles is 180°.



(a) Let third angle of triangle be x and $xy \parallel BC$ then

$\angle XAB = \angle ABC = 36°$ (alternate angles)

$\angle YAC = \angle ACB = 72°$ (alternate angles)

XAY is a straight line.

$\therefore \angle XAB + \angle A + \angle YAC = 180°$

$36° + \angle A + 72° = 180°$

$\Rightarrow \angle A = x = 180° - 108° = 72° = x$

(b) Let third angles of triangle be x then, as done in part (a).

$\angle XAB + \angle A + \angle YAC = 180°$

$150° + x + 15° = 180°$

$\Rightarrow x = 180° - 165° = 15°$

(c) Same as part (a). The third angle of triangle is 60° is 60°

(d) Let third angle of the triangle be x, then as done in part (a).

$\angle XAB + \angle A + \angle YAC = 180°$

$75° + x + 45° = 180°$

$\Rightarrow x = 180° - 120 = 60°$

2. If all angles of a triangle are 70° then

Sum of angles $= 70° + 70° + 70°$

$= 210 > 180°$

So, triangles does not exist.

If two angles of triangle are 70°, 70°, then their sum $= 70° + 70°$

$= 140°$

So third agle $= 180° - 140°$

$= 40°$

If all the agles of a triangle are equal say x the their sum

$= x + x + x = 180°$

$\Rightarrow 3x = 180°$

$\Rightarrow x = \frac{180°}{3} = 60°$

Thus, each angle of this triangle is a measure 60° and it is called a equilateral triangle.

3. Let $\angle B = \angle C = x$ then sum of angles of triangle $= \angle A + \angle B + \angle C = 180°$

$\Rightarrow 50° + x + x = 180°$

$\Rightarrow 2x = 180° - 50° = 130°$

$\Rightarrow x = \frac{130°}{2} = 65°$

Thus $\angle B = \angle C = 65°$.

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1. Steps of Construction

(1) Draw AB = 6 cm.

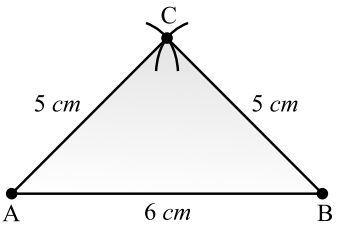
(2) From point A draw a ac of length 5 cm.

(3) From point B draw another circle of length 5 cm.

(4) C is the point of intersection of two circles.

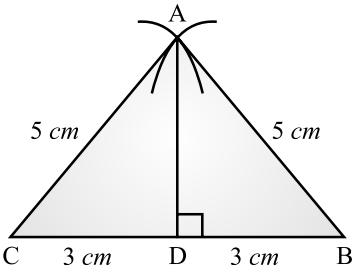
(5) Join AC and BC.

(6) ΔABC is the required triangle.

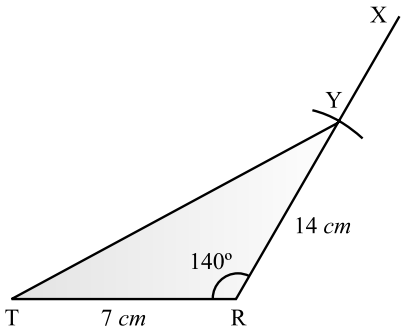


Again

(7) With the help of ruler and set square draw AD ⊥ BC.



2. Steps of Construction



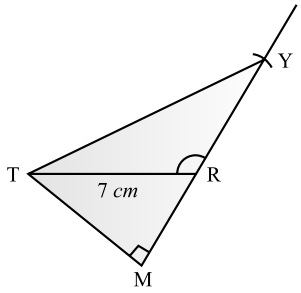
(1) Draw TR = 7 cm.

(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 aliged to RY and place the set square, we get altitude TM on extended RY.

Thus, TM is the required altitude.

3. Step 1 : Take AC = 5 cm as the hypotenuse.

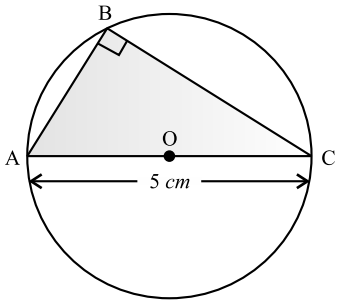
Step 2 : Find the mid-point O and AC.

Step 3 : Take O as center and OA = OC = 2.5 cm as radius.

Draw a circle.

Step 4 : Take any point B on this circle.

Then ∠ABC will always be 90° (angle in a semicircle).



Step 5 : Take any value of ∠A and ∠C whose sum is 90° (like 30° – 60°, 45° – 45°, 20° – 70°, etc.)

Thus, infinitely many triangles are possible. Point B can be anywhere on the circle (except A and C). In all cases, ∠B = 90° and AC = 5 cm.

4. (1) **Equilateral triangle** (i) one right angle.

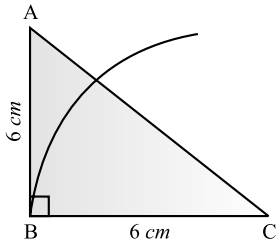
Constructuion steps :

Step 1 : Draw a line BC of length 6 cm as the base.

Step 2 : At point B, make an angle of 90°.

Step 3 : On the other arm of this angle, locate point A such that BA = 6 cm.

Step 4 : Taking C as centre and radius 6 cm, daw an arc. It is seen that this arc does not cut BA.



Therefore, it is not possible to construct a right-angled equilateral triangle.

(2) Isosceles triangle :

(i) One right angle : constrution steps :

Step 1 : Draw a line BC of length 6 cm as the base.

Step 2 : At point B, make an angle of 90°.

Step 3 : On the other arm of this angle, locate point A such that AB = 6 cm.

Step 4 : Join AC. Thus, the required isosceles triangle ABC is obtained, which is right-angled.

(ii) one obtuse angle : Construction steps :

Step 1 : Draw a line BC of lenght 6 cm as the base.

Step 2 : At point B, make an angle of 120.

Step 3 : On the other arm of this angle, locate point A such that BA = 6 cm.

Step 4 : Join AC. Thus, the required isosceles triangle ABC is obtained, which is obtuse-angled.

(b) Isosceles triangle with a right angle :

Step 1 : Assume right anlge $\angle B = 90°$.

Step 2 : $\angle A + \angle B + \angle C = 180°$

$\rightarrow \angle A + \angle C = 90°$.

Step 3 : for isosceles,

$\angle A = \angle C \rightarrow 2\angle A = 90°$

$\rightarrow \angle A = \angle C = 45°$.

Step 4 : Such a triangle is possible (45° – 90° – 45°).

Therefore, (i) right-angled isosceles triangle is possible – $\angle A = \angle C = 45°$, $\angle B = 90°$

(c) Isosceles triangle with an obtuse angle :

Step 1 : Aaaume obtuse angle $\angle A > 90°$.

Step 2 : $\angle B + \angle C = 180° - \angle A < 90°$.

Step 3 : If $\angle B = \angle C$ (isosceles), then $\angle B = \angle C = 45°$ (acute angles).

Steps 4 : Such a triangle is possible.

Example :

$\angle A = 100°$, $\angle B = \angle C = 40°$.

Therefore, (ii) obtuse-angled isosceles triangle is possible.

Example : $\angle A = 100°$, $\angle B = \angle C = 40°$.

Practice Time

Objective Questions

Multiple Choice Questions :

1. (b), 2. (c), 3. (c), 4, (a), 5. (c)

Fillt in the Blanks :

1. 60°
2. 90°
3. obtuse
4. hypotenuse
5. 55°

Ture/False

1. True 2. False 3. False 4. True 5. False

Subjective Questions :

1. Given angles are $3x°$, $(2x + 7)°$, and $(4x + 11)°$.

   Using the angle sum property of a triangle, the sum of all angles is 180°.

   $3x + (2x + 7) + (4x + 11) = 180$.

   $9x + 18 = 180$.

   $9x = 180 - 18 = 162$.

   $x = 162 \div 9 = 18$.

   So, the value of x is 18°.

2. Given ratio of angles is 3 : 4 : 5.

Let the angles be $3x$, $4x$, and $5x$.

Using the angle sum property,

$$3x + 4x + 5x = 180°.$$

$$12x = 180°.$$

$$x = 180° \div 12 = 15°.$$

First angle $= 3 \times 15 = 45°$.

Second angle $= 4x = 4 \times 15 = 60°$.

Third angle $= 5x = 5 \times 15 = 75°$.

So, the angles are 45°, 60°, and 75°.

3. Given sides are 11 cm, 4 cm, and 6 cm.

The triangle inequality property states that the sum of any two sides must be greater than the third side.

Checking the sum of the two smaller sides: $4 + 6 = 10$ cm.

Since 10 cm is not greater than 11 cm, the property is not satisfied.

So, it is not possible to have a triangle with these sides.

4. Given one acute angle is 38° and the triangle is a right triangle.

A right triangle has one angle equal to 90°.

Using the angle sum property, the other acute angle $= 180° - (90° + 38°)$.

Other angle $= 180° - 128° = 52°$.

So, the other angle is 52°.

5. Given each equal angle is twice the third angle.

Let the third angle be x.

The two equal angles are $2x$ and $2x$.

Using the angle sum property,

$$x + 2x + 2x = 180°.$$

$$5x = 180°.$$

$$x = 180° \div 5 = 36°.$$

Equal angles $= 2 \times 36 = 72°$.

So, the angles are 36°, 72°, and 72°.

6. Given sides are 5 cm and 9 cm.

The third side must be greater than the difference of the two sides: $9 - 5 = 4$ cm.

The third side must be less than the sum of the two sides: $9 + 5 = 14$ cm.

So, the third side can be any length greater than 4 cm and less than 14 cm.

7. Given base angle is four times the vertical angle.

Let the vertical angle be x.

Since it is an isosceles triangle, the two base angles are equal.

Each base angle $= 4x$.

Using the angle sum property,

$$x + 4x + 4x = 180°.$$

$$9x = 180°.$$

$$x = 180° \div 9 = 20°.$$

Base angles $= 4 \times 20 = 80°$.

So, the angles are 20°, 80°, and 80°.

8. Given the ratio of two acute angles in a right triangle is 7 : 8.

Let the angles be $7x$ and $8x$.

In a right triangle, the sum of the two acute angles is 90°.

$$7x + 8x = 90°.$$

$$15x = 90°.$$

$$x = 90° \div 15 = 6°.$$

First angle $= 7 \times 6 = 42°$.

Second angle = 8 × 6 = 48°.

So, the angles are 42° and 48°.

9. Given AB || DC, AD = DC, ∠ABC = 68°, and ∠DAC = 35°.

In triangle ADC, sides AD and DC are equal, so it is an isosceles triangle.

Base angles opposite to equal sides are equal, so

∠DCA = ∠DAC = 35°.

Using the angle sum property in triangle ADC,

$x + 35° + 35° = 180°.$

$x + 70° = 180°.$

$x = 180° - 70° = 110°.$

Since AB || DC, alternate interior angles are equal, so y = ∠DCA = 35°.

In triangle ABC, using the angle sum property, $y + z + 68° = 180°.$

$35° + z + 68° = 180°.$

$z + 103° = 180°.$

$z = 180° - 103° = 77°.$

So, the values are x = 110°, $y = 35°$, and $z = 77°$.

10. Given vertically opposite angles are equal, so x = 80°.

Angles on a straight line add up to 180°.

$2y + 110° = 180°.$

$2y = 180° - 110° = 70°.$

$y = 70° \div 2 = 35°.$

In the triangle formed, the sum of internal angles is 180°.

$3z + 2y + x = 180°.$

$3z + 70° + 80° = 180°.$

$3z + 150° = 180°.$

$3z = 180° - 150° = 30°.$

$z = 30° \div 3 = 10°.$

So, the values are $x = 80°$, $y = 35°$, and $z = 10°$.

11. Given PQ || SR and QR || PS.

(i) Since QR || PS, alternate interior angles are equal, so ∠SQR = ∠PSQ = 85°.

(ii) In triangle SQR,

∠QSR + ∠SQR + ∠SRQ = 180°.

∠QSR + 85° + 50° = 180°.

∠QSR + 135° = 180°.

∠QSR = 180° – 135° = 45°.

(iii) Since PQ || SR, alternate interior angles are equal, so

∠SQP = ∠QSR = 45°.

(iv) In triangle PQS,

∠P + ∠PSQ + ∠SQP = 180°.

∠P + 85° + 45° = 180°.

∠P + 130° = 180°.

∠P = 180° – 130° = 50°.

So, the values are (i) 85°, (ii) 45°, (iii) 45°, and (iv) 50°.

12. Given RS || MN.

(i) In triangle RMN,

∠M + ∠MRN + ∠MNR = 180°.

∠M + 100° + 25° = 180°.

∠M + 125° = 180°.

∠M = 180° – 125° = 55°.

(ii) ∠SRN + ∠RNM = 25°

(Alternate interio angles)

(iii) Since RS || MN, alternate interior angles are equal, so

∠SRN = ∠RNM = 25°.

Using the angle sum property in triangle LRS,

55° + ∠LRS + ∠LSR = 180°.

Since RS || MN, corresponding angles are equal, so

∠LRS = ∠M = 55°.

(iv) Since RS || MN, corresponding angles are equal, so

$\angle LSR = \angle LNM$.

$\angle LNM = \angle SNR + \angle RNM$

$= \angle SNR + 25°$.

In triangle LMN,

$55° + 55° + \angle LNM = 180°$.

$110° + \angle LNM = 180°$, so

$\angle LNM = 70°$.

$\angle LSR = 70°$.

(v) Angles on a straight line add up to 180°.

$\angle RSN + \angle LSR = 180°$.

$\angle RSN + 70° = 180°$.

$\angle RSN = 180° - 70° = 110°$.

(vi) From earlier, $\angle LNM = 70°$ and $\angle RNM = 25°$.

$\angle RNS = \angle LNM - \angle RNM$

$= 70° - 25° = 45°$.

So, (i) 55°, (ii) 80°, (iii) 55°, (iv) 70°, (v) 110°, and (vi) 45°.

Working with Fractions

Asscess Yourself-1

1. Priya reads $\frac{3}{8}$ of a book each day.

In 1 week (7 days)

$= 7 \times \frac{3}{8} = \frac{21}{8} = 2\frac{5}{8}$ books.

In April (30 days)

$= 30 \times \frac{3}{8} = \frac{90}{8} = \frac{45}{4}$

$= 11\frac{1}{4}$ books.

So, Priya reads $2\frac{5}{8}$ books in a week and $11\frac{1}{4}$ books in April.

2. A construction crew paves 3 km of road in 12 days.

In 1 day $= 3 \div 12 = \frac{1}{4}$ km, which is $\frac{1}{12}$ of the total 3 km road.

In 5 days $= 5 \times \frac{1}{4} = \frac{5}{4}$

$= 1\frac{1}{4}$ km.

So, the crew paves $\frac{1}{12}$ portion of the road per day and $1\frac{1}{4}$ km in 5 days.

3. Rohan and two friends buy 9 litres of paint each month, divided equally among 3 households.

Per household per month

$= 9 \div 3 = 3$ litres.

In 4 months $= 4 \times 3 = 12$ litres.

So, one household receives 3 litres per month and 12 litres in 4 months.

4. Train departs at 7:15 am on Tuesday. Each day it departs $\frac{1}{2}$ hour earlier.

From Tuesday to Friday = 3 days.

Total time moved earlier = 3 x $\frac{1}{2} = \frac{3}{2} = 1\frac{1}{2}$ hours = 1 hour 30 minutes.

New departure time = 7:15 am minus 1 hour 30 minutes = 5:45 am.

So, the train will depart on Friday at 5:45 am.

5. Multiply and express as a mixed fraction:

(a) $7 \times \frac{3}{5} = \frac{21}{5} = 4\frac{1}{5}$.

So, the answer is $4\frac{1}{5}$.

(b) $9 \times \frac{2}{3} = \frac{18}{3} = 6$. So, the answer is 6.

(c) $12 \times \frac{5}{8} = \frac{60}{8} = \frac{15}{2} = 7\frac{1}{2}$.

So, the answer is $7\frac{1}{2}$.

(d) $14 \times \frac{3}{7} = \frac{42}{7} = 6$.

So, the answer is 6.

Try If Yourself

1. $2 \times \frac{1}{5}$ as repeated addition:

$$= \frac{1}{5} + \frac{1}{5} = \frac{2}{5}.$$

So, the total fraction is $\frac{2}{5}$.

2. $\frac{3}{8} \times 4 = \frac{(3 \times 4)}{8} = \frac{12}{8} = \frac{3}{2} = 1\frac{1}{2}$.

So, the answer is $\frac{3}{2}$ or $1\frac{1}{2}$.

3. Meena drinks $\frac{1}{2}$ litre every hour.

In 5 hours $= 5 \times \frac{1}{2}$

$$= \frac{5}{2} = 2\frac{1}{2} \text{ litres.}$$

So, Meena drinks $2\frac{1}{2}$ litres of water in 5 hours.

4. A rope is $\frac{3}{4}$ metre long. Total length of 6 ropes :

$$= 6 \times \frac{3}{4} = \frac{18}{4} = \frac{9}{2} = 4\frac{1}{2} \text{ metres.}$$

So, the total length of rope is $4\frac{1}{2}$ metres.

Asscess Yourself-2

1. Find :

(a) $\frac{1}{3} \times \frac{1}{6} = \frac{(1 \times 1)}{(3 \times 6)} = \frac{1}{18}$.

So, the answer is $\frac{1}{18}$.

(b) $\frac{1}{4} \times \frac{2}{5} = \frac{(1 \times 2)}{(4 \times 5)} = \frac{2}{20} = \frac{1}{10}$.

So, the answer is $\frac{1}{10}$.

(c) $\frac{3}{7} \times \frac{3}{4} = \frac{(3 \times 3)}{(7 \times 4)} = \frac{9}{28}$.

So, the answer is $\frac{9}{28}$.

2. Use the unit square (diagram) method to represent:

(a) $\frac{1}{9}\times\frac{1}{12}$:

Divide the unit square into 9 equal horizontal strips and 12 equal vertical strips, creating 108 equal parts. The overlapping shaded part is 1 out of 108.

So, $\frac{1}{9}\times\frac{1}{12}=\frac{1}{108}$.

(b) $\frac{2}{5}\times\frac{3}{4}$:

Divide into 5 horizontal strips, shade 2. Divide into 4 vertical strips, shade 3. Overlapping region = 6 parts out of 20.

$$=\frac{6}{20}=\frac{3}{10}.$$

So, $\frac{2}{5}\times\frac{3}{4}=\frac{3}{10}$.

(c) $\frac{4}{6}\times\frac{3}{5}$:

Divide into 6 horizontal strips, shade 4. Divide into 5 vertical strips, shade 3. Overlapping region = 12 out of 30 parts.

$$=\frac{12}{30}=\frac{2}{5}.$$

So, $\frac{4}{6}\times\frac{3}{5}=\frac{2}{5}$.

3. Let the fractions be $\frac{2}{3}$ and $\frac{3}{4}$.

Direct multiplication rule:

$$\frac{2}{3}\times\frac{3}{4}=\frac{(2\times3)}{(3\times4)}=\frac{6}{12}=\frac{1}{2}.$$

Area/diagram method: Divide unit square into 3 horizontal strips and shade 2. Divide into 4 vertical strips and shade 3. The overlapping shaded region = 6 parts out of 12 = $\frac{1}{2}$.

So, $\frac{2}{3}\times\frac{3}{4}=\frac{1}{2}$ by both methods.

Asscess Yourself-3

1. A tap fills $\frac{7}{10}$ of a tank in 1 hour.

(a) How much of the tank will be filled in :

(i) $\frac{1}{2}$ hour = $\frac{7}{10}\times\frac{1}{2}=\frac{7}{20}$.

So, $\frac{7}{20}$ of the tank is filled.

(ii) $\frac{4}{7}$ hour = $\frac{7}{10}\times\frac{4}{7}=\frac{28}{70}=\frac{2}{5}$.

So, $\frac{2}{5}$ of the tank is filled.

(iii) $\frac{1}{5}$ hour = $\frac{7}{10}\times\frac{1}{5}=\frac{7}{50}$.

So, $\frac{7}{50}$ of the tank is filled.

(iv) $\frac{7}{10}$ hour = $\frac{7}{10}\times\frac{7}{10}=\frac{49}{100}$.

So, $\frac{49}{100}$ of the tank is filled.

(b) Time to fill the tank completely

$= 1 \div \frac{7}{10}=1\times\frac{10}{7}=\frac{10}{7}=1\frac{3}{7}$ hours.

So, the tank will be completely full in $1\frac{3}{7}$ hours.

2. The municipal office takes $\frac{1}{4}$ of Ravi's farmland. Remaining land

$$= 1 - \frac{1}{4} = \frac{3}{4}.$$

(a) Meera gets half of remaining = $\frac{1}{2} \times \frac{3}{4} = \frac{3}{8}$ of original land.

So, Meera gets $\frac{3}{8}$ of the original land.

(b) Karan gets $\frac{1}{3}$ of remaining

$= \frac{1}{3} \times \frac{3}{4} = \frac{3}{12} = \frac{1}{4}$ of original land.

So, Karan gets $\frac{1}{4}$ of the original land.

(c) Ravi keeps $= \frac{3}{4} - \frac{3}{8} - \frac{1}{4}$

$$= \frac{6}{8} - \frac{3}{8} - \frac{2}{8} = \frac{1}{8}.$$

So, Ravi keeps $\frac{1}{8}$ of the original land.

3. Area of rectangle with sides $2\frac{2}{3}$ m and $5\frac{1}{4}$ m

$$= \frac{8}{3} \times \frac{21}{4} = \frac{168}{12} = 14 \text{ m}^2.$$

So, the area of the rectangle is 14 m^2.

4. Ramesh plants 6 rose bushes with a gap of $\frac{2}{3}$ m between each pair.

Number of gaps = 6 – 1 = 5.

Total distance = $5 \times \frac{2}{3}$

$$= \frac{10}{3} = 3\frac{1}{3} \text{ m}.$$

So, the distance between the first and last bush is $3\frac{1}{3}$ m.

5. Comparing: $\frac{4}{5}$ of 750 g and $\frac{2}{7}$ of 5 kg.

$\frac{4}{5} \times 750 = 600$ g.

$\frac{2}{7} \times 5000 = \frac{10000}{7}$ g

= approximately 1428.6 g.

Since 1428.6 g is greater than 600 g, so $\frac{2}{7}$ of 5 kilograms is heavier.

Asscess Yourself-4

1. Evaluate the following :

(a) $4 \div \frac{3}{11} = 4 \times \frac{11}{3} = \frac{44}{3} = 14\frac{2}{3}$.

So, the answer is $14\frac{2}{3}$.

(b) $\frac{15}{7} \div 3 = \frac{15}{7} \times \frac{1}{3} = \frac{15}{21} = \frac{5}{7}$.

So, the answer is $\frac{5}{7}$.

(c) $\frac{4}{5} \div \frac{4}{5} = \frac{4}{5} \times \frac{5}{4} = \frac{20}{20} = 1$.

So, the answer is 1.

(d) $\frac{7}{5} \div \frac{21}{20} = \frac{7}{5} \times \frac{10}{21} = \frac{70}{105} = \frac{2}{3}$.

So, the answer is $\frac{2}{3}$.

(e) $\frac{7}{8} \div \frac{7}{8} = \frac{7}{8} \times \frac{8}{7} = \frac{56}{56} = 1.$

So, the answer is 1.

(f) $\frac{9}{11} \div \frac{1}{11} = \frac{9}{11} \times \frac{11}{1} = \frac{99}{11} = 9.$

So, the answer is 9.

(g) $\frac{15}{5} \div \frac{7}{3} = 3 \div \frac{7}{3}$

$= 3 \times \frac{3}{7} = \frac{9}{7} = 1\frac{2}{7}.$

So, the answer is $1\frac{2}{7}$.

(h) $\frac{3}{4} \div \frac{8}{12} = \frac{3}{4} \times \frac{12}{8} - \frac{36}{32} = \frac{9}{8} = 1\frac{1}{8}.$

So, the answer is $1\frac{1}{8}$.

2. Select the correct expression and solve :

(a) Gardener has 10 litres; of water each plant needs $\frac{2}{5}$ litre. Number of plants

$= 10 \div \frac{2}{5} = 10 \times \frac{5}{2} = \frac{50}{2} = 25.$

The correct expression is option (ii) $10 \div \frac{2}{5}$.

So, the gardener can water 25 plants.

(b) A roll of fabric of $\frac{3}{4}$ m makes 6 identical masks.

Length per mask

$= \frac{3}{4} \div 6 = \frac{3}{4} \times \frac{1}{6} = \frac{3}{24} = \frac{1}{8}$ m.

The correct expression is option (iii) $\frac{3}{4} \div 6$.

So, each mask uses $\frac{1}{8}$ m of fabric.

(c) Baker has 4 kg sugar; each batch needs $\frac{1}{8}$ kg.

Number of batches

$= 4 \div \frac{1}{8} = 4 \times 8 = 32.$

The correct expression is option (i) $4 \div \frac{1}{8}$.

So, the baker can make 32 batches of cookies.

3. Given :

Point needed for 5 m2 wall

$= \frac{1}{3}\ l.$

New wall area to cover = 12 m^2 first, lets find the point needed for 1 m^2 wall.

Point for 1 $m^2 = \frac{\frac{1}{3}}{5} = \frac{1}{3 \times 5} = \frac{1}{15}\ l.$

Now, lets calculate the point needed for 18 m^2 wall :

Point for 12 m^2 = $12 \times \frac{1}{15}$

Point for $12m^2 = \frac{12}{15} = \frac{4}{5}\ l.$

4. Given : Total number of levels = 500

Fraction of levels compdeted on Saturday = $\frac{1}{5}$

Fraction remaining levels completed on Sunday $= \frac{3}{10}$

Levels completed on Satuday

$= \frac{1}{5} \times 500 = 100$ levels

Remaining levels after Saturday

$= 500 - 100 = 400$ levels

Levels completed on Sunday

$= \frac{3}{10} \times 400 = 120$ levels

Total levels left $= 400 - 120$

$= 280$ levels

There are 280 levels left fo her to complete.

5. Given :

Distance on a full battery charge

$= 20$ m

Dattery fraction already used

$= \frac{2}{5}$

Part 1 : First find the remaiing battery fraction :

Remaining battery $= 1 - \frac{2}{5} = \frac{3}{5}$

Now find the remaining distance

$= \frac{3}{5} \times 20 = 3 \times 4 = 12$ km

Part 2 : Convert the mixed fraction to an improper fracction :

New battery capacity $= 1\frac{1}{2} = \frac{3}{2}$ charges

Calculate the total distance :

Total distance $= \frac{3}{2} \times 20$

$= 3 \times 10 = 30$ km

The drone can fly 12 km furthar on its current charge and it can travel 30 km using $1\frac{1}{2}$ battery chages.

6. Given : Taken time to down loading a large file by

Arjun $= 4\frac{1}{2}$ hours $= \frac{9}{2}$ hours

Taken time for fiber-optic conection

$= \frac{1}{4}$ of the $\frac{9}{2} = \frac{9}{2} \times \frac{1}{4}$

$= \frac{9}{8}$ hours $= 1\frac{1}{8}$ hours

So, It takes $\frac{9}{8}$ hours or $1\frac{1}{8}$ hours to downloads the file using the fiber optic conections.

7. Given : Total pizza $= 1$

Fraction of pizza eatern by Rohan and Sonia $= \frac{3}{5}$

Total number of remaining people sharing equally $= 3$

Calculate the remaining pizza equally amont 3 people

$= \frac{\frac{2}{5}}{3} = \frac{2}{5 \times 3} = \frac{2}{15}$

So, each of them got $\frac{2}{15}$ of the original pizza.

8. Given expression $= \frac{350}{420} \times \frac{550}{350}$

Simpligy the given expression

$$= \frac{350}{420} \times \frac{550}{350} = \frac{550}{420}$$

Since the numerator is greater than the denominator the value of the fraction is greater than 1.

So, $\frac{550}{420} > 1.$

Now, let's comare $\frac{550}{420}$ and $\frac{550}{425}$

When two fractions have the same numerator, the fraction with the smalle denominator is always the greater fraction.

Since $420 < 425$

So, $\frac{550}{420} > \frac{550}{425}$

So, Correct option are (a) and (d).

9. Given : The large main rectangle is divided into 4 equal large parts (quadants).

Only a portion fo the bottom-ight quadant is shaded.

Let the area of the whole large rectangle = 1

Therefore, the area of the bottom-right quadrant $= \frac{1}{4}$

The two diagonals divide this qudrant into 4 equal smaller triangles.

Area of each small triangle

$$= \frac{1}{4} \times \frac{1}{4} = \frac{1}{16}$$

The entrie tiangle is completely shaded :

$$\text{Area} = \frac{1}{16}$$

The right triangle is divided exactly in half hoizontally and its lower half is shaded :

$$\text{Area} = \frac{1}{2} \times \frac{1}{16} = \frac{1}{32}$$

Now, add these two parts togethe to get the total shaded fraction :

$$\text{Total shaded fraction} = \frac{1}{16} + \frac{1}{32}$$

Total shaded fraction

$$= \frac{2+1}{32} = \frac{3}{32}$$

So $\frac{3}{32}$ of the whole retangle is shaded.

10. Given : The numeical seies to evaluate goes from

$n = 2$ upto $n = 100$.

The variable weries to generalize goes from $n = 2$ upto $n = k$.

First, simplify the terms inside each individual bracket :

$$1 + \frac{1}{2} = \frac{3}{2}$$

$$1 + \frac{1}{3} = \frac{4}{3}$$

::::::::: :::::::

$$1 + \frac{1}{100} = \frac{101}{100}$$

Now, multiply all these simplified fractions together.

Poduct

$$= \frac{3}{2}\times\frac{4}{3}\times\frac{5}{4}\times\frac{6}{5}\times.....\times\frac{100}{99}\times\frac{101}{100}$$

$$= \frac{101}{2}$$

Following the exact same cancellation rule for a series ending at k :

General Product

$$= \frac{3}{2}\times\frac{4}{3}\times\frac{5}{4}\times.....\times\frac{(k+1)}{k}$$

All intermediat numerators and denominators will conicla out, leaving only the very first denominator (2) and the very last numerator (k + 1).

Geneal product = $\frac{k+1}{z}$

So, the value of the given expression is $\frac{101}{2}$ and the general statement fo the product upto any number k is $\frac{k+1}{2}$.

Figure it Out Exercise

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1. Tenzin drinks $\frac{1}{2}$ glass of milk every day.

   In 1 week = $7 \times \frac{1}{2} = \frac{7}{2} = 3\frac{1}{2}$ glasses.

   In January (31 days) = $31 \times \frac{1}{2}$

   $= \frac{31}{2} = 15\frac{1}{2}$ glasses.

   So, Tenzin drinks $3\frac{1}{2}$ glasses in a week and $15\frac{1}{2}$ glasses in January.

2. A team makes 1 km of canal in 8 days.

   In 1 day = $\frac{1}{8}$ km.

   In 5 days = $5 \times \frac{1}{8} = \frac{5}{8}$ km.

   So, the team makes $\frac{1}{8}$ km per day and $\frac{5}{8}$ km in a 5-day week.

3. Manju and two neighbours buy 5 litres of oil weekly; shared equally among 3 families.

   Per family per week

   $= 5 \div 3 = \frac{5}{3}$

   $= 1\frac{2}{3}$ litres.

   In 4 weeks

   $= 4 \times \frac{5}{3} = \frac{20}{3} = 6\frac{2}{3}$ litres.

   So, one family gets $\frac{5}{3}$ litres per week and $\frac{20}{3}$ litres in 4 weeks.

4. Moon sets $\frac{5}{6}$ hour later each day. From Monday to Thursday = 3 days.

   Total delay = $3 \times \frac{5}{6} = \frac{15}{6} = \frac{5}{2}$

   $= 2\frac{1}{2}$ hours.

So, the Moon sets $2\frac{1}{2}$ hours after 10 pm on Thursday.

5. Multiply and convert to a mixed fraction :

(a) $7 \times \frac{3}{5} = \frac{21}{5} = 4\frac{1}{5}$.

So, the answer is $4\frac{1}{5}$.

(b) $4 \times \frac{1}{3} = \frac{4}{3} = 1\frac{1}{3}$.

So, the answer is $1\frac{1}{3}$.

(c) $\frac{9}{7} \times 6 = \frac{54}{7} = \frac{7}{57}$.

So, the answer is $7\frac{5}{7}$.

(d) $\frac{13}{11} \times 6 = \frac{78}{11} = 7\frac{1}{11}$.

So, the answer is $7\frac{1}{11}$.

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1. Find the following products using the unit square method :

(a) $\frac{1}{3} \times \frac{1}{5} = \frac{1}{15}$.

So, the answer is $\frac{1}{15}$.

(b) $\frac{1}{4} \times \frac{1}{3} = \frac{1}{12}$.

So, the answer is $\frac{1}{12}$.

(c) $\frac{1}{5} \times \frac{1}{2} = \frac{1}{10}$.

So, the answer is $\frac{1}{10}$.

(d) $\frac{1}{6} \times \frac{1}{5} = \frac{1}{30}$.

So, the answer is $\frac{1}{30}$.

Now find $\frac{1}{12} \times \frac{1}{18} = \frac{1}{216}$.

So, the answer is $\frac{1}{216}$.

2. Find the following products :

(a) $\frac{2}{3} \times \frac{4}{5} = \frac{(2 \times 4)}{(3 \times 5)} = \frac{8}{15}$.

So, the answer is $\frac{8}{15}$.

(b) $\frac{1}{4} \times \frac{2}{3} = \frac{2}{12} = \frac{1}{6}$.

So, the answer is $\frac{1}{6}$.

(c) $\frac{3}{5} \times \frac{1}{2} = \frac{3}{10}$.

So, the answer is $\frac{3}{10}$.

(d) $\frac{4}{6} \times \frac{3}{5} = \frac{12}{30} = \frac{2}{5}$.

So, the answer is $\frac{2}{5}$.

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1. A water tank tap fills $\frac{7}{10}$ of the tank in 1 hour.

How much is filled if the tap is open for:

(a) $\frac{1}{3}$ hour $= \frac{7}{10} \times \frac{1}{3} = \frac{7}{30}$.

So, $\frac{7}{30}$ of the tank is filled.

(b) $\frac{2}{3}$ hour $= \frac{7}{10} \times \frac{2}{3} = \frac{14}{30} = \frac{7}{15}$.

So, $\frac{7}{15}$ of the tank is filled.

(c) $\frac{3}{4}$ hour $= \frac{7}{10} \times \frac{3}{4} = \frac{21}{40}$.

So, $\frac{21}{40}$ of the tank is filled.

(d) $\frac{7}{10}$ hour $= \frac{7}{10} \times \frac{7}{10} = \frac{49}{100}$.

So, $\frac{49}{100}$ of the tank is filled.

(e) For the tank to be full

$= 1 \div \frac{7}{10} = \frac{10}{7} = 1\frac{3}{7}$ hours.

So, the tap should run for

$1\frac{3}{7}$ hours.

2. The government takes $\frac{1}{6}$ of Somu's land. Remaining $= 1$ minus $\frac{1}{6} = \frac{5}{6}$.

(a) Krishna gets $\frac{1}{2} \times \frac{5}{6} = \frac{5}{12}$ of original land. So, Krishna gets $\frac{5}{12}$.

(b) Bora gets $\frac{1}{3} \times \frac{5}{6} = \frac{5}{18}$ of original land. So, Bora gets $\frac{5}{18}$.

(c) Somu keeps $= \frac{5}{6}$ minus $\frac{5}{12}$ minus $\frac{5}{18}$.

LCM of 6, 12 and 18 $= 36$.

$= \frac{30}{36}$ minus $\frac{15}{36}$ minus $\frac{10}{36}$

$= \frac{5}{36}$.

So, Somu keeps $\frac{5}{36}$ of the original land.

3. Area of rectangle with sides $3\frac{3}{4}$ ft and $9\frac{3}{5}$ ft $= \frac{15}{4} \times \frac{48}{5} = \frac{720}{20}$

$= 36$ sq ft.

So, the area of the rectangle is 36 sq ft.

4. Tsewang plants 4 saplings with $\frac{3}{4}$ m between consecutive saplings.

Number of gaps = 4 minus 1 = 3.

Distance $= 3 \times \frac{3}{4} = \frac{9}{4} = 2\frac{1}{4}$ m.

So, the distance between the first and last sapling is $2\frac{1}{4}$ m.

5. $\frac{12}{15}$ of 500 g $= \frac{4}{5} \times 500$

$= 400$ g.

$\frac{3}{20}$ of 4 kg $= \frac{3}{20} \times 4000 = 600$ g.

Since 600 g is greater than 400 g, so $\frac{3}{20}$ of 4 kg is heavier.

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1. Evaluate the following :

$3 \div \frac{7}{9} = 3 \times \frac{9}{7} = \frac{27}{7} = 3\frac{6}{7}.$

$\frac{14}{4} \div 2 = \frac{14}{4} \times \frac{1}{2} = \frac{14}{8} = \frac{7}{4} = 1\frac{3}{4}$

$\frac{2}{3} \div \frac{2}{3} = \frac{2}{3} \times \frac{3}{2} = 1.$

$\frac{14}{6} \div \frac{7}{3} = \frac{14}{6} \times \frac{3}{7} = \frac{42}{42} = 1.$

$\frac{4}{3} \div \frac{3}{4} = \frac{4}{3} \times \frac{4}{3} = \frac{16}{9} = 1\frac{7}{9}.$

$\frac{7}{4} \div \frac{1}{7} = \frac{7}{4} \times \frac{7}{1} = \frac{49}{4} = \frac{12}{14}.$

$\frac{8}{2} \div \frac{4}{15} = 4 \times \frac{15}{4} = 15.$

$\frac{1}{5} \div \frac{1}{9} = \frac{1}{5} \times 9 = \frac{9}{5} = 1\frac{4}{5}.$

$\frac{1}{6} \div \frac{11}{12} = \frac{1}{6} \times \frac{12}{11} = \frac{12}{66} = \frac{2}{11}.$

$3\frac{2}{3} \div 1\frac{3}{8} = \frac{11}{3} \div \frac{11}{8} = \frac{11}{3} \times \frac{8}{11} = \frac{8}{3} = 2\frac{2}{3}.$

2. Choose the correct expression and solve:

(a) Maria bought 8 m of lace; used $\frac{1}{4}$ m per bag. Number of bags $= 8 \div \frac{1}{4} = 8 \times 4 = 32.$

The correct expression is option (iii) $8 \div \frac{1}{4}$.

So, Maria decorated 32 bags.

(b) $\frac{1}{2}$ m ribbon makes 8 badges.

Length per badge $= \frac{1}{2} \div 8$

$= \frac{1}{2} \times \frac{1}{8} = \frac{1}{16}$ m.

The correct expression is option (iv) $\frac{1}{2} \div 8$. So, each badge uses $\frac{1}{16}$ m of ribbon.

(c) Baker has 5 kg flour; each loaf needs $\frac{1}{16}$ kg.

Number of loaves $= 5 \div \frac{1}{16}$

$= 5 \times 6 = 30.$

The correct expression is option (iii) $5 \div \frac{1}{16}$. So, the baker can make 30 loaves of bread.

3. $\frac{1}{4}$ kg of flour makes 12 rotis.

Flour per roti $= \frac{1}{16} \div 12$

$= \frac{1}{4} \times \frac{1}{12} = \frac{1}{48}$ kg.

For 6 rotis $= 6 \times \frac{1}{48} = \frac{6}{48} = \frac{1}{8}$ kg.

So, $\frac{1}{8}$ kg of flour is used to make 6 rotis.

4. $1 \div \frac{1}{6} = 1 \times \frac{6}{1} = 6$

Similarly, we can add as

$6 + 10 + 13 + 9 + 2 = 40.$ **Ans.**

5. Pages read yesterday $= \frac{1}{5} \times 400$

$= 80$ pages Pagesread today

$= \frac{3}{10} \times 400$

$= 120$ pages Total pages read

$= 80 + 120$

$= 200$ pages Pages remaining

$= 400 - 200 = 200$ pages

So, Mira still needs to read 200 more pages.

6. Distance covered

= Speed per litre × litres used

$= 16 \times 2\frac{3}{4} = 16 \times \frac{11}{4} = \frac{176}{4}$

$= 44$ km

So, the car will go 44 km using $2\frac{3}{4}$ litres of petrol.

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

So, the plane saves $4\frac{2}{3}$ hours.

8. Remaining cake $= 1 - \frac{4}{5} = \frac{1}{5}$.

Each friend's share $= \frac{1}{5} \div 3$

$= \frac{1}{5} \times \frac{1}{3} = \frac{1}{15}$

So, each friend got $\frac{1}{5}$ of the cake.

9. $\frac{565}{465} > 1$ (since $565 > 465$) and

$\frac{707}{676} > 1$ (since $707 > 676$).

Multiplying a number by a value greater than 1 increases it.

Since $\frac{707}{676} > 1$, the product $> \frac{565}{465} \rightarrow$ option (a) is true, (b) is false.

Since $\frac{565}{465} > 1$, the product $> \frac{707}{676} \rightarrow$ option (c) is true, (d) is false.

Both factors are greater than 1, so their product $> 1 \rightarrow$ option (e) is true, (f) is false.

So, the correct options are (a), (c), and (e).

10. The whole square is dividied upto 4 equal smaller squares focus on the bottom right square its subdivided furter. It is split into B equal triangles using diagonal lines of these 8 parts, 3 triangles ae shaded. Fraction of the whole taken by one small square $= \frac{1}{4}$ fraction of the small triangle that is shaded $= \frac{3}{8}$

Now $\frac{1}{4} \times \frac{3}{8} = \frac{3}{32}$.

11. From the figure,

(i) Colony divides into 2 equal parts.

$\therefore$ Each part repesents a fraction

$= \frac{1}{2}$

So, $\frac{1}{2}$ of whose ants reaches to the mango tree.

(ii) Bach divides into 2 pats.

$\therefore$ Each part represets a fraction

$$= \frac{1}{2} \div 2 = \frac{1}{2} \times \frac{1}{2} = \frac{1}{4}$$

So, $\frac{1}{4}$ of $\frac{1}{2}$ ants reaches to the mango tree.

(iii) The branch divides into 4 parts

$\therefore$ Each pat represents a fraction

$$= \frac{1}{4} \div 4 = \frac{1}{4} \times \frac{1}{4} = \frac{1}{16}$$

So, $\frac{2}{16}$ or $\frac{1}{4}$ ants reaches to mango tree and $\frac{1}{16}$ of $\frac{1}{4}$ ants reaches to sugacane.

(iv) The branch divides into 2 pats.

$\therefore$ Each pat represents a fraction

$$= \frac{1}{16} \div 2 = \frac{1}{16} \times \frac{1}{2} = \frac{1}{32}$$

So, $\frac{1}{32}$ of $\frac{1}{16}$ ants reaches to Mango tree and $\frac{1}{32}$ of $\frac{1}{16}$ ants eaches to sugarcane.

$\therefore$ Total fraction of the original colony who reached Mango tree

$$= \frac{1}{2} + \frac{1}{4} + \frac{2}{16} + \frac{1}{32}$$

$$= \frac{16+8+4+1}{32} = \frac{29}{32}$$

Total fraction of the original colony who reached sugacane field

$$= \frac{1}{16} + \frac{1}{32} \quad \frac{2+1}{32} = \frac{3}{32}$$

12. $1 - \frac{1}{2} = \frac{1}{2}$

$$\left(1-\frac{1}{2}\right) \times \left(1-\frac{1}{3}\right) = \frac{1}{2} \times \frac{2}{3} = \frac{2}{6} = \frac{1}{3}$$

$$\left(1-\frac{1}{2}\right) \times \left(1-\frac{1}{3}\right) \times \left(1-\frac{1}{4}\right) \times \left(1-\frac{1}{5}\right)$$

$$= \frac{1}{2} \times \frac{2}{3} \times \frac{3}{4} \times \frac{4}{5} = \frac{1}{5}$$

$$\left(1-\frac{1}{2}\right) \times \left(1-\frac{1}{3}\right) \times \ldots \times \left(1-\frac{1}{10}\right)$$

$$= \frac{1}{2} \times \frac{2}{3} \times \frac{3}{4} \times \frac{4}{5} \times \frac{5}{6} \times \frac{6}{7} \times \frac{7}{8} \times \frac{8}{9} \times \frac{9}{10} = \frac{1}{10}$$

General Statement : Each factor

$$\left(1-\frac{1}{k}\right) = \frac{(k-1)}{k}.$$

The product telescopes as all middle terms cancel :

$$\left(\frac{1}{2}\right) \times \left(\frac{2}{3}\right) \times \left(\frac{3}{4}\right) \times \ldots \times \left(\frac{(n-1)}{n}\right) = \frac{1}{n}$$

So, the product

$$\left(1-\frac{1}{2}\right) \times \left(1-\frac{1}{3}\right) \times \ldots \times \left(1-\frac{1}{5}\right)$$

always equals $\frac{1}{n}$.

Practice Time

Objective Questions

Multiple Choice Questions :

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

Fill in the Blanks :

1. greater than

2. $\frac{17}{9}$

3. $\frac{5}{19}$

4. $\frac{1}{7}$

5. $\frac{1}{10}$

Tue False :

1. False

2. False

3. False

4. True

5. False

Subjective Questions :

1. Multiply :

(a) $9\frac{3}{8}$ by 12 :

$$9\frac{3}{8} = \frac{75}{8}.$$

$$\frac{75}{8}\times 12 = \frac{900}{8} = \frac{225}{2} = 112\frac{1}{2}.$$

So, the product is $112\frac{1}{2}$.

(b) $6\frac{11}{14}$ by $3\frac{1}{2}$:

$$6\frac{11}{14} = \frac{95}{14}.\ 3\frac{1}{2} = \frac{7}{2}.$$

$$\frac{95}{12}\times\frac{7}{2} = \frac{665}{28} = 23\frac{21}{28} = 23\frac{3}{4}.$$

So, the product is $23\frac{3}{4}$.

2. Simplify :

(a) $\frac{14}{25}\times\frac{35}{51}\times\frac{34}{49}$:

Cancel :

$$\frac{14}{49} = \frac{2}{7},\ \frac{35}{25} = \frac{7}{5},\ \frac{34}{51} = \frac{2}{3}.$$

$$= \frac{2}{7}\times\frac{7}{5}\times\frac{2}{3} = \frac{(2\times 7\times 2)}{(7\times 5\times 3)} = \frac{28}{105} = \frac{4}{15}.$$

So, the answer is $\frac{4}{15}$.

(b) $3\frac{3}{7}\times 2\frac{1}{2}\times 1\frac{3}{4}$:

$$= \frac{24}{7}\times\frac{5}{2}\times\frac{7}{4}.$$

Cancel 7 and 7:

$$= \frac{24\times 5\times 1}{(1\times 2\times 4)} = \frac{120}{8} = 15.$$

So, the answer is 15.

3. Find :

(a) $\frac{5}{9}$ of $48 = \frac{5}{9}\times 48$

$$= \frac{240}{9} = \frac{80}{3} = 26\frac{2}{3}.$$

So, $\frac{5}{9}$ of 48 is $26\frac{2}{3}$.

(b) $\frac{11}{14}$ of $63 = \frac{11}{14}\times 63 = \frac{693}{14}$

$$= 49.5 = 49\frac{1}{2}.$$

So, $\frac{11}{14}$ of 63 is $49\frac{1}{2}$.

4. Write down the reciprocal of:

(a) $6 = \frac{6}{1}$. Reciprocal $= \frac{6}{1}$.

So, the reciprocal of 6 is $\frac{1}{6}$.

(b) $3\frac{5}{8} = \frac{29}{8}$. Reciprocal $= \frac{8}{29}$.

So, the reciprocal of $3\frac{5}{8}$ is $\frac{8}{29}$.

5. Simplify :

(a) $\frac{4}{9} \div \frac{5}{6} = \frac{4}{9} \times \frac{6}{5} = \frac{24}{45} = \frac{8}{15}$.

So, the answer is $\frac{8}{15}$.

(b) $5\frac{3}{5} \div 2\frac{1}{10}$:

$5\frac{3}{5} = \frac{28}{5}$. $2\frac{1}{10} = \frac{21}{10}$.

$\frac{28}{5} \div \frac{21}{10} = \frac{28}{5} \times \frac{10}{21} = \frac{280}{105} = \frac{8}{3} = 2\frac{2}{3}$.

So, the answer is $2\frac{2}{3}$.

6. Reduce the product in the simplest form:

(a) Using the numbers as given in the textbook (answer confirmed as $\frac{8}{3}$):

Verification using $1\frac{1}{7} \times 1\frac{3}{4} \times \frac{4}{3}$

$= \frac{8}{7} \times \frac{7}{4} \times \frac{4}{3} = \frac{8 \times 7 \times 4}{(7 \times 4 \times 3)} = \frac{8}{3}$

So, the answer is $\frac{8}{3}$.

(b) $2\frac{2}{17} \times 7\frac{2}{9} \times 1\frac{33}{52}$:

$= \frac{36}{17} \times \frac{65}{9} \times 1\frac{85}{52}$.

Cancel : $\frac{36}{9}$, $\frac{85}{17} = 5$, $\frac{65}{52} = \frac{5}{4}$

$= 4 \times 5 \times \frac{5}{4} = 5 \times 5 = 25.$

So, the answer is 25.

7. $6\frac{2}{9}$ is divided by a number to get $4\frac{2}{3}$. Find that number.

$\frac{56}{9} \div n = \frac{14}{3}$.

$n = \frac{56}{9} \div \frac{14}{3} = \frac{56}{9} \times \frac{3}{14}$

$= \frac{168}{126} = \frac{4}{3}$.

So, $6\frac{2}{9}$ must be divided by $\frac{4}{3}$.

8. A rope of $9\frac{3}{4}$ m is cut into 6 equal pieces.

$= \frac{39}{4} \div 6$

$= \frac{39}{4} \times \frac{1}{6} = \frac{29}{24} = \frac{13}{8} = 1\frac{5}{8}$ m.

So, each piece is $1\frac{5}{8}$ m long.

9. Simplify:

(a) $\frac{3}{5}$ of $2\frac{1}{2} + 2\frac{2}{3}$:

$= \frac{3}{5} \times \frac{5}{2} + \frac{8}{3} = \frac{3}{2} + \frac{8}{3}$.

LCM = 6 : $= \frac{9}{6}+\frac{16}{6}=\frac{25}{6}=4\frac{1}{6}$.

So, the answer is $4\frac{1}{6}$.

(b) $\left(\frac{1}{4}\text{ of }2\frac{2}{7}\right)\div\frac{3}{5}$:

$=\left(\frac{1}{4}\times\frac{16}{7}\right)\div\frac{3}{5}=\left(\frac{16}{28}\right)\div\frac{3}{5}$

$=\frac{4}{7}\times\frac{5}{3}=\frac{20}{21}$.

So, the answer is $\frac{20}{21}$.

10. Ashish's monthly salary
= Rs 24000.

Food = $\frac{1}{4}\times 24000$ = Rs 6000.

Remaining = 24000 minus 6000
= Rs 18000.

Rent = $\frac{1}{5}\times 18000$ = Rs 3600.

Education = $\frac{1}{6}\times 18000$
= Rs 3000.

(a) Ashish spends Rs 6000 on food, Rs 3600 on rent, and Rs 3000 on education.
So, the spending on each part is Rs 6000, Rs 3600, and Rs 3000 respectively.

(b) Total spent = 6000 + 3600 + 3000
= Rs 12600.
Money left = 24000 minus 12600
= Rs 11400.
So, Rs 11400 is still left with Ashish.

11. Shikha bought $3\frac{3}{4}$ m cloth for Rs 84. Ruby bought $4\frac{1}{2}$ m of the same cloth.

Price per metre = $84\div 3\frac{3}{4}$

$=84\div\frac{15}{4}=84\times\frac{4}{15}=\frac{336}{15}$

= Rs 22.40 per metre.

Ruby paid = $4\frac{1}{2}\times 22.40$

$=\frac{9}{2}\times 22.40$

$= 9\times 11.20$ = Rs 100.80.

So, Ruby paid Rs 100.80 for the cloth.

12. Each student contributed Rs $261\frac{1}{2}$. Total contribution was Rs $2876\frac{1}{2}$.

$261\frac{1}{2}=\frac{523}{2}$. $2876\frac{1}{2}=\frac{5753}{2}$.

Number of students

$=\frac{5753}{2}\div\frac{523}{2}$

$=\frac{5753}{523}=11$.

So, there are 11 students in the group.