Mathematics - 7
(Part–II)

1. Geometric Twins

Assess Yourself-1

1. This is a practical drawing activity. Measure the length of each arm of the symbol and the angle between the arms using a ruler and protractor. Draw the first arm, place the protractor at the endpoint, mark the required angle and draw the second arm at that angle with the measured length. Repeat for any additional arms.

So, by measuring and using these exact measurements, each symbol can be recreated as a congruent figure.

Think and Discuss

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1. No. Two circles are similar in shape but are congruent only when they have equal radii. A circle with radius 2 cm and another with radius 4 cm cannot be superimposed exactly over each other. So, circles are congruent only if and only if their radii are equal.

2. No. A square has all four sides equal, but a rectangle has only its opposite sides equal. Even though both have four right angles, they cannot be superimposed exactly unless the rectangle is also a square.

So, a square cannot be congruent a rectangle unless the rectangle has all sides equal.

Think and Discuss

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1. No. The SSA condition does not guarantee congruence. Two different triangles can be constructed with the same two sides and the same non-included angle, as shown by the ambiguous case in construction.

So, SSA is not a reliable condition for congruence.

2. Yes. The angle sum in any triangle is 180°. If two angles are equal in both triangles, the third angle in each must equal 180° – (sum of two angles) so the third angle is also equal.

So, the statement is true.

3. Since, O is the midpoint of both MQ and NP :

$$MO = OQ$$
$$NO = OP$$

In ΔMON and ΔQOP :

$$MO = QO$$
(O is midpoint of MQ)
$$NO = OP$$
(O is midpoint of NP)
$$\angle MON = \angle QOP$$
(vertically opposite angles)

By SAS, $\Delta MON \cong \Delta QOP$

So, the pairs of triangles are congruent.

Asscess Yourself-2

1. No, in a right triangle, the hypotenuse AC must be strictly greater than both other sides.

Here AC =4 cm = BC, which violates this rule.

So, such a right angled triangle cannot be drawn.

2. Using SSS construction, two triangles can be drawn at the same base using the proper measurement.

So, two congruent triangles can be drawn at the same base, one on each side (above and below the base).

3. No. Equal angles makes two triangles similar but they can have different sizes.

So, equal angles are not sufficient for congruence.

Figure it Out

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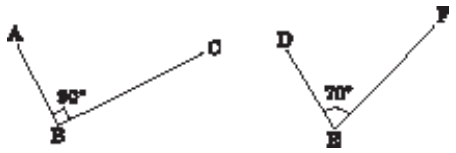
1. Let's measure the angles of given figure, with Protractor



Here ∠B is not congruent to ∠E

Thus, Given figures are not congruent.

2. From the given pairs,

figure (i) and (iv) are congruent, because they can be superimposed.

3. (a) We will measure radius or diameter of the given circle.

(b) We will measure length and breadth of the given rectangle using this.

(a) We place one circle over another circle. We check if they exactly superimpose, they are congruent, In this situation, both will have same radius.

(b) We place one rectangle over another rectangle. If they exactly superimpose they are congruent. In such case, both will have same length and breadth.

4. First we measure the length of line segments and angle between them of given figure. There check If the two figures are exactly superimpose.

Yes, each of the given figures are congruent.

Length of line segments in each figure are 2·2 cm and 1·2 cm and angle between them is 82°.

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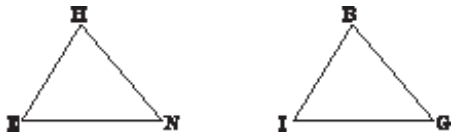
1. Given ΔHEN and ΔBIG are congruent.

If ΔHEN ≅ ΔBIG



It means H ↔ B, E ↔ I, N ↔ G

The other correct ways of expressing this congruence are:

ΔNEH ≅ ΔGIB, ΔNHE ≅ ΔGBI, ΔENH ≅ ΔIGB, ΔEHN ≅ ΔIBG, ΔHNE ≅ ΔBGI

2. From the given figure

In ΔRED and ΔJAM

RE = JA = 3·5 cm, ED = AM = 5 cm, RD = JM = 6 cm

Thus, ΔRED ≅ ΔJAM (By SSS Rule)

3. In ΔABC and ΔADC,

AB = AD (given); BC = CD (given)

AC = AC (common)

Thus ΔABC ≅ ΔADC (By SSS Rule)

Again, since ΔABC ≅ ΔADC

⇒ ∠BAC = ∠DAC [By CPLT]

and ∠BCA = ∠DCA

⇒ AC bisects both ∠BAD and ∠BCD.

4. Given that, In ΔDFE and ΔDGE

DF = DG (Given)

FE = GE

DE = DE (common)

So, ΔDFE ≅ ΔDGE (By SSS Rule)

The vertices must correspond correctly in congruence statements

In ΔDFE and ΔDGE

DF corresponds to DG; FE corresponds to GE and ED is common side

Given statements DF = DG, FE = GE does not support the congruency of ΔDFE and ΔGED, because corresponding sides are not equal.

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1. In ΔABC and ΔXZY

BC = ZY = 5 cm (given)

AB = XZ = 7 cm (given)

∠ABC = ∠XZY = 47° (given)

Thus, ΔABC ≅ ΔXZY (By SAS Rule)

2. In ΔCOD and ΔBOA

∠ABO = ∠CDO

∠AOB = ∠COD

AB = CD

So, ΔCOD ≅ ΔAOD

∴ AO = CO, BO = DO (By CPCT)

∠BAO = ∠DCO (By CPCT)

3. In ΔABC and ΔDBC

∠ABC = a = ∠DBC

and let ∠ACB = b = ∠DCB

BC is a common side of the two triangles, then

$\Delta ABC \cong \Delta DBC$

Angle Side Angle Congruence:

When two triangles are congruent, their corresponding parts are equal [CPCT]

Since $\Delta ABC \cong \Delta DBC$, their corresponding angles are equal.

Hence $\angle BAC = \angle BDC$

Yes, $\Delta BC \cong \Delta DBC$.

5. Given $\angle ABD = \angle DCA$;

$\angle ACB = \angle DBC$; $\angle AOB = \angle DOC$

$\because$ They are vertically opposite angles)

$CO = BO$; $(\because \angle OCB = \angle OBC)$

$\Delta COD \cong \Delta BOA$

Angie-side-angle condition

$\therefore$ $AB = DC$ (CPCT)

$\angle BAC = \angle CDB$ (CPCT).

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1. Given $\Delta AIR \cong \Delta FLY$

Corresponding vertices

$A \leftrightarrow F$; $I \leftrightarrow L$; $R \leftrightarrow Y$

Corresponding Sides

AI corresponds to FL

IR corresponds to LY

AR corresponds to FY

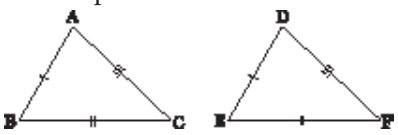
Corresponding Angles

$\angle A$ corresponds to $\angle F$

$\angle I$ corresponds to $\angle L$

$\angle R$ corresponds to $\angle Y$

2.



In ΔABC and ΔDEF

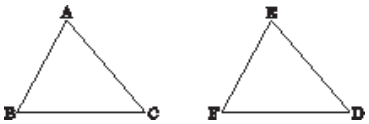
$AB = DE$ (given);

$BC = EF$ (given);

$CA = FD$ (given)

So, $\Delta ABC \cong \Delta DEF$ By SSS Rule.

(b)



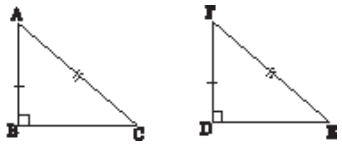
In ΔABC and ΔEFD

$AB = EF$; $\angle A = \angle E$;

$AC = ED$

So $\Delta ABC \cong \Delta EFD$ (By SAS Rule)

(c)



In ΔABC and ΔFDE

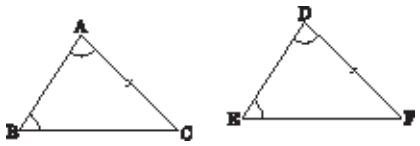
$AB = FD$ (given)

$\angle B = \angle D = 90°$ (given)

$AC = FE$

So $\Delta ABC \cong \Delta FDE$ (By RHS Rule)

(d)



In ΔABC and ΔDEF

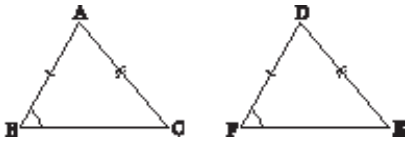
$\angle A = \angle D$ (given)

$\angle B = \angle E$ (given)

$AC = DF$ (given)

So $\Delta ABC \cong \Delta DEF$ (By AAS Rule)

(e)



In ΔABC and ΔDFE

$AB = DF$; $\angle B = \angle F$; $AC = DE$

Here two corresponding sides and one non included angle are equal. So triangles satisfy SSA condition which is not a valid congruence rule.

Thus ΔABC need not to be congruent to ΔDFE.

3. In ΔAOB and ΔDOC

$OA = OD$ (given); $OB = OC$ (given)

$\angle AOB = \angle DOC$

Thus $\Delta AOB \cong \Delta DOC$. So $\angle A = \angle D$

$\angle B = \angle C$ (By CPCT)

But $\angle A$ and $\angle D$, and $\angle C$ and $\angle B$ are alternate.

Hence AB is parallel to CD

Hence proved.

4. In ΔABC and ΔADC

$AD = AB$ (Sides of square)

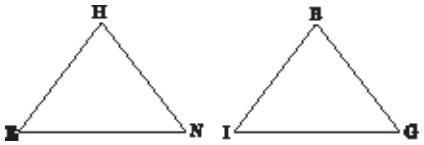
$CD = CB$ (Sides of square)

$AC = AC$ (Common)

So $\Delta ABC \cong \Delta ADC$ (By SSS condition)

Now In ΔABC and ΔCDA

AB = CD (sides of square are same)
BC = DA (sides of square)
AC = CA (Common)
So $\Delta ABC \cong \Delta ADC$
Let us consider two congruent triangles ΔHEN and ΔBIG



According to questions, six different ways are

$\Delta NEH \cong \Delta GIB$; $\Delta NHE \cong \Delta GBI$
$\Delta ENH \cong \Delta IGB$; $\Delta EHN \cong \Delta IBG$
$\Delta HNE \cong \Delta BGI$; $\Delta HEN \cong \Delta BIG$

5. In ΔBAC

$AB = AC$ = Radius of the circle
$\therefore \quad \angle ABC = \angle ACB = x$ (say)
then $x + x + 120° = 180°$
(Angle sum property of triangle)
$\Rightarrow \quad 2x + 120° = 180°$
$\Rightarrow \quad 2x = 180° - 120° = 60°$
$\Rightarrow \quad 2x = 60°$
$\Rightarrow \quad x = \frac{60°}{2} = 30°$
Thus $\angle B = \angle C = 30°$

6. In ΔCUR

$CU = CR$ (given)
$\Rightarrow \quad \angle CUR = \angle CRU = x$ (say)
$\therefore \quad x + x + 90° = 180°$
$\Rightarrow \quad 2x + 90° = 180°$
$\Rightarrow \quad 2x = 180° - 90°$
$\Rightarrow \quad x = \frac{90°}{2} = 45°$
$\therefore \quad \angle CRU = \angle CUR = 45°$
In ΔVRN
$VR = VN$
$\Rightarrow \quad \angle VRN = \angle VNR = x$ (say)
$\Rightarrow \quad x + x + 68° = 180°$
$\Rightarrow \quad 2x + 68° = 180°$
$\Rightarrow \quad 2x = 180° - 68° = 112°$
$\Rightarrow \quad x = \frac{112°}{2} = 56°$
$\therefore \quad \angle VRN = \angle VNR = 56°$

In ΔAUP,
$AU = UP$
$\Rightarrow \quad \angle UAP = \angle UPA = 56°$
$\therefore \quad 56° + 56° + \angle AUP = 180°$
$\Rightarrow \quad \angle AUP = 180° - 112° = 68°$
ΔBOF is an equilateral triangle
So $OB = OF = BF$
$\Rightarrow \quad \angle FOB = \angle FBO = \angle OFB = 60°$
$\angle RVN + \angle DVN = 180°$ (Linear Pair)
$68° + \angle DVN = 180°$
$\angle VND + \angle VDN + \angle NVD = 180°$
Since $VN = VD$
$\therefore \quad \angle VND = \angle VDN = x$ (माना)
$\therefore \quad x + x + \angle NVD = 180°$
$\therefore \quad 2x + 112° = 180°$
$2x = 180° - 112° = 68°$
$x = \frac{68°}{2} = 34°$
$\therefore \quad \angle VND = \angle VDN = 34°$
In ΔOLB
$\angle OBL = 90° - 60° = 30°$
$\angle LOB = 60°$
In ΔOPN,
$\angle OPN + \angle PON + \angle PNO = 180°$
$\angle OPN + 56° + 90° = 180°$
$\angle OPN = 180° - 146° = 34°$
Now, $\angle APK + \angle KPO + \angle OPN = 180°$
$44° + \angle KPO + 34° = 180°$
$\Rightarrow \quad \angle KPO = 180° - 78° = 102°$
In ΔKPO,
$\angle KPO + \angle POK + \angle PKO = 180°$
$102° + 30° + \angle PIO = 180°$
$\angle PKO = 180° - (132°) = 48°$
$\angle KAP + \angle KPA + \angle AKP = 180°$
$34° + 44° + \angle AKP = 180°$
$78° + \angle AKP = 180°$
$\angle AKP = 180° - 78° = 102°$
and $\angle PKO = 48°$
So, $\angle AKP + \angle PKO + \angle OKL = 180°$
$102° + 48° + \angle OKL = 180°$
$150° + \angle OKL = 180°$
$\therefore \quad \angle OKL = 180° - 150° = 30°$
In ΔKOL,

$\angle OKL + \angle OLK + \angle KOL = 180°$

$30° + 90° + \angle KOL = 180°$

$\therefore \quad \angle KOL = 180° - 120° = 60°$

$\angle KOL = 60°$

and $\Delta KOL \cong \Delta OBL$

$KL = LB$

$\angle OLK \cong OLB = 90°$ (SAS Rule)

Practice Time

Objective Questions

Multiple Choice Questions (MCQs)

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

Fill in the Blanks

1. hypotenuse, **2.** 60°, **3.** congruent, **4.** BC, **5.** Right angled triangle

True/False

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

Subjective Questions

1. From the figure, ΔABC has sides 4 cm, 3.6 cm, 5 cm and ΔDEF has sides 4 cm, 4.6 cm, 5 cm.

Since, length of side AC in ΔABC is not equal to length of side DF in ΔDEF.

So, the triangles do not satisfy the SSS condition for congruence.

2. ΔABC, ΔADB, ΔADC, ΔAOC, ΔAOB, ΔBOC, ΔODB and ΔODC.

So, there are eight triangles formed in the figure.

3. The figures shows ΔABC ≅ ΔDEF where both triangles have right angles at B and E respectively, with equal hypotenuse and equal sides.

4. One angle of a right angled triangle is 45°. The three angles are 90°, 45° and 180° – 90° – 45° = 45°.

Two angles are equal, so two opposite sides are equal, making it an isosceles right triangle.

So, this triangle is a right isosceles triangle.

5. The diagonal AC of rectangle ABCD divides it into ΔABC and ΔCDA.

In ΔABC and ΔCDA :

$AB = CD$ (opposite sides of rectangle)

$BC = DA$ (opposite sides)

$AC = CA$ (common diagonal)

By SSS condition,

$\Delta ABC \cong \Delta CDA$.

So, yes, the diagonal creates two congruent triangles and the SSS rule applies.

6. Yes, two congruent triangles can be colloquially called twin triangles because they are identical in every measurements of size and shape, just as twins are identical to each other and one can be placed exactly over the other.

7. In the figure, AB = DB, $\angle OAC = \angle OBD = 90°$, O is midpoint of CD so OC = OD.

In ΔOAC and ΔOBD :

$\angle OAC = \angle OBD = 90°$ (given in figure)

$OC = OD$ (O is midpoint of CD)

$AC = BD$ (given)

By RHS condition,

$\Delta OAC \cong \Delta OBD$

8. ΔPQR with PQ = PR and $\angle Q = 75°$

Since $PQ = PR$

$\angle R = \angle Q$ (angles opposite equal sides are equal).

$\angle R = 75°$

$\angle P = 180° - 75° - 75° = 30°$

So, $\angle P = 30°$ and $\angle R = 75°$.

9. ΔPQR has QR = 5, PQ = 12, $\angle Q = 90°$

$$PR = \sqrt{12^2 + 5^2}$$

$$= \sqrt{144+25}$$

$$= 13$$

ΔMNO has $ON = 5, MO = 13, \angle O = 90°$

$$MN = \sqrt{13^2 - 5^2}$$

$$= \sqrt{169-25}$$

$$= \sqrt{144} = 12$$

Both Δs have sides 5, 12, 13 with one right angle.

(c) By ASA : only onle angle (90°) is known in triangle, so ASA cannot be applied. The statement is not true.

10. In the given ΔABC with A at top, B at bottom-left, C at bottom-right :

(a) The side opposite to vertex A is BC.

(b) The vertex opposite to side AB is C.

(c) The angle opposite to side AC is $\angle B$.

(d) The included angle of sides CB and CA is $\angle C$.

2. Operations with Integers

Assess Yourself-1

1. Let the two numbers be x and y with $x > y$.

$$x + y = 96 \text{ and } x - y = 24$$

Adding both equations :

$$2x = 120, \text{ so } x = 60$$

$$y = 96 - 60 = 36$$

So, the two numbers are 60 and 36.

2. $x + y = 112$ and $x - y = 36$

Adding : $2x = 148, x = 74$

$$y = 112 - 74 = 38$$

So, the two numbers are 74 and 38.

3. $x + y = 59$ and $x - y = -33$

Adding : $2x = 26, x = 13$

$$y = 59 - 13 = 46$$

So, the two numbers are 13 and 46.

4. $x + y = 113$ and $x - y = -39$

Adding : $2x = 74, x = 37$

$$y = 113 - 37 = 76$$

So, the two numbers are 37 and 76.

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(i) The first move is positive, second is negative. Since both arcs are equal, the final position is zero.

(ii) The first move is positive, second is negative. Since the negative arcs is longer, the final position is negative.

(iii) First move is negative, second is positive. Since the positive arc is much longer and crosses O, the final position is positive.

(iv) All three moves are leftward in the negative direction. Therefore, the final position is negative.

(v) First move is negative, followed by two consecutive positive moves. The coin ends up well to the right of O, so the final position is positive.

Assess Yourself-2

(a) Take each token 5 times of set (a)

set (a) Contains three negative tokens

$\rightarrow \ominus \ominus \ominus$

Taking each 5 times : We repeat these three negative tokens 5 times.

Tokens in the bag : 15 negative tokens.

$\ominus \ominus \ominus$
$\ominus \ominus \ominus$
$\ominus \ominus \ominus$
$\ominus \ominus \ominus$
$\ominus \ominus \ominus$

Net value : $(-3) \times 5 = -15$.

(b) Take each token 5 times of set (b)

set (b) Contains Five negative tokens and two positive tokens.

Taking each 5 times : We repeat this entire group 5 times.

Tokens in the bag : 25 negative token and 10 positive tokens.

$\ominus\ominus\ominus\oslash\oslash\oslash\oslash$
$\ominus\ominus\ominus\oslash\oslash\oslash\oslash$
$\ominus\ominus\ominus\ominus\oslash\oslash\oslash$
$\ominus\ominus\ominus\oslash\oslash\oslash\oslash$
$\ominus\ominus\ominus\oslash\oslash\oslash\oslash$

Net value : – 15

(c) Take 5 each token times of set (c) set (c) Contains Eight negative tokens and five positive tokens.

Taking each 5 times : We repeat this entire group 5 times.

Tokens in the bag : 40 negative tokens

and 25 positive tokens.

Net value : – 15.

Assess Yourself-3

1. 3 is an odd count of negatives, so the product of 3 negative integers is negative.

2. Product of 6 number of positive integers is always positive.

3. The product of negative integers is positive when the count of negatives is even.

4. The product of negative integers is negative when the count of negatives is odd.

5. The product of two integers is negative when one of them is positive and the other is negative.

Assess Yourself-4

1. Yes, $\frac{\text{positive}}{\text{positive}}$ = positive,

$\frac{\text{negative}}{\text{negative}}$ = positive

$\frac{\text{positive}}{\text{negative}}$ = negative,

$\frac{\text{negative}}{\text{positive}}$ = negative

Examples : $\frac{15}{3} = 5; \frac{-15}{-3} = 5$

$\frac{15}{-3} = -5; \frac{-15}{3} = -5$

So, yes the same sign system applies to integer division.

2. $(-150) \times m = -750$

$$m = \frac{-750}{-150} = 5$$

So, 5 should be multiplied to (– 150) and the division form is $\frac{-750}{-150} = 5$.

3. No, A positive number divided by a positive number always gives a positive result.

4. Negative × Negative = Positive

$$\frac{\text{Positive}}{\text{Negative}} = \text{Negative}$$

So, the final result in negative.

5. First product : Negative × Negative = Positive

Second product : Negative × Negative = Positive.

$\frac{\text{Positive}}{\text{Positive}}$ = Positive.

So, the final answer is positive.

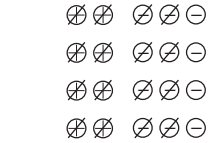
Assess Yourself-5

1. Visually show the distributive properly for 4[2 + (– 3)].

This distributive property states that :

$4 \times [2 + (-3)] = (4 \times 2) + (4 \times (-3)]$

It means 2 positives sign four times and 3 negatives sign four times



Net value : 4 negatives sign (– 4).

2. Visually show – 5[3 + (– 4)] and verify the distributive property :

$-5[3 + (-4)] = (-5) \times 3 + (-5) \times (-4)$

It means 3 negatives sign five times and 4 negatives sign five times.

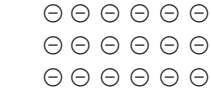
Net value : 5 positives sign (+ 5).

3. Visually show the expression

$-4[(-3) + (-4)] = (-4) \times (-3) + (-4) \times (-4)$

It means 3 negatives sign and 4 negatives sign four times.

Total 7 negatives sign four times.



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Net value : 7 negatives sign four times
$[(-7) \times (-4)] = 28$.

Figure it Out

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1. (a)

Ist Number	IInd Number	Sum	Difference
16	11	27	5
17	10	27	7
18	9	27	9
20	7	27	13

Correct pair is (18, 9)

(b) Sum = 4, Difference = 12

Ist Number	IInd Number	Sum	Difference
2	2	4	0
4	0	4	4
8	–4	4	12
10	–6	4	16

Correct pair is (8, – 4)

(c) Sum = 0, Difference = 10

Ist Number	IInd Number	Sum	Difference
5	–5	0	10
6	–6	0	12
7	–7	0	14
8	–8	0	16

Correct pair is (5, – 5)

(d) Sum = 0, Difference = – 10

Ist Number	IInd Number	Sum	Difference
3	–3	0	6
4	–4	0	8
–5	5	0	– 10
8	–8	0	16

Correct pair is (–5, 5)

(e) Sum = – 7, Difference = – 1

Ist Number	IInd Number	Sum	Difference
1	–8	–7	9
–4	–3	–7	–1
–2	–5	–7	3
–6	–1	–7	–5

Correct pair is (– 4, – 3)

(f) Sum = – 7, Difference = – 13

Ist Number	IInd Number	Sum	Difference
–1	–6	–7	5
–2	–5	–7	3
–3	–4	–7	1
–10	3	–7	–13

Correct pair is (–10, 3)

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1. (a) $3 \times (-2)$

Placing 2 negatives into an empty bag 3 times

i.e., $3 \times (-2) = -6$ (Product; Multiplier; Multiplicand)

(There are now 6 negatives in the bag)

(b) $(-5) \times (-2)$

Remove 2 negatives from the bag 5 times

$\therefore (-5) \times (-2) = 10$

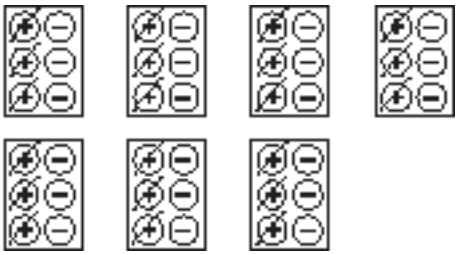
(c) $(-4) \times (-1)$

Remove 1 negative from the bag 4 times

$\therefore (-4) \times (-1) = 4$

(d) $(-7) \times 3$

Remove 3 positive from the bag 7 times



$\therefore (-7) \times 3 = -21$

2. Given that $123 \times 456 = 56088$

(a) We know that –ve × +ve = – ve

$\therefore (-123) \times 456 = -56088$

(b) We know that –ve × –ve = +ve

$\therefore (-123) \times (-456) = 56088$

(c) We know that +ve × –ve = –ve

$\therefore (123) \times (-456) = -56088$

3. Rules to Multiply two Integers

(1) If both the integers have the same sign then write their product with positive sign.

(2) If the integers have different sign then write their product with negative sign.

$(+) \times (+) = +$ $\quad (-) \times (-) = +$

$(+) \times (-) = -$ $\quad (-) \times (+) = -$

Here, $4 \times (-2) = -8$, $4 \times (-2 - 2 + 2) = -8$ and $4 \times (-4 - 2 + 4) = -8$

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1. (a) $4 \times (-3) = -(4 \times 3) = -12$

(b) $(-6) \times (-3) = +(6 \times 3) = 18$

(c) $(-5) \times (-1) = +(5 \times 1) = 5$

(d) $(-8) \times (4) = -(8 \times 4) = -32$

(e) $(-9) \times 10 = -(9 \times 10) = -90$

(f) $10 \times (-17) = -(10 \times 17) = -170$

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1. (a) $14 \times (-15) = -(14 \times 15) = -210$

(b) $-16 \times (-5) = 80$

(c) $36 \div (-18) = -(36 \div 18) = -2$

(d) $(-46) \div (-23) = 2$

2. According to questions,

Total temperature drop = 5°C per hour × 10 hrs = 50°C

Initially room temperature was 32°C

$\therefore$ Final room temperature = 32°C – 50°C = – 18°C

3. (a) Profit on 1 white cement bag =₹ 8

$\therefore$ Profit on 3,000 white cement bags = ₹ 3,000 × 8 = ₹ 24,000

Loss on 1 grey cement bag = ₹ 5

$\therefore$ Loss on 5,000 grey cement bags = ₹ 5,000 × 5 = ₹ 25,000

Clearly 25,000 > 24,000 *i.e.* Loss

Total Loss = 25,000 – 24,000 = ₹1,000

(b) Let number of grey cement bag sold = x

For neither profit nor loss

Profit from white cement bag + loss from grey cement bag = 0

i.e. $8 \times x + [(-5) \times 6400] = 0$

$\Rightarrow 8x - 32000 = 0$

$\Rightarrow 8x = 32000$

$\Rightarrow x = 4000$

Thus, company must sell 4,000 white cement bags.

4. (a) Let $(-3) \times x = 27$

Then $x = \dfrac{27}{-3} = -9$

(b) Let $5 \times x = (-35)$

Then $x = \dfrac{-35}{5} = -\left(\dfrac{35}{5}\right) = -7$

(c) $x \times (-8) = -56$

$x = \dfrac{-56}{-8} = 7$

(d) $x \times (-12) = 132$

$x = \dfrac{132}{-12} = -\left(\dfrac{132}{12}\right) = -11$

(e) $x \div (-8) = 7$

$x \times \dfrac{1}{(-8)} = 7$

$x = 7 \times (-8) = -(7 \times 8) = -56$

(f) $x \div 12 = -11$

$x \times \dfrac{1}{12} = -11$

$x = -11 \times 12 = -132$

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1. (a) $(-5) \times [18 + (-3)]$

$= -5 \times 18 + (-5) \times (-3) = -90 + 15 = -75$

(b) $(-7) \times 4 \times (-1) = [(-7) \times 4] \times (-1)$

$= (-28) \times (-1) = 28$

(c) $[(-2) \times (-1)] \times [(-5) \times (-3)]$
$= 2 \times (-5) \times (-3) = 2 \times 15 = 30$

2. (a) $(-27) \div 9 = -\left(27 \times \frac{1}{9}\right) = -3$

(b) $84 \div (-4) = 84 \times \frac{1}{-4} = -\left(\frac{84}{4}\right)$
$= -21$

(c) $(-56) \div (-2) = -(56) \times \left(\frac{1}{-2}\right)$
$= 28$

3. (a) $(-1) \times (-27) = 27$
(b) $(-1) \times (31) = -31$
(c) $(-1) \times (1) = -1$
(d) $(-1) \times (-1) = 1$
(e) $(-1) \times 0 = 0$

4. $-47 + 56 - 14 + 8 - 2 + 8 - 5$
$= -(47 - 56 + 14 - 8 + 2 - 8 + 5)$
$= -(-4)$ given $= 4$

5. The starting number – 21 (odd)
then $[(-21) \times (-3)] + 1 = 63 + 1 = 64$ (even)
$64 \div 2 = 32$ (even)
$32 \div 2 = 16$ (even)
$16 \div 2 = 8$ (even)
$8 \div 2 = 4$ (even)
$4 \div 2 = 2$ (even)
$2 \div 2 = 1$ (odd)
Now, – 21, 64, 32, 16, 8, 4, 2, 1,

Now for the starting number – 6 (even)
$-6 \div 2 = -3$ (odd)
$[(-3) \times (-3)] + 1 = 9 + 1 = 10$ (even)
$10 \div 2 = 5$ (odd)
$[5 \times (-3)] + 1 = -14$ (even)
$-14 \div 2 = -7$ (odd)
$[(-7) \times (-3)] + 1 = 22$ (even)
$22 \div 2 = 11$ (odd)

Hence the sequence is
– 6, – 3, 10, 5, – 14, – 7, 22, 11, ..., –1

6. (a) Let x answers were incorrect
Then according to question, $15 \times 4 - 2x = 40$
$\Rightarrow 60 - 2x = 40 \Rightarrow 60 - 40 = 2x$
$\Rightarrow x = \frac{20}{2} = 10$

So, Anita had 10 incorrect answers.
Total number of questions
= Sum of correct and incorrect answers
$= 15 + 10 = 25$ **Ans.**

(b) Let x answers be incorrect
Then, according to question,
$5 \times 4 - 2x = -10$
$\Rightarrow 20 - 2x = -10 \Rightarrow 20 + 10 = 2x$
$\Rightarrow 30 = 2x \Rightarrow x = \frac{30}{2} = 15$

Thus, Anil had 15 incorrect answers
yes, Anil leave some questions unanswered
Anil answered question
= (Total number of questions)
– (Anil's correct answers
+ Anil's incorrect answer)
$= 25 - (5 + 15)$
$= 25 - 20 = 5$ **Ans.**

7. Operation done by machine is
(I^{st} no.) – [II^{nd} no. × III^{rd} no.]
I^{st} Row $4 - [8 \times (-3)] = 4 - (-24) = 28$
II^{nd} Row $6 - (9 \times 6) = 6 - 54 = -48$
III^{rd} Row $2 - [3 \times (-2)]$
$= 2 - (-6) = 2 + 6 = 8$
IV^{th} Row $-9 - [5 \times (-8)] = -9 - (-40)$
$= -9 + 40 = 31$
V^{th} Row $7 - [-4 \times (-6)] = 7 - (24)$
$= 7 - 24 = -17$
VI^{th} Row $-16 - [-6 \times (-9)]$
$= -16 - (54) =$ **– 70**

Thus missing number is – 70.

8. Current Temperature = 8°C
Temperature drop after 1 hr = 5°C
∴ Temperature drop after 4 hrs $8 - 4 \times 5$
Hence required expression $= 8 - (5 \times 4)$

9. (a) Let three consecutive numbers are $n - 1, n, n + 1$
Then product $(n - 1)(n)(n + 1) = -6$
$(n - 1)(n)(n + 1) = -(1 \times 2 \times 3)$
Three consecutive integers are – 1, – 2, – 3

(b) Let three consecutive number are
$n - 1, n, n + 1$

$120 = 2 \times 2 \times 2 \times 3 \times 5$
$= (2 \times 2) \times 5 \times (2 \times 3) = 4 \times 5 \times 6$
here, $(n-1)(n)(n+1) = 120$
Hence consecutive integers are 4, 5 and 6.

10. According to question,
$13x - 9y$ = total (where x and y are non-negative integers)
(a) $(13-9) \times 5 = 13 \times 5 - 9 \times 5$
(b) Take 10 coins of + 13 and 10 coins of – 9
$10 \times 13 - 10 \times 9 = 130 - 90 = +40$ Pibs.
(c) Take 10 coins of + 13 and 20 coins of – 9
$10 \times 13 - 20 \times 9 = 130 - 180 = -50$ Pibs.
(d) Take 2 coins of + 13 and 2 coins of – 9
$2 \times 13 - 2 \times 9 = 26 - 18 = +8$ Pibs
(e) Take 7 coins of + 13 and 9 coins of – 9
$7 \times 13 - 9 \times 9 = 91 - 81 = +10$ Pibs
(f) Take 13 coins of + 13 and 19 coins of – 9
$13 \times 13 - 19 \times 9 = 169 - 171 = -2$ Pibs
(g) Take 7 coins of + 13 and 10 coins of – 9
$7 \times 13 - 10 \times 9 = 91 - 90 = +1$ Pibs
(h) Yes, It is possible
Take 122 coins of + 13 and 2 coins of –9
$122 \times 13 - 2 \times 9 = 1586 - 18 = 1568$ Pibs.

11. (a) $[32 \times (-18)] \div (-36)$
$= (-576) \div (-36) = 16$
(b) $(32) \div [(-36) \times (-18)]$
$= 32 \div 648 = \frac{32}{648} = \frac{4}{81}$
(c) $[25 \times (-12)] \div [(45) \times (-27)]$
$(-300) \div (-1215) = \frac{20}{81}$
(d) $[280 \times (-7)] \div [(-8) \times (-35)]\ (-1960) \div (280) = -7$

12. (a) $(-348) + (-1064)$
$= -348 - 1064 = -(348 + 1064)$
$= -1412$
(b) $(-348) - (-1064) = -348 + 1064$
$= 716$
(c) $348 - (-1064) = 348 + 1064 = 1412$
(d) $(-348) \times (-1064) = +(348 \times 1064)$
$= 370272$
(e) $(348) \times (-1064) = -(348 \times 1064)$
$= -370272$
(f) $348 \times 964 = 335472$
Arranging in increasing order, we get
$-370272 < -1412 < 716 < 1412 < 335472 < 370272$
i.e. (e) < (a) < (b) < (c) < (f) < (d)

13. Given that $(-548) \times 972 = -532656$
(a) $(-547) \times 972 = (-548 + 1) \times 972$
$= -548 \times 972 + 972 = -532656 + 972$
$= -531684$
(b) $(-548) \times 971 = -548 \times (972 - 1)$
$= -548 \times 972 + 548 = -532656 + 548$
$= -532108$
(c) $(-547) \times 971 = (-548 + 1) \times (972 - 1)$
$= -548 \times 972 + 548 + 972 - 1$
$= -532656 + 548 + 972 - 1 = -531137$

14. Given $207 \times (-33 + 7) = -5382$
$= 207 \times (-26) = -5382$
$\therefore -207 \times (33 - 7) = -207 \times 26 = -5382$

15. (a) Maximum possible value
$[-2 - (3 + 5)] \times (-6) = (-2 - 8) \times (-6)$
$= 60$
(b) Minimum possible value
$[3 - (-2) + 5] \times (-6) = (3 + 2 + 5) \times (-6) = -60$

16. (a) $\square + \square \times \square = -36$
5 different ways—
(i) $0 + (-6) \times (6) = -36$
(ii) $4 + (-5) \times (8) = -36$
(iii) $-4 + (-8) \times (4) = -36$
(iv) $-11 + (5) \times (-5) = -36$
(v) $-3 + (3) \times (-11) = -36$
Similarly we can find (b) and (c).

Practice Time

Multiple Choice Questions (MCQs)

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

Fill in the Blanks

1. $c \div b$, **2.** $(a \times b) - (a \times c)$, **3.** 1, **4.** Subtract, division, **5.** negative,

positive.

True/False

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

Subjective Questions

1. (a) $5 - (-5) = 5 + 5 = 10$.

(b) $5 + (-5) = 0$.

(c) $(-5) \times (-5) = 25$.

(d) $\dfrac{(-5)}{5} = -1$.

2. Product of two integers is 125 and one is 5.

$5 \times \text{other} = 125.$

$$\text{Other} = \frac{125}{5} = 25.$$

So, the other number is 25.

3. Given : $(a + b) + c = a + (b + c) = (a + c) + b$

The grouping of numbers does not change the result.

So, the Associative property of addition is used.

4. $(-8) \times (-4) = 32$

$32 \times 5 = 160$

5. Given : $87 - 48 + 30 - 41 + 20 - 31 + 8 - 5 + 4 = 24$.

The second expression is the additive inverse of the first.

Thus, $-87 + 48 - 30 + 41 - 20 + 31 - 8 + 5 - 4 = -24$.

6. (a) $527 - 8 - 527 = -8$.

(b) $527 + 8 - (-527) = 527 + 8 + 527 = 1062$.

(c) $-527 + 8 + 527 = 8$.

(d) $-527 - 8 - 525 = -1060$.

Values : (b) = 1062, (c) = 8, (a) = – 8, (d) = – 1060.

So, decreasing order is : $1062 > 8 > -8 > -1060$, that is (b) > (c) > (a) > (d).

7. (a) Let the integers be x.

$x \times (-3) = 54$

$$x = \frac{54}{(-3)} = -18$$

(b) Same as (a)

$x \times (-3) = -93$

$$x = \frac{-93}{-3} = 31$$

(c) Same as (a)

$x \times (-3) = 0$

$x = 0$

(d) same as (a)

$x \times (-3) = -1$

$$x = \frac{-1}{-3} = \frac{1}{3}.$$

8. (a) $-39 \times [(-46) \div (-23)]$

$$= -39 \times \left[\frac{(-46)}{(-23)}\right] = -18$$

$= -39 \times 2 = -78$

(b) $54 \div [(-6) \times (-3)] = 54 \div (18)$

$$= \frac{54}{18} = 3$$

(c) $$-18 \times \left[\frac{19}{57}\right] = -18 \times \frac{1}{3} = -6$$

9. Given $1968 \times (-205) = -403440$.

(a) $(-205) \times 1968$:

By commutative property, result is the same.

So, $(-205) \times 1968 = -403440$.

(b) $(-205) \times (-1968)$:

Both numbers are negative so product is positive.

So, $(-205) \times (-1968) = 403440$.

(c) 205×1968 :

Both numbers are positive so product is positive.

So, $205 \times 1968 = 403440$.

10. (a) $1253 - 253 = 1000$

but $253 - 1253 = -1000$. Not equal.

(b) $\dfrac{96}{16} = 6$

but $\frac{16}{96} = \frac{1}{6}$. Not equal.

(c) $\frac{125}{25} = 5$ but $\frac{25}{125} = \frac{1}{5}$. Not equal.

So, commutative property cannot be used for subtraction or division.

3. Finding Common Ground

Assess Yourself-1

1. (a) $315 = 3 \times 3 \times 5 \times 7$

3	315
3	105
5	35
7	7
	1

So, factors of 315 are : 1, 3, 5, 7, 9, 15, 21, 35, 45, 63, 105, 315.

(b) $165 = 3 \times 5 \times 11$

3	165
5	55
11	11
	1

So, factors of 165 are : 1, 3, 5, 11, 15, 33, 55, 165.

(c) $872 = 2 \times 2 \times 2 \times 109$

2	872
2	436
2	218
109	109
	1

So, factors of 872 are : 1, 2, 4, 8, 109, 218, 436, 872.

(d) $1173 = 3 \times 17 \times 23$

3	1173
17	391
23	23
	1

So, factors of 1173 are : 1, 3, 17, 23, 51, 69, 391, 1173.

(e) $2835 = 3 \times 3 \times 3 \times 3 \times 5 \times 7$

3	2835
3	945
3	315
3	105
5	35
7	7
	1

So, factors of 2835 are : 1, 3, 5, 7, 9, 15, 21, 27, 35, 45, 63, 81, 105, 135, 189, 315, 405, 567, 945, 2835.

(f) $3402 = 2 \times 3 \times 3 \times 3 \times 3 \times 7$

2	3402
3	1701
3	567
3	189
3	63
3	21
7	7
	1

So, factors of 3402 are : 1, 2, 3, 6, 7, 9, 14, 18, 21, 27, 42, 54, 63, 81, 126, 162, 189, 243, 378, 486, 567, 1134, 1701, 3402.

2. $870 \div 29 = 30$ exactly, and $870 \div 30 = 29$ exactly.

So, yes, both 29 and 30 are factors of 870.

3. $1792 = 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 7$

2	1792
2	896
2	448
2	224
2	112
2	56
2	28
2	14
7	7
	1

So, 2 is involved as a factor 8 times in

1792.

4. So, 1794 ÷ 28 gives remainder 2.
So, 28 is not a factor of 1794 because dividing 1794 by 28 leaves a remainder of 2.

Assess Yourself-2

1. (a) $80 = (2) \times (2) \times (2) \times 2 \times (5)$
$120 = (2) \times (2) \times (2) \times 3 \times (5)$

2 | 80
2 | 40
2 | 20
2 | 10
5 | 5
1

2 | 120
2 | 60
2 | 30
3 | 15
5 | 5
1

HCF = 2 × 2 × 2 × 5 = 40
So, HCF(80, 120) = 40.

(b) 140 = 2 × 2 × (5) × 7
125 = 5 × 5 × (5)

2 | 140
2 | 70
5 | 35
7 | 7
1

5 | 125
5 | 25
5 | 5
1

HCF = 5.
So, HCF(140, 125) = 5.

(c) 121 = (11) × (11)
363 = 3 × (11) × (11)

11 | 121
11 | 11
1

3 | 363
11 | 121
11 | 11
1

HCF = 11 × 11 = 121.
So, HCF(121, 363) = 121.

(d) 89 is prime. 99 = 3 × 3 × 11

89 | 89
1

3 | 99
3 | 33
11 | 11
1

So, HCF(89, 99) = 1.

(e) 720 = 2 × 2 × 2 × 2 × 3 × 3 × 5
1080 = 2 × 2 × 2 × 3 × 3 × 5 × 3

2 | 720
2 | 360
2 | 180
2 | 90
3 | 45
3 | 15
5 | 5
1

2 | 1080
2 | 540
2 | 270
3 | 135
3 | 45
3 | 15
5 | 5
1

HCF = 2 × 2 × 2 × 3 × 3 × 5 = 360.
So, HCF(720, 1080) = 360.

(f) 297 = 3 × 3 × 3 × 11
594 = 2 × 3 × 3 × 3 × 11

3 | 297
3 | 99
3 | 33
11 | 11
1

2 | 594
3 | 297
3 | 99
3 | 33
11 | 11
1

HCF = 3 × 3 × 3 × 11 = 297
So, HCF(297, 594) = 297.

Assess Yourself-3

1. (a) 64 = 2 × 2 × 2 × 2 × 2 × 2
136 = 2 × 2 × 2 × 17

2 | 64
2 | 32
2 | 16
2 | 8
2 | 4
2 | 2
1

2 | 136
2 | 68
2 | 34
17 | 17
1

HCF = 2 × 2 × 2 = 8
So, HCF(64, 136) = 8.

(b) 136 = 2 × 2 × 2 × 17
238 = 2 × 7 × 17

2	136
2	68
2	34
17	17
	1

2	238
7	119
17	17
	1

HCF = 2 × 17 = 34
So, HCF(136, 238) = 34.
(c) 72 = 2 × 2 × 2 × 3 × 3
174 = 2 × 3 × 29

2	72
2	36
2	18
3	9
3	3
	1

2	174
3	87
29	29
	1

HCF = 2 × 3 = 6
So, HCF(72, 174) = 6
(d) 54 = 2 × 3 × 3 × 3
336 = 2 × 2 × 2 × 2 × 3 × 7

2	54
3	27
3	9
3	3
	1

2	336
2	168
2	84
2	42
3	21
7	7
	1

HCF = 2 × 3 = 6
So, HCF(54, 336) = 6
(e) 520 = 2 × 2 × 2 × 5 × 13
1430 = 2 × 5 × 11 × 13

2	520
2	260
2	130
5	65
13	13
	1

2	1430
5	715
11	143
13	13
	1

HCF = 2 × 5 × 13 = 130
So, HCF(520, 1430) = 130
(f) 191 is prime.
292 = 2 × 2 × 73

191	191
	1

2	292
2	146
73	73
	1

No common prime factors exist.
So, HCF(191, 292) = 1.
(g) 81 = 3 × 3 × 3 × 3
108 = 2 × 2 × 3 × 3 × 3
135 = 3 × 3 × 3 × 5

3	81
3	27
3	9
3	3
	1

2	108
2	54
3	27
3	9
3	3
	1

HCF = 3 × 3 × 3 = 27.
So, HCF(81, 108, 135) = 27
(h) 119 = 7 × 17
136 = 2 × 2 × 2 × 17
323 = 17 × 19

7	119
17	17
	1

2	136
2	68
2	34
17	17
	1

17	323
19	19
	1

So, HCF(119, 136, 323) = 17.
2. Prime factorisation : 272 = 2 × 2 × 2 × 2 × 17 and 459 = 3 × 3 × 3 × 17.

2	272
2	136
2	68
2	34
17	17
	1

3	459
3	153
3	51
17	17
	1

Both share the prime factor 17 in their factorisations.
So, the HCF is 17, not 1. The composite form 34 × 8 and 51 × 9 hides the common factor 17 which only becomes

visible through prime factorisation.

Assess Yourself-4

1. (a) More such pairs where LCM is one of the two numbers : (3, 9), (4, 12), (5, 25), (7, 21), (6, 18).
In each pair, the smaller number divides the larger one exactly.
(b) General statements : In n divides m, then LCM(n, m) = m.
In algebra, LCM(n, kn) = kn for any positive integer k.
2. LCM(8, 9) = 72 = 8 × 9.
Since HCF(8, 9) = 1, their product equal their LCM.
General statement : The LCM of two co-prime numbers is equal to their product.
3. LCM(12, 84) = 84 because 12 divides 84.
General statement : When one number is a factor of the other, the LCM equals the larger number.
LCM(a, b) = b when a divides b.
4. LCM of $(2n + 1)$ and $(4n^2 + 6n + 2)$ is $(4n^2 + 6n + 2)$, which is multiple of $2n + 1$.
General statement : When one of the two given expressions is a multiple of the other, the LCM equals the larger expression.

Figure it Out

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1. (a) Factors of 90 are 1, 2, 3, 5, 6, 9, 10, 15, 18, 30, 45 and 90.
(b) Factors of 105 are 1, 3, 5, 7, 15, 21, 35, and 105.
(c) Factors of 132 are 1, 2, 3, 4, 6, 11,, 12, 22, 33, 44, 66, 132.
(d) Factors of 360 are 1, 2, 3, 4, 5, 6, 8, 9, 10, 12, 15, 18, 20, 24, 30, 36, 40, 45, 60, 72, 90, 120, 180, 360.
(e) Factors of 840 are 1, 2, 3, 4, 5, 6, 7, 8, 10, 12, 14, 15, 20, 21, 24, 28, 30, 35, 40, 42, 56, 60, 70, 84, 105, 120, 140, 168, 210, 280, 420, 840.

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1. (a) $\therefore$ 50 = 2 × 5 × 5
60 = 2 × 2 × 3 × 5
$\therefore$ Common Factors of 50, and 60 are 2, 5
(b) $\therefore$ 140 × 2 × 2 × 5 × 7
275 = 5 × 5 × 11
$\therefore$ Common factors of 140 and 275 = 5
HCF (140, 275) = 5
(c) 77 = 7 × 11
725 = 5 × 5 × 29
$\therefore$ Common factor = 1
HCF (77, 725) = 1
(d) 370 = 2 × 5 × 37
and 592 = 2 × 2 × 2 × 2 × 37
$\therefore$ Common factors = 2, 37
HCF (370, 592) = 2 × 37 = 74
(e) 81 = 3 × 3 × 3 × 3
243 = 3 × 3 × 3 × 3 × 3
$\therefore$ Common factors = 3 × 3 × 3 × 3
HCF (81, 243) = 3 × 3 × 3 × 3 = 81

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1. (a) 24 = 2 × 2 × 2 × 3
180 = 2 × 2 × 3 × 3 × 5
$\therefore$ HCF = 2 × 2 × 3 = 12
(b) 42 = 2 × 3 × 7
75 = 3 × 5 × 5; 24 = 2 × 2 × 2 × 3
HCF = (42, 75, 24) = 3
(c) 240 = 2 × 2 × 2 × 2 × 3 × 5
378 = 2 × 3 × 3 × 3 × 7
$\therefore$ HCF = (240, 378) = 2 × 3 = 6
(d) 400 = 2 × 2 × 2 × 2 × 5 × 5
2500 = 2 × 2 × 5 × 5 × 5 × 5
$\therefore$ HCF = (400, 2500) = 2 × 2 × 5 × 5 = 100
(e) 300 = 2 × 2 × 3 × 5 × 5
2500 = 2 × 2 × 2 × 2 × 2 × 5 × 5
HCF = (300, 800) = 2 × 2 × 5 × 5 = 100
2. No, one cannot say that 72 and 144 have no common factor other than 1, because their factorisation have composite numbers.
72 = 2 × 2 × 2 × 3 × 3
144 = 2 × 2 × 2 × 2 × 3 × 3
HCF = (72, 144) = 2 × 2 × 2 × 3 × 3 = 72 which is greater than 1

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1. (a) By Prime Factorisation.
30 = 2 × 3 × 5; 72 = 2 × 2 × 2 × 3 × 3

$\therefore$ LCM = (30, 72) = $2 \times 2 \times 2 \times 3 \times 3 \times 5$
= 360

(b) By Prime Factorisation

$36 = 2 \times 2 \times 3 \times 3$; $54 = 2 \times 3 \times 3 \times 3$

LCM = (36, 54) = $2 \times 2 \times 3 \times 3 \times 3 = 108$

(c) $105 = 3 \times 5 \times 7$ and $195 = 5 \times 3 \times 13$

$65 = 5 \times 13$

$\therefore$ LCM (105, 195, 65) = $3 \times 5 \times 7 \times 13$
= 1365

(d) $\therefore$ $222 = 2 \times 3 \times 37$; $370 = 2 \times 5 \times 37$

$\therefore$ LCM (222, 370) = $2 \times 3 \times 5 \times 37$
= 1110

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1. (a) Two consecutive even numbers

(i) 2, 4 $2 = 2 \times 1$; $4 = 2 \times 2 \times 1$
HCF (2, 4) = 2

(ii) 6, 8 $6 = 2 \times 3$; $8 = 2 \times 2 \times 2$
HCF = 2

General Statement— HCF of any two consecutive even numbers is 2.

Since, all even numbers are divisible by 2 and consecutive even numbers differe by 2

(b) Two consecutive odd numbers

(i) 3, 5 HCF (3, 5) = 1

(ii) 7, 9 HCF (7, 9) = 1

General Statement— HCF of any two consecutive odd numbers is 1.

Since, consecutive odd numbers are not divisible by any common even or odd factor other than 1, So they are always co-prime.

(c) Two Even Numbers

(i) 4, 10

$4 = 2 \times 2$; $10 = 2 \times 5$ HCF (4, 10) = 2

(ii) 8, 12

$8 = 2 \times 2 \times 2$; $12 = 2 \times 2 \times 3$

HCF (8, 12) = $2 \times 2 = 4$

General Statement—HCF of two even numbers is always an even number.

Since, all even numbers are divisible by 2

(d) Two consecutive numbers

(i) (7, 8) HCF (7, 8) = 1

(ii) (14, 15) $14 = 2 \times 7$; $15 = 3 \times 5$

HCF (14, 15) = 1

General Statement— HCF of any two consecutive numbers is 1

Since, consecutive numbers can never share any common factor other than 1, because every next number is exactly 1 more than the previous one.

(e) Two Co-prime Number

e.g. (i) 4, 9 HCF (4, 9) = 1

(ii) 5, 8 HCF (5, 8) = 1

General Statment—The HCF of two co-prime numbers is always 1.

Since co-prime numbers are defined as numbers that have no common factor other than 1.

2. (a) According to question, more such number pairs are

(i) LCM of 3 and 24

$3 = 3 \times 1$; $24 = 2 \times 2 \times 2 \times 3$

$\therefore$ LCM = $2 \times 2 \times 2 \times 3 = 24$

(ii) LCM of 4 and 12

$4 = 2 \times 2$; $12 = 2 \times 2 \times 3$

LCM (4, 12) = $2 \times 2 \times 3 = 12$

(iii) LCM of 5 and 15

$5 = 5 \times 1$; $15 = 3 \times 5$

LCM (5, 15) = $3 \times 5 = 15$

(b) General Statement—For any two positive integers, LCM of these numbers will be equal to one of the numbers (specially larger no.) If and only if the smaller number is a factor of the larger number.

Algebraic Description—Let a and b be two positive integers,

where $a < b$

The LCM of a and b will be b, if and only if b is a multiple of a. Thus

LCM (a, b) = b, If and only If $b = k \times a$, Where k is a positive integer.

3. (a) Two multiples of 3

e.g. **(i)** (6, 9)

LCM (6, 9) = $2 \times 3 \times 3 = 18$

(ii) 9, 12 $9 = 3 \times 3$; $12 = 2 \times 2 \times 3$

LCM = $2 \times 2 \times 3 \times 3 = 36$

Observation—The LCM of two multiples of 3 is also a multiple of 3.

Since, both numbers are divisible by 3

So, their common multiple will also be divisible by 3

General Statment—The LCM of two multiples of 3 is also a multiple of 3.

(b) Two Consecutive Even Numbers—

e.g. (i) 2, 4 $2 = 2 \times 1$; $4 = 2 \times 2$

LCM (2, 4) = 4

(ii) 6, 8 $6 = 2 \times 3$; $8 = 2 \times 2 \times 2$

LCM = $2 \times 2 \times 2 \times 3 = 24$

Observation—The LCM of two consecutive even numbers is half of their product.

Since, Consecutive even numbers always share a common factor of 2, but not more. So, when finding the LCM, One factor of 2 overlaps, so the LCM becomes smaller than their product.

General Statment—The LCM of two consecutive even numbers say $2n$ and $2n + 2$ is always equal to half of their product. i.e.

$$\text{LCM}(2n, 2n+2) = \frac{2n \times (2n+2)}{2}$$

$$= n(2n+2) = 2n^2 + 2n$$

(c) Two Consecutive Numbers

e.g. (i) 7, 8 LCM (7, 8) = 56

(ii) 8, 9 LCM (8, 9) = 72

Observation—The LCM of two consecutive numbers is equal to their product.

Since consecutive numbers have no common factors other than 1.

So, their product is the smallest number divisible by both.

General Statement—The LCM of two consecutive numbers is their product.

(d) Two Co-prime Numbers

e.g. (i) 4, 9 LCM (4, 9) = 36

(ii) 7, 10 LCM (7, 10) = 70

Observation—The LCM of two co-prime numbers is equal to their product.

Since, Co-prime numbers do not share any common factors except 1, so the smallest number that contains both is simply their product.

General Statment—The LCM of two co-prime numbers is equal to their product.

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1. In Ist Row, Blue Star's position 4 and 10

Difference in the position = 10 – 4 = 6

So, next position of Blue Star in Ist Row are

4, 10, 16, 22, ...

Now In IInd Row, Blue Star's Position 4 and 8

Difference in the position = 8 – 4 = 4

So, the next position of Blue Star in IInd Row are 4, 8, 12, 16, ...

Here we see that 16th position is common in both Rows.

Therefore Blue Star meet again at the 16th position. **Ans.**

2. (a) $5 \times 7 \times 11 \times 11$ and $5 \times 7 \times 7 \times 11 \times 2$

Here we see that all prime factors of $5 \times 7 \times 7 \times 11 \times 2$ are not present in $5 \times 7 \times 11 \times 11$

So not multiple of given number

(b) $5 \times 7 \times 11 \times 11$ and $5 \times 7 \times 7 \times 11 \times 2$

$5 \times 7 \times 11 \times 11 \times 2$ does not contain all the prime factors of $5 \times 7 \times 11 \times 11$

So not a factor of given number

3. (a) $3 \times 3 \times 5 \times 7 \times 7$ and $12 \times 7 \times 11 = 2 \times 2 \times 3 \times 7 \times 11$

$\therefore$ HCF $= 3 \times 7$

LCM $= 3 \times 3 \times 5 \times 7 \times 7 \times 2 \times 2 \times 11$

(b) $45 = 3 \times 3 \times 5$; $36 = 2 \times 2 \times 3 \times 3$

$\therefore$ HCF $= 3 \times 3$

LCM $= 3 \times 3 \times 5 \times 2 \times 2$

4. Let a and b be two numbers set

HCF $(a, b) = 1$ and LCM $(a, b) = 66$

we know that

HCF × LCM = Product of two numbers

i.e. $1 \times 66 = a \times b$

Possible pairs of factors of 66 are

(1, 66), (2, 33), (3, 22), (6, 11)

Any of these pairs of number will satisfy the conditions.

5. According to question

Number of cows = multiple of LCM (3, 5, 7)

LCM $(3, 5, 7) = 3 \times 5 \times 7 = 105$

Given that number of cows is less than 200

multiples of 105 are 105, 210.....

but number of cows is < 200

so, cowherd had 105 cows.

6. Given $l = 12$ cm, $b = 18$ cm, $h = 36$ cm.

According to question, we have to find HCF of 12, 18, 36

$12 = 2 \times 2 \times 3$; $18 = 2 \times 3 \times 3$;

$36 = 2 \times 2 \times 3 \times 3$

HCF = 2 × 3 = 6 cm
Required cubes are (b), (d) and (e).

7. For required number we have to find HCF (306, 36)
∴ 306 = 2 × 3 × 3 × 17
36 = 2 × 2 × 3 × 3
HCF = 2 × 3 × 3 = 18
Ans. (c)

8. LCM of 3, 4, 5 and 7 = 3 × 4 × 5 × 7 = 420
So, number must be multiple of 420
i.e. 420 K (where K is a whole number)
when 420 ÷ 11, leaves remainder 2
11 × 38 + 2 = 420
But remainder should be 10
∴ 2K = 10 ⇒ K = 5
Thus required number = 420 K
= 420 × 5 = 2100 **Ans.**

9. LCM of 6 and 9
6 = 2 × 3; 9 = 3 × 3
LCM = 2 × 3 × 3 = 18
According to question number is divisible by 6 and 9 but not by 10.

10. LCM is always quater than both individual numbers option (c) is correct.

11. Distance gained per leap
= Dog's leap distance
– Rabbit's leap distance
= 9 – 7 = 2
Dog needs to close a 150 foot head start

Number of leaps

$$= \frac{\text{Head Start Distance}}{\text{Distance Gained per Leap}}$$

$$= \frac{150}{2} = 75 \text{ leaps.}$$

12.
1 = 1	2 = 2
3 = 3	4 = 2 × 2
5 = 5	6 = 2 × 3
8 = 2 × 2 × 2	9 = 3 × 3
10 = 2 × 5	

∴ LCM (1, 2, 3, 4, 5, 6, 8, 9, 10)
= 2 × 2 × 2 × 3 × 3 × 5 = 360
Yes, this is the same answer.

13. $\frac{8}{15} + \frac{1}{20} + \frac{7}{36} + \frac{11}{63} + \frac{1}{21}$

Now, 15 = 3 × 5; 20 = 2 × 2 × 5;
36 = 2 × 2 × 3 × 3; 63 = 3 × 3 × 7;
21 = 3 × 7

LCM (15, 20, 36, 63, 21) = 2 × 2 × 3 × 3 × 5 × 7 = 1260

Now $\frac{8}{15} + \frac{1}{20} + \frac{7}{36} + \frac{11}{63} + \frac{1}{21}$

$$= \frac{8 \times 84 + 1 \times 63 + 7 \times 35 + 11 \times 20 + 1 \times 60}{1260}$$

$$= \frac{1260}{1260} = 1$$

Practice Time

Multiple Choice Questions (MCQs)

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

Fill in the Blanks

1. greater, **2.** 1, **3.** Product, 1, **4.** 24, HCF, **5.** 840.

True/False

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

Subjective Questions

1. 32 = 2 × 2 × 2 × 2 × 2
64 = 2 × 2 × 2 × 2 × 2 × 2
HCF(32, 64) = 2 × 2 × 2 × 2 × 2 = 32
LCM(32, 64) = 2 × 2 × 2 × 2 × 2 × 2 = 64.

2. Factors of 32 and 14
32 = 2 × 2 × 2 × 2 × 2
14 = 2 × 7
HCF(32, 14) = 2

3. Factors of 80 and 90.
80 = 2 × 2 × 2 × 2 × 5
90 = 2 × 3 × 3 × 5
LCM(80, 90) = 2 × 2 × 2 × 2 × 3 × 3 × 5 = 720

4. Prime factorisation of three numbers :
$2^2 \times 3 = 2 \times 2 \times 3$

$2 \times 3^2 = 2 \times 3 \times 3$

$2^3 \times 3 = 2 \times 2 \times 2 \times 3$

HCF $= 2 \times 3 = 6$.

5. Given : The product of two numbers $= 84$

HCF of these numbers $= 7$

Formula used : HCF $\times$ LCM = Product of two numbers

$7 \times \text{LCM} = 84$

$$\text{LCM} = \frac{84}{7}$$

$\text{LCM} = 12$

6. Prime factorisation of 120 and 300

$120 = 2 \times 2 \times 2 \times 3 \times 5$

$300 = 2 \times 2 \times 3 \times 5 \times 5$

LCM(120, 300) $= 2 \times 2 \times 2 \times 3 \times 5 \times 5 = 600$

7. Factors of 15, 21 and 28.

$15 = 3 \times 5$

$21 = 3 \times 7$

$28 = 2 \times 2 \times 7$

LCM(15, 21, 28) $= 2 \times 2 \times 3 \times 5 \times 7 = 420$

So, the smallest number divisible by 15, 21 and 28 is 420.

8. Given : HCFof two numbers $= 23$

Two factors of their LCM $= 13$ and 14

It means, two numbers are 23×13 and 23×14.

So, two numbers are 299 and 322.

9. Time interval of six bells ring $= 2, 4, 6, 8, 10, 12$ sec

Factors : $2 = 2^1$

$4 = 2^2$

$6 = 2 \times 3$

$8 = 2^3$

$10 = 2 \times 5$

$12 = 2^2 \times 3$

LCM(2, 4, 6, 8, 10, 12) $= 2^3 \times 3^1 \times 5^1 = 120$ sec.

So, all six bells ring together again after 120 seconds.

10. Given : time intervals of three balls ring $= 5, 6$ and 10 min.

Factors : $5 = 5^1$

$6 = 2 \times 3$

$10 = 2 \times 5$

LCM(5, 6 and 10) $= 2 \times 3 \times 5 = 30$ min

So, the three bells ring together again at 7 : 30 pm.

4. Another Peek Beyond The Point

Assess Yourself-1

1. (a) $24 \times 31 = 744$

$$\text{Tenth part} = \frac{744}{10} = 74.4$$

$$\text{Hundred part} = \frac{744}{100} = 7.44$$

$$\text{Thousand part} = \frac{744}{1000} = 0.744.$$

(b) $3.8 \times 40.5 = 153.9$

$$\text{Tenth part} = \frac{153.9}{10} = 15.39$$

$$\text{Hundred part} = \frac{153.9}{100} = 1.539$$

$$\text{Thousand part} = \frac{153.9}{1000} = 0.1539$$

(c) $23.6 \times 43.8 = 1033.68$

$$\text{Tenth part} = \frac{1033.68}{10} = 103.368$$

$$\text{Hundred part} = \frac{1033.68}{100} = 10.3368$$

$$\text{Thousand part} = \frac{1033.68}{1000} = 1.03368$$

(d) $325 \times 34 = 11050$

$$\text{Tenth part} = \frac{11050}{10} = 1105$$

$$\text{Hundred part} = \frac{11050}{100} = 110.50$$

$$\text{Thousand part} = \frac{11050}{1000} = 11.050$$

2. (a) 9.85×653

$9.85 \times 653 = 6432.05$.

(b) 98.5×65.3

1 + 1 = 2 = decimal places.
So, 98.5 × 65.3 = 6432.50
(c) 0.985 × 65.3
3 + 1 = 4 decimal places
So, 0.985 × 65.3 = 64.3205
(d) 98.5 × 6.53
1 + 2 = 3 decimal places
So, 98.5 × 6.53 = 643.205.
3. Quantity of milk per day = 3.5 litres
Total days = 31
Quantity of milk in 31 days = 3.5 × 31 = 108.5 litres
So, the household will use 108.5 litres of milk.
4. Sugar per recipe = 2.75 kg
Sugar needed = 2.75 × 3.5 = 9.625 kg
So, 9.625 kg of sugar is needed.
5. Earnings per hour = ₹ 5.75
Taken time by worker in a day = 8 hours.
Workers works in a week = 6 days
Daily income = ₹ 5.75 × 8 = ₹ 46.00
Weekly income = ₹ 46 × 6 = ₹ 276
So, the weekly income is ₹ 276.

Assess Yourself-2

1. (a) $\frac{13}{2} = \frac{13\times5}{2\times5} = \frac{65}{10} = 6.5$

(b) $\frac{75}{4} = \frac{75\times25}{4\times25} = \frac{1875}{100} = 18.75$

(c) $\frac{123}{8} = \frac{123\times125}{8\times125} = \frac{15375}{1000}$
$= 15.375$

(d) $\frac{215}{16} = \frac{215\times625}{16\times625} = \frac{134375}{10000}$
$= 13.4375$

2. (a) $\frac{2.52}{4} = 0.63$ **(b)** $\frac{0.252}{4} = 0.063$

(c) $\frac{25.2}{4} = 6.3$ **(d)** $\frac{252.0}{4} = 63.0$

3. (a) 24.8 ÷ 8 = 3.1.
So, the quotient is 3.1.
(b) 0.0248 ÷ 8 = 0.0031.
So, the quotient is 0.0031.
(c) 2.48 ÷ 8 = 0.31.
So, the quotient is 0.31.
(d) 248.0 ÷ 8 = 31.0.
So, the quotient is 31.0.
(e) 0.248 ÷ 8 = 0.031.
So, the quotient is 0.031.
4. (a) 560 ÷ 16 = 35.0.
So, the value of 35.0.
(b) 5.60 ÷ 16 = 0.35.
So, the value of 0.35.
(c) 5.06 ÷ 16 = 0.31625.
So, the value of 0.31625.
(d) 5.006 ÷ 16 = 0.312875.
So, the value of 0.312875.
(e) 0.56 ÷ 16 = 0.035.
So, the value is 0.035.

Assess Yourself-3

1. The length of a rope = 138.6 m
It is divided equally among 7 friends
Each gets = $\frac{138.6}{7}$ = 19.8 m
So, each friend get 19.8 m for rope.
2. Total weight of the bags of rice = 682.5 kg
Weight of each bag = 97.5 kg
Total number of bags = $\frac{682.5}{97.5} = 7$
So, there are 7 bags of rice.

3. (a) $\frac{5}{2} = \frac{5\times5}{2\times5} = \frac{25}{10} = 2.5$

(b) $\frac{3}{8} = \frac{3\times125}{8\times125} = \frac{375}{1000} = 0.375$

(c) $\frac{11}{50} = \frac{11\times2}{50\times2} = \frac{22}{100} = 0.22$

(d) $\frac{23}{16} = \frac{23\times625}{16\times625} = \frac{14375}{10000} = 1.4375$

4. Given : 56 × 92 = 5152
(a) 0.56 × 92
⇒ 2 + 0 = 2 decimal places
So, 0.56 × 92 = 51.52
(b) 5.6 × 9.2
⇒ 1 + 1 = 2 decimal places.
So, 5.6 × 9.2 = 51.52
(c) 0.056 × 92
⇒ 3 + 0 = 3 decimal places.
So, 0.056 × 92 = 5.152
(d) 0.56 × 0.92
⇒ 2 + 2 = 4 decimal places
So, 0.56 × 0.92 = 0.5152

5. (a) $35 \div x = 0.035$

$\Rightarrow \quad \frac{35}{x} = 0.035$

$\Rightarrow \quad x = \frac{35}{0.035} = \frac{35 \times 1000}{0.035 \times 1000}$

$= \frac{35000}{35} = 1000$

(b) $832 \div x = 8.32$

$\Rightarrow \frac{832}{x} = 8.32$

$\Rightarrow x = \frac{832}{8.32} = \frac{832 \times 100}{8.32 \times 100} = \frac{83200}{832}$

$= 100$

(c) $2968 \div x = 0.2968$

$\Rightarrow \frac{2968}{x} = 0.2968$

$\Rightarrow \quad x = \frac{2968}{0.2968} = \frac{2968 \times 10000}{0.2968 \times 10000}$

$= \frac{29680000}{2968} = 10000$

(d) $1 \div x = 0.0001$

$\Rightarrow \quad \frac{1}{x} = 0.0001$

$\Rightarrow \quad x = \frac{1}{0.0001} = \frac{1 \times 10000}{0.0001 \times 10000}$

$= \frac{10000}{1} = 10000$

6. (a) $\frac{23.5}{2.5} = \frac{23.5 \times 10}{2.5 \times 10} = \frac{235}{25} = 9.4$

So, the quotient is 9.4.

(b) $\frac{3.86}{0.25} = \frac{3.86 \times 100}{0.25 \times 100} = \frac{386}{25} = 15.44$

So, the quotient is 15.44.

(c) $\frac{296}{0.025} = \frac{296 \times 1000}{0.025 \times 1000} = \frac{296000}{25}$

$= 11840.$

So, the quotient is 11840.

(d) $\frac{999.8}{0.005} = \frac{999.8 \times 1000}{0.005 \times 1000} = \frac{999800}{5}$

$= 199960.$

So, the quotient is 199960.

Figure it Out

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1. (a) 6×4 tenths $= 24$ tenths

(b) $7 \times 0{\cdot}3 = 7 \times 3$ tenths $= 21$ tenths

(c) 9×5 hundredths $= 45$ hundredths

2. (a) $27{\cdot}34 \times 6$

$= \frac{2734}{100} \times 6 = \frac{16404}{100} = 164{\cdot}04$

(b) $4{\cdot}23 \times 3{\cdot}7$

$= \frac{423}{100} \times \frac{37}{10} = \frac{423 \times 37}{1000}$

$= \frac{15651}{1000} = 15{\cdot}651$

(c) $0{\cdot}432 \times 0{\cdot}23$

$= \frac{432}{1000} \times \frac{0{\cdot}23}{100} = \frac{9936}{100000} = 0{\cdot}09936$

3. Cloth required for 1 shirt $= 1{\cdot}65$ m

$\therefore$ Cloth required for 3 shirts $= 3 \times 1{\cdot}65$ m

$= \frac{3 \times 165}{100}\text{m} = \frac{495}{100}\text{m} = 4{\cdot}95$ m

Ans.

4. Cost of 1 book = ₹15·50

$\therefore$ Cost of 4 books = ₹4 × 15·50

$= \frac{4 \times 1550}{100} = \frac{6200}{100} =$ ₹62

Cost of 1 Eraser = ₹2·75

$\therefore$ Cost of 3 Erasers = 3 × ₹2·75

$= \frac{3 \times 275}{100} = \frac{825}{100} =$ ₹8·25

Total amount spend = ₹(62 + 8·25)

= ₹70·25.

5. Given that,

Thickness of 1 coin = 1·45 mm

Height of the cylinder

= Total thickness of 36 coins = $36 \times 1{\cdot}45$

$= \frac{36 \times 145}{100} = \frac{5220}{100} = 52{\cdot}2$ mm

We know that 10 mm = 1 cm

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

$\therefore$ 52·2 mm $= \frac{52{\cdot}2}{10}$ cm $= 5{\cdot}22$ cm.

6. Price of 1 kg of oranges = ₹56·50
Price of 2·250 kg of oranges
= ₹ 56·50 × 2·250

$$= \frac{5650 \times 2250}{100 \times 1000} = \frac{12712500}{100000}$$

$$= \frac{12712500}{100000} = 127{\cdot}125$$

Again, If we write 56·50 as 56·5 and 2·250 as 2·25

then 56·5 × 2·25

$$= \frac{565 \times 225}{10 \times 100} = \frac{127125}{1000}$$

= 127·125, we get same product.

7. Purchase cost of 1 note book = ₹ 23·6
Selling cost of 1 note book = 30
Profit per note book = Selling price – Purchase Cost = ₹ (30 – 23·6) = ₹ 6·4
$\therefore$ Total profit on 50 note books
= ₹ 6·4 × 50

$$= \frac{64}{10} \times 50 = \frac{3200}{10} = ₹\ 320$$

8. Given that 18 × 12 = 216

(a) $18 \times 1{\cdot}2 = \frac{18 \times 12}{10} = \frac{216}{10} = 21{\cdot}6 > 1$

(b) $18 \times 0{\cdot}12 = \frac{18 \times 12}{100} = \frac{216}{10} = 2{\cdot}16 > 1$

(c) $1{\cdot}8 \times 1{\cdot}2 = \frac{18 \times 12}{10 \times 10} = \frac{216}{100} = 2{\cdot}16 > 1$

(d) $0{\cdot}18 \times 0{\cdot}12 = \frac{18 \times 12}{100 \times 100}$

$$= \frac{216}{10000} = 0{\cdot}0216 < 1$$

(e) $0{\cdot}018 \times 0{\cdot}012 = \frac{18 \times 12}{1000 \times 1000}$

$$= \frac{216}{1000000} = 0{\cdot}000216 < 1$$

(Also, we know that when we multiply two positive numbers, both are less than 1 then their product will be less than 1)
Thus, (d) and (e) are less than one.

9. Yes, by monitoring decimal place value, we can find the answer without actual multiplication.
Rules: (i) If one of the two numbers is greater than 1 then their product will be greater than the original number.
(ii) Multiplying by a number between 0 and 1 then product will be less than the original number.
(iii) Multiplying two numbers between 0 and 1, then product will be less than both factors, less than 1.
Here (a) 7 × 0·6 (Greater than 1)
(b) 0·7 × 0·6 (less than 1)
(c) 0·7 × 6 (Greater than 1)
(d) 0·07 × 0·06 (less than 1)

10.

	× 10	× 100	× 1000
5·7	57	570	5700
23·02	230·2	2302	23020
0·92	9·2	92	920
0·306	3·06	30·6	306
24·67	246·7	2467	24670

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1. (a) $\frac{18 \times 2}{5 \times 2} = \frac{36}{10} = 3{\cdot}6$

Verification

T O Tenths

$$5\overline{)18\,(0\,3\cdot6}$$
$$-15$$
$$30$$
$$-30$$
$$0$$

Hence Proved

(b) $\frac{415 \times 25}{4 \times 25} = \frac{10375}{100}$

= 103·75 **Verification**

H T O Tenths Hundredth

$$4\overline{)415}\,(103\cdot 7\;5$$

-4, 15, -12, 30, -28, 20, -20, $\times$

$\therefore \quad \frac{415}{4} = 103{\cdot}75$ **Hence Proved**

(c) $\frac{1217 \times 5}{2 \times 5} = \frac{6085}{10} = 608{\cdot}5$

Verification

H T O Tenths

$$2\overline{)1217}\,(608\cdot 5$$

-12, 017, -16, 10, -10, 0

$\therefore \quad \frac{1217}{2} = 608{\cdot}5$

(d) $\frac{4827 \times 125}{8 \times 125} = \frac{603375}{1000} = 603{\cdot}375$

Verification

$$8\overline{)4827}\,(0603\cdot 375$$

-48, 027, -24, 30, -24, 60, -56, 40, -40, $\times$

$4827 \div 8 = 0603{\cdot}375$ **Hence proved**

2. (a) $\frac{1526}{4}$

Using long division method

$$4\overline{)1526}\,(381{\cdot}5$$

-12, 32, -32, 06, -4, 20, -20, $\times$

option (iii) is correct.

(b) $\frac{3567}{8}$

By Long division method

H T O T^{th} H^{th} Th^{th}

$$8\overline{)3567}\,(445\cdot 8\;7\;5$$

-32, 36, -32, 47, -40, 70, -64, 60, -56, 40, -40, $\times$

option (iii) is correct.

3. (a) $\frac{132}{4}$

$$4\overline{)132}\,(33$$

-12, 12, -12, 0

$\therefore$ Quotient (Q) = 33

(b) $\frac{132}{4} = \frac{132}{4 \times 10}$

```
          O  Th^th
40 ) 132 ( 3 · 3
    -120
     120
    -120
     ×
```

∴ Q = 3·3

(c) 1·32 ÷ 4

$$\frac{132}{4\times100} = \frac{132}{400}$$

```
          O   T^th  H^th
400 ) 1320 ( 0 ·  3    3
    -1200
     1200
    -1200
        0
```

∴ Q = 0·33

(d) $\frac{0{\cdot}132}{4} = \frac{0132}{4\times1000} = \frac{132}{4000}$

```
            O   T^th  H^th  Th^th
4000 ) 132000 ( 0 ·  0    3    3
    12000
     12000
    -12000
        0
```

∴ Q = 0·033

4. (a) $\frac{126}{8}$

```
          T  O  T^th  H^th
8 ) 126 ( 1  5 ·  7    5
    -8
     46
    -40
     60
    -56
      40
    -40
      ×
```

(b) 12·6 ÷ 8

```
          T  O  T^th  H^th
8 ) 12·6 ( 1 · 5  7    5
    -8
     46
    -40
     60
    -56
      40
    -40
      ×
```

(b) Similarly 1.26 ÷ 8 = 0.1575

(d) 0·126 ÷ 8 =

```
          O  T^th  H^th  T^th  TH^th
8 ) 01·26 ( 0 · 0    1    5    7    5
   -0
    12
   -8
    46
   -40
    60
   -56
     40
   -40
    ×
```

(e) 0·0126 ÷ 8

```
          O  T^th  H^th  T^th  TH^th
8 ) 0·0126 ( 0 · 0    0    1    5    7    5
   -0
    00
   -00
    12
   -8
    46
   -40
    60
   -56
     40
   -40
    ×
```

Q = 0·001575

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1. (a) $\frac{2\times2}{5\times2} = \frac{4}{10} = 0{\cdot}4$

(b) $\frac{13 \times 25}{4 \times 25} = \frac{325}{100} = 3{\cdot}25$

(c) $\frac{4 \times 2}{50 \times 2} = \frac{8}{100} = 0{\cdot}08$

(d) $\frac{5 \times 125}{8 \times 125} = \frac{625}{1000} = 0{\cdot}625$

2. $\frac{24{\cdot}86}{1{\cdot}2} = \frac{2486 \times 10}{120} = \frac{2486}{120}$

$120\overline{)2486}\,(20{\cdot}7166$

-240

860

-840

200

-120

800

-720

80

Q = 20·7166...

(b) 5·728 ÷ 1·52

$= \frac{5728 \times 100}{152 \times 1000} = \frac{5728}{1520}$

$1520\overline{)5728}\,(3{\cdot}76$

-4560

11680

-10640

10400

-9120

1280

∴ Q = 3·76

3. Given that 156 × 12 = 1872 ...(i)

(a) $15{\cdot}6 \times 1{\cdot}2 = \frac{156}{10} \times \frac{12}{10} = \frac{156 \times 12}{100}$

= 18·72, using (i)

(b) 187·2 ÷ 1·2

$\frac{187{\cdot}2}{1{\cdot}2} = \frac{1872}{12} = 156$ using (i)

(c) 18·72 ÷ 15·5

$= \frac{18{\cdot}72}{15{\cdot}6} = \frac{1872 \times 10}{156 \times 100} = \frac{12}{10} = 1{\cdot}2$

(d) 0·156 × 0·12

$= \frac{156 \times 12}{1000 \times 100} = \frac{1872}{100000} = 0{\cdot}01872$

4. (a) Let $25 \div x = 0{\cdot}25$

$\Rightarrow \quad x = \frac{25}{0{\cdot}025} = \frac{25 \times 1000}{25} = 1000$

(b) Let $25 \div x = 250$

$\Rightarrow \quad x = \frac{25}{250} = \frac{1}{10} = 0{\cdot}1$

(c) Let $25 \div x = 2{\cdot}5$

$\Rightarrow \quad x = \frac{25}{2{\cdot}5} = \frac{25 \times 10}{25} = 10$

(d) 25 ÷ 10 = 25 × .....

Let $25 \div 10 = 25 \times x$

$\Rightarrow \quad \frac{25}{25 \times 10} = \frac{1}{10} = 0{\cdot}1$

(e) Let $25 \div 0{\cdot}10 = 25 \times x$

$\Rightarrow \frac{25}{0{\cdot}10} = 25 \times x$

$\Rightarrow \quad x = \frac{25}{25 \times 0{\cdot}10} = \frac{100}{0{\cdot}10} = 10$

(f) Let $25 \div 0.01 \times x \Rightarrow \frac{25}{0{\cdot}01} = 25 \times x$

$\Rightarrow x = \frac{25}{25 \times 0{\cdot}01} = \frac{1}{001} = \frac{100}{001} = 100$

5. (a) 2·46 ÷ 1·5

$= \frac{2{\cdot}46}{1{\cdot}5} = \frac{246 \times 10}{100 \times 15} = \frac{246}{150}$

$150\overline{)246}\,(1{\cdot}64$

-150

960

-900

600

-600

$\times$

∴ Q = 1·64

(b) 2·46 ÷ 0·15

$= \frac{2{\cdot}46}{0{\cdot}15} = \frac{246 \times 100}{100 \times 15} = \frac{246}{15}$

$$15\overline{)246}\,(16.4$$
$$-15$$
$$96$$
$$-90$$
$$60$$
$$-60$$
$$\times$$

(c) 2·46 ÷ 0·015

$$= \frac{2\cdot46}{0\cdot015}$$

$$= \frac{246 \times 1000}{100 \times 15} = \frac{2460}{15}$$

$$15\overline{)2460}\,(164$$
$$-15$$
$$96$$
$$-90$$
$$60$$
$$-60$$
$$\times$$

$\therefore$ Q = 164

In 24·6 ÷ 1·5

$$= \frac{246 \times 10}{15 \times 10} = \frac{246}{15} = 16.4$$

and $\frac{2\cdot46}{0\cdot15} = \frac{246 \times 100}{15 \times 100} = \frac{246}{15} = 16.4$

Both have same quotient

6. Total length of wooden block = 4 m

No. of pieces = 5

Thus length of each piece $= \frac{4}{5}$

$$= \frac{4 \times 2}{5 \times 2} = \frac{8}{10} = 0\cdot8 \text{ m}$$

7. Perimeter of regular polygon

= 208·8 cm

Number of sides = 12

Thus length of each side

$$= \frac{\text{Perimeter}}{\text{Number of sides}}$$

$$= \frac{208\cdot8}{12} = 17\cdot4 \text{ cm}$$

$$12\overline{)208\cdot8}\,(17\cdot4$$
$$-12$$
$$88$$
$$-84$$
$$48$$
$$-48$$
$$\times$$

Thus, 17·4 cm. is required length.

8. Total quantity of juice = 3 L

Number of friends = 8

Juice distributed per friend $= \frac{3}{8}$ L

$\therefore \quad \frac{3}{8}\text{ L} = \frac{3}{8} \times 1000 \text{ mL}$

$$= \frac{3000}{8}\text{ml} = 375 \text{ ml}$$

$$8\overline{)3000}\,(375$$
$$-24$$
$$60$$
$$-56$$
$$40$$
$$-40$$
$$\times$$

Thus, 375 mL is required quantity.

9. Distance covered by car using 12·6 L petrol = 234·45 km

$\therefore$ Distance covered by car using 1 L petrol

$$= \frac{234\cdot45}{12\cdot6}\text{km}$$

$$\frac{234\cdot45}{12\cdot6} = \frac{23445 \times 10}{100 \times 126}$$

$$= \frac{23445}{1260} = 18\cdot607 \text{ km}$$

$$
\begin{array}{r|l}
1260 & 23445 \\
-1260 & \\
\hline
10845 & \\
-10080 & \\
\hline
7650 & \\
-7560 & \\
\hline
9000 & \\
-8820 & \\
\hline
180 &
\end{array}
\quad 18{\cdot}607
$$

Thus distance travelled per litre = 18·607 km

10. Total quantity of flour = 13·5 kg

Number of students = 15

Quantity of flour each student receive

$= \frac{13{\cdot}5}{15}\text{kg} = 0{\cdot}9$ kg

$$
\begin{array}{r|l}
15 & 13{\cdot}5 \\
-13{\cdot}5 & \\
\hline
\times &
\end{array}
\quad 0{\cdot}9
$$

Ans. 0·9 kg

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1. Step 1 : Cost per gram of Peanut Chikki: = Total cost ÷ Total weight

= ₹70.5 ÷ 210 g

= ₹0.3357 per gram (approx.)

Step 2 : Cost per gram of Potato Chips:

= Total cost ÷ Total weight

= ₹33.25 ÷ 110 g

= ₹0.3023 per gram (approx.)

Step 3 : Comparison:

Peanut Chikki: ₹0.3357 per gram

Potato Chips: ₹0.3023 per gram

Since ₹0.3023 < ₹0.3357, Potato Chips is cheaper.

Thus, Potato Chips is cheaper. Its cost per gram (₹0.302) is less than that of Peanut Chikki (₹0.336).

2. The Indian calendar is a solar-lunar calendar.

Months are based on moon phases.

Year length is based on the sun's movement.

The lunar year is 354 days.

The solar year is 365 days.

There is an 11-day difference between them.

An extra month is added every 2-3 years.

This month is called Adhik Mass.

It is like a leap year in the Gregorian calendar.

The sky is divided into 27 constellations.

Dates and festivals are decided using them.

Sun's zodiac change is called Sankranti.

For example, Makar Sankranti.

Mathematicians like Aryabhata calculated year length accurately.

These methods kept the calendar aligned with seasons and astronomy.

3. Step 1 : Cost Price (CP):

Bananas bought = 3 kg

Rate = ₹30 per kg

Cost Price = 3 × ₹30 = ₹90

Step 2 : Selling Price (SP):

Number of bananas = 35

Selling price per banana = ₹5

Selling Price = 35 × ₹5 = ₹175

Step 3 : Profit:

Profit = Selling Price − Cost Price

Profit = ₹175 − ₹90 = ₹85

Verification: CP + Profit = ₹90 + ₹85 = ₹175 = SP

Thus, Shyamala makes a profit of ₹85 by selling all the bananas.

4. Step 1 : Number of books that can be placed:

Number of books

= Length of shelf ÷ Thickness of each book

= 160 cm ÷ 2.5 cm

= 64 books

Step 2 : Space left:

Space occupied by 64 books

= 64 × 2.5 cm = 160 cm

Total shelf length = 160 cm

Space left = 160 − 160 = 0 cm

Step 3 : Comparison with teacher's wish:

Teacher wanted to place 80 books.

Only 64 books can fit on the shelf.

Verification: 64 × 2.5 cm = 160 cm = shelf length

Thus, 64 books can be placed on the shelf. No space is left. Only 64 out of 80 books can be placed.

5 .

Blank	Calculation	Answer
5.5 km = ___ m	5.5 × 1000 = 5500	5500 m
35 cm = ___ m	35 ÷ 100 = 0.35	0.35 m
14.5 cm = __ mm	14.5 × 10 = 145	145 mm
68 g = ___ kg	68 ÷ 1000 = 0.068	0.068 kg
9.02 m = __ mm	9.02 × 1000 = 9020	9020 mm
125.5 ml = __ l	125.5 ÷ 1000 = 0.1255	0.1255 l

Ans: All answers are given in the table above (highlighted in green).

6. Part (i): 6¼ ÷ 2½

6¼ = 6.25

2½ = 2.5

6.25 ÷ 2.5 = 625 ÷ 250 (multiply both by 100) = 2.5

Verification: 2.5 × 2.5 = 6.25

Thus, 6¼ ÷ 2½ = 2.5

Part (ii): 60¼ ÷ 3½

60¼ = 60.25

3½ = 3.5

60.25 ÷ 3.5

= 6025 ÷ 350 (multiply both by 100)

= 17.214... ≈ 17.21

Verification: 17.21 × 3.5 ≈ 60.24 ≈ 60.25 ☐

Thus, 60¼ ÷ 3½ ≈ 17.21

7. (a) ☐ × ☐ = 2.4

Way 1 : 1.2 × 2.0 = 2.4

Way 2 : 0.6 × 4.0 = 2.4

Way 3 : 0.8 × 3.0 = 2.4

Ans. (a) 1.2 × 2 = 2.4 | 0.6 × 4 = 2.4 | 0.8 × 3 = 2.4

(b) ☐ × ☐ = 14.5

Way 1 : 2.9 × 5.0 = 14.5

Way 2 : 29.0 × 0.5 = 14.5

Way 3 : 1.45 × 10 = 14.5

Ans. (b) 2.9 × 5 = 14.5 | 29 × 0.5 = 14.5 | 1.45 × 10 = 14.5

8. Key Rule : Multiplying or dividing both dividend and divisor by the same power of 10 does not change the quotient.

(a) 75.6 ÷ 3.6 = (756 ÷ 10) ÷ (36 ÷ 10)
= 756 ÷ 36 = 21

(b) 7.56 ÷ 0.36
= (756 ÷ 100) ÷ (36 ÷ 100)
= 756 ÷ 36 = 21

(c) 756 ÷ 0.36 = 756 ÷ (36 ÷ 100)
= (756 × 100) ÷ 36
= 75600 ÷ 36 = 21 × 100 = 2100

(d) 75.6 ÷ 360 = (756 ÷ 10) ÷ (36 × 10)
= 756 ÷ (36 × 100)
= 21 ÷ 100 = 0.21

(e) 7560 ÷ 3.6
= (756 × 10) ÷ (36 ÷ 10)
= 21 × 10 × 10 = 21 × 100 = 2100

(f) 7.56 ÷ 0.36 = (756 ÷ 100) ÷ (36 ÷ 100)
= 756 ÷ 36 = 21

9. Rule 1: If a is multiplied by 10, the quotient is also multiplied by 10.

Rule 2: If b is multiplied by 10, the quotient is divided by 10.

b a→	1517	151.7	15.17	1.517	15170
37	41	5	0.41	0.041	410
3.7	410	41	4.1	0.41	4100
0.37	4100	410	41	4.1	41000
0.037	41000	4100	410	41	410000
370	4.1	0.41	0.041	0.0041	41

Ans: All missing cells are filled in the table above.

10. (a) Maximum product:

Place largest digits in highest place values.

82.0 × 5.4 = 442.8 (maximum)

(b) Minimum product:

Place 0 in the tens place → 02.4 = 2.4

2.4 × 5.8 = 13.92 (using digits 2,4,5,8,0)

2.4 × 5.8 = 13.92 (minimum)

(c) Product greater than 150:

85.0 × 2.4 = 204.0 > 150

85.0 × 2.4 = 204 > 150

(d) Product nearest to 100:

$20.5 \times 4.8 = 98.4$ (only 1.6 less than 100)
$25.8 \times 4.0 = 103.2$ (3.2 more than 100)
Since $|98.4 - 100| = 1.6 < |103.2 - 100| = 3.2$,
$20.5 \times 4.8 = 98.4$ is nearer to 100.
$20.5 \times 4.8 = 98.4$ (nearest to 100) **Ans.**
(e) Product nearest to 5:
$5.8 \times 0.4 = 2.32 \rightarrow$ difference from 5: $|5 - 2.32| = 2.68$
$4.0 \times 0.2 = 0.80 \rightarrow$ difference: $|5 - 0.80| = 4.20$
Best option: $5.8 \times 0.4 = 2.32$ (closest to 2 with given digits)
$5.8 \times 0.4 = 2.32$ (nearest to 5)
11. Step 1 : Calculate approximate values:
(a) $245.05 \times 0.942368 \approx 230.93$
[multiplier $< 1 \rightarrow$ result $<$ 245.05]
(b) $245.05 \times 7.9682 \approx 1952.23$
[multiplier $> 1 \rightarrow$ result $>>$ 245.05]
(c) $245.05 \div 7.9682 \approx 30.75$
[divisor $> 1 \rightarrow$ result $<<$ 245.05]
(d) $245.05 \div 0.942368 \approx 260.06$
[divisor $< 1 \rightarrow$ result $>$ 245.05]
(e) $245.05 = 245.05$
(f) $7.9682 = 7.9682$
Step 2 : Arrange in increasing order:
(f) $7.97 <$ (c) $30.75 <$ (a) $230.93 <$ (e) $245.05 <$ (d) $260.06 <$ (b) 1952.23
Multiplying by a number less than 1 makes it smaller; dividing by a number less than 1 makes it larger.
Thus, Increasing order: (f) < (c) < (a) < (e) < (d) < (b)

Practice Time

Multiple Choice Questions (MCQs)

1. (c), **2.** (b), **3.** (b), **4.** (c), **5.** (d), **6.** (b), **7.** (d).

Fill in the Blanks

1. 365.2422, **2.** Left side, **3.** 2 and 5, **4.** Natural number decimal point, **5.** 0.0369, 3.69.

True/False

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

Subjective Questions

1. (a) $2.3 \times 10 = 23$. [1 m = 10 dm]
So, 2.3 m = 23 decimetres.
(b) $2.3 \times 100 = 230$. [1 m = 100 cm]
So, 2.3 m = 230 centimetres.
(c) $2.3 \times 1000 = 2300$. [1 m = 1000 mm]
So, 2.3 m = 2300 millimetres.
(d) $2.3 \div 10 = 0.23$. $\left[1\text{ m} = \frac{1}{10}\text{dam}\right]$
So, 2.3 m = 0.23 decametres.
2. Round trip per day = 927×2
= 1854 m.
Weekly distance = $1854 \times 6 = 11124$ m
= 11.124 km.
So, Shreya covers 11.124 kg during the week.
3. (a) 3.4 km = $3.4 \times 1000 = 3400$ metres.
(b) 4.5 m = $4.5 \times 100 = 450$ cm.
(c) 2.4 kg = $2.4 \times 1000 = 2400$ gram.
(d) 96 cm = $96 \div 100 = 0.96$ m.
4. Given $632 \times 49 = 30968$:
(a) $6.32 \times 4.9 : 2 + 1 = 3$ decimal places.
So, $6.32 \times 4.9 = 30.968$.
(b) $63.2 \times 0.49 : 1 + 2 = 3$ decimal places.
So, $63.2 \times 0.49 = 30.968$.
(c) $0.632 \times 49 : 3 + 0 = 3$ decimal places.
So, $0.632 \times 49 = 30.968$.
(d) $63.2 \times 4.9 : 1 + 1 = 2$ decimal places.
So, $63.2 \times 4.9 = 309.68$.
(e) $0.632 \times 0.49 : 3 + 2 = 5$ decimal places.
So, $0.632 \times 0.49 = 0.30968$.
(f) $0.00632 \times 4.9 : 5 + 1 = 6$ decimal places.
So, $0.00632 \times 4.9 = 0.030968$.
5. Thickness = 3.6 cm, 95 notebooks stacked.
Height of 95 books stacked = 3.6×95 = 342 cm = $342 \div 100 = 3.42$ m.

So, the total height is 342 cm or 3.42 metres.

6. Possible values where product = 2.4 :

Way 1 : $a = 0.24, b = 10 (0.24 \times 10 = 2.4)$

Way 2 : $a = 8, b = 0.3 (8 \times 0.3 = 2.4)$

So, two possible values are $a = 0.24, b = 10$ and $a = 8, b = 0.3$.

7. $8\frac{1}{4} \div 4\frac{1}{2} = 8.25 \div 4.5$:

$$\frac{8.25\times10}{4.5\times10} = \frac{82.5}{45} = \frac{11}{6}$$

So, $\frac{11}{6} = 1.8333...$ (repeating 3).

$60\frac{1}{4} \div 20\frac{1}{2} = 60.25 \div 20.5$:

$$\frac{60.25\times10}{20.5\times10} = \frac{602.5}{205} = \frac{241}{82}$$

So, $\frac{241}{82} = 2.939$.

8. Flour per cake = 0.75 kg, 3 dozen = 36 cakes.

Total quantity of flour = 0.75×36 = 27 kg.

So, 27 kg of flour is needed.

9. Speed of a car = 85.21 km/hour

Taken time by car = 8.5 hour

Formula used : Distance = Speed × Time

Distance = 85.21×8.5

Distance = 724.285 km

So, the car travels 724.285 km in 8.5 hours.

10. The weight of a large bag of candy = 23.2 kg

The weight of smaller each bay of candy = 0.4 kg

Number of small bag = $\frac{23.2}{0.4}$

$$= \frac{23.2\times10}{0.4\times10} = \frac{232}{4} = 58$$

So, the shopkeeper can make 58 small bags.

5. Connecting the Dots

Assess Yourself-1

1. New kick distances : 36 m, 35 m, 33 m, 38 m.

New average = $(36 + 35 + 33 + 38) \div 4$ = $142 \div 4 = 35.5$ m.

So, the new average distance is 35.5 m.

2. Marks scored : 75, 80, 62, 93, 85, 91.

Sum = 75 + 80 + 62 + 93 + 85 + 91 = 486.

Average = $486 \div 6 = 81$.

So, Anjum's average marks are 81.

3. Ages : 65, 60, 36, 34, 12, 10.

Sum = 65 + 60 + 36 + 34 + 12 + 10 = 217.

Average = $217 \div 6 = 36.2$ (approximately)

So, the average age per person in the family is approximately 36.2 years.

4. Shruti's marks : 79, 82, 100, 93, 85, 96.

Sum = 535.

Mean = $535 \div 6 = 89.17$

Mishti's marks : 85, 91, 73, 76, 91, 92.

Sum = 508

Mean = $508 \div 6 = 84.67$

So, Shruti performed better with a mean of 89.17 compared to Mishti's 84.67.

Assess Yourself-2

1. Onion prices (Monday to Sunday) : 26, 28, 20, 23, 25, 30, 34.

Sum = 26 + 28 + 20 + 23 + 25 + 30 + 34 = 186.

Mean = $186 \div 7 = 26.57$ per kg.

Tomato prices : 30, 32, 25, 18, 23, 21, 29.

Sum = 30 + 32 + 25 + 18 + 23 + 21 + 29 = 178.

Mean = $178 \div 7 = 25.43$ per kg.

So, onions are more expensive with an average price of rupees 26.57 per kg.

2. Number of milch animals : 2, 3, 0, 5, 4, 6, 0, 7, 3, 4, 5, 6, 2, 10, 7, 3, 4, 6, 8, 2, 0, 7.

$n = 22$.

Sum = 2 + 3 + 0 + 5 + 4 + 6 + 0 + 7 + 3 + 4 + 5 + 6 + 2 + 10 + 7 + 3 + 4 + 6 + 8 + 2 + 0 + 7 = 94.

Mean = $94 \div 22 = 4.3$ (approximately)

Arranging in order : 0, 0, 0, 2, 2, 2, 3, 3,

3, 4, 4, 4, 5, 5, 6, 6, 6, 7, 7, 7, 8, 10.
Median = $(11^{th} + 12^{th}) \div 2 = (4 + 4) \div 2 = 4$
So, Mean = 4.3 and Median = 4 milch animals.

3. Agricultural land in hectares (29 families) : 51, 46, 44, 53, 62, 64, 47, 56, 61, 56, 60, 57, 57, 50, 55, 66, 67, 52, 45, 59, 61, 55, 58, 62, 63, 61, 61, 68, 70.
Sum = 1667.
Mean = 1667 ÷ 29 = 57.5 (approximately)
Arranged in order : 44, 45, 46, 47, 50, 51, 52, 53, 55, 56, 56, 57, 57, 58, 59, 60, 61, 61, 61, 61, 62, 62, 63, 64, 66, 67, 68, 70.
Median = 15^{th} value = 58 hectares.
So, Mean = 57.5 hectares and Median = 58 hectares. The agricultural lands are mostly between 50 and 70 hectares 5 pieces of land are larger than that of the average area.

Assess Yourself-3

1. Graph

2. (a) Train is the most commonly used transport and it is used by 250 travellers.
(b) Car transport is used by number of 110 travellers.
(c) 72 people go to their destination on foot.
(d) 110 people travel by tractor.
(e) 1 unit = 20 people.

3. (i) Sri-Lanka
(ii) Vertical line represent number of matches won and lost by the Indian cricket team.
Scale – 1 unit = 10 matches
(iii) Afganistan
(iv) Australia
(v) Number of matches won by the Indian team = 58 + 58 + 72 + 62 + 58 + 87 + 35 + 4 = 434
Number of matches lost by the Indian team = 44 + 84 + 64 + 51 + 73 + 59 + 8 + 0 = 383.

4. Graph.

Figure it Out

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1. Number of attempts = 8
Number of bounces of the ball in 8 attempts = 6, 2, 9, 5, 4, 6, 3, 5
Average number of bounces of the ball

$$= \frac{\text{Sum of all the bounces}}{\text{Number of attempts}}$$

$$= \frac{6+2+9+5+4+6+3+5}{8}$$

$$= \frac{40}{8} = 5$$ **Ans.**

2. Do yourself.

3. Do yourself.

4. Nikhil's running times over the past week in seconds 17, 18, 17, 16, 19, 17, 18
Number of days in a week = 7
∴ Average running time of Nikhil

$$= \frac{\text{Total number of seconds}}{\text{Number of days}}$$

$$= \frac{17+18+17+16+19+17+18}{7}$$

$$= \frac{122}{7} = 17{\cdot}43 \text{ seconds}$$

Sunil's running time over the past week in seconds 20, 18, 18, 17, 16, 16, 17

$$= \frac{20+18+18+17+16+16+17}{7}$$

$$= \frac{122}{7} = 17{\cdot}43 \text{ seconds}$$

Ans. Both Nikhil and Sunil have the same average running time.

5. The enrolment in a school during six consecutive years = 1555, 1670, 1750, 2013, 2040, 2126
Number of years = 6

$$\therefore \text{Average} = \frac{\text{Sum of all the enrolments}}{\text{Number of years}}$$

$$= \frac{1555+1670+1750+2013+2040+2126}{6}$$

$$= \frac{11,154}{6} = 1,859$$ **Ans.**

Page-112

1. Monthly onion prices in Yahapur in

ascending order 24, 25, 26, 28, 30, 35, 39, 43, 44, 49, 56, 59

Number of observation = 12 (even)

$$\therefore \text{Median} = \frac{1}{2}\left[\frac{n}{2}+\left(\frac{n}{2}+1\right)\right]^{\text{th}} \text{term}$$

$$= \frac{1}{2}\left[\frac{12}{2}+\left(\frac{12}{2}+1\right)\right]^{\text{th}} \text{term}$$

$$= \frac{2}{2}\left[6^{\text{th}} + 7^{\text{th}}\right] \text{term} = \frac{1}{2}(35+39)$$

$$= \frac{74}{2} = 37$$

∴ Median of onion price in Yahapur = ₹37/kg

Monthly onion price in Wahapur in ascending order!

17, 19, 23, 30, 35, 38, 39, 42, 42, 52, 53, 60

Number of observations = 12 (even)

$$\text{Median} = \frac{1}{2}[6^{\text{th}} + 7^{\text{th}}] \text{ term}$$

$$= \frac{1}{2}(38+39) = \frac{1}{2}\times 77 = 38{\cdot}5$$

Median = ₹38·5/kg Ans.

2. Total number of observation = 20 (Ignoring the mising values)

Arranging the given data in ascending order,

we get 0, 0, 0, 0, 0, 0, 1, 1, 1, 2, 2, 2, 3, 4, 4, 4, 5, 8, 10, 25

Since number of observation = 20 (even)

$$\text{So Median} = \frac{1}{2}\left[\frac{n}{2}+\left(\frac{n}{2}+1\right)\right]^{\text{th}} \text{term}$$

$$= \frac{1}{2}\left[\frac{20}{2}+\left(\frac{20}{2}+1\right)\right]^{\text{th}} \text{term}$$

$$= \frac{1}{2}(10^{\text{th}} + 11^{\text{th}}) \text{ term}$$

$$= \frac{1}{2}(2+2) = 2$$

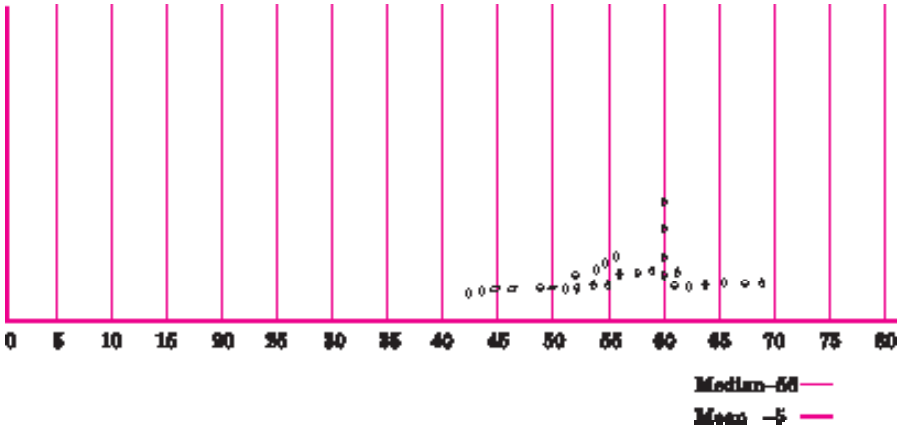
$$\text{Mean} = \frac{\text{Sum of observations}}{\text{No. of observations}}$$

$$= \frac{0+0+0+0+0+0+1+1+1+2+2+2+3+4+4+4+5+8+10+25}{20}$$

$$= \frac{72}{20} = 3{\cdot}7, \text{ median} = 2$$

The data shows the no. of domestic animals and pets students have at home. Most students have 0-4 pets.

3. The dot plot of height of trees



Arrange the given data in ascending order

43, 44, 45, 46, 49, 50, 51, 52, 52, 54, 54, 55, 55, 56, 56, 57, 58, 59, 60, 60, 60, 60, 61, 61, 62, 62,

63, 65, 66, 67

Number of observation = 29 (odd)

$\therefore$ Median $= \left(\frac{29+1}{2}\right)^{th}$ term $= 15^{th}$ term $= 56$

So, median feet is 56 feet

Mean $= \frac{\text{Sum of all the observations}}{\text{No. of observations}}$

$$= \frac{43+44+45+46+49+50+51+52+52+54+54+55+55+56+56+57+58+59+60+60+60+60+61+61+62+63+65+66+67}{29}$$

$= \frac{1621}{29} = 55{\cdot}896$

The height of the date palm trees range from 43 – 67 ft.

with most trees clustere around 55 – 60 ft.

Their Median height of trees = 56 feet and mean = 55·89 (approx)

13 Trees are shorter than the average height

4. Data: 5.6, 8, 3.09, 12.9, 6.5, 12.1, 11.3, 20.5, 7.4 (n = 9)

5.6 + 8 + 3.09 + 12.9 + 6.5 + 12.1 + 11.3 + 20.5 + 7.4 = 87.39

Mean = 87.39 ÷ 9 = 9.71 litres

Ascending order: 3.09, 5.6, 6.5, 7.4, 8, 11.3, 12.1, 12.9, 20.5

n = 9, median = 5th value = 8 litres

(a) Maximum value = 20.5 litres

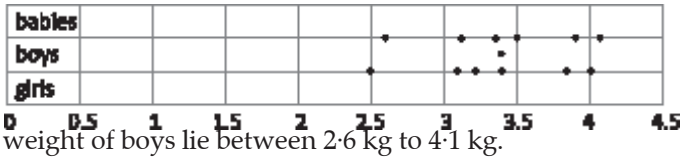
Mean always lies between minimum and maximum.

Median also always lies within the data.

No. Mean = 9.71 and median = 8 cannot both lie between 25–30.

(b) No. Mean and median always lie between minimum and maximum values.

5.



The weight of boys lie between 2·6 kg to 4·1 kg.

The height of girls lie between 2·5 kg and 4 kg.

The heaviest is baby boy and the lightest is baby girl **Ans.**

6. We infer from the dot plots and the central tendency measures:

(i) Boy's height lie between 130 – 148

Girl's height lie between 126 – 158

(ii) Both the tallest and shortest in the class are girls.

(iii)

	Whole Class	Girls	Boys
Mean	141·21	140·14	142·05

So we can say that boys are teller than girls in the class

	Whole Class	Girls	Boys
Median	142·5	140	143
		140.14	142.05
		Mean > Median	Mean < Median

If indicate for boys heights small inference of values on the lower side and for girls heights small inference of values on the higher side on comparing data of heights we find that boys and girls of this section are shorter in the height.

7. Given that

Weights of some sumo wrestlers are 295.2 kg 250.7 kg, 234.1 kg, 221.0 kg, 200.9 kg

$\therefore$ Average weight

$$= \frac{\text{Sum of Weights}}{\text{No. of Sumo Wrestlers}}$$

$$= \frac{(295.2 + 250.7 + 234.1 + 221.0 + 200.9)\text{kg}}{5}$$

$$= \frac{1201.9}{5}\text{kg} = 240.38 \text{ kg}$$

Weights of Ballet Dancers are
40.3 kg, 37.6 kg, 38.8 kg, 45.5 kg, 44.1 kg, 48.2 kg

$\therefore$ Average weight

$$= \frac{40.3 + 37.6 + 38.8 + 45.5 + 44.1 + 48.2}{6}$$

$$= \frac{254.5}{6} = 42.417 \text{ kg}$$

Comparison

$$\frac{\text{Average wt. of Sumo wrestler}}{\text{Average wt of Ballet Dancer}}$$

$$= \frac{240.38 \text{ kg}}{42.417 \text{ kg}} = 5.6 \text{ times} \approx 6 \text{ (round off)}$$

Thus, Sumo wrestler is approx. 6 times heavier as compared to a Ballet Dancer.

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1. (a) Scale 1 unit = 16 km/hr

(b) Do yourself

(c) Speed of green darner dragonfly = 64 km/hr

and speed of gentoo penguin = 35 km/hr

So we can say that speed of green darner dragonfly is approximately twice of the gentoo penguin.

(d) Since speed of sailfish = 109 km/hr

and speed of humpback whale = 26 km/hr

$26 \times 4 = 104$ km/hr

So, we can say that sailfish is about 4 times faster than a humpback whale.

Yes, according to given data, sailfish is the fastest aquatic animal in the world.

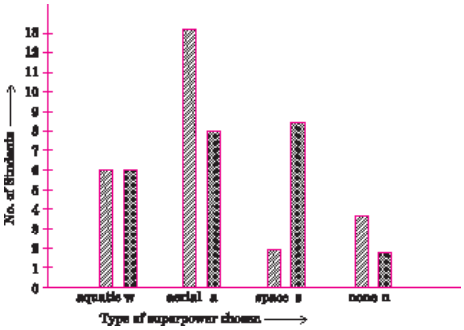
2. From the given observation, we prepare a table:

	w	*a*	*s*	*n*
Grade 5	6	13	2	4
Grade 9	6	8	9	2

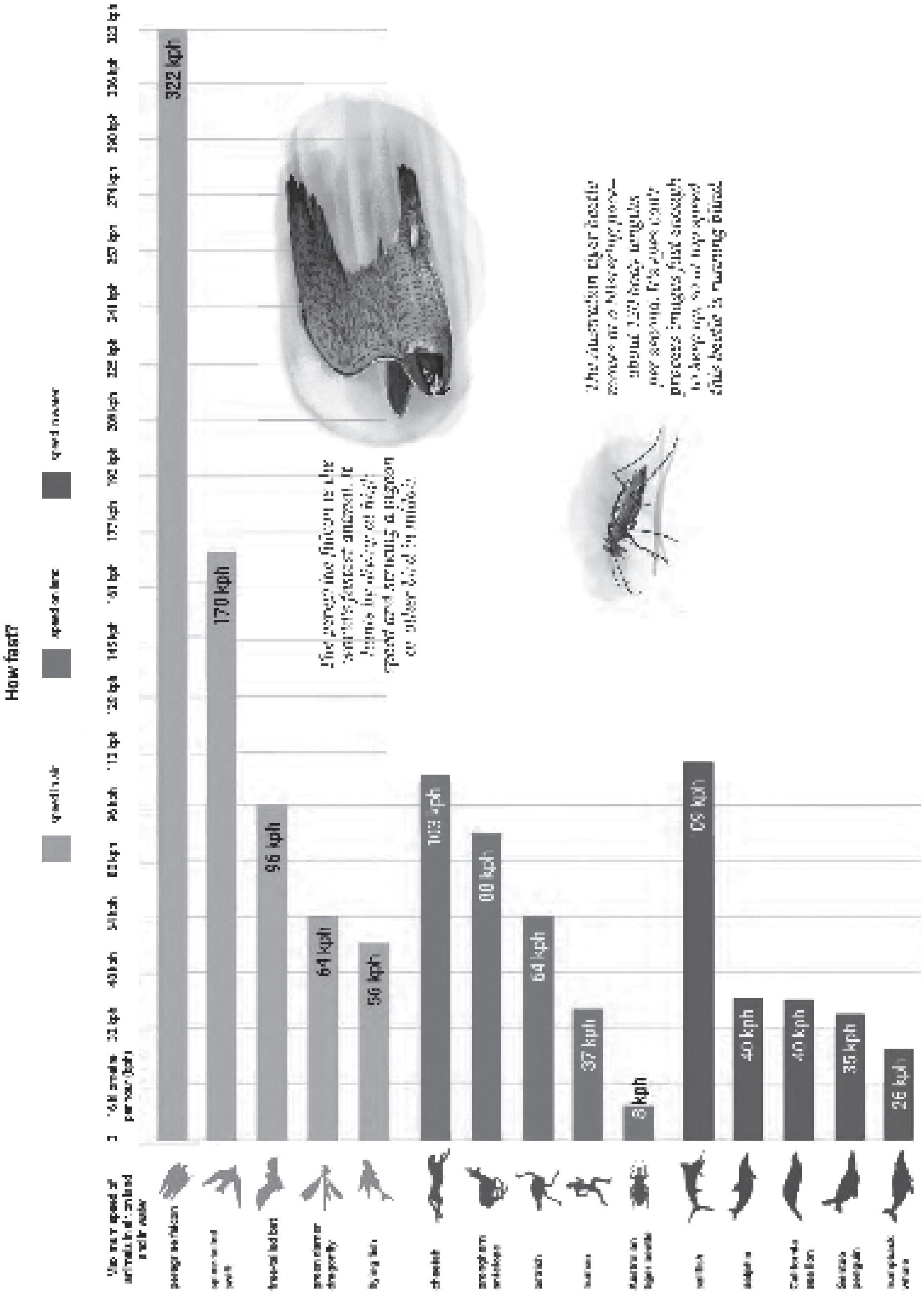
Following is a double bar graph with scale 1 unit = 1 student

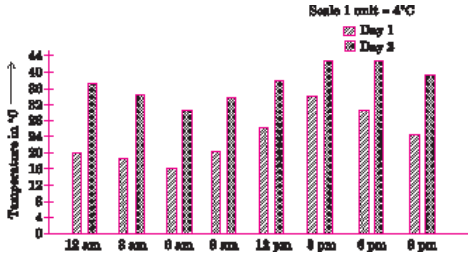
Grade 5

Grade 9



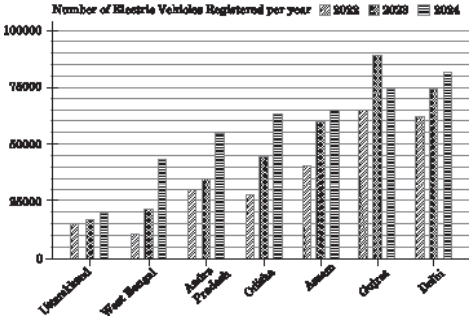
3.


How fast?
322 kph
170 kph
96 kph
64 kph
56 kph
64 kph
37 kph
8 kph
40 kph
40 kph
35 kph
26 kph



These days might belong to december and may.

4. (a)



(b) Scale 1 unit = 25000 Electric Vehicles

(c) (i) Mostly increase in vehicle registrations from 2022 and 2024.

(ii) Lowest no. of registration in uttrakhand highest no. of registration in Delhi and Gujarat.

(iii) On an average vehicle registration are increasing year by year.

(iv) Assam and Andhra Pradesh show significant growth in registrations.

(d) Registration in Assam

In 2022—27,000 (approx.)

In 2023—40,000 (approx.)

More registration = 40,000 – 27,000 = 13,000

Assam has approx 20,000 more registration in 2023 as compared to 2022.

(e) Registration in West Bengal

In 2022—12,000 (approx.)

In 2024—38,000 (approx.)

More registration = 38,000 – 22,000 = 38,000

Increase 3 times (approx)

(f) Yes, given statement is correct.

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1. (a) False, (b) True, (c) False, (d) True

2. (a) Average no. scored per game by A

$$= \frac{\text{Sum of points}}{\text{No. of games played}}$$

$$= \frac{14+16+10+10}{4} = \frac{50}{4} = 12{\cdot}5$$

(b) Player C play only 3 games, So to find mean total points will be divided by 3. Player B play all 4 games, so to find mean total points will be divided by 4.

(c) Player A is the best performer.

3. Given Total marks = 100

Marks obtained by group A are

85, 76, 90, 85, 39, 48, 56, 95, 81 and 75

$$\therefore \text{Mean} = \frac{\text{Sum of observations}}{\text{No. of observations}}$$

$$= \frac{85+76+90+85+39+48+56+95+81+75}{10}$$

$$= \frac{730}{10} = 73$$

Median

Arranging the marks in ascending order

39, 48, 56, 75, 76, 81, 85, 85, 90, 95

No. of observations = 10 even

$$\therefore \text{Median} = \frac{1}{2}\left[\frac{10}{2} + \left(\frac{10}{2}+2\right)\right]^{\text{th}} \text{term}$$

$$= \frac{1}{2}(5^{\text{th}} + 6^{\text{th}}) \text{ term} = \frac{1}{2}(76+81)$$

$$= \frac{157}{2} = 78{\cdot}5$$

Group 2. No of students = 9

$$\text{Mean} = \frac{\text{Sum of marks}}{\text{No. of students}}$$

$$= \frac{68+59+73+86+47+79+90+93+86}{9}$$

$$= \frac{681}{9} = 75{\cdot}67$$

Meadian

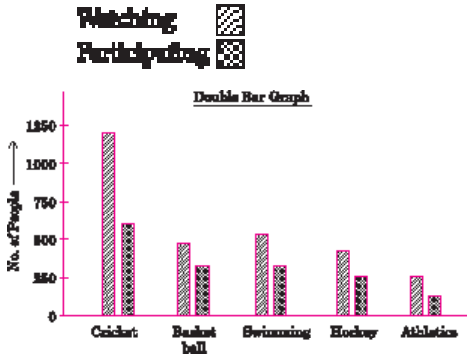
Arranging the given data in ascending order, we get 47, 59, 68, 73, 79, 86, 86, 90, 93

No. of observations = 9 (odd)

$$\therefore \quad \text{Median} = \left(\frac{9+1}{2}\right)^{\text{th}} \text{term}$$

$$= 5^{\text{th}} \text{ term} = 79$$

4. Scale I unit length = 250 people



Observations

(1) More people watch sports than participate in them.

(2) Athleties has the lowest numbers for both watching and participating.

(3) Basket ball and swimming have almost similar watching and participating.

5. To solve given problem first we have to find median. Arrange the given observations in ascending order, we get

101, 102, 106, 109, 110, 110, 112, 115, 115, 115, 115, 115, 117, 120, 120, 123, 125.

$$\text{Median} = \left(\frac{n+1}{2}\right)^{\text{th}} \text{item}$$

$$= \left(\frac{17+1}{2}\right)^{\text{th}} \text{item, here } n = 17$$

$$= 9^{\text{th}} \text{ item} = 115 \text{ cm.}$$

According to condition, two groups be

$$112 < \text{height} < 115$$

If we consider 114 cm as required height, then

Group 1 (less than 114 cm)

101, 102, 106, 109, 110, 112

Total Students = 7

Group 2 (more than 114 cm)

115, 115, 115, 115, 115, 117, 120, 120, 123, 125

Total Students = 10

6. Do yourself.

7. (d) is correct option.

(Since, there is no data avaiblable about other section student's height.)

8. (a) Estimated values for the number of sky-scrapers in new york–295

Tokyo – 169

London – 35

(b) (i) Valid, (ii) Valid, (iii) Invalid

9. Do Yourself.

10.

$$\text{Mean} = \frac{\text{Sum of values}}{\text{Total no. of values}}$$

$$= \frac{410+400+370+340+360+400+320+330+310+320+290+380+280+270+230+220+240}{17}$$

$$= \frac{5470}{17} = 321{\cdot}76 \approx 322 \text{ sec.}$$

Median

Arranging the given observations in ascending order, we get

220, 230, 240, 270, 280, 290, 310, 320, 320, 330, 340, 360, 370, 380, 400, 400, 410,
here $n = 17$ (odd)

$\therefore$ Median $= \left(\frac{17+1}{2}\right)^{th}$ term $= 9^{th}$ term $= 320$ sec.

11. Do yourself.
12. Do yourself.
13. Do yourself.

Practice Time

Multiple Choice Questions (MCQs)

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

Fill in the Blanks

1. median, **2.** mean, **3.** ascending order,
4. $\frac{n+1}{2}$, **5.** middle

True/False

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

Subjective Questions

1. Mean of 40, 60, 80, 100, 120.

Sum = 40 + 60 + 80 + 100 + 120 = 400.

Mean = 400 ÷ 5 = 80.

So, the mean is 80.

2. Median of 6, 9, 4, 8, 10, 11, 13.

Arranged : 4, 6, 8, 9, 10, 11, 13.

n = 7(odd).

Median = 4^{th} value = 9.

So, the median is 9.

3. Median of 15, 18, 11, 23, 20, 14.

Arranged in ascending order : 11, 14, 15, 18, 20, 23.

n = 6(even).

Median = (15 + 18) ÷ 2 = 33 ÷ 2 = 16.5.

So, the median is 16.5.

4. Average weight = 42.5 kg

Number of students = 20.

Total weight = Average multiplied by number = 42.5 × 20 = 850 kg.

So, the total weight of the class is 850 kg.

5. Mean of 6 numbers = 12.

Total = 12 multiplied by 6 = 72.

After removing one number, new mean = 11 for 5 numbers.

New total = 11 × 5 = 55.

Removed number = 72 – 55 = 17.

So, the removed number is 17.

6. Numbers : 12.5, 17.5, 22.5, 27.5, 32.5, 37.5.

Sum = 150

n = 6

Mean = 150 ÷ 6 = 25.

Arranged data : 12.5, 17.5, 22.5, 27.5, 32.5, 37.5.

Median = (22.5 + 27.5) ÷ 2
= 50 ÷ 2 = 25.

Mean = Median = 25.

So, the arithmetic mean and median of these numbers are both equal to 25, confirming they are the same.

7. Daily wages (rupees) : 200, 234, 210, 256, 250, 290, 280.

Sum = 200 + 234 + 210 + 256 + 250 + 290 + 280 = 1720.

Mean = 1720 ÷ 7
= 245.71 (approximately)

So, the average income per day of the family is approximately rupees 245.71.

8. Mean of 8 numbers = 15.

When each number is multiplied by 3, the new mean = 15 × 3 = 45.

so, the new mean is 45.

9. Marks of 15 students : 11, 32, 49, 27, 6, 4, 35, 0, 40, 42, 47, 8, 10, 15, 25.

Sum = 11 + 32 + 49 + 27 + 6 + 4 + 35 + 0 + 40 + 42 + 47 + 8 + 10 + 15 + 25 = 351.

Mean = 351 ÷ 15 = 23.4

So, the average marks of the class in mathematics is 23.4.

10. Tiger data : MP = 785, Karnataka = 563, Uttarakhand = 560, Maharashtra = 444, Assam = 227, UP = 222, Kerala = 213.

Graph.

6. Constructions and Tilings

Assess Yourself-1

1. No, the radius cannot be less than half the length of the line segment.
If the radius is less than half the length, the arcs from both endpoints will not intersect each other.
Without intersection points, it is impossible to draw the perpendicular bisector.
So, the radius must be greater than half the length of the line segment to construct the perpendicular bisector.
2. Draw MN = 7.3 cm with a ruler.
Draw the first perpendicular bisector to MN. This gives the midpoint at 3.65 cm from each end, dividing MN into 2 equal parts.
Draw the perpendicular bisector of the left half (from M to midpoint)
Draw the perpendicular bisector of the right half (from midpoint to N)
Each part = 7.3 divided by 4 = 1.825 cm.
So, 3 perpendicular bisectors are needed to divide MN into 4 equal parts.
3. If unequal radii are used while drawing two pairs of arcs, the intersection points obtained will not be equidistant from both endpoints of the line segment.
The line joining such points will therefore not be the perpendicular bisector.
So, equal radii must always be used from both endpoints to correctly construct the perpendicular bisector.

Assess Yourself-2

1. Draw each angle using a protractor. Then use compass to bisect.
(a) Draw 45° angle. Using compass, mark equal arcs on both arms from the vertex.
From those marks, draw equal arcs that intersect. Join intersection to vertex.
Each half = 45° by 2 = 22.5°
So, the bisector of a 45° angle gives two equal angles of 22.5° each.
(b) Draw 98° angle and bisect using the same compass method.
Each half = 98° divided by 2 = 49°.
So, the bisector of a 98° angle gives two equal angles of 49° each.
(c) Draw 135° angle and bisect using compass arcs.
Each half = 135° divided by 2 = 67.5°.
So, the bisector of a 135° angle gives two equal angles of 67.5° each.
2. Given angle = 120°
Bisect 120° to get two angles of 60° each.
Take one of the 60° angles and bisect it to get two angles of 30° each.
The remaining part from 120 is 60 + 30 = 90°.
So, by bisecting 120° and then bisecting one 60° portion, a 90° angle can be constructed at the required point.
3. Take point O on line AB and draw a perpendicular at O using compass arcs. This makes a 90° angle with AB.
Bisect this 90° angle to get 45°.
Bisect the 45° angle again to get 22.5°.
So, a 22.5° angle is constructed by bisecting the 90° angle twice.
4. Draw a 45° angle at a vertex. Place compass arcs on the opposite side from the vertex as described.
Use the standard arc intersection method to find the bisector.
Each resulting half = 22.5°
This confirms the method gives equal halves regardless of which side the arcs are drawn on.
So, bisecting a 45° angle on the opposite side of its vertex gives two equal angles of 22.5° each. The method is feasible.

Assess Yourself-3

Do yourself.

Assess Yourself-4

1. (a) Given line :

Fig.

parallel line :

Fig.

(b) Given line :

Fig.

Parallel line :

Fig.

(c) Given line :

Fig.

Parallel line :

Fig.

(d) Given line :

Fig.

Parallel line :

Fig.

We can form 6 parallel pairs in slanted edges.

(AD, BC), (AD, EH), (AD, FG), (BC, EH), (BC, FG), (EH, FG)

We can from 6 parallel pairs in vertical edges.

(AE, BF), (AE, CG), (AE, DH), (BF, CG), (BF, DH), (CG, DH)

There are 18 pairs of parallel lines.

Assess Yourself-5

1. Sketch a symmetrical four-sided support frame (ABCD) where the bottom line AD is parallel to the top line BC and the two sides are equal (AB = CD).

Fig.

Use a compass to draw overlapping circular arcs inside this frame, adjusting the size until it look like a clean clover leaf.

Fig.

Draw an inverted "V" shape to serve as your supporting lines.

Mark the exact middle point of each side place the compass on the midpoints to draw two matching curves that meet perfectly at the top point.

Fig.

2. Historical monuments where such arch design are found include Taj Mahal in Agra, Charminar in Hyderabad, Qutb Minar complex in Delhi, Fatehpur Sikri in Agra and Jama Masjid in Delhi.

So, these are famous historical monuments where trefoil and pointed arch designs can be observed.

Assess Yourself-6

1. (i) Draw a line segment AB.

(ii) Give a point O on the line segment AB.

(iii) With centre O and a suitable radius draw an arc and cut off PQ, then QR of the same radius.

(iv) With centre Q and R, draw two arcs intersecting each other at S.

(v) Join SO.

(vi) With centre Q and D draw two arcs intersecting each other at T.

(vii) Join OT and produce it to L.

Then $\angle LOB = 75°$.

Fig.

2. (i) Draw a line segment l.

(ii) Take a point P at a distance of 2.5 cm from this l.

(iii) Draw another line m parallel to l.

Fig.

3. (i) Draw a line segment AB = 5 cm.

(ii) Take a radius more than half of AB.

(iii) Draw an arc with A and B as centre above and below from line segment AB.

(iv) Mark the points P and Q on cut arcs.

(v) Join P and Q.

Fig.

Assess Yourself-7

1. Rearrange these pieces to form a cat, a dag, a rabbit, a swan, a camel, a fish and a horse.

Fig.

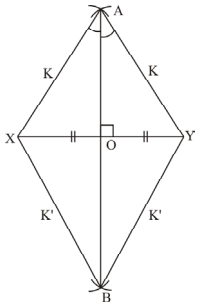
Figure it Out

Page-140

1. Yes, when constructing the perpendicular. It is necessary to have the same radius for the arcs above and below XY.

Construction—

(1) Draw a line segment XY.



(2) Choose distance 'K' (slightly greater than $\frac{1}{2}$XY)

(3) With centres at X and Y draw arcs of same radius 'K'. above and K' below XY intersecting at point A and B respectively.

(4) Join AB, intersecting XY at point O.

(5) Join AX, AY, BX and BY.

In ΔABX and ΔABY

AX = AY = K, BX = BY = K

AB = AB (common)

(By SSS Rule)

∴ ΔABX ≅ ΔABY

∴ ∠XAO = ∠YAO ...(i)

In ΔAOX and ΔAOY

AX = AY = K

∠XAO = ∠YAO from (i)

OA = OA (common)

∴ ΔAOX ≅ ΔAOY (By SAS Rule)

∴ OX = OY

and ∠AOX = ∠AOY ...(ii)

Also, ∠AOX + ∠AOY = ∠XOY = 180°

∴ 2∠AOX = 180° (from ii)

⇒ ∠AOX = 90°

∴ OX = OY and ∠AOX = ∠AOY = 90°

Thus, AB is the perpendicular bisector of the line XY.

2. Steps of Construction—

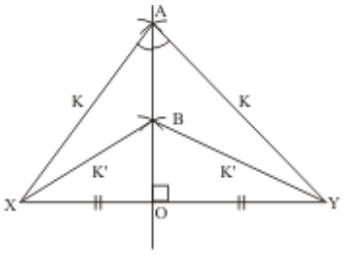
(1) Draw a line segment XY.

(2) Choose distances K and K' which are slightly greater than $\frac{1}{2}$XY .

(3) With centres at X and Y draw two arcs of radius K. and K' respectively above XY. These intersect each other at point A and B respectively.

(4) Join AB and produce upto O (intersecting XY at O)

(5) Join AX, AY, BX and BY.



In ΔABX and ΔABY

AX = AY = K

BX = BY = K'

AB = AB (common)

∴ ΔABX ≅ ΔABY (By SSS Rule)

∴ ∠XAO = ∠YAO

InΔAOX and ΔAOY

AX = AY = K

∠XAB = ∠YAB

OA = OA (common)

∴ ΔAOB = ΔAOY (By SAS Rule)

∴ OX = OY

Also ∠AOX + ∠AOY = 180°

∴ 2∠AOX = 180°

∴ ∠AOX = 90°

and ∠AOX = ∠AOY = 90°

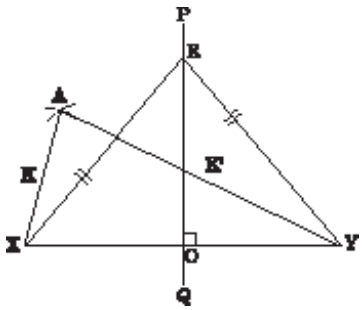
⇒ AB is perpendicular bisector of XY.

Here the pairs of arcs are both on the same side.

Thus, it is not necessary to construct the pairs of arcs above and below XY.

3. Step of Construction—

(1) Draw line XY



(2) With centres at X and Y draw arcs of

unequal radii say K and K′, they cut each other at point A.

(3) Let PQ is perpendicular bisector of XY.

(4) Let R be any point on PQ. Join RX and RY

In ΔROX and ΔROY

$$OX = OY$$
$$\angle ROX = \angle ROY$$
$$OR = OR \quad \text{(common)}$$
$$\therefore \quad \Delta ROX \cong \Delta ROY \quad \text{(By SAS Rule)}$$
$$\therefore \quad RX = RY$$

Thus for any point R on perpendicular bisector,

$$RX = RY$$

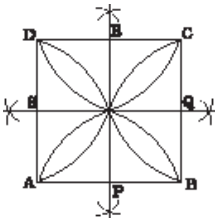
∴ Each point on the perpendicular bisector is equidistant from X and Y.

Since $AX \neq AY$

Point A is not on the perpendicular bisector.

Therefore, to construct perpendicular bisector, It is necessary that we use same radius for both arcs of a pair of arcs.

4. Step of Construction—



(1) Draw a square ABCD.

(2) Draw perpendicular bisectors of AB and CD as shown in figure.

(3) These perpendicular bisectors intersect the square at points P, Q, R and S.

(4) With centres at P, Q, R and S, draw semicircles in the square with radius equal to AP.

(5) Colour the boundary and get the required design.

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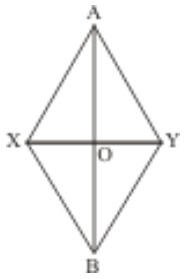
1. In the given figure,



XAY and XBY are two positions of the Rope. Points A and B are at the mid-point of the rope.

In ΔAXY and ΔAYB.

$$AX = AY \text{ and } BX = BY$$
$$AB = AB \text{ (common)}$$
$$\therefore \quad \Delta AXB \cong \Delta AYB \quad \text{(By SSS Rule)}$$
$$\therefore \quad \angle XAO = \angle YAO$$

Again, In ΔAXO and ΔAYO

$$OX = OY$$
$$\angle XAO = \angle YAO$$
$$AO = AO \quad \text{(common)}$$
$$\therefore \quad \Delta AXO \cong \Delta AYO \quad \text{(By SAS Rule)}$$
$$\therefore \quad \angle XOA = \angle YOA$$

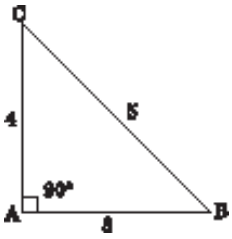
Also, $\angle XOA + \angle YOA = 180°$

$$\Rightarrow \quad 2\angle XOA = 180°$$
$$\Rightarrow \quad \angle XOA = 90° = \angle YOA$$

∴ $OX = OY$ and $\angle XOA = \angle YOA = 90°$

Therefore AB is perpendicular bisector of XY.

2. We know that if the sides of a triangle are in the ratio 3 : 4 : 5, then the angle opposite to the longest side is 90°.



In the above figure, sides AB, AC and BC of triangle are in the ratio 3 : 4 : 5. ∠A is opposite to longest side BC.

Steps of Construction

(1) Draw a line XY and mark a point A and it.

(2) At point A, we shall construct angle of 90°, using rope.

(3) Fix a small pole at point A.

(4) Take a rope and mark it at 0, 4, 8, 12 (in unit)

(5) Attach the 0 unit mark and 12 unit mark of the rope at A

(6) Attach the 3 unit mark at point B on XY with the help of pole at B.

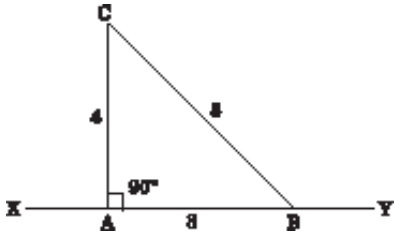
(7) Hold the 8 unit of the rope and stretch away from XY such that both sides of this points are tight.

(8) Place a hole at this point and call this point C.

In the obtained triangle ΔABC.

AB = 3 unit, AC = 4 unit and BC = 5 unit.

and the angle opposite to the longest side is ∠A



Thus by the 3 – 4 – 5 principle.

$$\angle A = 90°$$

Thus, AC is perpendicular to XY at given point A.

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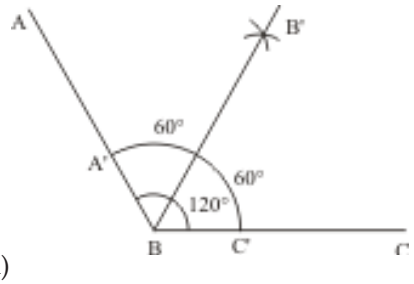
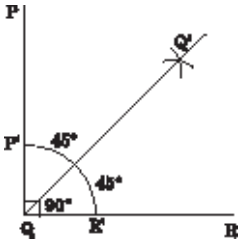
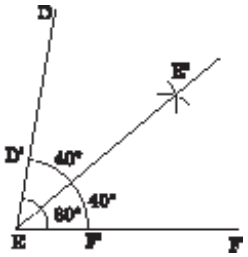
1. (i)



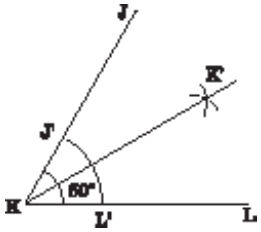
(ii)

(iii)

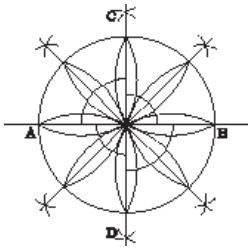




(iv)



2. Steps of Construction—



(1) Draw a line AB,

(2) with centres at A and B, draw arcs of equal radius above and below the line AB.

(3) Let the arcs intersect at the points C and D.

(4) Join C and D.

(5) Let AB and CD intersect at O.

(6) Draw the bisectors of ∠BOC, ∠COA, ∠AOD, and ∠DOB as shown in the figure,

(7) Draw a circle with centre at O and radius equal to the length of a petal in the given figure.

(8) Draw dots at the points of intersection of the circle with the lines.

(9) Using the dots and the centre of the circle, draw the petals as shown in the given figure.

(10) In the next step, we erase the extra lines and arcs.

The figure now obtained looks as required.

3. $\angle XOY$ be given angle

According to question,

(1) Draw an arc with centre O, intersecting these lines OX and OY at A and B respectively.

(2) With centres at A and B draw arcs of same radius, intersect at point C.

(3) Join AC, BC and OC and extend to CD.

In ΔOAC and ΔOBC

$OA = OB$

$AC = BC$

$OC = OC$ (common)

$\therefore \quad \Delta OAC \cong \Delta OBC$ (By SSS Rule)

$\therefore \quad \angle AOC = \angle BOC$

$\therefore \quad 180° - \angle AOC = 180° - \angle BOC$

$\therefore \quad \angle AOD = \angle BOD$

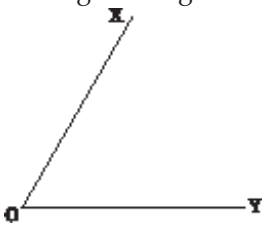
Thus OD is the bisector of the angle $\angle XOY$ and OC is the bisector of the $\angle XOY$.

4. Any angle can be bisect, using bisection method. By using angle bisection, we can make angles.

22·5°, 112·5°, 67·5°, 135°, 120°, 105°.

By using angle bisection, we cannot construct angle of 65·5°.

5. Let $\angle XOY$ be given angle



Step of bisect $\angle XOY$

(1) Fix a small pole at point O.

(2) Take a rope and make a loop at one end.

(3) Mark a point at some distance on the rope. Fix the loop of the rope at the pole at O and rotate the rope from OX to OY.

(4) Mark points A and B at fix distance mark on the rope.

(5) Fix small poles at A and B both.

(6) Take a rope and make loops on both ends.

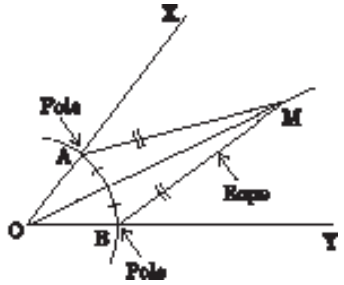
(7) Fix the loops with poles at A and B.

(8) Mark the mid-point of this rope and hold the rope at the mid-point.

(9) Make both ends of rope tight and mark its mid-point as M.

(10) Join AM, BM and OM.

In ΔOAM and ΔOBM



$OA = OB$; $AM = BM$; $OM = OM$ (common)

$\therefore \Delta OAM \cong \Delta OBM$

$\therefore \angle AOM = \angle BOM$ and $\angle XOM = \angle YOM$

Thus, OM is the bisector of the given angle $\angle XOY$.

12. Solve this similarly as question 4 page nubmer 4.

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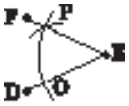
13. Given angles arc

(i)

(ii)



(iii)

(iv)

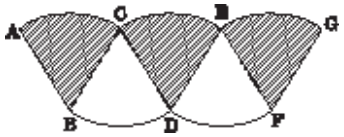
Step of Construction (i)

(1) Draw a line A′B′ along the direction of AB.

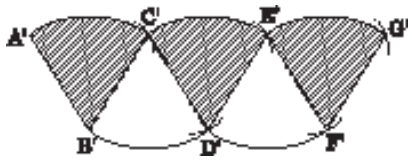
(2) With centre B and B′ draw arcs of equal radius.

(3) Arcs intersect AB and BC at M and N respectively.
(4) Let the arcintersect A′B′ at M′. Mark the arc M′N′ s.t. MN = M′N′
(5) Join B′N′
(6) Solve remaining similarly.

2. Given figure



Steps of Construction—
(1) Draw line A′B′ along the direction of AB.
(2) With centre at B′ draw an arc of radius A′B′ from A′ draw an arc A′C′ such that A′C′ = AC
(3) Join B′ and C′ and shade this sector.
(4) Again, with centre at C′ draw an arc of radius B′C′ from B′ draw an arc B′D′, such that B′D′ = BD.
(5) Join C′ and D′ and shade this sector.
(6) Again, with centre at D′, draw an arc of radius C′D′ from C′ draw an arc C′E′ such that C′E′ = CE.
(7) Join D′ and E′. Shade this sector.
(8) Similarly we continue this procedure by taking centre at E′ and F′.
(9) Erase the extra arcs from the figure constructed. We get required figure.



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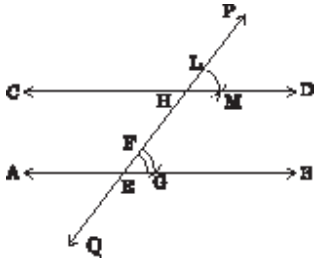
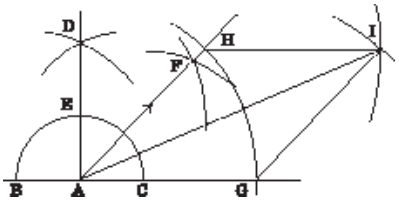
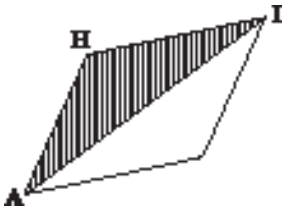
1. Steps of Construction



(1) Let AB be a given line and we shall draw a line parallel to AB.
(2) Draw line PQ intersecting AB at E.
(3) Mark a point H on PQ, where we shall draw line parallel to AB.
(4) With centres at E and H draw arcs of equal radius.
(5) Using compass, measure FG and mark LM s.t. LM = FG.
(6) Join H & M and extend this line on both sides.
(7) Here PQ is a transversal and ∠PHD = ∠HEG (corresponding angles)
∴ Lines AB and CD are parallel lines.
Similarly, we can draw other three pairs of parallel lines.

2. Steps of Construction—
There are 8 rhombus in given figure.
So acute angle between the adjacent sides of Rhombus = $\frac{360°}{8}$ = 45°. By joining 8 Rhombus of same size we can get given figure.
(1) Draw a line and take a point A on it.
(2) With centre A, draw a semi circle which cuts the line at B and C point.
(3) With centres at B and C draw arcs of equal radius. These arcs cut each other at point D.
(4) Join AD
(5) Draw bisector of ∠CAD. Let AF be angle bisector.
(6) With A as centre draw an arc intersecting extended AC and AF at G and H respectively.
(7) With centres at G and H, draw arcs of equal radius equal to AG. They meet at I.
(8) Join AI
(9) AGIH is a Rhombus with base angle 45°.
(10) Erase the extra arcs and lines, shade the upper triangle AHI





by using tracing paper we can make 8 such rhombus and place them together and get required figure.

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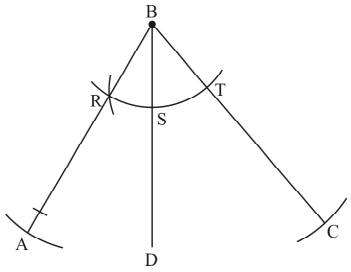
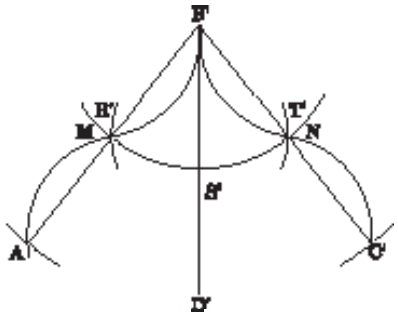
1. Given figure is



Steps of Construction—

(1) Draw a vertical line B′D′ with centres at B and B′, draw arcs of equal radius.



(2) Measure arc RS, then from R′ draw an arc R′S′ s.t. R′S′ - RS.

(3) Join B′R′ and extend this line. Make B′A′ equal to BA.

(4) Measure arc ST, using compass then from S′ draw an arc S′T′ s.t. S′T′ = ST.

(5) Join B′ and T′ and extend this line make B′C′ equal to BC.

(6) With the help of compass, find mid-point M and N of A′B′ and B′C′ respectively.

(7) On the lines A′M, MB′, B′N and NC′, draw similar arcs as shown in the figure.

(8) Erase the extra lines and arcs to get the required pointed arch with given support lines.

2. Steps of Construction—

(1) Draw a vertical line AB

(2) With centre at A draw an arc. With centre at C, draw an arc intersecting at D and E.

(3) Join AD and AE and extend these lines.

(4) Take point F on extended AD and G on extended AE such that AF = AG.

(5) Let M and N be mid-point of AF and AG respectively using compass, draw semicircles on the lines MF, AM, AN and NG.

(6) Erase the extra lines, and arcs to get the required arch design.

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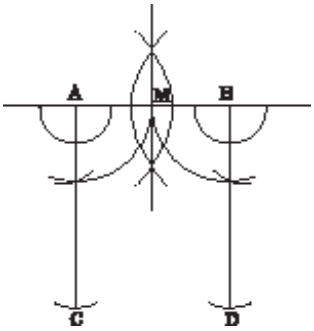
1. (a) Steps of Construction—

(1) Draw a line and mark points A and B on it.

(2) Draw perpendiculars from points A and B, below the line.

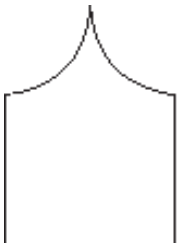


(3) Draw equal lines AC and BD.

(4) Find mid-point of AB and mark as M.

(5) With centres at A and B and radius AM, draw arcs as shown in the above figure.

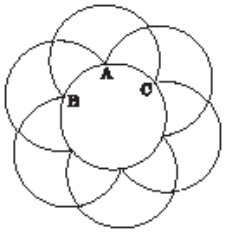
(6) Erase the extra lines, arcs and letters to get the required figure.



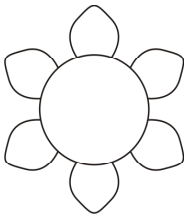
(b) Steps of Construction—

(1) Draw a circle.

(2) Take any point A on the circumference and draw arc of same radius as that of the circle outside the circle and touching its circumference at B and C. With centre at B, draw an arc of same radius outside the circle and touching the circumference. Repeat the process we will get following patterns.



(3) Erase the extra arcs and letters to get required figure.



(c) Steps of Construction—

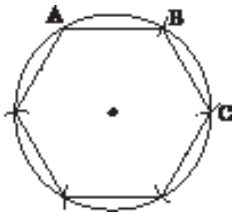
(1) Draw a circle.

(2) Take any point A on the circumference.

(3) Draw an arc with centre A and radius as that of the circle and intersect the circle at B.

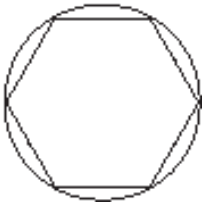
(4) With centre at B and same radius draw an arc intersecting the circle at C.

(5) Repeat the same process and gets the point D,E, F. Join AB, BC, CD, DE, EF, CA.



Erase the arcs and letters to get the required figure.

Obtained figure—

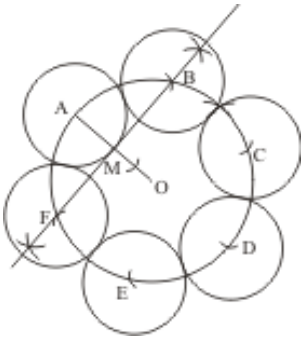


(d) Steps of Construction—

(1) Take any point A on the circle.

(2) Draw an arc of same radius as that of the circle intersecting the circle at B.

(3) With B as centre draw an arc of same radius intersecting the circle at C.

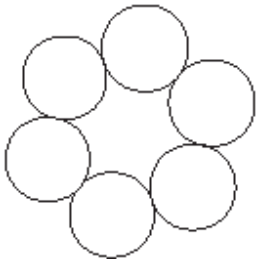


(4) Repeat this process and find points D, E and F.

(5) Join O an A. Find the mid-point of OA.

(6) Let M be the mid-point of OA. With centres at A, B, C, D, E and F, draw circles of radius equal to OM.

(7) Erase the extra lines, arcs and letters to get the required figures.

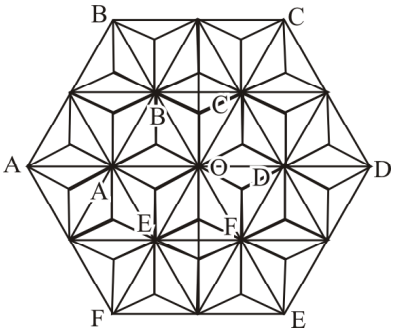


(e) Steps of Construction—

(1) Draw a circle, take any point A on the circle.

(2) Draw an arc with centre at A and radius OA, intersecting the circle at B.

(3) With centre at B and same radius draw an arc intersecting th circle at C.



(4) Repeat this process and get points of intersection D, E, F.

(5) Draw a circle with centre O and radius twice the OA.

(6) Join OA and extend to A'.

Similarly extend other lines.

(7) Join the lines as shown in the following figure.

(8) There arc 5, 7, 7, 5 triangles in Ist, IInd, IIIrd and IVth rows respectively.

(9) Join the vertices of each triangle to the centre of the respective triangles.

(10) Erase the extra lines, arcs and letters to get the required figure.

(a)

2. Steps of Construction—

(1) Draw a circle.

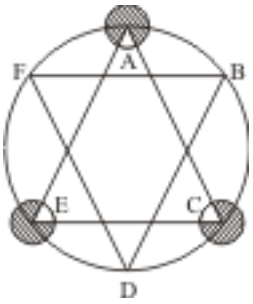
(2) Take any point A on the top of the circle and draw an arc with centre at A and radius as that of the circle and intersecting the circle at B.

(3) With centre at B and same radius draw an arc intersecting the circle at C.

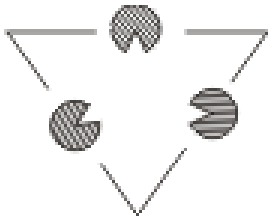
(4) Repeat this process to get points of intersection D, E and F.

(5) Join AC, CE, EA, BD, DF and FB.

(6) Draw three equal circles with wedges removed at A, C and E as shown below.



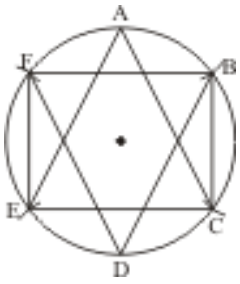
(7) Erase the extra arcs, circle and letters to get the required figure as shown below



3. Steps of Construction—

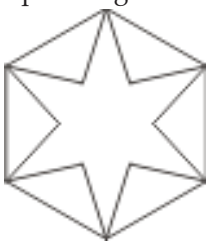
(1) Draw a circle.

(2) Take any point A on the top of the circle and draw an arc with centre at A and redius as that of the circle and intersecting the circle at B.

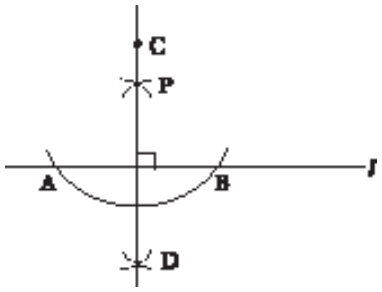


(3) With centre at B and same radius

draw an arc intersecting the circle at C.
(4) Repeat this process to get point of intersection D, E and F.
(5) Join the lines as shown in the figure.
(6) Erase the extra arcs, circle and letters to get the required figure as below:



4. Steps of Construction—
(1) Draw a line *l* and mark a point P outside *l*.
(2) With centre P, draw an arc so that it cuts the line *l* at two points say A and B.
(3) With cenres A and B, draw arcs of equal radius above and below AB.
(4) Let the arcs intersects at points C and D.
(5) Join CD. Line CD is perpendicular to line *l* and passes through the given point P.



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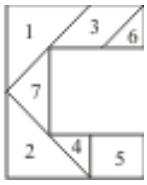
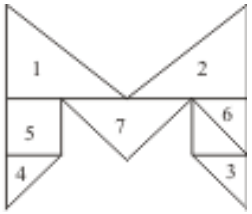
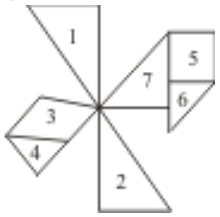
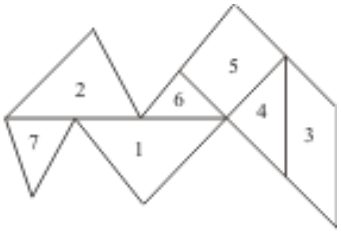
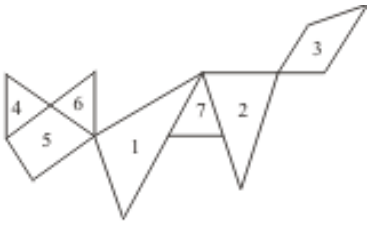
1. We prepare 10 sets of 7 tans obtained from a tangram based shape.

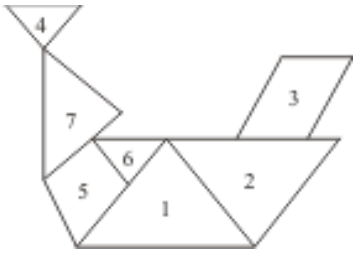
(i)


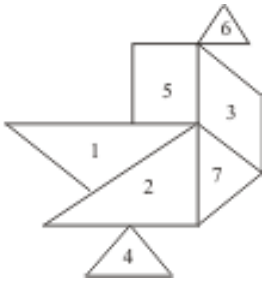
(ii)


(iii)


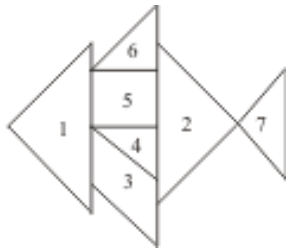
(iv)


(v)


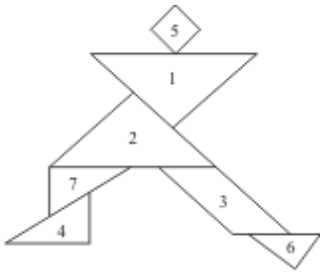
(vi)


(vii)


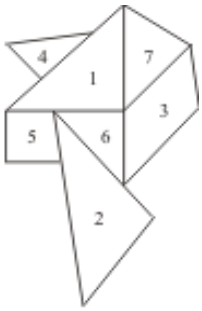
(viii)



(ix)



(x)



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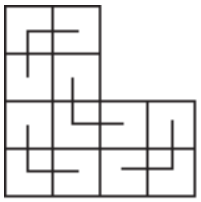
24. The given tiles can be used for tiling the region. The tiling shall use 4 tiles of the given shape.

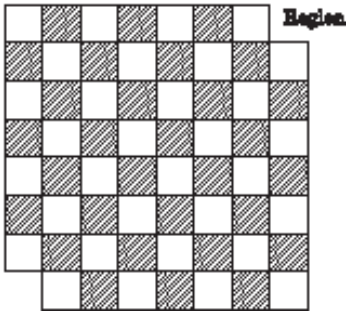


Region

Tile

25. By using the following tile

Given region be tiled region as shown in the following figure



Region

In the given region,

There are 30 shaded squares and 32 blank squares. Since these numbers are not equal. The given region cannot be tiled by using the given shape tiles.

Practice Time

Multiple Choice Questions (MCQs)

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

Fill in the Blanks

1. bisector, **2.** equidistant,

3. perpendicular, circumcentre,

4. parallel lines, **5.** equidistant.

True/False

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

Subjective Questions

1. (a) No. A perpendicular bisector divides a line segment into exactly 2 equal parts, not more than two.

(b) Yes. Each internal angle of a regular pentagon = (5-2) multiplied by 180 divided by 5 = 540 divided by 5 = 108 degrees.

(c) Yes. Two lines that never meet when extended indefinitely are called parallel lines.

(d) No. A beehive is an example of a regular hexagon, not a regular pentagon.

(e) Yes. We can draw a parallel line to a given line using the equal corresponding angles method.

2. Five objects that can be made using a tangram : rabbit, house, bird, fish cat.

So, these and many other shapes can be formed by rearranging the 7 tangram pieces.

3. Perpendicular bisector intersects AB at O. O is the midpoint.

OA = AB ÷ 2 = 5 ÷ 2 = 2.5 cm.

So, the length of OA is 2.5 cm.

4. Floor = 12 m × 15 m = 180 square metres.

Each tile = 1 square metre.

Number of tiles = 180 ÷ 1 = 180 tiles.

So, 180 tiles are needed to cover the floor.

5. Floor area = 10 square metres.

Wastage = 10 percent of 10 = 1 square metre.

Total tiles to buy = 10 + 1 = 11 square metres.

So, 11 square metres of tiles should be purchased.

6. Draw AB = 5.5 cm. From A draw arcs of radius more than 2.75 cm both above and below the line. Repeat from B with same radius. Join the two arc intersection points. This is the perpendicular bisector. Take any point P on this bisector. Since P lines on the perpendicular bisector, PA = PB.

So, the point P on the perpendicular bisector is equidistant from A and B.

7. Take point P on line AB. Mark equal lengths X and Y from P on either side using compass (so, PX = PY). Draw arcs from X and Y with equal radius, intersecting above the line at point O. Join O to P.

Angle OPB = angle OPA = 90 degrees.

So, the line OP is the required perpendicular to line AB at point P.

8. A tangram has 7 geometric shapes : 2 large right-angled triangles, 1 medium right-angled triangle, 2 small right-angled triangles, 1 square and 1 parallelogram.

So, there are 7 geometric shapes in a tangram.

9. Take point P at 3 cm above line AB by measuring with a ruler. Draw a transversal from P to meet AB at any point Q. Copy the angel formed at Q using compass arcs. Extend the arm at P to form line MN.

So, line MN through P is parallel to line AB.

10. Draw a circle with radius 2.5 cm and mark centre O.

Place compass at any point A on the circle. With the same radius 2.5 cm, mark point B on the circle. Move to B and mark C. Continue for D, E, F until back to A. Join A-B-C-D-E-F-A.

So, ABCDEF is the required regular hexagon with each side equal to 2.5 cm.

7. Finding the Unknown

Assess Yourself-1

1. (a) $9x + 13 = 22$

$9x = 22 - 13$

$9x = 9$

$x = 9 \div 9$

So, $x = 1$.

(b) $3y - 14 = 23$

$3y = 23 + 14$

$3y = 37$

$y = 37 \div 3$

So, $y = \frac{37}{3}$

(c) $5m = 90$

$m = 90 \div 5$

So, $m = 18$

(d) $\frac{x}{2} + 3 = 13$

$\frac{x}{2} = 13 - 3$

$\frac{x}{2} = 10$

$x = 10 \times 2$

So, $x = 20$.

(e) $5x + 9 = 2x + 18$

$5x - 2x = 18 - 9$

$3x = 9$

$x = 9 \div 3$

So, $x = 3$.

(f) $4(x - 3) = 16$

$x - 3 = 16 \div 4$

$x - 3 = 4$
$x = 4 + 3$
So, $x = 7$.

(g) Frame an equation that has solution 15 : $x - 15 = 0$.
So, the equation $x - 15 = 0$ has the solution $x = 15$.

(h) Frame an equation that has solution 0 : $x + 7 = 7$.
So, the equation $x + 7 = 7$ has the solution $x = 0$.

Assess Yourself-2

1. Six different equations whose solution is 3 :

$x + 3 = 0$
$2x = -6$
$x - 1 = -4$
$3x + 9 = 0$
$5x + 15 = 0$
$x + 5 = 2$

So, all six equations give the solution $x = -3$.

2. Find the value of each variable :

(a) $5 - x = 99$
$-x = 99 - 5$
$-x = 94$
$x = -94$
So, $x = -94$

(b) $x - 5 = 3x + 20$
$x - 3x = 20 + 5$
$-2x = 25$
$x = 25 \div (-2)$
So, $x = \frac{-25}{2}$

(c) $-2x + 8 = 16$
$-2x = 16 - 8$
$-2x = 8$
$x = 8 \div (-2)$
So, $x = -4$.

(d) $19y - 1 = 18y - 2$
$19y - 18y = -2 + 1$
$y = -1$
So, $y = -1$.

(e) $2 - 7x = 3x + 12$
$2 - 12 = 3x + 7x$
$-10 = 10x$
$x = -10 \div 10$
So, $x = -1$.

(f) $9x - 2 = 4x + 7$
$9x - 4x = 7 + 2$
$5x = 9$
$x = 9 \div 5$
So, $x = \frac{9}{5}$.

3. Let the number be n. Five times the number plus 35 equals 100.

$5n + 35 = 100$
$5n = 100 - 35$
$5n = 65$
$n = 65 \div 5$

So, the number is 13.

4. Let the number be n. The number added to half of itself gives 33.

$n + \frac{n}{2} = 33$
$\frac{3n}{2} = 33$
$n = 33 \times 2 \div 3.$
$n = 22$

So, the number is 22.

5. Let number of boys = $7k$ and girls = k $\left(\text{since girls} = \frac{1}{7} \text{ of boys}\right)$

$7k + k = 48$
$8k = 48$
$k = 6$
Boys $= 7 \times 6 = 42$. Girls $= 6$.

So, there are 42 boys and 6 girls in the class.

Figure it Out

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1. (a) $3x - 10 = 35$
Adding 10 on both sides, we get
$3x - 10 + 10 = 35 + 10 = 45$
Dividing both sides by 3, we get

$$\frac{3x}{3} = \frac{45}{3} = 15 \Rightarrow x = 15$$

Check LHS $= 3x - 10$
$= 3 \times 15 - 10 = 45 - 10 = 35 =$ RHS
LHS = RHS

(b) $5s = 3s$
Subtracting both sides $3s$, we get
$5s - 3s = 3s - 3s \Rightarrow 2s = 0$

$\Rightarrow \frac{2s}{2} = \frac{0}{2}$ (Dividing both sides by 2)

$\Rightarrow s = 0$

Check : LHS $= 5s$

$= 5 \times 0 = 0$

RHS $= 3s = 3(0) = 0$

LHS = RHS **Hence Proved.**

(b) $34 - 7 = 2u + 3$

Subtracting both sides $2u$, weg get

$3u - 7 - 2u = 2u + 3 - 2u$

$u - 7 = 3$

Adding 7 on both sides, we get

$u - 7 + 7 = 3 + 7$

$u = 10$

Check LHS $= 3u - 7$

$= 3 \times 10 - 7 = 30 - 7 = 23$

RHS $= 2u + 3$

$= 2 \times 10 + 3 = 20 + 3 = 23$

LHS = RHS **Hence Proved.**

(d) $4(m + 6) - 8 = 2m - 4$

$\Rightarrow 4m + 24 - 8 = 2m - 4$

$\Rightarrow 4m + 16 = 2m - 4$

Subtracting $2m$ from both sides, we get

$4m + 16 - 2m = 2m - 4 - 2m$

$2m + 16 = -4$

Subtracting 16 from both sides, we get

$2m + 16 - 16 = -4 - 16$

$\Rightarrow 2m = -20$

Dividing both sides by 2, we get

$\frac{2m}{2} = \frac{-20}{2} \Rightarrow m = -10$

Check LHS $= 4(m + 6) - 8$

$= 4(-10 + 6) - 8 = 4(-4) - 8$

$= -16 - 8 = -24$

RHS $= 2m - 4 = 2(-10) - 4 = -20 - 4$

$= -24$

LHS = RHS **Hence Proved.**

(e) $\frac{u}{15} = 6$

Multiplying both sides by15, we get

$\frac{u}{15} \times 15 = 6 \times 15 \Rightarrow u = 90$

Check LHS $= \frac{u}{15} = \frac{90}{15} = 6$

= RHS **Hence Proved.**

2. $u + 6 = u + 2$ has no. solution

Subtract u from both sides, we get

$u + 6 - u = u + 2 - 4$

$6 = 2$

Which is not possible, so it is an incorrect state-ment.

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1. (i) $x = -2$

Dividing both sides by 6, we get

$\frac{x}{6} = \frac{-2}{6} = \frac{-1}{3}$

(ii) $x = -2$

Multiplying both sides by 3, we get

$3 \times x = -2 \times 3$

$3x = -6$

Adding 2 on both sides, we get

$3x + 2 = -6 + 2$

$3x + 2 = -4$

(iii) $x = -2$

Multiplying both sides by 5, we get

$5 \times x = 5 \times (-2)$

$5x = -10$

Adding 6 on both sides, we get

$5x + 6 = -10 + 6$

$5x + 6 = -4$

(iv) $x = -2$

Subtracting 5 on both sides, we get

$x - 5 = -2 - 5$

$x - 5 = -7$

(v) $x = -2$

Adding 3 on both sides, we get

$x + 3 = -2 + 3$

$x + 3 = 1$

Multiplying both sides by 2

$2(x + 3) = 2$

2. (a) $2y = 60$

Dividing both sides by 2, we get

$\frac{2y}{2} = \frac{60}{2}$

$\Rightarrow y = 30$

(b) $-8 = 5x - 3$

Adding 3 on both sides, we get

$-8 + 3 = 5x - 3 + 3 - 5 = 5x$

on dividng by 5 both sides, we get

$\frac{-5}{5} = \frac{5x}{5} \Rightarrow -1 = x$

(c) $-53w = -15$

Dividing both sides by -53

$$\frac{-53w}{-53} = \frac{-15}{-53} \Rightarrow w = \frac{15}{53}$$

(d) $13 - z = 8$

Subtracting 13 from both sides, we get

$13 - z - 13 = 8 - 13$

$\Rightarrow \quad -z = -5$

Dividing both sides by -1, we get

$$\frac{-z}{-1} = \frac{-5}{-1} \Rightarrow z = 5$$

(e) $k + 8 = 12 - k$

Adding k on both sides, we get

$k + 8 + k = 12 - k + k$

$2k + 8 = 12$

Subtracting 8 from both sides, we get

$2k + 8 - 8 = 12 - 8 \Rightarrow 2k = 4$

Dividing both sides by 2, we get

$$\frac{2k}{2} = \frac{4}{2} \Rightarrow k = 2$$

(f) $7m = m - 3$

Subtracting m from both sides, we get

$7m - m = m - 3 - m \Rightarrow 6m = -3$

Dividing both sides by 6, we get

$$\frac{6m}{6} = \frac{-3}{6} \Rightarrow m = -\frac{1}{2}$$

(g) $3n = 10 + n$

Subtracting n from both sides, we get

$3n - n = 10 + n \Rightarrow 2n = 10$

Dividing both sides by 2

$$\frac{2n}{2} = \frac{10}{2} \Rightarrow n = 5$$

3. Let ten's place digit be x

Then hundred's place digit $= x - 3$

Unit's digit $= x + 3$

Sum of all the three digit $= 15$

According to questions,

$(x - 3) + x + (x + 3) = 15 \Rightarrow 3x = 15$

Dividing both sides by 3, we get

$$\frac{3x}{3} = \frac{15}{3}$$

$$x = 5$$

$\therefore$ Ten's digi $= x = 5$

Hundred's digit $= x - 3 = 5 - 3 = 2$

Unit's digit $= x + 3 = 5 + 3 = 8$

So number formed 258.

4. Let weight of a brick be x kg.

According to question, $x = \frac{x}{2} + 1$

Subtract $\frac{x}{2}$ from both sides

$$\frac{x}{1} - \frac{x}{2} = \frac{x}{2} + 1 \quad \frac{x}{2}$$

$$\frac{2x - x}{2} = 1$$

$$\frac{x}{2} = 1$$

Multiply both sides by 2

$$\frac{x}{2} \times 2 = 1 \times 2$$

$$x = 2$$

$\therefore$ weight if the brick = 2kg.

5. Let the no. be x.

According to question,

$$\frac{1}{4} \times x + 9 = x$$

$$\frac{x}{4} + 9 = x$$

$$\Rightarrow \quad 9 = \frac{x - x}{4}$$

$$\Rightarrow \quad 9 = \frac{4x \quad x}{4} \quad \frac{3x}{4}$$

$$\Rightarrow \quad 9 = \frac{3x}{4}$$

Divide both sides by $\frac{3}{4}$

$$9 \div \frac{3}{4} = \frac{3}{4}x \div \frac{3}{4}$$

$\Rightarrow \quad 9 \times \frac{4}{3} = \frac{3}{4} x \times \frac{4}{3}$

$\Rightarrow \quad 12 = x$

Thus, the required number is 12.

6. $4k + 1 = 13$

Subtracting 1 from both sides, we get

$4k + 1 - 1 = 13 - 1 \Rightarrow 4k = 12$

Dividing both sides by 4

$4k \div 4 = 12 \div 4 \Rightarrow k = 3$

(a) $8k + 2 = 8(3) + 2 = 24 + 2 = 26$

(b) $4k$

$4 \times 3 = 12$

(c) $k = 3$

(d) $4k - 1 = 4(3) - 1 = 12 - 1 = 11$

(e) $-k - 2 = -3 - 2 = -5$

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1. (a) $5 \times ... - 8 = 37$

Let missing term be x,

Then $5 \times x - 8 = 37$

$5x - 8 = 37 \Rightarrow 5x = 37 + 8$

$\Rightarrow 5x = 45 \Rightarrow x = \frac{45}{5} = 9$ **Ans.**

(b) $37 - (33 - ...) = 35$

Let missing term be x

Then $37 - (33 - x) = 35$

$\Rightarrow 37 - 33 + x = 35 \Rightarrow 4 + x = 35$

$\Rightarrow x = 35 - 4 = 31$ **Ans.**

Sol. (c) $-3 \times (-11 + ...) = 45$

Let missing term be x

Then $-3 \times (-11 + x) = 45$

Dividing both sides by -3, we get

$(-11 + x) = \frac{45}{-3} = -15$

$\Rightarrow -11 + x = -15 \Rightarrow x = -15 + 11$

$\Rightarrow x = -4$ **Ans.**

2. Let no. of ₹50 notes = x

= no. of ₹100 notes

Total money Ranju have ₹750

According to question,

value of ₹50 notes= ₹50 × x = ₹50x

value of ₹100 notes = ₹100 × x = ₹100x

$\therefore \quad$ ₹50x + ₹100x = ₹750

$\Rightarrow 150x = 750 \Rightarrow x = \frac{750}{150} = 5$

Thus Number of notes of ₹50 is 5.

Number of notes of ₹100 is 5.

3. Let each black blob hide x blue dotes. There are 3 black blobs and 4 blue dots in the picture

Total blue dots = 25

According to questions,

$3x + 4 = 25 \Rightarrow 3x = 25 - 4$

$\Rightarrow \quad x = \frac{21}{3} = 7$

Thus, each black blob hides 7 blue dots. **Ans.**

4. (a)

(i) $\overset{9}{\rightarrow} +3 \quad \overset{12}{\rightarrow} \times 4 \quad \overset{48}{\rightarrow} -5 = 43$

(ii) $\overset{17}{\rightarrow} +3 \quad \overset{20}{\rightarrow} \times 4 \quad \overset{80}{\rightarrow} -5 = 75$

(b) (i) Let the missing number be x

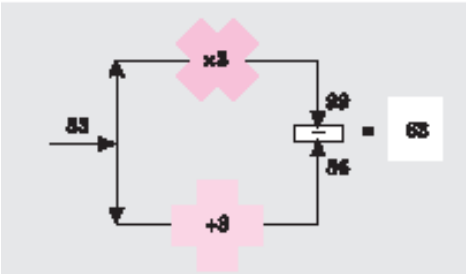
then, $x \times 3 - (x + 3) = 63$

$\Rightarrow \quad 3x - x - 3 = 63$

$\Rightarrow \quad 2x - 3 = 63$

$\Rightarrow \quad 2x = 63 + 3 = 66$

$\Rightarrow \quad x = \frac{66}{2} = 33.$



(ii) Let the missing number be y

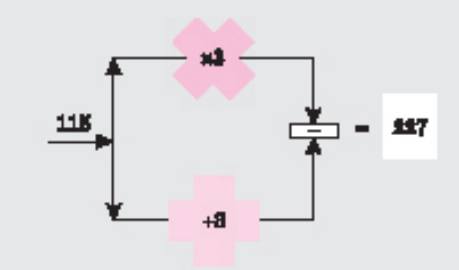
then $y \times 3 - (y + 3) = 227$

$\Rightarrow \quad 3y - y - 3 = 227 \Rightarrow 2y - 3 = 227$

$\Rightarrow \quad 2y = 227 + 3 = 230 \Rightarrow 2y = 230$

$\Rightarrow \quad y = \frac{230}{2} = 115$

Thus missing number is 115



5. (i) $\xrightarrow{45} \div 3 \quad \xrightarrow{15} \div 3 = 5$

Let missing number is x

Then $(x \div 3) \div 3 = 5$

$\Rightarrow x \div 3 = 5 \times 3 \Rightarrow \frac{x}{3} = 15$

$\Rightarrow x = 15 \times 3 = 45$

Thus, missing number is 45.

(ii) $\xrightarrow{-3} -4 \quad \xrightarrow{-7} -4 = -11$

Let missing number is y

Then $(y - 4) - 4 = -11$

$\Rightarrow \quad y - 4 - 4 = -11 \Rightarrow y - 8 = -11$

$\Rightarrow \quad y = -11 + 8 = -3 \Rightarrow y = -3$

Thus missing number is – 3

6. Fixed fee charged by taxi driver = ₹800

After that, charge per kilometer = ₹20

Let the distance covered by x km

According to question,

$x \times 20 + 800 = 2200$

$\Rightarrow \quad 20x = 2200 - 800$

$\Rightarrow \quad 20x = 1400 \Rightarrow x = \frac{1400}{20} = 70$

Thus, Total distance covered is 70 km.

7. Let x and $3x$ are two numbers

According to question,

$x + 3x = 76$

$\Rightarrow \quad 4x = 76 \Rightarrow x = \frac{76}{4} = 19$

$\therefore \quad x = 19$

$3x = 3 \times 19 = 57$

Thus 19 and 57 are required two numbers.

8. Total height of the window (including frame) = 34 cm

Total height of the window (excluding frame) = (34 – 3 – 3) cm = 28 cm.

Width of one rod of grill = 2 cm

Number of rods of the grill = 5

Total width of 5 rods= 5 × 2 cm = 10 cm

Let height of 1 gap be x cm

and number of gaps = 6

$\therefore$ Total height of gaps = $.6x$

According to question,

$10 + 6x = 28 \Rightarrow 6x = 28 - 10$

$\Rightarrow \quad 6x = 18 \Rightarrow x = \frac{18}{6} = 3$

Thus, Gap between two Rods = 3 cm.

9. Let the cost of chocolate milkshake be ₹ x

Cost of fruit juice = ₹ $(x - 15)$

Cost of 4 fruit juices and 7 chocolate milkshakes = ₹ 600

According to question,

$4(x - 15) + 7x = 600$

$\Rightarrow \quad 4x - 60 + 7x = 600$

$\Rightarrow \quad 4x + 7x = 600 + 60$

$\Rightarrow \quad 11x = 660$

$\Rightarrow \quad x = \frac{660}{11} = 60$

Thus, cost of 1 chocolate milkshake = ₹ 60

cost of 1 fruit juice = ₹60 – ₹15 = ₹45

10. Given, $28p - 36 = 98$

$\Rightarrow \quad 28p = 98 + 36$

$\Rightarrow \quad 28p = 134 \Rightarrow p = \frac{134}{28} = \frac{67}{14}$

Putting $p = \frac{67}{14}$ in $14p - 19$,

we get $14 \times \frac{67}{14} - 19 = 67 - 19 = 48$

Putting $p = \frac{67}{14}$ in $28p - 38$, we get

$28 \times \frac{67}{14} - 38 = 134 - 38 = 96$

11. (a) $\cancel{6x} + 9 \quad \cancel{36} \rightarrow$ Error

Variable terms should be on one side and constants on the other side before separating the coefficient from variable.

Correction

$6x + 9 = 66$

$6x = 66 - 9$

$6x = 57$

$x = \frac{57}{6} = \frac{19}{2} = 9\frac{1}{2}$

(b) $14y + 24 = 36$

$7y + 12 = 18$

(On dividing by 2 both sides)

$7y = 18 - 12 = 6 \Rightarrow y = \frac{6}{7}$

No Error.

(c) $4x - 5 = 9x + 8$

$4x = 9x + 8 - 5 \rightarrow$ Error

$4x = 9x + 3$

$4x - 9x = 3$

$-5x = 3$

$x = -\frac{5}{3} \rightarrow$ Error

Correction

$4x - 5 = 9x + 8$

$\Rightarrow \quad 4x = 9x + 8 + 5 \Rightarrow 4x = 9x + 13$

$\Rightarrow 4x - 9x = 13 \Rightarrow -5x = 13$

$\Rightarrow \quad x = -\frac{13}{5} \Rightarrow x = -2\frac{3}{5}$

12. (i) In ΔABC

Given that, AB = AC

$\Rightarrow \angle B = \angle C = y + 15$

(Angles opposite to equal sides of Δ)

In ΔABC, $\angle A + \angle B + \angle C = 180°$

[Angle sum property of Δ]

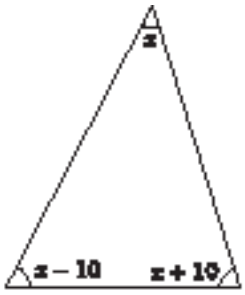
$\Rightarrow \quad y + (y + 15) + (y + 15) = 180°$

$\Rightarrow \quad 3y + 30 = 180° \Rightarrow 3y = 180° - 30$

$\Rightarrow \quad y = \frac{150}{3} = 50$

$\therefore \quad \angle A = 50°, \angle B = 65°, \angle C = 65°$

(ii)



In ΔABC, $\angle A + \angle B + \angle C = 180°$

[Angle sum property of triangle]

$\therefore \; x + x - 10 + x + 10 = 180°$

$\Rightarrow \quad 3x = 180°$

$\Rightarrow \quad x = \frac{180°}{3} = 60°$

$\therefore \quad \angle A = 60°$

$\angle B = x - 10 = 60 - 10 = 50°$

$\angle C = x + 10 = 60 + 10 = 70°$

$\therefore \quad \angle A = 60°, \angle B = 50°, \angle C = 70°$ **Ans.**

13. (i) $u = 6$

Multiply both sides by 2, we get $2u = 12$

Add 6 on both sides, we get

$2u + 6 = 12 + 6 \Rightarrow 2u + 6 = 18$

(ii) $u = 6$

Multiplying both sides by 2, we get $2u = 12$

Adding 3 both sides we get

$2u + 3 = 12 + 3 \Rightarrow 2u + 3 = 15$

(iii) $u = 6$

Multiplying both sides by 3 we get

$3u = 18$

Adding 7 on both sides, we get

$3u + 7 = 18 + 7$

$3u + 7 = 25$

(iv) $u = 6$

Adding 5 both sides we get

$u + 5 = 6 + 5$

$u + 5 = 11$

14. Let Amount given to first person be x

Amount given to second person be $2x$

Amount given to third person be $3(2x) = 6x$

Amount given to fourth person be $4(6x) = 24x$

Total Amount = 132

$x + 2x + 6x + 24x = 132$

$\Rightarrow \quad 33x = 132 \Rightarrow x = \frac{132}{33}$

$\Rightarrow \quad x = 4$

Amount given to first person is 4. **Ans.**

15. Let height of a giraffe be x m

According to question

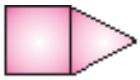
$$xm = 2\frac{1}{2}m + \frac{x}{2}m \Rightarrow x = \frac{5}{2} + \frac{x}{2}$$

$$\Rightarrow \quad x - \frac{x}{2} = \frac{5}{2} \Rightarrow \frac{2x - x}{2} = \frac{5}{2}$$

$$\Rightarrow \quad \frac{x}{2} = \frac{5}{2} \Rightarrow x = \frac{5}{2} \times 2 \quad 5$$

$\therefore$ Height of the giraffe = 5 m **Ans.**

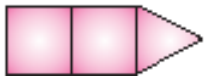
16. (a)



4 squares

$1 + 3$

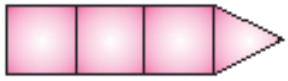
$1 + \underline{1} \times 3$



7 squares

$1 + 3 + 3$

$1 + \underline{2} \times 3$



10 squares

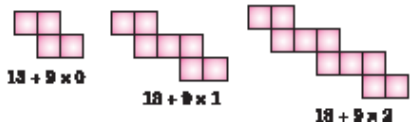
$1 + 3 + 3 + 3$ and so on

$1 + \underline{3} \times 3$ ..... $1 + \underline{x} \times 3$

No. of squares in 11th position will be

$1 + \underline{11} \times 3 = 1 + 33 = 34$

(b)



and so on

So, no. of sticks needed in 11th position will be $13 + 9 \times 10 = 103$

(c) Let the n^{th} arrangement have 85 sticks

$13 + (n - 1) \times 9 = 85$

$\Rightarrow 13 + 9n - 9 = 85 \Rightarrow 4 + 9n = 85$

$\Rightarrow 9n = 85 - 4 \Rightarrow 9n = 81 \Rightarrow n = \frac{81}{9} = 9$

Yes, the arrangement will have 85 sticks in position numbr 10.

(d) Let the n^{th} arrangment have 150 sticks.

$13 + (n - 1) \times 9 = 150$

$\Rightarrow 13 + 9n - 9 = 150 \Rightarrow 4 + 9n = 150$

$\Rightarrow \quad 9n = 150 - 4 \Rightarrow 9n = 146$

$\Rightarrow \quad n = \frac{146}{9} \Rightarrow n = 16\frac{2}{9}$

It is not a whole number.

So, no arrangment can be made with 150 sticks.

17. Let the number be x

According to question,

$x + 36 = 10 \times x \Rightarrow x + 36 = 10x$

$\Rightarrow \quad 36 = 10x - x \Rightarrow 36 = 9x$

$\Rightarrow \quad 36 \div 9 = x \Rightarrow x = 4$

18. (a) $5(r + 2) = 10$

$\Rightarrow \quad 5 \times (r + 2) = 10 \Rightarrow (r + 2) = 10 \div 5$

$\Rightarrow \quad r + 2 = 2 \Rightarrow r = 2 - 2 = 0$

$\Rightarrow \quad r = 0$

(b) $-3(u + 2) = 2(u - 1)$

$\Rightarrow \quad -3u - 6 = 2u - 2$

$\Rightarrow \quad -3u - 2u = -2 + 6$

$\Rightarrow \quad -5u = 4 \Rightarrow u = -\frac{4}{5}$

(c) $2(7 - 2n) = -6$

$\Rightarrow 2 \times 7 - 2 \times 2n = -6 \Rightarrow 14 - 4n = -6$

$\Rightarrow \quad -4n = -6 - 14 \Rightarrow -4n = -20$

$\Rightarrow \quad n = \frac{20}{4} = 5.$

(d) $2(x - 4) = -16$

$\Rightarrow 2 \times x - 2 \times 4 = -16 \Rightarrow 2x - 8 = -16$

$\Rightarrow 2x = -16 + 8 \Rightarrow 2x = -8$

$\Rightarrow x = \frac{-8}{2} = -4$

(e) $6(x - 1) = 2(x - 1) - 4$

$\Rightarrow 6 \times x - 6 \times 1 = 2 \times x - 2 \times 1 - 4$

$\Rightarrow 6x-6=2x-2-4 \Rightarrow 6x-2x=-2-4+6$

$\Rightarrow 4x=-6+6=0 \Rightarrow x=\frac{0}{4}=0$

(f) $3-7s=7-3s \Rightarrow 3-7=-3s+7s$

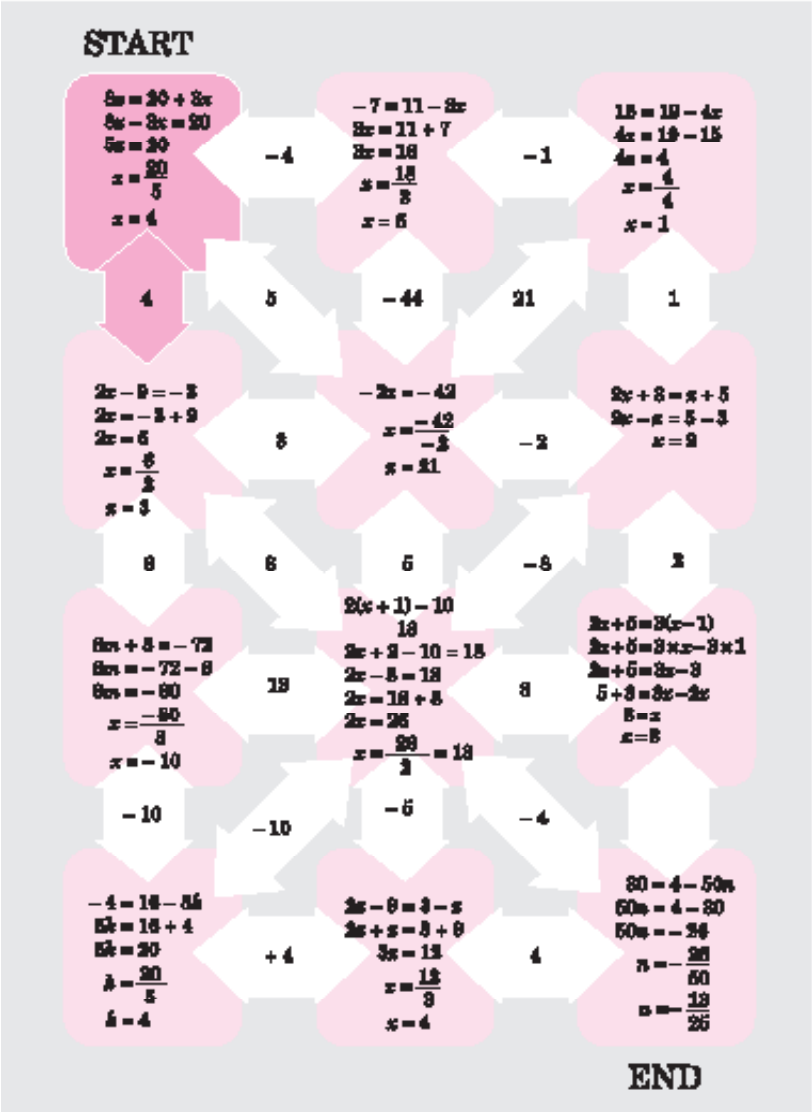
$\Rightarrow -4=4s \Rightarrow s=\frac{-4}{4}=-1 \Rightarrow s=-1$

(g) $2x+1=6-(2x-3) \Rightarrow 2x+1$
$=6-2x+3 \Rightarrow 2x+2x=6+3-1$
$\Rightarrow 4x=9-1 \Rightarrow 4x=8$

$\Rightarrow x=\frac{8}{4}=2$

(h) $10-5x=3(x-4)-2(x-7)$
$\Rightarrow 10-5x=3\times x-3\times 4-2\times x-2\times(-7)$
$\Rightarrow 10-5x=3x-12-2x+14$
$\Rightarrow -5x-3x+2x=-12+14-10$
$\Rightarrow -8x+2x=-22+14$
$\Rightarrow -6x=-8$
$\Rightarrow x=\frac{8}{6}=\frac{4}{3}$

19.



20. Let the number of children be x and number of donkeys be y

Then, according to question,

$$x + y = 28 \quad ...(1)$$

children have 2 feet

But donkey have 4 feet

Then according to questions

Total no. of feet $2x + 4y = 80$ ...(2)

from equation (1)

$$x + y = 28 \Rightarrow y = 28 - x$$

Substituting this value of y in equation (2), we get $2x + 4(28 - x) = 80$

$\Rightarrow 2x + 112 - 4x = 80 \Rightarrow -2x = 80 - 112$

$\Rightarrow -2x = -32 \Rightarrow x = \frac{32}{2} = 16$

from equation (1), $x + y = 28$

$\Rightarrow 16 + y = 28 \Rightarrow y = 28 - 16 = 12$

Thus, there are 16 children and 12 donkeys. **Ans.**

Practice Time

Multiple Choice Questions (MCQs)

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

Fill in the Blanks

1. Sanskrit, **2.** $5m + \frac{m}{5} = 78$, **3.** Zero

4. 45 metre, **5.** $x = \frac{D - B}{A - C}$.

True/False

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

Subjective Questions

1. (a) Input goes through + 7, then × 4, then – 10 to give 110.

Let input = n.

$$(n + 7) \times 4 - 10 = 110$$
$$(n + 7) \times 4 = 120$$
$$n + 7 = 30$$
$$n = 23$$

So, the input is 23.

(b) Input goes through multiplied by 2, then minus 20, then divided by 9 to give 4.

Let input = n

$$(2n - 20) \div 9 = 4$$
$$2n - 20 = 36$$
$$2n = 56$$
$$n = 8$$

So, the input is 28.

2. (a) $2x + 3 = 7$

$$2x = 4$$
$$x = 2$$

So, $x = 2$.

(b) $2x - 7 = 7x + 4$.

$$2x - 7x = 4 + 7$$
$$-5x = 11$$
$$x = \frac{-11}{5}$$

So, $x = \frac{-11}{5}$.

3. (a) Check if $x = 2$ is solution of $3x - 2 = 7$.

LHS = $3 \times 2 - 2 = 6 - 2 = 4$.

RHS = 7.

LHS does not equal RHS.

So, $x = 2$ is not a solution of the equation.

(b) Check if $x = -3$ is solution of $3x + 2 = -7$.

LHS = $3 \times (-3) + 2 = -9 + 2 = -7$.

RHS = -7.

LHS equal RHS.

So, $x = -3$ is a solution of the equation.

4. Let the number be n.

$$5n + 35 = 100$$
$$5n = 65$$
$$n = 13$$

So, the number is 13.

5. $\angle A = \angle B + \angle C$ ...(i)

$$\angle A + \angle B + \angle C = 180°$$
$$\angle A + \angle A = 180° \quad \text{(from (i))}$$
$$2\angle A = 180°$$

$$\angle A = \frac{180^\circ}{2} = 90^\circ$$

Given : $\angle B$ and $\angle C$ are in the ratio 4 : 5 and their sum = 90°

$$\angle B = \frac{4}{5} \times 90^\circ = 40^\circ$$

$$\angle C = \frac{5}{9} \times 90^\circ = 50^\circ$$

So, $\angle A = 90^\circ$, $\angle B = 40^\circ$, $\angle C = 50^\circ$.

6. Length $= 3w$

perimeter $= 112$ cm

$2(3w + w) = 112$

$2 \times 4w = 112$

$8w = 112$

$w = 14$ cm

Length $= 3 \times 14 = 42$ cm

So, the length of the rectangle is 42 cm and width is 14 cm.

7. Let total pearls $= n$.

Pearls fallen $= \frac{n}{3}$, no couch $= \frac{n}{5}$, retained by lady $= \frac{n}{6}$, caught by lover $= \frac{n}{10}$, remaining = 6.

$$\frac{n}{3}+\frac{n}{5}+\frac{n}{6}+\frac{n}{10}+6 = n$$

LCM of 3, 5, 6, 10 = 30

$$\frac{10n}{30}+\frac{6n}{30}+\frac{5n}{30}+\frac{3n}{30}+6 = n$$

$$\frac{24n}{30}+6 = n$$

$$6 = n-\frac{24n}{30}$$

$$6 = \frac{6n}{30}$$

$$6 = \frac{n}{5}$$

$$n = 30.$$

8. (a) Divide 922221 in the ratio 2 : 3 : 4.

Total parts = 2 + 3 + 4 = 9.

One part = 922221 ÷ 9 = 102469.

2 parts = 2 × 102469 = 204938.

3 parts = 3 × 102469 = 307407.

4 parts = 4 × 102469 = 409876.

So, the three parts are rupees 204938, rupees 307407 and rupees 409876.

(b) SP = rupees 426400, profit = 20 percent.

SP = CP × 1.2

CP = 426400 ÷ 1.2

CP = 355333.33 (approximately).

So, the cost price of the car is approximately rupees 355333.

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