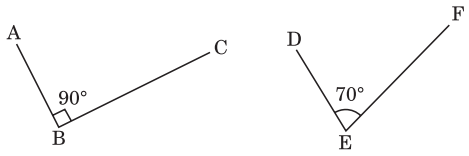
Mathematics - 7

Part II

1. Geometric Twins

NCERT Exercise 1.1

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°.

Practice Exercise 1.1

1. Two figures are congruent if they have the same shape and size. (a) Yes—same shape and size. (b) Yes—same sizes. (c) No— different proportions. (d) No — different sizes. (e) Yes — same shape and size. (f) No — different sizes.

2. (a) ≅ (b) length (c) length (d) measure

3. Since AB ≅ CD, congruent line segments have equal lengths. CD = AB = 8 cm.

Thus, the length of CD is 8 cm.

4. Perimeter of ABCD = 2 × (length + breadth)

= 64 m length + breadth = 32 m 20 + breadth = 32 m breadth = 12 m

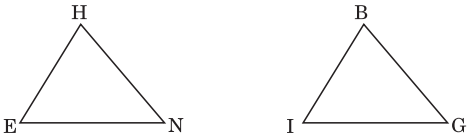
Since ABCD = PQRS, corresponding sides are equal. Thus, length of PQRS = 20 m and breadth of PQRS = 12 m.

5. (a) Thus, ∠BOD = ∠AOC. (Vertically opposite angle)

(b) Thus, ∠BOC = ∠ AOD. (Vertically opposite angle)

NCERT Exercise 1.2

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.

Practice Exercise 1.2

1. The SSS (Side-Side-Side) congruence rule states that two triangles are congruent if all three sides of one triangle are equal to the three corresponding sides of the other triangle.

Given :

AB = DF

BC= EF

For SSS congruence, a third pair of equal sides is needed.

The third side of ΔABC is AC.

The third side of ΔDEF is DE.

Thus, the additional information required is AC = DE.

2. (a) In ΔABC and ΔFDE:

AB = FD

BC = DE

CA = EF

All three sides of ΔABC are equal to the three corresponding sides of ΔFDE.

Thus, ΔABC ≅ ΔFDE (by SSS congruence rule).

(b) In ΔPQR and ΔXZY:

PQ = XZ

QR = ZY

RP = YX

All three sides are equal.

Thus, ΔPQR = ΔXZY (by SSS congruence rule).

(c) ΔPQS and ΔRST

QS = RS (equal)

PQ ≠ RS (not equal)

PS ≠ RT (not equal)

Since two pairs of sides are unequal, SSS condition is not satisfied.

Thus, ΔPQS and ΔRST are not congruent.

(d) In ΔDEF and ΔNML:

DE = NM

EF = ML

FD = LN

All three sides are equal.

Thus, ΔDEF = ΔNML (by SSS congruence rule).

(e) In ΔABO and ΔPQO :

AB = PQ

BO = QO

AO = PO

All three sides are equal.

Thus, ΔABO ≅ ΔPQO (by SSS congruence rule).

(f) In ΔABD and ΔCDB:

AB = CD (given)

BD = DB (common side, same segment)

AD = CB (given)

All three pairs of sides are equal.

Thus, ΔABD ≅ ΔCDB (by SSS congruence rule).

3. Given, AB = AC and D is the mid-point of BC

(a) State the three pairs of equal parts in ΔADB and ΔADC:

AB = AC (given, ΔABC is isosceles)

BD = DC (given, D is the mid-point of BC, so BD = DC)

AD = AD (common side to both triangles)

Thus, the three pairs are: AB = AC, BD = DC, AD = AD.

(b) In ΔADB and ΔADC:

AB = AC (given)

BD = DC (D is mid-point of BC)

AD = AD (common side)

All three sides of ΔADB are equal to the three corresponding sides of ΔADC.

Thus, yes, ΔADB = ΔADC by SSS congruence rule.

(c) Yes, by SSS congruence rule.

4. A congruence statement is meaningful only when the order of vertices correctly shows the correspondence between equal sides and angles.

Given: AC = BD, AD = BC, and AB = AB (common side).

Check (a): $\Delta ABC \cong \Delta ABD$ gives correspondence A↔A, B↔B, C↔D.

This requires:

AB = AB (True), BC = BD (but BC = AD is given, not BC = BD) → MISMATCH.

Statement (a) is not meaningfully written.

Check (b): $\Delta ABC \cong \Delta BAD$ gives correspondence A↔B, B↔A, C↔D.

This requires:

AB = BA (same segment → true)

BC= AD (given → true)

AC = BD (given → true)

All three pairs match correctly with the given data.

Thus, statement (b) $\Delta ABC \cong \Delta BAD$ is meaningfully written.

NCERT Exercise 1.3

1. In ΔABC and ΔXZY

BC = ZY = 5 cm (given)

AB = XZ = 7 cm (given)

$\angle ABC = \angle XZY = 47°$ (given)

Thus $\Delta ABC \cong \Delta XZY$ (By SAS Rule)

2. In ΔCOD and ΔBOA

$\angle ABO = \angle CDO$

$\angle AOB = \angle COD$

AB = CD

So $\Delta COD \cong \Delta AOD$

$\therefore$ AO = CO, BO = DO (By CPCT)

$\angle BAO = \angle DCO$ (By CPCT)

3. In ΔABC and ΔDBC

$\angle ABC = a = \angle DBC$

and let $\angle ACB = b = \angle DCB$

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)

Practice Exercise 1.3

1. The SAS (Side-Angle-Side) congruence rule: Two triangles are congruent if two sides and the included angle of one triangle equal the two sides and the included angle of the other.

(a) In ΔPQR and ΔXZY:

PQ = XZ (first side, marked equal)

$\angle Q = \angle Z = 45°$ (included angle between PQ & QR, and between XZ and ZY)

QR = ZY (second side, marked equal)

Two sides but the included angle are not given.

Thus, ΔPQR and ΔXZY are not congruent.

(b) In ΔACB and ΔFDE:

AC = FD (first side, marked equal)

$\angle C = \angle D = 120°$ (included angle between AC & CB, and between FD & DE)

CB = DE (second side, marked equal)

Two sides and the included angle are equal.

Thus, $\Delta ACB = \Delta FDE$ (by SAS congruence rule);

(c) In ΔPRQ and ΔRPS:

PR = RP (common side)

$\angle PRQ = \angle RPS = 45°$ (included angle, marked equal)

RQ = PS (second side, marked equal)

Two sides and the included angle are equal.

Thus, $\Delta PRQ = \Delta RPS$ (by SAS congruence rule).

(d) In ΔACB and ΔRPQ:

AC = RP = 3.5 cm (first side)

$\angle C = \angle P = 55°$ (included angle)

CB = PQ = 3 cm (second side)

Two sides and the included angle are equal.

Thus, $\Delta ACB \cong \Delta RPQ$ (by SAS congruence rule).

2. Given : AB = AC (ΔABC is isosceles)— first pair of sides

AD bisects $\angle A$, so $\angle BAD = \angle CAD$ — the included angles are equal

For SAS congruence, Side—Included Angle Side.

In ΔABD and ΔACD

AB = AC (given)

AD = AD (common)

∠BAD = ∠CAD (given)

Thus, by CPCT, BD = DC. Yes, it is true that BD = DC.

3. (a) AB || DC and line AC is a transversal cutting these two parallel lines.

Thus, ∠BAC = ∠DCA, because they are alternate interior angles (AB || DC, transversal AC).

(b) In ΔABC and ΔCDA:

AB = DC (given)

∠BAC = ∠DCA (proved in part (a)) included angle

AC = CA (common side)

Two sides and the included angle of ΔABC equal the corresponding two sides and included angle of ΔCDA.

Thus, ΔABC ≅ ΔCDA by SAS congruence rule.

(c) The three facts used to answer (b):

Fact 1: AB = DC (given)

Fact 2: ∠BAC = ∠DCA (alternate interior angles, since AB || DC)

Fact 3: AC = CA (common side)

These are the three facts used to establish ΔABC ≅ ΔCDA by SAS.

4. The ASA (Angle-Side-Angle) rule: Two triangles are congruent if two angles and the included side of one equal the two angles and the included side of the other.

From the figure: O is the intersection point of two line segments, with AO = OB and CO = OD (given).

In ΔAOC and ΔBOD:

∠AOC = ∠BOD (vertically opposite angles at O)—first angle

AO = OB (given) — included side between the two angles

∠OAC = ∠OBD (alternate interior angles, since the configuration of equal segments forces AC || BD) — second angle

Two angles and the included side are equal.

Thus, yes-ΔAOC ≅ ΔBOD by ASA congruence rule.

5. (a) In ΔABC and ΔFDE

∠A = ∠F = 45°

AC = FD = 5.7 cm (included side between A & B, and ∠F & ∠D)

∠B = ∠D = 70°

Thus, ΔABC = ΔFDE (by ASA congruence rule).

(b) In ΔABC and ΔANM

∠B = ∠N = 65°

BC= NM = 3.5 cm (included side)

∠C = ∠M = 65°

Thus, ΔABC = ΔANM (by ASA congruence rule).

(c) In the triangles

The two angles given are 50° each, but the included sides do not match correctly between the two triangles. Thus, Not congruent.

(d) In ΔABC and ΔXYZ

∠A = ∠X = 130°

BC = YZ = 2.8 cm (included side)

∠B = ∠Y = 30°

Thus, ΔABC = ΔXYZ (by ASA congruence rule).

NCERT Exercise 1.4

1. Given ΔAIR ≅ ΔFLY

Corresponding vertices

A ↔ F; I ↔ L; R ↔ Y

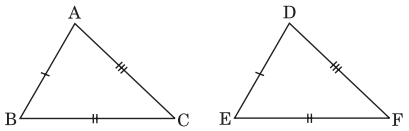
Corresponding Sides Corresponding Angles

AI corresponds to FL ∠A corresponds to ∠F

IR corresponds to LY ∠I corresponds to ∠L

AR corresponds to FY ∠R corresponds to ∠Y

2.



In ΔABC and ΔDEF

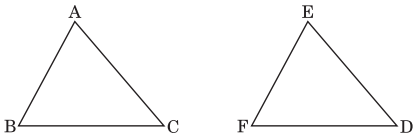
AB = DE (given);

BC = EF (given);

CA = FD (given)

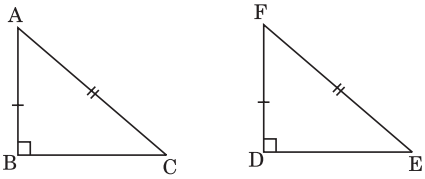
So ΔABC ≅ ΔDEF By SSS Rule

(b)



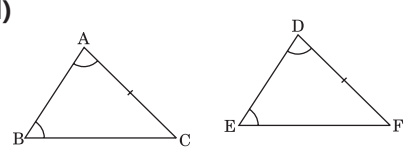
In ΔABC and ΔEFD
AB = EF; ∠A = ∠E; AC = ED
So ΔABC ≅ ΔEFD (By SAS Rule)

(c)



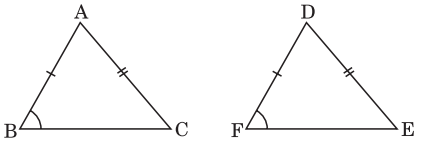
In ΔABC and ΔFDE
AB = FD (given)
∠B = ∠D = 90° (given)
AC = FE
So ΔABC ≅ ΔFDE (By RHS Rule)

(d)



In ΔABC and ΔDEF
∠A = ∠D (given)
∠B = ∠E (given)
AC = DF (given)
So ΔABC ≅ ΔDEF (By AAS Rule)

(e)

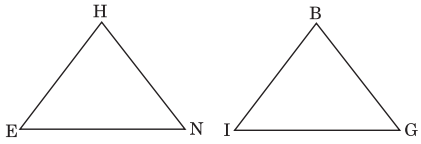


In ΔABC and ΔDFE
AB = DF; ∠B = ∠F; AC = DE
Here two corresponding sides and one non included angle are equal. So triangles satisfy SSA condition which is not a valid congruence rule.
Thus ΔABC need not to be congruent to ΔDFE.

3. In ΔAOB and ΔDOC
OA = OD (given); OB = OC (given)
∠AOB = ∠DOC
Thus ΔAOB ≅ ΔDOC. So ∠A = ∠D
∠B = ∠C (By CPCT)
But ∠A and ∠D, and ∠C and ∠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 ΔABC ≅ ΔADC (By SSS condition)
Now In ΔABC and ΔCDA
AB = CD (sides of square are same)
BC = DA (sides of square)
AC = CA (Common)
So ΔABC ≅ ΔADC
Let us consider two congruent triangles ΔHEN and ΔBIG



According to questions, six different ways are
ΔNEH ≅ ΔGIB; ΔNHE ≅ ΔGBI
ΔENH ≅ ΔIGB; ΔEHN ≅ ΔIBG
ΔHNE ≅ ΔBGI; ΔHEN ≅ ΔBIG

5. In ΔBAC
AB = AC = Radius of the circle
∴ ∠ABC = ∠ACB = x (say)
then $x + x + 120° = 180°$
(Angle sum property of triangle)
$\Rightarrow 2x + 120° = 180° \Rightarrow 2x = 180° - 120° = 60°$

$$\Rightarrow 2x = 60° \Rightarrow x = \frac{60°}{2} = 30°$$

Thus ∠B = ∠C = 30° **Ans.**

6. In ΔCUR

$$CU = CR \text{ (given)}$$
$$\Rightarrow \quad \angle CUR = \angle CRU = x \text{ (say)}$$
$$\therefore \quad x + x + 90º = 180º$$
$$\Rightarrow \quad 2x + 90º = 180º$$
$$\Rightarrow \quad 2x = 180º - 90º$$
$$\Rightarrow \quad x = \frac{90º}{2} = 45º$$
$$\therefore \quad \angle CRU = \angle CUR = 45º$$

In ΔVRN
VR = VN

$\Rightarrow \quad \angle VRN = \angle VNR = x$ (say)

$\Rightarrow \quad x + x + 68° = 180º$

$\Rightarrow \quad 2x + 68° = 180°$

$\Rightarrow \quad 2x = 180º - 68º = 112°$

$\Rightarrow \quad x = \frac{112º}{2} = 56º$

$\therefore \quad \angle VRN = \angle VNR = 56º$

In ΔAUP

$AU = UP$

$\Rightarrow \quad \angle UAP = \angle UPA = 56°$

$\therefore \quad 56° + 56° + \angle AUP = 180º$

$\Rightarrow \quad \angle AUP = 180º - 112° = 68°$

ΔBOF is an equilateral triangle

So $OB = OF = BF$

$\Rightarrow \quad \angle FOB = \angle FBO = \angle OFB = 60º$

$\angle RVN + \angle DVN = 180º$ (Linear Pair)

$68° + \angle DVN = 180º$

$\angle VND + \angle VDN + \angle NVD = 180º$

Since $VN = VD$

$\therefore \quad \angle VND = \angle VDN = x$ (माना)

$\therefore \quad x + x + \angle NVD = 180º$

$\therefore \quad 2x + 112° = 180º$

$2x = 180º - 112° = 68°$

$x = \frac{68º}{2} = 34°$

$\therefore \quad \angle VND = \angle VDN = 34°$

In ΔOLB

$\angle OBL = 90º - 60º = 30º$

$\angle LOB = 60º$

In ΔOPN,

$\angle OPN + \angle PON + \angle PNO = 180º$

$\angle OPN + 56° + 90º = 180º$

$\angle OPN = 180º - 146° = 34°$

Now, $\angle APK + \angle KPO + \angle OPN = 180º$

$44° + \angle KPO + 34° = 180º$

$\Rightarrow \quad \angle KPO = 180º - 78° = 102°$

In ΔKPO,

$\angle KPO + \angle POK + \angle PKO = 180º$

$102° + 30º + \angle PIO = 180º$

$\angle PKO = 180º - (132º) = 48°$

$\angle KAP + \angle KPA + \angle AKP = 180º$

$34° + 44° + \angle AKP = 180º$

$78° + \angle AKP = 180º$

$\angle AKP = 180º - 78° = 102°$

and $\angle PKO = 48°$

So, $\angle AKP + \angle PKO + \angle OKL = 180º$

$102° + 48° + \angle OKL = 180º$

$150º + \angle OKL = 180º$

$\therefore \quad \angle OKL = 180º - 150º = 30º$

n ΔKOL,

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

$30º + 90º + \angle KOL = 180º$

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

$\angle KOL = 60º$

and $\Delta KOL \cong \Delta OBL$

$KL = LB$

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

Practice Exercise 1.4

1. The RHS (Right-Hypotenuse-Side) rule: Two right triangles are congruent if the hypotenuse and one leg (side) of one equal the hypotenuse and one leg of the other.

Given:

$\angle Q = \angle D = 90°$ (right angles are equal)

QR = DE = 4 cm (one leg of each triangle is equal)

For RHS, the hypotenuse of each triangle must also be equal. Thus, PR = FE is required.

2. (a) In ΔLMN and ΔRQP

$\angle M = \angle Q = 90°$ (right angles)

Hypotenuse LN = Hypotenuse RP (equal, marked)

LM = RQ (one leg, equal, marked)

Thus, $\Delta LMN = \Delta RQP$ (by RHS congruence rule).

(b) In ΔABC and ΔEFD corresponding sides are not equal.

So, ΔABC and ΔEFD are not congruent.

(c) In ΔPQR and ΔYZX

$\angle P = \angle Y = 90º$

PR = XY

QR = XZ (hypotenuse)

So, $\Delta PQR \cong \Delta YZX$

(d) Not congruent

(e) In ΔPQR and ΔDRQ.

PQ = DR (given)

$\angle P = \angle D = 90º$

QR = QR (hypotenuse)

Thus, $\Delta PQR \cong \Delta DRC$

(f) In ΔOAC and ΔOBD

OA = OB (given)

OC = OD (hypotenuse)

∠A = ∠B (90°)

So, ΔOAC ≅ Δ OBD

3. OC is perpendicular to AB.

∴ ∠OCA = 90° = ∠OCB

OA = OB (Radius of a circle)

Also hypotenuse

DC = OC (Common)

∴ Δ OAC ≅ ΔOBC.

4. (a) The third pair of corresponding parts for ΔABC ≅ ΔADC by RHS:

Since AB ⊥ BC, ∠ABC = 90°. Since AD ⊥ CD, ∠ADC = 90°.

So both ΔABC and ΔADC are right triangles.

For RHS congruence:

Right angles: ∠ABC = ∠ADC = 90°

One side: AB = AD (given)

The remaining pair is the hypotenuse: AC = AC (common side, hypotenuse of both triangles).

Thus, the third pair of corresponding parts is AC = AC (common hypotenuse).

(b) Since ΔABC ≅ ΔADC by RHS congruence rule (∠B = ∠D = 90°, AB = AD, AC = AC), BC and DC are corresponding sides of the two congruent triangles.

Thus, BC = DC, by CPCT (Corresponding Parts of Congruent Triangles).

5. BD and CE are altitudes of ΔABC such that BD = CE.

(a) State three pairs of equal parts in ΔCBD and ΔBCE:

BD and CE are altitudes, so ∠BDC = 90° and ∠CEB = 90°.

∠BDC = ∠CEB = 90° (right angles, altitudes) first pair

BD = CE (given) — second pair

BC BC (common side, hypotenuse of both right triangles) — third pair

Thus, the three pairs are: ∠D = ∠E (90°), BD = CE, BC = BC.

(b) In ΔCBD and ΔBCE:

∠BDC = ∠CEB = 90° (right angles)

Hypotenuse BC = BC (common)

One leg BD = CE (given)

Both conditions of RHS congruence are satisfied.

Thus, ΔCBD = ΔBCE by RHS congruence rule.

(c) Is ∠DCB = ∠EBC? Why or why not?

Since ΔCBD ≅ ΔBCE (proved above), their corresponding parts are equal.

∠DCB in ΔCBD corresponds to ∠EBC in ΔBCE.

Thus, ∠DCB = ∠EBC, by CPCT (Corresponding Parts of Congruent Triangles).

6. Let the vertical angle (the angle between the two equal sides) = $x°$.

The two base angles are equal in an isosceles triangle.

Given: each base angle = $4x°$.

By the angle sum property of a triangle:

$x + 4x + 4x = 180°$

$9x = 180°$

$x = 20°$

Vertical angle = $x = 20°$

Each base angle = $4x = 4 \times 20° = 80°$

Verification: 20° + 80° + 80° = 180°

Thus, the three angles of the triangle are 20°, 80°, and 80°.

Chapter Innings

A. Multiple Choice Questions

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

6. (b)

B. Fill in the Blanks

1. ∠R = ∠X **2.** QR = ZX

3. ∠P = ∠Y **4.** QP = ZY

5. ∠Q = ∠Z **6.** RP = XY

C. True or False

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

6. True

D. Very Short Answer Type Questions

1. Not congruent because corresponding sides are not equal.

2. Since ΔPQR ≅ ΔSTU, P↔S, Q↔T, R↔U. So ∠Q = ∠T = 60°, thus x = ∠U = ∠R = 30°. And y = ∠S = ∠P = 180° – 60° – 30° 90°. Thus, x = 30° and y = 90°.

3. In the following figure, show that ΔPSQ and ΔPSR

In ΔPSQ and ΔPSR.

PQ = PR (hypotenuse) given

∠PSQ = ∠PSR = 90º,

PS = PS (common)

∴ Δ PSQ ≅ Δ PSR.

4. No equilateral triangles have all angles equal to 60°, but their sides may differ in length, so they need not be congruent.

5. Under ABC ↔ RQP: A ↔ R, B ↔ Q, C ↔ P. (a) CB (b) ∠B (c) AC

E. Short Answer Type Questions

1. (a) In ΔNQR and ΔMRQ: NQ = MR (each = $\frac{PQ}{2} = \frac{PR}{2}$, since N and M are midpoints and PQ = PR), ∠NQR = ∠MRQ (angles opposite equal sides PQ = PR), QR = RQ (common). By SAS, ΔNQR ≅ ΔMRQ.

(b) QM = RN (by CPCT from part (a).

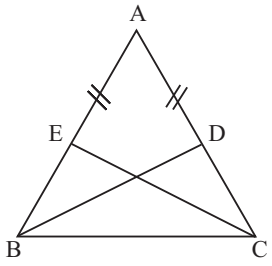
(c) In APMQ and APNR: PM = PN (each = half of PR and PQ respectively, and PQ = PR), PQ = PR (given), ∠P = ∠P (common). By SAS, ΔPMQ ≅ ΔPNR.

2. In ΔQPR and ΔBCA (Q↔B, P↔C, R↔A): QP = BC (PQ = CB, given), ∠P = ∠C (given, included angle), PR = CA (PA = CR, given). Thus ΔQPR ≅ ΔBCA by SAS rule.

3. In ΔABC and ΔEOD (A↔E, B↔O, C↔D): ∠B = 20 = 90°, AB = EO (equal legs), AC = ED (hypotenuse). Thus ΔABC ≅ ΔEOD by RHS rule.

4. Since ΔBAC ≅ AQRP (B↔Q, A↔R, C↔P): Equating included angles: $2x + 15 = 5x - 60 = 3x = 75$, so $x = 25$. Equating corresponding sides: $3x + 10 = 5y + 15 = 3(25) + 10 = 5y + 15 = 85 = 5y + 15y = 14$. Thus, $x = 25$ and $y = 14$.

5. In ΔABD and ΔACE (BD ⊥ AC, CE ⊥ AB): ∠ADB = ∠AEC = 90°, AB = AC (given, isosceles), ∠A = ∠A (common). By AAS, ΔABD ≅ ΔACE, Thus BD = CE (CPCT).



Hence, altitudes drawn to equal sides are equal.

F. Long Answer Type Questions

1. Since ΔQPS ≅ ΔSRQ (Q↔S, P↔R, S↔Q), ∠PQS = ∠RSQ and ∠PSQ = ∠RQS (CPCT).

(a) ΔQPS = ΔSRQ

∴ corresponding angles are equal.

$$\angle P = \angle R$$

$$\therefore \quad 3x + 12 = 106$$

$$3x = 106 - 12$$

$$x = 94$$

$$x = 47^\circ$$

(b) ∠PQS = 180° – (2 × 47 + 12)° – 42° = 180° – 106° – 42° = 32°. Thus, ∠PQS = 32°. (c) ∠QSR = ∠PQS = 32° (CPCT). So ∠PSR = ∠PSQ + ∠QSR = 42° + 32° = 74°. Thus, ∠PSR = 74°.

2. (a) SSS: (i) AR = PE (ii) RT = EN (iii) AT = PN. (b) SAS (∠T = ∠N,given); (i) RT = EN (ii) PN = AT. (c) ASA (AT = PN given): (i) ∠RAT = ∠EPN (ii) ∠ATR = ∠PNE.

3. (a) PM = QM—Given.

(b) ∠PMA = ∠QMA—Given. (c) AM = AM —Common side. (d) ΔAMP ≅ ΔAMQ — SAS congruence rule.

4. AAA condition does not guarantee congruence—two triangles can have the same angles but different side lengths (similar, not congruent). Thus, the student's claim is not justified.

5. In ΔACD and ΔABE: AC = AB (given, isosceles), AD = AE (since AD = AB + BD = AC + CE = AE, as BD = CE), ∠A = ∠A (common). By SAS, ΔACD ≅ ΔABE. Thus CD = BE (CPCT), i.e., BE = CD.

G. Assertion-Reason Questions

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

H. Case Study

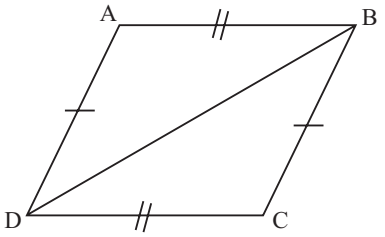
1. We know that opposite sides and angles of parallelogram are equal.

∴ In ΔABD and ΔCDB,

AB = DC

(opposite side of parallelogram)

BD = BD (Common)



Thus, ΔABD ≅ Δ CDB by SSS rule.

2. ΔAPD ≅ ΔBCQ (by RHS congruence rule)

3. $15\sqrt{3}$ m

2. Operations with Integers

Class Work 2.1

1. Using P = $a + b$: 5 = (–4) + b b = 5 + 49 Thus, the second movement is 9 units.

2. Movements in order: 1, –2, 3, 4, 5, –6, 7, –8, 9, –10 = (1 – 2) + (3 – 4) + (5 – 6) + (7 – 8) + (9 – 10) = (–1) + (–1) + (–1) + (–1) + (–1) = –5 Thus, the final position of the coin is –5.

NCERT Exercise 2.1

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)

Practice Exercise 2.1

1. (a) (–5) + (–9) = –14. Thus, one such pair is (–5, –9). (b) 9 + (–9) = 0. Thus, one such pair is (9, –9). (c) (–4) + (–5) = –9, which is smaller than both –4 and –5. Thus, one such

pair is (–4, –5). (d) 4 + 5 = 9, which is greater than both 4 and 5. Thus, one such pair is (4, 5).

2. (a) 4 – 5 = –1. Thus, one such pair is (4, 5). (b) 6 – 6 = 0. Thus, one such pair is (6, 6). (c) (–4) – (–5) = 1, which is greater than both –4 and –5. Thus, one such pair is (–4, –5). (d) 4 – 7 = –3, which is smaller than both 4 and 7. Thus, one such pair is (4, 7). (e) 5 – 1 = 4, which is greater than only 1. Thus, one such pair is (5, 1).

3. (a) (–5) + 2 = –3. Thus, one such pair is (–5, 2). (b) (–9) – (–4) = –5. Thus, one such pair is (–9, –4). (c) (–7) – (–9) = 2. Thus, one such pair is (–7, –9). (d) (–10) + 10 = 0. Thus, one such pair is (–10, 10).

4. (a) (–2) – (–10) = 8; both are negative integers. Thus, one such pair is (–2, –10). (b) (–6) + 1 = –5. Thus, one such pair is (–6, 1). (c) (–1) – 2 = –3. Thus, one such pair is (–1, 2).

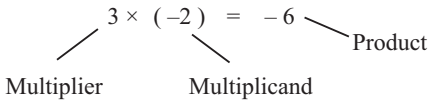
5. Team A: (–50) + 20 + 0 = –30 Team B: 20 + 0 + (–50) = –30 Both teams scored the same, i.e., –30. Thus, yes, we can add integers in any order (commutative property holds).

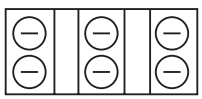
6. (a) 17+ 23 = 40. (b) (–10) + 3 = –7. (c) (–75) + 18 = –57. (d) 19 + (–25) = –6. (e) 27 + (–27) = 0. (f) (–20) + 0 = –20. (g) (–35) + (–10) = –45. (h) 7 – 9 = –2. (i) 17 – (–21) = 17 + 21 = 38. (j) (–8) – (–14) = –8 + 14 = 6. (k) (–21) – (–10) = –21 + 10 = –11. (l) 32 – (–17) = 32 + 17 = 49, (m) (–18) – (–18) = 0. (n) (–29) – 0 = –29.

NCERT Exercise 2.2

1. (a) 3 × (–2) = – 6

Placing 2 negatives into an empty bag 3 times i.e.,

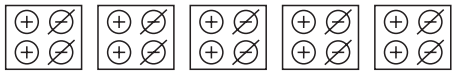




(There are now 6 negatives in the bag)

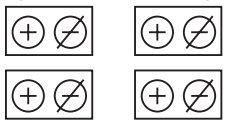
(b) (–5) × (–2) = 10

Remove 2 negatives from the bag 5 times



(c) (–4) × (–1)

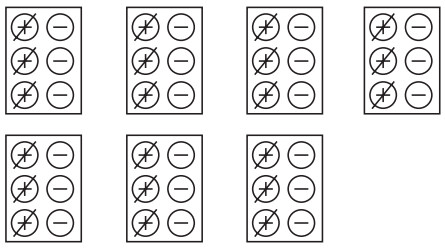
Remove 1 negative from the bag 4 times



∴ (–4) × (–1) = 4

(d) (–7) × 3

Remove 3 positive from the bag 7 times



∴ (–7) × 3 = –21

2. Given that 123 × 456 = 56088

(a) We know that –ve × +ve = –ve

∴ (–123) × 456 = –56088

(b) We know that –ve × –ve = +ve

∴ (–123) × (–456) = 56088

(c) We know that +ve × –ve = –ve

∴ (123) × (– 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.

(+) × (+) = + (–) × (–) = +

(+) × (–) = – (–) × (+) = –

Here, 4 × (–2) = –8, 4 × (–2 – 2 + 2) = –8 and 4 × (– 4 – 2 + 4) = –8

4. (a) 4 × (–3) = – (4 × 3) = –12

(b) (–6) × (–3) = + (6 × 3) = 18

(c) (–5) × (–1) = + (5 × 1) = 5

(d) (–8) × (4) = –(8 × 4) = –32

(e) (–9) × 10 = –(9 × 10) = –90

(f) 10 × (–17) = (10 × 17) = –170

Practice Exercise 2.2

1. (a) $4 \times (-8) = -(4 \times 8) = -32$. Thus, $4 \times (-8) = -32$.

(b) $8 \times (-2) = -(8 \times 2) = -16$. Thus, $8 \times (-2) = -16$.

(c) $8 \times (-7) = -(8 \times 7) = -56$. Thus, $8 \times (-7) = -56$.

(d) $10 \times (-1) = -(10 \times 1) = -10$. Thus, $10 \times (-1) = -10$.

(e) $6 \times (-19) = -(6 \times 19) = -114$. Thus, $6 \times (-19) = -114$.

(f) $12 \times (-32) = -(12 \times 32) = -384$. Thus, $12 \times (-32) = -384$.

(g) $7 \times (-22) = -(7 \times 22) = -154$. Thus, $7 \times (-22) = -154$.

(h) $15 \times (-16) = -(15 \times 16) = -240$. Thus, $15 \times (-16) = -240$.

2. (a) $21 \times (-32) = -(21 \times 32) = -672$. Thus, $21 \times (-32) = -672$.

(b) $(-42) \times 12 = -(42 \times 12) = -504$. Thus, $(-42) \times 12 = -504$.

(c) $(-55) \times 15 = -(55 \times 15) = -825$. Thus, $(-55) \times 15 = -825$.

(d) $(-31) \times (-100) = 31 \times 100 = 3100$. Thus, $(-31) \times (-100) = 3100$.

(e) $(-25) \times (-72) = 25 \times 72 = 1800$. Thus, $(-25) \times (-72) = 1800$.

(g) $(-83) \times (-28) = 83 \times 28 = 2324$. Thus, $(-83) \times (-28) = 2324$.

3. (a) $3 \times (-1) = -3$. Thus, $3 \times (-1) = -3$.

(b) $(-1) \times 225 = -225$. Thus, $(-1) \times 225 = -225$.

(c) $(-21) \times (-30) = 21 \times 30 = 630$. Thus, $(-21) \times (-30) = 630$.

(d) $(-316) \times (-1) = 316$. Thus, $(-316) \times (-1) = 316$.

NCERT Exercise 2.3

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 x 10 hrs = 50°C

Initially room temperature was 32°C

Final room temperature.

= 32°C – 50°C = –18°C

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

∴ Profit on 3,000 white cement bags

= ₹ 3,000 × ₹ 8 = ₹ 24,000

Loss on 1 grey cement bag = ₹ 5

∴ 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) $x \div (-8) = 7$

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

$x = 7$

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

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

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

Practice Exercise 2.3

1. (a) (–45) ÷ (-9) = 45 ÷ 9 = 5. Thus, (–45) ÷ (–9) = 5.

(b) 200 ÷ (–25) = –(200 ÷ 25) = –8. Thus, 200 ÷ (–25) = –8.

(c) (–210) ÷ 21 = –(210 ÷ 21) = –10. Thus, (–210) ÷ 21 = –10.

(d) (–49) ÷ 49 = –(49 ÷ 49) = –1. Thus, (–49) ÷ 49 = –1

(e) 0 ÷ (–18) = 0. Thus, 0 ÷ (–18) = 0.

(f) (–784) ÷ (–56) = 784 ÷ 56 = 14. Thus, (–784) ÷ (–56) = 14.

2. (a) 345 ÷ 345 = 1. Thus, the blank is 345.

(b) (–75) ÷ 75 = –1. Thus, the blank is 75.

(c) (–217) + (–217) = 1. Thus, the blank is –217.

(d) (–63) ÷ (–1) = 63. Thus, the blank is –1.

(e) (–124) ÷ (–31) = 4. Thus, the blank is –124.

(f) (–88) ÷ 22 = –4. Thus, the blank is 22.

3. (a) 18 = [(–2) + 1] = 18 ÷ (–1) = –18. Thus, 18 ÷ [(–2) + 1] = –18.

(b) (–47) ÷ [(–45) + (–2)] = (–47) ÷ (–47) = 1. Thus, (–47) ÷ [(–45) + (–2)] = 1.

(c) [(–9) + 7] ÷ [(–3) + 1] = (–2) ÷ (–2) = 1. Thus, [(–9) + 7] + [(–3) + 1] + 1.

(d) [(–88) ÷ (–4)] ÷ (–2) = 22 ÷ (–2) = –11. Thus, [(–88) ÷ (–4)] ÷ (–2) = –11.

4. (–6, 2), (12, –4), (–12, 4,), (9, –3), (–9, 3). There could be many such pairs.

5. Temperature at 12 noon = 10°C. It decreases at 2°C per hour. Time to reach –8°C: 10 + (–2) t = –8 (–2) × t = –18 t = 9 hours 12 noon +9 hours = 9 pm. Temperature at midnight (12 hours after noon): = 10 + (–2) × 12 = 10 – 24 = –14°C. Thus, the temperature will be –8°C at 9 pm, and at midnight it will be –14°C.

6. Descent rate = 6 m/min. Starting point = 10 m above ground = +10. Target = –350 m. Total distance to cover = 10 + 350 = 360 m. Time = 360 ÷ 6 = 60 minutes = 1 hour. Thus, the elevator will take 1 hour to reach –350 m.

NCERT Exercise 2.4

1. (a) (–5) × [18 + (–3)]

= –5 × 18 + (–5) × (–3) = –90 + 15 = –75

(b) (–7) × 4 × (–1) = [(–7) × 4] × (–1)

= (–28) × (–1) = 28

(c) [(–2) × (–1)] × [(–5) × (–3)]

= 2 × (–5) × (–3) = 2 × 15 = 30

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

(b) 84 ÷ (–4) = 84 × $\frac{1}{-4}$ = $-\left(\frac{84}{4}\right)$ = –21

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

3. (a) (–1) × (–27) = 27

(b) (–1) × (31) = –31

(c) (–1) × (1) = –1

(d) (–1) × (–1) = 1

(e) (–1) × 0 = 0

4. –47 + 56 – 14 + 8 – 2 + 8 – 5

= –(47 – 56 + 14 – 8 + 2 – 8 + 5) = (–4)

= – 4

5. The starting number –21 (odd)

then [(–21) × (–3)] + 1 = 63 + 1 = 64 (even)

64 ÷ 2 = 32 (even)

32 ÷ 2 = 16 (even)

16 ÷ 2 = 8 (even)

8 ÷ 2 = 4 (even)

4 ÷ 2 = 2 (even)

2 ÷ 2 = 1 (odd)

Now, –21, 64, 32, 16, 8, 4, 2, 1

Now for the starting number –6 (even)

–6 ÷ 2 = –3 (odd)

[(–3) × (–3)] + 1 = 9 + 1 = 10 (even)

10 ÷ 2 = 5 (odd)

[5 × (–3)] + 1 = –14 (even)

–14 ÷ 2 = –7 (odd)

[(–7) × (–3)] + 1 = 22 (even)

22 ÷ 2 = 11 (odd)

Hence the sequence is –6, –3, 10, 5, –14, –7, 22, 11 → – 32 → 16 → – 8 → – 4 → – 2 → – 174 → 2 → 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

(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

7. Operation done by machine is (I^{st} no.) – (II^{nd} no. × III^{rd} no.]

1^{st} Row $4 - 18 \times (-3)] = 4 - (-24) = 28$

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 $7 - 1 - 4 \times (-6)] = 7 - (24)$

$= 7 - 24 - 17$

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

$\therefore$ Temperature drop after 4 hrs $8 - 4 \times 5$

$= 8 - 20$

$= -12$

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) $(13 - 9) \times 5 = 13 \times 5 - 9 \times 5 = 20$

(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) × (–1064) = +(348 × 1064) = 370272

(e) (348) × (–1064) = –(348 × 1064) = –370272

(f) 348 × 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) × 972 = –532656

(a) (–547) × 972 = (–548 + 1) × 972

= –548 × 972 + 972 = –532656 + 972

= –531684

(b) (–548) × 971 = – 548 × (972 – 1)

= – 548 × 972 + 548 = – 532656 + 548 = – 532108

(c) (– 547) × 971 = (– 548 + 1) × (972 – 1)

= – 548 × 972 + 548 + 972 – 1

= – 532656 + 548 + 972 – 1 = – 531137

14. Given 207 × (– 33 + 7) = – 5382

= 207 × (– 26) = – 5382

∴ – 207 × (33 – 7) = – 207 × 26 = – 5382

15. (a) Maximum possible value

(– 2) × (– 6) + 5 – 3

= 14

(b) Minimum possible value

– 6 × 5 + 3 – (– 2)

= – 25

16. (a) □ + □ × □ = – 36

5 different ways—

(i) 0 + (– 6) × (6) = – 36

(ii) 4 + (– 5) × (8) = – 36

(iii) – 4 + (– 8) × (4) = – 36

(iv) – 11 + (5) × (– 5) = – 36

(v) – 3 + (3) × (– 11) = – 36

Write (b) and (c)

Practice Exercise 2.4

1. 10 × [6 + (–2)] = 10 × 4 = 40. 10 × 6 + 10 × (–2) = 60 + (–20) = 40. Thus, yes, 10 × [6 + (–2)] = 10 × 6 + 10 × (–2).

2. (–15) × [(–7) + (–1)] = (–15) × (–8) = 120. (–15) × (–7) + (–15) × (–1) = 105 + 15 = 120.

Thus, yes, (–15) × [(–7) + (–1)] = (–15) × (–7) + (–15) × (–1).

3. (a) (–49) × 18 = (–49) × (20 – 2) = (–49) × 20 + (–49) × (–2) = –980 + 98 = –882. Thus, (–49) × 18 = –882.

(b) (–25) × (–31) = (–25) × (–30 – 1) = (–25) × (–30) + (–25) × (–1) = 750 + 25 = 775. Thus, (–25) × (–31) = 775.

(c) 70 × (–19) + (–1) × 70 = 70 × (–19) + 70 × (–1) = 70 × [(–19) + (–1)] = 70 × (–20) = – 1400.

Thus, 70 × (–19) + (–1) × 70 = –1400.

4. (a) 18 × [7 + (–3)] = 18 × 4 = 72. [18 × 7] + [18 × (–3)] = 126 + (–54) = 72. Thus, 18 × [7 + (–3)] = [18 × 7] + [18 × (–3)]. Verified.

(b) (–21) × [(–4) + (–6)] = (–21) × (–10) = 210. [(–21) × (–4)] + [(–21) × (–6)] = 84 + 126 = 210. Thus, (–21) × [(–4) + (–6)] = [(–21) × (–4)] + [(–21) × (–6)]. Verified.

5. (–1) × a = –a. Thus, (–1) × a is equal to –a.

6. (–1) × 5 = –5, (–1) × 4 = –4

(–1) × 3 = –3, (–1) × 2 = –2

(–1) × 1 = – 1, (–1) × 0 = 0

(–1) × (–1) = 1

7. (a) 13 ÷ [(–2) + 1] = 13 ÷ (–1) = –13. Thus, 13 ÷ [(–2) + 1] = –13.

(b) (–31) ÷ [(–30) + (–1)] = (–31) ÷ (–31) = 1. Thus, (–31) ÷ [(–30) + (–1)] = 1.

(c) [(–36) ÷ 12] ÷ 3 = (–3) ÷ 3 = –1. Thus, [(–36) ÷ 12] ÷ 3 = –1.

(d) [(–6) + 5] ÷ [(–2) + 1] = (–1) ÷ (–1) = 1. Thus, [(–6) + 5] + [(–2) + 1] = 1.

8. a = –144, b = 12, c = –3.

(a + b) ÷ c = (–144 + 12) ÷ (–3) = (–132) ÷ (–3) = 44.

a ÷(b + c) = (–144) ÷ (12 + (–3)) = (–144) ÷ 9 = –16. Since 44 ≠ –16,

Since 44 ≠ –16, thus (a + b) ÷ c ≠ a ÷ (b + c).

Chapter Innings

A. Multiple Choice Questions

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

B. Fill in the Blanks

1. –11 **2.** –6 **3.** 1 **4.** 87 **5.** –94 **6.** –68

C. True or False

1. True **2.** False **3.** False **4.** False **5.** True **6.** True

D. Match the following

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

E. Very Short Answer Type Questions

1. (a) (–8) × (–5) + (–6) = 40 – 6 = 34.

(b) [(–6) × (–3)] + (–4) = 18 – 4 = 14.

(c) (–10) × [(–13) + (–10)] = (–10) × (–23) = 230.

(d) 5

2. (–7) × 4 = –28, (–7) × 3 = –21. (–7) × 2 = –14, (–7) × 1 = –7, (–7) × 0 = 0, (–7) × (–1) = 7, (–7) × (–2) = 14, (–7) × (–3)= 21. Thus (–7) × (–3) = 21.

3. (a) –15 (b) –16

4. (–3, 1), (9, –3), (6, –2), (–24, 8). (18, –6)

5. (a) (–15) × 8 + (–15) × 4 = (–15) × (8 + 4) = (–15) × 12 = –180. (b) [32 + 2 × 17 + (–6)] + 15 = [32 + 34 – 6] ÷ 15 = 60 ÷ 15 = 4.

F. Short Answer Type Questions

1. (a) 26 × (–48) + (–48) × (–36) = (–48) × (26 – 36) = (–48) × (–10) = 480.

(b) – 5 + 1, 8 × 53 × (–125) = (–1000) × 53 = –53000.

(c) 15 × (–25) × (–4) × (–10) = 1500 × (–10) = –15000.

(d) (–41) × 102 = (–41) × (100 + 2) = –4100 – 82 – 4182.

(e) 62500.

(f) 336.

(g) (–17) × (–29) = 17 × 29 = 493.

(h) (–53) × (–19) + 53 = 53 × (19 + 1) = 53 × 20 = 1060. L

2. (a) LHS: 12 ÷ (–4 + 2) = 12 ÷ (–2) = –6. RHS: (12 ÷ (–4)) + (12 ÷ 2) = –3 + 6 = 3. Since –6 ≠ 3, verified.

(b) LHS: (–10) ÷ (1 + 1) = –5. RHS: (–10 ÷ 1) + (–10 ÷ 1) = –20. Since –5 –20, verified.

3. (a) (–9) × 0 × 83 × (–83) = 0. (b) 432 × 761 – 432 × 762 = 432 × (761 – 762)) = 432 × (–1) = –432. (c) 1957 × 39 – (–1957) = 1957 × (39 + 1) = 1957 × 40 = 78280, (d) –5 × [32 × (–36) + 32] = –5 × [–1152 + 32] = (–5) × (–1120) = 5600

4. (a) positive (b) positive (c) negative (d) positive

5. No—[(–45) + (–15)] ÷ (–3) = 3 ÷ (–3) = –1, but (–45) ÷ [(–15) + (–3)] = (–45) ÷ 5 = –9. Since –1 ≠ –9, division is not associative.

G. Long Answer Type Questions

1. (a) Correct answers = 9, incorrect = 15 – 9 = 6. Score = 9 × 4 + 6 × (–2) = 36 – 12 = 24. Thus total score = 24. (b) Correct = 5, incorrect = 15 – 5 = 10. Score = 5 × 4 + 10 × (–2) = 20 – 20 = 0. Thus total score = 0.

2. (a) Distance descended = 5 × 60 = 300 m. Position = –300 m. Thus elevator is 300 m below starting position. (b) Descent = 5 × 45 = 225 m. New position = 15 – 225 = –210 m. Thus elevator is 210 m below ground level.

3. (a) [(–30) – (18)] ÷ [19 + (–13)] = (–48) ÷ (6) = –8. (b) [90 + (–5)] + [(–81) + (–9)] = (–18) ÷ 9 = –2. (c) [400 × (–20)] + [(–250) × (–8)] = (–8000) ÷ 2000 = –4. (d) [–155 + (–100)] ÷ [(–300) + 45] = (–255) ÷ (–255) = 1.

H. Assertion Reason Questions

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

I. Case Study

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

3. Finding Common Ground

Class Work 3.1

1. 14 = 2 × 7,30 = 2 × 3 × 5; HCF = 2. Thus, the longest jump size is 2.

2. 7 and 11 are both prime numbers with no common factor other than 1; HCF = 1. Thus, the longest jump size is 1.

3. 30 = 2 × 3 × 5, 50 = 2 × 5^2; HCF = 2 × 5 = 10. Thus, the longest jump size is 10.

4. 28 = 22 × 7, 42 = 2 × 3 × 7; HCF = 2 × 7 = 14. Thus, the longest jump size is 14.

Yes, the longest jump size is always the same as the HCF of the two numbers.

NCERT Exercise 3.1

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.

2. (a) ∴ 50 = 2 × 5 × 5

60 = 2 × 2 × 3 × 5

∴Common Factors of 50, and 60 are 2, 5

HCF = 10

(b) ∴ 140 × 2 × 2 × 5 × 7

275 = 5 × 5 × 11

∴ Common factors of 140 and 275 = 5

HCF (140, 275) = 5

(c) 77 = 7 × 11

725 = 5 × 5 × 29

∴ Common factor = 1

HCF (77, 725) = 1

(d) 370 = 2 × 5 × 37

and 592 = 2 × 2 × 2 × 2 × 37

∴ Common factors = 2, 37

HCF (370, 592) = 2 × 37 = 74

(e) 81 = 3 × 3 × 3 × 3

243 = 3 × 3 × 3 × 3 × 3

∴ Common factors = 3 × 3 × 3 × 3

HCF (81, 243) = 3 × 3 × 3 × 3 = 81

3. (a) 24 = 2 × 2 × 2 × 3

180 = 2 × 2 × 3 × 3 × 5

∴ 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

∴ HCF = (240, 378) = 2 × 3 = 6

(d) 400 = 2 × 2 × 2 × 2 × 5 × 5

2500 = 2 × 2 × 5 × 5 × 5 × 5

∴ 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

4. No, we 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

Practice Exercise 3.1

1. (a) 1, 5, 25 (b) 1, 2, 3, 4, 6, 9, 12, 18, 36 (c) 1, 2, 3, 4, 6, 8, 9, 12, 16, 18, 24, 36, 48, 72, 144 (d) 1, 3, 9, 27, 81, 243, 729

2. (a) $48 = 2^4 \times 3$ (b) $136 = 2^3 \times 17$ (c) $637 = 7^2 \times 13$ (d) $945 = 3^3 \times 5 \times 7$ (e) $1224 = 2^3 \times 3^2 \times 17$ (f) $1323 = 3^3 \times 7^2$

3. (a) Common factors of 12, 16 = 1, 2, 4; HCF = 4 (b) Common factors of 16, 24= 1, 2, 4, 8; HCF = 8 (c) Common factors of 36, 60 = 1, 2, 3, 4, 6, 12; HCF = 12 (d) Common factors of 40, 48 = 1, 2, 4, 8; HCF = 8

4. (a) $289 = 17^2$, 391 = 17 × 23; HCF = 17 (b) $144 = 2^4 \times 3^2$, $252 = 2^2 \times 3^2 \times 7$. 630 = 2 × 3^2 × 5 × 7; HCF = 2 × 3^2 = 18 (c) $625 = 5^4$, $3125 = 5^5$, $15625 = 5^6$; HCF = 5^4 = 625

5. 398 – 7 = 391 = 17 × 23. 436 – 11 = 425 5^2 × 17, 542 – 15 = 527 = 17 × 31; HCF of 391, 425 and 527 = 17. Thus, the largest required number is 17.

6. HCF of any two consecutive numbers is always 1, since consecutive numbers share no common factor other than 1.

7. Width = 735 cm = 3 × 5 × 7^2, Length = 1155 cm = 3 × 5 × 7 × 11; HCF = 3 × 5 × 7 = 105 cm. Thus, the length of the largest tile is 1 m 5 cm.

8. (a) HCF of 161 and 207 = 23; $\frac{161}{207} = \frac{7}{9}$

(b) HCF of 517 and 799 = 47; $\frac{517}{799} = \frac{11}{17}$

Class Work 3.2

1. Aliya visits every 10 days; Monday comes every 7 days; LCM of 10 and 7 = 70. Thus, the next time she will get free gajak is on the 70th day from today.

2. (a) LCM of 4 and 6 = 12 (b) LCM of 7 and 11 = 77 (c) LCM of 14 and 30 = 210 (d) LCM of 15 and 55 = 165. Yes, the answer is always the LCM of the two numbers, because the LCM is the smallest number that is a multiple of both numbers, which is exactly when both 'idli' and 'vada' are called out together.

3. (a) $90 = 2 \times 3^2 \times 5$, $150 = 2 \times 3 \times 5^2$; LCM $= 2 \times 3^2 \times 5^2 = 450$ (b) $84 = 2^2 \times 3 \times 7$, $132 = 2^2 \times 3 \times 11$; LCM $= 2^2 \times 3 \times 7 \times 11 = 924$. Thus, LCM of 90 and 150 is 450 and LCM of 84 and 132 is 924.

NCERT Exercise 3.2

1. (a) By Prime Factorisation.

$30 = 2 \times 3 \times 5$; $72 = 2 \times 2 \times 2 \times 3 \times 3$

$\therefore$ 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) $= 2 \times 3 \times 5 \times 37 = 1110$

2. (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.

3. (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.

4. (a) Two multiples of 3 e.g.
(i) (6, 9) LCM (6, 9) = 2 × 3 × 3 = 18
(ii) 9, 12 9 = 3 × 3; 12 = 2 × 2 × 3
LCM = 2 × 2 × 3 × 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 × 1; 4 = 2 × 2
LCM (2, 4) = 4
(ii) 6, 8 6 = 2 × 3; 8 = 2 × 2 × 2
LCM = 2 × 2 × 2 × 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.

Practice Exercise 3.2

1. (a) 12, 24, 36 (b) 40, 80, 120 (c) 30, 60, 90 (d) 36, 72, 108

2. (a) 18 = 2×3^2, 777 × 11; LCM = $2 \times 3^2 \times 7 \times 11 = 1386$ (b) 88 = $2^3 \times 11$, 120 = $2^3 \times 3 \times 5$; LCM = $2^3 \times 3 \times 5 \times 11 = 1320$ (c) 150 = $2 \times 3 \times 5^2$, 180 = $2^2 \times 3^2 \times 5$; LCM = $2^2 \times 3^2 \times 5^2 = 900$ (d) 396 = $2^2 \times 3^2 \times 11$, 720 = $2^4 \times 3^2 \times 5$. 1080 = $2^3 \times 3^3 \times 5$; LCM = $2^4 \times 3^3 \times 5 \times 11 = 23760$ (e) 1440 = $2^5 \times 3^2 \times 5$, 1800 = $2^3 \times 3^2 \times 5^2$, 1920 = $2^7 \times 3 \times 5$; LCM = $2^7 \times 32 \times 5^2 = 28800$ (f) 1102 = 2 × 19 × 29, 1421 = $7^2 \times 29$, 2436 = $2^2 \times 3 \times 7 \times 29$; LCM = $2^2 \times 3 \times 7^2 \times 19 \times 29 = 323988$

3. (a) LCM of 320, 480 = $2^6 \times 3 \times 5 = 960$ (b) LCM of 108, 135, 162 = $2^2 \times 3^4 \times 5 = 1620$ (c) LCM of 112, 140, 168 = $2^4 \times 3 \times 5 \times 7 = 1680$ (d) LCM of 240, 420, 660 = $2^4 \times 3 \times 5 \times 7 \times 11 = 18480$ (e) LCM of 108, 96, 72, 54, 36 = $2^5 \times 3^3 = 864$ (f) LCM of 243, 351, 432, 486 = $2^4 \times 3^5 \times 13 = 50544$

4. LCM of 16, 28, 40, 77 = $2^4 \times 5 \times 7 \times 11 = 6160$; required number = 6160 + 9 = 6169. Thus, the lowest natural number is 6169.

5. LCM of 10, 15, 20 = $2^2 \times 3 \times 5 = 60$; required number = 60 + 2 = 62. Thus, the least number of apples in the heap is 62.

6. LCM of 3, 7, 12, 14 = $2^2 \times 3 \times 7 = 84$ seconds = 1 minute 24 seconds; 14 minutes = 840 seconds; $\frac{840}{84}$ = 10 times. Thus, the four bells next toll together **1 minute 24 seconds**

past 12 o'clock and will do so **10 times** in 14 minutes.

7. LCM of 32, 36, 45 = $2^5 \times 3^2 \times 5 = 1440$; smallest 5-digit number = 10000; $\frac{10000}{1440}$ gives remainder 1360; next multiple = $7 \times 1440 = 10080$. Thus, the least 5-digit number exactly divisible is 10080.

Class Work 3.3

1. (a) $18 \times 10 = 180$, $18 \times 15 = 270$; $180 = 2^2 \times 3^2 \times 5$, $270 = 2 \times 3^3 \times 5$; HCF = $2 \times 3^2 \times 5 = 90$

(b) $10 \times 38 = 380$, $10 \times 21 = 210$; $380 = 2^2 \times 5 \times 19$, $210 = 2 \times 3 \times 5 \times 7$; HCF = $2 \times 5 = 10$

(c) $5 \times 13 = 65$, $5 \times 20 = 100$; $65 = 5 \times 13$, $100 = 2^2 \times 5^2$; HCF = 5 (d) $12 \times 16 = 192$, $12 \times 20 = 240$; $192 = 2^6 \times 3$, $240 = 2^4 \times 3 \times 5$; HCF = $2^4 \times 3 = 48$

2. (a) $45 \times 105 = 4725$; LCM = 315; $\frac{4725}{315} = 15$. Yes, LCM × 15 = product.

(b) $275 \times 352 = 96800$; LCM = 8800; $\frac{96800}{8800} = 11$. Yes, LCM × 11 = product.

(c) $105 \times 95 = 9975$; LCM = 1995; $\frac{9975}{1995} = 5$. Yes, LCM × 5 = product.

(d) $222 \times 370 = 82140$; LCM = 1110; $\frac{82140}{111074}$. Yes, LCM × 74 = product. Pattern:

In each case, the number by which LCM is multiplied to get the product is actually the HCF of the two numbers.

3. The product of two numbers is always greater than or equal to their LCM. Thus, Product of the numbers > LCM.

NCERT Exercise 3.3

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.

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 = $3 \times 7 = 21$
LCM = $3 \times 3 \times 5 \times 7 \times 7 \times 2 \times 2 \times 11 = 97{,}020$
(b) $45 = 3 \times 3 \times 5$; $36 = 2 \times 2 \times 3 \times 3$
$\therefore$ HCF = $3 \times 3 = 9$
LCM = $3 \times 3 \times 5 \times 2 \times 2 = 180$

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 = $2 \times 3 = 6$ cm
Required cubes are (b), (d) and (e).

7. For required number we have to find HCF (306, 36)

$\therefore$ 306 = 2 × 3 × 3 × 17

36 = 2 × 2 × 3 × 3

HCF = 2 × 3 × 3 = 18 (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

$\therefore$ 2K = 10 $\Rightarrow$ K = 5

Thus required number = 420 K

= 420 × 5 = 2100

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. Thus, answer is (f).

10. LCM is always greater 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

$\therefore$ 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 Exercise 3.3

1. LCM of 4, 6, 9 = 22 × 32 = 36. Thus, all three rows show Blue together again at position 36.

2. (a) HCF × LCM = product of numbers; 6 × LCM = 1296; LCM = $\frac{1296}{6}$ = 216. Thus, LCM = 216. (b) HCF × LCM = first number × second number; 1296 = 36 × other number; other number = $\frac{1296}{36}$ = 36. Thus, the other number is 36.

3. HCF × LCM = first number × second number; 7 × 210 = 42 × other number; other number = $\frac{1470}{42}$ = 35. Thus, the other number is 35.

4. LCM of 4, 6, 9 = $2^2 \times 3^2$ = 36.. Thus, the least number of sheep is 36.

5. LCM of 12, 15, 20 = $2^2 \times 3 \times 5$ = 60; highest multiple of 60 below 300 = 4 × 60 = 240. Thus, the maximum number of pencils is 240.

6. LCM of 8, 12, 18 = $2^3 \times 3^2$ = 72; multiples of 72 between 200 and 300 are 216 and 288. Since the farmer has exactly full boxes, both are valid but Answer Key confirms 216. Thus, the farmer has 216 mangoes.

Chapter Innings

A. Multiple Choice Questions

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

6. (c)

B. Fill in the Blanks

1. 1, **2.** multiples, **3.** factors,
4. 6, **5.** 5040

C. True or False

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

D. Match the following

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

E. Very Short Answer Type Questions

1. HCF of (96-72), (120-96), (120-72) = HCF of 24, 24, 48 = 24. Thus, the greatest number is 24.

2. 36 = 22 × 32, 48 = 24 × 3, 72 = 23 × 32, HCF = 22 × 3 = 12. Thus, HCF = 12.

3. HCF of 24 and 36 = 12. Largest 3-digit multiple of 12 = 996. Thus, the required number is 996.

4. $7a + 7b = 1001$, so $a + b = 143$. Co-prime pair: (71, 72). Numbers = 7 × 71 = 497 and 7 × 72 = 504. Thus, the numbers are 504 and 497.

5. LCM of 12, 18, 24 = 23 × 32 = 72. Thus, LCM = 72.

F. Short Answer Type Questions

1. HCF × LCM = product of numbers = 12 × 360 = 4320. Co-prime pair with product 30: (3, 10). Numbers = 12 × 3 = 36 and 12 × 10 = 120. Thus, the numbers are 120 and 36.

2. LCM of 16, 24, 32 = 25 × 3 = 96. Thus, minimum units = 96.

3. Numbers = 5 × 7 = 35 and 11 × 7 = 77. Thus, the numbers are 35 and 77.

4. Lengths in cm: 450, 990, 1620. HCF = 2 × 32 × 5 = 90 cm. Thus, length of each plank = 90 cm.

5. 70 – 1 = 69 and 50 – 4 = 46. HCF of 69 and 46 = 23. Thus, the greatest required number is 23.

G. Long Answer Type Questions

1. Let numbers be 2k and 3k. HCF = k, LCM = 6k. k × 6k = 294 $6k^2 = 294$, $k^2 = 49$, k = 7. Numbers = 2 × 7 = 14 and 3 × 7 = 21. Thus, the two numbers are 14 and 21.

2. LCM of 6, 7, 8 = 168. Required number = $168n + 3$. For divisibility by 9: 168 = 6 (mod 9), so $6n + 3 = 0$ (mod 9), giving $n = 1$. Number = 168 + 3 = 171. Check: 171 ÷ 9 = 19. Thus, the required number is 171.

3. LCM of 42, 60, 78. 42 = 2 × 3 × 7, 60 = 2^2 × 3 × 5, 78 = 2 × 3 × 13. LCM = 2^2 × 3 × 5 × 7 × 13 = 5460 seconds 1 hour 31 minutes. 9 : 30 : 00 + 1 : 31 : 00 = 11 : 01 : 00 hours. Thus, they whistle together again at 11 : 01 : 00 hours.

4. HCF of 180 and 105 = 15. Size of tile = 15 m × 15 m. Number of tiles = (180 ÷ 15) × (105 ÷ 15) = 12 × 7 = 84. Thus, tile size = 15 m × 15 m and number of tiles = 84.

5. Breadths: 60 ÷ 6 = 10 m, 84 ÷ 6 = 14 m, 108 ÷ 6 18 m. HCF of 10, 14, 18 = 2. Thus, breadth of each flower bed = 2 m.

6. HCF of 182 and 247 = 13. Maximum students = 13. Chocolates per student = 182 ÷ 13 = 14.

Candies per student = 247 ÷ 13 = 19. Thus, 13 students each get 14 chocolates and 19 candies.

H. Assertion-Reason Questions

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

I. Case Study

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

4. Another Peek Beyond The Point

Class Work 4.1

1. (a) $\frac{3}{10} = 0.3$ (b) $\frac{4}{100} = 0.04$ (c) $\frac{67}{1000} = 0.067$ (d) $\frac{457}{100} = 4.57$ (e) $\frac{71}{100} = 0.71$ (f) $\frac{43}{100} = 0.43$

2. (a) $\frac{254}{1000} = \frac{200}{1000} + \frac{50}{1000} + \frac{4}{1000} = \frac{2}{10} + \frac{5}{100} + \frac{4}{1000}$

$= 0.2 + 0.05 + 0.004$ Thus, $\frac{254}{1000} = 0.254$

(b) $\frac{847}{10000} = \frac{800}{10000} + \frac{40}{10000} + \frac{7}{10000} = \frac{8}{100} + \frac{4}{1000} + \frac{7}{10000}$

$= 0.08 + 0.004 + 0.0007$ Thus, $\frac{847}{10000} = 0.0847$

(c) $\frac{173}{100} = \frac{100}{100} + \frac{70}{100} + \frac{3}{100} = 1 + \frac{7}{10} + \frac{3}{100}$

$= 1 + 0.7 + 0.03$ Thus, $\frac{173}{100} = 1.73$

(d) $\frac{23}{1000} = \frac{20}{1000} + \frac{3}{1000} = \frac{2}{100} + \frac{3}{1000} =$

$0.02 + 0.003$ Thus, $\frac{23}{1000} = 0.023$

Class Work 4.2

1. $596 \times 248 = 147808$. Total decimal places in 5.96 and 24.82 + 1 = 3. Thus, $5.96 \times 24.8 = 147.808$

2. $57 \times 1335 = 76095$. Total decimal places in 5.7 and 13.35 = 1 + 2 = 3. Thus, $5.7 \times 13.35 = 76.095$

3. $58 \times 124 = 7192$. Total decimal places in 5.8 and 1.24 = 1 + 2 = 3. Thus, $5.8 \times 1.24 = 7.192$

NCERT Exercise 4.1

1. (a) 6×4 tenths = 24 tenths

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

(c) 9×3 hundredths = 27 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 = 1·65 m

$\because$ 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= ₹ $4 \times 15{\cdot}50$

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

Cost of 1 Eraser = ₹ 2·75

$\therefore$ Cost of 3 Erasers = $3 \times$ ₹ 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

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

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

6. Price of 1 kg of oranges = ₹ 56·50

Price of 2·250 kg of oranges = ₹ $56{\cdot}50 \times 2{\cdot}250$

$= \frac{5650 \times 2250}{100 \times 1000} = \frac{127125\cancel{00}}{1000\cancel{00}}$

$= \frac{127125\cancel{00}}{1000\cancel{00}} = 127{\cdot}125$

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

then $56{\cdot}5 \times 2{\cdot}25$

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

= 127·125, Yes, 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

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

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

(f) 1.8 × 12 = 21.6

21.6 > 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

Practice Exercise 4.1

1. (a) 24 (b) 379 (c) 1357 (d) 1780.2 (e) 4130 (f) 43310 (g) 562 (h) 5306 (i) 7 (j) 0.4 (k) 80 (l) 10

2. (a) 1.8 (b) 41.4 (c) 18.6 (d) 210.7 (e) 0.2 (f) 1244.12 (g) 1.84 (h) 45.296

3. (a) 1.05 (b) 8.34 (c) 43.34 (d) 12.07 (e) 0.036 (f) 1.792 (g) 0.0327 (h) 10.8864 (i) 1.0105 (j) 440.044

4. (a) 9.09 × 0.9 × 0.09 = 8.181 × 0.09 0.73629 (b) 8.3 × 4.86 × 9.41 = 40.338 × 9.41 = 379.58058 (c) 0.726 × 0.5 × 0.03 0.363 × 0.03 0.01089 (d) 0.0843 × 5.4 × 2.36 = 0.45522 × 2.36 = 1.0743192

5. Since 6.157 × 16 = 98.512, therefore: (a) 61.57 × 16 = 985.12 (b) 615.7 × 0.16 = 98.512 (c) 61.57 × 160 = 9851.2

6. Area of floor 4.5 × 3.2 14.4 sq m. Thus, the area of the floor is 14.4 sq m.

7. Distance covered = 55.5 × 3.5 = 194.25 km. Thus, the car covers 194.25 km.

8. Cost of 2.8 m cloth = 24.75 × 2.8 = 69.30. Thus, the cost of 2.8 m cloth is ₹ 69.30.

Class work 4.3

Decimal	÷10	÷100	÷1000	÷10000
18.7	1.87	0.187	0.0187	0.00187
21.1	2.11	0.211	0.0211	0.00211
0.13	0.013	0.0013	0.00013	0.000013
214.6	21.46	2.146	0.2146	0.02146
58	5.8	0.58	0.058	0.0058

NCERT Exercise 4.2

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) $\frac{415\times25}{4\times25}=\frac{10375}{100}$

$= 103{\cdot}75$ **Verification**

H T O Tenths Hundredth

$4\overline{)415}\,(1\,0\,3\cdot\,7\quad5$

-4

15

-12

30

-28

20

-20

$\times$

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

(c) $\frac{1217\times5}{2\times5}=\frac{6085}{10}=608{\cdot}5$

Verification

H T O Tenths

$2\overline{)1217}\,(6\,0\,8\cdot\,5$

-12

017

-16

10

-10

0

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

(d) $\frac{4827\times125}{8\times125}=\frac{603375}{1000}=603{\cdot}375$

Verification

$8\overline{)4827}\,(0\,6\,0\,3\cdot3\,7\,5$

-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}

$8\overline{)3567}\,(4\,4\,5\cdot8\quad7\quad5$

-32

36

-32

47

-40

70

-64

60

-56

40

-40

$\times$

option (iii) is correct.

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

$$4\overline{)132}\,(33$$
$$-12$$
$$12$$
$$-12$$
$$0$$

∴ Quotient (Q) = 33

(b) $\frac{13{\cdot}2}{4} = \frac{132}{4\times10}$

$$40\overline{)132}\,(3\cdot3 \quad (\text{O } \text{Th}^{th})$$
$$-120$$
$$120$$
$$-120$$
$$\times$$

∴ Q = 3·3

(c) 1·32 ÷ 4

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

$$400\overline{)1320}\,(0\cdot3\;3 \quad (\text{O } \text{T}^{th} \text{ H}^{th})$$
$$-1200$$
$$1200$$
$$-1200$$
$$0$$

∴ Q = 0·33

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

$$4000\overline{)132000}\,(0\cdot0\;3\;3 \quad (\text{O } \text{T}^{th} \text{ H}^{th} \text{ Th}^{th})$$
$$12000$$
$$12000$$
$$-12000$$
$$0$$

∴ Q = 0·033

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

$$8\overline{)126}\,(15\cdot7\;5 \quad (\text{T O } \text{T}^{th} \text{ H}^{th})$$
$$-8$$
$$46$$
$$-40$$
$$60$$
$$-56$$
$$40$$
$$-40$$
$$\times$$

(b) 12·6 ÷ 8

$$8\overline{)12{\cdot}6}\,(1\cdot5\;7\;5 \quad (\text{T O } \text{T}^{th} \text{ H}^{th})$$
$$-8$$
$$46$$
$$-40$$
$$60$$
$$-56$$
$$40$$
$$-40$$
$$\times$$

(c) Similarly 1.26 ÷ 8 = 0.1575

(d) 0·126 ÷ 8 =

$$8\overline{)01{\cdot}26}\,(0\cdot0\;1\;5\;7\;5 \quad (\text{O } \text{T}^{th} \text{ H}^{th} \text{ T}^{th} \text{ TH}^{th})$$
$$-0$$
$$12$$
$$-8$$
$$46$$
$$-40$$
$$60$$
$$-56$$
$$40$$
$$-40$$
$$\times$$

(e) 0·0126 ÷ 8

$$8\overline{)0{\cdot}0126}\,(0\cdot0\;0\;1\;5\;7\;5 \quad (\text{O } \text{T}^{th} \text{ H}^{th} \text{ T}^{th} \text{ TH}^{th})$$
$$-0$$
$$00$$
$$-00$$
$$12$$
$$-8$$
$$46$$
$$-40$$
$$60$$
$$-56$$
$$40$$
$$-40$$
$$\times$$

Q = 0·001575

Practice Exercise 4.2

1. (a) 0.49 (b) 5.35 (c) 0.08 (d) 4.41 (e) 37.232 (f) 0.064 L

2. (a) 0.037 (b) 0.004 (c) 0.0092 (d) 5.323 (e) 0.438 (f) 0.6955

3. (a) 0.0069 (b) 0.0368 (c) 0.07853 (d) 0.1274 (e) 0.0002 (f) 0.00008

4. (a) 4.4 (b) 0.12 (c) 2.2 (d) 4.815 (e) 0.11 (f) 2.07 (g) 10.9 (h) 0.07

5. Cost of one radio = 21982.05 ÷ 57 = 385.65. Thus, the cost of one radio is 385.65.

6. (a) 60.48 ÷ 12 = 5.04 (b) 117.6 ÷ 21 = 5.6 (c) 217.44 ÷ 18 = 12.08 (d) 2.575 ÷ 25 = 0.103 (e) 0.768 ÷ 25 = 0.03072 (f) 0.175 ÷ 5 = 0.007

7. Average score per wicket = 321 + 15 = 21.4. Thus, the bowler's average is 21.4 runs per wicket.

8. Cost of each toy = 783.60 ÷ 24 = 32.65. Thus, the cost of each toy is ₹ 32.65.

Class Work 4.4

1. 10 ÷ 9 = 1.111... and 100 ÷ 11 = 9.0909... Both divisions never end-the digits repeat in a cycle. These are called non-terminating repeating decimals.

2. No, the quotient is not always greater than the dividend when the divisor is a decimal.

The quotient is greater than the dividend only when the divisor is less than 1. When the divisor is greater than 1 (even if it is a decimal), the quotient will be less than the dividend.

NCERT Exercise 4.3

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

(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. (a) $\frac{24{\cdot}86}{1{\cdot}2} = \frac{2486\times 10}{100\times 12} = \frac{2486}{120}$

$$\begin{array}{r|l} 120 & 2486 \\ & -240 \\ \hline & 860 \\ & -840 \\ \hline & 200 \\ & -120 \\ \hline & 800 \\ & -720 \\ \hline & 80 \end{array} \quad 20{\cdot}7166$$

Q = 20·7166...

(b) 5·728 ÷ 1·52

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

$$\begin{array}{r|l} 1520 & 5728 \\ & -4560 \\ \hline & 11680 \\ & -10640 \\ \hline & 10400 \\ & -9120 \\ \hline & 1280 \end{array} \quad 3{\cdot}76$$

$\therefore$ 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 ÷ x = 0·25

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

(b) Let 25 ÷ x = 250

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

(c) Let 25 ÷ x = 2·5

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

(d) 25 ÷ 10 = 25 × .....

Let 25 ÷ 10 = 25 × x

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

(e) Let 25 ÷ 0·10 = 25 × x

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

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

(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) $2{\cdot}46 \div 1{\cdot}5$

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

$150\overline{)246}\,(1{\cdot}64$
-150
960
-900
600
-600
$\times$

$\therefore \quad Q = 1{\cdot}64$

(b) $2{\cdot}46 \div 0{\cdot}15$

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

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

(c) $2{\cdot}46 \div 0{\cdot}015$

$= \frac{2{\cdot}46}{0{\cdot}015}$

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

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

$\therefore Q = 164$

In $24{\cdot}6 \div 1{\cdot}5$

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

and $\frac{2{\cdot}46}{0{\cdot}15} = \frac{246 \times 100}{15 \times 100} = \frac{246}{15} = 16.4$

Both have same quotient

6. Total length of wooden block = 4 m

No. of pieces = 5

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

$= \frac{4 \times 2}{5 \times 2} = \frac{8}{10} = 0{\cdot}8$ m **Ans.**

7. Perimeter of regular polygon = 208·8 cm

Number of sides = 12

Thus length of each side = $\frac{\text{Perimeter}}{\text{Number of sides}}$

$= \frac{208{\cdot}8}{12} = 17{\cdot}4$ cm

$12\overline{)208{\cdot}8}\,(17{\cdot}4$
-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

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

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

$8\overline{)3000}\,(375$
-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

∴ Distance covered by car using 1 L petrol

$= \frac{234{\cdot}45}{12{\cdot}6}$ km

$\frac{234{\cdot}45}{12{\cdot}6} = \frac{23445 \times 10}{100 \times 126}$

$= \frac{23445}{1260}$ = 18·607 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 = $\frac{13{\cdot}5}{15}$ kg = 0·9 kg

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

Ans. 0·9 kg

Practice Exercise 4.3

1. (a) 7 ÷ 3.5 = 70 ÷ 35 = 2 (b) 36 + 0.2 = 360 ÷ 2 = 180 (c) 3.25 0.5 32.5 ÷ 5 = 6.5 (d) 30.94 ÷ 0.7 = 309.4 ÷ 7 = 44.2 (e) 0.5 + 0.25 = 50 ÷ 25 = 2 (f) 7.75 ÷ 0.25 = 775 ÷ 25 = 31 (g) 76.5 ÷ 0.15 = 7650 ÷ 15 = 510 (h) 37.8 ÷ 1.4 = 378 +14=27 (i) 2.73 ÷ 1.3 = 27.3 ÷ 13 = 2.1 (j) 25.5 ÷ 0.5 = 255 ÷ 5 = 51

2. Number of sides = 12.5 ÷ 2.5 = 5. Thus, the polygon has 5 sides.

3. Distance per litre = 43.2 ÷ 2.4 = 432 ÷ 24 = 18 km. Thus, the vehicle covers 18 km in one litre.

4. Cost per litre = 1210.75 ÷ 14.5 = 12107.5 ÷ 145 = 83.5. Thus, the cost of refined oil is ₹ 83.5 per litre.

5. Other number = 38.745 ÷ 2.7 = 387.45 ÷ 27 = 14.35. Thus, the other decimal number is 14.35.

NCERT Exercise 4.4

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. 3.15, 2.16

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

6. Part (i): $6\frac{1}{4} \div 2\frac{1}{2}$

$6\frac{1}{4} = 6.25$

$2\frac{1}{2} = 2.5$

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

Part (ii): $60\frac{1}{4} \div 3\frac{1}{2}$

$60\frac{1}{4} = 60.25$

$3\frac{1}{2} = 3.5$

60.25 ÷ 3.5

= 6025 ÷ 350 (multiply both by 100)

= 17.214... ≈ 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 **Ans.**

(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	**4.1**	**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) **Ans.**

(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) **Ans.**

(c) Product greater than 150:
85.0 × 2.4 = 204.0 > 150
85.0 × 2.4 = 204 > 150 **Ans.**
(d) Product nearest to 100:
20.5 × 4.8 = 98.4 (only 1.6 less than 100)
25.8 × 4.0 = 103.2 (3.2 more than 100)
Since |98.4 – 100| = 1.6 < |103.2 – 100| = 3.2,
20.5 × 4.8 = 98.4 is nearer to 100.
20.5 × 4.8 = 98.4 (nearest to 100) **Ans.**
(e) Product nearest to 5:
5.8 × 0.4 = 2.32 → difference from 5: |5 – 2.32| = 2.68
4.0 × 0.2 = 0.80 → difference: |5 – 0.80| = 4.20
Best option: 5.8 × 0.4 = 2.32 (closest to 2 with given digits)
5.8 × 0.4 = 2.32 (nearest to 5) **Ans.**

11. Step 1 : Calculate approximate values:
(a) 245.05 × 0.942368 ≈ 230.93
[multiplier < 1 → result < 245.05]
(b) 245.05 × 7.9682 ≈ 1952.23
[multiplier > 1 → result >> 245.05]
(c) 245.05 ÷ 7.9682 ≈ 30.75
[divisor > 1 → result << 245.05]
(d) 245.05 ÷ 0.942368 ≈ 260.06 [divisor < 1 → 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 Exercise 4.4

1. Cost per gram of chocolate biscuits = 82.50 ÷ 250 0.33 per gram. Cost per gram of salted biscuits = 48.75 ÷ 150 = 0.325 per gram. Thus, salted biscuits are cheaper per gram.

2. Cost of 4 kg apples = 4 × 75 = 300. Selling price of 24 apples = 24 × 15 = 360. Profit = 360 – 300 = 60. Thus, Renu makes a profit of ₹ 60.

3. Number of books that fit = 140 ÷ 3.5 = 40 books. The librarian wanted 45 books but only 40 can fit. Space left = 140 – (40 × 3.5) = 140 – 140 = 0. Thus, 40 books can be placed on the shelf with no space left.

4. 32.87 ÷ 1.9 17.3 and 3.287 ÷ 19 = 0.173. Thus, the two are different.

5. (a) 100 (b) 1000 (c) 1525 (d) 7.89 (e) 5.04 (f) 0.001

6. The number format is 3□6□.8□□. Digits already used: 3, 6, 8. Remaining digits: 0, 1, 2, 4, 5, 7, 9 (no repetition allowed). (a) Greatest possible number = 3967.854 (b) Smallest possible number = 3061.824

7. Converting to decimals: $5\frac{3}{4}$ = 5.75, 5.721, $5\frac{7}{8}$ = 5.875, $5(\frac{17}{25})$ = 5.68, 5.693.
Thus, descending order: $5\frac{7}{8}$ > $5\frac{3}{4}$ > 5.721 > 5.693 > $5\frac{17}{25}$

Chapter Innings

A. Multiple Choice Questions

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

B. Fill in the Blanks

1. 397.872, **2.** 0.06764,
3. 0.00076845, **4.** 0.14946, **5.** 0.02

C. True or False

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

D. Match the following

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

E. Very Short Answer Type Questions

1. (a) 13 (b) 368 (c) 1537 (d) 1680.7 (e) 5 (f) 0.8

2. (a) 3110 (b) 15610 (c) 362 (d) 4307 (e) 90 (f) 2400.8

3. (a) 30 (b) 2750 (c) 40802 (d) 5002.4

4. (a) 0.48 (b) 5.25 (c) 0.07 (d) 3.31 (e) 0.078 (f) 4.326

5. (a) 0.236 (b) 0.9853 (c) 0.0263 (d) 0.03853 (e) 0.1289 (f) 0.0005

F. Short Answer Type Questions

1. (a) 8 × 4.6 = 36.8 (b) 2.71 × 5 = 13.55 (c) 20.1 × 4 = 80.4 (d) 0.05 × 7 = 0.35 (e) 211.02 × 4 = 844.08 (f) 2 × 0.86 = 1.72

2. (a) 2.5 × 0.3 = 0.75 (b) 0.1 × 51.7 = 5.17 (c) 0.2 × 316.8 = 63.36 (d) 1.3 × 3.1 = 4.03 (e) 0.5 × 0.05 = 0.025 (f) 11.2 × 0.15 = 1.68

3. (a) 1.07 × 0.02 = 0.0214 (b) 10.05 × 1.05 = 10.5525 (c) 101.01 × 0.01 = 1.0101 (d) 100.01 × 1.1 = 110.011

4. (a) 43.2 ÷ 6 = 7.2 (b) 60.48 + 12 = 5.04 (c) 117.6 ÷ 21 = 5.6 (d) 217.44 ÷ 18 = 12.08 (e) 2.575 ÷ 25 = 0.103 (f) 6.08 ÷ 8 = 0.76

5. (a) 3.28 ÷ 0.8 = 4.1 (b) 0.288 ÷ 0.9 = 0.32 (c) 253.95 ÷ 15 = 16.93 (d) 2.0484 ÷ 0.18 = 11.38 (e) 0.228 ÷ 0.38 = 0.6 (f) 0.8085 ÷ 0.35 = 2.31

G. Long Answer Type Questions

1. (a) 101 ÷ 25 = 4.04 (b) 31 ÷ 40 = 0.775 (c) 11 ÷ 16 = 0.6875 (d) 28 ÷ 0.56 = 50 (e) 204 ÷ 0.17 = 1200 (f) 148 ÷ 0.074 = 2000.

2. 17.4 2.9 6. Thus the polygon has 6 sides.

3. 1122.20÷15.5 72.40. Thus cost per litre = Rs.72.40.

4. 1.5008 ÷ 0.56 2.68. Thus the other decimal is 2.68.

5. 9.80 × 106.5 = 1043.7. Thus the charge = Rs.1043.7.

6. 108.50 × 18.5 = 2007.25. Thus the cost = Rs. 2007.25.

H. Assertion : Reason Questions

1. (D) **2.** (B) **3.** (C) **4.** (E) **5.** (A)

I. Case Study

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

5. Connecting The Dots

Class Work 5.1

1. Add the study hours of all 7 days and divide by 7. Mean = Total study hours ÷ 7. This gives the average study hours for the week.

2. Add the sleeping hours of all 7 days and divide by 7. Mean = Total sleeping hours ÷ 7.

3. Mean pocket-expenses = (16.40 + 17.00 + 17.50 + 13.75 + 12.60 + 17.25)÷6=94.50 ÷ 6 = 15.75. Thus, Rajul's mean pocket-expenses per day are 15.75.

4. Average of $\frac{1}{2}$ and $\frac{1}{3} = \frac{5}{12}$. Average of $\frac{1}{2}$ and $\frac{5}{12} = \frac{11}{24}$. Average of $\frac{11}{24}$ and $\frac{5}{12} = \frac{21}{48}$. Average of $\frac{5}{12}$ and $\frac{1}{3} = \frac{3}{8}$. Average of $\frac{5}{12}$ and $\frac{3}{8} = \frac{19}{48}$. Thus, five numbers between $\frac{1}{3}$ and $\frac{1}{2}$ are $\frac{11}{24}, \frac{21}{48}, \frac{5}{12}, \frac{19}{48}, \frac{3}{8}$.

5. Shreyas's group mean = (3 + 8 + 10 + 5 + 4) ÷ 5 = 30 ÷ 5 = 6. Parag's group mean = (5 + 6 + 4 + 3 + 4 + 8) ÷ 630 ÷ 65. Thus, each member of Shreyas's group gets a bigger share of 6 guavas.

6. Mean = (2 + 7 + 9 + 4 + 3) ÷ 5 = 25 ÷ 5 = 5. Thus, the average number of Hibiscus flowers blooming per day is 5.

7. Shubham's mean = (0 + 17 + 21 + 90) ÷ 4 = 128 ÷ 4 = 32. Yashasvi's mean = (67 + 55 + 18 + 35) ÷ 4 = 175 ÷ 4 = 43.75. Thus, Yashasvi performed better with a higher mean score of 43.75.

NCERT Exercise 5.1

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

$\therefore$ 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.**

Practice Exercise 5.1

1. (a) A's mean = (14 + 16 + 10 + 10) ÷ 4 = 50 ÷ 4 = 12.5 points per game. (b) C played only 3 games (did not play Game 3), so total points = 8 + 11 + 13 = 32. We divide by 3, not 4, because C only participated in 3 games. (c) B's mean = (0 + 8 + 6 + 4) ÷ 4 = 18 ÷ 4 = $\frac{9}{2}$ = 4.5 points per game. (d) A has the highest mean of 12.5 points per game. Thus, A is the best performer.

2. Marks: 85, 76, 90, 85, 39, 48, 56, 95, 81, 75. (a) Highest marks = 95, Lowest marks = 39.

(b) Range = 95 – 39 = 56. (c) Mean = (85 + 76 + 90 + 85 + 39 + 48 + 56 + 95 + 81 + 75) ÷ 10 = 730 ÷ 1073. Thus, the mean marks of the group are 73.

3. Mean enrolment = (1555 + 1670 + 1750 + 2013 + 2540 + 2820 ÷ 6 = 12348 ÷ 6 = 2058. Thus, the mean enrolment of the school is 2058.

4. (a) Range = 20.5 0.0 20.5 mm. (b) Mean = (0 + 12.2 + 2.1 + 0 + 20.5 + 5.5 + 1.0) ÷ 7 = 41.3 ÷ 7 = 5.9 mm. (c) Days with rainfall less than mean (5.9 mm): Monday, Wednesday, Thursday, Sunday, and Tuesday—but Tuesday is 12.2 which is more. So Mon (0), Wed (2.1), Thu (0), Sun (1.0) = 5 days. Thus, on 5 days the rainfall was less than the mean rainfall.

5. Heights: 135, 150, 139, 128, 151, 132, 146, 149, 143, 141. (a) Tallest girl = 151 cm. (b) Shortest girl = 128 cm. (c) Range = 151 – 128 = 23 cm. (d) Mean = (135 + 150 + 139 + 128 + 151 + 132 + 146 + 149 + 143 + 141) ÷ 10 = 1414 ÷ 10 = 141.4 cm. (e) Girls taller than 141.4 cm: 150, 151, 146, 149, 143 thus 5 girls have heights more than the mean height.

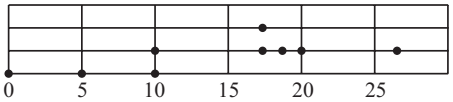
Class Work 5.2

1. Poovizhi's family heights with outlier 118: Mean = (118 + 165 + 170 + 173 + 175) ÷ 5 = 801 ÷ 5 = 160.2 cm; Median = 170 cm. Without outlier 118: Mean = (165 + 170 + 173 + 175) ÷ 4 = 683 ÷ 4 = 170.75 cm; Median = (170 + 173) ÷ 2 = 171.5 cm. Thus, removing the outlier increases both the mean and the median, bringing them closer to the actual central height of the family.

2. Data from slips: 0, 0, 1, 2, 3, 5, 5, 6, 7, 8, 8, 10, 12, 15, 40. Mean = (0 + 0 + 1 + 2 + 3 + 5 + 5 + 6 + 7 + 8 + 8 + 10 + 12 + 15 + 40) ÷ 15 = 122 ÷ 158.13 (approx). Median = 8th value = 6. The mean will be greater than the median because the outlier 40 pulls the mean upward. (a) The value 40 is the outlier as it is much larger than the rest. (b)

Without 40: Mean = 82 ÷ 14 = 5.86 (approx); Median = (5 + 6) ÷ 2 = 5.5. The mean drops significantly while the median remains largely stable.

3. Pages: 10, 16, 16, 18, 20, 22, 26 (arranged). Mean = 128 ÷ 7 = 18.28 (approx). Median = 4th value = 18.



4. Arranged: 17, 18, 24, 25, 35, 36, 46. n = 7 (odd), so median = 4th value = 25. Thus, the median of the data is 25.

NCERT Exercise 5.2

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)

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

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

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

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

$\therefore$ 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)

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

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

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

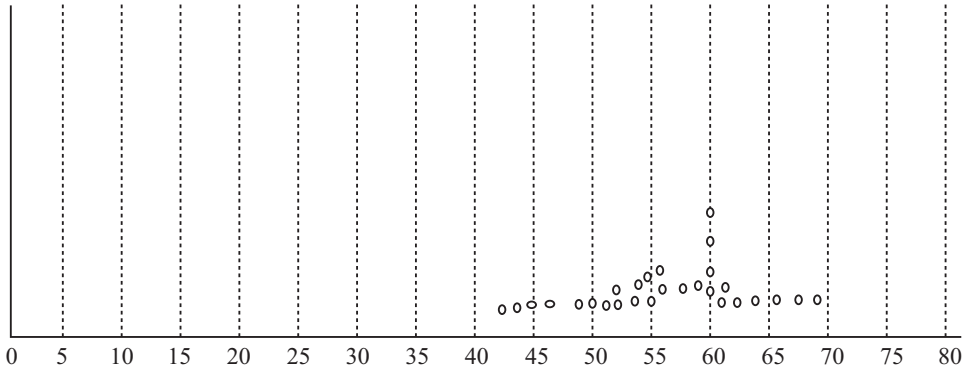
$$\text{Mean} = \frac{\text{Sum of observations}}{\text{No. of observations}}$$

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

$$= \frac{72}{20} = 3{\cdot}6, \text{ median} = 2$$

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)

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

$= 15^{\text{th}}$ term = 56

So, median feet is 56 feet

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

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

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

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

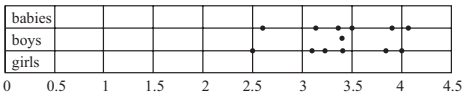
Mean always lies between minimum and maximum.

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

(iv)

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

(v) If indicate for boys height 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

∴ 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

∴ 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.

Practice Exercise 5.2

1. Arranged in ascending order: 5, 9, 10, 12, 15, 16, 19, 20, 20, 20, 20, 23, 24, 25, 25. n = 15 (odd), so median = 8th value = 20. Thus, the median of this data is 20.

2. Arranged: 6, 8, 10, 10, 15, 15, 15, 50, 80, 100, 120. Mean = (6 + 15 + 120 + 50 + 100 + 80 + 10 + 15 + 8 + 10 + 15) ÷ 11 = 429 ÷ 11 = 39. Median = 6th value = 15.

Thus, Mean = 39 and Median = 15. No, they are not the same.

3. Arranged: 32, 35, 36, 37, 38, 38, 38, 40, 42, 43, 43, 43, 45, 47, 50. n = 15 (odd), so median = 8th value = 40. Thus, the median weight is 40 kg.

4. Arranged: 12, 12, 13, 13, 14, 14, 14, 16, 19. n = 9 (odd), so median = 5th value = 14. Thus, the median of the data is 14.

5. (a) False (b) False (c) False (d) False

Class Work 5.3

1. From the graph, the **blue team** batted first as their bars appear in the first set of overs. The blue team won the match as they scored more runs overall than the red team.

2. The blue team scored 15 runs in over 12.

3. The red team scored the least number of runs in the 4th over.

4. Yes, it is easy to tell the target set by the team batting first, as we can add up the runs scored in each over by the first batting team from the double bar graph.

NCERT Exercise 5.3

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 × 4 = 104 km/hr

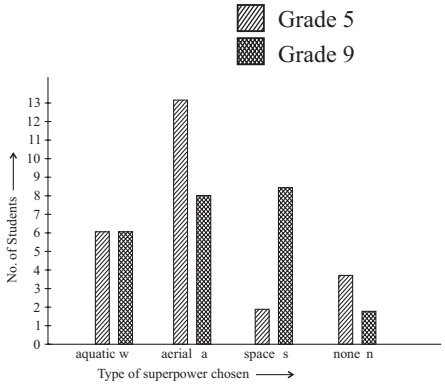
So, we can say that sailfish is about 4 times faster than a humpback whale.

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

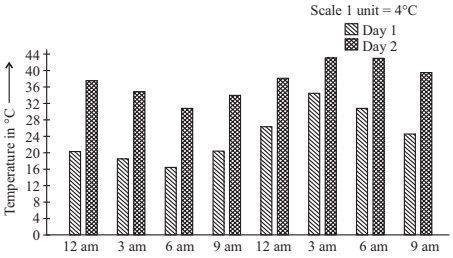
2. From the given observation, we prepare a table:

	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

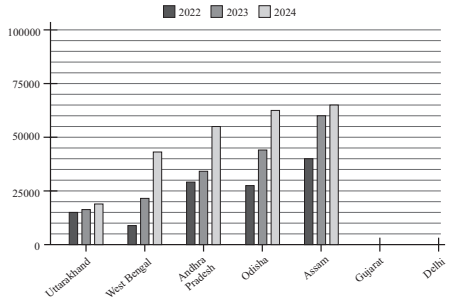


3.



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)

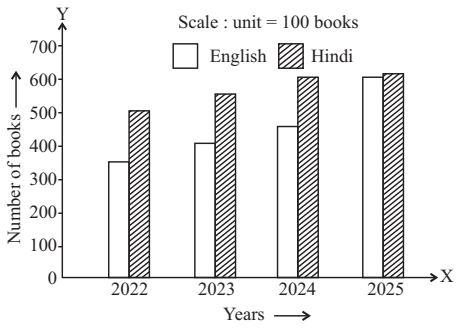
(f) Yes, given statement is correct.

Practice Exercise 5.3

1. After drawing the double bar graph for quarterly and half yearly scores, it is observed that most students—Ashish (10→15), Arun (15→18), Kavish (12→16), and Rita (9→15) show marked improvement. Only Maya's improvement (2021) is minimal. Thus, the teacher concludes that the new teaching technique is effective and should be continued.

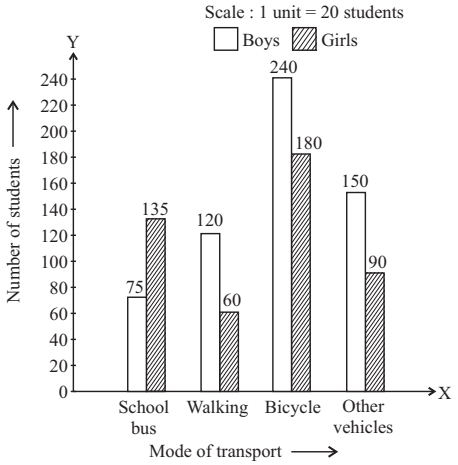
2. (a) Fraction of watches that leaked to the number tested for each company: For A = $\frac{20}{40} = \frac{1}{2}$, For B = $\frac{10}{40} = \frac{1}{4}$, For C = $\frac{15}{40} = \frac{3}{8}$, For D = $\frac{20}{32} = \frac{5}{8}$. (b) Company B has the least fraction of leaked watches ($\frac{1}{4}$). Thus, Company B has the better watches.

3.



(a) The difference in sales in 2022 = 500 – 350 = 150; 2023 = 525 – 400 = 125; 2024 = 600 450 = 150; 2025 = 650 – 620 30. Thus, the difference is least in 2025. (b) Yes, English book sales rose faster—from 350 in 2022 to 620 in 2025, an increase of 270, whereas Hindi books increased by only 150 in the same period.

4.



(a) Bicycle is used by the most students (240 boys + 180 girls = 420).Thus, bicycle is the most used mode of transport. (b) School bus is used by more girls (135) than boys (75). Thus, school bus is the mode of transport used by more girls than boys.

Class Work 5.4

1. (a) Yes—the table shows heights of both boys and girls increased at every age from 1989 to 2019. (b) No—13-year-old girls in 1989 = 143.2 cm; 14-year-old girls in 2009 = 148 cm. Since 143.2 < 148, this statement cannot be justified. (c) Yes 15-year-old boys in 2019 = 159 cm; 16-year-old boys in 1989 = 158.9 cm. Since 159 > 158.9, this statement can be justified. (d)(No)—the data gives only average heights, not individual heights of every girl, so this cannot be justified. (e) No—at ages 11 and 12, girls' average height is more than boys' average height in several years. So this statement cannot be justified for all ages. (f) Data inappropriate—the table only goes up to age 19, so we cannot determine what happens beyond age 19.

2. Boys in 2019: The difference between ages 12 and 13 = 148.3 – 142.2 = 6.1 cm, which is the largest. Thus, boys grew the most between ages 12 and 13. Girls in 2019: The difference between ages 10 and 11 = 138.6 – 132.8 = 5.8 cm, which is the largest. Thus, girls grew the most between ages 10 and 11.

NCERT Exercise 5.4

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

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

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

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

Marks obtained by group B

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

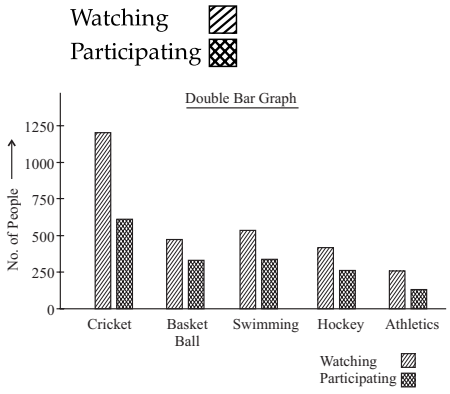
Arranging the given data in ascending order, we get 47, 59, 68, 73, 79, 86, 86, 90, 93

No. of observations = 9 (odd)

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

$= 5^{\text{th}}$ 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. 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.

$$\text{Median} = \left(\frac{n+1}{2}\right)^{\text{th}} \text{ item}$$

$= \left(\frac{17+1}{2}\right)^{th}$ item, here $n = 17$

$= 9^{th}$ item = 115 cm.

According to condition, two groups be

112 < 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

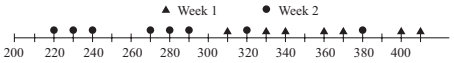
Tokyo – 169

London – 35

(b) (i) Valid, (ii) Valid, (iii) Invalid

9. Do Yourself.

10.



$$\text{Mean} = \frac{\text{Sum of values}}{\text{Total no. of values}}$$

$$= \frac{\begin{array}{r}410+400+370+340+360\\+400+320+330+310\\+320+290+380+280\\+270+230+220+240\end{array}}{17}$$

$$= \frac{5470}{17} = 321{\cdot}76 \approx 322 \text{ sec.}$$

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 $\boldsymbol{n} = 17$ (odd)

$\therefore$ Median $= \left(\frac{17+1}{2}\right)^{th}$ term

$= 9^{th}$ term = 320 sec.

Chapter Innings

A. Multiple Choice Questions

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

B. Fill in the Blanks

1. frequency **2.** Corresponding observation **3.** Collection of data **4.** 6.5 **5.** odd

C. True or False

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

D. Very Short Answer Type Questions

1. Arranging: 6, 8, 10, 12, 14. n = 5 (odd), median = 3rd value = 10.

2. Arranging: 6, 9, 10, 12, 13, 14, 18, 19, 20, 25. $n = 10$' (even), median $= \frac{(13+14)}{2} = 13.5$.

3. $\frac{(6+10+12+x=16)}{5} = 14 \rightarrow 44 + x =$ 70. Thus $x = 26$.

4. First 5 multiples of 3: 3, 6, 9, 12, 15. Mean $= \frac{45}{59}$.

5. First five primes: 2, 3, 5, 7, 11. Mean $= \frac{28}{5} = 5.6$, Median = 5

E. Short Answer Type Questions

1. Sum of three = 120. Lowest = 19, so remaining two sum = 101. To maximize one, minimize the other (must be > 19 and different from 19). Second = 20, highest = 81.

2. Sum of 6 = 18.5 × 6 = 111. Sum of five given = 86. Sixth = 111 – 86 = 25.

3. Sum of 10 = 151.8 × 10 = 1518. New sum = 1518 + 157.6 + 154.4 = 1830. New mean $= \frac{1830}{12} = 152.5$ cm.

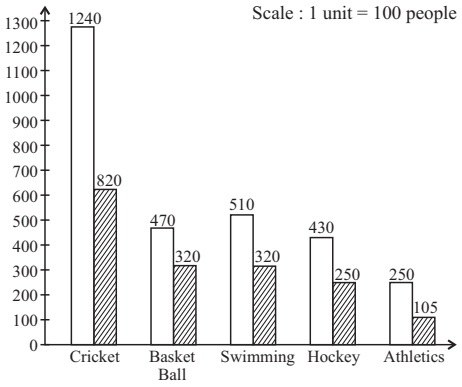
4. Arranged: 3, 6, 7, 10, x, $x + 4$, 19, 20, 25, 28. Median $= \frac{(x+x+4)}{2} = x + 2 = 13$. Thus $x = 11$.

5. Data: 135, 150, 139, 128, 151, 132, 146, 149, 143, 141. (a) Tallest = 151 cm. (b) Shortest = 128 cm. (c) Mean = $\frac{1414}{10}$ = 141.4 cm. (d) Heights above 141.4: 150, 151, 146, 149, 143 = 5 girls.

F. Long Answer Type Questions

1. (a) Maths improved most (88 to 95, gain of 7). (b) S. Science improved least (73 to 75,
gain of 2). (c) Hindi went down (72 to 65).

2. (a)



(b) Cricket is the most popular sport. (c) Watching sports is more preferred.

3. (a) Jammu has the largest difference: 41 – 26 = 15°C. (b) Hottest city = Jammu, Coldest city = Bangalore. (c) Bangalore and Jaipur, or Bangalore and Ahmedabad. (d) Mumbai has the least difference: 32 – 27 = 5°C.

G. Assertion-Reason Questions

1. (A) **2.** (D) **3.** (B) **4.** (A) **5.** (E)

H. Case Study

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

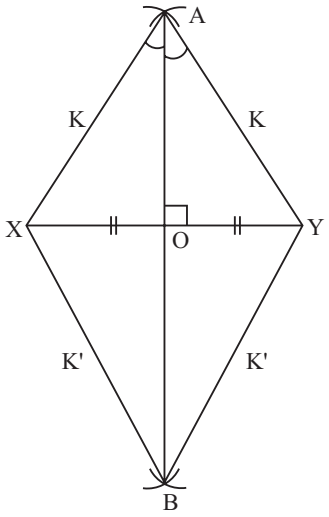
6. Constructions and Tilings

NCERT Exercise 6.1

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°

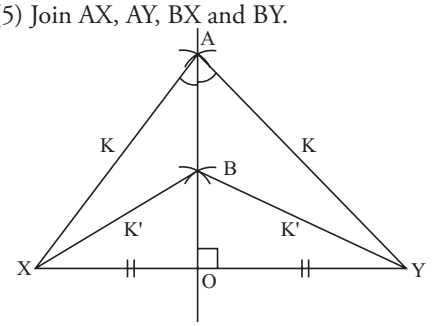
Thus, AB is the perpendicular bisector of the line XY.

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 .

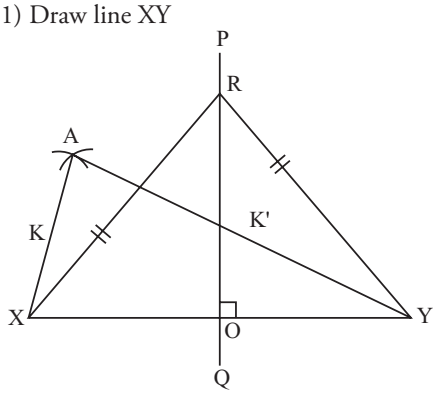
(3) With centres at X and Y draw two arcs of radius K. and K' respectively above XY. These intersect each other at point A and B respectively.
(4) Join AB and produce upto O (intersecting XY at O)
(5) Join AX, AY, BX and BY.



In ΔABX and ΔABY
AX = AY = K
BX = BY = K'
AB = AB (common)
∴ ΔABX ≅ ΔABY (By SSS Rule)
∴ ∠XAO = ∠YAO
In ΔAOX 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—

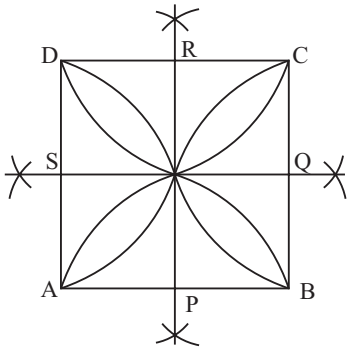
(1) Draw line XY



(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
∠ROX = ∠ROY
OR = OR (common)
∴ ΔROX ≅ ΔROY (By SAS Rule)
∴ 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 ≠ 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.

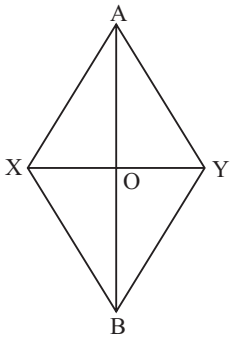
4. Step of Construction—

(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.

5. 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 Δ AXY and ΔAYB.

AX = AY and BX = BY

AB = AB (common)

∴ ΔAXB ≅ ΔAYB (By SSS Rule)

∴ ∠XAO = ∠YAO

Again, In ΔAXO and ΔAYO

OX = OY

∠XAO = ∠YAO

AO = AO (common)

∴ ΔAXO ≅ ΔAYO (By SAS Rule)

∴ ∠XOA = ∠YOA

Also, ∠XOA + ∠YOA= 180°

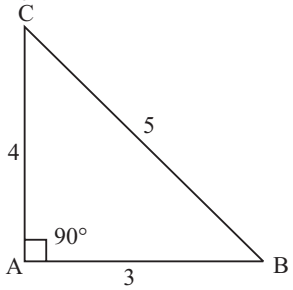
⇒ 2∠XOA = 180°

⇒ ∠XOA = 90° = ∠YOA

∴ OX = OY and ∠XOA = ∠YOA = 90°

Therefore AB is perpendicular bisector of XY.

6. 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.

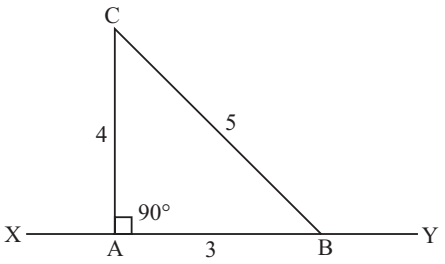
(7) Hold the 8 unit of the rope and stretch away from XY such that both sides of this points are tight.

(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

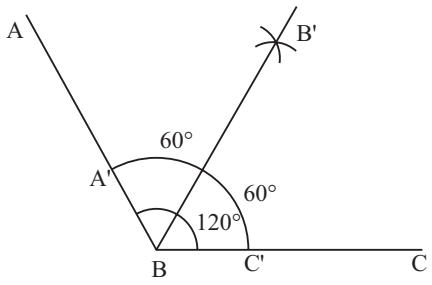


Thus by the 3 – 4 – 5 principle.

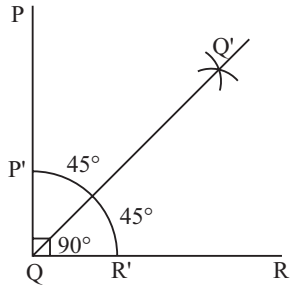
∠A = 90°

Thus, AC is perpendicular to XY at given point A.

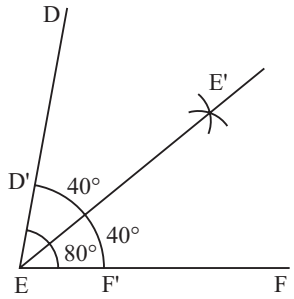
7. (i)



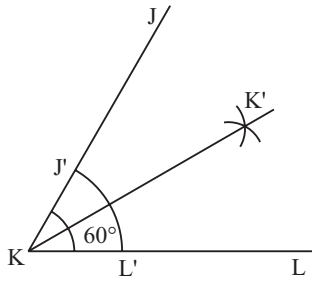
(ii)



(iii)

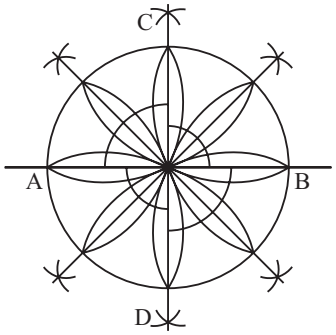


(iv)



8. 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.

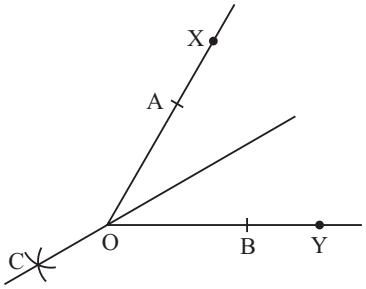
(8) Draw dots at the points of intersection of the circle with the lines.

(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.

9. ∠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)

∴ ΔOAC ≅ ΔOBC (By SSS Rule)

∴ ∠AOC = ∠BOC

∴ 180° – ∠AOC = 180° – ∠BOC

∴ ∠AOD = ∠BOD

Thus OD is the bisector of the angle ∠XOY and OC is the bisector of the ∠XOY.

10. 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°.

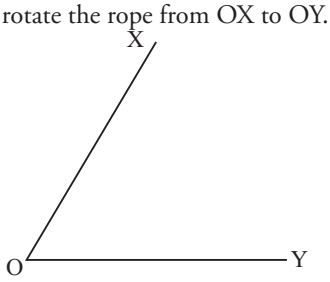
11. Let ∠XOY be given angle

Step of bisect ∠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.

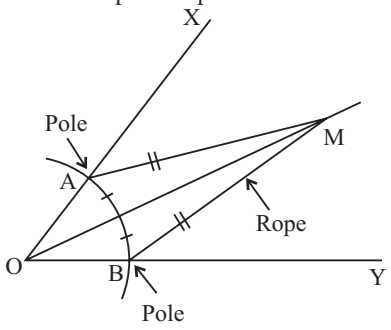


(4) Mark points A and B at fix distance mark on the rope.

(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)

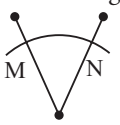
∴ ΔOAM ≅ ΔOBM

∴ ∠AOM= ∠BOM and ∠XOM = ∠YOM

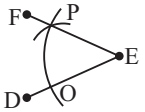
Thus, OM is the bisector of the given angle ∠XOY.

12. Given angles arc

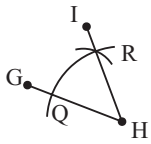
(i)



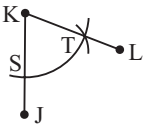
(ii)



(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.

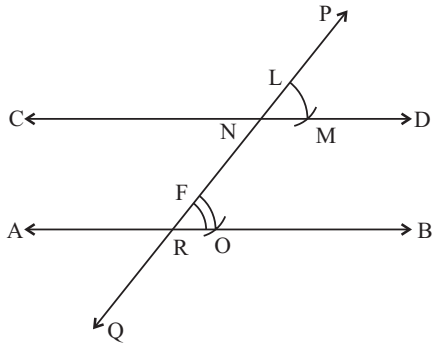
(4) Let the arcintersect A'B' at M'. Mark the arc M'N' s.t. MN = M'N'

(5) Join B'N'

(6) Solve remaining similarly.

13. 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 NC and mark LM s.t. LM = FG.

(6) Join H and 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.

14. 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.

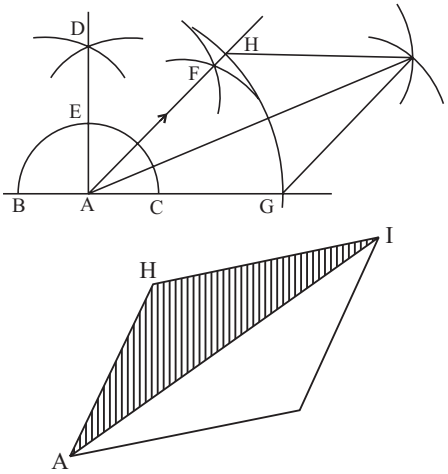
(6) With A as centre draw an arc intersecting extended AC and AF at G and H respectively.

(7) With centres at G and H, draw arcs of equal radius equal to AG. They meet at I.

(8) Join AI

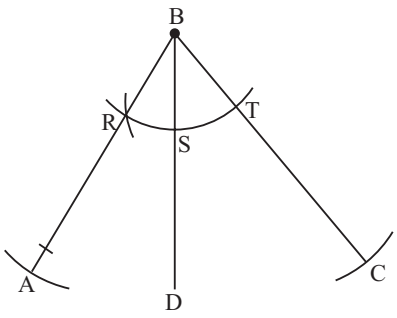
(9) AGIH is a Rhombus with base angle 45°.

(10) Erase the extra arcs and lines, shade the upper triangle AHI



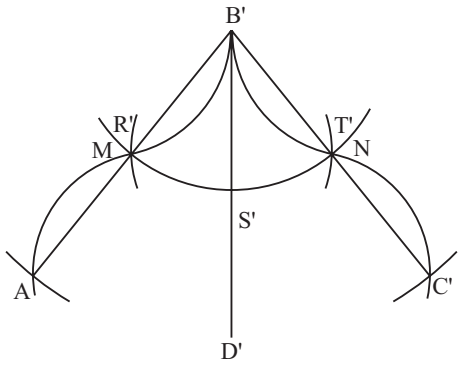
by using tracing paper we can make 8 such rhombus and place them together and get required figure.

15. 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.

16. 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.

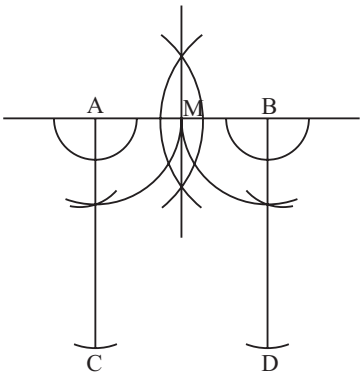
(5) Let M and N be mid-point of AF and AG respectively using compass, draw semicircles on the lines MF, AM, AN and NG.

(6) Erase the extra lines, and arcs to get the required arch design.

17. (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.

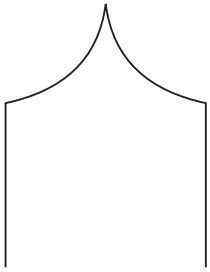


(3) Draw equal lines AC and BD.

(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.

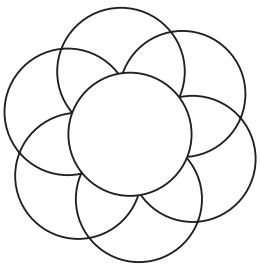
(6) Erase the extra lines, arcs and letters to get the required figure.



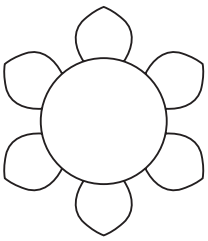
(b) Steps of Construction—

(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—

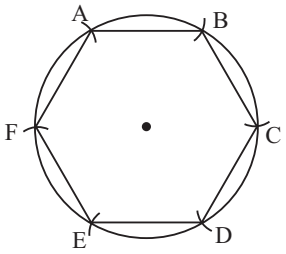
(1) Draw a circle.

(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.

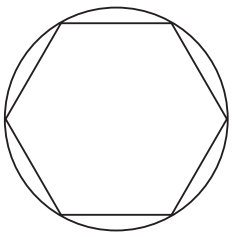
(4) With centre at B and same radius draw an arc intersecting the circle at C.

(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—

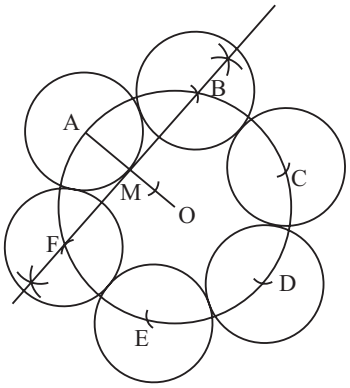


(d) Steps of Construction—

(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.

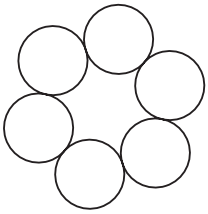


(4) Repeat this process and find points D, E and F.

(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.

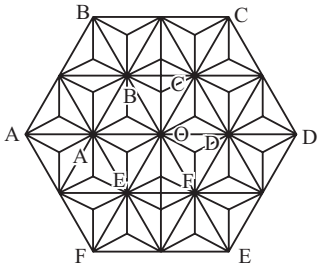


(e) Steps of Construction—

(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'.

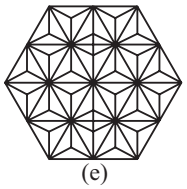
Similarly extend other lines.

(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.



(e)

18. Steps of Construction—

(1) Draw a circle.

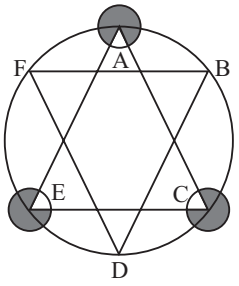
(2) Take any point A on the top of the circle and draw an arc with centre at A and radius as that of the circle and intersecting the circle at B.

(3) With centre at B and same radius draw an arc intersecting the circle at C.

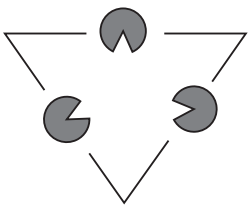
(4) Repeat this process to get points of intersection D, E and F.

(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.



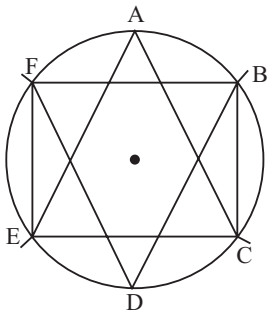
(7) Erase the extra arcs, circle and letters to get the required figure as shown below



19. 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.

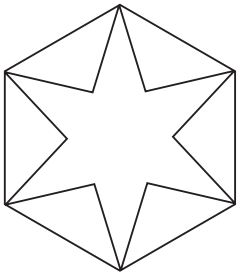


(3) With centre at B and same radius draw an arc intersecting the circle at C.

(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:



20. Steps of Construction—

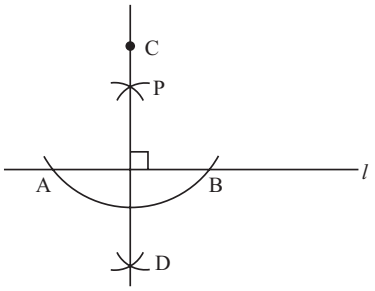
(1) Draw a line l and mark a point P outside l.

(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.

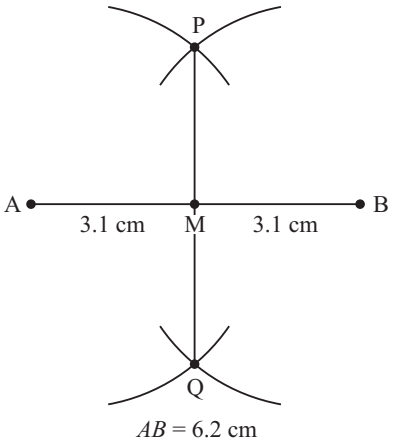
(4) Let the arcs intersects at points C and D.

(5) Join CD. Line CD is perpendicular to line l and passes through the given point P.



Practice Exercise 6.1

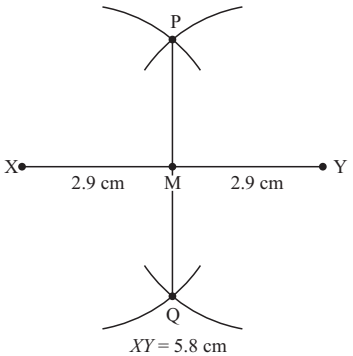
1. Draw AB = 6.2 cm. With A and B as centres and radius more than 3.1 cm, draw arcs on both sides intersecting at P and Q. Join PQ, which cuts AB at M. PQ is the perpendicular bisector and AM = MB = 3.1 cm.



AB = 6.2 cm

[Figure: Line segment AB = 6.2 cm with perpendicular bisector PQ passing through midpoint M]

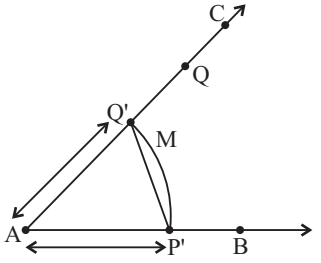
2. Draw XY = 5.8 cm. With X and Y as centres and radius more than 2.9 cm, draw arcs on both sides intersecting at P and Q. Join PQ, which cuts.XY at M. PQ is the perpendicular bisector and XM = MY = 2.9 cm.



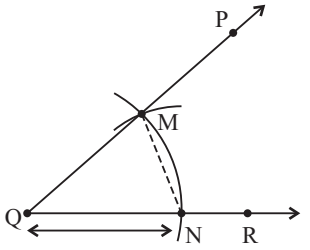
XY = 5.8 cm

[Figure: Line segment XY = 5.8 cm with perpendicular bisector PQ passing through midpoint M]

3. Draw a ray AB. With Q as centre and any radius, draw an arc cutting QP at M and QR at N. With A as centre and same radius, draw an arc cutting AB at P'. With P' as centre and radius MN, cut the arc at Q'. Join AQ' and extend to C. ∠BAC = ∠PQR.

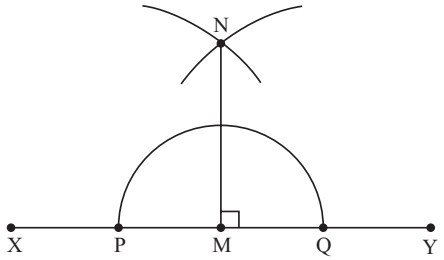


$\angle BAC = \angle PQR$



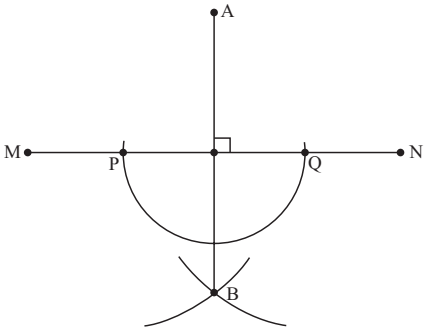
[Figure: Angle BAC equal to given angle PQR constructed using compass]

4. Draw line XY and mark point M on it. With M as centre and any radius, draw a semicircle cutting XY at P and Q. With P and Q as centres and radius more than half of PQ, draw arcs intersecting at N. Join MN. MN is perpendicular to XY.



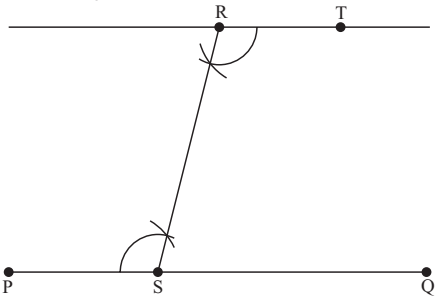
[Figure: Line XY with perpendicular MN through point M]

5. Draw line MN and mark point A outside it. With A as centre, draw an arc cutting MN at P and Q. With P and Q as centres and radius more than half of PQ, draw arcs intersecting at B on the opposite side. Join AB, meeting MN at the foot of perpendicular.



[Figure: Line MN with perpendicular from external point A]

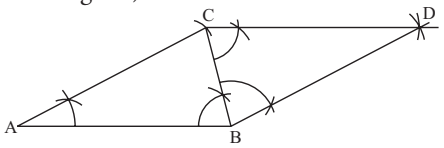
6. Draw line PQ and mark point R outside it. Take any point S on PQ and join RS. Construct SRT equal to ZRSP (alternate angles) at R. Extend RT on both sides. The line through R is parallel to PQ.



RTI PQ (Alternate interior angles ∠SRT = ∠RSP)

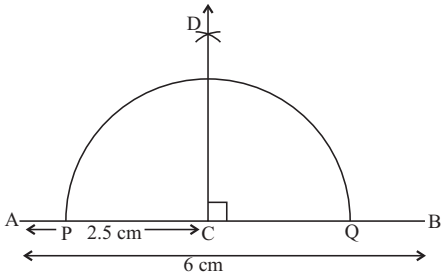
[Figure: Line PQ and parallel line through external point R]

7. Draw AB = 4.5 cm. At B, construct ∠ABC = 60°. Along BC, cut BC = 5,cm. Through C, draw a line parallel to AB. Through B, draw a line parallel to AC. They meet at D. On measuring, BD = 5 cm and CD = 4.5 cm (opposite sides of parallelogram).



[Figure: Parallelogram ABDC with ∠ABC = 60°, AB = 4.5 cm, BC= 5 cm]

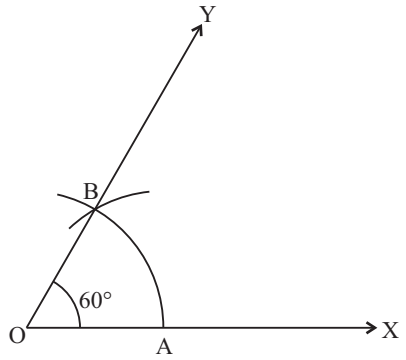
8. Draw AB = 6 cm. Mark C on AB such that AC = 2.5 cm. With C as centre and any radius, draw a semicircle cutting AB at P and Q. With P and Q as centres and radius more than half of PQ, draw arcs intersecting at D. Join CD. CD is perpendicular to AB at C.



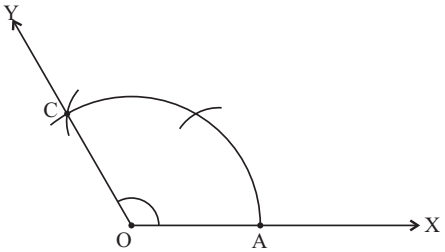
[Figure: Line segment AB = 6 cm with perpendicular CD at point C where AC = 2.5 cm)

9. Constructions of angles using compass:

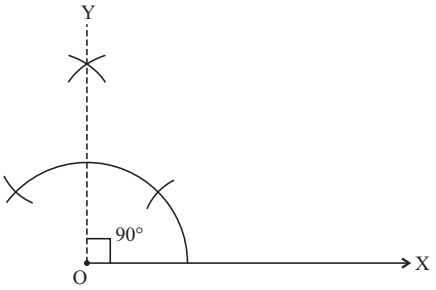
(a) 60°: Draw ray OX, with O as centre any radius cut OX at A, with A as centre same radius cut the arc at B, join OB.



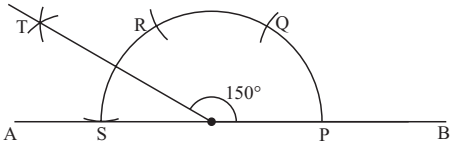
(b) 120°: Continue from (a), with B as centre cut the arc at C, join OC.



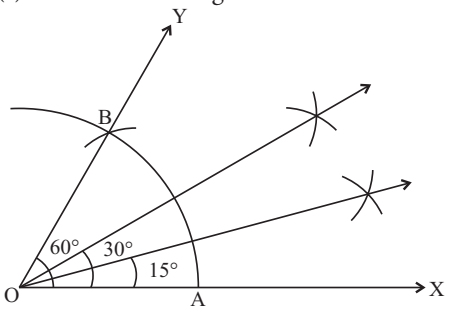
(c) 90°: Use perpendicular construction method at O on line OX.



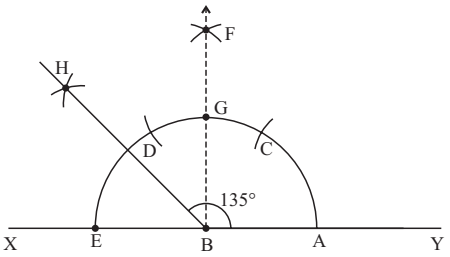
(d) 150°: Bisect the angle between 120° and 180°.



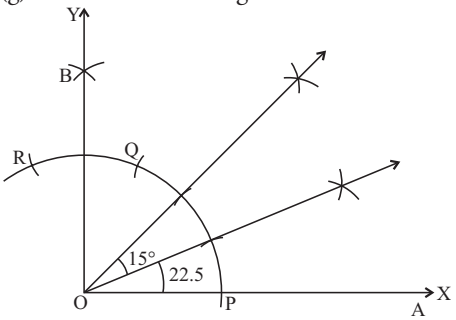
(e) 15°: Bisect 30° angle.



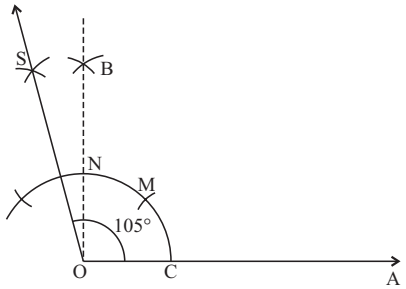
(f) 135°: Bisect the angle between 90° and 180°.



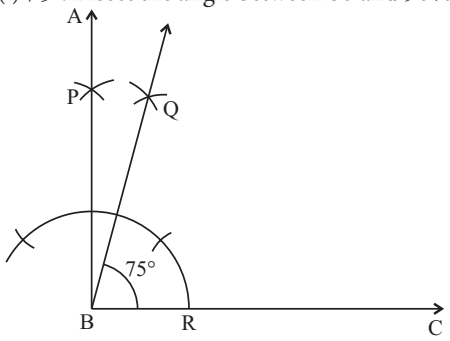
(g) 22.5°: Bisect 45° angle.



(h) 105°: Bisect the angle between 90° and 120°.

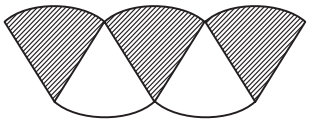


(i) 75°: Bisect the angle between 60 and 90%



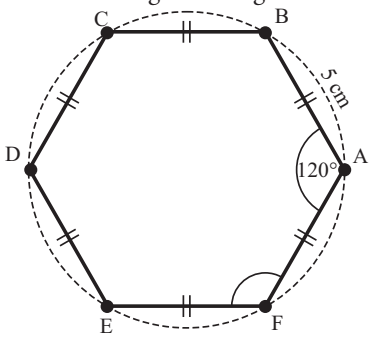
[Figure: Each angle constructed using ruler and compass with appropriate arcs]

10. Draw two intersecting semicircles of equal radius along a straight line such that the centre of each semicircle lies on the circumference of the other. Shade the overlapping leaf-shaped region.



[Figure: Two intersecting semicircles with shaded lens-shaped overlap region]

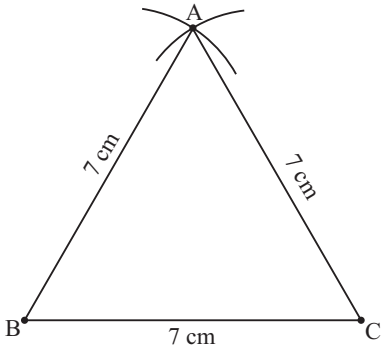
11. Draw AB = 5 cm. At A and B, construct angles of 120° each and mark AF = BC= 5 cm. At F and C, construct angles of 120° each and mark FE = CD = 5 cm. Join DE. ABCDEF is the regular hexagon.



Regular hexagon, all sides 5 cm, all interior angles = 120°

[Figure: Regular hexagon ABCDEF with each side 5 cm and each interior angle 120°)

12. Draw BC = 7 cm. With B as centre and radius 7 cm, draw an arc. With C as centre and same radius 7 cm, draw another arc cutting the first at A. Join AB and AC. Triangle ABC is the required equilateral triangle.



[Figure: Equilateral triangle ABC with each side 7 cm]

Class Work 6.1

1. Yes, it is tileable. If one dimension (say m) is even and n is odd, we can tile each column with $\frac{m}{2}$ vertical tiles. Since there are n columns, the total number of tiles needed is $n \times \frac{m}{2}$. This strategy covers the entire grid without gaps or overlaps.

2. No, it is not tileable. When both m and n are odd, the total number of unit squares $m \times n$ is odd. Since each 2 × 1 tile covers exactly 2 unit squares, the total squares covered must always be even. An odd number of squares cannot be tiled by 2 × 1 tiles.

3. Yes. the 5 × 3 grid with a unit square removed is tileable with 2 × 1 tiles. Using black-and- white checkerboard colouring, a 5 × 3 grid has 8 squares of one colour and 7 of the other. Since the removed corner square belongs to the majority colour (8), we are left with 7 black and 7 white squares, so it can be tiled.

4. No, the given region in Fig. 6.50 is not tileable with 2 × 1 tiles. Using black-and-

white colouring, the removed unit square makes the count of black and white squares unequal. Since each 2 × 1 tile must cover one black and one white square, an unequal count means the region cannot be tiled completely.

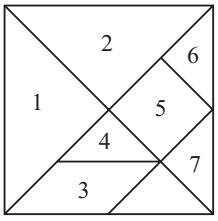
Class Work 6.2

1. Yes, if the plain grid is tileable, then the black-and-white grid is also tileable. This is because each 2 × 1 tile placed on the plain grid automatically covers one black and one white square in the black-and-white grid, so the same arrangement of tiles works for both.

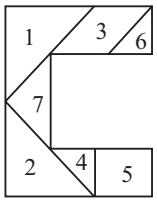
2. Yes, if the black-and-white grid is tileable, then the plain grid is also tileable. Removing the colouring does not change the arrangement of tiles, so any valid tiling of the black-and-white grid is a valid tiling of the plain grid as well.

NCERT Exercise 6.2

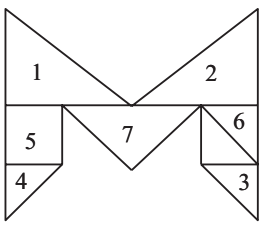
1. We prepare 10 sets of 7 tans obtained from a tangram based shape.



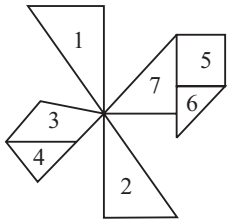
(i)



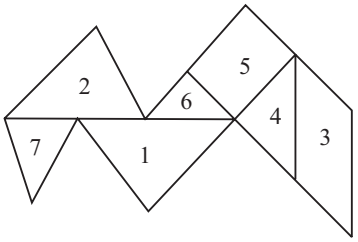
(ii)



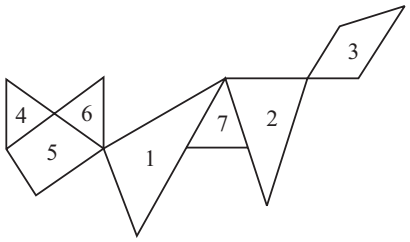
(iii)



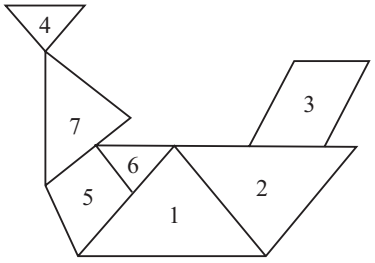
(iv)



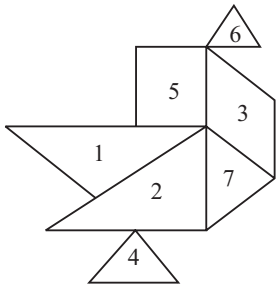
(v)



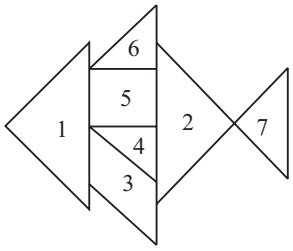
(vi)



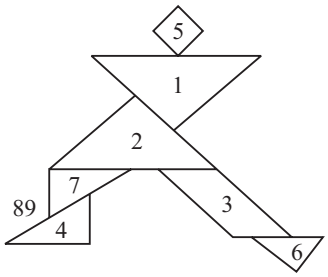
(vii)



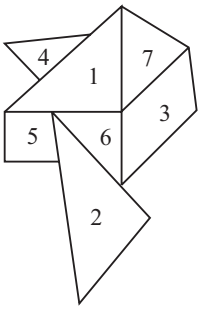
(viii)



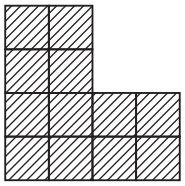
(ix)



(x)



2. (a) The given tiles can be used for tiling the region. The tiling shall use 4 tiles of the given shape.

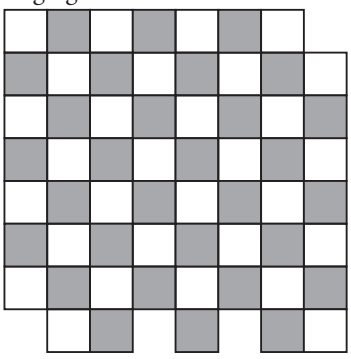


Region to be tiled

Tile

(b) By using the following tile

Given region be tiled region as shown in the following figure



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 Exercise 6.2

1. First figure (boat/ship-like shape): The pieces used are 1 (large triangle), 2 (large triangle), 3 (medium triangle), 4 (small triangle), 5 (square), 6 (parallelogram), and 7 (small triangle) rearranged to form the figure.

Second figure (running person): The pieces 1, 2, 3, 4, 5, 6, and 7 are rearranged - large triangles form the body and leg, medium and small triangles form the arms and head, square and parallelogram form remaining body parts.

Third figure (horse/animal): The pieces 1, 2, 3, 4, 5, 6, and 7 are rearranged - large triangles form the body, medium triangle forms the neck, small triangles form the legs and head, square forms the torso, and parallelogram forms the tail.

All three figures use all 7 pieces of the tangram without overlaps or gaps. L

2. (a) Yes, this is a tiling pattern. The triangular unit shape repeats to cover the entire region without any gaps or overlaps.

(b) No, this is not a tiling pattern. The oval/ elliptical shapes leave gaps between them and therefore do not cover the region completely.

7. Finding the Unknown

Class Work 7.1

1. Given $5p + 2 = 17$. Trying $p = 3$: $5(3) + 2 = 15 + 2 = 17$. LHS = RHS. Thus, $p = 3$.

2. Given $3m - 14 = 4$. Trying $m = 6$: $3(6) 14 = 18 - 14 = 4$. LHS = RHS. Thus, $m = 6$.

Class Work 7.2

1. (a) $3n - 2 = 46 \Rightarrow 3n = 48 \Rightarrow n = 16$. (b) $5m + 7 = 17 \Rightarrow 5m = 10 \Rightarrow m = 2$. (c) $\frac{20p}{3} = 40 \Rightarrow 20p = 120 \Rightarrow p = 6$. (d) $\frac{3p}{10} = 6 \Rightarrow 3p = 60 \Rightarrow p = 20$.

2. (a) $x + 3 = 0$, $x = 3 : 3 + 3 \neq 60$. No. (b) $x + 3 = 0$, $x = 0 : 0 + 3 = 30$. $3 \neq 0$ No. (c) $x + 3 = 0$, $x = -3 : -3 + 3 = 0$. Yes. (d) $x - 7 = 1$, $x = 7 : 7 - 7 = 0 \neq 1$. No. (e) $5x = 25$, $x = 0 : 5(0) = 0 \neq 25$. No. (f) $5x = 25$, $x = 5: 5(5) = 25$. Yes. (g) $5x = 25$, $x = -5: 5(-5) = -25 \neq 25$. No. (h) $\frac{m}{3} = 2$, $m = -6: -\frac{6}{3} = -2 \neq 2$. No. (i) $\frac{m}{3} = 2$, $m = 0: \frac{0}{3} = 0 \neq 2$. No. (j) $\frac{m}{3} = 2$, m = 6: $\frac{6}{3} = 2$. Yes.

Class Work 7.3

1. $-4 = 5(x - 2) = -4 = 5x - 10 = 10 - 4 = 5x = 6 = 5x = x = \frac{6}{5}$.

2. $16 = 4 + 3(x + 2) \Rightarrow 16 = 4 + 3x + 6 \Rightarrow 16 = 3x + 10 \Rightarrow 3x = 6 \Rightarrow x = 2$.

3. $6x + 5 = 2x + 17 \Rightarrow 6x - 2x = 17 - 54x = 12 \Rightarrow x = 3$.

4. $3(x - 3) = 5(2x + 1) \Rightarrow 3x - 9 = 10x + 5 = 3x - 10x = 5 + 9 - 7x = 14 \Rightarrow x = -2$.

5. $3(2x - 1) - 2(2 - 5x) = 16x - 3 - 4 + 10x = 1 \Rightarrow 16x - 7 = 1 \Rightarrow 16x = 8 \Rightarrow x = \frac{1}{2}$

6. $3x - 2(2x - 5) = 2(x + 3) - 8 \Rightarrow 3x - 4x + 10 = 2x + 6 - 8x + 10 = 2x - 2 - x - 2x = -2 - 10 - 3x = -12 \Rightarrow x = 4$.

NCERT Exercise 7.1

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.**

(c) $34 - 7 = 2u + 3$

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.

3. (i) $x = -2$
Dividing both sides by 6, we get
$\frac{x}{6} = \frac{-2}{6} = \frac{-1}{3}$
$3x = -6$ equation.
(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
$3x + 2 = -6 + 2$
$3x + 2 = -4$ equation.
(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
$5x + 6 = -10 + 6$
$5x + 6 = -4$ equation.
(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
$2(x + 3) = 2$ equation.

4. (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
$13 - z - 13 = 8 - 13 \Rightarrow -z = -5$
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
$\frac{2n}{2} = \frac{10}{2} \Rightarrow n = 5$

5. $4k + 1 = 13$
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) $-k - 2 = -3 - 2 = -5$

6. (a) $5 \times \ldots - 8 = 37$

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) $37 - (33 - \ldots) = 35$

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) $-3 \times (-11 + \ldots) = 45$

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.**

Practice Exercise 7.1

1. (a) $x + 4 = 9$ (b) $y - 2 = 8$ (c) $10a = 70$ (d) $\frac{b}{5} = 6$ (e) $\frac{3t}{4} = 15$ (f) $7m + 7 = 77$ (g) $\frac{x}{4} - 4 = 4$ (h) $6y - 6 = 60$ (i) $\frac{z}{3} + 3 = 30$

2. (a) 5 subtracted from x is 9. (b) Five times a number p is 20. (c) Three times of a number n and Seven added to it is 1. (d) 2 subtracted from one-fifth of a number m gives 6.

3. Trial and error method

(a) P + 4 = 15

Put P = 0

$0 + 4 \neq 15$

Put P = 3

$3 + 4 \neq$

Put P = 11

11 + 4 = 15

15 = 15

P = 15

(b) m – 7 = 3

Put m = 1

1 – 7

$-6 \neq 3$

Put m = 3

$3 - 7 \neq 3$

$-4 \neq 3$

Put m = 9

$9 - 7 = 2 \neq 3$

Put m = 10

10 – 7 = 3

3 = 3

m = 3

(c) 2m – 9 = 11

Put m = 5

$2 \times 5 - 9 = 11$

10 – 9

$1 \neq 11$

Put m = 8

$2 \times 8 - 9 = 11$

$-7 \neq 11$

Put m = 10

$2 \times 10 - 9 = 11$

20 – 9 = 11

11 = 11

m = 10

(d) $\frac{m}{5} = 3$

Put m = 2

$\frac{2}{5} \neq 3$

Put m = 15,

$\frac{15}{5} \neq 3$

3 = 3

m = 15

4. (a) $x - 1 = 0$: Add 1 to both sides; $x = 1$. (b) $x + 1 = 0$: Subtract 1 from both sides; $x = -1$. (c) $x - 1 = 5$: Add 1 to both sides; $x = 6$. (d) $x + 6 = 2$: Subtract 6 from both sides; $x = -4$. (e) $31 = 42$: Divide both sides by 3; 1

= 14. (f) $\frac{b}{2}$ = 6: Multiply both sides by 2; b = 12. (g) $\frac{p}{7}$ = 4: Multiply both sides by 7; p = 28. (h) $4x = 25$: Divide both sides by 4; $x = \frac{25}{4}$.

5. (a) $10p = 100 \Rightarrow p = 10$. (b) $10p + 10 = 100 \Rightarrow 10p = 90 \Rightarrow p = 9$. (c) $\frac{p}{4} = 5 \Rightarrow p = 20$. (d) $-\frac{p}{3} = 5p = -15$. (e) $\frac{3p}{4} = 6 \Rightarrow 3p = 24 \Rightarrow p = 8$. (f) $3s = -9 \Rightarrow s = -3$. (g) $3s + 12 = 0 \Rightarrow 3s = -12 \Rightarrow s = -4$. (h) $3s = 0 \Rightarrow s = 0$.

6. (a) $12p - 5 = 25 \Rightarrow 12p = 30 \Rightarrow p = \frac{30}{12} = \frac{5}{2}$. (b) $4(m + 3) = 18 \Rightarrow 4m + 12 = 18 \Rightarrow 4m = 6 \Rightarrow m = \frac{3}{2}$. (c) $-2(x + 3) = 8 \Rightarrow -2x - 6 = 8 \Rightarrow -2x = 14 \Rightarrow x = -7$ (d) $-4 = 5(x - 2) \Rightarrow -4 = 5x - 10 \Rightarrow 6 = 5x \Rightarrow x = \frac{6}{5}$. (e) $16 = 4 + 3(x + 2) \Rightarrow 16 = 3x + 10 \Rightarrow 3x = 6 \Rightarrow x = 2$. (f) $6x + 5 = 2x + 17 \Rightarrow 4x = 12 \Rightarrow x = 3$. (g) $3(x - 3) = 5(2x + 1) \Rightarrow 3x - 9 = 10x + 5 \Rightarrow -7x = 14 \Rightarrow x = -2$. (h) $3(2x - 1) - 2(2 - 5x) = 1 \Rightarrow 6x - 3 - 4 + 10x = 1 \Rightarrow 16x = 8 \Rightarrow x = \frac{1}{2}$.

7. (a) $\frac{x}{2} + \frac{3}{2} = \frac{2x}{5 - 1} \Rightarrow$ multiply by 10: $5x + 15 = 4x - 10 \Rightarrow x = -25$. (b) $\frac{3}{4} - (x - 1) = x - 3 \Rightarrow \frac{3}{4} - x + 1 = x - 3 \Rightarrow \frac{7}{4} + 3 = 2x \Rightarrow \frac{7}{4} + \frac{12}{4} = 2x \Rightarrow \frac{19}{4} = 2x \Rightarrow x = \frac{19}{8}$. (c) $x - \frac{x}{4} - \frac{1}{2} = 3 + \frac{x}{4} \Rightarrow x - \frac{x}{4} - \frac{x}{4} = 3 + \frac{1}{2} \Rightarrow \frac{x}{2} = \frac{7}{2} \Rightarrow x = 7$. (d) $\frac{(6x - 2)}{9} + \frac{(3x + 5)}{18} = \frac{1}{3} \Rightarrow$ multiply by 18: $2(6x - 2) + (3x + 5) = 6 \Rightarrow 12x - 4 + 3x + 5 = 6 \Rightarrow 15x + 1 = 6 \Rightarrow x = \frac{1}{3}$. (e) $0.6x + \frac{4}{5} = 0.28x + 1.16 \Rightarrow 0.6x + 0.8 = 0.28x + 1.16 \Rightarrow 0.32x = 0.36 \Rightarrow x = \frac{9}{8}$. (f) $0.5x + \frac{x}{3} = 0.25x + 7 \Rightarrow \frac{x}{2} + \frac{x}{3} - \frac{x}{4} = 7 \Rightarrow \frac{(6x + 4x - 3x)}{12} = 7 \Rightarrow \frac{7x}{12} = 7 \Rightarrow x = 12$.

NCERT Exercise 7.2

1. 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 digit = $x = 5$

Hundred's digit= $x - 3 = 5 - 3 = 2$

Unit's digit= $x + 3 = 5 + 3 = 8$

So number formed 258.

2. Let weight of a brick be x kg.

According to question, $x = \frac{x}{2} + 1$

Subtract $\frac{x}{2}$ from both sides

$$\frac{x}{1} - \frac{x}{2} = \frac{x}{2} + 1 - \frac{x}{2}$$

$$\frac{2x - x}{2} = 1$$

$$\frac{x}{2} = 1$$

Multiply both sides by 2

$$\frac{x}{2} \times 2 = 1 \times 2$$

$$x = 2$$

$\therefore$ weight if the brick = 2kg.

3. Let the no. be x.

According to question,

$\frac{1}{4} \times x + 9 = x$

$\frac{x}{4} + 9 = x$

$\Rightarrow 9 = \frac{x - x}{4}$

$\Rightarrow 9 = \frac{4x - x}{4} = \frac{3x}{4} \Rightarrow 9 = \frac{3x}{4}$

Divide both sides by $\frac{3}{4}$

$9 \div \frac{3}{4} = \frac{3}{4}x \div \frac{3}{4} \Rightarrow 9 \times \frac{4}{3} = \frac{3}{4}x \times \frac{4}{3}$

$\Rightarrow 12 = x$

Thus, the required number is 12.

4. 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

$\therefore$ ₹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

5. 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,

$3x + 4 = 25 \Rightarrow 3x = 25 - 4 \Rightarrow x = \frac{21}{3} = 7$

(Where x is the dots under one blob)

Thus, each black blob hides 7 blue dots.

Ans.

6. (a)

(i) $\xrightarrow{9} +3 \xrightarrow{12} \times 4 \xrightarrow{48} -5 = 43$

(ii) $\xrightarrow{17} +3 \xrightarrow{20} \times 4 \xrightarrow{80} -5 = 75$

(b) (i) Let the missing number be x

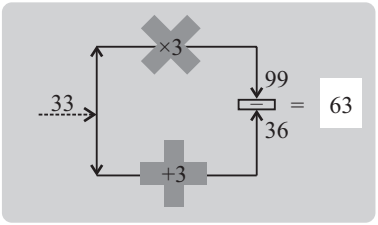
then, $x \times 3 - (x + 3) = 63$

$\Rightarrow 3x - x - 3 = 63$

$\Rightarrow 2x - 3 = 63$

$\Rightarrow 2x = 63 + 3 = 66$

$\Rightarrow x = \frac{66}{2} = 33$



(ii) Let the missing number be y

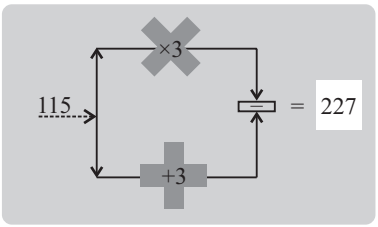
then $y \times 3 - (y + 3) = 227$

$\Rightarrow 3y - y - 3 = 227 \Rightarrow 2y - 3 = 227$

$\Rightarrow 2y = 227 + 3 = 230 \Rightarrow 2y = 230$

$\Rightarrow y = \frac{230}{2} = 115$

Thus missing number is 115



7. (i) $\xrightarrow{45} \div 3 \xrightarrow{15} \div 3 = 5$

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) $\xrightarrow{-3} -4 \xrightarrow{-7} -4 = -11$

Let missing number is y

Then $(y - 4) - 4 = -11$

$\Rightarrow y - 4 - 4 = -11 \Rightarrow y - 8 = -11$

$\Rightarrow y = -11 + 8 = -3 \Rightarrow y = -3$

Thus missing number is -3

8. Fixed fee charged by taxi driver = ₹800

After that, charge per kilometer = ₹20

Let the distance covered by x km

According to question, $x \times 20 + 800 = 2200$

$\Rightarrow 20x = 2200 - 800$

$\Rightarrow 20x = 1400 \Rightarrow x = \frac{1400}{20} = 70$

Thus, Total distance covered is 70 km.

9. Let x and $3x$ are two numbers

According to question,

$x + 3x = 76$

$\Rightarrow 4x = 76 \Rightarrow x = \frac{76}{4} = 19$

$\therefore x = 19$

$3x = 3 \times 19 = 57$

Thus 19 and 57 are required two numbers.

10. 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,

$10 + 6x = 28 \Rightarrow 6x = 28 - 10$

$\Rightarrow 6x = 18 \Rightarrow x = \frac{18}{6} = 3$

Thus, Gap between two Rods = 3 cm.

11. 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,

$4(x - 15) + 7x = 600$

$\Rightarrow 4x - 60 + 7x = 600$

$\Rightarrow 4x + 7x = 600 + 60$

$\Rightarrow 11x = 660$

$\Rightarrow x = \frac{660}{11} = 60$

Thus, cost of 1 chocolate milkshake = ₹60

cost of 1 fruit juice = ₹60 – ₹15 = ₹45

12. (a) $\cancel{6x} + 9 = \cancel{11} \rightarrow$ 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

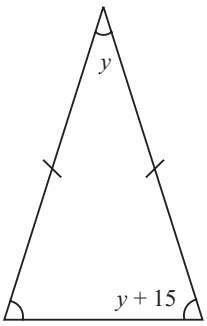
$4x - 5 = 9x + 8$

$\Rightarrow 4x = 9x + 8 + 5 \Rightarrow 4x = 9x + 13$

$\Rightarrow 4x - 9x = 13 \Rightarrow -5x = 13$

$\Rightarrow x = -\frac{13}{5} \Rightarrow x = -2\frac{3}{5}$

13. (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]

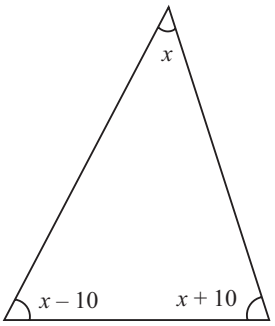
$\Rightarrow \quad y + (y + 15) + (y + 15) = 180°$

$\Rightarrow \quad 3y + 30 = 180° \Rightarrow 3y = 180° - 30$

$\Rightarrow \quad y = \frac{150}{3} = 50$

$\therefore \quad \angle A = 50°, \angle B = 65°, \angle C = 65°$

(ii)



In ΔABC, $\angle A + \angle B + \angle C = 180°$

[Angle sum property of triangle]

$\therefore x + x - 10 + x + 10 = 180°$

$\Rightarrow 3x = 180°$

$\Rightarrow x = \frac{180°}{3} = 60°$

$\therefore \angle A = 60°$

$\angle B = x - 10 = 60 - 10 = 50°$

$\angle C = x + 10 = 60 + 10 = 70°$

$\therefore \angle A = 60°, \angle B = 50°, \angle C = 70°$ **Ans.**

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 $4(6x) = 4x$

Total Amount = 132

$x + 2x + 6x + 24x = 132$

$\Rightarrow 33x = 132 \Rightarrow x = \frac{132}{33}$

$\Rightarrow x = 4$

Amount given to first person is 4 **Ans.**

15. Let height of a giraffe be x *m*

According to question

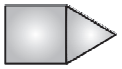
$xm = 2\frac{1}{2}m + \frac{x}{2}m \Rightarrow x = \frac{5}{2} + \frac{x}{2}$

$\Rightarrow x - \frac{x}{2} = \frac{5}{2} \Rightarrow \frac{2x - x}{2} = \frac{5}{2}$

$\Rightarrow \frac{x}{2} = \frac{5}{2} \Rightarrow x = \frac{5}{2} \times 2 = 5$

$\therefore$ Height of the giraffe = 5 *m* **Ans.**

16. (a)



4 squares

1 + 3

1 + $\underline{1}$ × 3

7 squares

1 + 3 + 3

1 + $\underline{2}$ × 3

10 squares

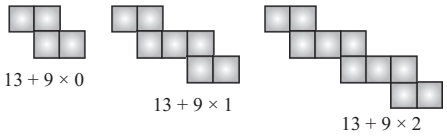
1 + 3 + 3 + 3 and so on

1 + $\underline{3}$ × 3 ..... 1 + $\underline{x}$ × 3

No. of squares in 11th position will be

1 + $\underline{11}$ × 3 = 1 + 33 = 34

(b)



and so on

So, no. of sticks needed in 11th position will be

13 + 9 × 10 = 103

(c) Let the n^{th} arrangement have 85 sticks

13 + (n – 1) × 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.

$13 + (n - 1) \times 9 = 150$

$\Rightarrow 13 + 9n - 9 = 150 \Rightarrow 4 + 9n = 150$

$\Rightarrow 9n = 150 - 4 \Rightarrow 9n = 146$

$\Rightarrow n = \frac{146}{9} \Rightarrow n = 16\frac{2}{9}$

It is not a whole number.

So, no arrangment can be made with 150 sticks.

17. Let the number be x

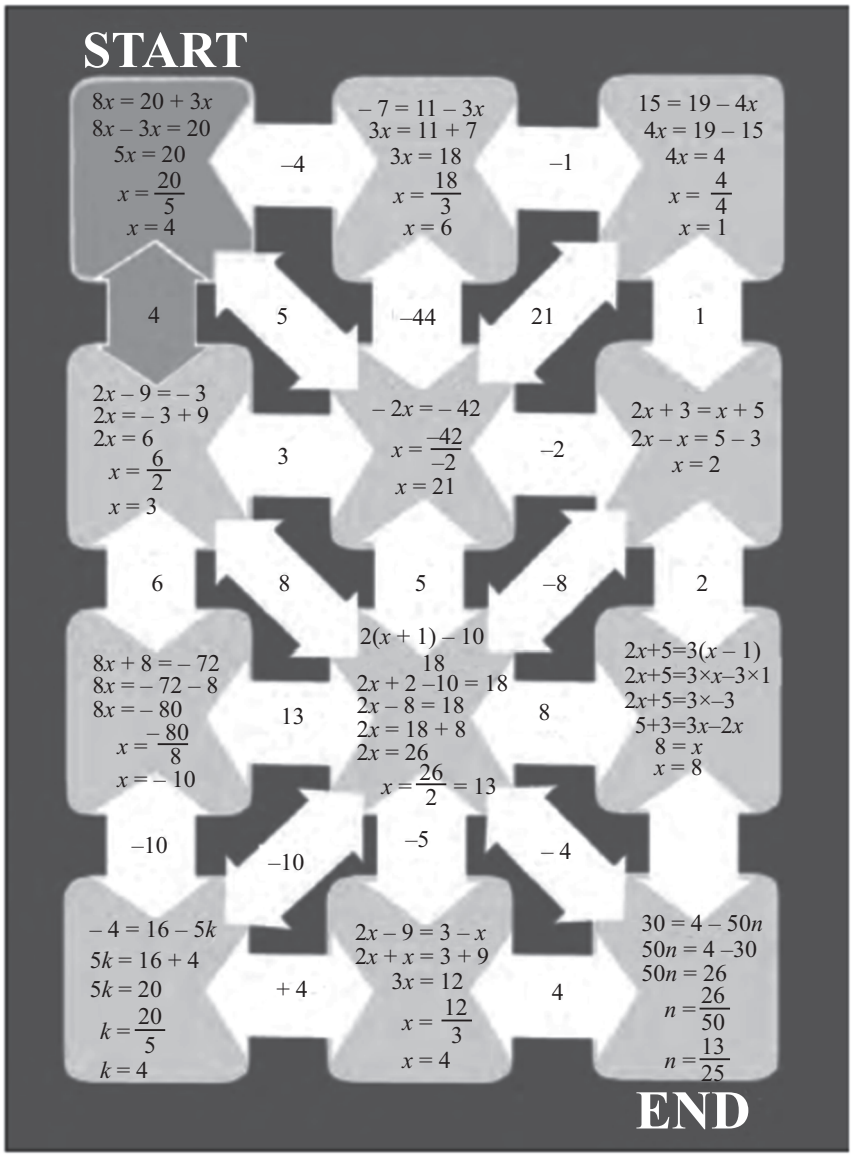
According to question,

$x + 36 = 10 \times x \Rightarrow x + 36 = 10x$

$\Rightarrow 36 = 10x - x \Rightarrow 36 = 9x$

$\Rightarrow 36 \div 9 = x \Rightarrow x = 4$

18.



19. Let the number of children be x and number of donkeys be y
Then, according to question,

$x + y = 28$ ...(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 Exercise 7.2

1. (a) Let Parmit have x marbles. Then $5x + 7 = 37$. (b) Let Laxmi's age be x years. Then $3x + 4 = 49$. (c) Let the lowest score be x. Then $2x + 7 = 87$. (d) Let each base angle be b. Then vertex angle = $2b$, and $2b + b + b = 180°$, i.e., $4b = 180°$. (e) Let each small box contain m mangoes. Then $8m + 4 = 100$.

2. Let the number be x. Then $3x + 11 = 32 \Rightarrow 3x = 21 \Rightarrow x = 7$. Thus, the number is 7.

3. Let the number be x. Then $\frac{x}{4} = 7 + 3 = 10 \Rightarrow x = 40$. Thus, the number is 40.

4. Let Raju's age be x years. Then $3x + 5 = 44 \Rightarrow 3x = 39 \Rightarrow x = 13$. Thus, Raju's age is 13 years.

5. Let the lowest score be x. Then $2x + 7 = 87 \Rightarrow 2x = 80 \Rightarrow x = 40$. Thus, the lowest score is 40.

6. Let each base angle be b. Then $2b + 40° = 180° \Rightarrow 2b = 140° \Rightarrow b = 70°$. Thus, each base angle is 70°.

7. Let Rahul score x runs. Then Sachin scored $2x$ runs. Given $x + 2x = 200 - 2 = 198 \Rightarrow 3x = 198 \Rightarrow x = 66$. Thus, Rahul scored 66 runs and Sachin scored 132 runs.

8. Let the unit's digit be x. Then ten's digit = $x + 4$. Number = $10(x + 4) + x = 11x + 40 \Rightarrow$ Sum of digits = $(x + 4) + x = 2x + 4$. Given $2x + 4 = (\frac{1}{7})(11x + 40) \Rightarrow 7(2x + 4) = 11x + 40$
$\Rightarrow 14x + 28 = 11x + 40 \Rightarrow 3x = 12 \Rightarrow x = 4$. Number = $11(4) + 40 = 84$. Thus, the number is 84.

9. Let the father's present age be x years. Then son's age = $\frac{x}{3}$. After 12 years: father = $x + 12$, son = $\frac{x}{3} + 12$. Given $x + 12 = 2(\frac{x}{3} + 12)$
$\Rightarrow x + 12 = \frac{2x}{3} + 24 = x - \frac{2x}{3} = 12 \Rightarrow \frac{x}{3} = 12$
$\Rightarrow x = 36$. Son's age = $\frac{36}{3} = 12$ years. Thus, father is 36 years and son is 12 years.

10. Let the length be x cm. Then breadth = $\frac{2x}{3}$. Perimeter = $2(x + \frac{2x}{3}) = 135 \Rightarrow 2(\frac{5x}{3}) = 135 \Rightarrow \frac{10x}{3} = 135 \Rightarrow x = 40.5$. Breadth = $\frac{2(40.5)}{3} = 27$. Thus, length = 40.5 cm and breadth = 27 cm.

Chapter Innings

A. Multiple Choice Questions

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

B. Fill in the Blanks

1. $\frac{9}{2}$ **2.** 24 **3.** 16 **4.** 0.002 **5.** 60

C. True or False

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

D. Match the following

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

E. Very Short Answer Type Questions

1. (a) $3x + 11 = 32$ (b) $6z - 5 = 7$

2. (a) No (b) No (c) Yes (d) No

3. (a) The sum of p and 4 is 15. (b) 7 subtracted from m is 3. (c) Twice a number m is 7. (d) One-fifth of a number m is 3.

4. (a) $2(x + 4) = 12 \rightarrow x = 2$. Thus, $x = 2$. (b)

$3(n-5) = 21 \rightarrow n = 12$. Thus, $n = 12$. (c) $3(n-5) = -21 \rightarrow n = -2$. Thus, $n = -2$. (d) $-4(2+x) = 8 - 4x = 16x = -4$. Thus, $x = -4$.

F. Short Answer Type Questions

1. (a) $5p + 2 = 17$; testing $p = 3$: $5(3) + 2 = 17$ = RHS. Thus, $p = 3$. (b) $3n - 14 = 4$; testing $n = 6$: $3(6) - 14 = 4$ = RHS. Thus, $n = 6$.

2. (a) $3(x-2) = 2(x+1) - 3 \rightarrow 3x - 6 = 2x - 1 \rightarrow x = 5$. Thus, $x = 5$. (b) $2(x - 1) = x + 2 \rightarrow 2x - 2 = x + 2x = 4$. Thus, $x = 4$.

3. (a) $3x - \frac{1}{3} = 2(x - \frac{1}{2}) + 5 \rightarrow 3x - \frac{1}{3} = 2x + 4x = 4 + \frac{1}{3} = \frac{13}{3}$. Thus, $x = \frac{13}{3}$. (b) $4(2x - 1) - 2(x - 5) = 5(x + 1) + 3 \rightarrow 8x - 4 - 2x + 10 = 5x + 86x + 6 = 5x + 8x = 2$. Thus, $x = 2$.

4. At $x = -1$: $2(-1)3 - 5(-1)2 + a(-1) - 7 = 10 \rightarrow -2 - 5 - a - 7 = 10 \rightarrow -14 - a = 10 \rightarrow a = -24$. Thus, $a = -24$.

5. (a) $8x + 4 = 60 \rightarrow x = 7$. Thus, the number is 7. (b) $\frac{x}{5} - 4 = 3 \rightarrow x = 35$. Thus, the number is 35. (c) $(\frac{3}{4})x + 3 = 21 \rightarrow x = 24$. Thus, the number is 24, (d) $2m - 11 = 15 \rightarrow m = 13$. Thus, the number is 13. (e) $50 - 3x = 8 \rightarrow x = 14$. Thus, the number is 14. (f) $\frac{(x + 19)}{5} = 8 \rightarrow x + 19 = 40 \rightarrow x = 21$. Thus, Prachi's number is 21. (g) $(\frac{5}{2})n - 7 = 23 \rightarrow (\frac{5}{2})n = 30 \rightarrow n = 12$. Thus, Saqib's number is 12.

G. Long Answer Type Questions

1. Let daughter's present age = x years and father's present age = y years. Ten years ago: $y - 10 = 6(x - 10) \rightarrow y = 6x - 50$...(i). After 10 years: $y + 10 = 2(x + 10) \rightarrow y = 2x + 10$ ...(ii). From (i) and (ii): $6x - 50 = 2x + 10 \rightarrow 4x = 60 \rightarrow x = 15$, $y = 2(15) + 10 = 40$. Thus, father's present age = 40 years and daughter's present age = 15 years.

2. Let breadth = x cm, length = $(x + 6)$ cm. $2[(x + 6) + x] = 108 \rightarrow 2(2x + 6) = 108 \rightarrow 4x + 12 = 108 \rightarrow 4x = 96 \rightarrow x = 24$. Thus, length = 30 cm and breadth = 24 cm.

3. Let chair = Rs. x, table = Rs. $(x + 10)$. $(x + 10) + 2x = 340 \rightarrow 3x + 10 = 340 \rightarrow 3x = 330 \rightarrow x = 110$. Thus, chair = Rs. 110 and table = Rs. 120.

4. Let units digit = u, tens digit = $u + 6$. Number = $10(u + 6) + u = 11u + 60$. Sum of digits = $2u + 6$. $11u + 60 = 10(2u + 6) \rightarrow 11u + 60 = 20u + 60 \rightarrow 9u = 0 \rightarrow u = 0$. Thus, the number is = 60.

5. Let first girl have x marbles (heaps of 6), second girl have $(480 - x)$ marbles (heaps of 9). $\frac{x}{6} + \frac{(480 - x)}{972}$. Multiplying by 18: $3x + 2(480 - x) = 1296 \rightarrow 3x + 960 - 2x = 1296 \rightarrow x = 336$. Thus, first girl has 336 marbles and second girl has 144 marbles.

H. Assertion-Reason Questions

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

I. Case Study

Let Sara's age = x. Ann's age = $x - 3$. Mother's age = $3x = 4(x - 3) \rightarrow 3x = 4x - 12 \rightarrow x = 12$. Thus, Sara = 12 years, Ann = 9 years, Mother = 36 years.

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

❑❑