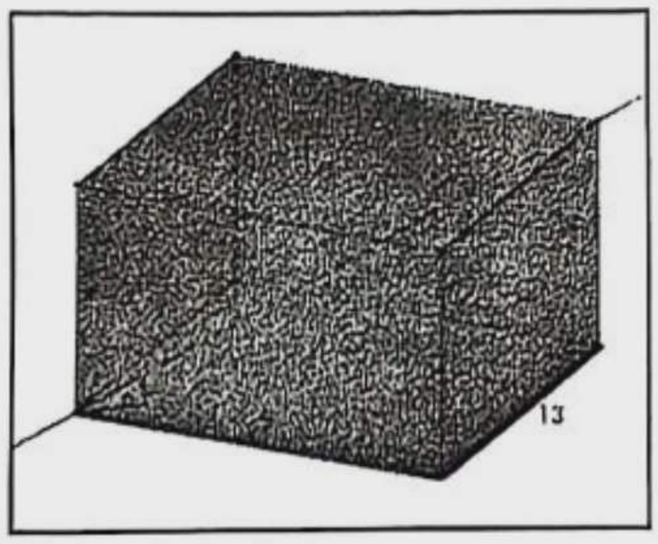
Chapter 08

Quadrilateral

Contents for Discussion

• Quadrilateral • Types of Quadrilateral • Theorems related to Quadrilaterals • Area of Quadrilaterals • Solid • Construction of Quadrilaterals.



Learning Outcomes : After studying this chapter I will be able to–

- Verify and logically prove the properties of quadrilaterals;
- Construct quadrilaterals from given data;
- Find the area of quadrilaterals by the formula of triangles;
- Construct rectangular solids;
- Find the area of surfaces of cubic and rectangular solids.

Practice

Solutions to Mathematical Problems following 100% accurate format for best prep.

Dear learners, mathematical problems of this chapter have been divided into exercise, multiple choice, short, creative and exercise-based activities in light of the learning outcomes. Practice the solutions well to ensure the best preparation in the exam.

Exercise 8.1 : Quadrilateral, Types of Quadrilateral & Theorems related to Quadrilaterals

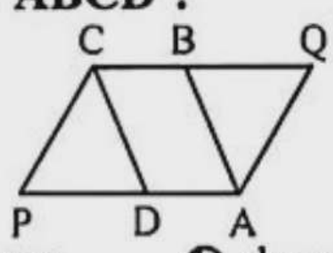
At a Glance Important Contents of Exercise

- **Straight Angle :** If an angle is equal to 180°, it is called a straight angle.
- **Adjacent Angles :** If two angles share the same vertex and their common arm lies between them, then they are called adjacent angles.
- **Complementary Angles :** If the sum of two adjacent angles is 90°, then each angle is the complement of the other.
- **Perpendicular & Right Angle :** If two adjacent angles on the same line are equal, then each of them is a right angle. The arms of a right angle are perpendicular to each other.
- **Supplementary Angles :** If the sum of two adjacent angles is 180°, then each angle is the supplement of the other.
- **Quadrilateral :** A closed figure formed by four line segments is called a quadrilateral.
- **Parallelogram :** A quadrilateral in which the opposite sides are parallel is called a parallelogram.
- **Rectangle :** A parallelogram in which one angle is a right angle is called a rectangle. All four angles of a rectangle are right angles.
- **Rhombus :** A rhombus is a parallelogram in which adjacent sides are equal in length. That is, a rhombus has opposite sides parallel and all four sides equal.
- **Square :** A square is a rectangle in which adjacent sides are equal.
- **Trapezium :** A quadrilateral in which one pair of opposite sides is parallel is called a trapezium.
- Area of a Trapezium = (Sum of the parallel sides ÷ 2) × Height.
- Area of a Rhombus = $\frac{1}{2}$ × (Product of the diagonals).
- For a rectangular solid with length a units, width b units, and height c units, its surface area = 2(ab + bc + ac) square units.
- For a cube with edge length a units, its total surface area = $6a^2$ square units.

Solutions to Exercise Problems — Let's solve the textbook problems

MCQs with Answers

1. **Which one of the following is true for a parallelogram?**
   ⓐ opposite sides are not parallel
   ⓑ if one angle is right angle, it is a rectangle
   ⓒ opposite sides are unequal
   ⓓ the diagonals are equal **(b)**
2. **Which one of the following is a property of a rhombus?**
   ⓐ the diagonals are equal
   ⓑ all angles are right angles
   ⓒ opposite angles are unequal
   ⓓ all sides are equal **(d)**
3. i. The sum of four angles of a quadrilateral is four right angles.
   ii. If the adjacent sides of a rectangle are equal, it is a square.
   iii. All rhombuses are parallelograms.
   In view of the above information which one of the following is correct?
   ⓐ i and ii ⓑ i and iii
   ⓒ ii and iii ⓓ i, ii and iii **(d)**
4. **In the quadrilateral PAQC, PA = CQ and PA || CQ. If the bisectors of ∠A and ∠C are AB and CD respectively, what is the name of the region ABCD ?**



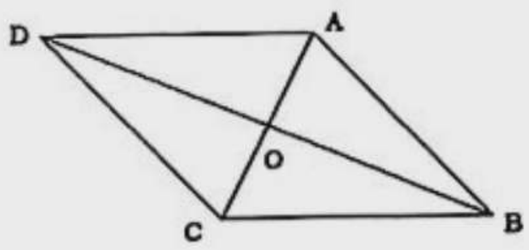
   ⓐ parallelogram ⓑ rhombus
   ⓒ rectangle ⓓ square **(a)**

   ⏩ **Explanation :** As PA = CQ and PA || CQ. So, PAQC is a parallelogram.
   We know, opposite angles of prallelogram are equal
   ∴ ∠PAQ = ∠PCQ
   As CD and AB are bisector of ∠C and ∠A. So,
   ∠PCD = ∠QCD = ∠PAB = ∠BAQ
   ∴ AD || BC of ABCD quadrilaterals and
   ∠BAD = ∠BCD = acuteangle
   ∴ ABCD is a parallelogram.

Solutions to Geometrical Problems

5. The median BO of ΔABC is produced up to D so that BO = OD. Prove that, ABCD is a parallelogram.

Solution :

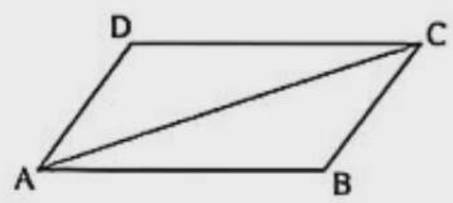


Proposition : According to the above figure, we have any ΔABC with OB as one of the medians. BO is extended up to D so that BO = OD. Now we shall have to prove that ABCD is a parallelogram.

Proof : According to proposition,
CO = OA, BO = OD
Now comparing ΔBOC and ΔAOD, we have,
BO = OD, CO = OA and ∠BOC = ∠AOD, since they are vertically opposite angles.
∴ ΔBOC ≅ ΔAOD.
So, CB = DA.
Similarly, comparing ΔCOD and ΔAOB, we have BA = CD.
So, ABCD is a quadrilateral where BD and CA are its two diagonals.
Again, since CO = OA and BO = OD, hence it is obvious, the diagonals of the quadrilateral mutually bisect each other.
So, proved that ABCD is a parallelogram.

6. Prove that a diagonal of a parallelogram divides it into two congruent triangles.

Solution :

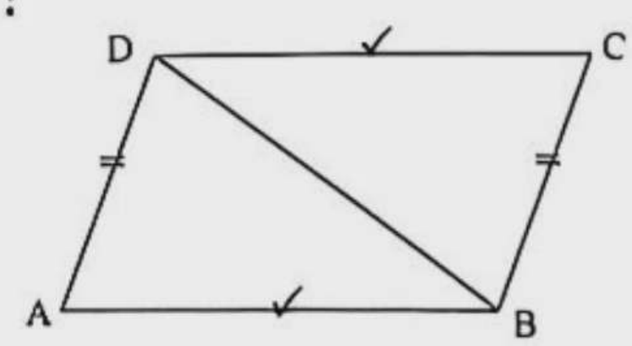


Proposition : Let us suppose, ABCD is any parallelogram and AC is one of its diagonals. We shall have to prove that ΔABC and ΔACD are congruent.

Proof : According to proposition, ABCD is any parallelogram.
∴ AB = DC, AD = BC and ∠ABC = ∠ADC and AC is common to both the triangles.
∴ ΔABC ≅ ΔACD
That is, a diagonal of a parallelogram divides it into two congruent triangles. **(Proved)**

7. Prove that, if the opposite sides of a quadrilateral are equal and parallel, it is a parallelogram.

Solution :

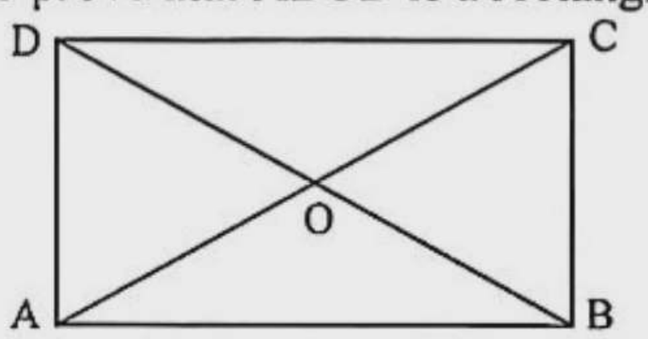


Proposition : Let us suppose that ABCD is any quadrilateral with AB = DC, AD = BC and AB || DC, AD || BC. Now we have to proved that ABCD is a parallelogram.

Construction : Let us join B and D.

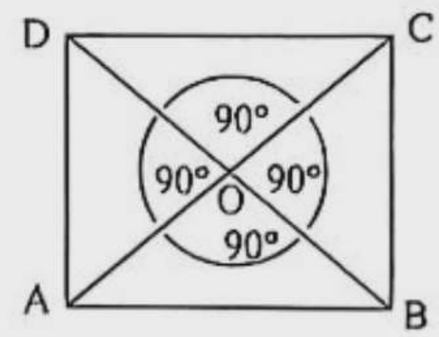
Proof : We have been given, AB = DC, AD = BC, AB || DC and AD || BC.
Now comparing ΔABD and ΔBCD, we have,
AB = DC, AD = BC, BD is common to both the triangles.
So, ΔABD ≅ ΔBCD
∴ ∠A = ∠C, ∠ABD = ∠BDC ..... (i)
∠ ADB = ∠DBC..... (ii)
So, ∠ADB + ∠BDC = ∠ABD + ∠DBC. {from (i) and (ii)
⇒ ∠ADC = ∠ABC.
That is, the opposite angles of the quadrilateral ABCD are mutually equal. Moreover, its opposite sides are mutually equal and parallel.
∴ The quadrilateral ABCD is a parallelogram.
(Proved).

8. Prove that, if two diagonals of a parallelogram are equal, it is a rectangle.
Solution :
Proposition : Let us suppose, ABCD is any parallelogram with equal diagonals AC and BD. We have to prove that ABCD is a rectangle.



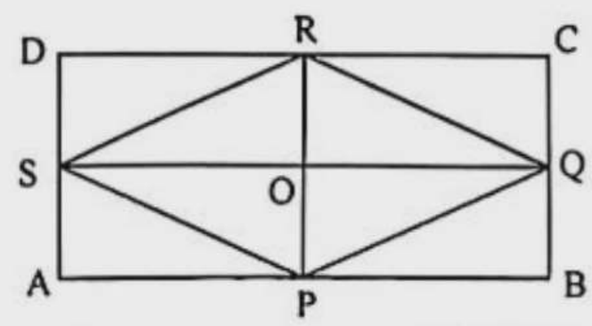
Proof : According to proposition, ABCD is a parallelogram.
So, AB = DC, AB || DC and AD = BC, AD || BC.
Now from ΔABD and ΔBCD, we have,
∠ADB = ∠DBC and ∠ABD = ∠BDC, since they are mutually alternate angles.
Similarly from ΔACD and ΔACB, we can have, ∠ACD = ∠BAC and ∠ACB = ∠DAC.
Now comparing ΔAOD and ΔBOC where O is the point of intersection of AC and BD, we have,
∠ADO = ∠CBO, ∠DAO = ∠BCO and
∠AOD= ∠BOC, since they are vertically opposite angles.
∴ ΔAOD ≅ ΔBOC.
So, OA = OC and BO = OD.
Thus it is obvious that the diagonals of ABCD mutually bisect each other. Besides, AC = BD as per proposition.
Therefore, ABCD is a rectangle. **(Proved).**

9. Prove that, if two diagonals of a quadrilateral are mutually equal and bisect each other at right angles, it is a square.
Solution :
Proposition : Let us suppose, ABCD is a quadrilateral with diagonals AC = diagonal BD and AC bisects BD at O at right angles. We have to prove that ABCD is a square.



Proof : As per proposition, AC and BD are mutually perpendicular. So, ∠AOB = ∠BOC = ∠COD = ∠DOA = 90°.
Again, AC bisects BD at O
So, AO = OC and BO = OD
Now comparing ΔAOD and ΔBOC, we have,
AO = OC, BO = OD and ∠AOD = ∠BOC
∴ ΔAOD ≅ ΔBOC.
So, AD = BC.
Similarly comparing ΔAOB and ΔCOB we can have, AO = OC and OB = BO ∠AOB = ∠BOC
∴ΔAOB ≅ ΔBOC.
∴ AB = BC
Again, in the same way, comparing
ΔAOD and ΔCOD, we can have AD = CD
So, we have AB = BC = CD = DA
Therefore, ABCD is a square. **(Proved).**

10. Prove that, the quadrilateral formed by joining the mid-points of adjacent sides of a rectangle is a rhombus.
Solution :



Proposition : Let us suppose, ABCD is a rectangle and P,Q,R and S are the mid-points of AB, BC, CD and DA respectively. So, PQRS is a quadrilateral. We have to prove that PQRS is a rhombus.
Construction : P, Q; Q, R; R, S and S, P are joined. S, Q and P, R are also joined. Let SQ and PR intersect mutually at O.
Proof : According to proposition, P, Q, R and S are the mid-points of AB, BC, CD and DA. So, We have, SA = SD, PA = PB, QB = QC and RC = RD.
Now comparing ΔAPS and ΔDSR, we have,
SA = SD, RD = PA, ∠RDS = ∠PAS, since ABCD is a rectangle. So, ΔAPS ≅ ΔDSR.
∴ SR = SP.
Similarly comparing ΔASP and ΔBQP; ΔBQP and ΔCQR, we can have, SP = PQ and PQ = QR.
So, SP = PQ = QR = SR.
Again, ABCD is a rectangle and S, Q are the mid-points of AD and BC respectively.

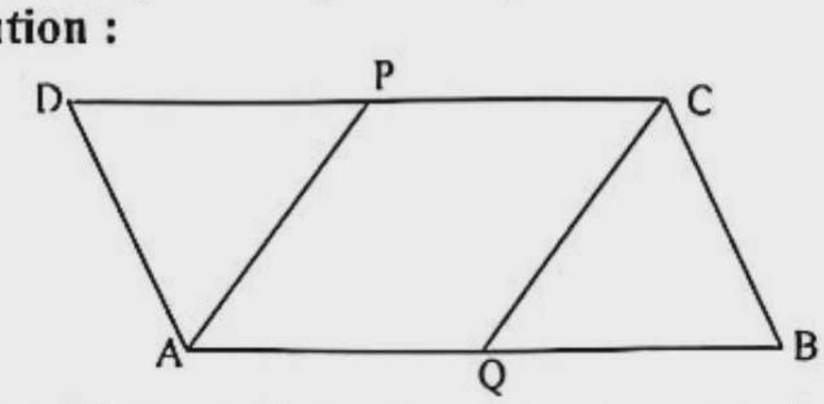
So, SQ divides equally the rectangle ABCD into two rectangles ABQS and SQCD. Similarly PR divides the rectangle ABCD into two equal rectangles APRD and PBCR. Therefore, SQ and PR divide ABCD into four equal rectangles APOS, BPOQ, CQOR and DSOR.

$\therefore$ $\angle SOR = \angle QOR = \angle POS = \angle QOP = 90°$ and $OP = OR$ and $OS = OQ$.

Therefore, PQRS is a rhombus. **(Proved).**

11. Prove that, the bisectors of any two opposite angles of a parallelogram are parallel to each other.

Solution :



Proposition : Let us suppose, we have a parallelogram ABCD where $\angle A$ is opposite to $\angle C$. Let us also suppose, AP is the bisector of $\angle A$ and CQ is the bisector of $\angle C$. We have to prove that $AP \parallel QC$.

Proof : Here, $\angle ADC = \angle ABC$, because they are mutually opposite angles of the parallelogram ABCD. For the similar reason, $\angle DAB = \angle BCD \Rightarrow$ $\frac{1}{2}\angle DAB = \frac{1}{2}\angle BCD \Rightarrow \angle DAP = \angle BCQ$,

since AP and CQ are bisectors of $\angle A$ and $\angle C$ respectively.

Now comparing ΔADP and ΔBCQ, we have, $\angle ADP = \angle CBQ$, $\angle DAP = \angle BCQ$ and $AD = BC$, since they are the opposite sides of the parallelogram ABCD.

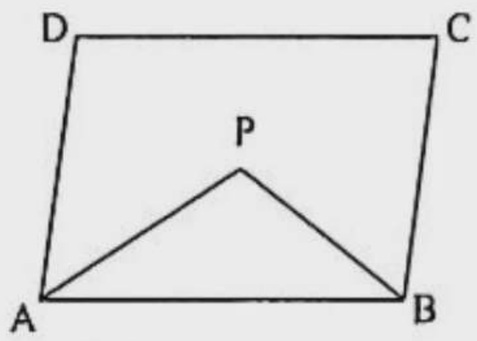
$\therefore \Delta ADP \cong \Delta BCQ$.

So, $AP = CQ$ and $DP = BQ \Rightarrow PC = AQ$.

Since $AQ \parallel PC$ as per proposition, hence AQCP is a parallelogram and thus $AP \parallel QC$. **(Proved).**

12. Prove that, the bisectors of any two adjacent angles of a parallelogram are perpendicular to each other.

Solution :



Proposition : Let us suppose, ABCD is a parallelogram and the bisectors of the adjacent angles of A and B are AP and BP. We shall have to prove that AP and BP are mutually perpendicular.

Proof : According to proposition, $\angle A$ and $\angle B$ are adjacent angles. Besides, AP and BP are bisectors of $\angle A$ and $\angle B$ respectively.

$\therefore$ $\frac{1}{2}\angle A = \angle BAP$ and $\frac{1}{2}\angle B = \angle ABP$.

Again, $AD \parallel BC$ and AB is their transversal.

$\therefore$ $\angle A + \angle B = 180°$

or, $\frac{1}{2}(\angle A + \angle B) = \frac{1}{2} \times 180°$

or, $\frac{1}{2}\angle A + \frac{1}{2}\angle B = 90°$

or, $\angle BAP + \angle ABP = 90°$ ..... (i)

Now, from ΔAPB, we have,

$\angle ABP + \angle BAP + \angle APB = 180°$

or, $90° + \angle APB = 180°$, from (i), putting $\angle BAP + \angle ABP = 90°$.

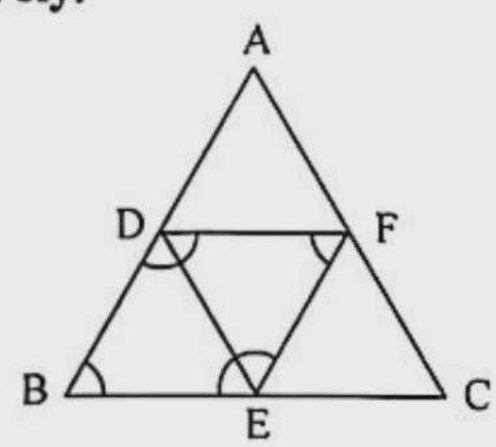
or, $\angle APB = 180° - 90°$

or, $\angle APB = 90°$

That is, AP and BP are mutually perpendicular.

$\therefore$ $AP \perp BP$ **(Proved).**

13. In the figure, ABC is an equilateral triangle. D, E and F are the mid-points of AB, BC and AC respectively.



(a) Prove that, $\angle BDF + \angle DFE + \angle FEB + \angle EBD$ = 4 right angles.

(b) Prove that, $DF \parallel BC$ and $DF = \frac{1}{2}BC$.

Solution :

(a) **Proposition :** ΔABC is an equilateral triangle and D, E, F are mid-points of AB, BC and CA. We have to prove that $\angle BDF + \angle DFE + \angle FEB + \angle EBD$ = 4 right angles.

Construction : D, E; E, F and F, D are joined.

Proof :

(a) From ΔBDE, we have,

$\angle BDE + \angle DBE + \angle BED$ = 2 right angles .... (1)

Again, from ΔDEF, we have,

$\angle DEF + \angle EFD + \angle EDF$ = 2 right angles .... (2)

Adding (1) and (2), we have,

$\angle BDE + \angle EDF + \angle EFD + \angle DBE + \angle DEF + \angle BED$ = (2 + 2) right angles.

or, $\angle BDF + \angle EFD + \angle DBE + \angle BEF$ = 4 right angles. **(Proved.)**

(b) According to proposition,

$AB = BC = CA \Rightarrow \frac{1}{2}AB = \frac{1}{2}BC = \frac{1}{2} = CA \Rightarrow$

$AD = DB = BE = EC = CF = FA$ and $\angle A = \angle B = \angle C$.

Now from ΔDBE and ΔFEC, we have,

$DB = CF$, $BE = EC$ and $\angle B = \angle C$

$\therefore$ $\Delta DBE \cong \Delta FEC$

So, $DE = EF$.

Again comparing ΔADF and ΔFEC, we have

$\therefore$ $DF = EF = DE$.

$\therefore$ ΔDEF equilateral

In the same way ΔEFC,

$CF = CE$

$\therefore$ $\angle CFE = \angle CEF = 60°$ ($\angle C = 60°$)

$\therefore$ ΔEFC equilateral

$\therefore$ $CF = EF = BD = BE = DF$

From, quadrilateral BEFD, we get,

DE = transversal of BD and EF,

$\angle BDE = \angle DEF$ = alternate angles, because both ΔBDE and ΔDEF are equilateral triangles

$\therefore$ $BD \parallel EF$ and $BD = EF$

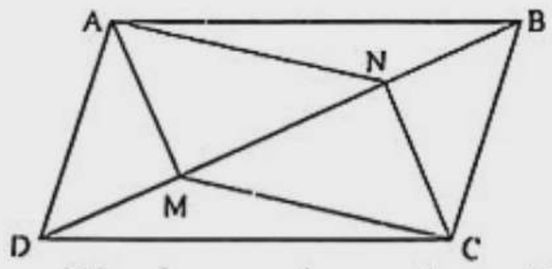
Similarly, $DF \parallel BE$ and $DB = FE$

Again $DF = BE = \frac{1}{2}BC$

So, $DF \parallel BC$, and $DF = \frac{1}{2}BC$. **(Proved)**

14. In the parallelogram ABCD, AM and CN are both perpendiculars to DB. Prove that ANCM is also a parallelogram.

Solution :



Proposition : We have given that ABCD is any parallelogram. AM and CN are perpendiculars to DB. We have to prove that ANCM is a parallelogram.

Proof : According to proposition, AM and CN are perpendiculars to DB.

$\therefore$ $\angle AMD = \angle BNC = 90°$.

Now comparing ΔAMD and ΔBNC, we have,

$\angle AMD = \angle BNC$, $\angle ADM = \angle CBN$, since they are mutually alternate angles to each other and $AD = BC$, as per proposition.

$\therefore$ ΔAMD and ΔBNC are congruent.

So, $AM = CN$.

Again, comparing ΔAMN and ΔCMN, we have,

$AM = CN$, MN is common to both of them,

$\angle AMN = \angle CNM = 90°$ as per proposition,

$\therefore$ $\Delta AMN \cong \Delta CMN$.

$\therefore$ $AN = CM$

and $\angle ANM = \angle CMN$

Here, AM and CN are two straight lines and MN is their transversal.

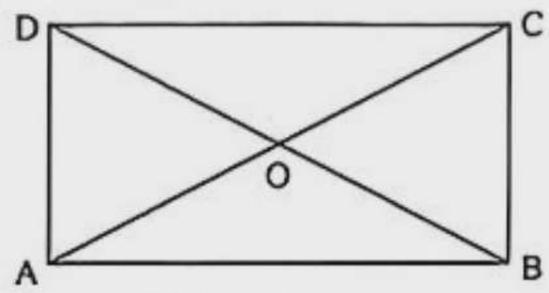
$\therefore$ $AM \parallel CN$ [$\because \angle ANM = \angle CMN$]

In this way it can be proved that $AN \parallel MC$

$\therefore$ AMCN is a parallelogram **(Proved.)**

Creative Questions with Solutions

Ques. 15 In the figure, $AB = CD$ and $AB \parallel CD$.



a. Name the two triangles on base AB. 2

b. Prove that, AD and BC are equal and parallel to each other. 4

c. Show that, $OA = OC$ and $OB = OD$. 4

Solution to Question No. 15 :

a The two triangle with base AB are ΔABD and ΔABC and They are congruent reght triangles.

b We have, $AB \parallel CD$ and $AB = CD$ and BD is an intersector of AB and CD.

Now, from ΔABD and ΔBCD, we have, $\angle ABD = \angle BDC$, $\angle ADB = \angle DBC$, since they are alternate angles. BD is common to both the triangles.

$\therefore$ $\Delta ABD \cong \Delta BDC$.

Therefore, $AD = BC$.

Besides, $AD \parallel BC$, because, $AB \parallel CD$ and $AB = CD$.

$\therefore$ $AD = BC$ and $AD \parallel BC$. **(Proved.)**

c According to proposition,

$AB = CD$, $AB \parallel CD$.

Again from (b), we have,

$AD = BC$ and $AD \parallel BC$,

$\therefore$ ABCD is a parallelogram and diagonals AC and BD intersect at O.

Now comparing ΔAOD and ΔBOC, we have, $AD = BC$, $\angle ADO = \angle CBO$, $DAO = \angle BCO$, since they are mutually alternate angles.

So, ΔAOD and ΔBOC are congruent.

$\therefore$ $AO = OC$ and $BO = OD$. **(Proved).**

Ques. 16 ABCD is a parallelogram. The diagonals AC and BD bisect at O.

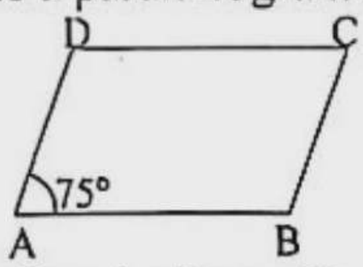
a. Find out the value of $\angle ABC$ if $\angle BAD = 70°$. 2

b. If $AC = BD$, then prove that ABCD is a rectangle. 4

c. If $AB = AD$, prove that, AC and BD bisect at the point 'O' at right angle. 4

Solution to Question No. 16 :

a Here ABCD is a parallelogram and $\angle A = 70°$.



$\therefore \angle A = 70° = \angle C$ and $\angle B = \angle D$

Now, $\angle A + \angle B + \angle C + \angle D$

$= 70° + \angle B + 70° + \angle B$, since $\angle B = \angle D$

$= 2\angle B + 140°$ .....(i)

But we know $\angle A + \angle B + \angle C + \angle D = 360°$ .....(ii)

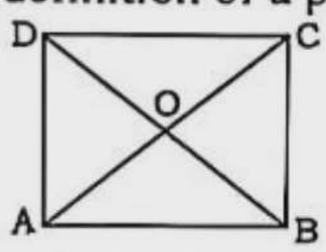
$\therefore 2\angle B + 140° = 360°$, from (i) and (ii)

or, $2\angle B = 220° \Rightarrow \angle B = 110°$

$\therefore \angle ABC = 110°$

b Let, ABCD is a parallelogram where the two diagonals AC and BD are mutually equal and they intersect at O. Now, it is required to prove that ABCD is a rectangle.

Proof : In the parallelogram ABCD, AB = DC, AD = BC, by the definition of a parallelogram.



Now, in ΔABD and ΔABC, AD = BC, AC = BD, by proposition, AB is common to both the triangles.

$\therefore \Delta ABD$ and ΔABC are congruent.

$\therefore \angle BAD = \angle ABC$ .....(i)

Again, in ΔABC and ΔBCD, AB = DC, BC is common to all and AC = BD, by proposition.

$\therefore \Delta ABC \cong \Delta BCD$.

$\therefore \angle ABC = \angle BCD$ .....(ii)

Similarly, comparing ΔBCD and ΔACD, we can have,

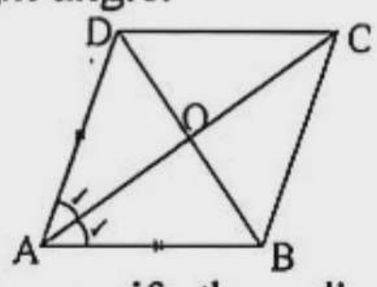
$\angle BCD = \angle ADC$ .....(iii)

Now from (i), (ii) and (iii) we can have, $\angle BAD = \angle ABC = \angle BCD = \angle CDA$.

Since ABCD is a parallelogram and its 4 angles are mutually equal, ABCD is a rectangle by definition.

So, ABCD is a rectangle. **(Proved)**

c Let, in the parallelogram ABCD, AB = AD and its diagonals AC and BD mutually intersect at O. Now it is required to prove that AC and BD bisect each other at right angle.



Proof : We know, if the adjacent sides of a parallelogram are equal, the parallelogram is a rhombus.

In parallelogram ABCD, AB = AD.

So, ABCD is a rhombus.

$\angle BAC = \angle CAD$, since AC is a diagonal of ABCD.

Now in ΔAOD and ΔAOB, AD = AB, $\angle BAO = \angle DAO$, AO is common to both the triangle.

$\therefore \Delta AOD \cong \Delta AOB$.

$\therefore$ OD = OB and $\angle AOD = \angle AOB$ ..... (i)

Again, O is a point on the straight line BD.

$\therefore$ straight angle BOD = 180°

$= \angle BOA + \angle DOA = 2\angle BOA$, from (i)

$\therefore 2\angle BOA = 180° \Rightarrow \angle BOA = 90°$.

$\therefore$ AO is perpendicular to BD.

So, AO is a perpendicular bisector of BD.

Similarly, comparing ΔAOB, ΔBOC; ΔBOC, ΔCOD and ΔCOD, ΔAOD, it can be seen that OB is perpendicular bisector of AC, OC is a perpendicular bisector of BD, OD is a perpendicular bisector of AC.

So, AC and BD bisect each other at right angles. **(Proved)**

Ques. 17 The diagonals AC and BD of the quadrilateral BACD are unequal and the sum of any two adjacent angels is two right angles.

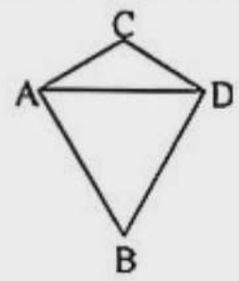
a. Define 'Kite' with the figure. 2

b. Prove that AB = CD and AD = BC. 4

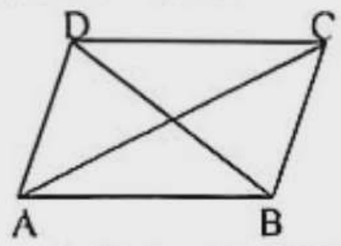
c. If the perpendiculars BP and PQ are drawn from the points B and D on AC, prove that BPDQ is a parallelogram. 4

Solution to Question No. 17 :

a A quadrilateral whose two pairs of adjacent sides are mutually equal is known as a kite. A geometric figure ACDB of a kite is shown below :



b Let ABCD is a quadrilateral where diagonals AC and BD are unequal and the adjacent angles are two right angles. Now it is required to prove that AB = CD and AD = BC.



Proof : In the quadrilateral ABCD, $\angle A + \angle B = 180°$ given.

Again $\angle B + \angle C = 180°$, for the same reason stated above.

$\therefore \angle A + \angle B = \angle B + C \Rightarrow \angle A = \angle C$ .....(i)

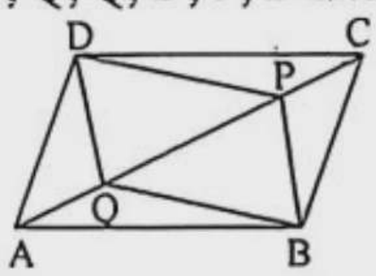
In the same way, we can have, $\angle B + \angle C = \angle C + \angle D \Rightarrow \angle B = \angle D$ .....(ii)

Now from (i) and (ii) it can be concluded that the opposite angles sides of ABCD are mutually equal and such it is a parallelogram.

$\therefore$ AB = CD and AD = BC **(Proved)**

C Let BP and DQ are two perpendiculars drawn from B and D respectively to the diagonal AC of the parallelogram ABCD. Now it is required to prove that BPDQ is a parallelogram.

Construction : B, Q; Q, D; P, D and B, P are joined.



Proof : In ΔADQ and ΔBPC,
$\angle DAQ = \angle BCP$, alternate angles.
$\angle AQD = \angle BPC$, right angles.
AD = BC, opposite side of parallelogram ABCD.
$\therefore \Delta ADQ \cong \Delta BPC$.
$\therefore$ BP = DQ .....(i)
Similarly, in ΔPBQ and ΔQPD, BP = QD, from (i) above, PQ is common to both.
$\angle PQD = \angle BPQ$, right angle.
$\therefore \Delta BPQ \cong \Delta PQD$
$\therefore$ BQ = PD .....(ii)
and $\angle QPD = \angle PQB$, $\angle PQD = \angle BPQ$ ..... (iii)
Now from (i), (ii) and (iii) it is clear that BPDQ is a quadrilateral whose opposite sides are mutually equal.
So, BPDQ is a parallelogram. **(Proved)**

Creative Geometrical with Solutions

18. The length, the breadth and the height of a rectangular solid are 10 cm, 8 cm and 5 cm respectively. Find the area of the entire faces of the solid.

Solution : We know that,
area of the whole surface of a rectangular solid
= 2(ab + bc + ca), where a, b and c are the length, breadth and height of the rectangular solid
Here a = 10 cm, b = 8 cm and c = 5 cm.
$\therefore$ The required area of the whole surface of the solid $= 2(10 \times 8 + 8 \times 5 + 5 \times 10)$ sq. cm
$= 2(80 + 40 + 50)$ sq. cm
$= 2(170)$ sq. cm $= 340$ sq. cm
So, area of whole surface is 340 sq. cm.

19. If the edge of a cubic box is 6.5 cm, find the area of the entire faces of the box.

Solution : We know,
the area of whole surface of a cube
$= 6a^2$, where a = the length of an edge of the cube
Here a = 6.5 cm
$\therefore$ The area of the whole surface of the cube sized box $= 6 \times (6.5)^2$ sq. cm
$= 253.5$ sq. cm
So, the required area of the whole surface of the box is 253.5 sq. cm.

Multiple Choice Q/A Designed as per topic

8.1 Quadrilateral ▸ Textbook Page 133

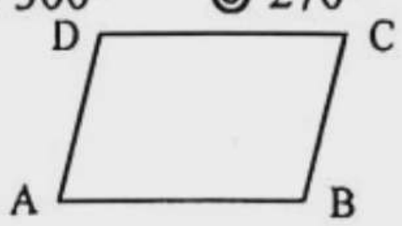
1. Which one set of four angles should be the angles of a quadrilateral? *(Easy)*
ⓐ 90°, 90°, 60° and 20° ⓑ 110°, 90°, 70° and 70°
d ⓒ 80°, 80°, 100° and 90° ⓓ 90°, 70°, 110° and 90°

2. The measures of the angles of a square or a rectangle are — ? *(Easy)*
ⓐ 90°, 90°, 70° and 20° ⓑ 110°, 90°, 70° and 70°
c ⓒ 90°, 90°, 90° and 90° ⓓ 90°, 70°, 110° and 90°

3. A — is a special case of a square — *(Medium)*
ⓐ quadrilateral ⓑ parallelogram
d ⓒ rectangle ⓓ rhombus

4. What is called the quadrilateral whose two pairs of adjacent sides are equal? *(Medium)* *[DB '19]*
ⓐ Rectangle ⓑ Square
c ⓒ Kite ⓓ Parallelogram

5. What is the sum of four angles of a quadrilateral? *(Easy)* *[DB '19]*
a ⓐ 360° ⓑ 300° ⓒ 270° ⓓ 180°

6.


In figure ABCD is a parallelogram.
If $\angle ABC = 100°$, then $\angle BAD$ = What? *(Easy)* *[JB '19]*
a ⓐ 80° ⓑ 90° ⓒ 100° ⓓ 180°

7. How many independent and unique data are needed to construct a quadrilateral? *(Easy)* *[CB '18]*
d ⓐ 1 ⓑ 3 ⓒ 4 ⓓ 5

8. What is the total of four angles of a kite? *(Medium)* *[JB '16]*
ⓐ 360° ⓑ 300°
a ⓒ 180° ⓓ 90°

9. The parallel two sides of a trapezium are 7 cm and 5 cm respectively and the perpendicular distance between the two sides is 4 cm, what is the area in sq. cm? *(Medium)* *[DB' 15]*
b ⓐ 12 ⓑ 24 ⓒ 70 ⓓ 120

10. To construct a quadrilateral how many unique data are required? *(Easy)* *[Din.B' 15]*
c ⓐ 3 ⓑ 4 ⓒ 5 ⓓ 6

8.2 Types of Quadrilateral ▸ Textbook Page 134

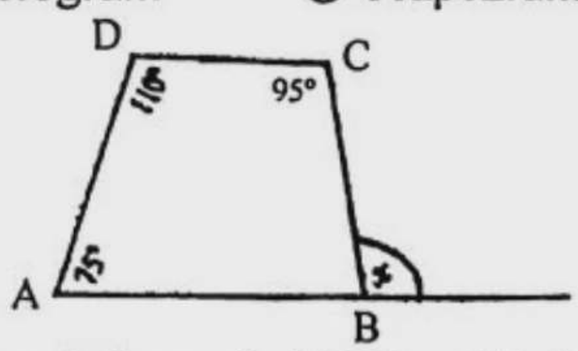
11. What is called a parallelogram when one angle is 90°? *(Hard)* *[RB '19]*
ⓐ Rectangle ⓑ Square
a ⓒ Rhombus ⓓ Trapezium

12. What is the sum of four angles of a kite? *(Easy)* *[JB '19]*
ⓐ 120° ⓑ 180°
d ⓒ 270° ⓓ 360°

13. Whose two diagonals and opposite angles are equal? *(Easy)* *[JB '18]*
ⓐ Rectangle ⓑ Rhombus
ⓐ ⓒ Parallelogram ⓓ Trapezium

14. If two diagonals are given, which one of the following can be drawn? *(Medium)* *[DjB '18]*
ⓐ Rhombus ⓑ Rectangle
ⓐ ⓒ Parallelogram ⓓ Trapezium

15.



In the quadrilateral ABCD, AB || CD, AD adn BC are non parellel, ∠x = ? *(Easy)* *[RB '17]*
ⓑ ⓐ 45° ⓑ 95° ⓒ 85° ⓓ 135°

16. How many degree are there of the sum of four angles of a quadrilateral? *(Hard)* *[RB' 15]*
ⓒ ⓐ 180° ⓑ 270° ⓒ 360° ⓓ 450°

17. The length of a house is three times its breadth. If the area of the house is 147 square metre, then what is its breadth? *(Easy)* *[RB' 15]*
ⓐ 11 metre ⓑ 10 metre
ⓒ ⓒ 7 metre ⓓ 5 metre

18. What type of quadrilateral is ABCD? *(Easy)* *[JB' 15]*
ⓐ Square ⓑ Rhombus
ⓒ Trapezium ⓓ Parallelogrm
[**Note:** correct answer is rectangle.]

19. If all the sides are equal of a quadrilateral but the angles are not right angle, what type of quadrilateral is it? *(Easy)* *[Ctg.B' 15]*
ⓐ Square ⓑ Rectangle
ⓒ ⓒ Rhombus ⓓ Parallelogram

20. What is called the quadrilateral region whose two pairs of adjacent sides are equal? *(Easy)* *[SB' 15]*
ⓐ Rectangular region ⓑ Square region
ⓑ ⓒ Kite ⓓ Trapezium

21. How many data are to be known to draw a quadrilateral? *(Medium)* *[SB' 15]*
ⓓ ⓐ Two ⓑ Three ⓒ Four ⓓ Five

22. A quadrilateral with exactly two distinct consecutive pairs of sides of equal lengths is —. *(Medium)* *[Din.B' 15]*
ⓐ rectangle ⓑ parallelogram
ⓓ ⓒ trapezium ⓓ kite

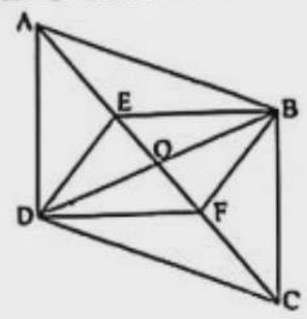
23. i. Every rectangle is equiangular
ii. Every square is equilateral
iii. Every square is equiangular
Which of the following is correct? *(Medium)*
ⓓ ⓐ i & ii ⓑ i & iii ⓒ ii & iii ⓓ i, ii & iii

24. i. If two adjacent sides are given, rectangle can be drawn.
ii. If four angles are given, a quadrilateral can be drawn.
iii. If a side of a square is given, the square can be drawn.
Which one is correct according to the above information : *(Easy)*
ⓑ ⓐ i & ii ⓑ i & iii ⓒ ii & iii ⓓ i, ii & iii

25. In a rhombus— *(Easy)* *[CB '19]*
i. the diagonals are equal
ii. opposite angles are equal
iii. the diagonals bisect each other at right angles
Which one is correct?
ⓐ i & ii ⓑ i & iii
ⓒ ⓒ ii & iii ⓓ i, ii & iii

26. Look at the following information's : *[DB' 15]*
i. The sum of four angles of a quadrilateral is 180°
ii. If two adjacent sides of a rectangle are equal, it is a square
iii. Every rhombus is a parallelogram
Which one of the following is true? *(Medium)*
ⓐ i & ii ⓑ ii & iii
ⓑ ⓒ i & iii ⓓ i, ii & iii

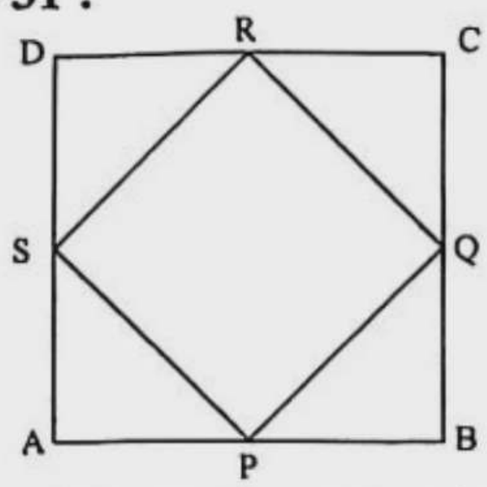
Answer the questions 27 and 28 according to the data given below :
In adjoining quadrilateral ABCD, AB || DC, AD || BC and AB ≠ AD. ∠ABF = ∠FBC, ∠ADE = ∠EDC and OE = OF.



27. How many parallelograms are there in the figure? *(Medium)*
ⓐ ⓐ 2 ⓑ 4 ⓒ 6 ⓓ 8

28. If AC = BD, what kind of parallelogram is ABCD? *(Hard)*
ⓐ Square ⓑ Rectangle
ⓑ ⓒ Rhombus ⓓ Trapezium

According to the stem answer the questions No. 29 – 31 :



P, Q, R and S are the mid-points of AB, BC, CD and AD respectively of the rectangle ABCD and AB = 10 units, BC = 6 units. *[RB' 15]*

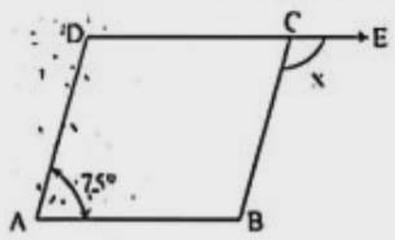
29. What is the area of ABCD? *(Hard)*
ⓐ 30 square unit ⓑ 60 square unit
ⓑ ⓒ 90 square unit ⓓ 100 square unit

30. What does PQRS indicate? *(Medium)*
ⓐ Rectangle ⓑ Rhombus
ⓓ ⓒ Parallelogram ⓓ Square

31. What is the area of PQRS? *(Medium)*
ⓐ 34 square unit ⓑ 60 square unit
ⓐ ⓒ 70 square unit ⓓ 80 square unit

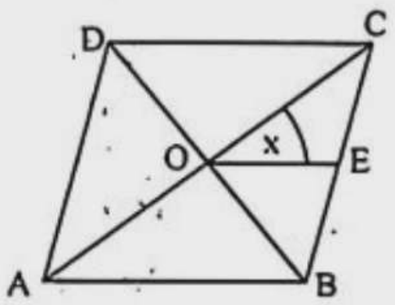
8.3 Theorems related to Quadrilaterals ▶ Textbook Page 135

32. ABCD is a parallelogram. Then ∠x = —? *(Medium)*



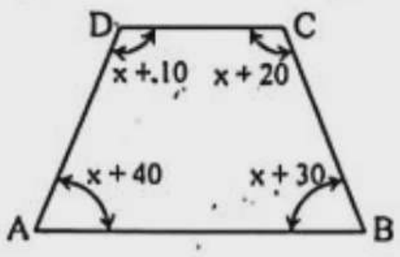
ⓐ 75° ⓑ 85°
ⓓ ⓒ 95° ⓓ 105°

33. ABCD be a rhombus and OE is the bisector of ∠BOC. Then ∠x = —? *(Medium)*



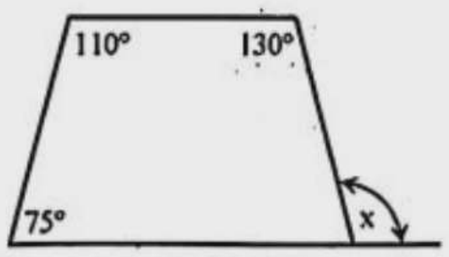
ⓐ 75° ⓑ 85°
ⓓ ⓒ 95° ⓓ 45°

34. In the adjoining quadrilateral ABCD, ∠x = What? *(Hard)*



ⓐ 75° ⓑ 85°
ⓓ ⓒ 95° ⓓ 65°

35. In the quadrilateral below, ∠x = ? *(Hard)*

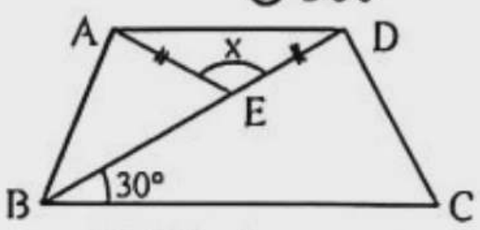


ⓐ 135° ⓑ 85°
ⓐ ⓒ 95° ⓓ 65°

36. The distance between the parallel sides of a trapezium is 5cm and its area is 40sq cm. What is the sum of length of the two parallel sides? *(Medium)* *[CB '19]*
ⓐ 8 cm ⓑ 13 cm
ⓒ ⓒ 16 cm ⓓ 21 cm

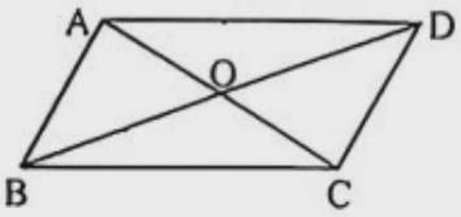
37. What is sum of four angles of a kite? *(Easy)* *[CtgB '19]*
ⓐ 180° ⓑ 270°
ⓓ ⓒ 300° ⓓ 360°

38.



If in figure, ABCD is a trapezium, then what is the value of x? *(Hard)* *[DjB '19]*
ⓐ 60° ⓑ 90°
ⓒ ⓒ 120° ⓓ 150°

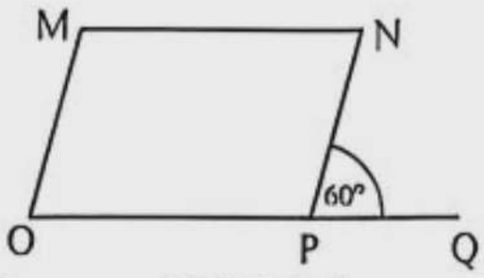
39.



In parallelogram ABCD, ∠ABC = 65°, then ∠BAD = ? *(Easy)* *[DB '18]*
ⓒ ⓐ 50° ⓑ 65° ⓒ 115° ⓓ 130°

40. The adjacent sides of a rectangle are 6 cm and 8 cm. Which one is the length of the diagonal in cm? *(Easy)* *[DB '18]*
ⓓ ⓐ 56 ⓑ 48 ⓒ 28 ⓓ 10

41.



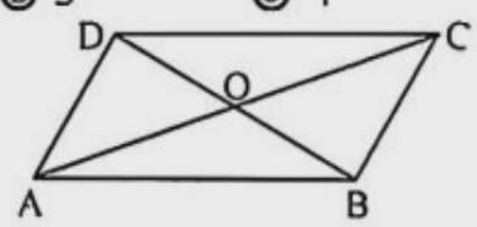
In the figure, MOPN is a parallelogram. Then ∠MOP + ∠MNP = ? *(Hard)* *[CB '18]*
ⓓ ⓐ 300° ⓑ 240° ⓒ 180° ⓓ 120°

42. The length of two diagonals of a rhombus are 6 cm and 8 cm. What is the area of rhombus? *(Easy)* *[CtgB '18]*
ⓐ 10 sq cm ⓑ 24 sq cm
ⓑ ⓒ 28 sq cm ⓓ 48 sq cm

43. Three sides are given. In which case of the following a triangle is possible to draw? *(Easy)* *[SB '18]*
ⓐ 4 cm, 7 cm and 13 cm
ⓑ 3 cm, 5 cm and 8 cm
ⓒ 3 cm, 6 cm and 10 cm
ⓓ ⓓ 6 cm, 8 cm and 10 cm

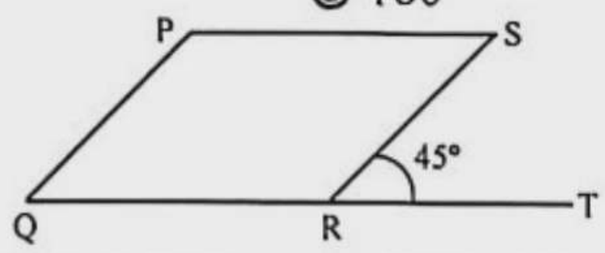
44. How many data are required to construct a certain quadrilateral? *(Hard)* *[BB '18]*
ⓓ ⓐ 2 ⓑ 3 ⓒ 4 ⓓ 5

45.



In the figure, if ∠BAD = 60°, which one is the value of ∠ADC? *(Hard)* *[BB '18]*
ⓐ 90° ⓑ 100°
ⓒ ⓒ 120° ⓓ 180°

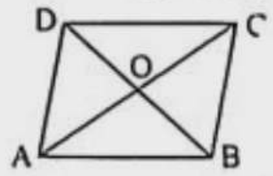
46.



In PQRS parallelogram ∠P + ∠R = What? *(Hard)* *[DjB '18]*
ⓒ ⓐ 90° ⓑ 135° ⓒ 270° ⓓ 315°

47. If the height of a trapezium is 6 cm. and the lengths of the parallel sides are 8 cm. and 7 cm. respectively, what is its area in sq. cm? *(Easy)* *[CB '16]*
ⓐ ⓐ 45 ⓑ 90 ⓒ 168 ⓓ 180

48.

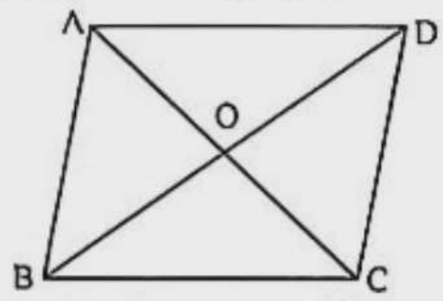


The diagonals of a parallelogram are AC and BD bisect each other at O. If ∠ADC = 110°, then ∠BAD = ? *(Easy)* *[SB '16]*
ⓒ ⓐ 180° ⓑ 110° ⓒ 70° ⓓ 50°

49. In the rhombus ABCD if ∠BCD = 130° then ∠ABC = what? *(Medium)* *[CB' 15]*

ⓑ ⓐ 30° ⓑ 50° ⓒ 90° ⓓ 130°

50.

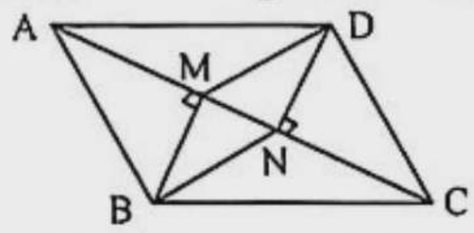


In figure, ABCD is a parallelogram. Where AO = 5 cm and OD = 7 cm. Which one of the following is correct? *(Medium)*

ⓐ BC = 14 cm ⓑ BO = 5 cm

ⓒ ⓒ BD = 14 cm ⓓ CD = 10 cm

51.



In the figure, ABCD is a parallelogram. If BM ⊥ AC and DN ⊥ AC, then— *(Hard)* *[DjB '19]*

i. BM ∥ ND

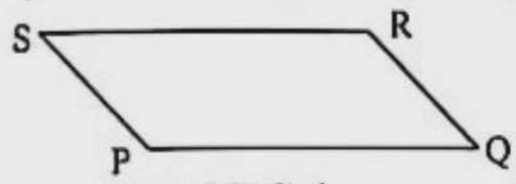
ii. BM = DN

iii. BMDN is a rhombus

Which one is correct?

ⓐ ⓐ i & ii ⓑ ii & iii ⓒ i & iii ⓓ i, ii & iii

52.



In the figure, if PQRS is a parallelogram, — *(Hard)* *[DjB '19]*

i. ∠P + ∠Q + ∠R + ∠S = 180°

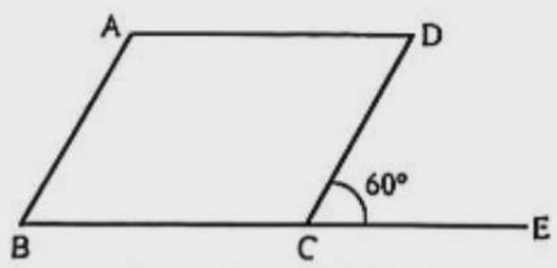
ii. PQ = QR, ∠Q = 90°, it is a square

iii. RQ = RS, it is a rhombus

Which one is correct?

ⓓ ⓐ i & ii ⓑ ii & iii ⓒ i & iii ⓓ i, ii & iii

53.



ABCD is a rhombus. If AC = 4 unit and BD = 7 unit, then —. *(Medium)* *[RB '18]*

i. the area of the rhombus = 14 sq unit.

ii. ∠A + ∠C = 240°

iii. area of the ΔABC = 8 sq unit

Which one of the following is correct?

ⓐ i & ii ⓑ ii & iii

ⓐ ⓒ i & iii ⓓ i, ii & iii

54. If one side of a square is 4 cm, its —. *(Easy)* *[DjB '18]*

i. area is 16 sq cm

ii. half of perimeter is 8 cm

iii. length of diagonal is $4\sqrt{2}$ cm

Which one of the following is correct?

ⓐ i & ii ⓑ ii & iii

ⓓ ⓒ i & iii ⓓ i, ii & iii

55. In Δ PQR, PQ > PR. *(Medium)* *[DjB '17]*

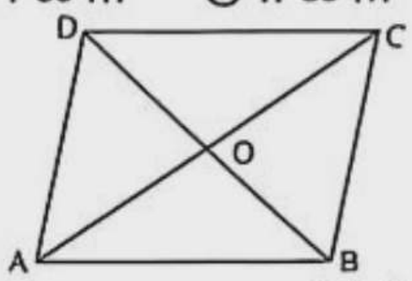
i. PQ + PR = QR

ii. QR + PR > PQ iii. PQ – PR < RQ

Which one is correct?

ⓒ ⓐ i & ii ⓑ i & iii ⓒ ii & iii ⓓ i, ii & iii

56.



(Medium) [Ctg.B' 15]

In ABCD rhombus, AC = 6 cm

i. AO = 3 cm

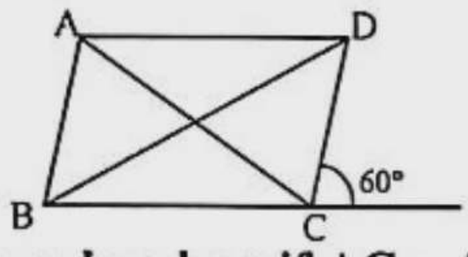
ii. AC > BD iii. ∠BCD > ∠ABC

Which one of the following is true?

ⓐ i & ii ⓑ i & iii

ⓐ ⓒ ii & iii ⓓ i, ii & iii

57.



ABCD is a rhombus, if AC = 4 unit and BD = 7 unit, then — *(Easy)* *[Rajuk Uttara Model College, Dhaka]*

i. ∠B + ∠D = 120°

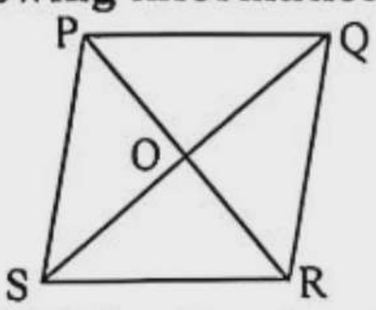
ii. Half of the area of rhombus = 7 sq. unit

iii. Area of ΔABC = 8 sq. unit

Which one is correct?

ⓐ ⓐ i & ii ⓑ i & iii ⓒ ii & iii ⓓ i, ii & iii

Answer the question No. 58 and 59 based on the following information :



In the fig. PQRS is a rhombus. *(Medium)* *[JB '18]*

58. Which one is correct of the following?

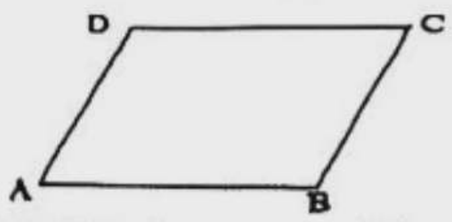
ⓐ PO = PS ⓑ OR = OQ

ⓓ ⓒ ∠POQ = ∠PQO ⓓ ∠ROS = 90°

59. What is the area of PQRS? *(Medium)*

ⓐ PS × RS ⓑ PR × QS

ⓒ ⓒ $\frac{1}{2}$ × PR × QS ⓓ $\frac{1}{2}$ × OR × OQ



In figure, ABCD is a parallelogram where ∠DAB = 60°.

Answer the question No. 60 and 61 on the above information :

60. ∠B + ∠C = ? *(Hard)* *[RB '17]*

ⓒ ⓐ 90° ⓑ 120° ⓒ 180° ⓓ 270°

61. If ∠A = 120°, ∠C = ? *(Medium)* *[RB '17]*

ⓓ ⓐ 45° ⓑ 60° ⓒ 90° ⓓ 120°

Answer the question No. 62 and 63 in the light of the picture given below :

62. ∠COD = what? *(Easy)* *[JB '17]*
ⓒ ⓐ 45° ⓑ 60° ⓒ 90° ⓓ 120°

63. If ∠ABO = 30° then ∠BCD = what? *(Medium)* *[JB '17]*
ⓒ ⓐ 60° ⓑ 90° ⓒ 120° ⓓ 150°

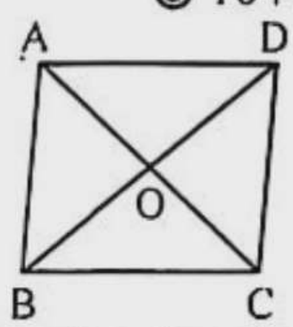
8.4 Area of Quadrilaterals ▸ Textbook Page 138

64. The area of a rectangle is 36 square cm and its breadth is 4 cm. What is its perimeter? *(Easy)*
ⓒ ⓐ 6 cm ⓑ 16 cm ⓒ 26 cm ⓓ 36 cm

65. If the perimeter of a square is 40 cm, then its area —. *(Medium)*
ⓐ 60 sq. cm. ⓑ 80 sq. cm.
ⓓ ⓒ 90 sq. cm. ⓓ 100 sq. cm.

66. The lengths of two parallel sides of a trapezium are 13 cm and 8 cm respectively. If its perpendicular distance between two parallel sides is 4 cm, how many sq cm will be the area of the trapezium? *(Medium)[DB '19]*
ⓐ 42 sq cm ⓑ 52 sq cm
ⓐ ⓒ 84 sq cm ⓓ 104 sq cm

67.

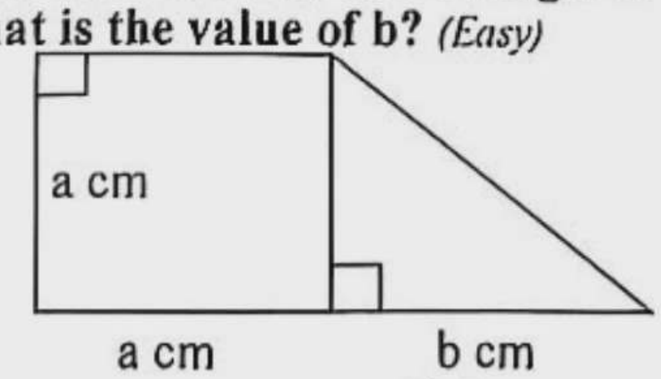


In the figure, ABCD is a rhombus and AC = 6cm, BD = 8cm. What is the length of AB? *[RB '19]*
ⓐ 5cm ⓑ 7cm
ⓐ ⓒ 14cm ⓓ 25cm

68. How many data are needed to construct a rhombus? *(Easy) [JB '19]*
ⓑ ⓐ 1 ⓑ 2 ⓒ 3 ⓓ 4

69. How many edges of a rectangular solid? *(Easy) [JB '19]*
ⓒ ⓐ 12 ⓑ 8 ⓒ 6 ⓓ 4

70. The area of the square given in figure is 16 sq m and area of the triangle is 16 sq m. What is the value of b? *(Easy)* *[CtgB '19]*

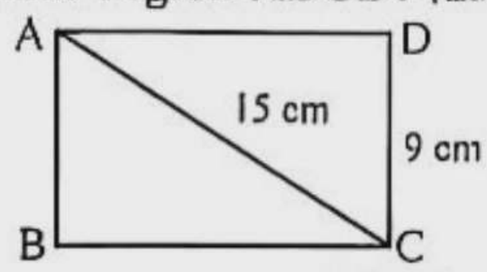


ⓐ 1m ⓑ 2m
ⓓ ⓒ 4m ⓓ 8m

71. The length of each side of a square is 5 cm. What is the area of the square drawn on its diagonal? *(Hard)* *[SB '19]*
ⓐ 120 sq cm ⓑ 105 sq cm
ⓓ ⓒ 140 sq cm ⓓ 125 sq cm

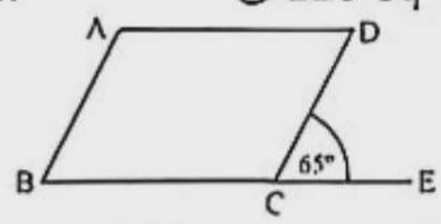
72. If the diametre of a circle is 2 cm, what is the circumference of the circle? *(Hard)[SB '19]*
ⓐ 3.14 cm ⓑ 6.28 cm
ⓑ ⓒ 12.57 cm ⓓ 25.13 cm

73. What is the area of the following rectangular region ABCD? *(Easy)* *[SB '19]*



ⓐ 108 sq cm ⓑ 135 sq cm
ⓓ ⓒ 180 sq cm ⓓ 225 sq cm

74.

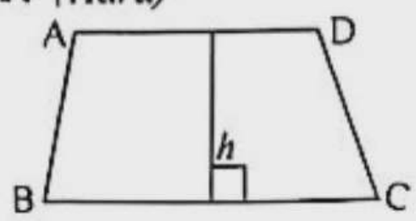


ABCD is a parallelogram and if ∠DCE = 65°, ∠BAD = What? *(Hard)* *[SB '19]*
ⓐ 35° ⓑ 65°
ⓒ ⓒ 115° ⓓ 130°

75. If the lengths of the diagonals of a rhombus are 8 cm and 6 cm, which one is the area of the rhombus in sq cm? *(Easy)* *[DB '18]*
ⓐ ⓐ 24 ⓑ 48 ⓒ 72 ⓓ 96

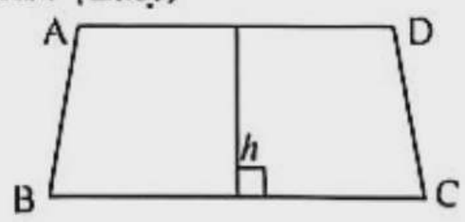
76. The length breadth and height of a rectangular solid are 5 cm, 3 cm and 2 cm respectively. Which one is the whole surface area of the rectangular solid? *(Medium) [RB '18]*
ⓐ 30 sq cm ⓑ 31 sq cm
ⓒ ⓒ 62 sq cm ⓓ 76 sq cm

77. Which one is the area of the following trapezium? *(Hard)* *[SB '18]*



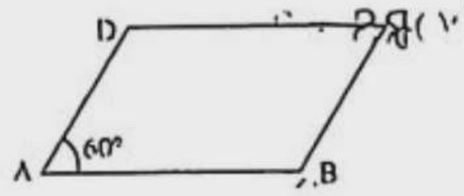
ⓐ $\frac{1}{2}$(AD + BC) sq unit ⓑ $\frac{1}{2}$h (AD + BC) sq unit
ⓑ ⓒ $\frac{1}{2}$h (AB + CD) sq unit ⓓ $\frac{1}{2}$ × AC × BD sq unit

78. Which one of the following is the area of trapezium? *(Easy)* *[DjB '18]*



ⓐ $\frac{1}{2}$(AD + BC) Sq unit
ⓑ $\frac{1}{2}$h (AD + BC) sq unit
ⓒ $\frac{1}{2}$h (AB + CD) sq unit
ⓑ ⓓ $\frac{1}{2}$ × AC × BD sq unit

79. If ABCD is a parallelogram ∠B + ∠D = ? *(Hard) [DB '17]*



ⓐ 120° ⓑ 180°
ⓒ ⓒ 240° ⓓ 300°

80. If the height of a trapezium is 6 cm and the length of the parallel sides are 9 cm and 7 cm respectively. What is the area of it in square cm? *(Easy)* *[RB '17]*
ⓑ ⓐ 42 ⓑ 48 ⓒ 54 ⓓ 63

81. If parallel two sides are a unit and b unit and its perpendicular distance is h unit of a trapezium then which one is the area of a trapezium in sq. unit? *(Medium)* *[JB '17]*
ⓐ abh ⓑ (a + b + h)
ⓒ ⓒ $\frac{1}{2}(a+b)h$ ⓓ $\sqrt{a^2+b^2+h^2}$

82. What is the formula to determine the area of a trapezium? *(Medium)* *[CtgB '17]*
ⓐ the product of the two parallel sides × height
ⓑ the sum of the two parallel sides × height
ⓒ the average of the two parallel sides × height
ⓒ ⓓ the sum of product of two parallel sides and height

83. The edge of a cube is 3.5 cm. What is the area of the whole surface of the cube? *(Hard)[SB '17]*
ⓐ 60 sq. cm ⓑ 65.5 sq. cm
ⓓ ⓒ 70 sq. cm ⓓ 73.5 sq. cm

84. The lengths of a side of a square is 'a'. What is the lengths of diagonal? *(Medium)* *[DjB '17]*
ⓒ ⓐ 4a ⓑ $\sqrt{2}a$ ⓒ $\sqrt{2}a$ ⓓ a^2

85. The lengths of two diagonals of a rhombus are 8 cm and 9 cm. What is the area of rhombus? *(Hard)* *[RB '16]*
ⓐ 144 sq. cm. ⓑ 72 sq. cm.
ⓒ ⓒ 36 sq. cm. ⓓ 34 sq. cm.

86. Two parallel sides of a trapezium are 8 cm and 11 cm. Its height is 6 cm. What is the area of the trapezium? *(Hard)* *[RB '16]*
ⓐ 114 sq. cm ⓑ 88 sq. cm
ⓒ ⓒ 57 sq. cm ⓓ 25 sq. cm

87. If the side of a cube is $\sqrt{2}$ cm. What is the area of the whole faces of the cube? *(Medium)[RB '16]*
ⓐ 2 sq. cm ⓑ $2\sqrt{2}$ sq. cm
ⓓ ⓒ $6\sqrt{2}$ sq. cm ⓓ 12 sq. cm

88. How many sq. metre is the area of total surface of a cube with side $\sqrt{5}$ meter? *(Easy)[CtgB '16]*
ⓒ ⓐ 5 ⓑ 20 ⓒ 30 ⓓ 150

89. How many times is a square to the square drawn on its diagonal? *(Easy)* *[CtgB '16]*
ⓐ Half ⓑ Equal
ⓒ ⓒ Two times ⓓ Three times

90. If the edge of a cube is 4 cm, what is the area of the entire faces of the cube in sq. cm? *(Medium)* *[DB' 15]*
ⓐ 16 ⓑ 64
ⓓ ⓒ 69 ⓓ 96

91. If the lengths of two diagonals of a rhombus are 8 cm and 6 cm respectively, what is the area of it in sq. cm? *(Medium)* *[DB' 15]*
ⓐ 14 ⓑ 24
ⓑ ⓒ 48 ⓓ 96

92. What is the area of rectangle ABCD When AB = 18m and AD = 10m? *(Medium)* *[JB' 15]*
ⓐ 60 sq. m. ⓑ 100 sq. m.
ⓒ ⓒ 180 sq. m. ⓓ 360 sq. m.

93. If the parallel two sides of a quadrilateral are a and b respectively and height is h, which one is the formula for determining area of trapezium? *(Easy)* *[Ctg.B' 15]*
ⓐ $\frac{1}{2}(a \times b)h$ ⓑ $\frac{1}{2}(a+b)h$
ⓑ ⓒ $2(a+b)h$ ⓓ $\frac{1}{2}(a+b)$

94. The area of a square is 64 sq. unit. What is the length of the diagonal of the square? *[Rajuk Uttara Model College, Dhaka]*
ⓓ ⓐ $2\sqrt{8}$ ⓑ $\sqrt{8}$ ⓒ 8 ⓓ $8\sqrt{2}$

95. If the length of the each arm of a square is 'a' unit then —. *(Easy)*
i. Its area = a^2 sq. units
ii. The diagonal = $\sqrt{2}$ a units
iii. The perimeter = 4a units
iv. All the above
Which of the following is correct?
ⓐ i & iv ⓑ ii & iv
ⓓ ⓒ iii & iv ⓓ All the above (iv)

96. i. The area of a parallelogram = $\frac{1}{2}(d_1 \times d_2)$ sq. units. (d_1 and d_2 are two diagonals)
ii. The opposite angles of a parallelogram are mutually equal
iii. The perimeter of parallelogram is 4a units ('a' is the length of each side)
What is the geometric figure true for the above information? *(Medium)*
ⓐ It is a square ⓑ It is a rectangle
ⓓ ⓒ It is a quadrilateral ⓓ It is a rhombus

97. If the length and breadth of a rectangle are 'a' units and 'b' units respectively then which of the following is true? *(Hard)*
i. Its area = (a × b) sq. units
ii. The length of its diagonal = $\sqrt{a^2+b^2}$ units
iii. Its perimeter = 2(a + b) units
Which of the following is correct?
ⓓ ⓐ i ⓑ ii ⓒ iii ⓓ i, ii & iii

98. If the base and height of a parallelogram are 'a' and 'b' units respectively then? *(Hard)*

i. its area = (a × b) sq. units
ii. its perimeter = 2(a + b) unit
iii. its opposite sides are equal

Which of the following is correct?

ⓓ ⓐ i & ii ⓑ ii ⓒ i & iii ⓓ i, ii & iii

99. i. The trapezium has only one pair of parallel straight lines
ii. The opposite angles of a cyclic quadrilateral are supplementary
iii. A rectangle is a parallelogram with right angles
iv. All the above

Which of the following is correct? *(Medium)*

ⓓ ⓐ i & iv ⓑ ii & iv ⓒ iii & iv ⓓ iv

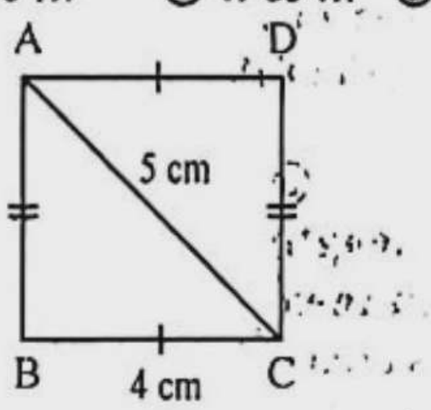
100. If the length of a side of a square is 5 metre then its— *(Hard)* *[DB '19]*

i. area is 25 sq metres
ii. length of diagonal is 10 metres
iii. perimetre is 20 metres

Which one is correct?

ⓑ ⓐ i & ii ⓑ i & iii ⓒ ii & iii ⓓ i, ii & iii

101.



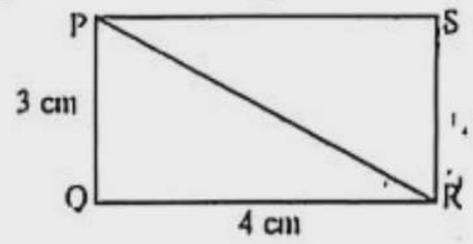
In the figure — *(Medium)* *[RB '19]*

i. AB = 3cm
ii. The area of ABCD = 12cm²
iii. Perimetre of ABCD = 14cm

Which one is correct?

ⓓ ⓐ i & ii ⓑ i & iii ⓒ ii & iii ⓓ i, ii & iii

102.



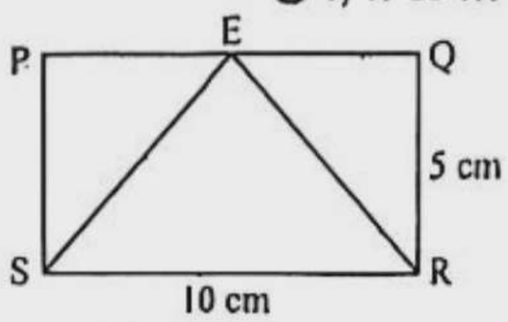
In figure PQRS is a rectangle, its —. *(Easy)* *[SB '18]*

i. length of diagonal is 5 cm
ii. area is 12 sq cm
iii. perimeter is 14 cm

Which one of the following is correct?

ⓐ i & ii ⓑ i & iii
ⓓ ⓒ ii & iii ⓓ i, ii & iii

103.



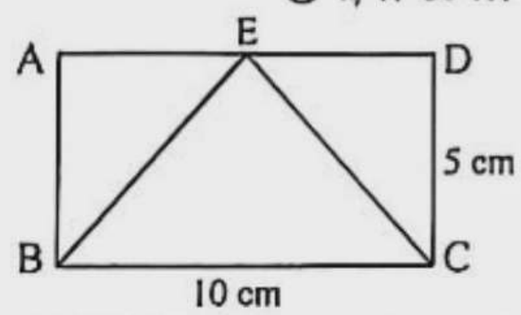
In the figure, PQRS is a rectangular region. If E is the mid-point of PQ —. *(Easy)* *[DB '18]*

i. ΔPES ≅ ΔQER
ii. □PQRS = 2 × ΔESR
iii. ΔESR = 25 square metre

Which one of the following is correct?

ⓐ i & ii ⓑ i & iii
ⓓ ⓒ ii & iii ⓓ i, ii & iii

104.



In figure, ABCD is a rectangular. If E is the midpoint of AD— *(Easy)* *[RB '17]*

i. Δ ABE ≅ ΔCDE
ii. □ ABCD = 2 × ΔBEC
iii. Δ BCE = 25 square metre

Which one is correct?

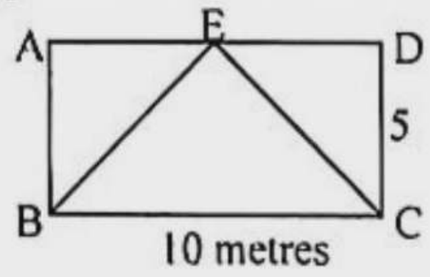
ⓓ ⓐ i & ii ⓑ i & iii ⓒ ii & iii ⓓ i, ii & iii

105. i. The sum of four angles of a quadrilateral 180°
ii. If two adjacent sides of a rectangle are equal it is a square
iii. Every rhombus is a parallelogram

Which one is correct? *(Easy)* *[DB '16]*

ⓐ i & ii ⓑ i & iii
ⓒ ⓒ ii & iii ⓓ i, ii & iii

106. Observe the rectangular figure, where E is the midpoint of AD. *(Hard)* *[JB '16]*

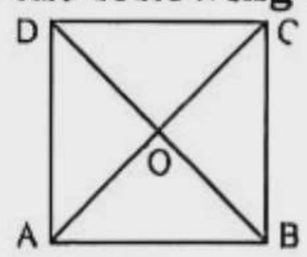


i. ΔABE ≅ ΔCDE
ii. □ ABCD = 2 × ΔBEC
iii. ΔBCE = 25 square metres

Which one is correct?

ⓐ i & ii ⓑ i & iii
ⓓ ⓒ ii & iii ⓓ i, ii & iii

Answer the questions No. 107 and 108 according to the following figure :



Two diagonals of the square ABCD meet at the point 'O' and BC = 6 cm. *[DB '19]*

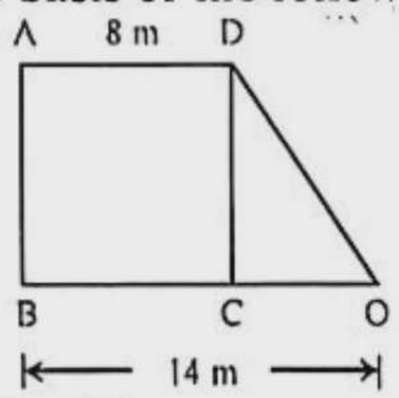
107. ∠AOB = What? *(Easy)*

ⓓ ⓐ 30° ⓑ 45° ⓒ 60° ⓓ 90°

108. What is the length of AC in cm? *(Medium)*

ⓑ ⓐ 6 cm ⓑ $6\sqrt{2}$ cm ⓒ $9\sqrt{2}$ cm ⓓ 12 cm

Answer to the questions number 109 and 110 on the basis of the following figure :



In figure ABCD is a square. *[RB '19]*

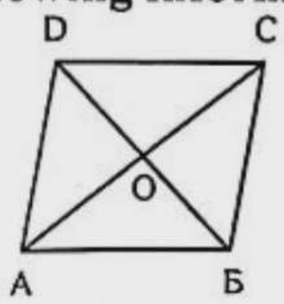
109. Which one is the length of OD? *(Hard)*

ⓒ ⓐ 6m ⓑ 8m ⓒ 10m ⓓ 14m

110. What is the area of region ABOD? *(Medium)*

ⓑ ⓐ $56m^2$ ⓑ $88m^2$ ⓒ $112m^2$ ⓓ $176m^2$

Answer to the questions No. 111 and 112 by using the following information :



In figure ABCD is a rhombus. AC = 8 cm and BD = 6 cm. *[JB '19]*

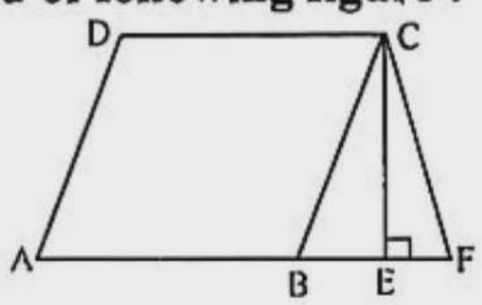
111. Which one is the length of the side AB? *(Medium)*

ⓐ ⓐ 5 cm ⓑ 7 cm ⓒ 10 cm ⓓ 12 cm

112. What is the area of the rhombus ABCD? *(Medium)*

ⓐ 14 sq cm ⓑ 24 sq cm
ⓑ ⓒ 28 sq cm ⓓ 48 sq cm

Answer to the questions No. 113 and 114 on the based of following figure :



In figure, AB = 6 unit, AD = 5 unit and CE = 4 unit, BE = EF, AD ∥ BC and AD = BC. *[SB '19]*

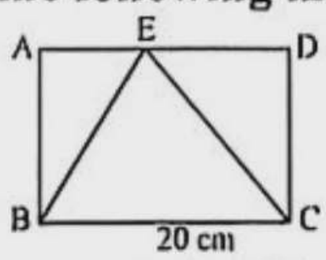
113. What is the area of ΔBCF? *(Easy)*

ⓐ 12 sq unit ⓑ 20 sq unit
ⓐ ⓒ 24 sq unit ⓓ 30 sq unit

114. What is the area of the trapezium ADCF? *(Medium)*

ⓐ 20 sq unit ⓑ 24 sq unit
ⓓ ⓒ 30 sq unit ⓓ 36 sq unit

Answer the questions no. 115 and 116 in the light of the following information :



Area of the rectangle is 240 sq. cm.

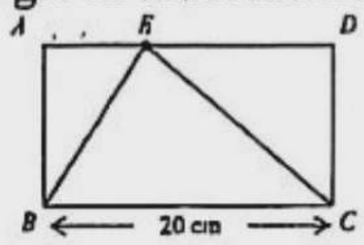
115. What is the perimeter of the rectangle ABCD in cm? *(Easy)* *[CtgB '17]*

ⓐ 16 ⓑ 32
ⓓ ⓒ 52 ⓓ 64

116. If the perimeter of a kite is 18 cm and the ratio of the two unequal sides is 2 : 1, then what is the length of the largest side of it in cm.? *(Easy)* *[CtgB '17]*

ⓐ 3 ⓑ 6
ⓑ ⓒ 8 ⓓ 12

Answer the questions No. 117 and 118 with the help of given information :



The area of the rectangle is 200 sq. cm.

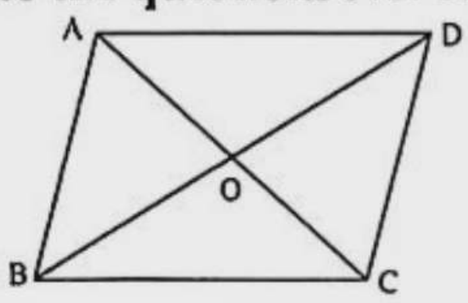
117. Which is the height of ΔEBC? *(Medium)* *[SB '17]*

ⓐ 8 cm ⓑ 10 cm
ⓑ ⓒ 12 cm ⓓ 14 cm

118. Which is the permieter of the rectangular ABCD? *(Hard)* *[SB '17]*

ⓐ 40 cm ⓑ 50 cm
ⓒ ⓒ 60 cm ⓓ 80 cm

Answer to the questions No. 119 – 122 :



In figure, ABCD is a rhombus, AD = 5 cm and BO = 4 cm. *[DB '16]*

119. What is the value of ∠AOD = ? *(Medium)*

ⓐ 90° ⓑ 120°
ⓐ ⓒ 150° ⓓ 180°

120. ∠ABC + ∠BCD + ∠CDA + ∠DAB = what? *(Easy)*

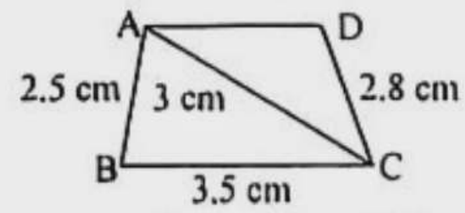
ⓐ 90° ⓑ 180°
ⓓ ⓒ 270° ⓓ 360°

121. Length of OC = what? *(Hard)*

ⓐ 2 cm ⓑ 3 cm
ⓑ ⓒ 4 cm ⓓ 5 cm

122. Area of ABCD = what? *(Easy)*

ⓐ $12.5\ cm^2$ ⓑ $24\ cm^2$
ⓑ ⓒ $30\ cm^2$ ⓓ $40\ cm^2$



Answer the questions No. 123 and 124 in respect of the above figure : *[JB '16]*

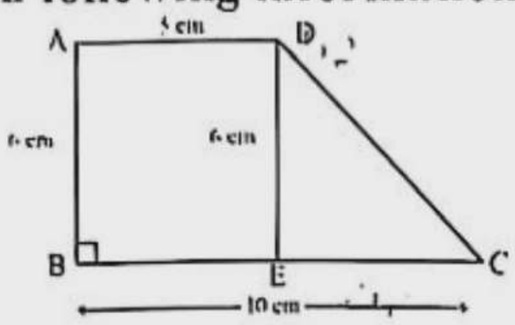
123. What will be the area of a square constructed with side AC in sq. cm? *(Medium)*

ⓑ ⓐ 6 ⓑ 9 ⓒ 9.5 ⓓ 18.5

124. The perimeter of ΔADC is 8 cm. What is the length of AD in cm? *(Easy)*

ⓒ ⓐ 1.2 ⓑ 2.1 ⓒ 2.2 ⓓ 2.8

Answer to the questions No. 125 – 127 based on following information :



[CtgB '16]

125. If AD = BE, which type of quadrilateral is ABCD? *(Easy)*
ⓐ Square
ⓑ Parallelogram
ⓒ Rhombus
ⓓ Trapezium

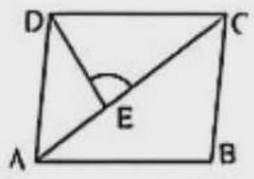
126. If ∠B = 90°, what is the area of ABED in sq. cm? *(Hard)*
ⓐ 22
ⓑ 30
ⓒ 44
ⓓ 60

127. What is the length of CD in centimeter? *(Medium)*
ⓐ $\sqrt{11}$
ⓑ $\sqrt{15}$
ⓒ $\sqrt{30}$
ⓓ $\sqrt{61}$

8.5 Solid

Textbook Page 139

128. In parallelogram ABCD, AC = 10 m, DE = 4m. What is the area of ABCD in sq. metre? *(Hard)* *[DB '17]*



ⓐ 20 ⓑ 28 ⓒ 40 ⓓ 80

129. What is the weight of 250 milliliters water in kg? *(Easy)* *[JB '16]*
ⓐ 0.25 ⓑ 0.50 ⓒ 25 ⓓ 250

130. Length, breadth and height of a rectangular solid are respectively 4 cm, 3 cm and 2 cm, what is the area of the entire faces of the solid in sq. cm? *(Medium)* *[Ctg.B' 15]*
ⓐ 26 ⓑ 13 ⓒ 25 ⓓ 52

Mr Rahim bought a gold bar of which length is 4 cm, breadth is 3 cm and height is 1 cm. [Gold is 19.3 times heavier than water]

Answer to the question No. 131 and 132 on the basis of the above information. *[Ctg.B' 15]*

131. What is the value of the gold bar in cubic cm? *(Easy)*
ⓐ 12 ⓑ 8 ⓒ 24 ⓓ 16

132. What is the weight of the gold bar in gm in the above stem? *(Medium)*
ⓐ 154.4 ⓑ 463.2 ⓒ 231.6 ⓓ 308.8

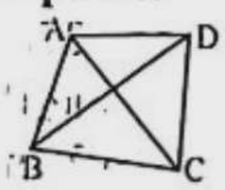
Short Q/A Designed as per topic

8.1 & 8.2 Quadrilateral and Types of Quadrilateral

Textbook Page 133 & 134

Question 1. What is quadrilateral region? Draw a quadrilateral and name its different parts.

Solution : A quadrilateral is a closed figure bounded by four line segments. The region bounded by the figure is called quadrilateral region.



In the figure, the region bounded by AB, BC, CD, and AD line segments are the region of quadrilateral ABCD.

∴ AB, BC, CD, and AD are the four sides. A, B, C, and D are the vertices. AC and BD are the two diagonals. ∠ABC, ∠BCD, ∠CDA, and ∠DAB are the four angles of the quadrilateral.

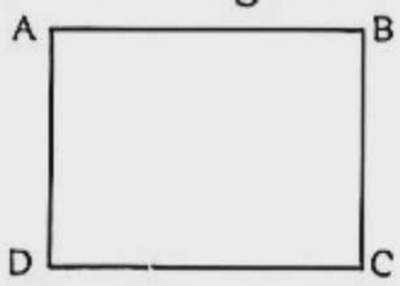
Question 2. Write four characteristics of a quadrilateral.

Solution : The four characteristics of a quadrilateral are :

i. A quadrilateral is a closed figure bounded by four line segments.
ii. It has four vertices.
iii. It has two diagonals.
iv. The sum of its four angles is equal to four right angles or 360°.

Question 3. Define a rectangle with a diagram.

Solution : A rectangle is a parallelogram with a right angle. The region bounded by a rectangle is a rectangular region.



In the diagram, ABCD is a rectangle where one angle is a right angle.

Question 4. Write four similarities between a rhombus and a parallelogram.

Solution : The four similarities between a rhombus and a parallelogram are:

i. Both the rhombus and the parallelogram are bounded by four line segments.
ii. In both figures, the sum of any two adjacent angles is 180°.
iii. In both figures, one pair of opposite angles is acute angles and the other pair of opposite angles is obtuse angles.
iv. The two diagonals of both figures are unequal.

Question 5. Explain why a rhombus is a type of parallelogram.

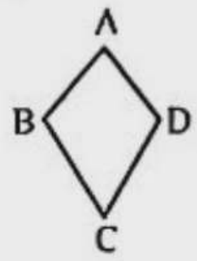
Solution : A quadrilateral with opposite sides parallel is called a parallelogram. On the other hand, a rhombus is a parallelogram with equal adjacent sides. Again, the opposite sides of a rhombus are parallel and all sides are equal. The opposite angles of a parallelogram and a rhombus are equal. The two diagonals of a parallelogram and a rhombus bisect each other. So, if the two adjacent sides of a parallelogram are equal, the parallelogram becomes a rhombus. Therefore, we can say that a rhombus is a type of parallelogram.

Question 6. Explain why a square is a type of rhombus.

Solution : A rhombus is a parallelogram with equal adjacent sides. That is, the opposite sides of a rhombus are parallel and all sides are equal. On the other hand, a square is a parallelogram with all right angles and all sides equal. So, the characteristics of a rhombus are found in a square. But not all the characteristics of a square are in a rhombus. That is, the definition of a rhombus is present in a square. Therefore, we can say that a square is a type of rhombus.

Question 7. Define a kite with a diagram.

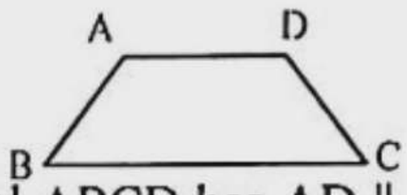
Solution : A kite is a quadrilateral with exactly two distinct consecutive pairs of sides of equal length.



In the diagram, ABCD is a quadrilateral with AB = AD and BC = CD. So, the quadrilateral ABCD is a kite.

Question 8. Define a trapezium with a diagram.

Solution : A trapezium is a quadrilateral with a pair of parallel sides.



In the diagram, the quadrilateral ABCD has AD || BC, i.e., one pair of opposite sides is parallel. So, the quadrilateral ABCD is a trapezium.

Question 9. Write four differences between a square and a rhombus.

Solution : The differences between a square and a rhombus are as follows :

Square	Rhombus
i. All angles of a square are right angles.	i. No angle of a rhombus is a right angle.
ii. The diagonals of a square are equal.	ii. The diagonals of a rhombus are not equal.
iii. The two diagonals of a square divide it into right-angled triangles.	iii. The two diagonals of a rhombus divide it into acute-angled or obtuse-angled triangles.
iv. The area of a square = side × side.	iv. The area of a rhombus = $\frac{1}{2}$ × the product of the diagonals.

Question 10. Write four differences between a rhombus and a rectangle.

Solution : The four differences between a rhombus and a rectangle are as follows :

Rhombus	Rectangle
i. All sides of a rhombus are equal.	i. The opposite sides of a rectangle are equal.
ii. No angle of a rhombus is a right angle.	ii. All angles of a rectangle are right angles.
iii. The diagonals of a rhombus are not equal.	iii The diagonals of a rectangle are equal.
iv. The diagonals of a rhombus bisect each other at right angles.	iv. The diagonals of a rectangle do not bisect each other at right angles.

Question 11. The length of two adjacent sides of a parallelogram is 10 cm and 4 cm. Find its perimeter.

Solution : Given that, the two adjacent sides of the parallelogram are 10 cm and 4 cm respectively.

∴ The perimeter of the parallelogram = 2 × (the sum of the two adjacent sides)

= 2 (10 + 8) cm

= 2 × 18 = 36 cm.

The required perimeter is 36 cm.

Question 12. The perimeter of a parallelogram is 28 cm. If the ratio of the two adjacent sides is 4:3, then what is the length of the larger side in cm?

Solution : Let the two adjacent sides of the parallelogram be 4x cm and 3x cm.

So, its perimeter = 2 (4x + 3x) cm.

According to the question, 2 (4x + 3x) = 28.

or, 2 × 7x = 28.

or, 14x = 28.

or, $x = \frac{28}{14} = 2$.

So, the length of the larger side = 4x = 4 × 2 = 8 cm.

The required length of the larger side is 8 cm.

Question 13. If the lengths of two adjacent sides of a rectangle are 4 cm and 3 cm, then what is the length of its diagonal?

Solution : Given that, the lengths of two adjacent sides of the rectangle are 4 cm and 3 cm. That is, the length = 4 cm and the breadth = 3 cm.

The length of the diagonal = $\sqrt{4^2 + 3^2} = \sqrt{16 + 9} = \sqrt{25} = 5$ cm

The required length of the diagonal is 5 cm.

Question 14. If the length of a rectangle is 12 cm and the breadth is 5 cm, then find the half-perimeter of the rectangle.

Solution : Here, the length = 12 cm and the breadth = 5 cm.

So, the half-perimeter of the rectangle = $\frac{1}{2} \times 2$ (length + breadth) = $\frac{1}{2} \times 2\,(12 + 5)$ cm = 17 cm.

The required half-perimeter is 17 cm.

Question 15. If the perimeter of a square is 36 cm, then what is the length of its diagonal in cm?

Solution : Let the length of a side of the square be a cm.

So, its perimeter = 4a cm.

According to the question, 4a = 36.

Or, $a = \frac{36}{4} = 9$.

So, the length of its diagonal = $\sqrt{2}a = \sqrt{2} \times 9 = 9\sqrt{2}$ cm.

The required length of the diagonal is $9\sqrt{2}$ cm.

Question 16. If the perimeter of a kite is 54 cm and the ratio of its unequal sides is 5 : 4, then what is the length of its largest side in cm?

Solution : Let the largest side = 5x and the smallest side = 4x.

So, the perimeter = 2 (5x + 4x) cm.

According to the question, 2 (5x + 4x) = 54.

or, $2 \times 9x = 54$.

or, $18x = 54$.

$\therefore x = \frac{54}{18} = 3$.

So, the largest side = 5x = (5 × 3) cm = 15 cm.

Question 17. If the perimeter of a square is a unit, then what is its area?

Solution : Given that, the perimeter of the square = a unit.

So, the length of one side of the square = $\frac{a}{4}$ unit.

So, the area of the square = $\left(\frac{a}{4}\right)^2$ square unit

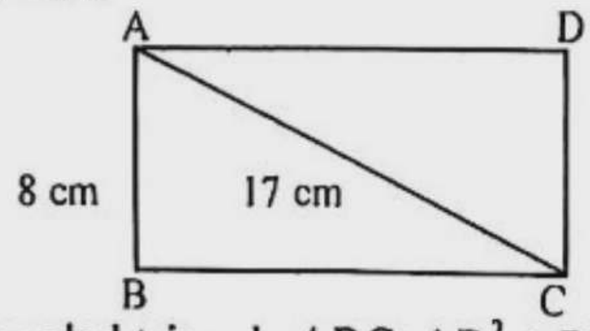
$= \frac{a^2}{16}$ square unit.

The required area is = $\frac{a^2}{16}$ square unit.

Question 18. Find the area of the adjacent rectangle ABCD.

Solution :

Given that, the rectangle ABCD has AB = 8 cm and AC = 17 cm.



In the right-angled triangle ABC, $AB^2 + BC^2 = AC^2$.

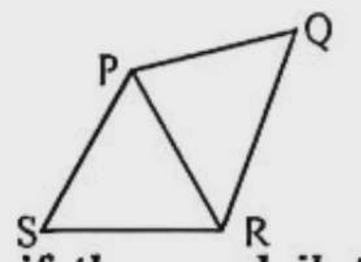
or, $BC^2 = AC^2 - AB^2 = 17^2 - 8^2 = 289 - 64 = 225$.

or, $BC = \sqrt{225} = 15$ cm.

So, the area of the rectangle ABCD = AB × BC = 8 × 15 square cm = 120 square cm.

8.3 Theorems Related to Quadrilaterals ▸ Textbook Page 135

Question 19.



In the diagram, if the quadrilateral PQRS has ∠PQR = 70°, ∠QPR = 2∠PQR, PR is the bisector of ∠QRS, and ∠PSR = 80°, then what is the value of ∠PRQ?

Solution : Given that, ∠PQR = 70° and ∠PSR = 80°.

∴ ∠QPR = 2∠PQR = 2 × 70° = 140°.

We know that the sum of the four angles of a quadrilateral is 360°.

So, ∠PQR + ∠QPR + ∠PSR + ∠QRS = 360°.

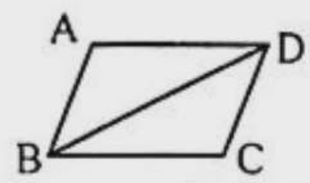
or, 70° + 140° + 80° + ∠QRS = 360°.

or, ∠QRS = 360° − 290° = 70°.

or, 2∠PRQ = 70° [Since PR is the bisector of ∠QRS].

or, ∠PRQ = 35°.

Question 20.



In the diagram, if the quadrilateral ABCD has AB and CD equal and parallel and ∠BCD = 120°, then what is the value of ∠ADC?

Solution : In ΔABD and ΔBCD, AB = CD, ∠ABD = ∠BDC [Since AB || CD], and BD = BD.

So, ΔABD ≅ ΔBCD.

So, ∠BAD = ∠BCD = 120°.

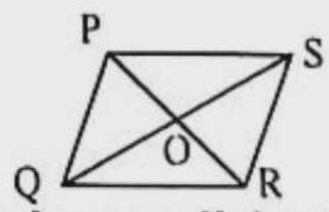
∴ ∠BAD + ∠ADC = 180° [The sum of adjacent angles on the same side of the transversal is 180°].

or, 120° + ∠ADC = 180°

or, ∠ADC = 180° − 120° = 60°

∴ ∠ADC = 60°.

Question 21.



In the diagram, if the parallelogram PQRS has ∠PQR = 70°, then what is the value of ∠QPS?

Solution : We know that the sum of the interior angles on the same side of the transversal of a parallelogram is 180°.

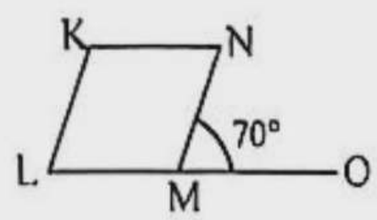
So, ∠PQR + ∠QPS = 180°

or, 70° + ∠QPS = 180°

or, ∠QPS = 180° − 70° = 110°

The required value of ∠QPS is 110°.

Question 22.



In the diagram, if the quadrilateral KLMN is a rhombus, then what is the value of ∠L + ∠N?

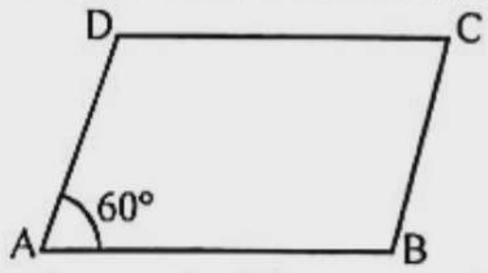
Solution : Since the quadrilateral KLMN is a rhombus, KL ∥ MN and KN and LM are transversals.

So, ∠KLM = corresponding ∠NMO = 70°

And ∠KNM = alternate ∠NMO = 70°.

∴ ∠L + ∠N = 70° + 70° = 140°.

Question 23. If the parallelogram ABCD has ∠A = 60°, then what is the value of ∠B + ∠D?



Solution : We know that the opposite angles of a parallelogram are equal.

Here, ∠A = 60°.

So, ∠C = 60°.

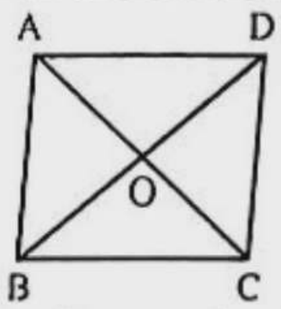
Now, ∠A + ∠B + ∠C + ∠D = 360°.

or, 60° + ∠B + 60° + ∠D = 360°.

or, ∠B + ∠D = 360° − 120° = 240°.

∴ ∠B + ∠D = 240°.

Question 24. In the diagram, ABCD is a rhombus. If AC = 12 cm and BD = 16 cm, then what is the length of the side AB?



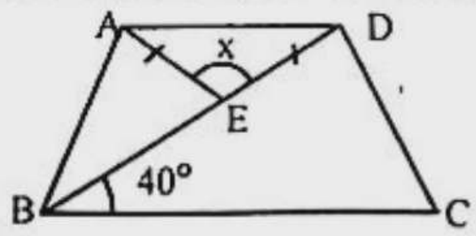
Solution : Since the diagonals of a rhombus bisect each other at right angles, $AO = \frac{1}{2} AC = \frac{1}{2} \times 12$ cm $= 6$ cm and $BO = \frac{1}{2} BD = \frac{1}{2} \times 16$ cm $= 8$ cm.

Now, in ΔAOB, $AB^2 = AO^2 + BO^2 = 6^2 + 8^2 = 36 + 64 = 100$.

∴ $AB = \sqrt{100} = 10$ cm.

Therefore, the length of the side AB is 10 cm.

Question 25. In the diagram, if ABCD is a trapezium, then what is the value of x?



Solution : Since AD ∥ BC, ∠ADB = alternate ∠CBD = 40°.

Again, in ΔAED, AE = DE.

So, ∠EAD = ∠ADE = 40°.

Now, ∠AED + ∠EAD + ∠EDA = 180°.

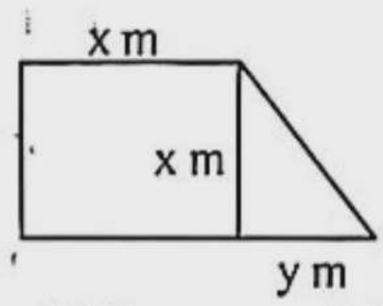
or, x + 40° + 40° = 180°.

or, x = 180° − 80° = 100°.

The required value of x is 100°.

8.4 Area of Quadrilaterals ▸ Textbook Page 138

Question 26.



In the diagram, if the area of the square is 25 square meters and the area of the triangular region is 10 square meters, then find the value of y.

Solution : Given that, the length of a side of the square = x meters.

So, its area = x^2 square meters.

According to the first condition, $x^2 = 25$.

or, $x = \sqrt{25} = 5$.

Again, the area of the triangular region $= \frac{1}{2} \times x \times y$ square meters.

According to the second condition, $= \frac{1}{2} \times x \times y = 10$.

or, xy = 20.

or, 5y = 20 [Since x = 5].

or, $y = \frac{20}{5} = 4$.

∴ The required value of y is 4.

Question 27. If the area of a square is 121 square cm, then what is its perimeter?

Solution : Let the length of a side of the square be x cm.

So, the area of the square = x^2 square cm.

According to the question, $x^2 = 121$.

or, $x = \sqrt{121} = 11$.

So, the perimeter of the square = 4x = (4 × 11) cm = 44 cm.

The required perimeter is 44 cm.

Question 28. What is a trapezium? Write the formula for finding the area of a trapezium.

Solution : A quadrilateral with one pair of parallel sides is called a trapezium. The area of a trapezium is equal to half the sum of its two parallel sides multiplied by the perpendicular distance between them.

That is, if the lengths of the two parallel sides of a trapezium are a and b and the perpendicular distance between them is h, then the area of the trapezium $= \frac{1}{2} \times (a + b) \times h$.

Question 29. What is a rhombus? Write the formula for finding the area of a rhombus, including the introduction of variables.

Solution : A parallelogram with equal adjacent sides is called a rhombus. If the lengths of the two diagonals of a rhombus are d_1 and d_2, then its area $= \frac{d_1 \times d_2}{2}$

That is, the area of a rhombus $= \frac{\text{Product of the diagonals}}{2}$.

Question 30. The lengths of the two parallel sides of a trapezium are 12 cm and 9 cm respectively. If the perpendicular distance between the two parallel sides is 4 cm, then what is the area of the trapezium in square cm?

Solution : Let the two parallel sides be a = 12 cm and b = 9 cm, and the perpendicular distance between them be h = 4 cm.

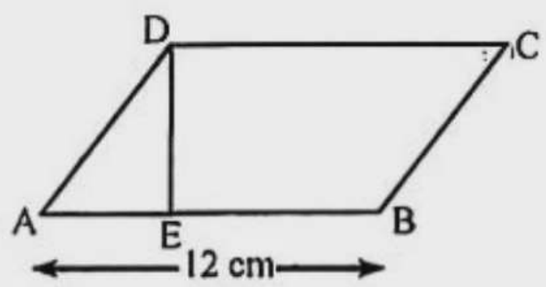
So, the area of the trapezium $= \frac{1}{2} \times (a + b) \times h$

$= \frac{1}{2}(12 + 9) \times 4$ square cm

$= 21 \times 2 = 42$ square cm.

The required area is 42 square cm.

Question 31. Find the area of the parallelogram ABCD.



Solution : Here, the base of the parallelogram ABCD is AB = 12 cm, and the height is DE = 6 cm.

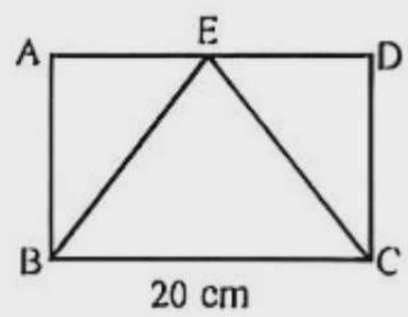
∴ The area of the parallelogram ABCD = AB × DE

$= 12 \times 6$

$= 72$ square cm.

The required area of the parallelogram ABCD is 72 square cm.

Question 32.



If the area of the rectangle ABCD is 240 square cm, then what is the height of ΔBEC in cm?

Solution : Given that, the length of the rectangle ABCD is BC = 20 cm.

We know, area of a rectangle = length × breadth.

So, the breadth $= \frac{\text{area}}{\text{length}} = \frac{240}{20} = 12$ cm.

So, the height of ΔBEC is 12 cm.

Question 33. If the lengths of the two diagonals of a rhombus are 4 cm and 9 cm, then what is the area of the rhombus in square cm?

Solution : Let the two diagonals of the rhombus be $d_1 = 8$ cm and $d_2 = 9$ cm.

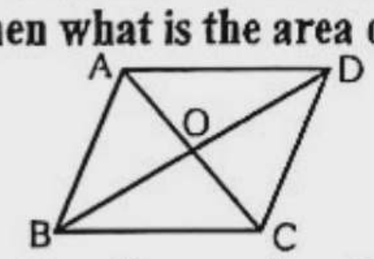
So, the area of the rhombus $= \frac{1}{2} \times d_1 \times d_2$

$= \frac{1}{2} \times 8 \times 9$ square cm

$= 36$ square cm.

The required area is 36 square cm.

Question 34. If the rhombus ABCD has AB = 5 cm and BO = 4 cm, then what is the area of the rhombus?



Solution : Since the diagonals of a rhombus bisect each other at right angles, ∠AOB = 1 right angle.

So, $AO^2 + BO^2 = AB^2$.

or, $AO^2 = AB^2 - BO^2 = 5^2 - 4^2 = 25 - 16 = 9$.

or, $AO = \sqrt{9} = 3$ cm.

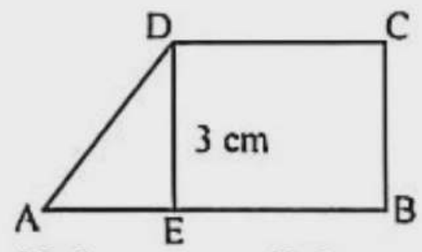
And BD = 2 BO = 2 × 4 cm = 8 cm.

AC = 2AO = 2 × 3 cm = 6 cm.

∴ The area of the rhombus $= \frac{1}{2} \times 8 \times 6 = 24$ square cm.

The required area is 24 square cm.

Question 35.



In the diagram, if the area of the trapezium ABCD is 48 square cm and the distance between the parallel sides is 3 cm, then what is the average length of the two parallel sides?

Solution : Let the lengths of the two parallel sides be a and b, and the distance between them be h = 3 cm.

So, the area of the trapezium $= \frac{1}{2}(a + b)\,h$

or, $48 = \frac{1}{2} \times (a + b) \times 3$.

or, $\frac{a + b}{2} = 16$

∴ The average length of the two parallel sides is 16 cm.

8.5 Solid

▸ Textbook Page 139

Question 36. What is a rectangular solid? Write the formula for finding the area of the entire surface of a rectangular solid.

Solution : A solid body with length, breadth, and height is called a rectangular solid. A rectangular solid has six rectangular faces or surfaces, each of which is a rectangular region.

The area of the entire surface of a rectangular solid = 2 (length × breadth + length × height + breadth × height)

That is, if the length, breadth, and height of a rectangular solid are a, b, and c respectively, then its area = 2(ab + ac + bc) square units.

Question 37. Write four characteristics of a rectangular solid.

Solution : The four characteristics of a rectangular solid are as follows :

i. A rectangular solid has three dimensions: length, breadth, and height.
ii. A rectangular solid has six faces or surfaces.
iii. Each face or surface is rectangular.
iv. If the length, breadth, and height of a rectangular solid are a, b, and c respectively, then the area of its entire surface = 2(ab + bc + ca) square units.

Question 38. What is meant by a cube? Write the formula for finding the area of the entire surface of a cube.

Solution : A square solid is called a cube. It has six mutually equal square faces or surfaces, each of which is a square region. Again, two mutually opposite faces are parallel. All the edges or sides of a cube are equal. So, the area of all faces is equal. If the length of a side of a cube is a unit, then the area of its entire surface = $6a^2$ square units.

Question 39. Write four characteristics of a cube.

Solution : The four characteristics of a cube are:

i. A cube has six faces.
ii. Each face of a cube is square.
iii. All the faces of a cube are equal to each other.
iv. All the edges or sides of a cube are equal to each other.

Question 40. Find the area of the entire surface of a cube with a side of 5 cm.

Solution : Let the length of a side of the cube be a = 5 cm.
So, the area of the entire surface of the cube = $6a^2$
= $6 \times (5)^2$ square cm
= (6×25) = 150 square cm.
The required area is 150 square cm.

Question 41. If the length, breadth, and height of a rectangular solid are 7 cm, 5 cm, and 3 cm respectively, then find the area of its entire surface.

Solution : Let the length be a = 7 cm, the breadth be b = 5 cm, and the height be c = 3 cm.
∴ The area of its entire surface = 2(ab + bc + ca)
= $2(7 \times 5 + 5 \times 3 + 3 \times 7)$ square cm
= 2×71 = 142 square cm.
The required area is 142 square cm.

Question 42. If the side of a cube-shaped box is 4.5 cm, then find the volume of the box.

Solution : Let the length of a side of the box be a = 4.5 cm.
∴ The volume of the box = a^3
= $(4.5)^3$ cubic cm
= 91.125 cubic cm.
The required volume of the box is 91.125 cubic cm.

Question 43. If the length of a rectangular solid is a = 5 cm, the breadth is b = 3 cm, and the height is c = 1 cm, then what is its volume in cubic cm?

Solution : The volume of the rectangular solid = abc
= $(5 \times 3 \times 1)$ = 15 cubic cm.
The required volume of the solid is 15 cubic cm.

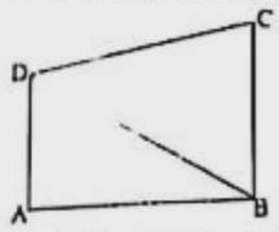
Creative Q/A — Designed as per learning outcomes

Ques. 01 Read attentively the following statement :
"ABCD is a quadrilateral. BD is a diagonal of it."

a. Now according to the given information draw a geometric figure and give a brief description. 2
b. If AB = CD and ∠ABD = ∠BDC, prove that ABCD is a parallelogram. 4
c. Prove that the sum of four angles of ABCD is four right angles. 4

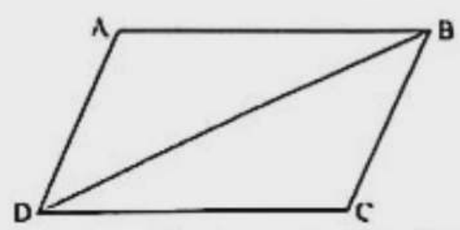
Solution to Question No. 01 :

a Based on the given data, a quadrilateral ABCD with diagonal BD is drawn below :



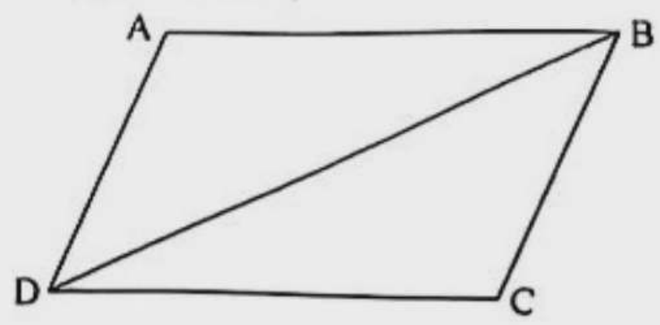
In the figure above, AB, BC, CD and DA are four sides and BD is a diagonal of the quadrilateral ABCD.

b Given that in quadrilateral ABCD, AB = CD and ∠ABD = ∠BDC. Let us prove that ABCD is a parallelogram.



Proof : Since AB = CD and ∠ABD = ∠BDC are given and these two are alternate angles, then AB ∥ CD.
Now, in ΔABD and ΔBCD we get,
AB = CD [Given]
BD is the common arm
And ∠ABD = ∠BDC. ∴ ΔABD ≅ ΔBCD.
∴ AD = BC and ∠ADB = ∠DBC. But they are the alternate angle. Hence, AD ∥ BC.
Hence, the quadrilateral ABCD is a parallelogram.

c Given that, ABCD is a quadrilateral. BD is its one diagonal. Let us prove that the sum of four angles of it is equal to four right angles i.e. ∠A + ∠B + ∠C + ∠D = 360°.



Proof : We know that, the sum of the three angles of any triangle is 180°. Then from ΔABD and ΔBCD we get,

∠BDA + ∠A + ∠DBA = 180° ----- (i)

And ∠BDC + ∠C + ∠DBC = 180° ---- (ii)

Now, by adding equation (i) and (ii) we get,

∠BDA + ∠A + ∠DBA + ∠BDC + ∠C + ∠DBC = 180° + 180°

or, (∠BDA + ∠BDC) + ∠A + (∠DBA + ∠DBC) + ∠C = 360°

or, ∠D + ∠A + ∠B + ∠C = 360°

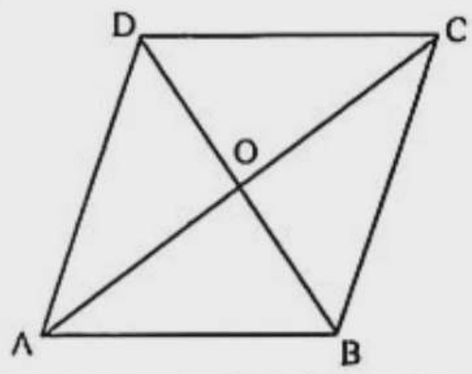
∴ ∠A + ∠B + ∠C + ∠D = 360°.

Ques. 02 Read attentively the following statement :
"ABCD is a rhombus. Two diagonals AC and BD intersect at O."

a. Now according to the given data draw a geometric figure and give a brief description. 2
b. Prove that the diagonals AC and BD bisect each other i.e. OA = OC and OB = OD. 4
c. Prove that the diagonals bisect each other at right angles i.e. ∠AOB = ∠BOC = ∠COD = ∠AOD = 90°. 4

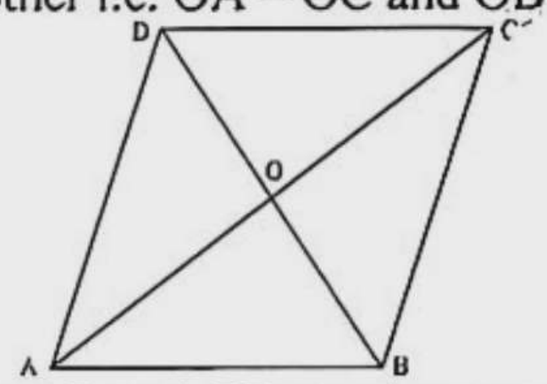
Solution to Question No. 02 :

a According to the given data, a rhombus is drawn below :



In the above figure, ABCD is a rhombus. AC and BD are its diagonals intersecting at O.

b Let us prove that the two diagonals AC and BD bisect each other i.e. OA = OC and OB = OD.



Proof : Here AB and CD are the opposite arms of a rhombus, they are parallel and AC is their transversal.

∴ ∠BAC = ∠ACD [Being alternate angles]

i.e. ∠BAO = ∠OCD

Again, AB and CD are the opposite arms of a rhombus, they are parallel and BD is their transversal.

∴ ∠ABD = ∠BDC [Being alternate angles]

i.e. ∠ABO = ∠ODC

Now in ΔAOB and ΔCOD we get,

∠BAO = ∠OCD **[Proved]**

∠ABO = ∠ODC [Do]

and, AB = CD [Opposite sides of a rhombus]

∴ ΔAOB ≅ ΔCOD

∴ OA = OC and OB = OD. **(Proved)**

c Let us prove that, ∠AOB = ∠BOC = ∠COD = ∠AOD = 90°.

In ΔAOB and ΔAOD we get,

AB = AD [Sides of rhombus]

OB = OD [Proved in 'b']

OA is the common arm.

∴ ΔAOB ≅ ΔAOD

∴ ∠AOD = ∠AOB, but they are the adjacent angles lying on the same side of BD.

∴ ∠AOD = ∠AOB = 90°

Again ∠AOB = ∠COD [Vertically opposite angles]

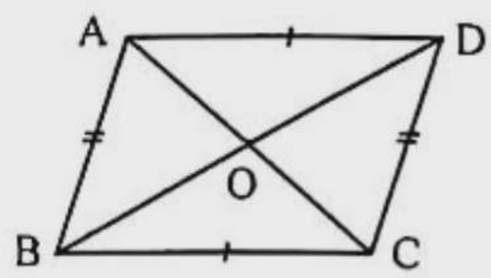
∴ ∠AOB = ∠COD = 90° [∠AOB = 90°]

And again, ∠AOD = ∠BOC (vertically opposite)

∴ ∠BOC = 90°

Hence, ∠AOB = ∠BOC = ∠COD = ∠AOD = 90°.

Ques. 03



In the figure AC and BD are two diagonals of the parallelogram ABCD.

a. Find the area of whole surface of a cube with 4 cm edge. 2
b. Prove that, ∠ABC + ∠BCD + ∠ADC + ∠BAD = 4 right angles. 4
c. Prove that, AO = OC and BO = OD. 4

▸ *Dhaka Board 2019*

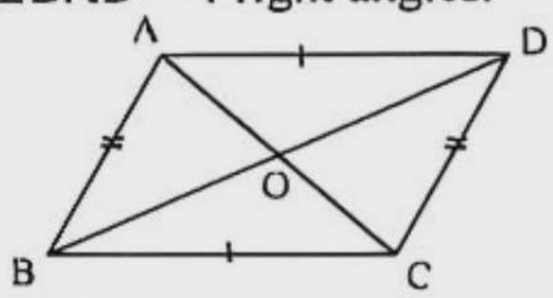
Solution to Question No. 03 :

a Given that, the edge of a cube = 4 cm.

We know, area of whole surface of a cube = $6a^2$, where 'a' is the length of a edge of a cube.

∴ Area of whole surface of the cube = 6×4^2 sq. cm.
= 96 sq. cm.

b According to the given information, ABCD is a parallelogram where AD ∥ BC and AB ∥ DC. AC and BD are two diagonals of the parallelogram. Now, it is required to Prove that, ∠ABC + ∠BCD + ∠ADC + ∠BAD = 4 right angles.

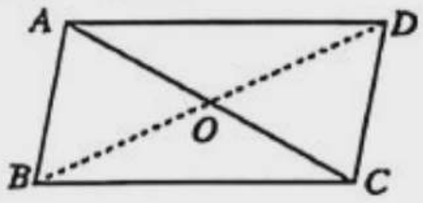


Proof : ∠BAD = ∠BCD and ∠ABC = ∠ADC, since ABCD is a parallelogram and opposite angles are mutually equal.

Now, $\angle ADB = \angle DBC$, since BD is a transversal of AD and BC.
Again, $\angle ABD = \angle BDC$, since BD is a transversal of AB and DC.
We know that the measures of 3 angles of any triangle is 180°.
$\therefore$ In ΔABD, $\angle BAD + \angle ABD + \angle ADB = 180°$ ..... (1)
And in ΔBCD, $\angle BCD + \angle DBC + \angle BDC = 180°$ ..... (2)
Now, adding equations (1) and (2), we get,
$\angle BAD + \angle ABD + \angle ADB + \angle BCD + \angle DBC + \angle BDC = 360°$
or, $\angle BAD + \angle BCD + (\angle ABD + \angle DBC) + (\angle ADB + \angle BDC) = 360°$ or, 4 right angles
or, $\angle BAD + \angle BCD + \angle ABC + \angle ADC = 4$ right angles
$\therefore \angle ABC + \angle BCD + \angle ADC + \angle BAD = 4$ right angles **(Proved)**

c Theorem 3

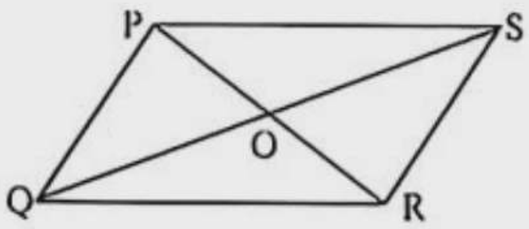
Let the diagonals AC and BD of the parallelogram ABCD intersect at O. It is required to prove that AO = OC and BO = OD.



Proof :

Steps	Justification
1. The lines AB and DC are parallel and AC is their transversal. Therefore, $\angle BAC$ = alternate $\angle ACD$.	[Alternate angles are equal] [Alternate angles are equal]
2. The lines BC and AD are parallel and BD is their transversal Therefore, $\angle BDC$ = alternate $\angle ABD$.	$\because \angle BAC = \angle ACD$ and $\angle BDC = \angle ABD$ [ASA theorem]
3. Now, between ΔAOB and ΔCOD, $\angle OAB = \angle OCD$, $\angle OBA = \angle ODC$ and AB = DC. So, $\Delta AOB \cong \Delta COD$. Therefore, AO = OC and BO = OD. **(Proved)**	

Ques. 04



Two diagonals PR and QS of a parallelogram PQRS intersect at point O.
a. Find the area of the rhombus whose length of two diagonals are 8 cm and 9 cm. 2
b. Prove that, PO = OR and OQ = OS. 4
c. If PR = QS, then prove that, PQRS is a rectangle. 4

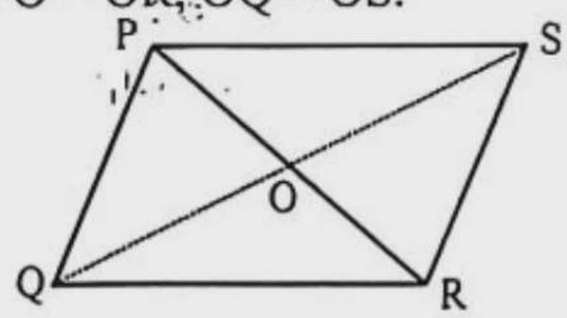
▸ *Chattogram Board 2019*

Solution to Question No. 04 :

a Given, length of two diagonals of a rhombus are 8 cm and 9 cm.
We know that, Area of rhombus = half of the product of two diagonals

$\therefore$ Area of the rhombus $= \left(\frac{1}{2} \times 8 \times 9\right)$ sq. cm.
$= 36$ sq. cm.

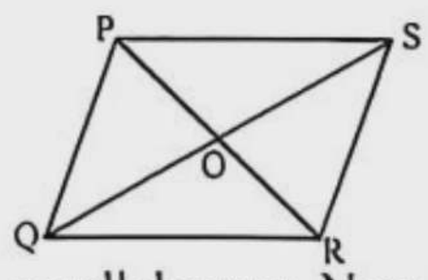
b Let the diagonals PR and QS of the parallelogram PQRS intersect at O. It is required to prove that PO = OR, OQ = OS.



Proof :

Steps	Justification
1. The lines PQ and SR are parallel and PR is their transversal. Therefore, $\angle QPR$ = alternate $\angle PRS$.	[Alternate angles are equal] [Alternate angles are equal]
2. The lines PQ and SR are parallel and QS is their transversal. Therefore, $\angle QSR$ = alternate $\angle PQS$.	$\because \angle QPR = \angle PRS$ and $\angle QSR = \angle PQS$ [ASA theorem]
3. Now, between ΔPOQ and ΔROS, $\angle OPQ = \angle ORS$, $\angle OQP = \angle OSR$ and PQ = SR. So, $\Delta POQ \cong \Delta ROS$. Therefore, PO = OR and OQ = OS. **(Proved)**	

c



Let, PQRS is a parallelogram. Now it is required to prove that, PQRS is a rectangle when PR = QS.
Proof : In ΔPQS and ΔPQR,
PS = QR, Since opposite sides of a parallelogram are equal.
PR = QS, according to proposition.
PQ is common to both the triangle.
$\therefore \Delta PQS$ and ΔPQR are congruents.
$\therefore \angle P = \angle Q$.
Similarly, comparing ΔPRS and ΔRQS, it can be shown that $\angle R = \angle S$.
But, $\angle P = \angle R$ and $\angle Q = \angle S$, Since opposite angles of a parallelgoram are equal.
$\therefore \angle P = \angle Q = \angle R = \angle S$ and PR = QS
Therefore, according to the definition of rectangle, PQRS is a rectangle.
Thus, proved that parallellogram PQRS is a rectangle when PR = QS.

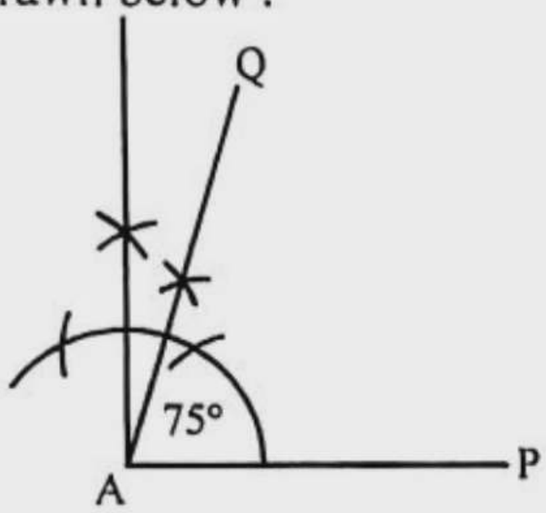
Ques. 05 ABCD is a parallelogram. The bisector BP of ∠B intersects AD at the point P, the bisector DQ of ∠D intersects BC at Q and the bisector CR of ∠C intersects DQ at R.

a. Draw the angle 75° with the help of pencil and compus. 2
b. Prove that, ∠CRD = 90°. 4
c. Prove that, BP ∥ DQ. 4

Dinajpur Board 2019

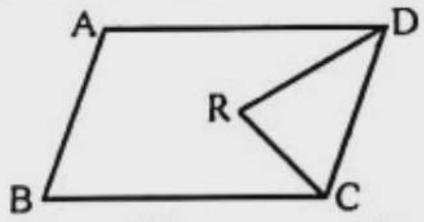
Solution to Question No. 05 :

a An angle 75° with the help of pencil and compass is drawn below :



Here, in the above figure ∠PAQ = 75°

b Let ABCD is a parallelogram where bisectors of ∠C and ∠D mutually intersects at R. We have to prove that, ∠CRD = 90°



Construction : Two bisectors CR and DR of ∠C and ∠D respectively are drawn.

Proof : In parallelogram ABCD,

∠C + ∠D = 180°

or, $\frac{1}{2}\angle C + \frac{1}{2}\angle D = 90°$

or, ∠DCR + ∠CDR = 90°, since $\angle DCR = \frac{1}{2}\angle C$

and $\angle CDR = \frac{1}{2}\angle D$

But in ΔDRC,

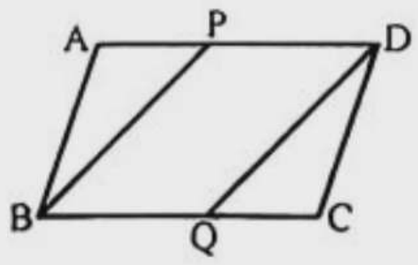
∠DCR + ∠CDR + ∠CRD = 180°

or, 90° + ∠CRD = 180° [∵ ∠DCR + ∠CDR = 90°]

or, ∠CRD = 180° – 90°

∴ ∠CRD = 90° **[Proved]**

c Let ABCD is a parallelogram. The bisector BP of ∠B intersects AD at the point P, the bisector DQ of ∠D intersects BC at Q. We have to prove that, BP ∥ DQ.



Proof : In the parallelogram ABCD,

∠ABC = ∠ADC

[∵ opposite angles of parallelogram are equal]

∴ ∠PBQ = ∠PDQ [BP and DQ are their bisectors respectively]

Again, AD ∥ BC and BP is their transversal.

∴ ∠PBQ = ∠APB [Alternate angles]

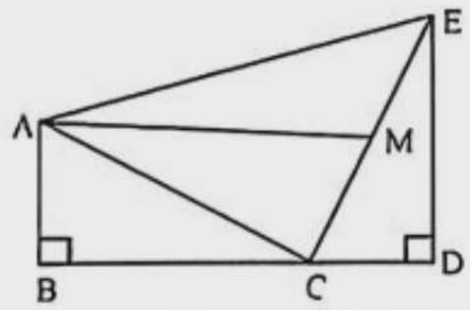
∴ ∠PBQ = ∠PDQ = ∠APB [∵ ∠PBQ = ∠PDQ]

i.e. ∠PDQ = ∠APB

But these are corresponding angles.

∴ BP ∥ DQ **[Proved]**

Ques. 06



In the figure ∠B = ∠D = 90°, AB =CD, BC = DE and M is the mid-point of CE.

a. Prove that, ΔABC ≅ ΔCDE. 2
b. Prove that, $AC^2 = AB^2 + BC^2$. 4
c. Show that, $AE^2 + CM^2 = AM^2 + CE^2$. 4

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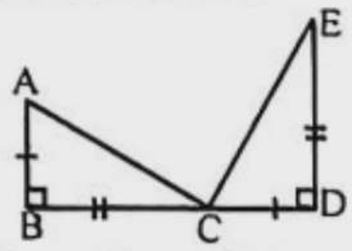
Solution to Question No. 06 :

a Let, in the triangle ABC and triangle CDE, ∠B = ∠D = 90°, AB = CD and BC = DE. We have to prove that ΔABC ≅ ΔCDE.



Proof : Since ∠B = ∠D = 90°,

so the both ΔABC and ΔCDE are right angled triangles.

∴ $AC^2 = AB^2 + BC^2$ ..... (i)

and $CE^2 = DE^2 + CD^2$ ..... (ii)

From equation (i), we get,

$AC^2 = AB^2 + BC^2$

$= CD^2 + DE^2$ [∵ AB = CD and BC = DE]

$= CE^2$ [From equation (ii)]

or, $AC^2 = CE^2$

∴ AC = CE

Now in ΔABC and ΔCDE

∠B = ∠D = 90°

AB = CD,

BC = DE

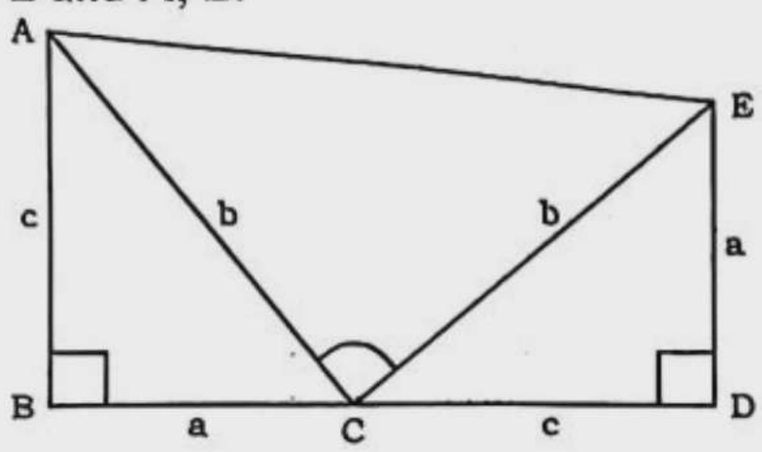
and AC = CE

∴ ΔABC ≅ ΔCDE **[Proved]**

b Here, ABC is a right angled triangle, ∠B = 1 right angle and AC is the hypotenuse. Let AC = b, AB = c and BC = a.

It is required to prove that, $AC^2 = AB^2 + BC^2$.

Construction : BC is produced up to D in such a way that CD = AB = c. Also draw perpendicular DE at D on BC produced, so that DE = BC = a. Join C, E and A, E.

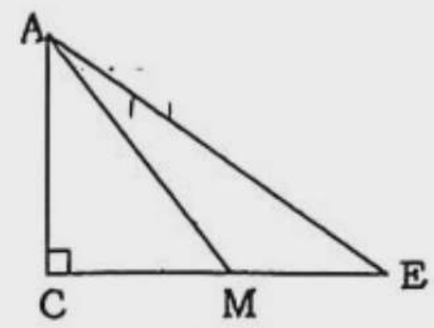


Proof :

Steps	Justification
(1) In ΔABC and ΔCDE, AB = CD = c, BC = DE = a and included ∠ABC = included ∠CDE	[each right angle]
Hence, ΔABC ≅ ΔCDE. ∴ AC = CE = b and ∠BAC = ∠ECD.	[SAS theorem] ∴ ∠BAC = ∠ECD.
(2) Again, since AB ⊥ BD and ED ⊥ BD ∴ AB ∥ ED. Therefore, ABDE is a trapezium.	[Area of trapezium $= \frac{1}{2}$ sum of parallel sides × distance between parallel sides]
(3) Moreover, ∠ACB + ∠BAC = ∠ACB + ∠ECD = 1 right angle ∴ ∠ACE = 1 right angle Now area of the trapezium ABDE = area of (Δ region ABC + Δ region CDE + Δ region ACE) or, $\frac{1}{2}BD(AB + DE) = \frac{1}{2}ac + \frac{1}{2}ac + \frac{1}{2}b^2$ or, $\frac{1}{2}(BC + CD)(AB + DE) = \frac{1}{2}[2ac + b^2]$ or, $(a + c)(a + c) = 2ac + b^2$ [multiplying by 2] or, $a^2 + 2ac + c^2 = 2ac + b^2$ or, $a^2 + c^2 = b^2$. That is $AC^2 = AB^2 + BC^2$. **Proved)**	

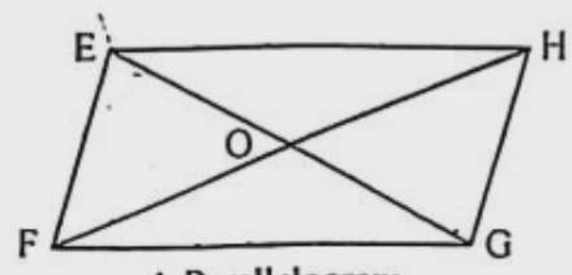
c Let, in the right ΔACE where ∠C = 90°, M is a point on CE.
Now, it is required to prove that, $AE^2 + CM^2 = AM^2 + CE^2$.

Proof : From right ΔACE, We get, by following Pythagoras theorem,
$AE^2 = AC^2 + CE^2$ ..... (1)



Again, in the right ΔACM, we get by following the same theorem,
$AM^2 = AC^2 + CM^2$ ..... (2)
Now, adding CM^2 to (1), we get,
$AE^2 + CM^2 = AC^2 + CE^2 + CM^2$
$= AC^2 + CE^2 + AM^2 - AC^2$, from (2)
$= AM^2 + CE^2$
∴ $AE^2 + CM^2 = AM^2 + CE^2$. **(Proved)**

Ques. 07



A Parallelogram

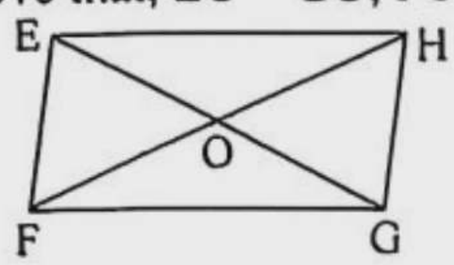
a. The two diagonals of a rhombus are 12cm and 15cm. Find the area of rhombus. 2
b. Prove that, EO = GO and FO = HO. 4
c. Prove that, the bisectors of two angles ∠F and ∠G of a prallelogram are perpendicular to each other. 4

▸ *Mymensingh Board 2019*

Solution to Question No. 07 :

a We know,
Area of any rhombus $= \frac{1}{2}$ × product of the two diagonals of the rhombus.
Here, the diagonals of the given rhombus are 12 cm and 15 cm.
∴ The area of the rhombus $= \left(\frac{1}{2} \times 12 \times 15\right)$ sq cm
= 90 sq cm

b **Proposition :** Let the diagonals EG and FH of the parallelogram EFGH intersect at O. It is required to prove that, EO = GO, FO = HO.

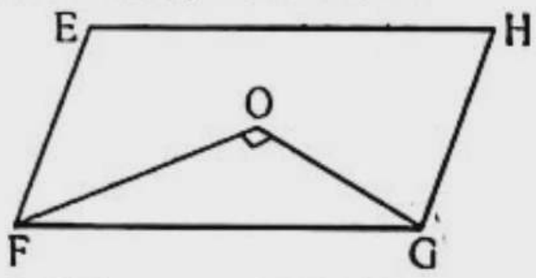


Proof :

Steps	Justification
(1) The lines EF and HG are parallel and EG is their transversal.	[Alternate angles are equal]
(2) The lines FG and EH are parallel and FH is their transversal. Therefore, ∠FHG = alternate ∠EFH.	[Alternate angles are equal]

Steps	Justification
(3) Now, between ΔEOF and ΔGOH, $\angle OEF = \angle OGH$, $\angle OFE = \angle OHG$ and $EF = HG$. So, $\Delta EOF \cong \Delta GOH$. Therefore, $EO = GO$ and $FO = HO$. **(Proved)**	$\because \angle FEG = \angle EGH$ and $\angle FHG = \angle EFH$ [ASA theorem]

c Let, EFGH is a paralellogram where bisectors of $\angle F$ and $\angle G$ mutually meet at O. Now it is required to prove that, $FO \perp GO$.



Proof : In parallelogram EFGH,

$\angle F + \angle G = 180°$

or, $\frac{1}{2}\angle F + \frac{1}{2}\angle G = 90°$

or, $\angle OFG + \angle OGF = 90°$ ..... (i), since $\angle OFG = \frac{1}{2}\angle F$ and $\angle OGF = \frac{1}{2}\angle G$.

But in ΔOFG,

$\angle OFG + \angle OGF + \angle FOG = 180°$

or, $90° + \angle FOG = 180°$ [From equation (i)]

or, $\angle FOG = 90°$, which means $FO \perp GO$.

$\therefore FO \perp GO$ **(Proved)**

Ques. 08 Diagonals PR and QS of parallelogram PQRS intersect at O.

a. If $\angle PQR = 120°$, find out the value of the complementary angle of $\angle QPS$. 2

b. Prove that, $OP = OR$ and $OQ = OS$. 4

c. If $\angle PQR = 90°$, prove that, $PR = QS$. 4

▸ *Rajshahi Board 2018*

Solution to Question No. 08 :

a According to the given information, in parallelogram PQRS, $\angle PQR = 120°$.

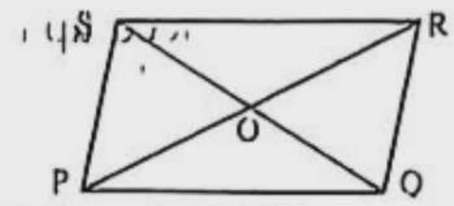
$\therefore \angle PSR = 120°$.

$\therefore \angle QPS = \frac{360° - (120° + 120°)}{2} = 60°$.

$\therefore$ Complementary angle of $\angle QPS = 90° - 60°$
$= 30°$.

b Given a parallelogram, PQRS, where O is the point of intersection of the diagonals PR and QS. Now, it is required to prove that $OP = OR$ and $OQ = OS$.

Construction : P, R and Q, S are joined such that O is their point of intersection.



Proof : In ΔPOQ and ΔROS,

$PQ = RS$, $\angle POQ = \angle ROS$,	[since they are vertically opposite angles]
$\angle QPR$ or $\angle QPO = \angle SRP$ or $\angle SRO$,	[Since they are alternate angles due to $PQ \parallel SR$ and PR is their transversal]
Similarly, $\angle PQS$ or $\angle PQO = \angle RSQ$ or, $\angle RSO$,	[Since they are alternate angles due to $PS \parallel QR$ and QS is their transversal.]

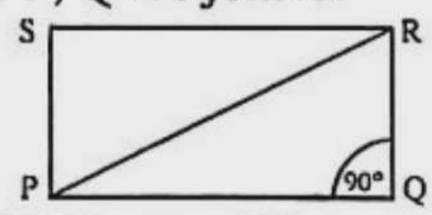
$\therefore \Delta POQ \cong \Delta ROS$.

$\therefore OP = OR$ and $OQ = OS$. **(Proved)**

c Here, given a parallelogram PQRS where $\angle PQR = 90°$.

Now, it is to be proved that $PR = QS$.

Construction : P, Q are joined.



Proof : Since PQRS is a parallelogram and $\angle PQR = 90°$.

$\therefore \angle PSR = 90°$,

$\therefore \angle QPS + \angle QRS = 360° - 2 \times 90° = 180°$.

$\Rightarrow \angle QPS + \angle QPS = 180°$, [Since opposite angles of a parallelogram are mutually equal]

$\Rightarrow 2\angle QPS = 180°$

$\Rightarrow \angle QPS = 90°$

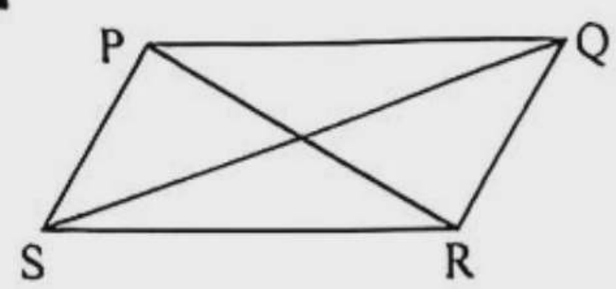
$\Rightarrow \angle QRS = 90°$.

$\therefore$ PQRS is a rectangle.

We know, diagonals of a rectangle are mutually equal.

Thus, $PR = QS$. **(Proved)**

Ques. 09



In the figure PQRS is a parallelogram.

a. If the side of a cube is 5 cm, what is the area of the whole surface of the cube? 2

b. In the light of the stem prove that, $\angle P + \angle Q + \angle R + \angle S$ = Four right angle. 4

c. If diagonals $PR = QS$, then prove that, PQRS is a rectangle. 4

▸ *Chattogram Board 2018*

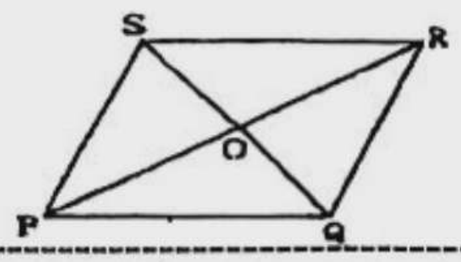
Solution to Question No. 09 :

a Given that the side of a cube = 5 cm
We know, area of whole surface of a cube = $6a^2$, where 'a' is the length of a side of the cube.
∴ area of the whole surface of the cube in question = 6×5^2 sq. cm. or 150 sq. cm.

b According to the given information, PQRS is a parallelogram where PQ || SR and PS || QR, PR and QS are two diagonals of the parallelgoram. Now, it is to be proved that, ∠P + ∠Q + ∠R + ∠S = 4 right angle.
Proof : ∠P = ∠R and ∠Q = ∠S, Since PQRS is a parallelogram and opposite angles are mutually equal.
Now, ∠PQS = ∠QSR, Since QS is a transversal of PQ and SR.
Again, ∠PSQ = ∠SQR
We know that the measure of 3 angles of any triangle is 180°.
∴ in ΔPQS, ∠P + ∠PQS + ∠PSQ = 180° ..... (1)
And in ΔQRS, ∠R + ∠RSQ + ∠SQR = 180° ..... (2)
Now, adding (1) and (2), we get,
∠P + ∠PQS + ∠QSP + ∠R + ∠QSR + ∠SQR = 180° + 180°
or, ∠P + ∠PQS + ∠SQR + ∠R + ∠QSP + ∠QSR = 360°
or, ∠P + ∠Q + ∠R + ∠S = 360° or, 4 right angles.
∴ ∠P + ∠Q + ∠R + ∠S = 4 right angles. **(Proved)**

c Let, PQRS is a parallelogram. Now it is required to prove that PQRS is a rectangle when PR = QS.
Proof : In ΔPQS and ΔPQR,
PS = QR, Since opposite sides of a parallelogram are equal.
PR = QS, according to proposition.
PQ is common to both the triangle.
∴ ΔPQS and ΔPQR are congruents.
∴ ∠P = ∠Q.
Similarly, comparing ΔPRS and ΔRQS, it can be shown that ∠R = ∠S.
But, ∠P = ∠R and ∠Q = ∠S, Since opposite angles of a parallelgoram are equal.
∴ ∠P = ∠Q = ∠R = ∠S and PR = QS
Therefore, according to the defination of rectangle, PQRS is a rectangle.
Thus, proved that parallegram PQRS is a rectangle when PR = QS.

Ques. 10



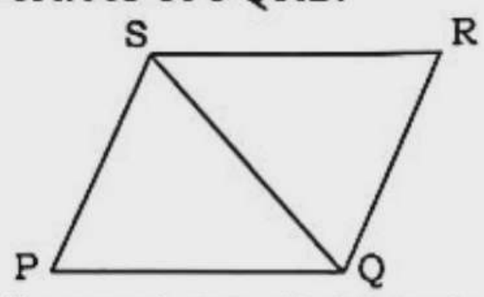
In the figure PQ = SR and PQ || SR
a. Write down the name of two triangles which lying on the same base PQ and the same parallel line PQ and SR. 2
b. Prove that, ∠P + ∠Q + ∠R + ∠S = four right angle. 4
c. Show that, OP = OR and OQ = OS. 4

▸ *Rajshahi Board 2017*

Solution to Question No. 10 :

a The name of two triangles which stand on the same base PQ are ΔPQS and ΔPQR.

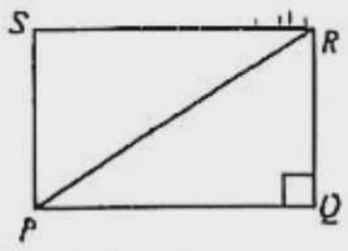
b Let PQRS is a quadrilateral where PQ = SR and PQ || SR. Now it is required to prove that ∠P + ∠Q + ∠R + ∠S = 4 right angles.
Construction : SQ diagonal is drawn by joining the opposite vertices of PQRS.



Proof : The diagonal SQ divides the quadrilateral PQRS into two parts namely ΔPQS and ΔQRS.
In ΔPQS, ∠P + ∠PQS + ∠PSQ = 180°, since the sum of three angles of any triangle is 180°.....(1)
Again, in ΔQRS, ∠SQR + ∠R + ∠RSQ = 180°, since the sum of three angles of any triangle is 180°.....(2)
Now adding (1) and (2) we get,
∠P + ∠PQS + ∠PSQ + ∠SQR + ∠R + ∠RSQ = 180° + 180°.
or, ∠P + ∠PQS + ∠RQS + ∠R + ∠PSQ + ∠RSQ = 360°.
or, ∠P + ∠Q + ∠R + ∠S = 4 × 90°.
or, ∠P + ∠Q + ∠R + ∠S = 4 right angles **(Proved).**

c Let, PQRS is a quadrilateral where PQ = SR and PQ || SR. The diagonals PR and QS mutually intersect at O. Now it is required to prove that OP = OR and OQ = OS.
Proof : Here, PQ = SR and PQ || SR. QS is a transversal of SR and PQ. Therefore, ∠PSQ = ∠RQS, since they are alternate angles.
Again, PQ || SR and PR is a transversal of PQ and SR. Therefore, ∠PRQ = ∠RPS, since they are alternate angles.
Now, in ΔPOS and in ΔQOR,
∠PSQ = ∠PSO = ∠RQS = ∠RQO and
∠RPS = ∠OPS = ∠PRQ = ∠ORQ.
∠POS = ∠QOR, Since they are vertically opposite angles.
∴ ΔPOS ≅ ΔQOR.
So, OP = OQ and OR = OS **(Proved).**

Ques. 11



In figure, PQ = 4cm, QR = 3cm.

a. In light of the stem, find out the length of PR. 2

b. In light of the stem, prove that sum of four angles of a quadrilateral PQRS is four right angles. 4

c. In light of the stem, if PQ || SP and PS || QR, then prove that PQ and RS diagonals bisect each other. 4

▸ *Comilla Board 2017*

Solution to Question No. 11 :

a Here in ΔPQR, we have,

PQ = 4 cm, QR = 3 cm and ∠PQR = 90°

Now according to the theorem of Pythagoras,

$$PR^2 = PQ^2 + QR^2 = (4\text{ cm})^2 + (3\text{ cm})^2$$

$= (16 + 9)$ sq. cm = 25 sq. cm

∴ PR = $\sqrt{25}$ cm = 5 cm.

b Let, PQRS is a quadrilateral where PR is diagonal of PQRS.

According to the stem,

PR divides the quadrilateral PQRS into two triangles namely ΔPQR and ΔPRS

Now for ΔPQR,

∠PQR + ∠QPR + ∠PRQ = 180°,

since the sum of three angles of any triangle is 180° ..... (1)

Again, for ΔPRS,

∠PRS + ∠RPS + ∠PSR = 180°, for the same reason stated above ..... (2)

From (1) and (2) we can have,

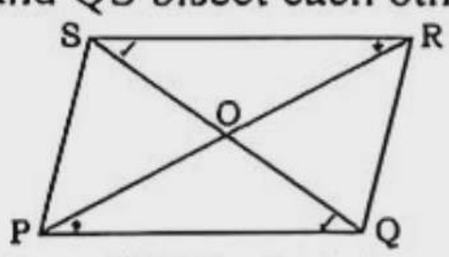
∠PQR + ∠QPR + ∠PRQ + ∠PRS + ∠RPS + ∠PSR = 180° + 180°

or, ∠PQR + ∠QPR + ∠RPS + ∠PRQ + ∠PRS + ∠PSR = 360°

or, ∠PQR + ∠QPS + ∠QRS + ∠PSR = 360° = 4 × 1 right angle

Therefore, it is proved that the sum of 4 angles of a quadrilateral PQRS is 4 right angles.

c Let, PQRS is a quadrilateral such that PQ || SP and PS || QR. Now it is required to prove that the diagonals PR and QS bisect each other.



Proof : PQ || SR and PR is their transversal.

∴ ∠PRS = ∠RPQ, since they are alternate angles.

Again, PS || QR and QR is their transversal.

∴ ∠RSQ = ∠PQS, since they are alternate angles.

Besides, PQ = SR and PS = QR, since PQ || SR and PS || QR.

Now in ΔPOQ and ΔROS, we get,

PQ = SR, ∠PRS = ∠ORS = ∠RPQ = ∠OPQ and

∠RSQ = ∠RSO = ∠PQS = ∠PQO

∴ ΔPOQ ≅ ΔROS

∴ OP = OR and OQ = OS, which implies that PR and QS mutually bisect each other.

Therefore, it is proved that diagonals PR and QS bisect each other.

Ques. 12 The two diagonals AC and BD of the parallelogram ABCD intersect each other at the point 0.

a. The length of the two diagonals of rhombus is 11 cm, and 15 cm respectively. Find the area. 2

b. Prove that, AO = CO, BO = DO. 4

c. If AB = AD, then prove that, ∠AOB = 1 right angle. 4

▸ *Barisal Board 2017*

Solution to Question No. 12 :

a Here the length of two diagonals of a rhombus are 11 cm and 15 cm.

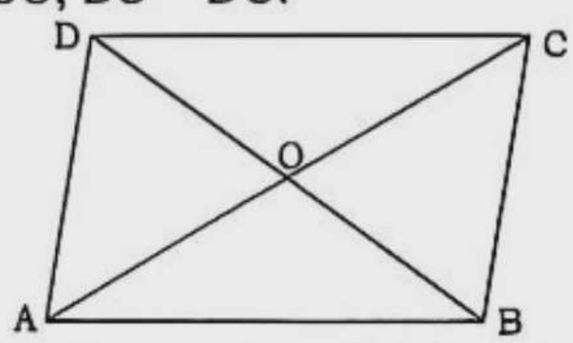
We know,

Area of a rhombus = $\frac{1}{2}$ × product of two diagonals of the rhombus

∴ Area of the given rhombus = $\frac{11 \times 5}{2}$ sq. cm

= 82.5 sq. cm

b Let, ABCD is a parallelogram. The two diagonals AC and BD of the parallelogram ABCD mutually intersect at O. Now it is required to prove that AO = CO, BO = DO.



Proof : According to the adjoining figure, AB || DC, BD is a transversal of them.

∴ ∠BDC = ∠ABD, since they are alternate angles.

Again, AB || DC, AC is their transversal

∴ ∠ACD = ∠CAB

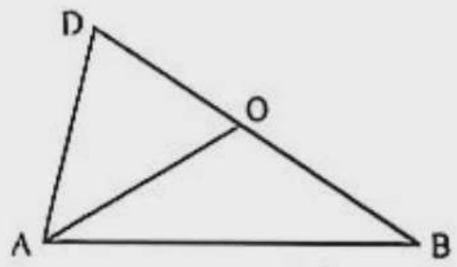
∴ in ΔAOB and ΔCOD,

AB = DC, ∠ACD = ∠CAB, ∠BDC = ∠ABD

∴ ΔAOB ≅ ΔCOD

∴ AO = CO and BO = DO. **(Proved)**

c Let, ABCD is a parallelogram such that AB = AD. Now, it is required to prove that ∠AOB = 1 right angle.



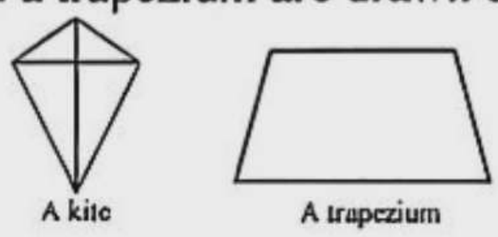
Proof : According to proposition, AB = AD.
∴ ABD is issosceles triangle
∴ ∠ABD = ∠ADB
Now in ΔAOD and ΔAOB,
AD = AB, ∠ABO = ∠ADB,
since ∠ABD = ∠ADB
and AO is common to both of the triangles.
∴ ΔAOD ≅ ΔAOB
∴ ∠AOD = ∠AOB
But ∠BOD is a straight angle which implies AO ⊥ BD.
∴ ∠AOD = 90° = ∠AOB
So, ∠AOB = 1 right angle. **(Proved)**

Ques. 13 The diagonals AC and BD of the parallelogram ABCD intersect at O.
a. Draw a kite and a Trapezium. 2
b. Prove that AO = OC and BO = OD 4
c. If the two bisectors of ∠B and ∠C meet together of the point E. Prove that BE ⊥ CE. 4

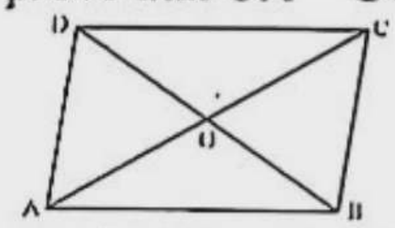
▸ *Dinajpur Board 2017*

Solution to Question No. 13 :

a A kite and a trapezium are drawn below :



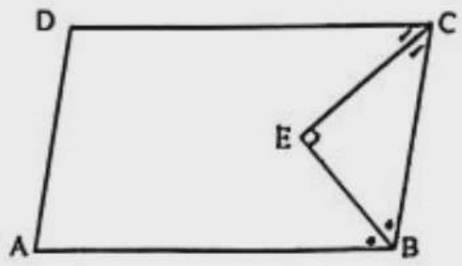
b Let, two diagonals AC and BD of a parallelogram ABCD mutually intersect at O. Now it is required to prove that OA = OC and BO = OD.



Proof : Here, AB ∥ DC and AC, a diagonal of ABCD is a transversal.
∴ ∠ACD = ∠CAB.
Again, AB ∥ DC and the diagonal BD of ABCD is a transversal.
∴ ∠BDC = ∠DBA
Now in ΔAOB and ΔCOD, we have, AB = DC, since they, are the opposite sides of the parallelogram ABCD.
∠ACD = ∠CAB and ∠BDC = ∠DBA
∴ ΔAOB and ΔCOD are congruent
∴ OA = OC and BO = DO. **(Proved)**

c Let, ABCD is a parallelogram where bisectors of ∠B and ∠C mutually meet at E. Now it is to be proved that BE ⊥ CE.

Construction : Two bisectors BE and CE of ∠B and ∠C respectively are drawn.



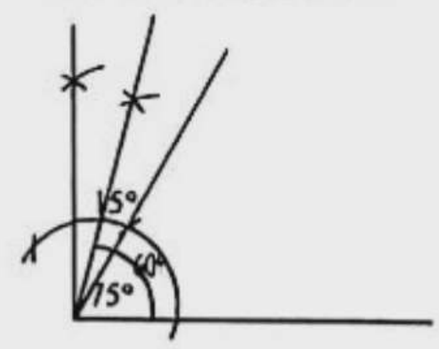
Proof : In parallelogram ABCD,
∠B + ∠C = 180°
or, $\frac{1}{2}\angle B + \frac{1}{2}\angle C = 90°$
or, ∠EBC + ∠ECB = 90°, since $\angle EBC = \frac{1}{2}\angle B$
and $\angle ECB = \frac{1}{2}\angle C$ ..... (1)
But in ΔBEC,
∠EBC + ∠ECB + ∠BEC = 180°
⇒ 90° + ∠BEC = 180°, putting ∠EBC + ∠ECB = 90° from (1)
⇒ ∠BEC = 180° − 90°
⇒ ∠BEC = 90°, which means BE ⊥ CE
∴ BE ⊥ CE. **(Proved)**

Ques. 14 Two specific lines are a = 6 cm, b = 4.5 cm and two angles are ∠x = 75° and ∠y = 85°.
a. Draw ∠x with pencil and compass. 2
b. Draw a rectangle by considering two given lines as adjacent sides. (Steps of construction in needed). 4
c. Construct a Trapezium considering a and b two parallel sides and two given angles on the side a. (Labelling and description of construction is needed). 4

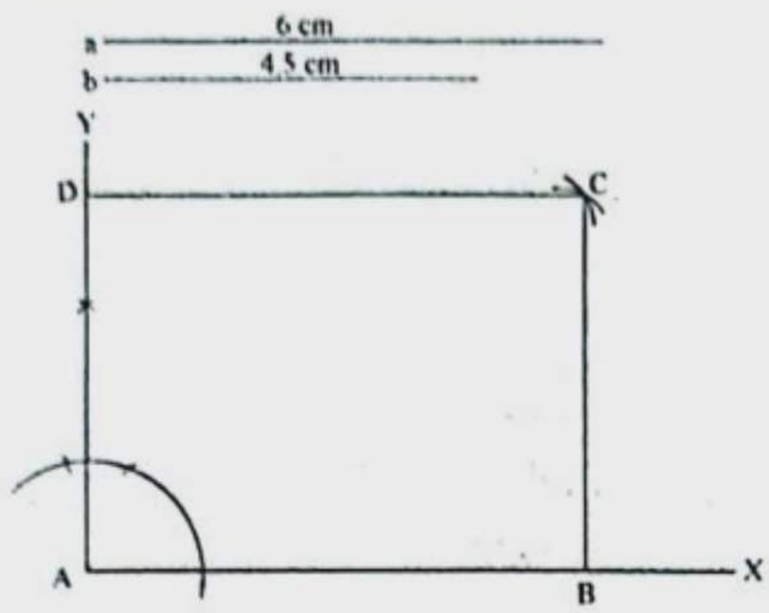
▸ *Ideal School & College, Dhaka*

Solution to Question No. 14 :

a ∠x = 75° is constructed below :

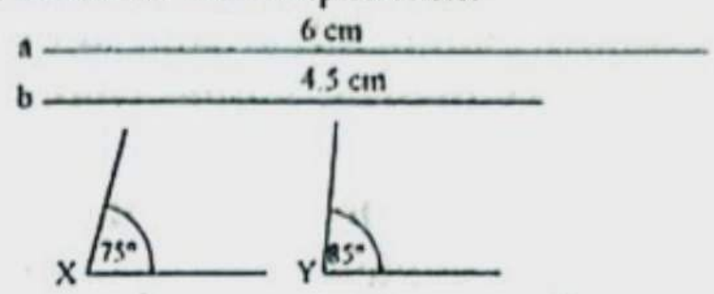


b Let, a = 6 cm and b = 4.5 cm are two adjacent sides of a rectangle. The rectangle is required to be constructed.

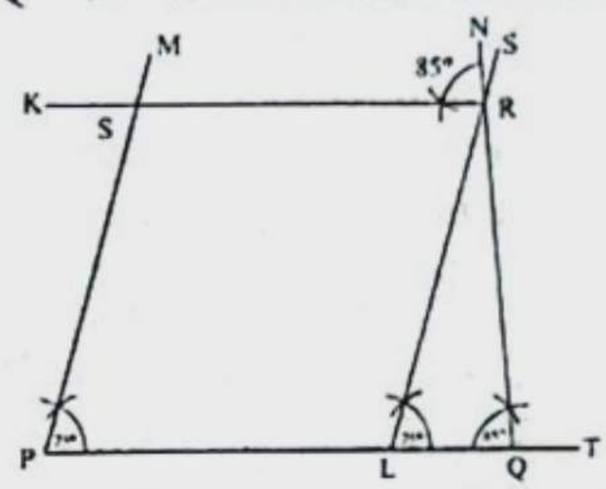


Description of construction : AB = a = 6 cm is taken from any line segment AX. AY ⊥ AX is drawn at A. AD = b = 4.5 cm is taken from AY. Then centering B and taking radius of b = 4.5 cm, an arc is drawn within the region of ∠XAY.
Again, centering D and taking a = 6 cm, another arc is drawn in the same side of previous arc. Let the two arcs mutually intersect at C. Finally, C, B and C, D are joined. Thus a rectangle ABCD is drawn which is the desired rectangle.

c Let, a = 6 cm and b = 4.5 cm are two parallel sides of a trapezium and ∠X = 75° and ∠Y = 85° are two adjacent angles of the side of a. It is required to draw the trapezium.



Description of construction : A line segment PT is taken. PQ = a = 6 cm is taken from PT. At P



∠TPM = ∠X is drawn. Again, at Q, ∠PQN = ∠Y = 85° is drawn. From PQ, PL = b = 4.5 cm is taken. At L, ∠QLS = X is also drawn.
Let, LS intersects QN at R. At R, ∠NRK = ∠Y is drawn. Let RK intersects PM at S.
Thus trapezium PQRS is drawn which is the desired trapezium.

Exercise 8.2 : Construction of Quadrilaterals

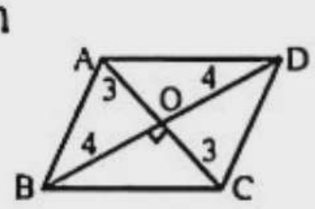
At a Glance Important Contents of Exercise

- **Construction of Quadrilaterals** : A particular Quadrilateral can be constructed if any one of the following combinations of data is known :
  (a) Four sides and an angle
  (b) Four sides and a diagonal
  (c) Three sides and two diagonals
  (d) Three sides and two included angles
  (e) Two sides and three angles.
- Sometimes special quadrilaterals can be constructed with fewer data. In such cases five data can be retrieved logically.
  - A square can be constructed if only one side is given. Here, four sides are equal and an angle is a right angle.
  - A rectangle can be constructed if two adjacent sides are given. Here the opposite sides are equal to each other and one angle is a right angle.
  - A rhombus can be constructed if a side and an angle are given. Here four sides are equal.
  - A parallelogram can be constructed if two adjacent sides and the included angle are given. Here the opposite sides are equal.

Solutions to Exercise Problems — Let's solve the textbook problems

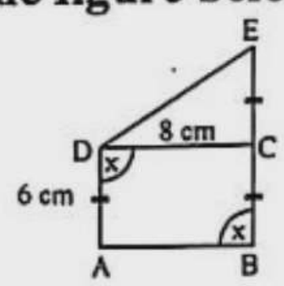
MCQs with Answers

1. **How many independent and unique data are necessary to draw a quadrilateral?**
   ⓒ ⓐ 3 ⓑ 4 ⓒ 5 ⓓ 6
2. **In which of the following the diagonals bisect at right angles?**
   ⓐ Square and Rectangle
   ⓑ Rhombus and Parallelogram
   ⓒ Rectangle and Kite
   ⓓ ⓓ Rhombus and Kite
3. **What will be the length of its side if the length of two diagonal of a rhombus are 6 cm and 8 cm?**
   ⓐ 4.9 cm (approx.) ⓑ 5 cm
   ⓑ ⓒ 6.9 cm (approx) ⓓ 7 cm
   ▸▸ **Explanation :** At ΔBOC



   $BC = \sqrt{BO^2 + CO^2}$
   $= \sqrt{4^2 + 3^2}$
   $= \sqrt{16 + 9}$
   $= \sqrt{25} = 5$ cm.
4. **The peremeter of a Kite is 24 cm and the ratio of the unequal sides is 2 : 1. What will be the length of the smallest side in cm?**
   ⓒ ⓐ 8 ⓑ 6 ⓒ 4 ⓓ 3
   ▸▸ **Explanation :** $2(2x + x) = 24$ or, $3x = 12$
   $\therefore x = 4$
5. **Distance between the parallel sides of a trapezium is 3 cm and its area is 48 sq. cm. What will be the average length of the two parallel sides in cm?**
   ⓑ ⓐ 8 ⓑ 16 ⓒ 24 ⓓ 32
   ▸▸ **Explanation :** We know, area of trapezium $= \frac{1}{2}(a + b) \times h$
   or, $48 = \frac{1}{2}(a + b) \times 3$
   or, $\frac{1}{2}(a + b) = \frac{48}{3}$ $\therefore \frac{1}{2}(a + b) = 16$.
6. **For all the parallelograms —.**
   i. opposite sides are equal and parallel
   ii. bisectors of the opposite angles are parallel to each other
   iii. Area = the product of two adjacent sides
   Which one of the following is correct?
   ⓐ ⓐ i & ii ⓑ i & iii ⓒ ii & iii ⓓ i, ii & iii
7. **The length of the adjacent sides of a rectangle are 4 cm and 3 cm.**
   i. half of the perimeter is 7 cm
   ii. the length of a diagonal is 5 cm
   iii. the area is 12 sq cm
   Which one of the following is correct?
   ⓓ ⓐ i & ii ⓑ i & iii ⓒ ii & iii ⓓ i, ii & iii
   ▸▸ **Explanation :** (i) Correct; half perimeter = $\frac{2(4+3)}{2}$ cm = 7 cm.
   (ii) Correct; diagonal $= \sqrt{4^2 + 3^2} = \sqrt{16 + 9} = 5$ cm.
   (iii) Correct; Area of rectangle $= (4 \times 3)$ cm^2 = 12 cm^2
8. i. If two adjacent sides are given, a rectangle can be drawn.
   ii. If four angles are given, a quadrilateral can be drawn.
   iii. If a side of a square is given, the square can be drawn.
   Which one of the following is correct?
   ⓑ ⓐ i & ii ⓑ i & iii ⓒ ii & iii ⓓ i, ii & iii

Answer the questions 9, 10, 11 and 12 in the light of the figure below :



Figure

9. **What is the length of BD in cm?**
   ⓒ ⓐ 7 ⓑ 8 ⓒ 10 ⓓ 12
   ▸▸ **Explanation :** At ΔABD
   $BD^2 = AB^2 + AD^2$ [∴ AB = CD]
   $= 8^2 + 6^2 = 64 + 36 = 100$
   ∴ BD = 10.
10. **What is the perimeter of the quadrilateral ABED in cm?**
    ⓓ ⓐ 24 ⓑ 26 ⓒ 30 ⓓ 36
11. **What is the area in sq. cm of ΔBDE?**
    ⓐ ⓐ 48 ⓑ 36 ⓒ 28 ⓓ 24
    ▸▸ **Explanation :** ΔBDE = Δ BCD + Δ CDE
    $= \left(\frac{1}{2} \times BC \times CD\right) + \left(\frac{1}{2} \times CE \times CD\right)$
    $= \left(\frac{1}{2} \times 6 \times 8\right) + \left(\frac{1}{2} \times 6 \times 8\right)$
    $= 24 + 24 = 48$ cm^2
12. **What be the area of the quadrilateral ABED in sq. cm?**
    ⓒ ⓐ 48 ⓑ 64 ⓒ 72 ⓓ 96
    ▸▸ **Explanation :** Area of ΔABD $= \frac{1}{2} \times AD \times AB$
    $= \frac{1}{2} \times 6 \times 8$
    $= 24$ cm^2
    Area of ABED = Area of ΔABD + Area of ΔBDE
    $= (24 + 48)$ cm^2 = 72 cm^2

Solutions to Geometrical Problems

13. Construct quadrilateral with the following given data :

(a) The lengths of four sides are 3 cm, 3.5 cm. 2.8 cm. 3 cm and one angle is 45°.

(b) The lengths of four sides are 4 cm, 3 cm, 3.5 cm, 4.5 cm and one angle is 60°.

(c) The lengths of four sides are 3.2 cm, 3.5 cm, 2.5 cm, 2.8 cm and one diagonal is 5 cm.

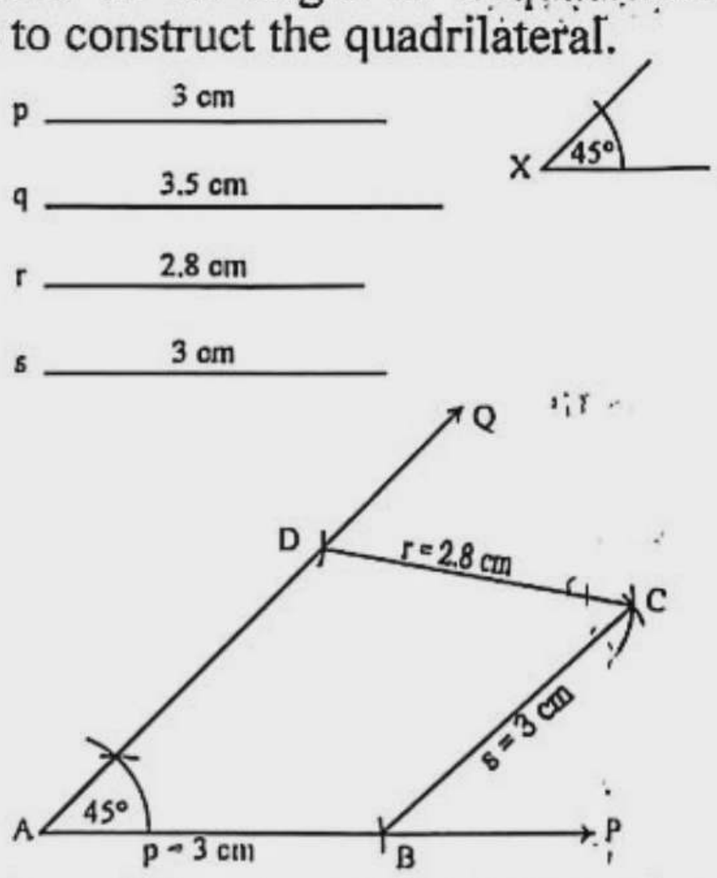
(d) The lengths of four sides are 3.2 cm, 3 cm, 3.5 cm, 2.8 cm and one diagonal is 5 cm.

(e) The lengths of three sides are 3 cm, 3.5 cm, 2.5 cm and two angles are : 60° and 45°.

(f) The lengths of three sides are 3 cm, 4 cm, 4.5 cm and two diagonals are 5.2 cm and 6 cm.

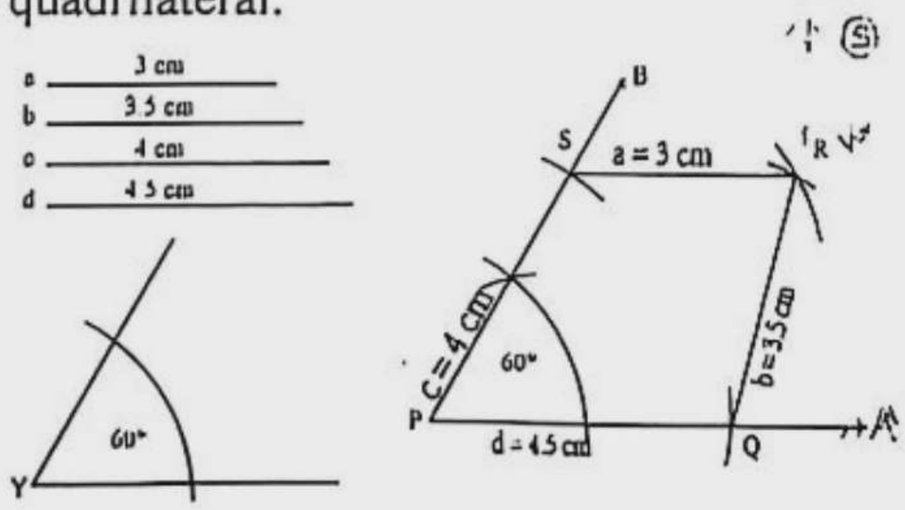
Solution :

(a) **Proposition :** 3 cm, 3.5 cm. 2.8 cm and 3 cm are the length of four sides and 45° is the measure of an angle of a quadrilateral. We have to construct the quadrilateral.



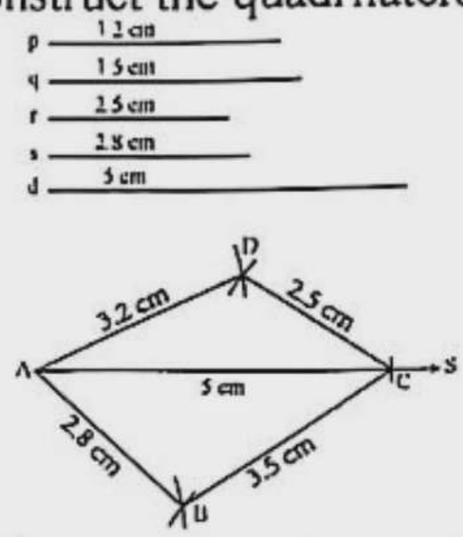
Description of Construction : Let us take any ray, AP. From AP, p = 3 cm has been taken as AB. An angle PAQ measuring X = 45° is drawn at A. From AQ, AD equivalent to q = 3.5 cm is taken. Then centering D and B subsequently and taking radius of r = 2.8 cm and s = 3 cm respectively let us draw two arcs in between the angle QAP. Let, the arcs mutually intersect at C. Then joining D, C and B, C we have the required quadrilateral ABCD.

(b) **Proposition :** 4 cm, 3 cm, 3.5 cm, 4.5 cm are four sides and 60° is an angle of a quadrilateral. We shall have to draw the quadrilateral.



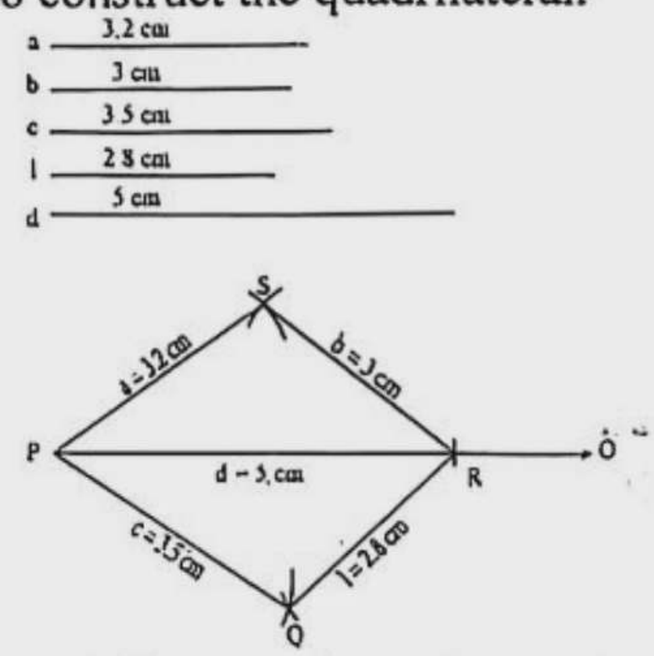
Description of Construction : Let us take PQ equivalent to d = 4.5 cm from any ray PA. Then an angle APB equivalent to Y = 60° is drawn at P. From PB, SP equal to c = 4 cm is taken. After that two arcs in between ∠APB are drawn centering S and Q with radius 3 cm and 3.5 cm respectively. Let, they mutually intersect at R. S, R and Q, R are subsequently joined. Thus, is constructed the required quadrilateral PQRS.

(c) **Proposition :** 3.2 cm, 3.5 cm, 2.5 cm, 2.8 cm are the length of four sides and 5 cm is the length of one diagonal of a quadrilateral. We have to construct the quadrilateral.



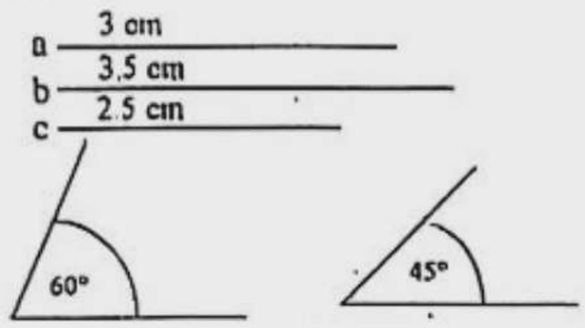
Description of Construction : Let us draw any ray AS. Let us take AC equal to d = 5 cm from AS. Then two arcs are drawn on the same side of AC centering A and C with radius 3.2 cm and 2.5 cm respectively. Let the two arcs intersect at D. Again, two more arcs are drawn on the side of AC opposite to D taking radius of 3.5 cm and 2.8 cm centering C and A respectively. Let the two arcs intersect at B. Thereafter, joining A, B; B, C; C, D and D, A we have the required quadrilateral ABCD.

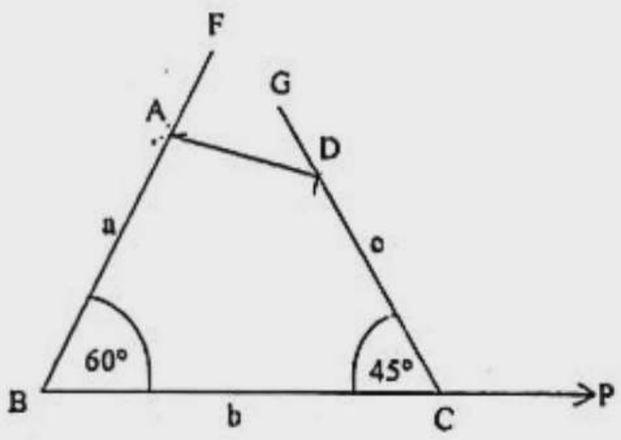
(d) **Proposition :** 3.2 cm, 3 cm, 3.5 cm and 2.8 cm are the length of four sides and 5 cm is the length of one diagonal of a quadrilateral. We have to construct the quadrilateral.



Description of Construction : Let us draw any ray PO and then take PR equivalent to d = 5 cm from PO. Centering P and R and taking radius of 3.2 cm and 3 cm respectively, let us draw two arcs on one side of PR. Let the arcs intersect at S. Further centering P and Q and taking radius of 3.5 cm and 2.8 cm, two more arcs are drawn on the side opposite to S. Let the two arcs intersect at Q. Thereafter, joining P, Q; Q, R; R, S and S, P we have the quadrilateral PQRS which is the required quadrilateral.

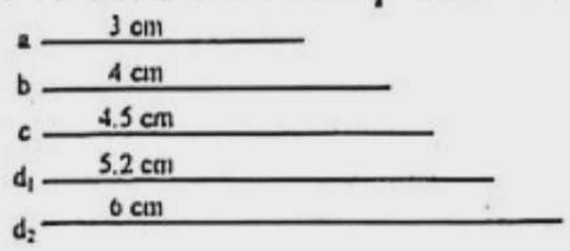
(e) **Proposition :** 3 cm, 3.5 cm, 2.5 cm are lengths of three sides and 60° and 45° are two angles of a quadrilateral. We have to construct the quadrilateral.

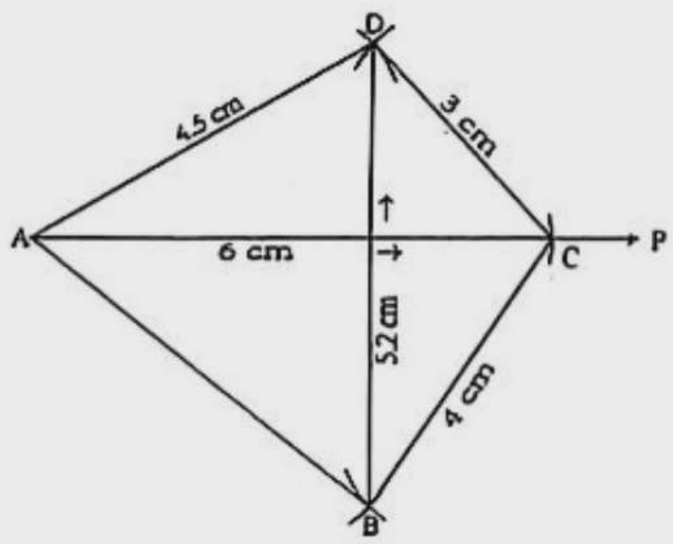




Description of construction : Let us take BC = 3.5 cm from any ray BP. Then an angle CBF = 60° is drawn at B and an another angle BCG = 45° is also drawn at C. Let us take BA = a = 3 cm from BF and CD = c = 2.5 cm from CG. A and D are joined. Thus required quadrilateral ABCD is drawn.

(f) **Proposition :** 3 cm, 4 cm, 4.5 cm are the lengths of three sides and 5.2 cm, 6 cm are the lengths of two diagonals of a quadrilateral. We shall have to construct the quadrilateral.

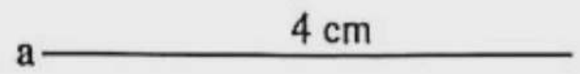




Description of Construction : Let, AC = d_2 = 6 cm has been taken from any ray AP. Then centering A and C successively and taking c = 4.5 cm and a = 3 cm as radius, two arcs are drawn on the same side of AC so that they intersect each other at D. Further taking radii of d_1 = 5.2 cm and b = 4 cm and centering D and C two more arcs are drawn on the side of AC opposite to D. Let, they intersect mutually at B. Joining A, D; C, D; A, B and C, B we have the required quadrilateral ABCD.

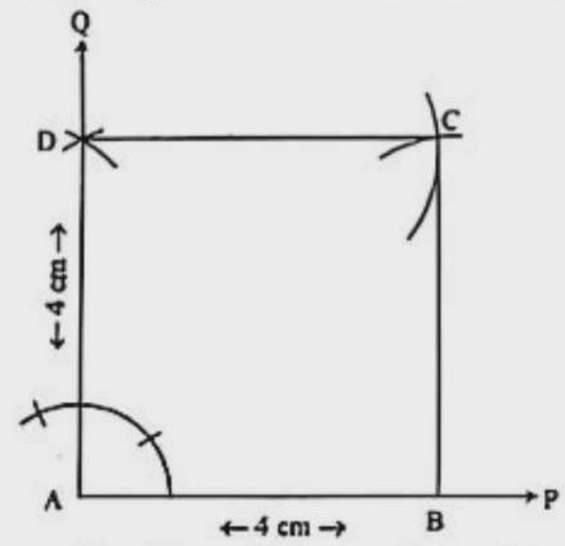
14. The length of a side of a square is 4 cm. Construct the square.

Solution :



Proposition : Let a = 4 cm is the length of one side of a square. We shall have to draw the square.

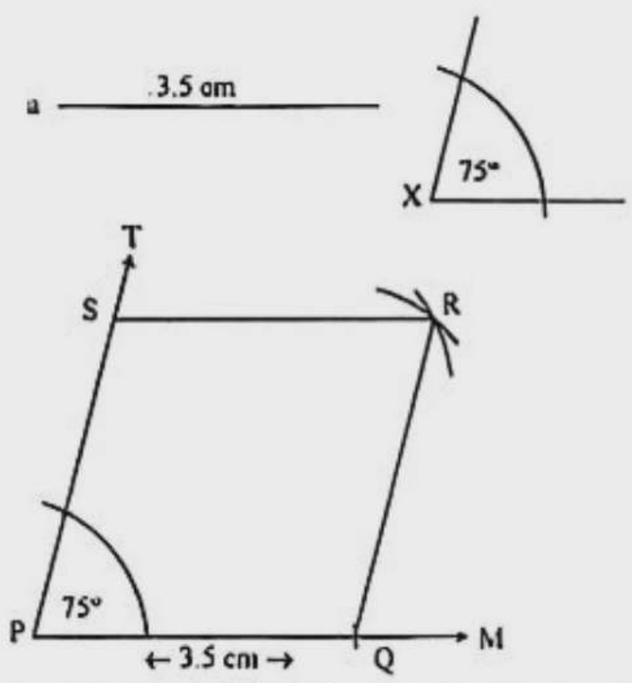
Description of Construction : Let us take any ray AP. Now from AP, AB = a = 4 cm is taken.



Then a perpendicular AQ at A is drawn. AD = 4 cm is taken from AQ. Now centering D and B successively and taking radius of 4 cm, two arcs are drawn within ∠BAD. Let the two arcs intersect each other at C. Thereafter, joining D, C and B, C we have a square, ABCD which is the required square, has been asked to draw.

15. The length of a side of a rhombus is 3.5 cm and one angle is 75°. Construct the rhombus.

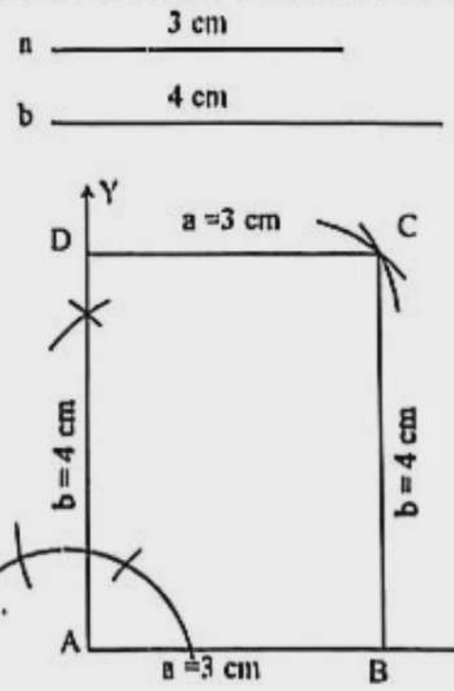
Solution : Proposition : Let, the length of one side of a rhombus is, a = 3.5 cm and the measure of one of its angles is, x = 75°. We shall have to draw the rhombus.



Description of construction : Let us take any ray PM. Then PQ = a = 3.5 cm is taken from PM. An angle QPT measuring X = 75° is also drawn at P on PQ. From PT, PS = 3.5 cm is also taken. Thereafter, centering Q and S successively and taking radius of 3.5 cm, two arcs are drawn within ∠QPS. Let, the two arcs mutually intersect at R. Now let us join Q, R and S, R. Thus, we have the required rhombus PQRS which has been asked to draw.

16. The lengths of the adjacent two sides of a rectangle are 3 cm and 4 cm respectively. Construct the rectangle.

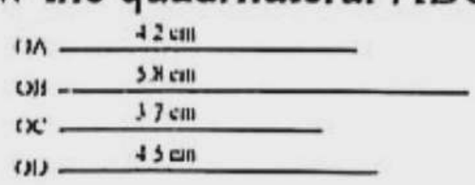
Solution : Proposition : Let the two adjacent sides of a rectangle are of length a = 3 cm and b = 4 cm. We shall have to construct the rectangle.

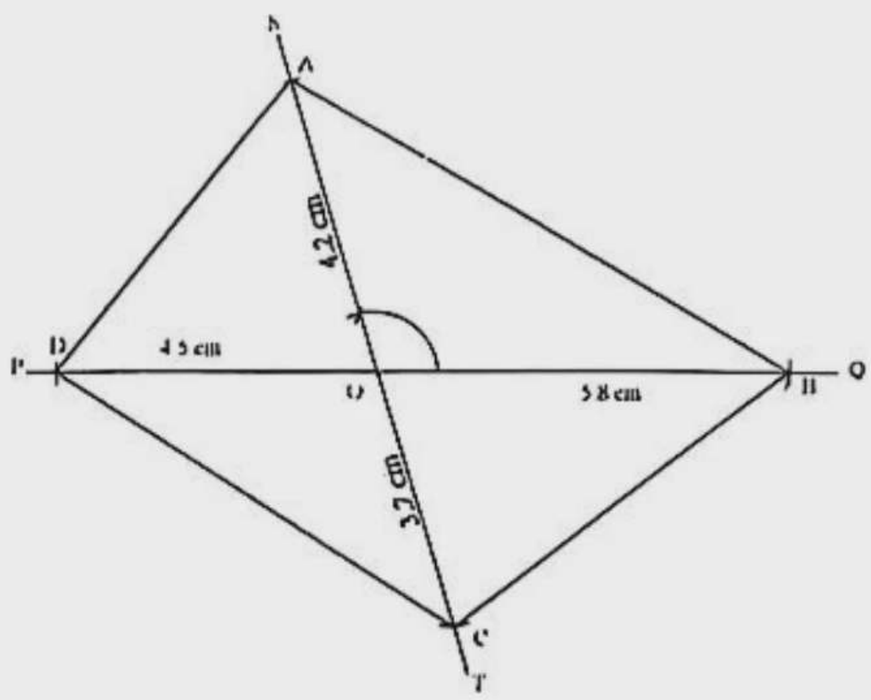


Description of construction : Let us take any ray AZ. Then AB = a = 3 cm is taken from the ray, AZ. A perpendicular AY is drawn at A on AZ. From AY, AD = b = 4 cm is taken. Centering D and taking radius of 3 cm, an arc is drawn in the region within ∠BAD. Further, centering B and taking radius of 4 cm, another arc is drawn on the same side of the previous arc drawn. Let, the two arcs mutually intersect at C. Then, joining D, C and B, C we have a rectangle ABCD which is the required rectangle, asked to draw.

17. Two diagonals AC and BD of a quadrilateral ABCD intersect each other at the point O, in such a way that OA = 4.2 cm, OB = 5.8 cm, OC = 3.7 cm, OD = 4.5 cm and ∠AOB = 100°. Construct the quadrilateral ABCD.

Solution : Proposition : Let, the four segments of diagonals of a quadrilateral ABCD are OA = 4.2 cm, OB = 5.8 cm, OC = 3.7 cm, OD = 4.5 cm and the angle between OA and OB is ∠AOB = 100°. We shall have to draw the quadrilateral ABCD.



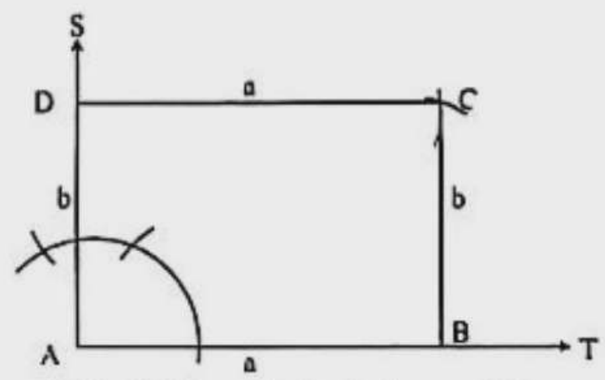


Description of construction : Let us take any line segment PQ with a point, O on it so that O lies at about the middle of PQ. From OQ, OB = 5.8 cm is taken. Then an angle BOS equal to 100° is drawn. From OS, OA = 4.2 cm is taken. SO is produced up to T. From OT, OC = 3.7 cm is taken. After that OD = 4.5 cm is taken from OP. Finally, let us join A, B; B, C; C, D and D, A. Thus, we have the required quadrilateral ABCD.

18. The lengths of two adjacent sides of a rectangle are given. Construct the rectangle.

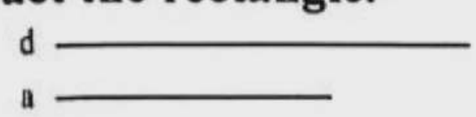
Solution : Proposition : Let us suppose a and b are the lengths of two adjacent sides of a rectangle, we shall have to construct the rectangle.

Description of construction : Let us take any line segment AT. From AT, let us take AB = a. Then a perpendicular AS on AB is drawn at A as shown below :

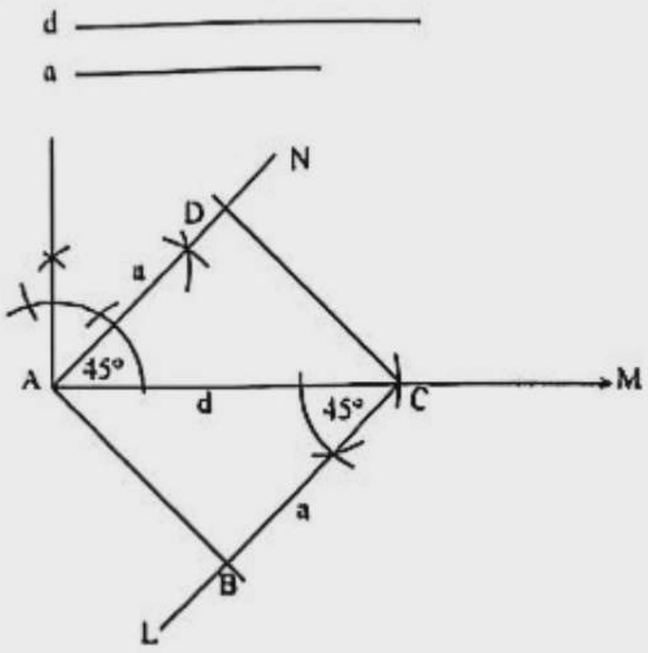


Again from AS, AD = b is taken. Now, centering B and taking radius equal to b, an arc is drawn within ∠BAD. Further centering D and taking radius equal to a, another arc is drawn on the same side of the previous arc drawn. Let, the two arcs mutually intersect at C. Now joining B, C and D, C we have the rectangle ABCD which is the required rectangle.

19. The length of a diagonal and a side are given. Construct the rectangle.



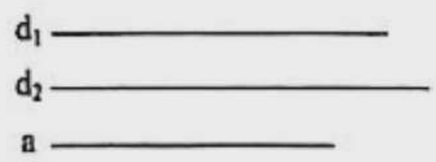
Solution : Proposition : Let us suppose, the length of one side and one diagonal of a rectangle are a and d respectively. We shall have to construct the rectangle.



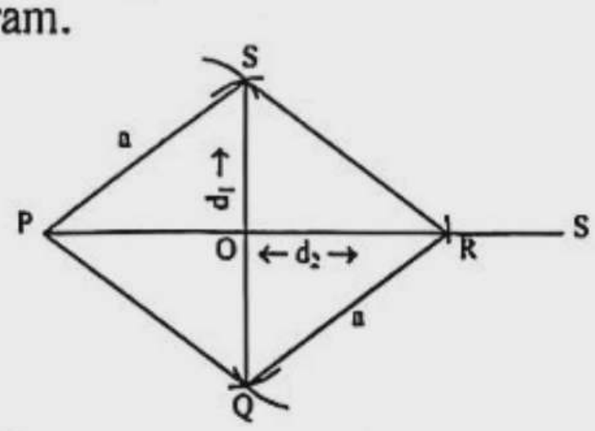
Let us take any ray AM. From AM, AC = d is taken. At A, an angle CAN, measuring 45° is drawn. From AN, AD = a is taken. Then at C, ∠ACL = 45° is drawn. From CL, CB = a is taken. Finally, A, B and C, D are joined. Thus, a rectangle ABCD is constructed which is the required rectangle.

20. The length of one side and two diagonals are given. Construct the parallelogram.

Solution :



Proposition : Let us suppose, the length of two diagonals and one side of a parallelogram be d_1, d_2, and a respectively. We shall have to construct the parallelogram.

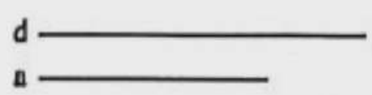


Construction

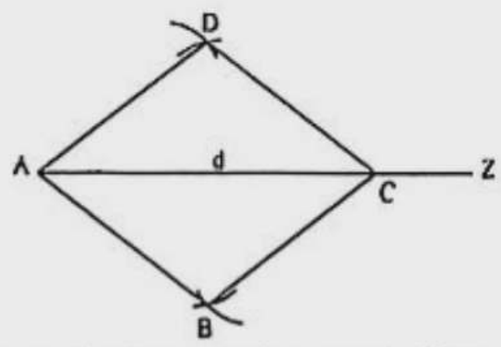
Let us take any line segment PS. From PS, PR = d_2 is taken. Then mid-point O of PR is found out. Centering P and R, two arcs are drawn successively on either side of PR taking radius equal to a. Afterwards, centering O and taking radius equal to half of d_1 let us draw two more arcs on either side of PR. Let us suppose, the arcs mutually intersect at Q and S respectively. Finally P, Q; Q, R; R, S and S, P are joined. Thus the parallelogram PQRS is constructed which is the required parallelogram.

21. The length of one side and a diagonal are given. Construct the rhombus.

Solution :



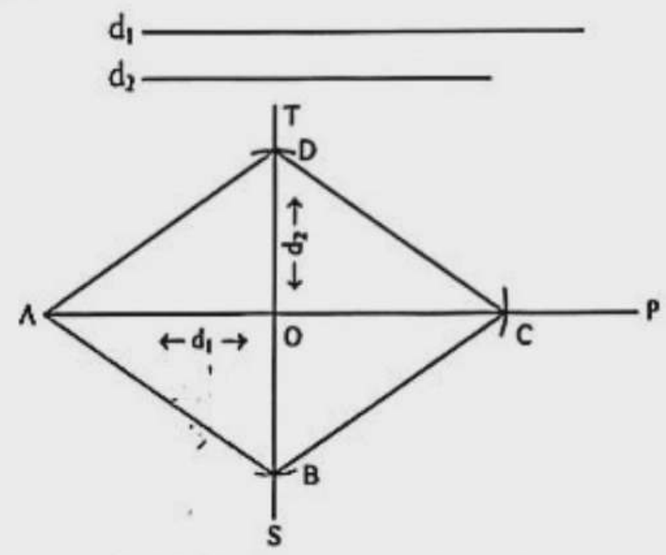
Proposition : Let us suppose, the lengths of one diagonal 'd' and one side 'a' of a rhombus are d and a respectively. We shall have to construct the rhombus.



Construction : Let us take any line segment AZ. From AZ, AC = d is taken. Then centering A and C and taking radius equal to a, four arcs are drawn successively on both sides of AC. Let the arcs mutually intersect at B and D respectively. Finally A, B; B, C; C, D and D, A are joined. Thus, we have the rhombus ABCD which is the required rhombus.

22. The lengths of two diagonals are given. Construct the rhombus.

Solution :



Proposition : Let us suppose, d_1 and d_2 are the lengths of two diagonals of a rhombus. We have to draw the rhombus.

Construction : Let us take a line segment AP and take AC = d_1 from it. The mid-point O of AC is found out. Then a perpendicular bisector ST is drawn at O. Thereafter, from OT, OD = $\frac{d_2}{2}$ and from OS, OB = $\frac{d_2}{2}$ are taken. Finally, A, B; B, C; C, D and D, A are joined. Thus we have drawn the required rhombus ABCD.

Creative Questions with Solutions

Ques. 23 Two adjacent sides of a parallelogram are 4 cm and 3 cm and their included angle is 60°.

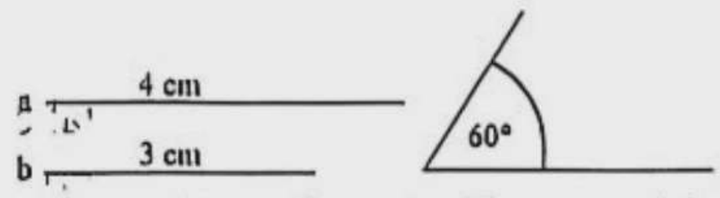
a. Express the above information in a figure. 2

b. Draw the parallelogram with the description of drawing. 4

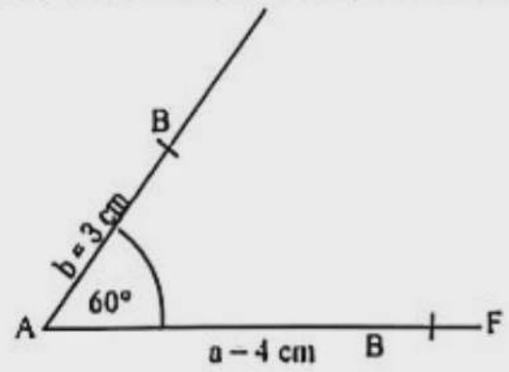
c. Draw a square with a diagonal equal to the larger diagonal of the parallelogram. Give the description of the drawing. 4

Solution to Question No. 23 :

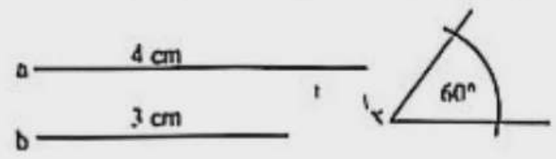
a

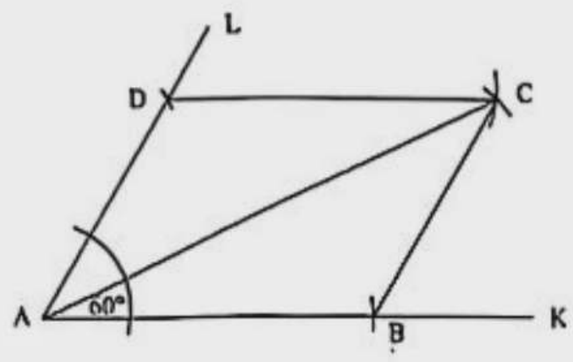


We have given two adjacent sides a and b and the included angle of the sides measuring 60°. Let us draw the figure with the above information.



b Let us suppose, two adjacent sides of a parallelogram are a = 4 cm and b = 3 cm and the included angle between the sides is x = 60°. We shall have to construct the parallelogram.



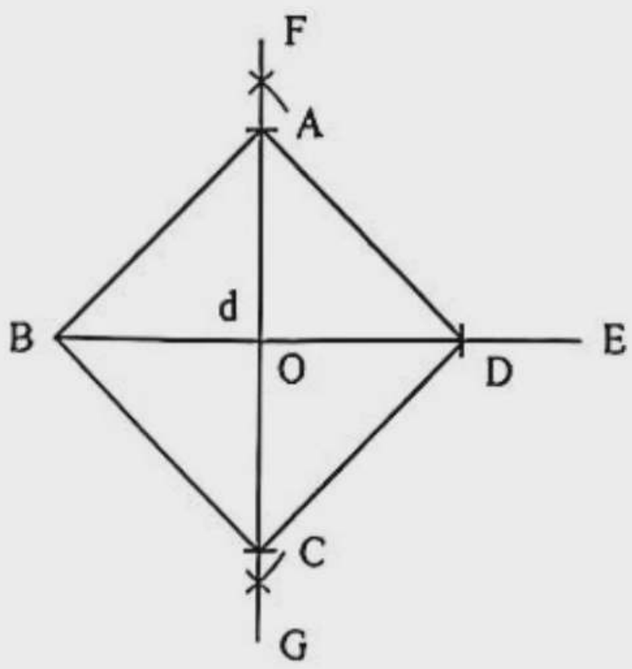


Description of construction : Let us take AB = 4 cm from any line segment AK. An angle BAL measuring X = 60° is drawn at A. From AL, AD = b is taken. Centering D and taking radius equal to a, an arc is drawn within ∠BAD. Again centering B and taking radius, b = 3 cm, another arc is drawn on the same side of AB and AD. Let, they mutually intersect at C. Finally, join B, C and D, C. Thus, we have the parallelogram ABCD which is the required parallelogram.

c We have AC, the greater diagonal of the constructed parallelogram ABCD. Now, we shall have to construct a square with diagonal of length AC = d.

d ———————

Description of construction :



Description of construction : Let us take BD = d from any line segment BE. Then perpendicular bisector FG of BD is drawn which intersect BD at O. From OF and OG, $\frac{1}{2}d$ = OA and $\frac{1}{2}$ d = OC are taken respectively. Now, A, B; B, C; C, D and D, A are joined. Thus, we have drawn the required square ABCD which has been asked to draw.

Ques. 24 Two specific lines are a = 6 cm, b = 4.5 cm and two angles are ∠x = 75° and ∠y = 85°.

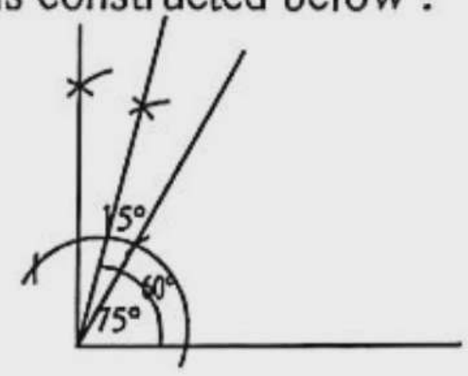
a. Draw ∠x with pencil and compass. 2

b. Consider two lines adjacent sides. Draw a rectangle (Labelling and description of construction is needed). 4

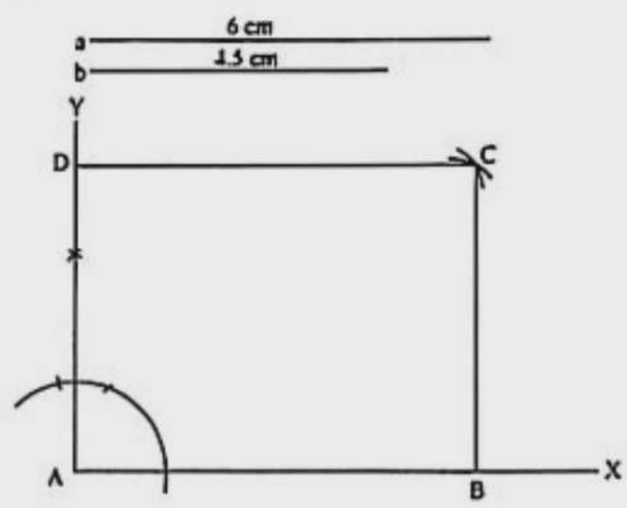
c. Draw a Trapezium considering a and b two parallel sides and two given angles on the side 'a' (Lebelling and description of construction is needed). 4

Solution to Question No. 24 :

a ∠x = 75° is constructed below :

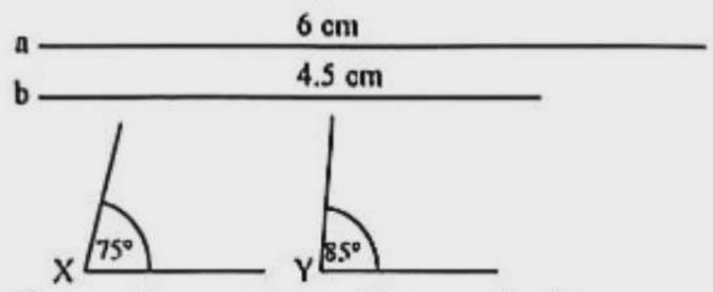


b Let, a = 6 cm and b = 4.5 cm are two adjacent sides of a rectangle. The rectangle is required to be constructed.

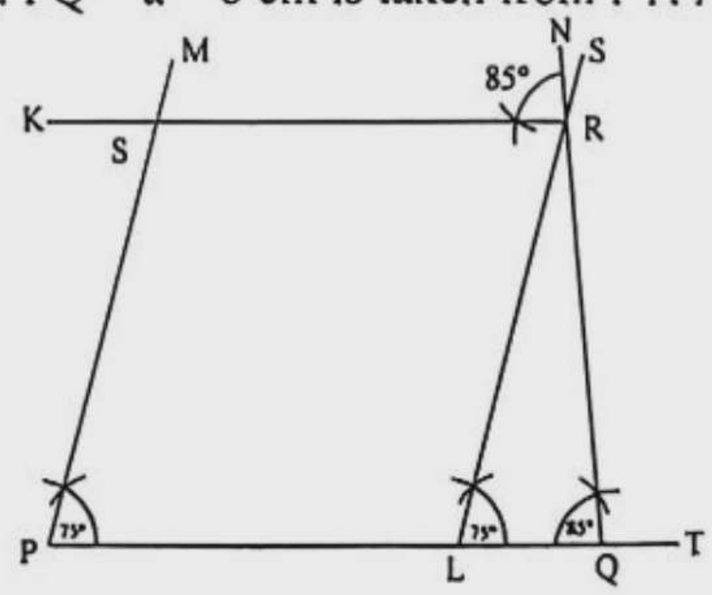


Description of construction : AB = a = 6 cm is taken from any line segment AX. AY ⊥ AX is drawn at A. AD = b = 4.5 cm is taken from AY. Then centering B and taking radius of b = 4.5 cm, an arc is drawn within the region of ∠XAY.
Again, centering D and taking a = 6 cm, another arc is drawn in the same side of previous arc. Let the two arcs mutually intersect at C. Finally, C, B and C, D are joined. Thus a rectangle ABCD is drawn which is the desired rectangle.

c Let a = 6 cm and b = 4.5 cm are two parallel sides of a trapezium and ∠X = 75° and ∠Y = 85° are two adjacent angles of the side of a. It is required to draw the trapezium.



Description of construction : A line segment PT is taken. PQ = a = 6 cm is taken from PT. At P



Multiple Choice Q/A — Designed as per topic

8.6 Construction of Quadrilaterals ▸ Textbook Page 143

1. **If the four sides are equal and the diagonals are unequal of a quadrilateral, what is the name of the quadrilateral?** *(Easy) [RB '18]*
   ⓐ Square ⓑ Rectangle
   ⓒ ⓒ Rhombus ⓓ Trapezium

2. **If ABCD is quadrilateral and diagonal AC = diagonal BD. Which one of the following is correct?** *(Medium) [JB '18]*
   ⓐ Rhombus ⓑ Parallelogram
   ⓒ ⓒ Rectangle ⓓ Trapezium

3. **Which one of the following measurements of sides is possible to draw a triangle?** *(Hard) [CB '18]*
   ⓐ 3, 4, 6 ⓑ 3, 5, 8
   ⓐ ⓒ 4, 3, 9 ⓓ 5, 5, 10

4. **Which one of the following is property of a rhombus?** *(Easy) [DB '17]*
   ⓐ The diagonals are equal
   ⓑ Each angle is right angle
   ⓒ Opposite angles are unequal
   ⓓ ⓓ All sides are equal

5.

   If perimeter of above triagnle is 12 metre, which one of the following is correct? *(Hard) [CB '17]*
   ⓐ $p - q = 6$ ⓑ $3p + 2q = 12$
   ⓑ ⓒ $p - 2q = 6$ ⓓ $2p - q = 12$

6. **If ∠B = 60° of a parallelogram ABCD, which one of the following is the value of ∠C?** *(Hard) [CB '17]*
   ⓐ 60° ⓑ 90°
   ⓒ ⓒ 120° ⓓ 240°

7. **How many data are needed to construct a quadrilateral?** *(Easy) [SB '17]*
   ⓒ ⓐ 1 ⓑ 4 ⓒ 5 ⓓ 6

8. **What are the sum of four angles of a trapezium?** *(Medium) [SB '17]*
   ⓓ ⓐ 90° ⓑ 120° ⓒ 180° ⓓ 360°

9. **Which one of the following case a particular quadrilateral is possible to draw?** *(Easy) [BB '17]*
   ⓐ Three sides and two angles
   ⓑ Three sides and one angle
   ⓒ Three sides and one diagonal
   ⓐ ⓓ One side and two angles

10. **If two adjacent sides are given which one of the following can be drawn?** *(Medium) [CB '16]*
    ⓐ square ⓑ parallelogram
    ⓓ ⓒ rhombus ⓓ rectangle

11. **If a diagonal is given, which one of the following can be drawn?** *(Medium) [CtgB '16]*
    ⓐ Rhombus ⓑ Rectangle
    ⓓ ⓒ Parallelogram ⓓ Square

12. **How many independent and unique data are necessary to draw a quadrilateral?** *(Medium) [SB '16]*
    ⓐ 6 ⓑ 5
    ⓑ ⓒ 3 ⓓ 2

13. **The perimeter of a parallelogram is 30 cm and the ratio of the adjacent sides is 3 : 2. What is the length of the smallest side in cm?** *(Easy) [DjB '16]*
    ⓐ 12 ⓑ 9
    ⓒ ⓒ 6 ⓓ 3

14. **Two pairs of adjacent sides of which of the following quadrilateral are equal?** *(Hard) [DjB '16]*
    ⓐ Parallelogram ⓑ Rectangle
    ⓒ ⓒ Kite ⓓ Trapezium

15. **To construct a quadrilateral how many unique data are required?** *(Hard) [DjB '16]*
    ⓐ 6 ⓑ 5
    ⓑ ⓒ 4 ⓓ 3

16. **What is called the quadrilateral of which two pairs of adjacent sides are equal?** *(Easy) [DB' 15]*
    ⓐ Rectangle ⓑ Parallelogram
    ⓒ ⓒ Square ⓓ Kite

17. **How many independent unique data are necessary to draw a quadrilateral?** *(Easy) [DB' 15]*
    ⓐ 2 ⓑ 3
    ⓓ ⓒ 4 ⓓ 5

18. **Which one of the following is correct for a parallelogram?** *(Easy) [CB' 15]*
    ⓐ The opposite sides are unparallel
    ⓑ If one angle is right angle then it is a rectangle
    ⓒ The opposite sides are unequal
    ⓑ ⓓ The diagonals are equal

19. **At the construction of geometric figure —** *(Easy) [SB '19]*
    i. a rhombus can be drawn if a side and an angle is given
    ii. if two adjacent sides and their included angles are given, the parallelogram can be drawn
    iii. if the diagonals of a quadrilateral bisect each other, it will be a rhombus
    Which one is correct?
    ⓓ ⓐ i & ii ⓑ i & iii ⓒ ii & iii ⓓ i, ii & iii

20. A quadrilateral is possible to construct if —. *(Hard)* *[JB '17]*
i. three sides and two included angles
ii. four sides and a diagonal
iii. three sides and two diagonals
Which one of the following is correct?
ⓐ ⓐ i & ii ⓑ i & iii ⓒ ii & iii ⓓ i, ii & iii

21. In parallelogram —. *[CtgB '16]*
i. the opposite sides of a parallelogram are equal
ii. a diagonal of parallelogram divides it into two congruent triangles
iii. opposite angles are equal
Which one is correct? *(Medium)*
ⓐ i & ii ⓑ i & iii
ⓓ ⓒ ii & iii ⓓ i, ii & iii

22. If only one side is given then what is possible to be drawn —. *(Easy)* *[SB '16]*
i. rhombus ii. square
iii. equilateral triangle
Which one is correct?
ⓐ i & ii ⓑ i & iii
ⓒ ⓒ ii & iii ⓓ i, ii & iii

23. In a rectangle —. *(Easy)* *[CB' 15]*
i. if two adjacent sides are equal then it is a square
ii. the diagonals bisect each other perpendicularly
iii. if the lengths of two adjacent sides are 5 cm and 7 cm then the area is 35 sq. m
Which one of the following is true?
ⓐ i & ii ⓑ i & iii
ⓓ ⓒ ii & iii ⓓ i, ii & iii

Answer the question No. 24 and 25 in base of the following informations :
Diagonal PR = 6 cm and diagonal QS = 4 cm of a rhombus PQRS.

24. Which one of the following is area of the rhombus PQRS? *(Easy)* *[CB '17]*
ⓐ 7 sq.cm ⓑ 24 sq.cm
ⓒ 28 sq. cm ⓓ 48 sq.cm
[**N.B. :** Correct answer : 12 sq. cm.]

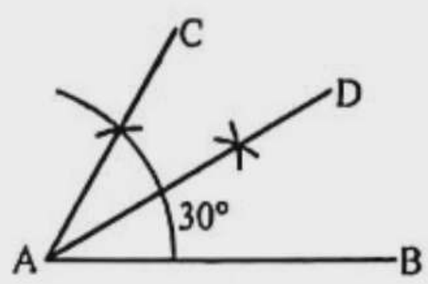
25. Which one of the following is perimeter of the rhombus PQRS? *(Easy)* *[CB '17]*
ⓐ 12 sq. cm ⓑ 12 cm
ⓒ 20 sq.cm ⓓ 20 cm
[**NB :** Correct answer : 14.42 sq. cm. (approx.)]

Short Q/A Designed as per topic

8.6 Construction of Quadrilaterals ▸ Textbook Page 143

Question 1. Draw an angle of 30° with the help of a scale and compass.

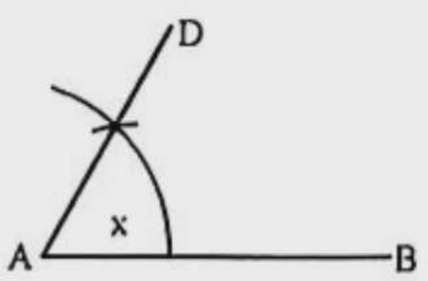
Solution : An angle of 30° is drawn with the help of a scale and compass as shown below :



In the diagram, ∠BAD = 30°.

Question 2. Draw ∠x = 60° using a pencil and compass.

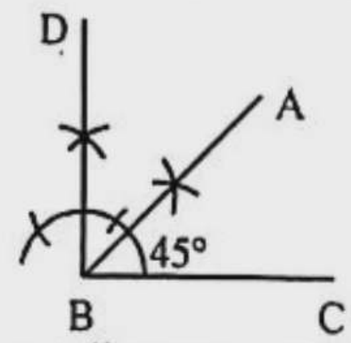
Solution : ∠x = 60° is drawn using a pencil and compass as shown below :



In the diagram, ∠BAD = ∠x = 60°

Question 3. Draw an angle of 45° using a pencil and compass.

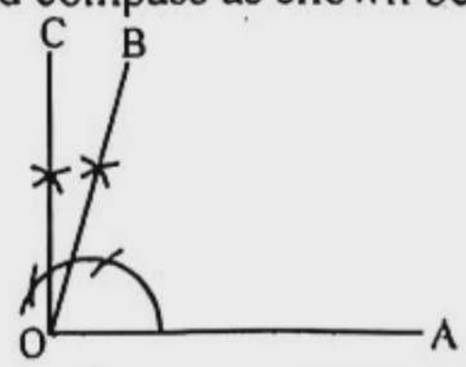
Solution : An angle of 45° is drawn using a pencil and compass as shown below :



In the given diagram, ∠ABC = 45°.

Question 4. Draw an angle of 75° with the help of a pencil and compass.

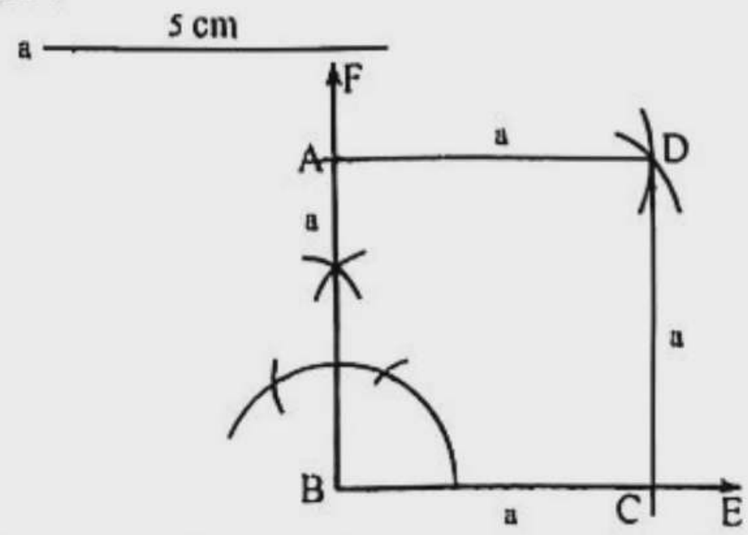
Solution : An angle of 75° is drawn with the help of a pencil and compass as shown below :



In the diagram, ∠AOB = 75°.

Question 5. Draw a square with a side of 5 cm.

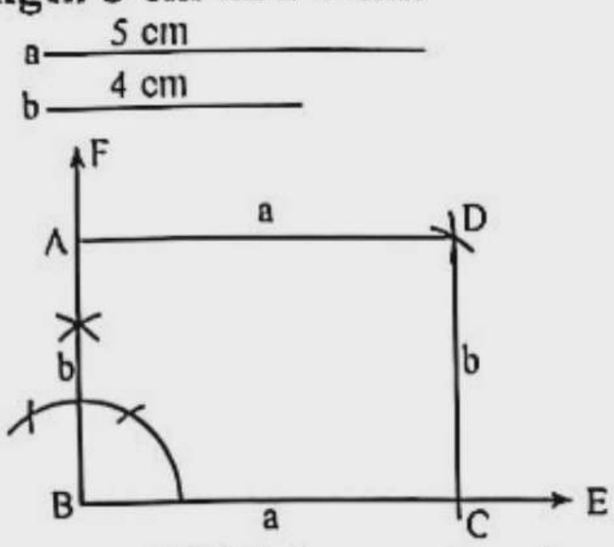
Solution :



In the diagram, ABCD is a square with sides AB = BC = CD = AD = 5 cm.

Question 6. Draw a rectangle with two adjacent sides of length 5 cm and 4 cm.

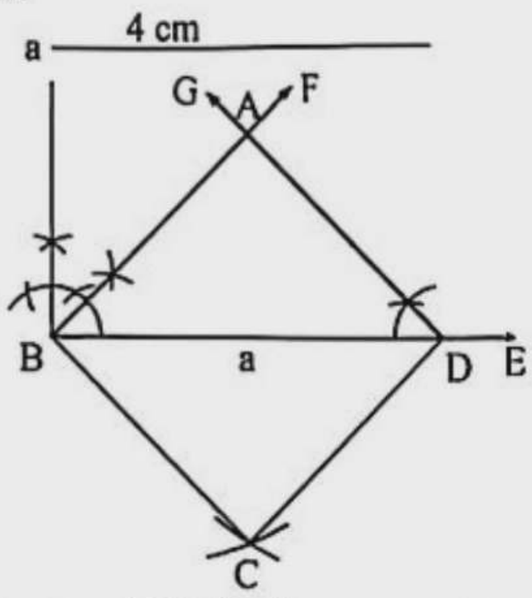
Solution :



In the diagram, ABCD is a rectangle with AB = CD = 5 cm and BC = AD = 4 cm.

Question 7. Draw a square with a diagonal of length 4 cm.

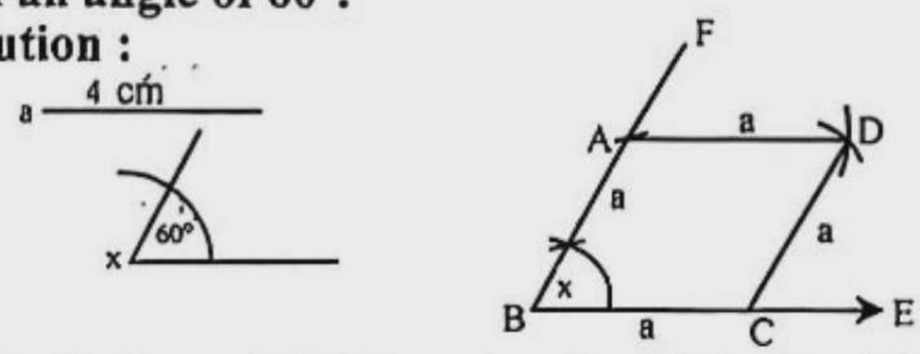
Solution :



In the diagram, ABCD is a square with diagonal BD = a = 4 cm.

Question 8. Draw a rhombus with a side of 4 cm and an angle of 60°.

Solution :

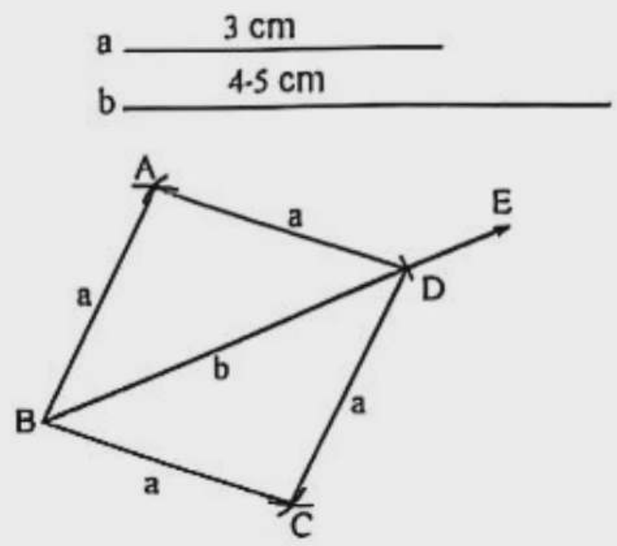


In the diagram, ABCD is a rhombus with sides AB = BC = CD = AD = 4 cm and an angle ∠ABC = 60°.

Question 9. Draw a rhombus with a side of 3 cm and a diagonal of 4.5 cm.

Solution :

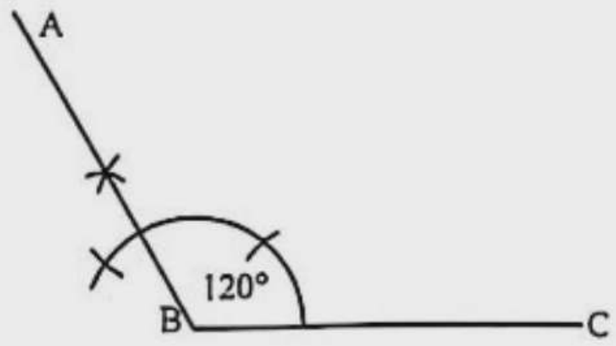
Solution :



In the diagram, ABCD is a rhombus with sides AB = BC = CD = AD = 3 cm and diagonal BD = 4.5 cm.

Question 10. Draw an angle of 120° using a pencil and compass.

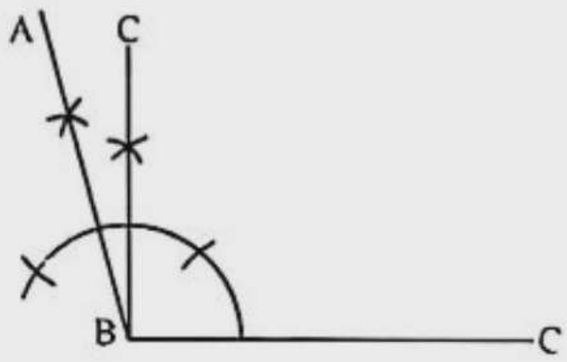
Solution : An angle of 120° is drawn using a pencil and compass as shown below :



In the diagram, ∠ABC = 120°.

Question 11. Draw an angle of 105° using a pencil and compass.

Solution : An angle of 105° is drawn using a pencil and compass as shown below :



In the diagram, ∠ABC = 105°.

Creative Q/A — Designed as per learning outcomes

Ques. 01 If lengths of two adjacent sides of a quadrilateral are a = 5cm, b = 4cm and three angles are ∠x = 80°, ∠y = 85°, ∠z = 110°.

a. Construct 45° angle with the help of pencil and compass. 2

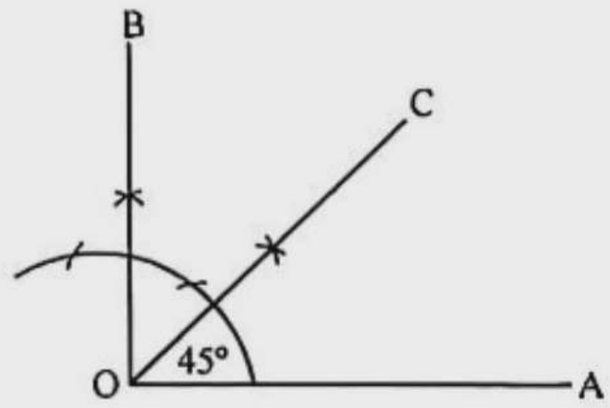
b. Construct the quadrilateral. [Sign of the construction and description are necessary] 4

c. Construct such a rhombus whose length of one side is equal to a and one angle is equal to ∠x. [Sign of the construction and description are necessary] 4

• *Dhaka Board 2019*

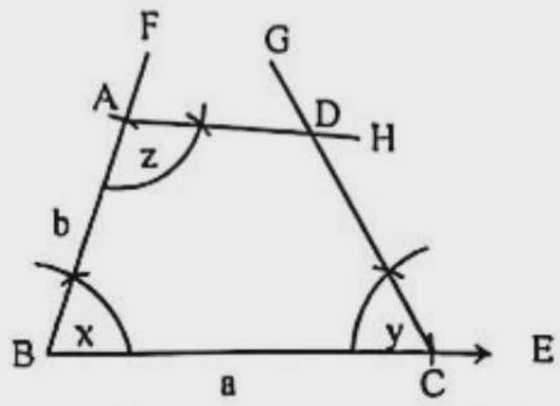
Solution to Question No. 01 :

a An angle of 45° is constructed below by using pencil and compass :



In the adjoining figure ∠AOC is drawn measuring 45°.

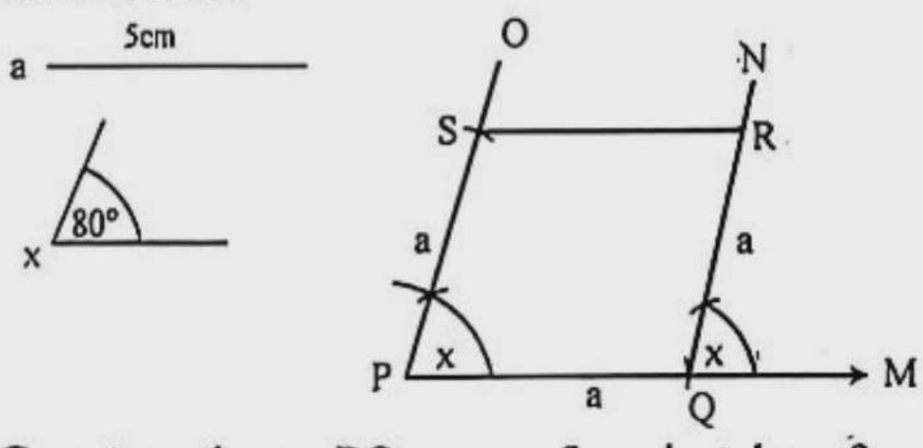
b Let, a = 5cm, b = 4 cm be two adjacent sides of a quadrilateral and three angles $\angle x = 80°$, $\angle y = 85°$ and $\angle z = 110°$ is given. The quadrilateral is to be constructed.



Construction : From any ray BE let us take BC = a = 5cm. Two angles $\angle CBF = \angle x = 80°$ and $\angle BCG = \angle y = 85°$ at B and C respectively are drawn.

Let, us cut BA = b = 4cm from BF and construct an angle $\angle BAH = \angle z = 110°$ at A. AH and CG intersect at D. Thus, ABCD is the required quadrilateral.

c Let one side a = 5cm and an angle $\angle x = 80°$ is given of a rhombus. The rhombus is required to be constructed.



Construction : PQ = a = 5cm is taken from any line segment PM. Then $\angle QPO = \angle x = 80°$ is drawn at P and $\angle MQN = \angle x = 80°$ is also drawn at Q. Now, QR = PQ = a from QN and PS = PQ = a from PO is taken. Finally R, S are joined. Thus, rhombus PQRS is drawn which is the required rhombus.

Ques. 02 The lengths of the adjacent two sides of a parallelogram are 6cm, 5cm and their included angle is 70°.

a. The length of a side of a square is 6cm, construct the square. [Sign of construction is essential. 2

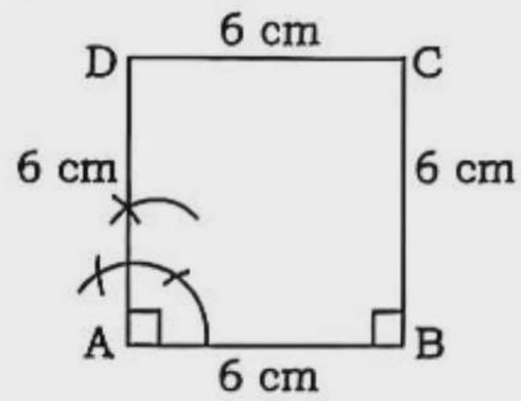
b. Construct the parallelogram. [Sign of construction and description are essential] 4

c. Considering the two sides of parallelogram as two diagonals of a rhombus, construct the rhombus. [Sign of construction and description are essential] 4

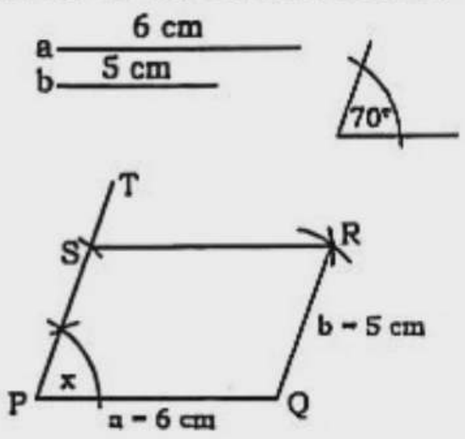
• *Rajshahi Board 2019*

Solution to Question No. 02 :

a Let, one side of a square = 6 cm. The square is drawn below :



b Let, two adjacent sides of a parallelogram are a = 6 cm and b = 5 cm and their included angle is x = 70°. Now the parallelogram is to be constructed.



Description of construction : Any line segment PQ = 6 cm is taken. $\angle QPT = x = 70°$ is drawn at P. PS = b = 5 cm is taken from PT. Then centering S and taking radius of a = 6 cm. an arc is drawn in the region of $\angle QPT$. Again, centering Q and taking radius of b = 5 cm.

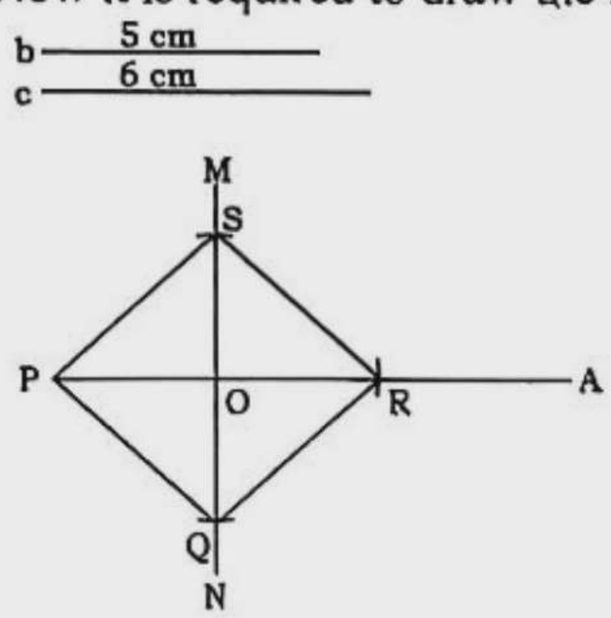
another arc is drawn in the same region of the previous arc.

Let the two arcs mutually intersect at R. S, R and Q, R are joined.

Thus a parallelogram PQRS is drawn which is the desired parallelogram.

c According to the stem sides of the given are 5cm and 6cm,

Let b = 5cm and c = 6cm are two diagonals of a rhombus. Now it is required to draw the rhombus.



Construction and description : PR = c = 6cm is taken from any line segment PA. Then the perpendicular bisector MN of PR at point O is drawn, $OQ = \frac{b}{2}$ is taken from ON. Again, $OS = \frac{b}{2}$ is also taken from OM. Finally, P, Q; Q, R; R, S and P, S are joined. Thus, a rhombus PQRS is drawn which is the required rhombus.

Ques. 03 The lengths of three sides of quadrilateral are 5 cm., 4 cm, 3 cm and their included angles are 60° and 75°.

a. The length of two adjacent sides of a rectangle are 5 cm and 4 cm. Construct the rectangle. 2

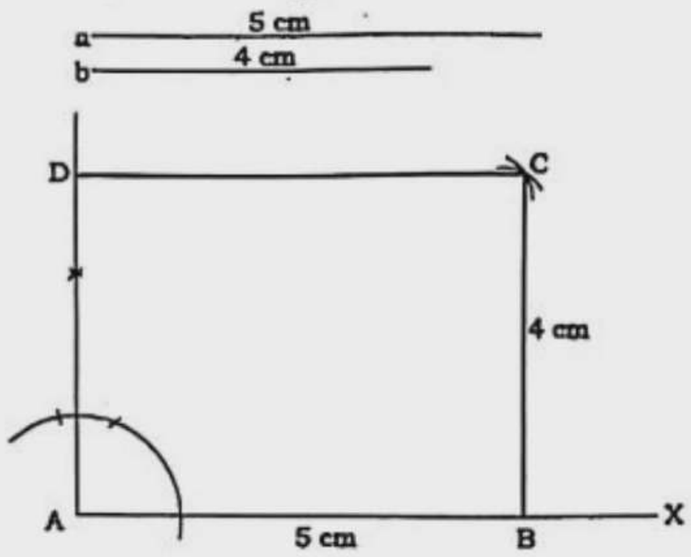
b. Draw the quadrilateral with the description of drawing. 4

c. Draw the rhombus considering the sum of three sides and the smallest angle of the given quadrilateral as the perimetre and an angle of a rhombus. [Sign of construction and description is essential.] 4

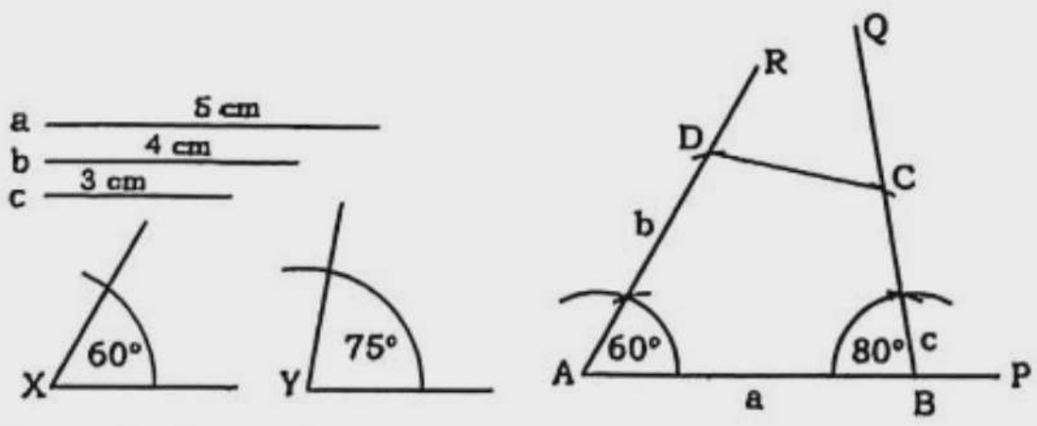
● *Jashore Board 2019*

Solution to Question No. 03 :

a As desired, a rectangle is drawn below :

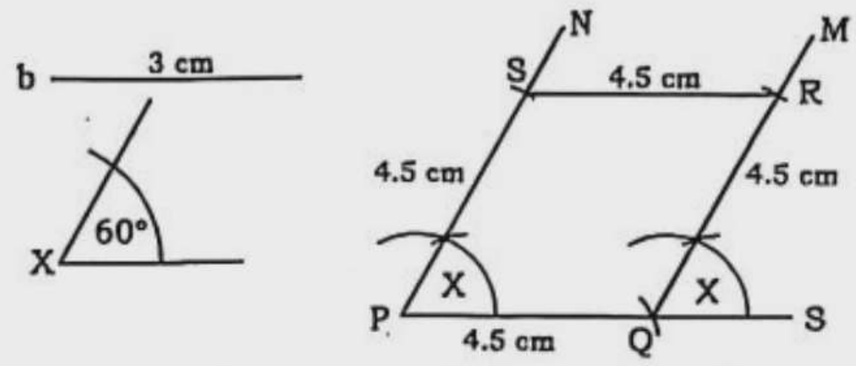


b **Data :** Given 3 sides a = 5cm, b = 4 cm and c = 3 cm and 2 included angles ∠X = 60°, ∠Y = 75° of a quadrilateral. The quadrilateral is needed to be constructed.



Description of construction : AB = a = 5cm is taken from any line segment AP. At A, ∠PAR = ∠X = 60° and at B, ∠ABQ = ∠Y = 75° are drawn. Then BC = C = 3 cm is taken from BQ and AD = b = 4 cm is taken from AR. C, D are finally joined. Thus, a quadrilateral ABCD is drawn which is the required quadrilateral.

c Given one side as $\frac{3+4+5}{4}$ or 3 cm and one angle, ∠x = 60° of a rhombus. The rhombus is required to be constructed.



Description of constructions : PQ = b = 3 cm is taken from any line segment PS.

Then ∠SPN = ∠x = 60° is drawn at P and ∠SQM = ∠x = 60° is also drawn at Q. Now, QR = PQ from QM and PS = PQ from PN is taken. Finally, R, S are joined. Thus, rhombus PQRS is drawn which is the required rhombus.

Ques. 04 The length of two sides of a quadrilateral are p = 5cm, q = 3.8 cm and three angles are ∠x = 75°, ∠y = 80° and ∠z = 100°.

a. Construct a square of which length of each side is 4cm. 2

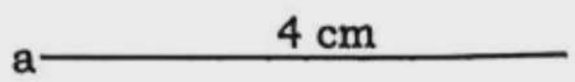
b. Draw the quadrilateral. [Sign of construction and description are needed] 4

c. Draw a parallelogram taking p and q are adjacent sides and their included angle is ∠x. [Sign of construction and description are needed] 4

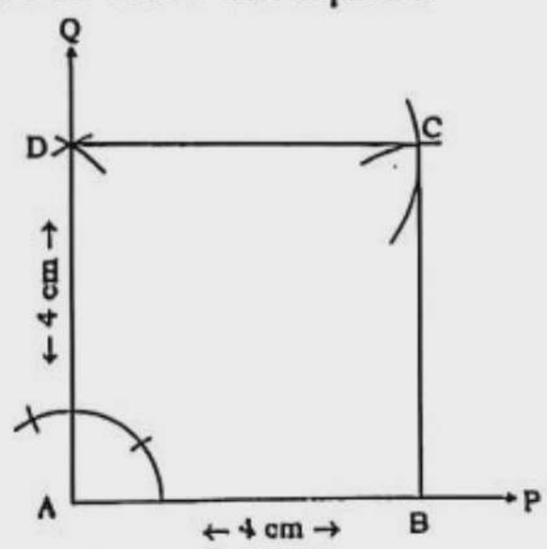
● *Cumilla Board 2019*

Solution to Question No. 04 :

a

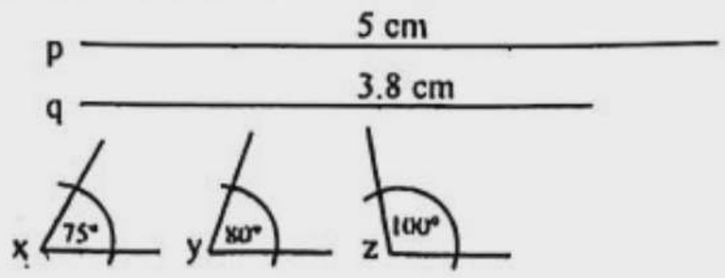


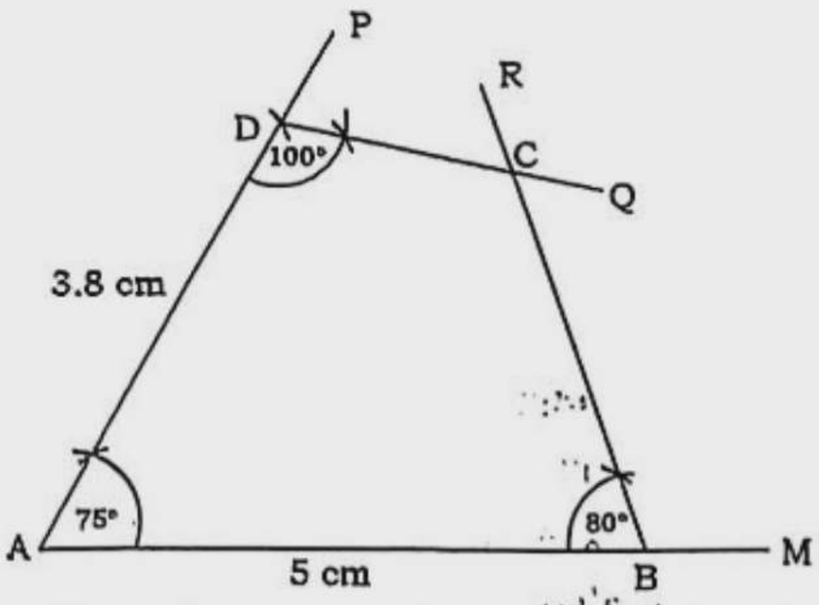
Let a = 4 cm is the length of one side of a square. We shall have to draw the square.



Here, ABCD is the required square.

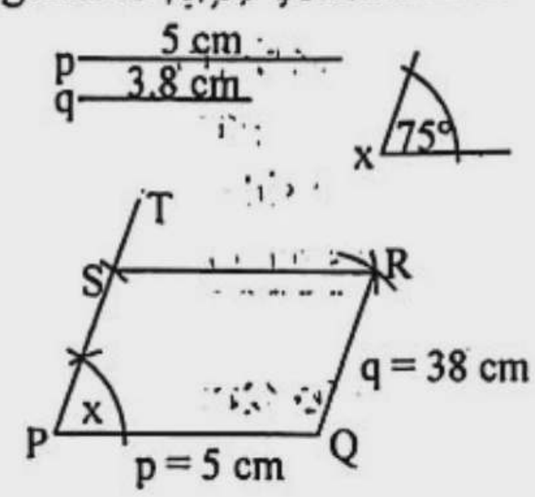
b Let, the two sides p = 5 cm and q = 3.8 cm and three angles ∠x = 75°, ∠y = 80° and ∠z = 100° of a quadrilateral are given. The quadrilateral is required to draw.





Description of construction : AB = 5 cm is taken from any line segment AM. ∠MAP = 75° is drawn at A and ∠ABR = 80° is drawn at B. AD = 3.8 cm is taken from AP. Then ∠ADQ = 100° is drawn at D. Let, DQ and BR mutually intersect at C.
Thus a quadrilateral ABCD is drawn with the given information.

c Let, two adjacent sides of a parallelogram are p = 5 cm and q = 3.8 cm and their included angle is x = 75°. Now the parallelogram is to be constructed.



Description of construction : Any line segment PQ = 5 cm is taken. ∠QPT = x = 75° is drawn at P. PS = q = 3:8 cm is taken from PT. Then centering P and taking radius of p = 5 cm. an arc is drawn in the region of ∠QPT. Again, centering Q and taking radius of q = 3.8 cm.
Another arc is drawn in the same region of the previous arc.
Let the two arcs mutually intersect at R. S, R and Q, R are joined.
Thus a parallelogram PQRS is drawn which is the desired parallelogram.

Ques. 05 Three sides of a quadrilateral are 5 cm, 4 cm and 4.5 cm. Length of two diagonals are 6 cm and 7 cm.

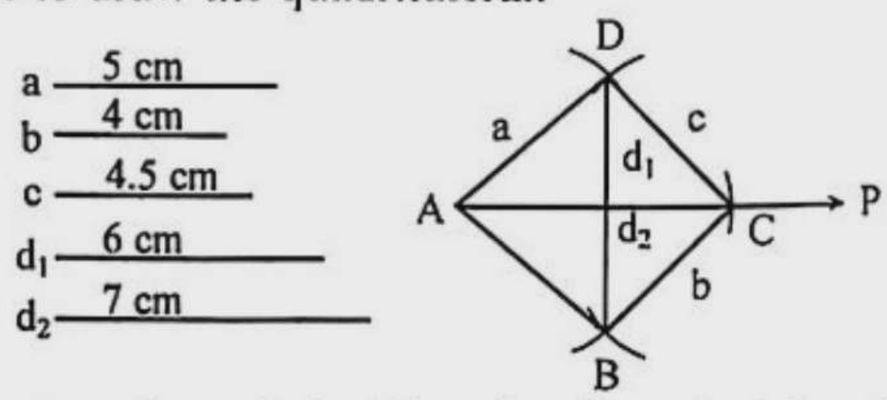
a. What is the length of a diagonal of a square whose perimetre is 16 cm? 2
b. Draw the quadrilateral. [Sign and description of construction is needed] 4
c. Draw a rombus whose two diagonals are equal to the two diagonals of the quadrilateral. 4

• *Chattogram Board 2019*

Solution to Question No. 05 :

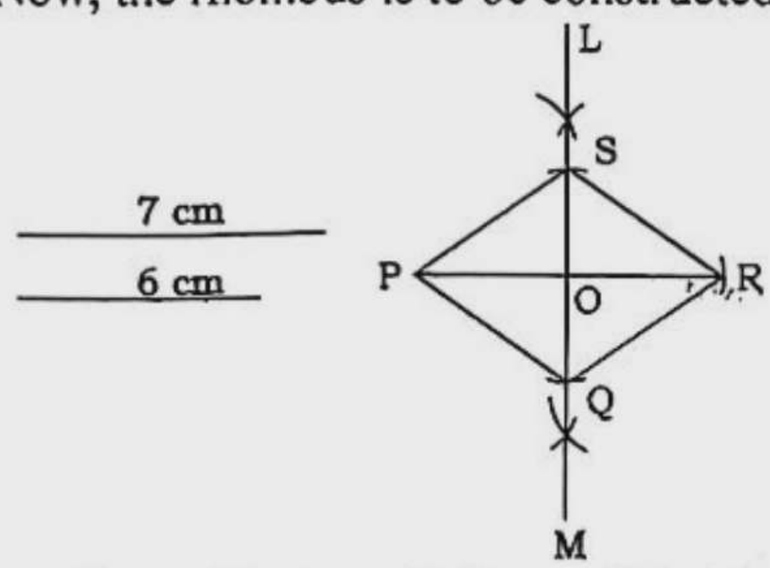
a We know that, if a square has a length of side 'a' unit then it's perimetre is 4a unit and diagonal is $a\sqrt{2}$ unit.
From the question we have perimetre of a square is 16 cm
∴ 4a = 16
or, $a = \frac{16}{4}$
∴ a = 4
∴ The length of diagonal of the square = $a\sqrt{2}$ unit
$= 4\sqrt{2}$ cm
∴ Determined length of the diagonal is $4\sqrt{2}$ cm.

b Let, a = 5 cm, b = 4 cm and c = 4.5 cm are the lengths of three sides and d_1 = 6 cm, d_2 = 7 cm are the lengths of two diagonals of a quadrilateral. We have to draw the quadrilateral.



Construction : Let, AC = d_2 = 7 cm is taken from any ray AP. Then centering A and C and taking a = 5 cm and c = 4.5 cm as radius, two arcs are drawn on the side of AC so that they interesct each other at D. Further taking radii of d_1 = 6 cm and b = 4 cm and centering D and C two more arcs are drawn on the side of AC opposite to D. Let, they intersect mutually at B. Joining A, D; C, D; A, B and B, C we have the required quadrilateral ABCD.

c Let two diagonals of a rhombus are 7 cm and 6 cm. Now, the rhombus is to be constructed.



Construction with description : PR = 7 cm is taken. Then bisector LM of PR is drawn. Let O is the point of intersection of PR and LM. OS = $\frac{6\text{ cm}}{2}$ or 3 cm is taken from LO and OQ = 3 cm is taken from OM. Finally, P, Q; Q, R, R, S and P, S are joined.
Thus, a rhombus PQRS is drawn which is the desired rhombus.

Ques. 06 The length of three sides of a quadrilateral are a = 4 cm, b = 5cm, c = 5.9 cm and the two diagonals are d = 6.5 cm, e = 7 cm.

a. Find the area of a circle with the radius 'd'. 2

b. Draw the quadrilateral with sign of construction and description. 4

c. Draw a rhombus with a side equal to the 'c' and an angle is 65°. [Sign of construction and description are essential.] 4

● *Sylhet Board 2019*

Solution to Question No. 06 :

a We know that,

Area of a circle with radius 'r' = πr^2 sq. unit

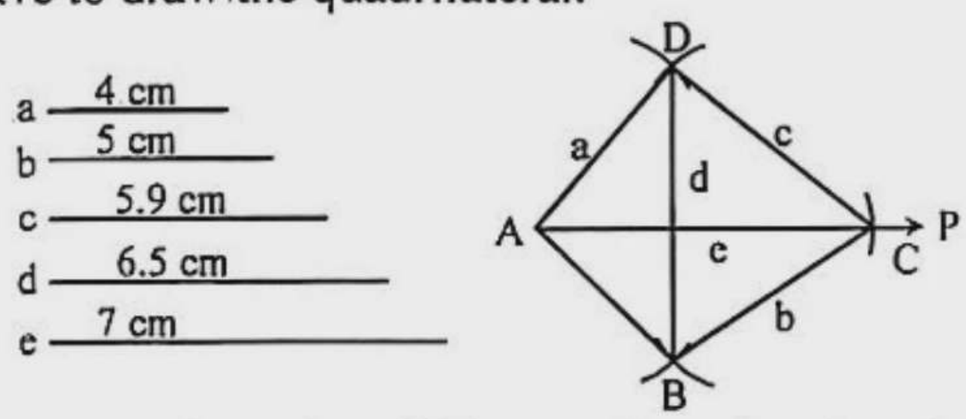
∴ Area of a circle with the radius 'd' = πd^2 sq. unit

$= \pi \times (6.5)^2$ sq. cm

[∵ d = 6.5]

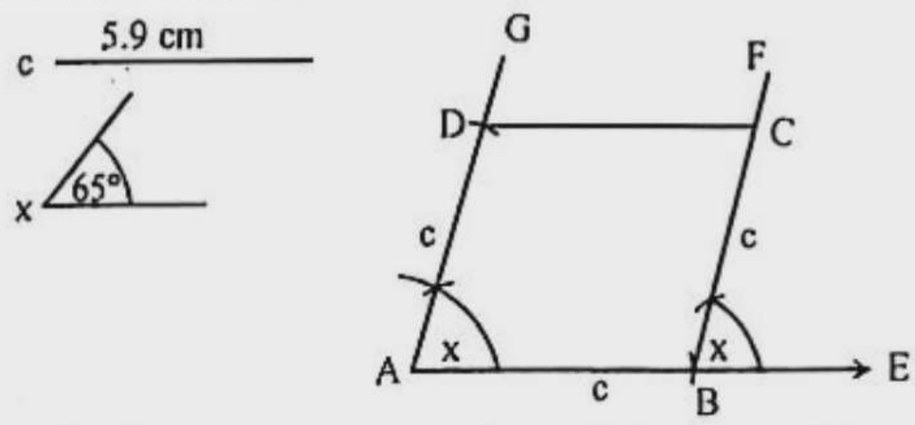
= 132.73 sq. cm.

b Let, a = 4cm, b = 5cm and c = 5.9 cm are the lengths of three sides and d = 6.5 cm. e = 7 cm are the lengths of two diagonals of a quadrilateral. We have to draw the quadrilateral.



Construction : Let, AC = e = 7 cm is taken from any ray AP. Then centering A and C taking a = 4 cm and c = 5.9 cm as radius, two arcs are drawn on the side of AC so that they intersect each other at D. Further taking radii of d = 6.5 cm and b = 5 cm and centering D and C two more arcs are drawn on the side of AC opposite to D. Let, they intersect mutually at B. Joining A, D; C, D; A, B and B, C we have the required quadrilateral ABCD.

c Let, the length of a side of rhombus, c = 5.9 cm and its one angle, ∠x = 65° is given, we have to draw the rhombus.



Description of construction : AB = c = 5.9 cm is taken from any line segment AE. Then ∠BAG = ∠x = 65° is drawn at A and ∠EBF = ∠x = 65° is also drawn at B. Now, BC = AB from BF and AD = AB from AG is taken. Finally D, C are joined. Thus, rhombus ABCD is drawn which is the required rhombus.

Ques. 07 a = 6 cm, b = 7 cm and c = 7.5 cm.

a. The length of a side of a rhombus is 4cm and one diagonal 5.5cm. Construct the rhombus. [Only signs are essential not the description] 2

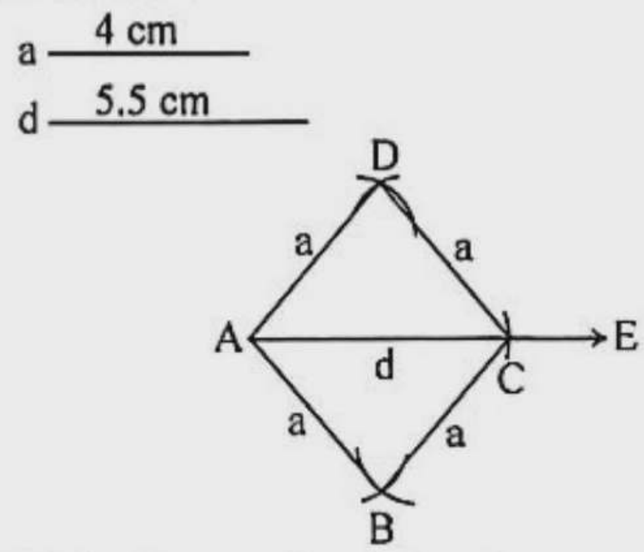
b. The length of a diagonal 'a' is given in the stem. Construct the square. [Sign and description of construction are essential] 4

c. Draw the parallelogram whose length of one side is 'a' and two diagonals are 'b' and 'c' given in the stem. [Sign and description of construction are essential] 4

● *Mymensingh Board 2019*

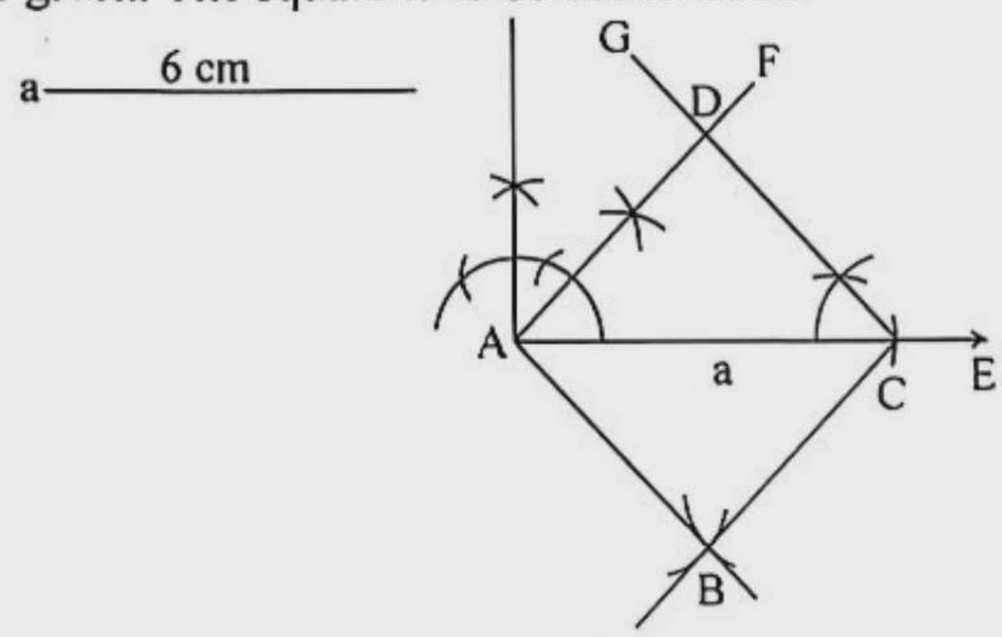
Solution to Question No. 07 :

a Based on the given information a rhombus is constructed below :



Here, ABCD is the required rhombus.

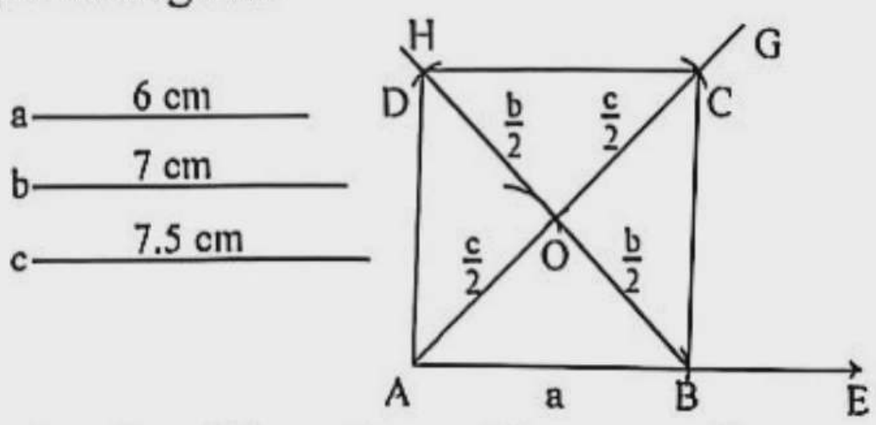
b Here, length of a diagonal of a square a = 6 cm is given. The square is to be constructed.



Construction Procedure : At first from any ray AE let's take AC = a = 6 cm.

Now draw ∠CAF = 45° at A and ∠ACG = ∠CAF at C. AF and CG intersects at point D. Then centering A and C let's draw two arcs of radius AD and CD on the side of AC opposite to D. Two arcs intersect at point B. Finally join A, B and C, B. Thus, ABCD is the required square.

c Let, length of one side, a = 6 cm and two diagonals b = 7 cm and c = 7.5 cm of a parallelogram is given. It is required to construct the parallelogram.



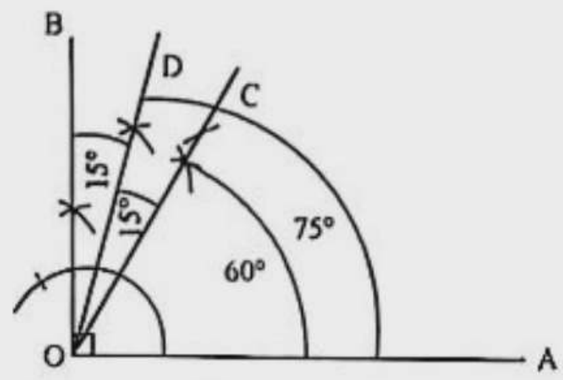
Construction Procedure : From any line segment AE, AB = a is taken. Centering A and B let's draw two arcs with radius $\frac{b}{2}$ and $\frac{c}{2}$ respectively on the same side of AB. Two arcs mutually intersect at O. Now extend AO to OG and BO to OH. From OG let's take OC = $\frac{c}{2}$ and from OH let's take OD = $\frac{b}{2}$. Join A, D; D, C and B, C.
Thus, ABCD is the required parallelogram.

Ques. 08 The length of three sides are a = 6 cm, b = 3.5 cm, c = 4 cm and the angles adjacent to the greater side are ∠x = 75° and ∠y = 65°.
a. Draw ∠x with the pencil compass. 2
b. Construct a quadrilateral. [Sign of the construction and description are necessary] 4
c. Construct a rhombus, consider the diagonal of the rhombus as the sides a and c followed by the stem. 4

● *Dhaka Board 2018*

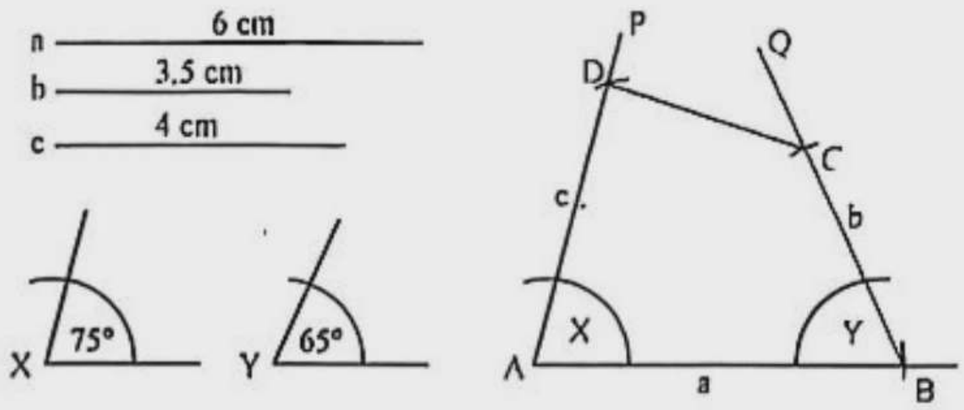
Solution to Question No. 08 :

a ∠x = 75° is drawn below by using pencil compas :



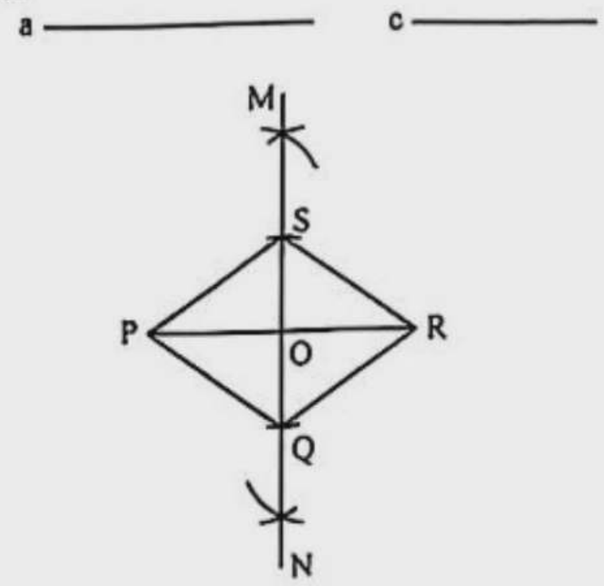
In the above figure, ∠AOB = 90°,
∠AOC = 60°
∠BOC = 30°
∠COD = 15
∠AOD = 75°

b Here, given three sides a = 6cm, b = 3.5cm, c = 4cm and the angles adjacent to the greater side are ∠X = 75° and ∠Y = 65° of a quadrilateral.
Now, the quadrilateral is required to be constructed.



Description of construction : A line segment AB = a is taken. ∠BAP = X at A and ∠ABQ = Y at B are drawn. Then from AP, AD = C and from BQ, BC = b are taken. Finally, C, D are joined. Thus, a quadrilateral ABCD is drawn which is the required quadrilateral.

c Here, two diagonals a = 6cm and C = 4cm of a rhombus are given. Now, the rhombus is to be constructed.



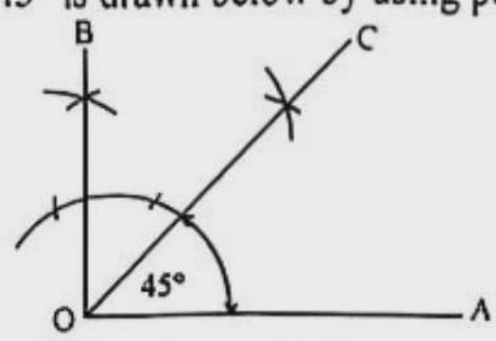
Construction : Any line segment PR = a is taken. Then bisector, MN of PR is drawn. Let the bisector intersects PR at O.
From OM, OS = $\frac{C}{2}$ and from ON, OQ = $\frac{C}{2}$ are taken. Finally, P, Q; Q, R; R, S and S, P are joined. Thus, a rhombus PQRS is drawn which is the required rhombus.

Ques. 09 The length of three sides of a quadrilateral are a = 6 cm, b = 4.5 cm and c = 3.5 and two Marks angles are ∠x = 60°, ∠y = 80°.
a. Draw angle 45° with the help of pencil compass. 2
b. Construct the quadrilateral. (Sign of construction and description are needed.) 4
c. Construct a rhombus which one side is equal to b and one angle is equal to ∠x. (Sign of construction and description are needed) 4

● *Rajshahi Board 2018*

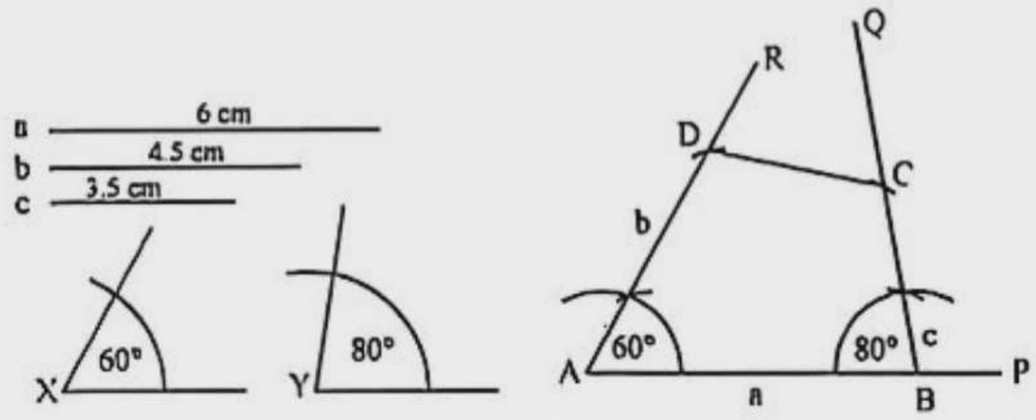
Solution to Question No. 09 :

a An angle of 45° is drawn below by using pencil compass :



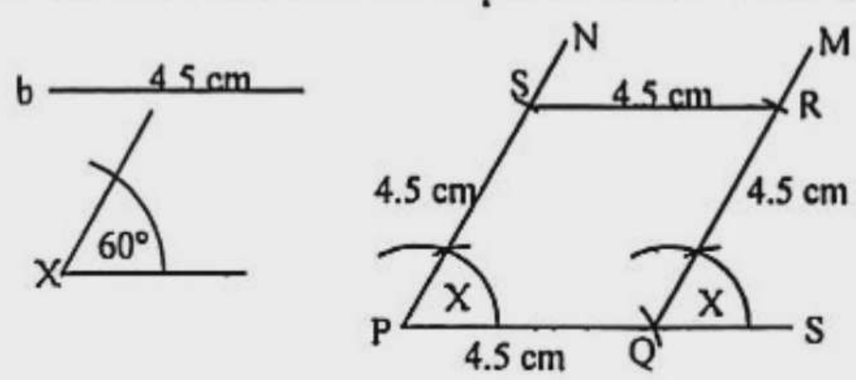
In the adjoining figure, ∠AOC measuring 45° is drawn above.

b **Data :** Given 3 sides a = 6cm, b = 4.5 cm and c = 3.5 cm and 2 angles ∠x = 60°, ∠Y = 80° of a quadrilateral. The quadrilateral is needed to be constructed.



Description of construction : AB = a = 6cm is taken from any line segment AP. At A, ∠PAR = x = 60° and at B, ∠ABQ = y = 80° are drawn. Then BC = C = 3.5 cm is taken from BQ and AD = b = 4.5 cm is taken from AR. C, D are finally joined. Thus, a quadrilateral ABCD is drawn which is the required quadrilateral.

c Given a side b = 4.5cm and one angle, ∠x = 60° of a rhombus. The rhombus is required to be constructed.



Description of constructions : PQ = b = 4.5cm is taken from any line segment PS.

Then ∠SPN = ∠x = 60° is drawn at P and ∠SQM = ∠x = 60° is also drawn at Q. Now, QR = PQ from QM and PS = PQ from PN is taken. Finally, R, S are joined. Thus, rhombus PQRS is drawn which is the required rhombus.

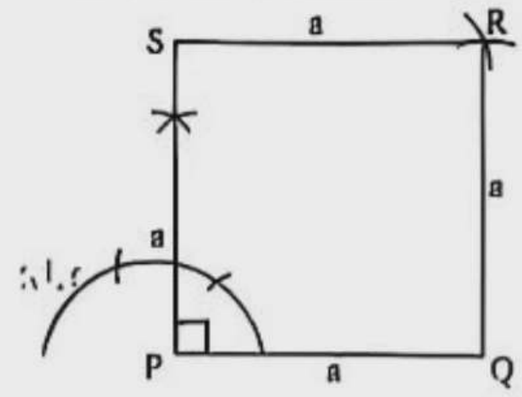
Ques. 10 The length of three sides a = 4cm, b = 5 cm, c = 6 cm and the two adjacent angles of the largest sides are ∠x = 70° and ∠y = 85°.

a. If a is the side of a square construct the square. 2
b. Using stem construct the quadrilateral. [The sign of construction and description are essential.] 4
c. Considering the two larger sides of stem as diagonals of a rhombus, construct the rhombus. [The sign of construction and description are essential.] 4

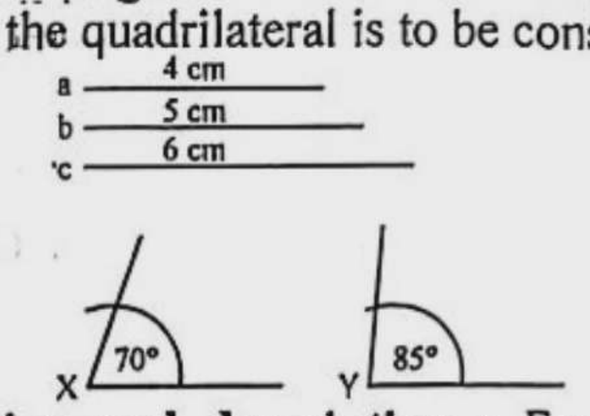
• *Sylhet Board 2018*

Solution to Question No. 10 :

a A square PQRS having one side of length of 'a' unit is drawn below :

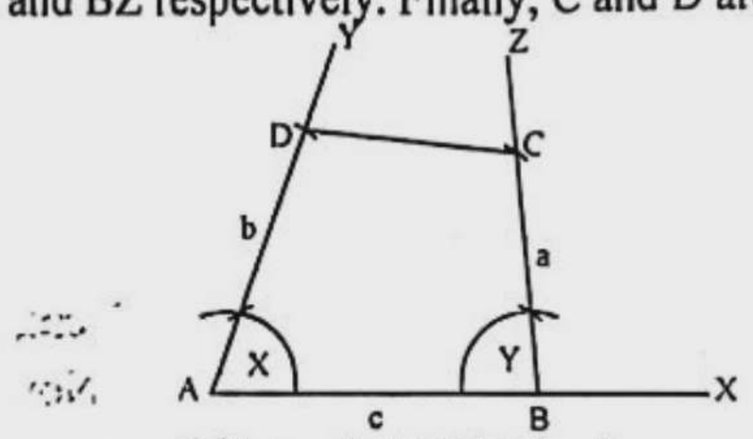


b Let, the lengths of three sides of a quadrilateral are a = 4cm, b = 5cm, c = 6cm and two adjacent angles of the largest sides are ∠X = 70° and ∠Y = 85°. Now, the quadrilateral is to be constructed.



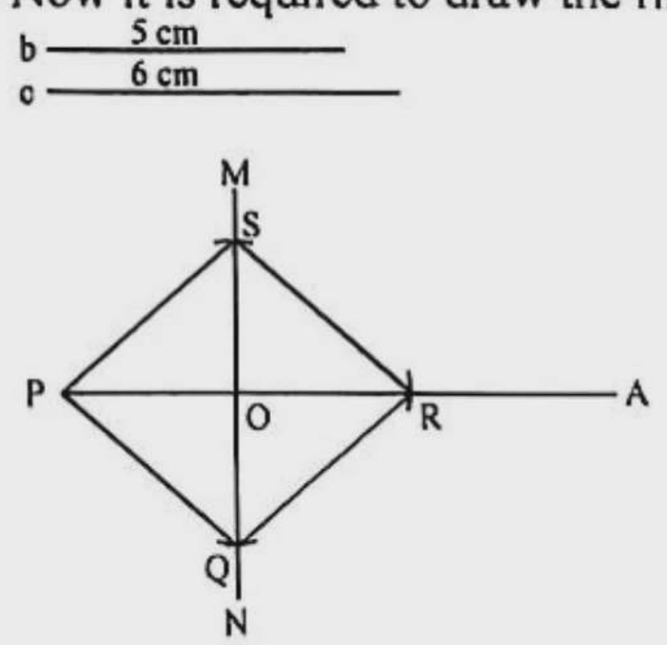
Construction and description : From any line segment AX, AB = C = 6cm is taken. ∠BAY = ∠X = 70° is drawn at A. Then at B, ∠ABZ = ∠Y = 85° is also drawn.

Now, AD = b = 5cm and BC = a = 4cm are taken from AY and BZ respectively. Finally, C and D are joined.



Thus, a quadrilateral ABCD is drawn which is the required quadrilateral.

c According to the stem, two larger sides of the given quadrilateral are b = 5 cm and C = 6 cm, Let b = 5 cm and c = 6 cm are two diagonals of a rhombus. Now it is required to draw the rhombus.



Construction and description : PR = C = 6 cm is taken from any line segment PA. Then the perpendicular bisector MN of PR at point O is drawn. From OM, OQ = $\frac{b}{2}$ is taken from ON. Again, OS = $\frac{b}{2}$ is taken from OM. Finally, P, Q; Q, R; R, S and P, S are joined. Thus, a rhombus PQRS is drawn which is the required rhombus.

Ques. 11 Two adjacent sides are a = 4.7 cm, b = 3.6 cm and their included angle is ∠x = 60° of a parallelogram.

a. Determine the area of a rhombus of which two diagonals are a and b. 2

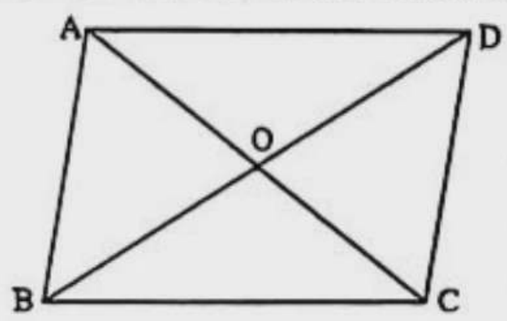
b. Construct the parallelogram. 4

c. Construct a square taking the smallest diagonal of the parallelogram as length. 4

● *Barishal Board 2018*

Solution to Question No. 11 :

a Let the diagonals AC = a and BD = b of a rhombus ABCD intersect each other at O.

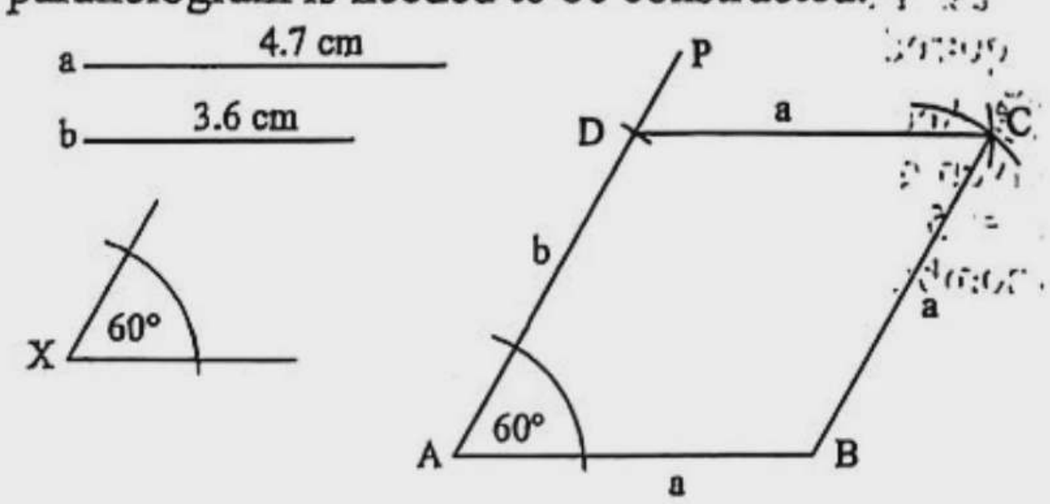


Area of rhombus = area of triangle DAC + area of triangle BAC.

$$= \frac{1}{2} . a \times \frac{1}{2}b + \frac{1}{2}a \times \frac{1}{2}b$$

$$= \frac{1}{2}a \times b.$$

b Here given two adjacent sides a = 4.7 cm, b = 3.6 cm and their included angle, x = 60°. Now the parallelogram is needed to be constructed.



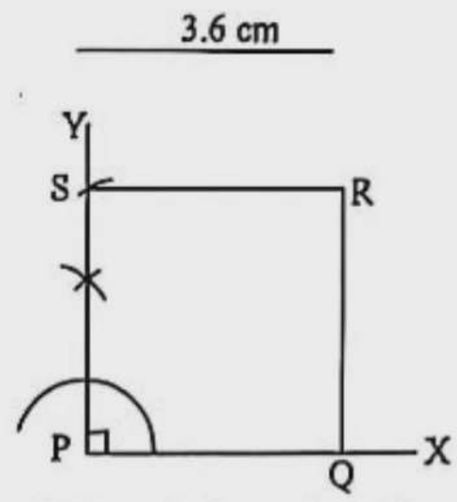
Construction :

Any line segment AB = a is taken ∠BAP = x = 60° is drawn at A. Then AD = b is taken from AP. Centering D and taking radius of 'a', an arc is drawn within the region of ∠BAP. Again, centering B and taking radius of 'b', another arc is drawn in the same region of the arc drawn earlier. Let the two arcs mutually intersect at C. Finally, C, D and B, C are joined.

Thus, a rhombus ABCD is drawn which is the required parallelogram.

c Here, the smallest side of the parallelogram = 3.6 cm

Now, a square is to be constructed whose one side is of length of 3.6 cm.



Construction : PQ = 3.6 cm is taken from any line segment PX. PY ⊥ PX is drawn at P. Then PS = PQ is taken. Now, centering Q and taking radius = PQ, an arc is drawn within the region of ∠XPY. Again, centering S and taking radius = PQ, another arc is drawn in the same region of the arc drawn earlier. Let the two arcs mutually intersect at R. Finally, Q, R and R, S are joined.

Thus, PQRS is a square which is the desired square.

Ques. 12 The lengths of three sides of quadrilateral are 6 cm, 5 cm, 4 cm and its two included angles are 80° and 70° respectively.

a. If the length of side of a square is 5 cm. Draw the square. 2

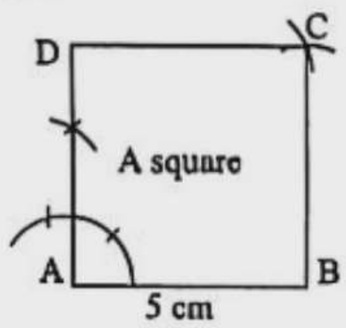
b. Draw the quadrilateral. [The sign and description of construction are essential.] 4

c. Draw the rhombus considering the smallest side and the smallest angle of the above quadrilateral as one side and one angle of a rhombus. [The sign and description of construction are essential.] 4

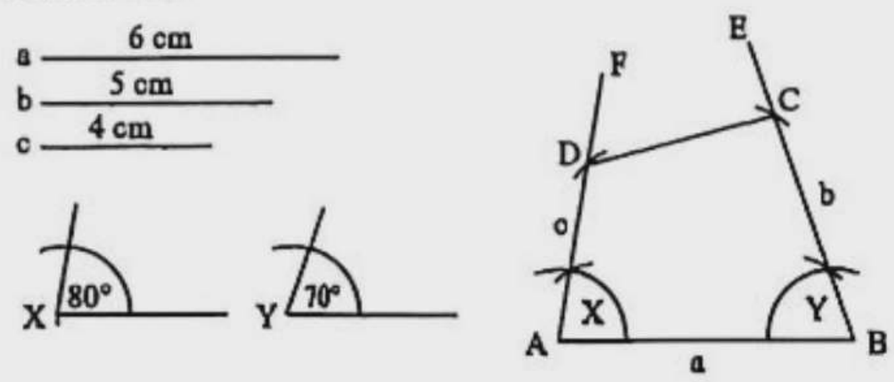
● *Dinajpur Board 2018*

Solution to Question No. 12 :

a A square having the length of one side is of 5 cm is drawn below :

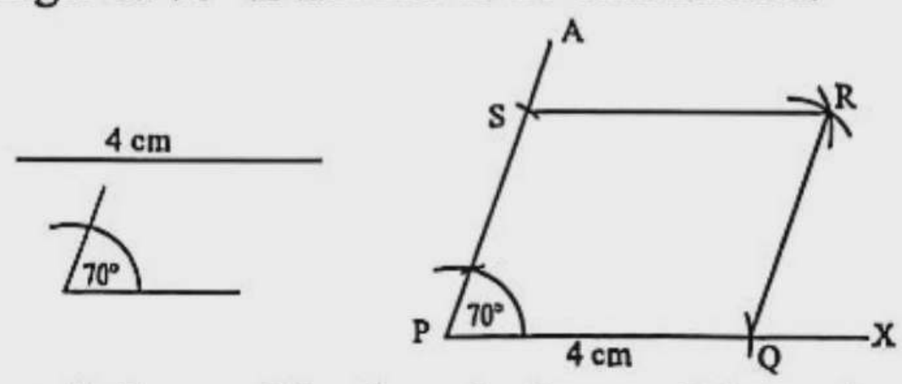


b According to the given information, the lengths of 3 sides of a quadrilateral are a = 6cm, b = 5cm and c = 4cm and their included angles X = 80° and Y = 70°. Now, the quadrilateral is required to be constructed.



Construction : Any line segment, AB = a = 6cm is taken. ∠BAF = X = 80° is drawn at A and ∠ABF = Y = 70° is drawn at B. BC = b = 5cm is taken from BE and AD = C = 4cm is taken from AF. C, D are joined.
Thus, a quadrilateral ABCD is drawn which is the required quadrilateral.

c Here smallest side of the quadrilateral is 4cm and smallest angle of the same is 70°
∴ A rhombus having a side of length of 4cm and an angle of 70° is needed to be constructed.



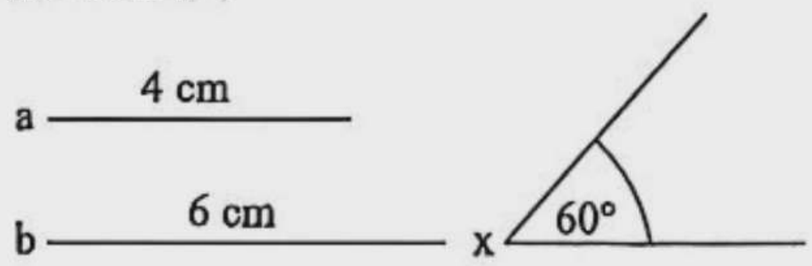
Constriction with description : PQ = 4cm is taken from any line segment PX. ∠XPA = 70° is drawn at P. Then PS = PQ is taken from PA. Now, centering Q and taking radius of PQ, an arc is drawn in the region of ∠XPA. Again, centering S and taking the same radius, another arc is drawn in the same region of the arc drawn earlier. Let the two arcs mutually intersect at R. S, R and Q, R are joined finally. Thus, a rhombus PQRS is drawn which is the desired rhombus.

Ques. 13 The length of two sides are a = 4 cm. and b = 6 cm. and one angle ∠x = 60°.
a. Express the above information in a figure. 2
b. Draw the parallelogram which two adjacent sides are equal a and b and included angle is equal to ∠x. [The sign of construction and statement are essential] 4
c. Construct a rectangle which one side is equal to the length 'a' and a diagonal is equal to the length 'b'. [The sign of construction and statement are essential] 4

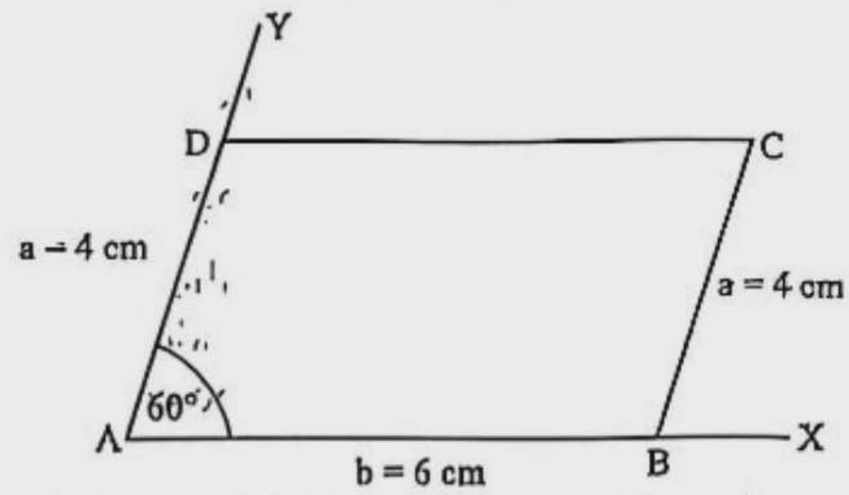
• *Dhaka Board 2017*

Solution to Question No. 13 :

a The geometric figures of the given information is shown below :

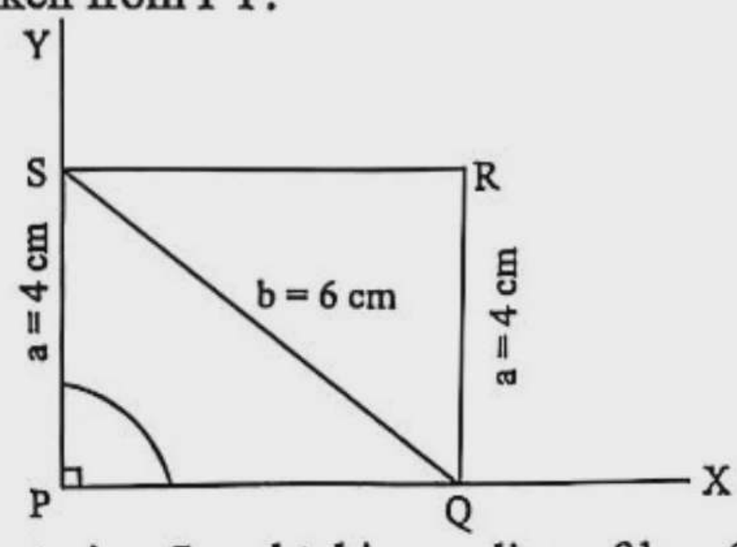


b Let a = 4 cm and b = 6 cm are two adjacent sides of a parallelogram and x = 60° is the included angle of a and b. Now the parallelogram is required to be constructed.



Description of Construction : AB = b = 6cm is taken from any line segment AX. An angle XAY = X = 60° is drawn at A. AD = a = 4 cm is taken from AY. Then centering D and taking radius of b = 6 cm, an arc is drawn in the region of ∠XAY. Again, taking radius of a = 4 cm and centering B, another arc is drawn in the same region stated above. Let the two arcs mutually intersect at C. B, C and D, C are joined.
Thus, a parallelogram ABCD is drawn which is the desired parallelogram.

c Let a = 4 cm is a one side and b = 6 cm is one diagonal of a rectangle. The rectangle is required to be constructed.
Description of Construction : Any line segment PX is taken. At P, PY ⊥ PX is drawn. PS = a = 4 cm is taken from PY.



Then centering S and taking radius of b = 6 cm, an arc is drawn. Let the arc intersects PX at Q. Now centering S and taking radius of PQ an arc is drawn in the region of ∠XPY. Again, centering Q and taking radius of PS = a = 4 cm another arc is drawn in the same region stated above. Let the two arcs mutually intersect at R. Finally, S, R and Q,R are joined. Thus, a rectangle PQRS is drawn which is the required rectangle.

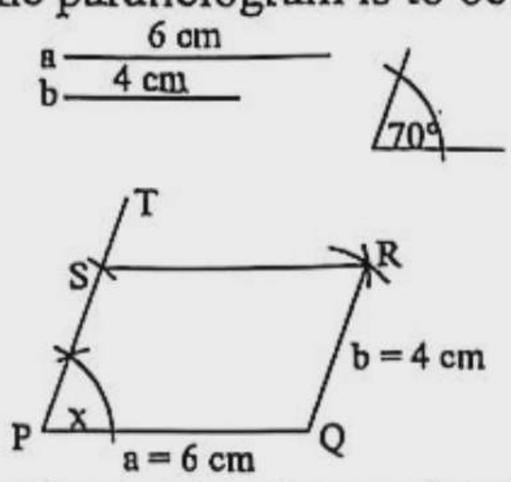
Ques. 14 Two adjacent sides of a parallelogram are 6 cm and 4 cm and their included angle is 70°.
a. If the edge of a cubic box is 7.3 cm, find the area of a face of the box. 2
b. Draw the parallelogram with the description of drawing. 4
c. Draw a rectangle with a side equal to the larger side and a diagonal equal to the larger diagonal of the parrallelogram. [Sign and description of construction are essential] 4

• *Comilla Board 2017*

Solution to Question No. 14 :

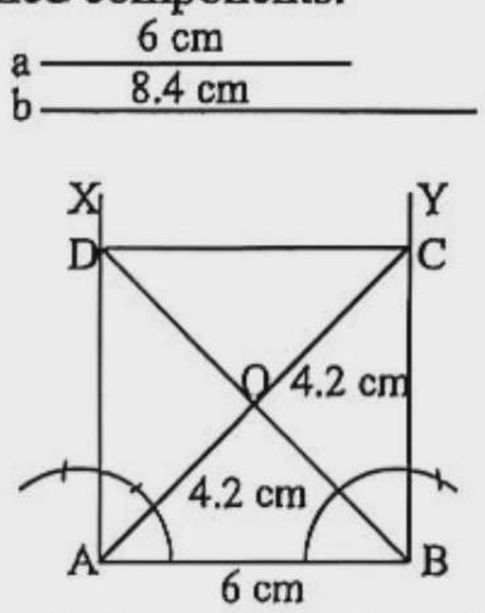
a Given that, the edge of a cubic box = 7.3 cm.
∴ Area of a face of the cubic box
$= 7.3 \times 7.3$ sq. cm = 53.29 sq. cm

b Let, two adjacent sides of a parallelogram are a = 6 cm and b = 4 cm and their included angle is x = 70°. Now the parallelogram is to be constructed.



Description of construction : Any line segment PQ = 6 cm is taken. ∠QPT = x = 70° is drawn at S. PS = b = 4 cm is taken from PT. Then centering S and taking radius of a = 6 cm. an arc is drawn in the region of ∠QPT. Again, centering Q and taking radius of b = 4 cm. Another arc is drawn in the same region of the previous arc.
Let the two arcs mutually intersect at R. S, R and Q, R are joined.
Thus a parallelogram PQRS is drawn which is the desired parallelogram.

c According to the given information, the larger side of the parallelogram a = 6 cm and the largesr diagonal of the given parallelogram is b = 8.4 cm, obtained physically by measuring the diagonal PR of PQRS from the figure in (b) above. Now a rectangle is required to be constructed with the above mentioned components.



Sign and description of construction : Any line segment AB = 6 cm is taken. Then centering A and B successivel and taking radius of $\frac{b}{2}$ = 4.2 cm, two arcs are drawn above the line segment AB. Let they meet at O.
AX ⊥ AB and BY ⊥ AB are also drawn at A and B respectively. Then AO and BO are produced. Let AO produced meets BY at C and BO produced meets AX at D.
Thus a rectangle ABCD is drawn which is the desired rectangle.

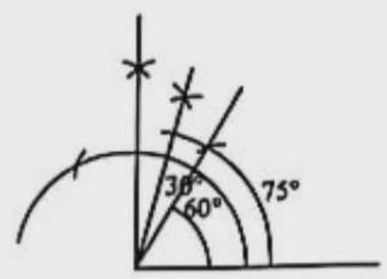
Ques. 15 Two lines segment a = 5 cm and b = 6.5 cm and ∠x = 75°.

a. Draw ∠x with the pencil compuss. 2
b. If the length of the two adjacent sides a and b of the parallelogram and ∠x is their included angle, then construct the parallelogram. [Sign of the construction and description are necessary] 4
c. Draw the square taking $\frac{b}{2}$ as the side of the square. [sign of the construction and description are necessary] 4

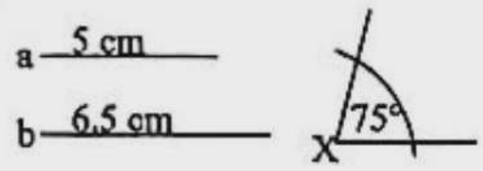
● *Chittagong Board 2017*

Solution to Question No. 15 :

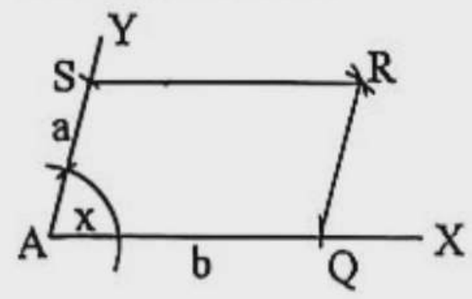
a ∠x= 75° is drawn below with the help of pencil compuss :



b Let, a and b are two adjacent sides of a parallelogram and ∠x is their included angle. Now the parallelogram is to be constructed.



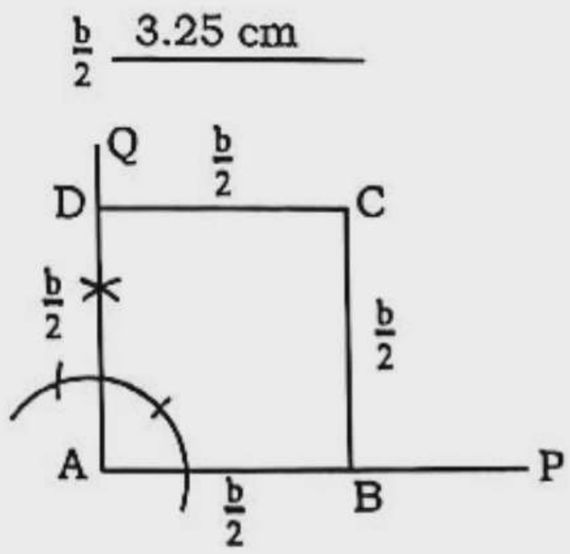
Sign and description of construction : A line segment AQ = b is taken from any line segment AX. ∠XAY = x is drawn at A.



From AY, AS = a is taken, then centering s and taking radius of b = 6.5 cm, an arc is drawn in the region of ∠XAY. Again, centering at Q and taking radius of a = 5 cm, another arc is drawn in the same region of previous arc drawn.
Let, the two arcs mutually intersect at R. S, R and Q, R are finally joined. Thus, a parallelogram PQRS is drawn which is the required parallelogram.

c Let, $\frac{b}{2}$ or $\frac{6.5}{2}$ cm or 3.25 cm is the length of side of a square. The square is required to be constructed.

Sign and description of construction : From any line segment AP, AB = $\frac{b}{2}$ is taken.



AQ ⊥ AP is drawn at A. Then centering at D and at B successively and taking radius of $\frac{b}{2}$ = 3.25 cm for each of the cases, two arcs are drawn in the region of ∠PAQ. Let the two arcs mutually meet at C. D, C and B, C are joined finally.

Thus, a square ABCD is drawn which is the desired square.

Ques. 16 There are two adjacent sides 4 cm, 5cm and three angles 110°, 85°, 60° of a quadrilateral.

a. Express the above information in a figure. 2

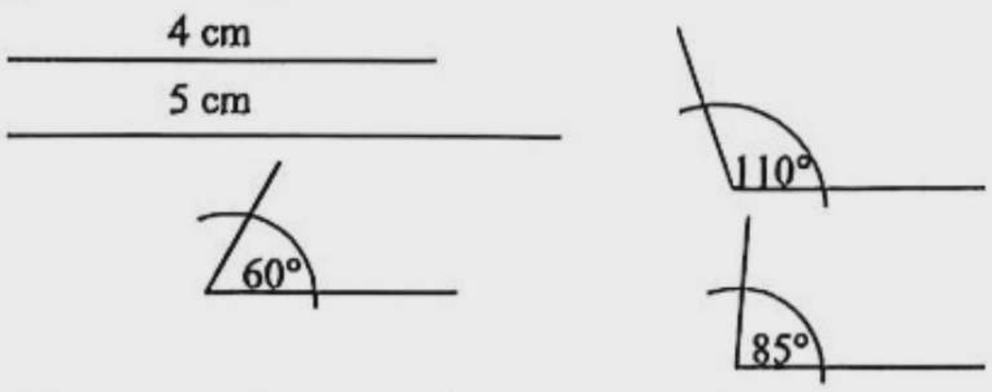
b. Draw the quadrilateral with the sign and description of the construction. 4

c. If the given sides are the two diagonals of any rhombus. Then construct the rhombus. (Sign of construction and description are essential).4

● *Dinajpur Board 2017*

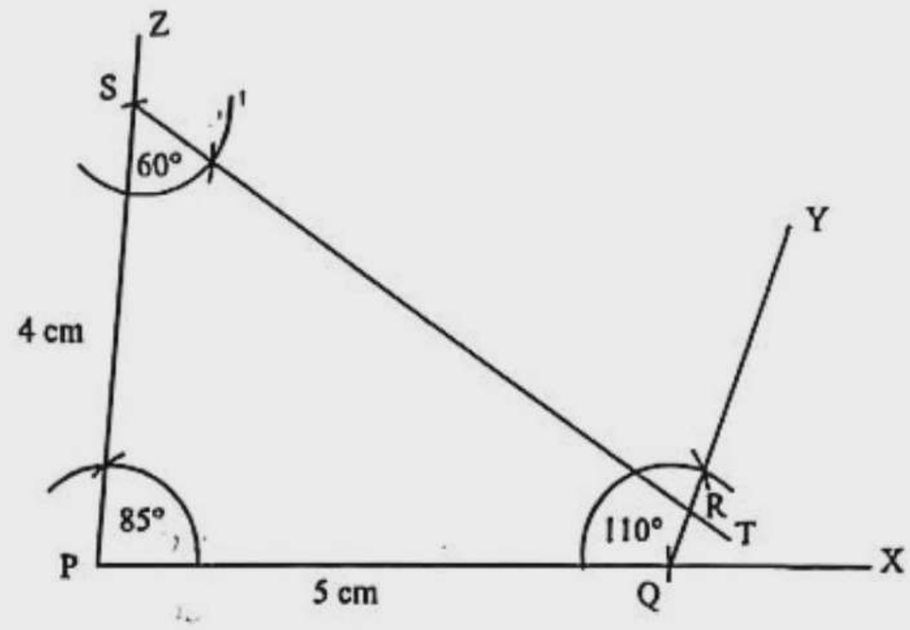
Solution to Question No. 16 :

a The given information is expressed below in geometric figures :



The above figures refers to two adjacent sides and three angles of a quadrilateral.

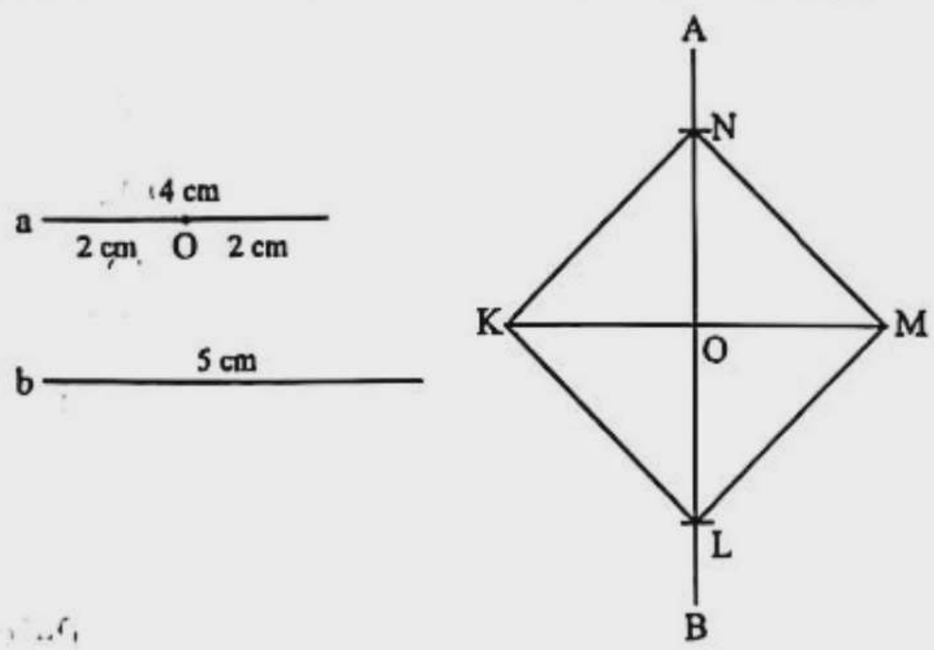
b Let, two adjacent sides a = 4 cm and b = 5 cm and three angles x = 110, y = 85° and z = 60° of a quadrilateral are known. The quadrilateral is required to be constructed.



Description with sign of construction : PQ = 5 cm is taken from any line segment PX. ∠PQY = 110° is drawn at Q. ∠XPZ = 85° is also drawn at P. PS = 4 cm is taken from PZ. At S, ∠PST = 60° is drawn. Let ST intersects QY at R.

Thus a quadrilateral PQRS is drawn which is required quadrilateral.

c Let a = 4 cm and b = 5 cm are two diagonals of a rhombus. The rhombus is to be constructed.



Sign and description of construction : Any line segment KM = 5 cm is taken. A perpendicular bisector AB of KM is drawn. From OB, OL = $\frac{1}{2}$ a = 2 cm is taken. Again, from OA, ON = $\frac{1}{2}$ a = 2 cm is also taken. Finally, K, L; L, M; M, N and N, K are joined.

Thus a rhombus KLMN is drawn which is the required rhombus.

Ques. 17 Two parallel sides of trapezium are m = 6 cm and n = 3.4 cm and two angles are ∠x = 60° and ∠y = 50°.

a. Draw ∠x without using protector & bisect it. 2

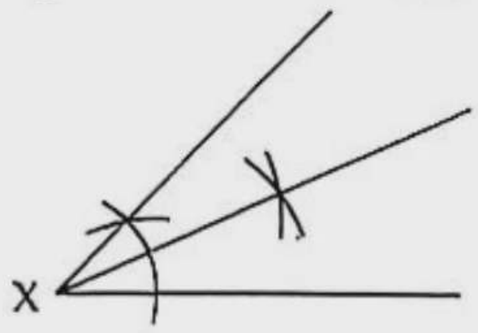
b. Draw a square with a diagonal equal to the larger side of the trapezium with description. 4

c. If two ∠x and ∠y on the side m then draw the trapezium with description. 4

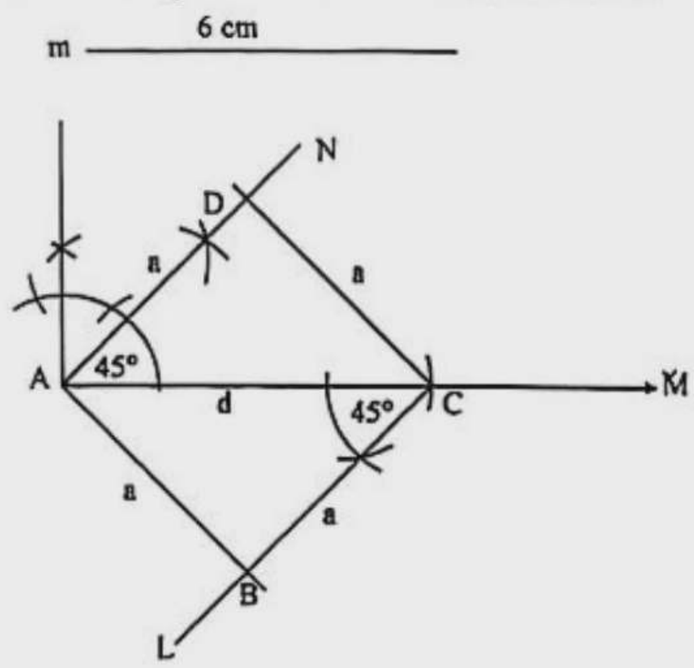
▸ *Rajuk Uttara Model College, Dhaka*

Solution to Question No. 17 :

a $\angle x = 60°$ angle has been drawn below :

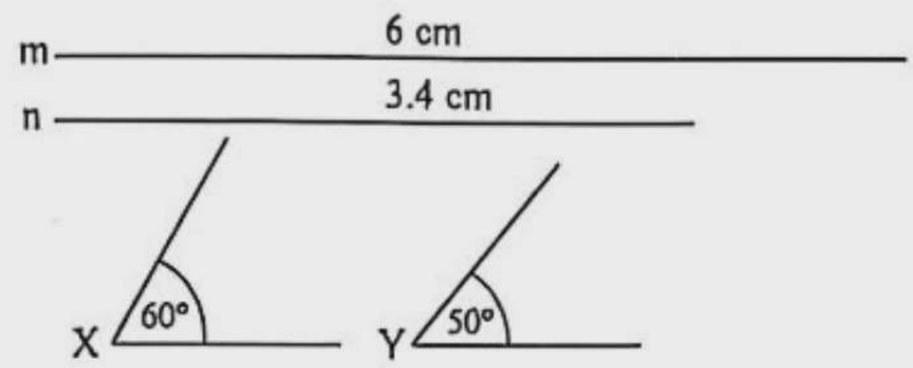


b Here, the given diagonal of a square, m = 6 cm. The square is required to be constructed.

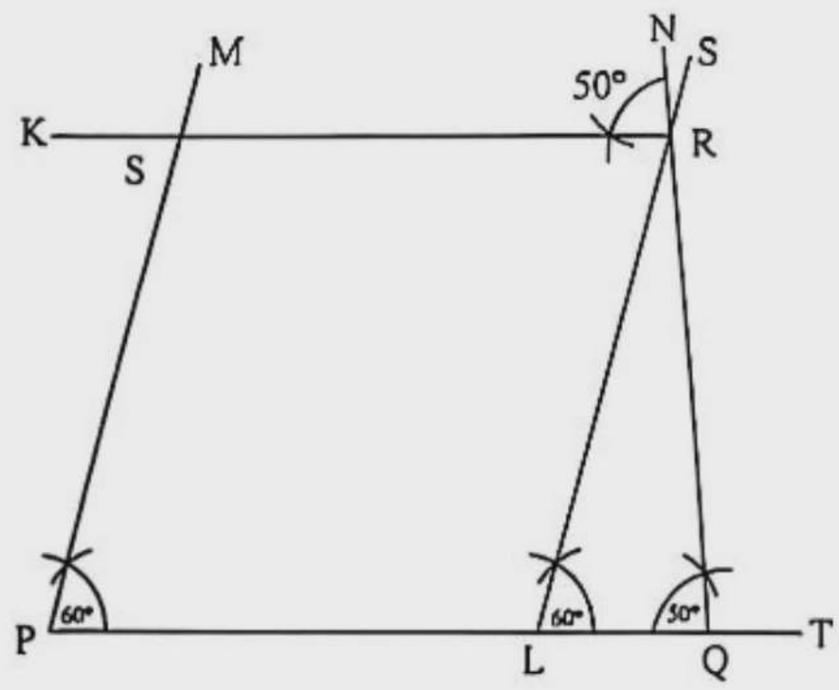


Let us take any ray AM. From AM, AC = m is taken. At A, an angle CAN, measuring 45° is drawn. From AN, we cut AD with any radius. Then at C, $\angle ACL = 45°$ is drawn. From CL, CB = AD is taken. Finally, A, B and C, D are joined. Thus, a square ABCD is constructed which is the required square.

c Let m = 6 cm and n = 3.4 cm are two parallel sides of a trapezium and $\angle X = 60°$ and $\angle Y = 50°$ are two adjacent angles of the side of a. It is required to draw the trapezium.



Description of construction : A line segment PT is taken. PQ = m = 6 cm is taken from PT. At P



$\angle TPM = \angle X$ is drawn. Again, at Q, $\angle PQN = \angle Y = 50°$ is drawn. From PQ, PL = n = 3.4 cm is taken. At L, $\angle QLS = X$ is also drawn.

Let LS intersects QN at R. At R, $\angle NRK = \angle Y$ is drawn. Let RK intersects PM at S.

Thus trapezium PQRS is drawn which is the desired trapezium.

Solutions to Textual Activities — Along with textual reference

Activity 01 **Four sides and an angle are required to construct a quadrilateral. Are you successful in constructing the quadrilateral by five of any measurement? Explain.** ▸ Textbook Page 144

Solution : To draw a quadrilateral, the measurements of four sides and one diagonal are required. However, if these five parameters have arbitrary measurements, the quadrilateral cannot be drawn. This is because these five parameters must have specific measurements to form a quadrilateral.

Activity 02 **The lengths of four sides and a diagonal are required to construct a quadrilateral. Do you think five of any measurement can construct the quadrilateral? Justify your answer.** ▸ Textbook Page 145

Solution : To draw a quadrilateral, the lengths of its four sides and one diagonal are required. However, a quadrilateral cannot be drawn with just any measurements for these five given parameters. The specified five parameters must have certain measurements to form a valid quadrilateral.

Appendix

Multiple Choice Q/A Designed as per topic

1. **In which century BCE did the Greek mathematician Euclid write the remarkable book "Elements"?** *(Easy)*
c ⓐ 300 ⓑ 320 ⓒ 330 ⓓ 350

2. **Which is the oldest branch of mathematics?** *(Easy)*
ⓐ Geometry ⓑ Arithmetic
a ⓒ Algebra ⓓ Statistics

3. **Who is the author of the famous book "Elements"?** *(Easy)*
ⓐ Ptolemy ⓑ Pythagoras
c ⓒ Euclid ⓓ Archimedes

4. **Which of the following has no endpoints?** *(Easy)*
a ⓐ Line ⓑ Point ⓒ Line segment ⓓ Ray

5. **Euclid was a mathematician from which country?** *(Easy)*
b ⓐ Egypt ⓑ Greece ⓒ England ⓓ Germany

6. **Which of the following has only one endpoint?** *(Easy)*
d ⓐ Line ⓑ Point ⓒ Line segment ⓓ Ray

7. **How many degrees is a straight angle?** *(Easy)*
c ⓐ 360° ⓑ 270° ⓒ 180° ⓓ 90°

8. **What is the complement of a 30° angle?** *(Medium)*
b ⓐ 45° ⓑ 60° ⓒ 90° ⓓ 180°

9. **One-third of the complement of 60° is equal to what?** *(Medium)*
a ⓐ 10° ⓑ 20° ⓒ 30° ⓓ 40°
Explanation : One-third of the complement of $60° = \frac{1}{3}(90° - 60°)$
$= \frac{1}{3} \times 30° = 10°$

10. **Half of the supplement of 60° is equal to what?** *(Medium)*
c ⓐ 30° ⓑ 45° ⓒ 60° ⓓ 90°
Explanation : Half of the supplement of $60° = \frac{1}{2}(180° - 60°)$
$= \frac{1}{2} \times 120° = 60°$

11. **What is the general term for the topics discussed in geometry?** *(Easy)*
ⓐ Theorem ⓑ Corollary
d ⓒ Axiom ⓓ Postulate

12. **What is the term for a postulate in which a geometric concept is illustrated through a drawing and its accuracy is proven logically?** *(Easy)*
ⓐ Construction ⓑ Theorem
a ⓒ Postulate ⓓ Given

13. **What is the term for a postulate in which a geometric concept is logically established?** *(Easy)*
ⓐ Construction ⓑ Theorem
b ⓒ Postulate ⓓ Corollary

14. **How many steps are involved in proving a theorem?** *(Easy)*
c ⓐ 2 ⓑ 3 ⓒ 4 ⓓ 5

15. **Geometry is a branch of mathematics that is—** *(Easy)*
b ⓐ A language ⓑ An ancient branch
ⓒ A branch of measurement ⓓ A mathematical branch

16. **What is the measure of each angle in an equilateral triangle?** *(Easy)*
b ⓐ 30° ⓑ 60° ⓒ 45° ⓓ 90°

17. **What can be confirmed using the superposition method?** *(Easy)*
ⓐ Congruence ⓑ Similarity
a ⓒ Divisibility ⓓ Uniformity

18. **If two line segments are congruent, what will be their lengths?** *(Easy)*
b ⓐ Similar ⓑ Equal ⓒ Unequal ⓓ Dissimilar

19. **Which method is used to determine congruence?** *(Easy)*
ⓐ Superposition ⓑ Side-by-side placement
c ⓒ Supernatant ⓓ Neither

20. **If two angles are congruent, what will be their measures?** *(Easy)*
a ⓐ Equal ⓑ Unequal ⓒ Dissimilar ⓓ similar

21. **What is the condition for the congruence of two line segments?** *(Medium)*
ⓐ They intersect
ⓑ Distance remains the same everywhere
ⓒ Lengths are equal
b ⓓ They form angles

22. **The corresponding angles of congruent triangles will be—** *(Medium)*
ⓐ Equal ⓑ Similar
a ⓒ Unequal ⓓ Dissimilar

23. **If one triangle is exactly equal to another triangle, what is it called?** *(Easy)*

ⓑ ⓐ Similar ⓑ Congruent ⓒ Equal ⓓ Dissimilar

24. **Which symbol is used to represent the congruence of two triangles?** *(Easy)*

ⓑ ⓐ = ⓑ ≅ ⓒ ⊥ ⓓ ≠

25. **If two objects have the same shape and size, what are they called?** *(Easy)*

ⓐ Similar ⓑ Symmetric
ⓓ ⓒ Dissimilar ⓓ Congruent

26. **If two triangles completely match each other in all aspects, what are they called?** *(Easy)*

ⓐ Congruent ⓑ Symmetric
ⓐ ⓒ Similar ⓓ Dissimilar

27. **How will the corresponding sides of congruent triangles be?** *(Easy)*

ⓐ Similar ⓑ Unequal
ⓒ ⓒ Equal ⓓ Dissimilar

28. **The conditions for the congruence of a right-angled triangle–**

i. Hypotenuse is equal
ii. One leg is equal
iii. Any one angle is equal

Which one is correct? *(Medium)*

ⓐ ⓐ i & ii ⓑ i & iii ⓒ ii & iii ⓓ i, ii & iii

29. **In an isosceles triangle–**

i. If the equal angles are 60°, the triangle will be equilateral.
ii. If the equal angles are 45°, the triangle will be a right-angled triangle.
iii. If the equal angles are less than 45°, the triangle will be an obtuse-angled triangle.

Which one is correct? *(Hard)*

ⓓ ⓐ i & ii ⓑ i & iii ⓒ ii & iii ⓓ i, ii & iii

30. **The conditions for the congruence of a triangle–**

i. Two sides and the included angle are equal.
ii. All three sides are equal.
iii. Two angles and the adjacent side are equal.

Which one is correct? *(Medium)*

ⓒ ⓐ i ⓑ i & ii ⓒ i, ii & iii ⓓ ii & iii

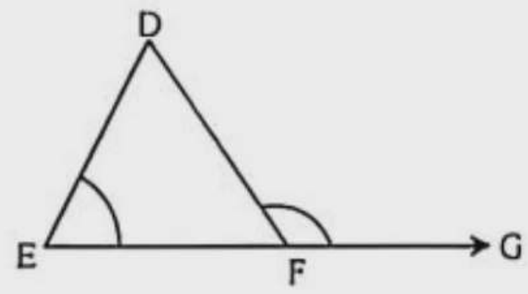
31. **The applicable congruence rules–**

i. Side-Side-Side (SSS)
ii. Angle-Side-Angle (ASA)
iii. Side-Angle-Side (SAS)

Which one is correct? *(Medium)*

ⓓ ⓐ i & ii ⓑ i & iii ⓒ ii & iii ⓓ i, ii & iii

Answer the question no 32 and 33 according to following information.



At ΔDEF ∠DEF = 45°, ∠DFE = 70°

32. **Which is the exterior angle of ΔDER?** *(Hard)*

ⓐ ∠DEF ⓑ ∠EFD
ⓒ ⓒ ∠DFG ⓓ ∠EDF

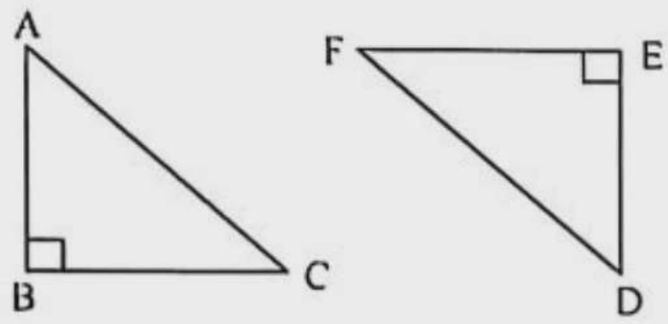
33. **∠DFG = what?** *(Hard)*

ⓐ 135° ⓑ 130°
ⓐ ⓒ 90° ⓓ 45°

Explanation : At ΔDEF
∠DEF + ∠DFE + ∠EDF = 180°
or, 70° + 45° + ∠EDF = 180°
or, ∠EDF = 180° – 150° = 65°
∴ External ∠DFG = Internal (∠DEF + ∠EDF)
= 70° + 65° = 135°

34. **∠EDF = what?** *(Hard)*

ⓑ ⓐ 45° ⓑ 65° ⓒ 90° ⓓ 135°



At ΔABC and ΔDEF AC = DF and AB = DE

Answer the question no 35 and 36 according to following information.

35. **Which of the following is the relation between ΔABC and ΔDEF?** *(Medium)*

ⓒ ⓐ Similar ⓑ Dissimilar ⓒ Congruent ⓓ Incongruent

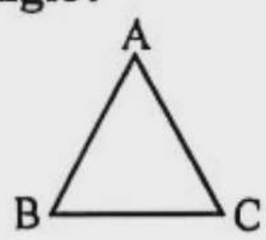
36. **If area of ΔABC is 30 cm^2, what is the area of ΔDEF?** *(Hard)*

ⓐ 35 cm^2 ⓑ 40 cm^2
ⓓ ⓒ 60 cm^2 ⓓ 30 cm^2

Short Q/A Designed as per topic

Question 1. What is meant by a triangle?

Solution : A triangle is a closed figure bounded by three line segments. The line segments are called the sides of the triangle, and the common point of two sides is called a vertex. A triangle has three sides and three angles.



Question 2. What is meant by the perimeter of a triangle?

Solution : The sum of the lengths of the three sides of a triangle is called the perimeter of the triangle. In the diagram, the perimeter of the triangle ABC = (AB + BC + CA) units.

Question 3. How many types of triangles are there based on sides, and what are they?

Solution : There are three types of triangles based on sides. They are : (1) equilateral triangle, (2) isosceles triangle, and (3) scalene triangle.

Question 4. How many types of triangles are there based on angles, and what are they?

Solution : There are three types of triangles based on angles. They are : (1) acute-angled triangle, (2) right-angled triangle, and (3) obtuse-angled triangle.

Question 5. Write two characteristics of a triangle.

Solution : Two characteristics of a triangle are:

(1) The sum of the three angles of a triangle is 180°.

(2) The sum of any two sides is greater than the third side.

Question 6. Write four characteristics of a triangle related to angles.

Solution : Four characteristics of a triangle related to angles are:

(1) All three angles of an acute-angled triangle are acute angles.

(2) Only one angle of a right-angled triangle is a right angle. The other two angles are acute angles.

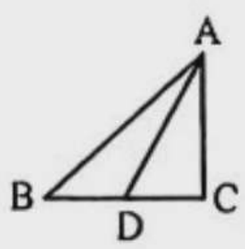
(3) Only one angle of an obtuse-angled triangle is an obtuse angle. The other two angles are acute angles.

(4) The two acute angles of a right-angled isosceles triangle are equal.

Question 7. Define the median of a triangle with a diagram.

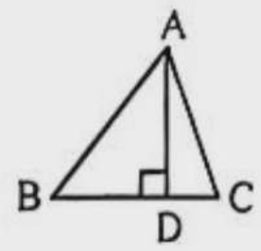
Solution : The line segment drawn from a vertex of a triangle to the midpoint of the opposite side is called a median.

In the diagram, AD is the median of triangle ABC.



Question 8. Define the height of a triangle with a diagram.

Solution : The perpendicular distance from a vertex of a triangle to the opposite side is called the height of the triangle. The height can be determined from each vertex. In the diagram, AD is the height of triangle ABC.



Question 9. Write two differences between the height and the median of a triangle.

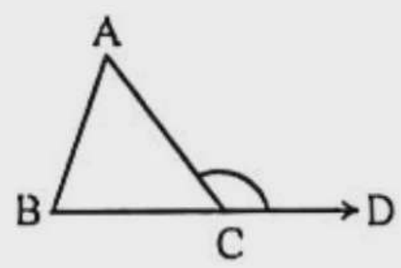
Solution : The differences between the height and the median of a triangle are:

Height	Median
1. The height is the perpendicular drawn from a vertex of a triangle to the opposite side.	1. The median is the line segment drawn from a vertex of a triangle to the midpoint of the opposite side.
2. The height of a triangle can be inside or outside the triangle.	2. The median of a triangle is always inside the triangle.

Question 10. Define the exterior angle of a triangle with a diagram.

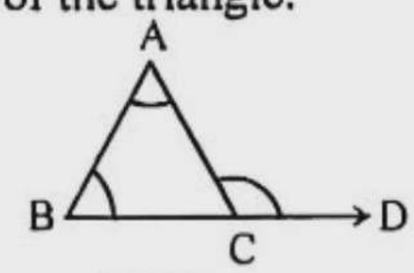
Solution : When one side of a triangle is extended, the angle that is formed is called an exterior angle of the triangle.

In the diagram, ∠ACD is an exterior angle of triangle ΔABC.



Question 11. Define the opposite interior angles of a triangle with a diagram.

Solution : The two angles of a triangle that are not adjacent to an exterior angle are called the opposite interior angles of the triangle.



In the diagram, ∠ACD is an exterior angle of triangle ΔABC. The opposite interior angles of exterior ∠ACD is ∠ABC and ∠BAC.

Question 12. What is an interior angle of a triangle?

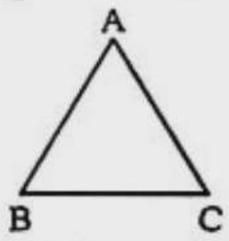
Solution : When two sides of a triangle meet, they form an angle inside the triangle, which is called an interior angle of the triangle. A triangle has three interior angles, and the sum of these three angles is 180°.

Question 13. What is the relationship between the sides and angles of a triangle?

Solution : The three sides of a triangle create three angles. The largest angle is opposite the largest side, and the smallest angle is opposite the smallest side. Similarly, the largest side is opposite the largest angle, and the smallest side is opposite the smallest angle. The angles opposite the equal sides are also equal.

Question 14. Write the relationship between the sides and angles of triangle ABC.

Solution :



In triangle ABC, the angle opposite side AB is ∠ACB,
The angle opposite side BC is ∠BAC,
And the angle opposite side AC is ∠ABC.

Question 15. What type of triangle is triangle ABC if ∠A = 70° and ∠B = 20°?

Solution : In triangle ABC, ∠A + ∠B + ∠C = 180° [The sum of the three angles of a triangle is 180°].
or, 70° + 20° + ∠C = 180°.
∴ ∠C = 180° – 70° – 20° = 180° – 90° = 90°.
[Since one angle of triangle ABC is 90° or a right angle, triangle ABC is a right-angled triangle.]

Question 16. If ∠A = ∠B = 40° in triangle ΔABC, then show that triangle ABC is an isosceles triangle.

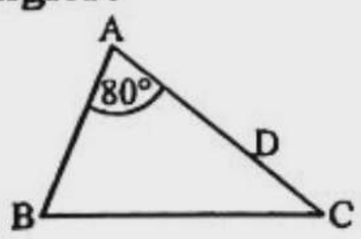
Solution : If two angles of a triangle are equal, then the sides opposite those angles are also equal.
In triangle ABC, since ∠A = ∠B = 40°, AC = BC.
That is, two sides of triangle ABC are equal.
Therefore, triangle ABC is an isosceles triangle. **[Showed]**

Question 17. What type of triangle is triangle ΔABC if ∠A = 70° and ∠B = 40°?

Solution : In triangle ΔABC, ∠A + ∠B + ∠C = 180°
[The sum of the three angles of a triangle is 180°].
or, 70° + 40° + ∠C = 180°.
or, ∠C = 180° – 110° = 70°.
So, ∠A = ∠C = 70°.
We know that the sides opposite equal angles are equal. Therefore, the triangle is isosceles.

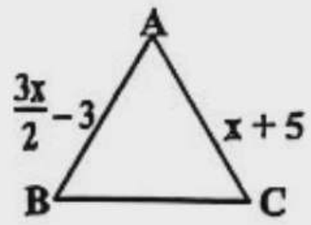
Question 18. If AC > AB and ∠BAC = 80° in triangle ΔABC, then what is the sum of the other two angles?

Solution :



In triangle ΔABC,
AC > AB and ∠BAC = 80°
Again, ∠BAC + ∠ABC + ∠ACB = 180°
[The sum of the three angles of a triangle is 180°].
or, 80° + ∠ABC + ∠ACB = 180°.
or, ∠ABC + ∠ACB = 180° – 80° = 100°.
The sum of the other two angles is 100°.

Question 19. What is the value of x in triangle ΔABC if AB = AC?



Solution : AB = AC.

or, $\frac{3x}{2} - 3 = x + 5$

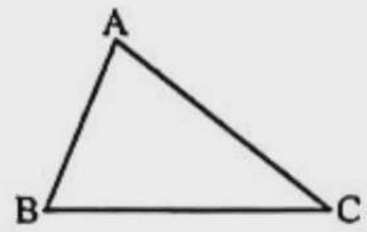
or, $\frac{3x}{2} = x + 8$

or, 3x = 2x + 16

∴ x = 16.

Question 20. What is the relationship between AC and AB in triangle ΔABC if ∠B > ∠C?

Solution : In the diagram, ∠B > ∠C. We know that if one angle of a triangle is greater than another angle, then the side opposite the greater angle is larger than the side opposite the smaller angle.

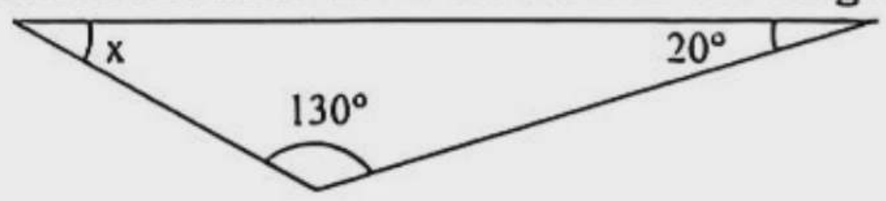


That is, if ∠ABC > ∠ACB, then AC > AB.

Question 21. Write the relationship between the sum or difference of any two sides of a triangle and the third side.

Solution : The sum of the lengths of any two sides of a triangle is greater than the length of the third side. The difference of the lengths of any two sides of a triangle is less than the length of the third side.

Question 22. Find the value of x in the diagram.



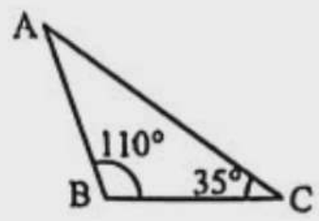
Solution : We know that the sum of the three angles of a triangle is 180°
or, ∠x + 130° + 20° = 180°
or, ∠x = 180° – 130° – 20°
∴ ∠x = 30°
The required value of x is 30°.

Question 23. If ∠ABC = 110° and ∠ACB = 35° in triangle ΔABC, then find the value of ∠BAC.

Solution : Given that, in triangle ΔABC

∠ABC = 110° and ∠ACB = 35°

We know that the sum of the three angles of a triangle is 180°



∴ ∠ABC + ∠ACB + ∠BAC = 180°

or, 110° + 35° + ∠BAC = 180°

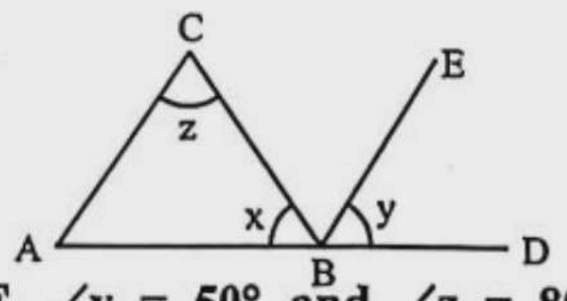
or, ∠BAC + 145° = 180°

or, ∠BAC = 180° – 145°

∴ ∠BAC = 35°.

The required value of 35°.

Question 24.

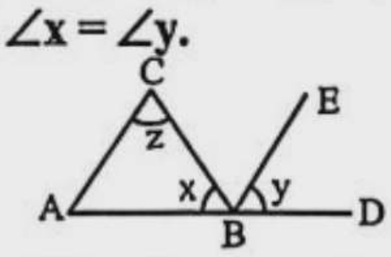


If AC ∥ BE, ∠y = 50° and ∠z = 80° in the diagram, then show that ∠x = ∠y.

Solution : Here,

∠y = 50°

∠z = 80°



We know, that the sum of the three angles of a triangle is 180°

∴ ∠ABC + ∠BCA + ∠CAB = 180°

or, ∠x + ∠z + ∠y = 180° [∵ AC ∥ BE ∴ ∠CAB = ∠EBD = ∠y]

or, ∠x + 80° + 50° = 180° [∵ ∠y = 50° and ∠z = 80°]

or, ∠x + 130° = 180°

or, ∠x = 180° – 130°

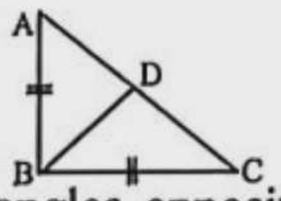
or, ∠x = 50°

∵ ∠y = 50°

∴ ∠x = ∠y. **(Showed)**

Question 25. If AB = BC and ∠B = 1 right angle in the right-angled triangle ABC, then what is the value of ∠C?

Solution : Here, in the right-angled triangle ABC ∠ABC = 1 right angle and AB = BC.



So, ∠BAC + ∠ACB = 90° [The angles opposite equal sides are equal, so ∠BAC = ∠ACB].

or, ∠ACB + ∠ACB = 90°

or, 2∠ACB = 90°

∴ ∠ACB = 45° which means ∠C = 45°.

Question 26. If the three sides of a triangle are 6 cm, 8 cm, and 10 cm respectively, then verify whether it is possible to draw a triangle with these sides.

Solution We know that the sum of any two sides of a triangle is greater than the third side.

Here, 6 + 8 = 14 > 10

6 + 10 = 16 > 8

And 8 + 10 = 18 > 6

Therefore, it is possible to draw a triangle with these sides.

Question 27. Is it possible to draw a triangle with sides of 2 cm, 3 cm, and 4 cm? Verify.

Solution : We know that the sum of any two sides of a triangle is greater than the third side.

Here, 2 + 3 = 5 > 4

2 + 4 = 6 > 3

And 3 + 4 = 7 > 2

Therefore, it is possible to draw a triangle with these sides.

Question 28. Is it possible to draw a triangle with sides of 2 cm, 3 cm, and 6 cm? Verify.

Solution : We know that the sum of any two sides of a triangle is greater than the third side.

Here, 2 + 6 = 8 > 3

3 + 6 = 9 > 2

But 2 + 3 = 5 ≯ 6

Therefore, it is not possible to draw a triangle with these sides.

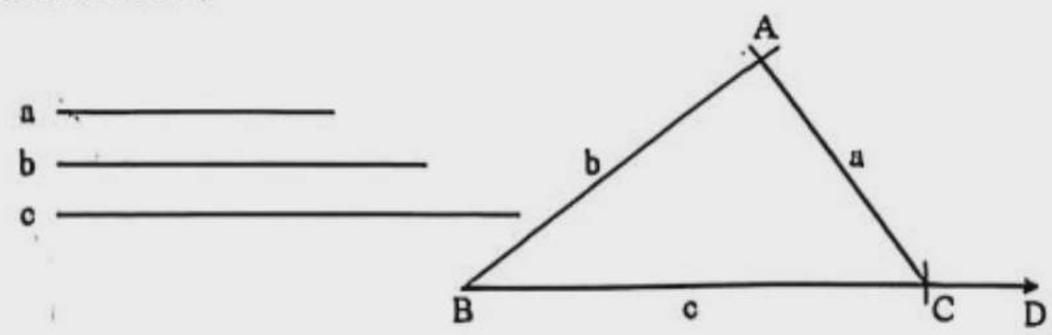
Question 29. What data are required to draw a specific triangle?

Solution : A specific triangle can be easily drawn if the following data are known:

1. Three sides.
2. Two sides and the included angle.
3. One side and the two angles adjacent to it.
4. Two angles and the side opposite one of them.
5. Two sides and the angle opposite one of them.
6. The hypotenuse and one other side or angle of a right-angled triangle.

Question 30. Draw a triangle whose three sides are given.

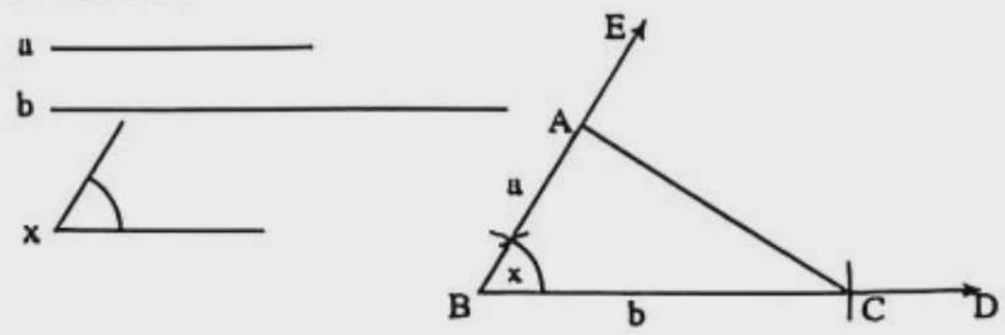
Solution :



A triangle ABC is drawn, where AC = a, AB = b and BC = c.

Question 31. Draw a triangle whose two sides and the included angle are given.

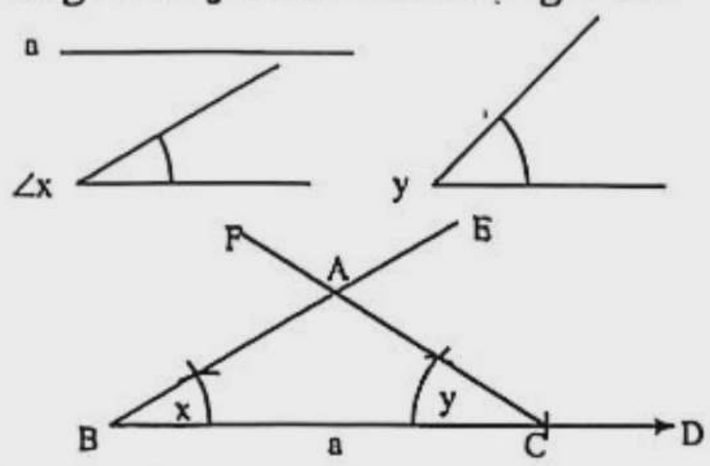
Solution :



A triangle ABC is drawn with AB = a, BC = b and the included angle ∠ABC = ∠x

Question 32. Draw a triangle whose one side and the two angles adjacent to it are given.

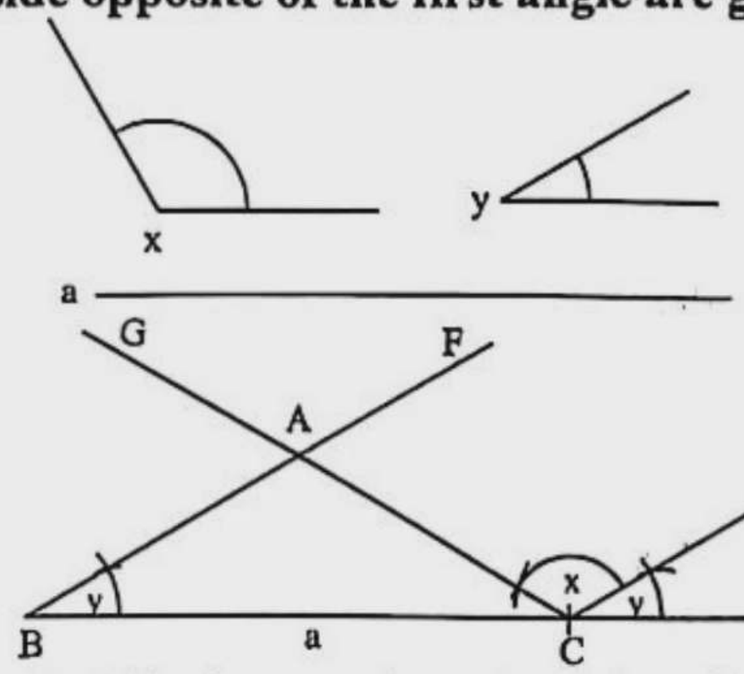
Solution :



A triangle ABC is drawn, where BC = a and the adjacent angles ∠ABC = ∠x and ∠ACB = ∠y.

Question 33. Draw a triangle whose two angles and the side opposite of the first angle are given.

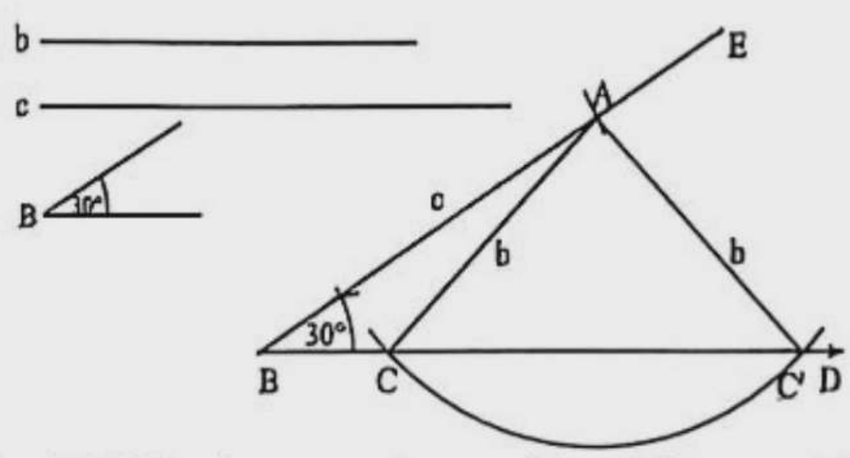
Solution :



A triangle ABC is drawn, where the side BC = a is opposite of ∠A.

Question 34. Draw a triangle whose two sides and the angle opposite one of the sides are given.

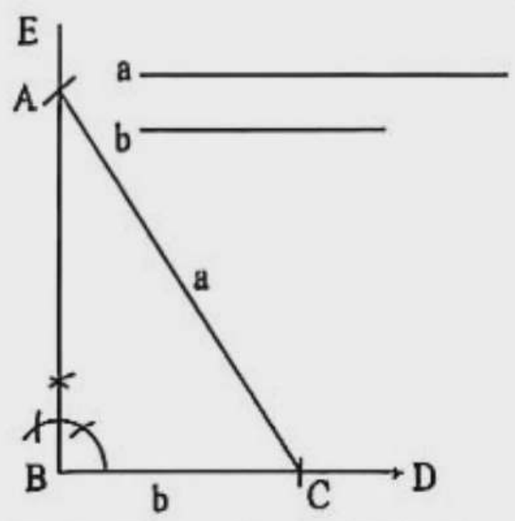
Solution :



A triangle ABC is drawn, where sides AB = c, AC = b, and the angle ∠ABC = 30° opposite side AC = b.

Question 35. Draw a right-angled triangle whose hypotenuse and one other side are given.

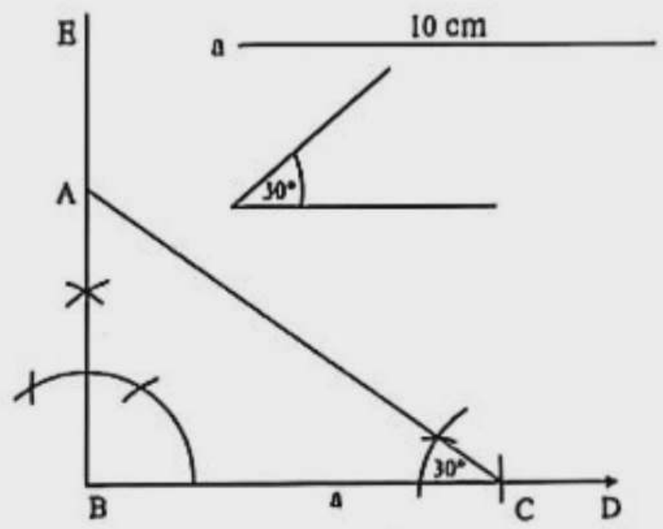
Solution :



A right-angled triangle ABC is drawn, where hypotenuse AC = a and one side BC = b.

Question 36. Draw a right-angled triangle whose one side is 10 cm and one acute angle is 30°.

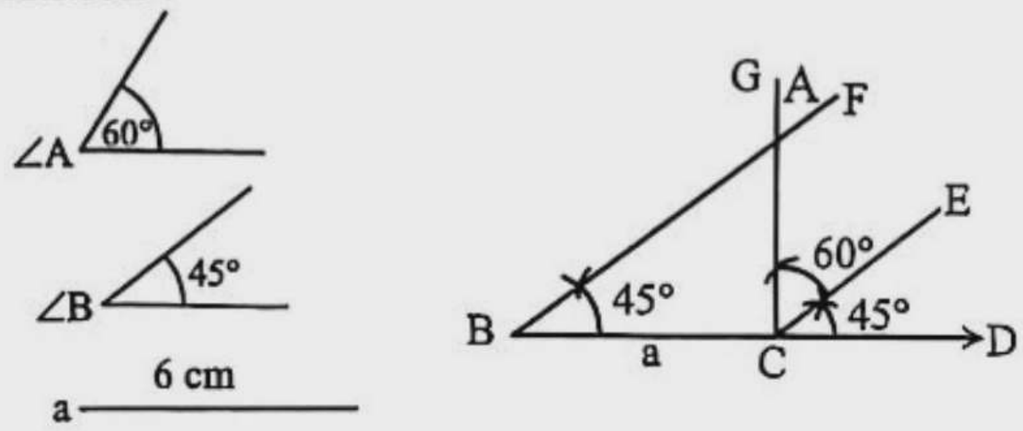
Solution :



A triangle ABC is drawn, where one side BC = a = 10 cm and one acute angle ∠ACB = 30°.

Question 37. Draw a triangle whose two angles are 45° and 60° and the side opposite the 60° angle is 6 cm.

Solution :



A triangle ABC is drawn, where ∠ABC = 45°, ∠BAC = 60°, and the side BC = a = 6 cm opposite ∠BAC.

Question 38. What is meant by the congruence of two objects?

Solution : When one object completely matches another object, the two objects are said to be congruent to each other. That is, two objects are congruent when they have the same shape and size.

Question 39. What is meant by the congruence of triangles?

Solution : If two triangles have the same shape and size, they are said to be congruent. If two triangles are congruent, then their corresponding sides and corresponding angles are equal.

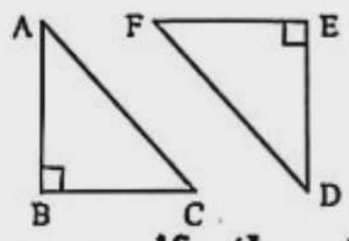
Question 40. If AB = DE and BC = EF in triangles ΔABC and ΔDEF, then what other condition is required for the triangles to be congruent?

Solution : Two triangles will be congruent if the three sides of one triangle are equal to the three sides of the other triangle.

∴ Triangles ΔABC and ΔDEF will be congruent if AB = DE, BC = EF, and AC = DF.

That is, if AC = DF, then the two triangles will be congruent.

Question 41.



In the diagram, if the two triangles are congruent, will the hypotenuses be equal? Verify

Solution : If triangles ΔABC and ΔDEF are congruent, then the three sides of one triangle will be equal to the three sides of the other triangle, and the three angles of one triangle will be equal to the three angles of the other triangle.

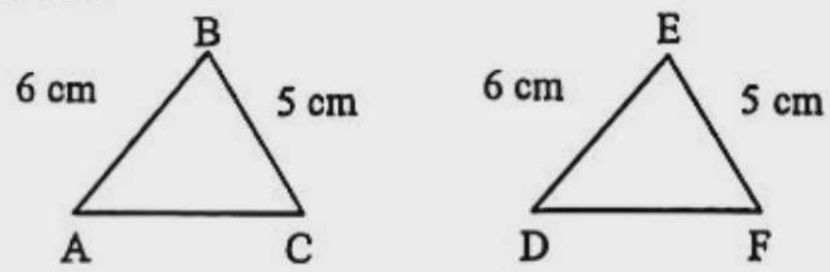
That is, AB = DE, BC = EF and AC = DF

Again, ∠A = ∠D, ∠B = ∠E and ∠C = ∠F

That is, if the two triangles are congruent, then the hypotenuse AC = the hypotenuse DF.

Question 42. If AB = DE = 6 cm and BC = EF = 5 cm in triangles ΔABC and ΔDEF, and the perimeter of triangle DEF is 20 cm, then what is the value of AC for the triangles to be congruent?

Solution :



If triangles ΔABC and ΔDEF are congruent, then their corresponding sides will be equal. That is, AB = DE, BC = EF, and AC = DF.

If the perimeter of triangle ΔDEF is 20 cm, then–

DE + EF + DF = 20

or, 6 + 5 + DF = 20 [Given that]

or, 11 + DF = 20

or, DF = 20 – 11

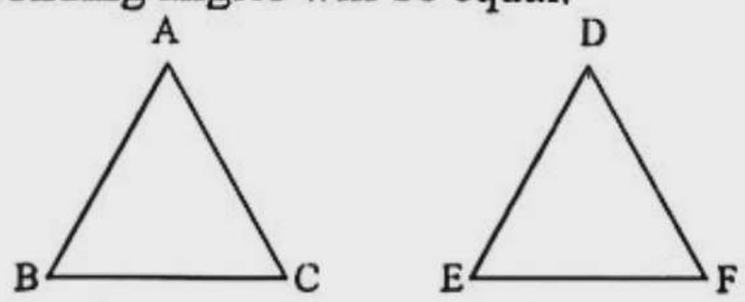
∴ DF = 9

Therefore, AC = DF = 9 cm.

So, if AC = 9 cm, then the two triangles will be congruent.

Question 43. Under what condition will triangles ΔABC and ΔDEF be congruent if AB = DE and AC = DF?

Solution : We know that if two triangles are congruent, then their corresponding sides and corresponding angles will be equal.



Given that, in triangles ΔABC and ΔDEF, AB = DE and AC = DF

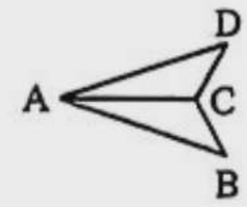
If triangles ΔABC and ΔDEF are congruent, then the three sides and the three angles of one triangle will be equal to the corresponding sides and angles of the other triangle.

Here, AB = DE, AC = DF and the remaining side BC = the side EF,

And the angles ∠A = ∠D, ∠B = ∠E, and ∠C = ∠F is needed.

Therefore, for the triangles to be congruent, ∠A = ∠D, ∠B = ∠E, ∠C = ∠F, and BC = EF is needed.

Question 44. In the diagram, if BC = CD and AB = AD, then determine the angle that is equal to ∠ACB.



Solution : Here, in triangles ΔABC and ΔADC

BC = CD

AB = AD

and AC = AC [common side].

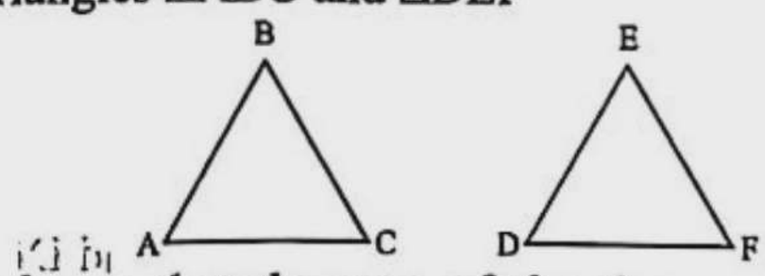
So, Δ ABC ≅ Δ ADC

Therefore, ∠ACB = ∠ACD

The required angle is ∠ACD

Question 45. If ∠A = 70°, ∠B = 80° and ∠C = ∠F in triangles, ΔABC ≅ Δ DEF, then what is the value of ∠F?

Solution : Let ∠A = 70°, ∠B = 80°, and ∠C = ∠F in triangles ΔABC and ΔDEF



We know that the sum of the three angles of a triangle is 180°

∴ ∠A + ∠B + ∠C = 180°

or, 70° + 80° + ∠C = 180°

or, 150° + ∠C = 180°

or, ∠C = 180° – 150°

∴ ∠C = 30°

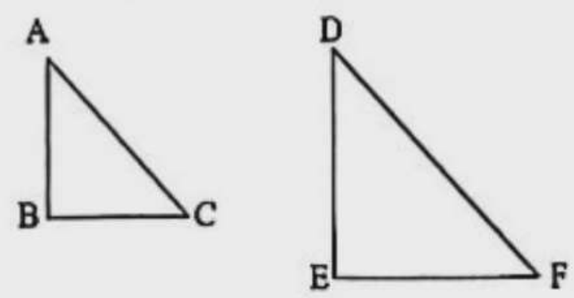
Since ∠C = ∠F

∴ ∠F = 30°

The required value of ∠F is 30°.

Question 46. What is similarity? Show with a diagram.

Solution : Two or more objects are similar if they have the same shape, regardless of their size.



In the diagram, triangles ΔABC and ΔDEF have the same shape, but the distances between corresponding points are not equal.

Therefore, triangles ΔABC and ΔDEF are similar.

Question 47. What can we say if two triangles or polygons are similar?

Solution : If two triangles or polygons are similar, then:

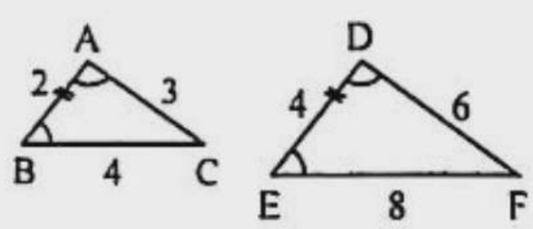
1. Their corresponding angles are equal.
2. Their corresponding sides are proportional.

Question 48. Explain why congruence is a special case of similarity.

Solution : The ratio of the sides of similar figures indicates the enlargement or reduction of one figure compared to the original figure.

Similar figures have the same shape but may not have the same size. If the size of similar figures is the same, then they become congruent figures. Therefore, congruence is a special case of similarity.

Question 49.



Show the relationship between the sides of the two triangles in the diagram.

Solution : In the given triangles ΔABC and ΔDEF,

$$\frac{AB}{DE}=\frac{2}{4}=\frac{1}{2}$$

$$\frac{BC}{EF}=\frac{4}{8}=\frac{1}{2}$$

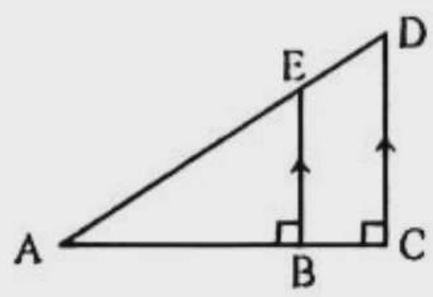
$$\frac{AC}{EF}=\frac{3}{6}=\frac{1}{2}$$

Since each ratio is equal, sides DE, EF, and DF are proportional to sides AB, BC, and AC respectively.

Question 50. What is meant by the similarity of triangles?

Solution : If the three sides of one triangle are proportional to the three sides of another triangle, then the two triangles are similar. Or, if the corresponding angles of two triangles are equal, then the triangles are similar with angle. That is, the two triangle will be similar

Question 51.



Verify whether the two triangles in the diagram are similar.

Solution The two triangles in the diagram are ΔABE and ΔACD,

where, BE || CD

∴ ∠ABE = ∠ACD [each is a right angle],

∠AEB = ∠ADC [corresponding angles],

and ∠DAC = ∠EAB [common angle].

∴ ΔABE and ΔACD are similar.

Question 52.

Explain the similarity of two triangles of the figure.

Solution : The two triangle of the figure are ΔPQN and ΔPLM.

Now, ΔPQN and ΔPLM

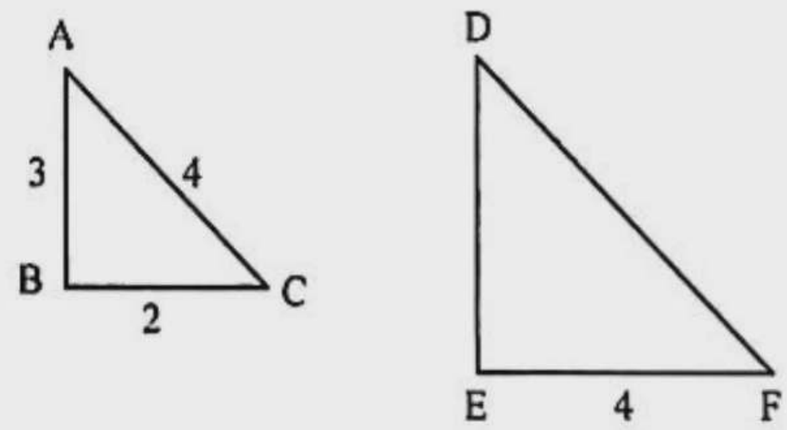
∠PQN = ∠PLM [similar angle]

∠PNQ = ∠PML [similar angle]

∠QPN = ∠LPM [common angle]

So, ΔPQN and ΔPLM are similar

Question 53.



In figure, if ΔABC and ΔDEF are similar, then DF = what?

Solution : Since ΔABC and ΔDEF are similar.

So, $\frac{AC}{DF}=\frac{BC}{EF}$

or, $\frac{4}{DF}=\frac{2}{4}$

or, $2DF = 4 \times 4$

$\therefore\ DF=\frac{4\times 4}{2}=8.$

Question 54. Write two conditions for the similarity of triangles.

Solution : Two conditions for the similarity of triangles are as follows :

1. The three sides of one triangle must be proportional to the three sides of the other triangle.
2. Two angles of one triangle must be equal to two angles of the other triangle.

Question 55. What are the conditions for the sides and angles of triangles to be similar?

Solution : If two sides of one triangle are proportional to two sides of another triangle, and the included angle of that two sides are equal to each other, then the two triangles are similar.

Question 56. What should be the relationship between the hypotenuse and sides of two triangles for them to be similar?

Solution : If the hypotenuse and one side of one right-angled triangle are proportional to the hypotenuse and the corresponding side of another right-angled triangle, then the two triangles are similar.

Question 57. What are similar quadrilaterals?

Solution : Two quadrilaterals are similar if their corresponding angles are equal and their corresponding sides are proportional.

Question 58. What is the relationship between the corresponding angles and sides of similar quadrilaterals? Or, what are the conditions for similar quadrilaterals?

Solution : For similar quadrilaterals :

1. The corresponding angles are equal.
2. The corresponding sides are proportional.

Creative Q/A — Designed as per learning outcomes

Mathematics

Ques. 01 AB and CD are two parallel straight line. PQ straight line intersects them at E and F

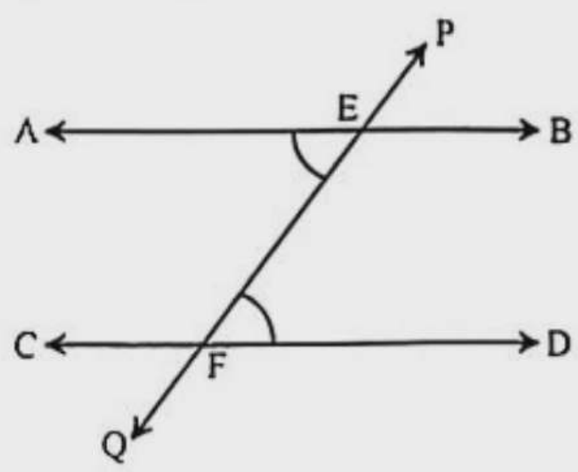
a. Draw the figure according to stem. *(Easy)* 2

b. Prove that, ∠AEF = ∠EFD. *(Medium)* 4

c. Prove that, ∠BEF + ∠BED = 2 right angle. *(Hard)* 4

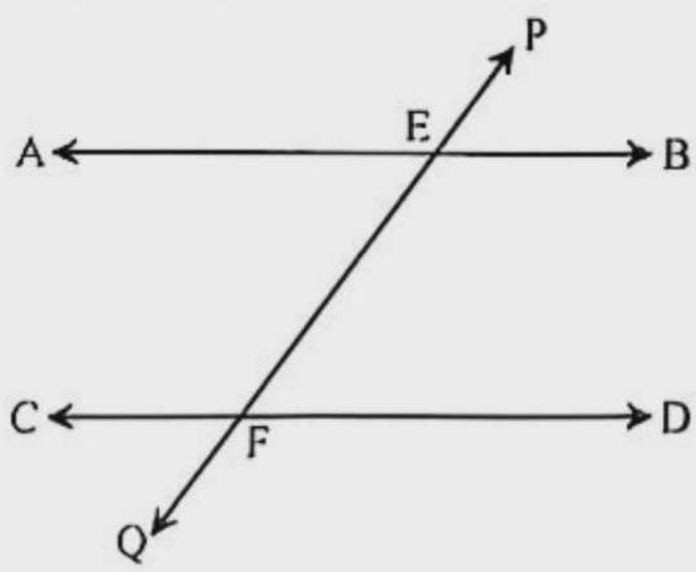
Solution to Question No. 01 :

a



Let AB || CD and the transversal PQ intersect them at E and F respectively.

b

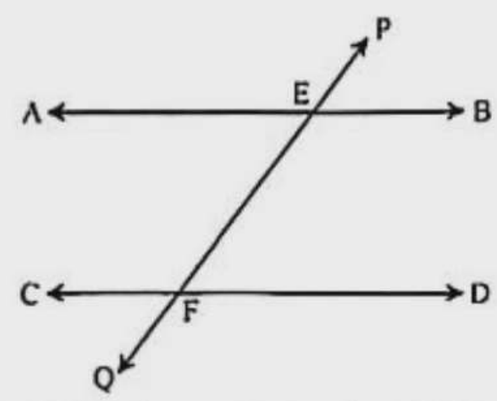


Let AB || CD and the transversal PQ intersect them at E and F respectively. It is required to prove that ∠AEF = alternate ∠EFD

Proof :

Steps	Justification
(1) ∠PEB = Corresponding ∠EFD	[According definition of parallel lines corresponding angles are equal.]
(2) ∠PEB = Vertically opposite ∠AEF	[Vertically opposite angles are equal]
Therefore, ∠AEF = ∠EFD **(Proved)**	[From (1) and (2)]

c

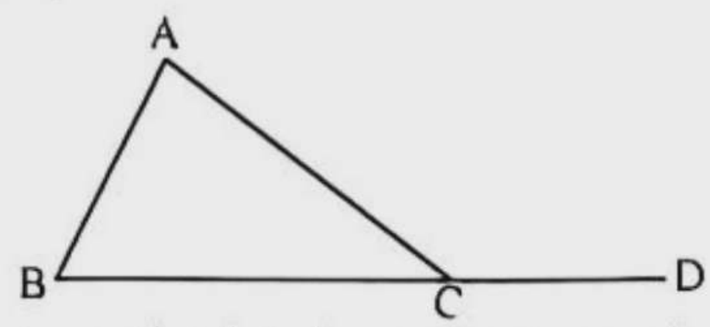


Let AB || CD and the transversal PQ intersect them at E and F respectively. It is required to prove that, ∠BEF + ∠EFD = two right angle

Proof :

Steps	Justification
(1) ∠PEB + ∠BEF = two right angle	[∠PEF = one straight angle]
(2) ∠PEB = ∠AEF = ∠EFD	[From 'b' we get]
∴ ∠EFD + ∠BEF = two right angle	[From (1) and (2)]
So, ∠BEF + ∠EFD = two right angle **(Proved)**	

Ques. 02



a. What are the interior opposite angles of the exterior angle ∠ACD? 2

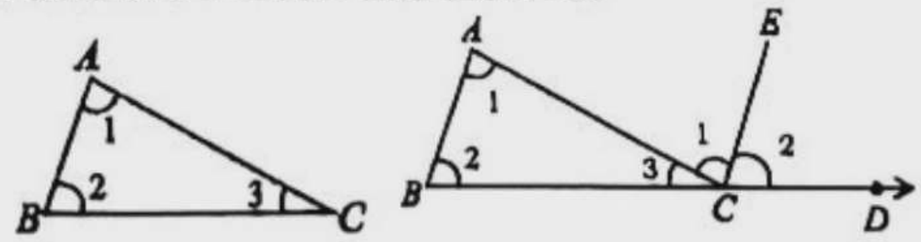
b. Prove that, ∠ABC + ∠BAC + ∠ACB = 180°. 4

c. Prove that, (AB + AC) > BC. 4

Solution to Question No. 02 :

a The interior opposite angles of the exterior angle ACD are ∠CAB and ∠ABC.

b



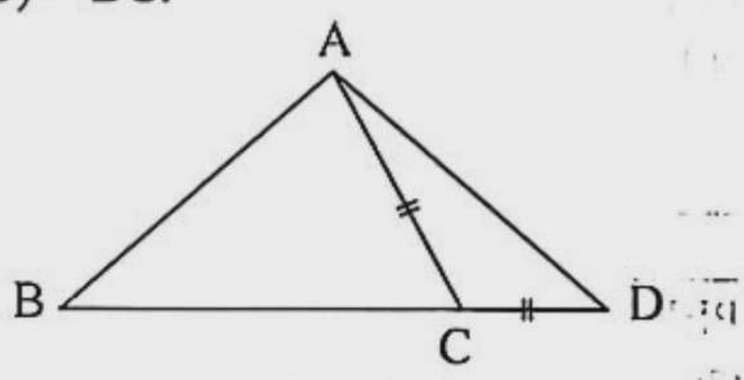
Particular enunciation : Let ABC be a triangle. It is required to prove that $\angle BAC + \angle ABC + \angle ACB = 2$ right angles.

Construction : Extended BC to D and drawn CE parallel to BA.

Proof :

Steps	Justification
(1) $\angle BAC = \angle ACE$	[BA and CE are parallel and AC is a transversal]
(2) $\angle ABC = \angle ECD$	[∵ The alternate angles are equal]
(3) $\angle BAC + \angle ABC = \angle ACE + \angle ECD = \angle ACD$	[BA and CE are parallel and BD is a transversal]
(4) $\angle BAC + \angle ABC + \angle ACB = \angle ACD + \angle ACB$	[∵ The corresponding angles are equal]
(5) $\angle ACD + \angle ACB = 2$ right angles	[Adding $\angle ACB$ to both sides]
∴ $\angle BAC + \angle ABC + \angle ACB = 2$ right angles. **(Proved)**	

c **Particular enunciation :** Let, ABC is a triangle and BC is its biggest side.
Now, it is required to prove that
$(AB + AC) > BC$.



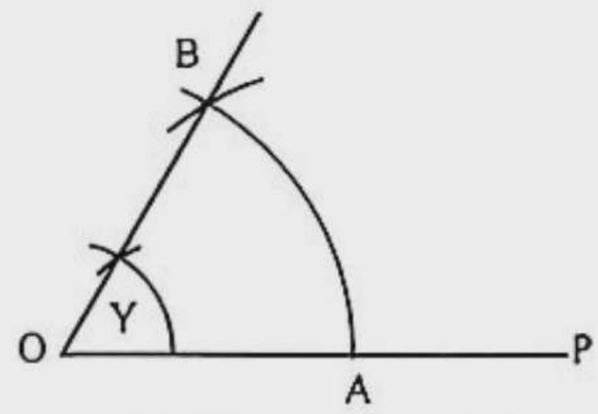
Construction : The side BC of ΔABC is extended to D in such a way so that AC = CD. A and D are joined.

Proof : In ΔACD, AC = CD, By construction.
∴ ADC = $\angle CAD$, since opposite angles of equal sides in a triangle are equal.
Again, $\angle BAD > \angle CAD$
$\Rightarrow \angle BAD > \angle ADC$.
∴ In ΔABD, side BD > side AB
or, side BC of ΔABC + side CD of ΔACD > side AB of ΔABC
or, side BC of ΔABC + side AC of ΔACD > side AB of ΔABC
or, side BC of ΔABC + side AC of ΔABC > side AB of ΔABC
That is in ΔABC, side AB + side AC > side BC.
Thus, in ΔABC, AB + AC >BC. **(Proved).**

Ques. 03 Consider line segments a = 6cm, b = 4cm and $\angle X = 30°$, $\angle Y = 60°$.
a. Construct $\angle Y$ with pencil compass. 2
b. Construct a triangle with sides 'a' and 'b' and their including angle $\angle Y$. [Sign and description of construction is must] 4
c. Construct a triangle with sides 'a' and it's adjoining angles $\angle X$ and $\angle Y$. [Sign and description of construction is must] 4

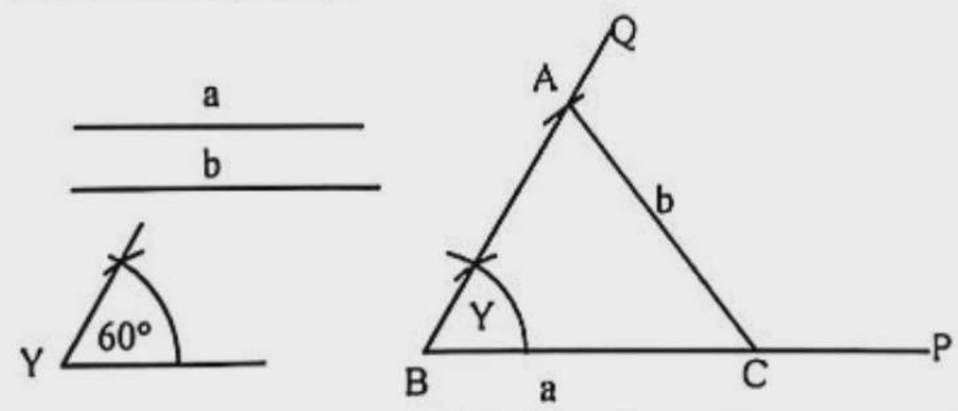
Solution to Question No. 03 :

a $\angle Y = 60°$ is constructed below by using pencil compass :



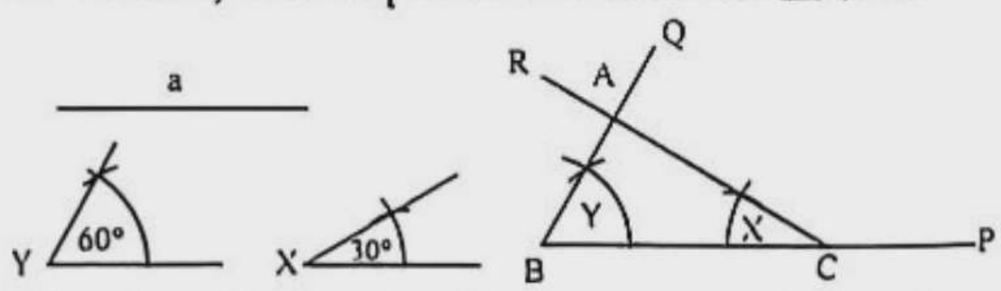
$\angle AOB = \angle Y = 60°$

b Let, 'a' and 'b' are two sides and $\angle Y = 60°$ is their included angle in ΔABC. Now, it is required to construct ΔABC.



Construction : BC = 'a' is taken from any line segment BP.
At B, $\angle Y = 60°$
$\angle PBQ$ is drawn. Then centering C and taking radius of 'b', an arc is drawn above BP.
Let the arc, intersects BQ at A. Finally, A and C are joined.
Thus, the required ΔABC is drawn.

c Let ABC is a triangle. whose one side is 'a' and its two adjacent angles are $\angle X = 30°$ and $\angle Y = 60°$. Now, it is required to construct ΔABC.

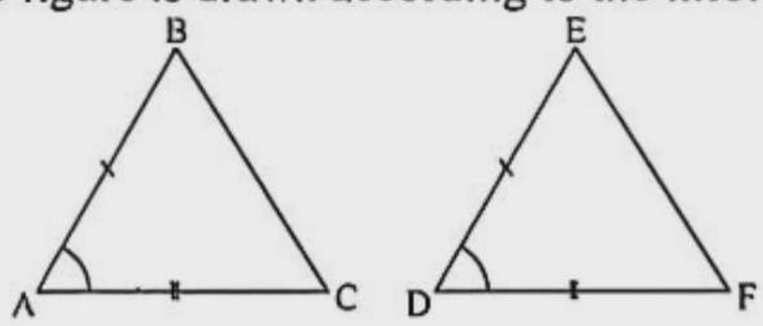


Construction : Any line segment BP is taken. BC = a is then taken from BP.
Again, $\angle PBQ = \angle Y = 60°$ at B and $\angle BCR = \angle X = 30°$ at C are drawn. Let, BQ and CR mutually intersect at A.
Thus, ΔABC is drawn which is the desired triangle.

Ques. 04 At ΔABC and Δ DEF AB = DE, AC = EF and Included $\angle BAC$ = Included $\angle EDF$
a. Draw the figure according to the information. *(Easy)* 2
b. Prove that, $\Delta ABC \cong \Delta DEF$ *(Medium)* 4
c. If $\angle B = \angle E$, $\angle C = \angle F$ and BC = EF, then prove that two triangles are congruent *(Hard)* 4

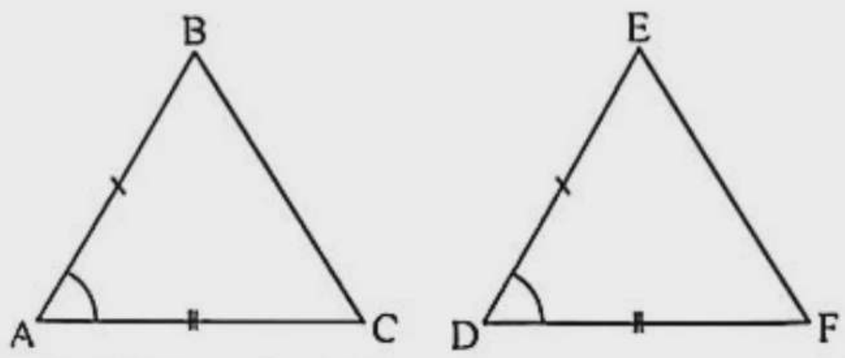
Solution to Question No. 04 :

a The figure is drawn according to the information



In the ΔABC and ΔDEF, AB = DE, AC = DF and the included ∠BAC = the included ∠EDF.

b

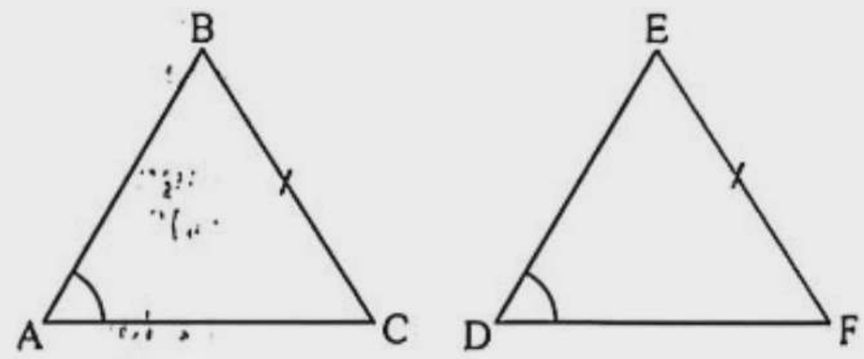


In the ΔABC and ΔDEF, AB = DE, AC = DF and the included ∠BAC = the included ∠EDF. It is required to prove that ΔABC ≅ ΔDEF

Proof :

Steps	Justification
(1) Place ΔABC on ΔDEF so that the point A falls on the point D, the side AB along the side DE and C falls on the same side of DE as F. Now as AB = DE, the point B must coincide with the point E.	[congruence of sides]
(2) Again, since AB falls along DE, and ∠BAC = ∠EDF, AC must fall along DF.	[congruence of angles]
(3) Now since AC = DF, the point C must coincide with the point F.	[congruence of angles]
(4) Then since B coincides with E and C with F the side BC must coincide with the side EF. Hence the ΔABC coincides with the ΔDEF. ΔABC ≅ DEF **(Proved)**	[A unique line can be drawn through two points]

c



Let in the ΔABC and ΔDEF, ∠B = ∠E, ∠C = ∠F and the side BC = the corresponding side EF. It is required to prove that the ΔABC ≅ ΔDEF.

Proof :

Steps	Justification
(1) Place the ΔABC on the ΔDEF, so that B falls on E, BC along EF and A falls on the side of EF as D. Then, since BC = EF, C coincides with F.	
(2) Again because ∠B = ∠E, BA must fall along ED and because ∠C = ∠F, CA must fall along FD.	[congruence of sides] [congruence of angles]
(3) ∴ The common point A of BA and CA coincides That is, ΔABC falls on ΔDEG equally. with the common point D of BD and ED. ∠ABC ≅ ΔDEF **(Proved)**	

Super Suggestions

Super Suggestions with 100% preparatory questions selected by the Master Trainer Panel

Dear learners, important multiple choice, short and creative questions of this chapter selected by Master Trainer Panel for Half-Yearly and Annual Exams are presented below. Learn the answers to the mentioned questions well to ensure 100% preparation.

Question Pattern		7★	5★	3★
MCQs with Answers	Learn each MCQs in this chapter thoroughly.			
Short Q/A	Exercise 8.1	3, 7, 9, 12, 14, 18, 20, 34, 38	2, 5, 10, 13, 19, 21, 25, 40	4, 6, 15, 22, 32, 35, 37, 39
	Exercise 8.2	2, 5, 9	3, 7, 10	4, 6, 11
	Appendix	2, 5, 8, 11, 13, 15, 22, 28, 32, 37, 39	3, 6, 9, 14, 17, 21, 25, 29, 45, 48, 51	4, 7, 12, 24, 27, 31, 35, 38, 41, 52, 56
Creative Q/A	Exercise 8.1	2, 5, 9, 11	3, 6, 10, 13	1, 4, 12, 14
	Exercise 8.2	1, 4, 6, 9	2, 5, 7	3, 8, 17
	Appendix	2	1, 4	3

Assessment & Evaluation

A question bank presented in the form of a class test to assess the preparation

Class Test Time : 3 hours **Mathematics** Full marks : 100

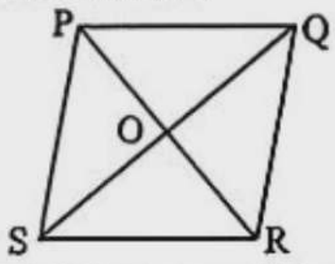
Class : Eight

Multiple Choice Questions (Each question carries 1 mark) $1 \times 30 = 30$

[N.B. : Answer all the questions. Each question carries one mark. Block fully, with a ball-point pen, the circle of the letter that stands for the correct/best answer in the "Answer Sheet" for Multiple Choice Question Type Examination.]

1. **What is the sum of four angles of a quadrilateral?**
   ⓐ 360° ⓑ 300° ⓒ 270° ⓓ 180°
2. **How many independent and unique data are needed to construct a quadrilateral?**
   ⓐ 1 ⓑ 3 ⓒ 4 ⓓ 5
3. **What is the total of four angles of a kite?**
   ⓐ 360° ⓑ 300° ⓒ 180° ⓓ 90°
4. **To construct a quadrilateral how many unique data are required?**
   ⓐ 3 ⓑ 4 ⓒ 5 ⓓ 6
5. **What is the sum of four angles of a kite?**
   ⓐ 120° ⓑ 180° ⓒ 270° ⓓ 360°
6. **Whose two diagonals and opposite angles are equal?**
   ⓐ Rectangle ⓑ Rhombus
   ⓒ Parallelogram ⓓ Trapezium
7. **How many data are to be known to draw a quadrilateral?**
   ⓐ Two ⓑ Three ⓒ Four ⓓ Five
8. i. Every rectangle is equiangular
   ii. Every square is equilateral
   iii. Every square is equiangular
   Which of the following is correct?
   ⓐ i & ii ⓑ i & iii ⓒ ii & iii ⓓ i, ii & iii
9. **What is sum of four angles of a kite?**
   ⓐ 180° ⓑ 270° ⓒ 300° ⓓ 360°
10. **The adjacent sides of a rectangle are 6 cm and 8 cm. Which one is the length of the diagonal in cm?**
    ⓐ 56 ⓑ 48 ⓒ 28 ⓓ 10
11. **In the rhombus ABCD if $\angle BCD = 130°$ then $\angle ABC$ = what?**
    ⓐ 30° ⓑ 50° ⓒ 90° ⓓ 130°

Answer the question No. 12 and 13 based on the following information :



In the fig. PQRS is a rhombus.

12. **Which one is correct of the following?**
    ⓐ PO = PS ⓑ OR = OQ
    ⓒ $\angle POQ = \angle PQO$ ⓓ $\angle ROS = 90°$
13. **What is the area of PQRS?**
    ⓐ PS × RS ⓑ PR × QS
    ⓒ $\frac{1}{2} \times PR \times QS$ ⓓ $\frac{1}{2} \times OR \times OQ$
14. **If the perimeter of a square is 40 cm, then its area —.**
    ⓐ 60 sq. cm. ⓑ 80 sq. cm.
    ⓒ 90 sq. cm. ⓓ 100 sq. cm.
15. **How many data are needed to construct a rhombus?**
    ⓐ 1 ⓑ 2 ⓒ 3 ⓓ 4
16. **How many edges of a rectangular solid?**
    ⓐ 12 ⓑ 8 ⓒ 6 ⓓ 4
17. **The lengths of a side of a square is 'a'. What is the lengths of diagonal?**
    ⓐ 4a ⓑ $\sqrt{2}a$ ⓒ $\sqrt{2}a$ ⓓ a^2
18. **How many sq. metre is the area of total surface of a cube with side $\sqrt{5}$ meter?**
    ⓐ 5 ⓑ 20 ⓒ 30 ⓓ 150
19. **How many times is a square to the square drawn on its diagonal?**
    ⓐ Half ⓑ Equal
    ⓒ Two times ⓓ Three times
20. **If the edge of a cube is 4 cm, what is the area of the entire faces of the cube in sq. cm?**
    ⓐ 16 ⓑ 64 ⓒ 69 ⓓ 96
21. **What is the area of rectangle ABCD When AB = 18m and AD = 10m?**
    ⓐ 60 sq. m. ⓑ 100 sq. m.
    ⓒ 180 sq. m. ⓓ 360 sq. m.
22. **If ABCD is quadrilateral and diagonal AC = diagonal BD. Which one of the following is correct?**
    ⓐ Rhombus ⓑ Parallelogram
    ⓒ Rectangle ⓓ Trapezium
23. **If $\angle B = 60°$ of a parallelogram ABCD, which one of the following is the value of $\angle C$?**
    ⓐ 60° ⓑ 90° ⓒ 120° ⓓ 240°
24. **How many data are needed to construct a quadrilateral?**
    ⓐ 1 ⓑ 4 ⓒ 5 ⓓ 6
25. **What are the sum of four angles of a trapezium?**
    ⓐ 90° ⓑ 120° ⓒ 180° ⓓ 360°
26. **Two pairs of adjacent sides of which of the following quadrilateral are equal?**
    ⓐ Parallelogram ⓑ Rectangle
    ⓒ Kite ⓓ Trapezium
27. **To construct a quadrilateral how many unique data are required?**
    ⓐ 6 ⓑ 5 ⓒ 4 ⓓ 3
28. **What is called the quadrilateral of which two pairs of adjacent sides are equal?**
    ⓐ Rectangle ⓑ Parallelogram
    ⓒ Square ⓓ Kite
29. **Which is the oldest branch of mathematics?**
    ⓐ Geometry ⓑ Arithmetic
    ⓒ Algebra ⓓ Statistics
30. **What is the term for a postulate in which a geometric concept is logically established?**
    ⓐ Construction ⓑ Theorem
    ⓒ Postulate ⓓ Corollary

Short-Answer Question (Each question carries 2 marks)

Answer any 10 of the following questions : $2 \times 10 = 20$

1. What is quadrilateral region? Draw a quadrilateral and name its different parts.
2. Write four similarities between a rhombus and a parallelogram.
3. Explain why a square is a type of rhombus.
4. Define a trapezium with a diagram.
5. Write four differences between a rhombus and a rectangle.
6. If the lengths of two adjacent sides of a rectangle are 4 cm and 3 cm, then what is the length of its diagonal?
7. If the perimeter of a square is 36 cm, then what is the length of its diagonal in cm?
8. If the perimeter of a square is a unit, then what is its area?
9. Find the area of the adjacent rectangle ABCD.
10. What is a trapezium? Write the formula for finding the area of a trapezium.
11. What is a rhombus? Write the formula for finding the area of a rhombus, including the introduction of variables.
12. What is a rectangular solid? Write the formula for finding the area of the entire surface of a rectangular solid.
13. Write four characteristics of a rectangular solid.
14. Write four characteristics of a cube.
15. If the side of a cube-shaped box is 4.5 cm, then find the volume of the box.

Creative Question (Each question carries 10 marks)

Answer any 5 of the following questions : $10 \times 5 = 50$

Mathematics

1. Read attentively the following statement :
"ABCD is a quadrilateral. BD is a diagonal of it."
   a. Now according to the given information draw a geometric figure and give a brief description. 2
   b. If AB = CD and ∠ABD = ∠BDC, prove that ABCD is a parallelogram. 4
   c. Prove that the sum of four angles of ABCD is four right angles. 4
2. ABCD is a parallelogram. The bisector BP of ∠B intersects AD at the point P, the bisector DQ of ∠D intersects BC at Q and the bisector CR of ∠C intersects DQ at R.
   a. Draw the angle 75° with the help of pencil and compus. 2
   b. Prove that, ∠CRD = 90°. 4
   c. Prove that, BP ∥ DQ. 4
3. Diagonals PR and QS of parallelogram PQRS intersect at O.
   a. If ∠PQR = 120°, find out the value of the complementary angle of ∠QPS. 2
   b. Prove that, OP = OR and OQ = OS. 4
   c. If ∠PQR = 90°, prove that, PR = QS. 4
4. The two diagonals AC and BD of the parallelogram ABCD intersect each other at the point 0.
   a. The length of the two diagonals of rhombus is 11 cm, and 15 cm respectively. Find the area. 2
   b. Prove that, AO = CO, BO = DO. 4
   c. If AB = AD, then prove that, ∠AOB = 1 right angle. 4
5. The diagonals AC and BD of the parallelogram ABCD intersect at O.
   a. Draw a kite and a Trapezium. 2
   b. Prove that AO = OC and BO = OD 4
   c. If the two bisectors of ∠B and ∠C meet together of the point E. Prove that BE ⊥ CE. 4
6. The length of two sides of a quadrilateral are p = 5cm, q = 3.8 cm and three angles are ∠x = 75°, ∠y = 80° and ∠z = 100°.
   a. Construct a square of which length of each side is 4cm. 2
   b. Draw the quadrilateral. [Sign of construction and description are needed] 4
   c. Draw a parallelogram taking p and q are adjacent sides and their included angle is ∠x. [Sign of construction and description are needed] 4
7. The length of three sides of a quadrilateral are a = 4 cm, b = 5cm, c = 5.9 cm and the two diagonals are d = 6.5 cm, e = 7 cm.
   a. Find the area of a circle with the radius 'd'. 2
   b. Draw the quadrilateral with sign of construction and description. 4
   c. Draw a rhombus with a side equal to the 'c' and an angle is 65°. [Sign of construction and description are essential.] 4
8. The length of three sides of a quadrilateral are a = 6 cm, b = 4.5 cm and c = 3.5 and two Marks angles are ∠x = 60°, ∠y = 80°.
   a. Draw angle 45° with the help of pencil compass. 2
   b. Construct the quadrilateral. (Sign of construction and description are needed.) 4
   c. Construct a rhombus which one side is equal to b and one angle is equal to ∠x. (Sign of construction and description are needed) 4

Answer Sheet ▸ Multiple Choice Questions

1	ⓐ	2	ⓓ	3	ⓐ	4	ⓒ	5	ⓓ	6	ⓐ	7	ⓓ	8	ⓓ	9	ⓓ	10	ⓓ	11	ⓑ	12	ⓓ	13	ⓒ	14	ⓓ	15	ⓑ
16	ⓒ	17	ⓒ	18	ⓒ	19	ⓒ	20	ⓓ	21	ⓒ	22	ⓒ	23	ⓒ	24	ⓒ	25	ⓓ	26	ⓒ	27	ⓑ	28	ⓒ	29	ⓐ	30	ⓑ

Solving Reference ▸ Short-Answer Questions

1 ▸ See Page 261; Ques. 01
2 ▸ See Page 261; Ques. 04
3 ▸ See Page 262; Ques. 06
4 ▸ See Page 262; Ques. 08
5 ▸ See Page 262; Ques. 10
6 ▸ See Page 262; Ques. 13
7 ▸ See Page 263; Ques. 15
8 ▸ See Page 263; Ques. 17
9 ▸ See Page 263; Ques. 18
10 ▸ See Page 264; Ques. 28
11 ▸ See Page 265; Ques. 29
12 ▸ See Page 265; Ques. 36
13 ▸ See Page 266; Ques. 37
14 ▸ See Page 166; Ques. 39
15 ▸ See Page 266; Ques. 42

Solving Reference ▸ Creative Questions

1 ▸ See Page 266; Ques. 01
2 ▸ See Page 269; Ques. 05
3 ▸ See Page 271; Ques. 08
4 ▸ See Page 273; Ques. 12
5 ▸ See Page 274; Ques. 13
6 ▸ See Page 286; Ques. 04
7 ▸ See Page 288; Ques. 06
8 ▸ See Page 289; Ques. 09