EXERCISE 27 (B)

Question 1.

In a trapezium ABCD, side AB is parallel to side DC. If ∠A = 78° and ∠C = 120°, find angles B and D.

Solution:

∵ AB || DC and BC is transversal

∴∠B and ∠C, ∠A and ∠D are Cointerior angles with their sum = 180°

i.e. ∠B + ∠C = 180°

⇒ ∠B + 120° = 180°

⇒ ∠B = 180° – 120°

⇒ ∠B = 60°

Also ∠A + ∠D = 180°

⇒ 78° + ∠D = 180°

⇒ ∠D = 180° – 78°

∠D = 102°

Question 2.

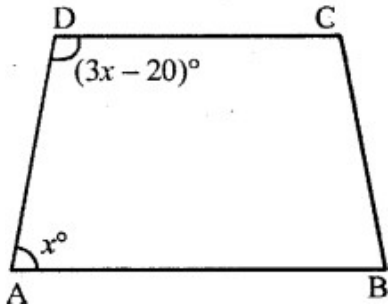
In a trapezium ABCD, side AB is parallel to side DC. If ∠A = x° and ∠D = (3x – 20)°; find the value of x.

Solution:

∵AB || DC and BC is transversal

∴∠A and ∠B are Co-interior angles with their sum = 180°

i.e. ∠A + ∠D = 180°



⇒ x° + (3x – 20)° = 180°

⇒ x° + 3x° – 20° = 180°

⇒ 4x° = 180° + 20°

x° = $\frac{200}{4}$ = 50°

∴Value of x = 50°

Question 3.

The angles A, B, C and D of a trapezium ABCD are in the ratio 3 : 4 : 5 : 6.

Le. ∠A : ∠B : ∠C : ∠D = 3:4: 5 : 6. Find all the angles of the trapezium. Also, name the two sides of this trapezium which are parallel to each other. Give reason for your answer

Solution:

As the trapezium ABCD is a quadrilateral,

$\therefore$ Sum of its interior angles $= 360°$

$\Rightarrow \angle A + \angle B + \angle C + \angle D = 360°$

$\Rightarrow 3x + 4x + 5x + 6x = 360°$

$\Rightarrow 18x = 360°$

$\Rightarrow x = \frac{360°}{18} = 20°$

$\therefore \angle A = 3x = 3 \times 20° = 60°$

and $\angle B = 4x = 4 \times 20° = 80°$

and $\angle C = 5x = 5 \times 20° = 100°$

and $\angle D = 6x = 6 \times 20° = 120°$

AB is parallel to DC.

$\because \angle A + \angle D = 180°$,

$\angle A$ and $\angle D$ are co-interior angles whose sum $= 180°$

Question 4.

In an isosceles trapezium one pair of opposite sides are ….. to each Other and the other pair of opposite sides are ….. to each other.

Solution:

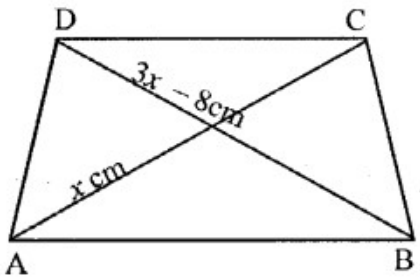
In an isosceles trapezium one pair of opposite sides are **parallel** to each other and the other pair of opposite sides are **equal** to each other.

Question 5.

Two diagonals of an isosceles trapezium are x cm and (3x – 8) cm. Find the value of x.

Solution:

∵The diagonals of an isosceles trapezium are of equal length

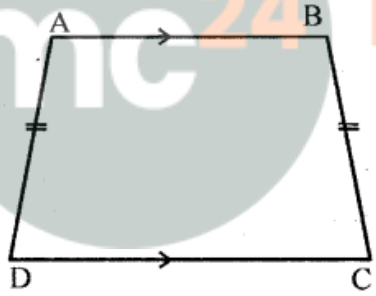


∴3x – 8 = x
⇒ 3x – x = 8 cm
⇒ 2x = 8 cm⇒ x = 4 cm
∴ The value of x is 4 cm

Question 6.
Angle A of an isosceles trapezium is 115° ; find the angles B, C and D.
Solution:

Since, the base angles of an isosceles trapezium are equal,

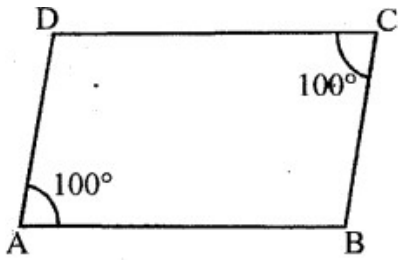
∴ ∠A = ∠B = 115°



Also, ∠A and ∠D are co-interior angles and their sum = 180°

∴ ∠A + ∠D = 180°
⇒ 115° + ∠D = 180°
⇒ ∠D = 180° – 115°
⇒ ∠D = 650°
Also, ∠D = ∠C = 65°
∴ ∠B = 115°, ∠C = 65° and ∠D = 65°

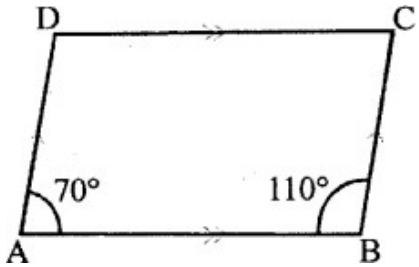
Question 7.
Two opposite angles of a parallelogram are 100° each. Find each of the other two opposite angles.
Solution:
Given : Two opposite angles of a parallelogram are 100° each



∵ Adjacent angles of a parallelogram are supplementary,
∴∠A + ∠B = 180°

⇒ 100° + ∠B = 180°
⇒ ∠B = 180° – 100°
⇒ ∠B = 80°
Also, opposite angles of a parallelogram are equal
∴∠D = ∠B = 80°
∴∠B = ∠D = 80°

Question 8.
Two adjacent angles of a parallelogram are 70° and 110° respectively. Find the other two angles of it.
Solution:
Given two adjacent angles of a parallelogram are 70° and 110° respectively.



Since, we know that opposite angles of a parallelogram are equal
∴∠C = ∠A = 70° and ∠D = ∠B = 110°

Question 9.
The angles A, B, C and D of a quadrilateral are in the ratio 2:3: 2 : 3. Show this quadrilateral is a parallelogram.
Solution:

Given, Angles of a quadrilateral are in the ratio 2 : 3 : 2 : 3

i.e. A : B : C : D are in the ratio 2 : 3 : 2 : 3

To prove - Quadrilateral ABCD is a parallelogram

Prooft - Let us take $\angle A = 2x$, $\angle B = 3x$, $\angle C = 2x$ and $\angle D = 3x$

We know, that the sum of interior angles of a quadrilateral = 360°

$\Rightarrow \angle A + \angle B + \angle C + \angle D = 360°$

$\Rightarrow 2x + 3x + 2x + 3x = 360°$

$\Rightarrow 10x = 360°$

$\Rightarrow x = \frac{360°}{10} = 36°$

$\therefore \angle A = \angle C = 2x = 2 \times 360° = 72°$

$\angle B = \angle D = 3x = 3 \times 36° = 108°$

Now, A quadrilateral ABCD is considered as a parallelogram.

(*i*) When opposite angles are equal,

i.e. $\angle A = \angle C = 72°$ and $\angle B = \angle D = 108°$

(*ii*) When adjacent angles are supplementary

i.e. $\angle A + \angle B = 180°$

and $\angle C = \angle D = 180°$

$\Rightarrow 72° + 108°$ and $72° + 108° = 180°$

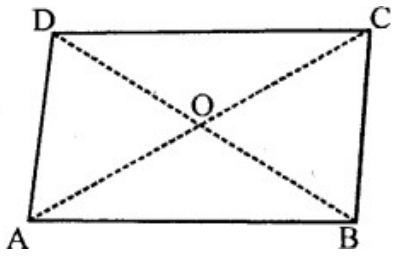
$\Rightarrow 180° = 180°$ and $180° = 180°$

Since, quadrilateral ABCD fulfils the conditions

$\therefore$ Quadrilateral ABCD is a parallelogram.

Question 10.

In a parallelogram ABCD, its diagonals AC and BD intersect each other at point O.



If AC = 12 cm and BD = 9 cm ; find; lengths of OA and OD.

Solution:

∵ When diagonal AC and BD intersect each other at point O,

then $OA = OC = \frac{1}{2} AC$

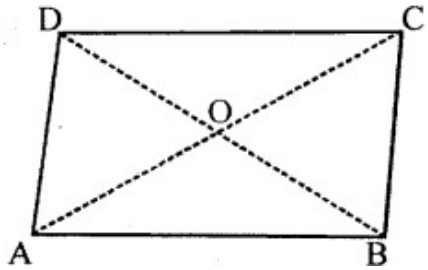
and $OB = OD = \frac{1}{2} BD$

$\therefore OA = \frac{1}{2} \times AC = \frac{1}{2} \times 12 = 6$ cm

and $OB = \frac{1}{2} \times BD = \frac{1}{2} \times 9 = 4.5$ cm

Question 11.

In parallelogram ABCD, its diagonals intersect at point O. If OA = 6 cm and OB = 7.5 cm, find the length of AC and BD.



Solution:

$\because$ When diagonal AC and BD intersect each other at point O,

then $OA = OC = \frac{1}{2} AC$

and $OB = OD = \frac{1}{2} BD$

$\therefore \quad OA = \frac{1}{2} \times AC \Rightarrow AC = 2 \times OA$

$\Rightarrow \quad AC = 2 \times 6 \text{ cm} = 12 \text{ cm},$

and $OB = \frac{1}{2} \times BD \Rightarrow BD = 2 \times OB$

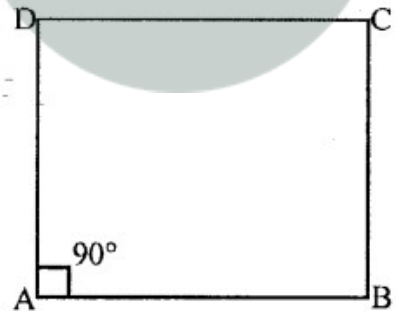
$\Rightarrow \quad BD = 2 \times 7.5 \text{ cm} \Rightarrow BD = 15 \text{ cm}$

Question 12.

In parallelogram ABCD, $\angle A = 90°$
(i) What is the measure of angle B.
(ii) Write the special name of the parallelogram.

Solution:

In parallelogram ABCD, $\angle A = 90°$



(i) $\because$ In a parallelogram, adjacent angles are supplementary

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

$\Rightarrow \quad 90° + \angle B = 180°$

$\Rightarrow \quad \angle B = 180° - 90°$

$\Rightarrow \quad \angle B = 90°$

(ii) The name of the given parallelogram is a rectangle.

Question 13.

One diagonal of a rectangle is 18 cm. What is the length of its other diagonal?

Solution:

∵ In a rectangle, diagonals are equal

⇒ AC = BD

Given, one diagonal of a rectangle = 18cm

∴ Other diagonal of a rectangle will be = 18cm

i.e. AC = BD = 18cm.

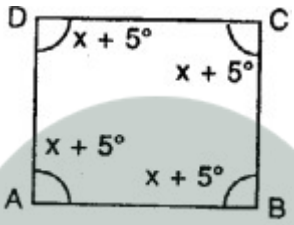
Question 14.

Each angle of a quadrilateral is x + 5°. Find:

(i) the value of x

(ii) each angle of the quadrilateral.

Give the special name of the quadrilateral taken.



Solution:

(*i*) We have,

$\angle A + \angle B + \angle C + \angle D = 360°$

∵ We know that the sum of interior angles of a quadrilateral is 360°

$\therefore \angle A + \angle B + \angle C + \angle D = 360°$

$\Rightarrow x + 5° + x + 5° + x + 5° + x + 5° = 360°$

$\Rightarrow 4x + 20° = 360°$

$\Rightarrow 4x = 360° - 20°$

$\Rightarrow x = \frac{340°}{4} = 85°$

(*ii*) Each angle of the quadrilateral ABCD $= x + 5°$

$= 85° + 5°$

$= 90°$

The name of the given quadrilateral is a rectangle.

Question 15.

If three angles of a quadrilateral are 90° each, show that the given quadrilateral is a rectangle.

Solution:

The given quadrilateral ABCD will be a rectangle, if its each angle is 90°
Since, the sum of interior angles of a quadrilateral is 360°.
∴∠A +∠B + ∠C + ∠D = 360°
⇒ 90° + 90° + 90° + ∠D = 360°
⇒ 270° + ∠D = 360°
⇒ ∠D = 360° – 270°
⇒ ∠D = 90°
Since, each angle of the quadrilateral is 90°.
∴The given quadrilateral is a rectangle.

Question 16.

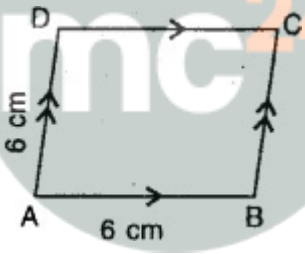
The diagnols of a rhombus are 6 .cm and 8 cm. State the angle at which these diagnols intersect.

Solution:

The diagnols of a Rhombus always intersect at 90°.

Question 17.

Write, giving reason, the name of the figure drawn alongside. Under what condition will this figure be a square.

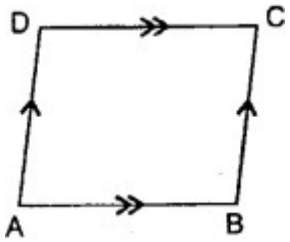


Solution:

Since, all the sides of the given figure are equal.
i.e. AB = BC = CD = DA = 6 cm
∴ The given figure is a rhombus.
This figure shall be considered as a square, if any angle is 90°.

Question 18.

Write two conditions that will make the adjoining figure a square.



Solution:

The conditions that will make the ad-joining figure a square are :
(i) All the sides must be equal.
(ii) Any angle is 90°.