EXERCISE 27(B)

1. In a trapezium ABCD, side AB is parallel to side DC. If $\angle A = 78^0$ and $\angle C = 120^0$, find angles B and D.

Solution:

Given

AB || DC and BC is transversal

We know that,

The sum of co-interior angles of a parallelogram = 180^0

Hence,

$\angle B + \angle C = 180^0$

$\angle B + 120^0 = 180^0$

$\angle B = 180^0 - 120^0$

We get,

$\angle B = 60^0$

Also,

$\angle A + \angle D = 180^0$

$78^0 + \angle D = 180^0$

$\angle D = 180^0 - 78^0$

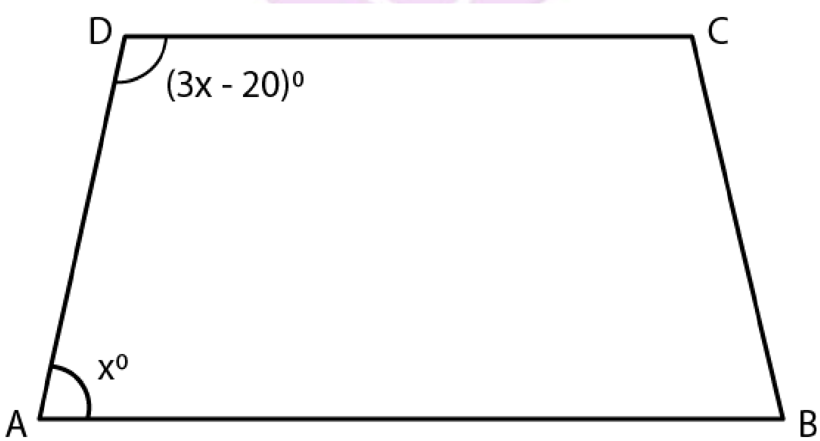
We get,

$\angle D = 102^0$

Therefore, $\angle B = 60^0$ and $\angle D = 102^0$

2. In a trapezium ABCD, side AB is parallel to side DC. If $\angle A = x^0$ and $\angle D = (3x – 20)^0$; find the value of x.

Solution:



Given

AB || DC and BC is transversal

The sum of co-interior angles of a parallelogram = 180^0

Hence,
$\angle A + \angle D = 180^0$
$x^0 + (3x - 20)^0 = 180^0$
$x^0 + 3x - 20^0 = 180^0$
$4x^0 = 180^0 + 20^0$
$4x^0 = 200^0$
$x^0 = 200^0 / 4$
We get,
$x^0 = 50^0$
Hence, the value of x is 50^0

3. The angles A, B, C and D of a trapezium ABCD are in the ratio 3: 4: 5: 6. Let ∠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:
Let us consider the angles of a parallelogram ABCD be 3x, 4x, 5x and 6x
We know that,
The sum of angles of a parallelogram = 360^0
Hence,
$\angle A + \angle B + \angle C + \angle D = 360^0$
$3x + 4x + 5x + 6x = 360^0$
$18x = 360^0$
$x = 360^0 / 18$
We get,
$x = 20^0$
Now, the angles are,
$\angle A = 3x = 3 \times 20^0$
$\angle A = 60^0$
$\angle B = 4x = 4 \times 20^0$
$\angle B = 80^0$
$\angle C = 5x = 5 \times 20^0$
$\angle C = 100^0$
$\angle D = 6x = 6 \times 20^0$
$\angle D = 120^0$
Here,
The sum of ∠A and ∠D = 180^0
Therefore, AB is parallel to DC and the angles are co-interior angles whose sum = 180^0

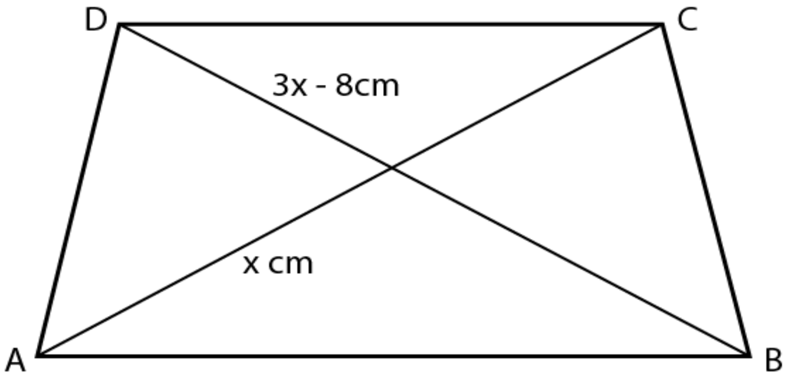
4. In a isosceles trapezium one pair of opposite sides are ………… to each other and the other pair of opposite sides are …………… to each other.

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.

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

Solution:



We know that,

The diagonals of an isosceles trapezium are of equal length

Figure

Hence,

3x – 8 = x

3x – x = 8

2x = 8

x = 8 / 2

We get,

x = 4

Therefore, the value of x is 4 cm

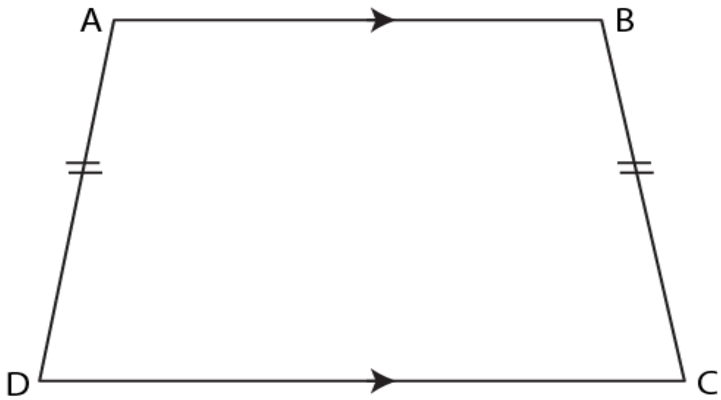
6. Angle A of an isosceles trapezium is 115^0; find the angles B, C and D.

Solution:

Since, the base angles of an isosceles trapezium are equal

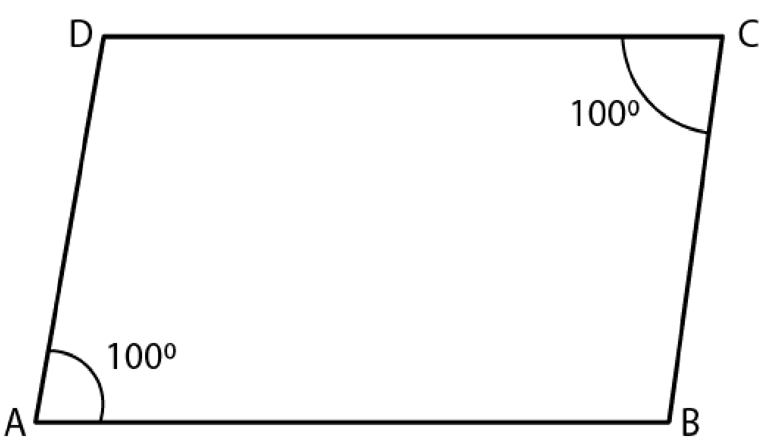
Hence,

$\angle A = \angle B = 115^0$



Also,
$\angle A$ and $\angle D$ are co-interior angles
The sum of co-interior angles of a quadrilateral is 180^0
So,
$\angle A + \angle D = 180^0$
$115^0 + \angle D = 180^0$
$\angle D = 180^0 - 115^0$
We get,
$\angle D = 65^0$
Hence,
$\angle D = \angle C = 65^0$
Therefore, the values of angles B, C and D are 115^0, 65^0 and 65^0

7. Two opposite angles of a parallelogram are 100^0 each. Find each of the other two opposite angles.
Solution:
Given
Two opposite angles of a parallelogram are 100^0 each



The sum of adjacent angles of a parallelogram = 180^0
Hence,
$\angle A + \angle B = 180^0$
$100^0 + \angle B = 180^0$
$\angle B = 180^0 - 100^0$
We get,
$\angle B = 80^0$
We know that,
The opposite angles of a parallelogram are equal
$\angle D = \angle B = 80^0$
Therefore, the other two opposite angles $\angle D = \angle B = 80^0$

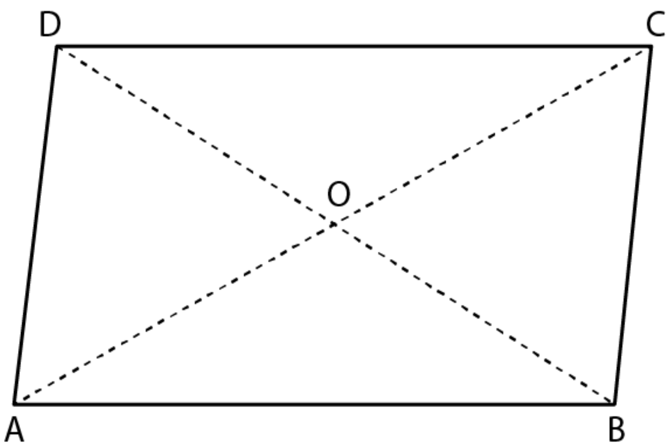
8. Two adjacent angles of a parallelogram are 70^0 and 110^0 respectively. Find the other two angles of it.
Solution:
Given
Two adjacent angles of a parallelogram are 70^0 and 100^0 respectively

We know that,
Opposite angles of a parallelogram are equal.
Hence, $\angle C = \angle A = 70^0$ and $\angle D = \angle B = 110^0$

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
Let us consider the angles A, B, C and D be 2x, 3x, 2x and 3x
We know that,
The sum of interior angles of a quadrilateral = 360^0
So,

$\angle A + \angle B + \angle C + \angle D = 360^0$
$2x + 3x + 2x + 3x = 360^0$
$10x = 360^0$
$x = 360^0 / 10$
We get,
$x = 36^0$
Hence, the measure of each angle is as follows
$\angle A = \angle C = 2x = 2 \times 36^0$
$\angle A = \angle C = 72^0$
$\angle B = \angle D = 3x = 3 \times 36^0$
$\angle B = \angle D = 108^0$
Since the opposite angles are equal and
The adjacent angles are supplementary
i.e $\angle A + \angle B = 180^0$
$72^0 + 108^0 = 180^0$
$180^0 = 180^0$ and
$\angle C + \angle D = 180^0$
$72^0 + 108^0 = 180^0$
$180^0 = 180^0$
Quadrilateral ABCD fulfills the condition
Therefore, a quadrilateral ABCD is a parallelogram

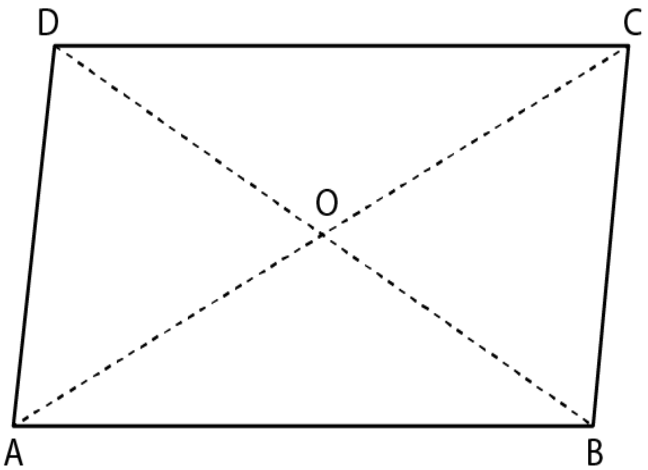
10. In a parallelogram ABCD, its diagonals AC and BD intersect each other at point O.



If AC = 12 cm and BD = 9 cm; find; lengths of OA and OB
Solution:
Given
AC and BD intersect each other at point O

So,
OA = OC = (1 / 2) AC and
Similarly,
OB = OD = (1 / 2) BD
Hence,
OA = (1 / 2) × AC
= (1 / 2) × 12
= 6 cm
OB = (1 / 2) × BD
= (1 / 2) × 9
= 4. 5 cm

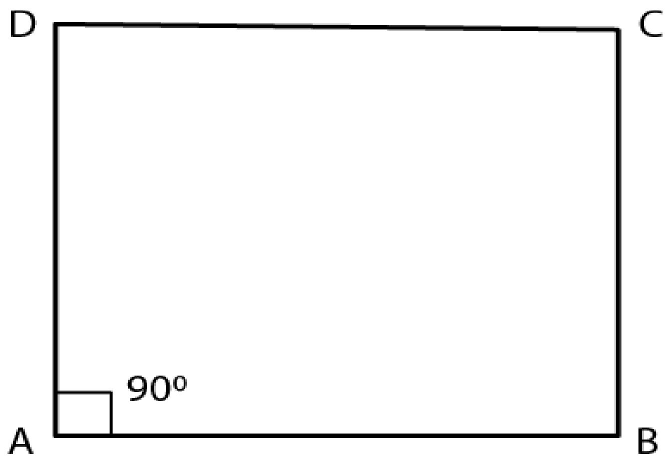
11. In a parallelogram ABCD, its diagonals intersect at point O. If OA = 6 cm and OB = 7.5 cm, find the lengths of AC and BD.



Solution:
The diagonals AC and BD intersect each other at point O
So,
OA = OC = (1 / 2) AC and
OB = OD = (1 / 2) BD
So,
OA = (1 / 2) × AC
AC = 2 × OA
AC = 2 × 6
We get,
AC = 12 cm and
OB = (1 / 2) × BD
BD = 2 × OB
BD = 2 × 7.5

We get,
BD = 15 cm

12. In a parallelogram ABCD, $\angle A = 90^0$
(i) What is the measure of angle B.
(ii) Write the special name of the parallelogram.
Solution:
Given
In a parallelogram ABCD, $\angle A = 90^0$

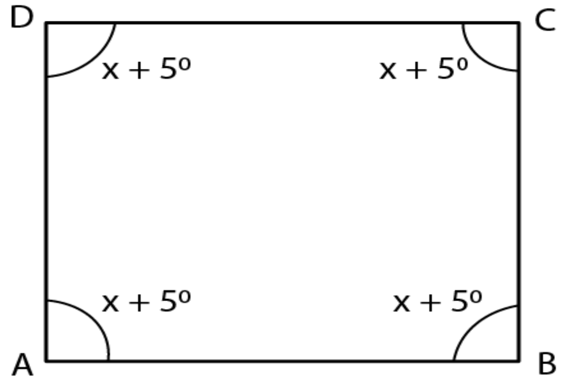


(i) We know that,
In a parallelogram, adjacent angles are supplementary
Hence,
$\angle A + \angle B = 180^0$
$90^0 + \angle B = 180^0$
$\angle B = 180^0 - 90^0$
We get,
$\angle B = 90^0$
Therefore, the measure of $\angle B = 90^0$
(ii) Since all the angles of a given parallelogram is right angle.
Hence the given parallelogram is a rectangle

13. One diagonal of a rectangle is 18 cm. What is the length of its other diagonal?
Solution:
We know that,
In a rectangle, the diagonal are equal
Hence,
AC = BD
Given that one diagonal of a rectangle is 18 cm

Hence, the other diagonal of a rectangle will be = 18 cm
Therefore, the length of the other diagonal is 18 cm

14. Each angle of a quadrilateral is x + 5^0. Find:
(i) the value of x
(ii) each angle of the quadrilateral.
(iii) Give the special name of the quadrilateral taken.



Solution:
(i) We know that,
The sum of interior angles of a quadrilateral is 360^0
Hence,
$\angle A + \angle B + \angle C + \angle D = 360^0$
$x + 5^0 + x + 5^0 + x + 5^0 + x + 5^0 = 360^0$
$4x + 20^0 = 360^0$
$4x = 360^0 - 20^0$
$4x = 340^0$
$x = 340^0 / 4$
We get,
$x = 85^0$
Hence, the value of x is 85^0
(ii) Each angle of the quadrilateral ABCD = x + 5^0
= $85^0 + 5^0$
We get,
= 90^0
Therefore, each angle of the quadrilateral = 90^0
(iii) The name of the taken quadrilateral is a rectangle

15. If three angles of a quadrilateral are 90^0 each, show that the given quadrilateral is a rectangle.
Solution:

If each angle of quadrilateral is 90^0, then the given quadrilateral will be a rectangle
We know that,
The sum of interior angles of a quadrilateral is 360^0
Hence,
$\angle A + \angle B + \angle C + \angle D = 360^0$
$90^0 + 90^0 + 90^0 + \angle D = 360^0$
$270^0 + \angle D = 360^0$
$\angle D = 360^0 - 270^0$
We get,
$\angle D = 90^0$
Since,
Each angle of the quadrilateral = 90^0
Therefore, the given quadrilateral is a rectangle.