Chapter 3. Understanding Quadrilaterals

Question 1

A quadrilateral has three acute angles, each measures 80°. What is the measure of the fourth angle?

Solution:

Sum of the four angles of a quadrilateral = 360°

80° + 80° + 80° + 4th angle = 360°

∴ 4th angle = 360° - (80°+80°+80°)=360°-240°=120°

Question 2

In a quadrilateral ABCD, the measure of the three angles A, B and C of the quadrilateral are 110°, 70° and 80° respectively. Find the measure of the third angle.

Solution:

The measure of A = 110°

The measure of B = 70°

The measure of C = 80°

The sum of the four angles of the quadrilateral ABCD = ∠A + ∠B + ∠C +∠D=360°.

∠A + ∠B + ∠C = 110°+70°+80° = 260°

∠A + ∠B + ∠C +∠D = 360°

∠D = 360°-(∠A + ∠B + ∠C)

= 360°-260°

= 100°

Question 3

In a quadrilateral ABCD, ∠ D is equal to 150° and ∠ A = ∠ B = ∠ C. Find ∠ A, ∠ B and ∠ C.

Solution:

Measure of ∠ D = 150°

Let ∠ A= ∠ B = ∠ C = x°

Sum of the angles of the quadrilateral is 360°.

⇒ x° +x° +x° +150° = 360°

⇒ 3x° +150° = 360°

⇒ 3x° = 360° -150° = 210°

$\therefore x = \frac{210°}{3} = 70°$

∴ ∠ A = 70°, ∠ B = 70° and ∠ C = 70°.

Question 4

The angles of a quadrilateral are in the ratio 1:2:3:4. What are the measures of the four angles?

Solution:

Given the ratio of the angles of a quadrilateral = 1:2:3:4

Therefore, let the angles of the quadrilateral be x, 2x, 3x and 4x.

The sum of the angles of a quadrilateral is 360°.

$\Rightarrow x+2x+3x+4x = 360°$

$\Rightarrow 10x = 360°$

$\Rightarrow x = 36°$

$\Rightarrow 2x = 2 \times 36° = 72°$

$\Rightarrow 3x = 3 \times 36° = 108°$

$\Rightarrow 4x = 4 \times 36° = 144°$

$\therefore$ The measures of the four angles are 36°, 72°, 108° and 144°.

Question 5

The In a quadrilateral

(i) which of them have their diagonals bisecting each other?

(ii) which of them have their diagonals perpendicular to each other?

(iii) which of them have equal diagonals ?

Solution:

Diagonals bisect each other in

a) parallelogram

b) rhombus

c) rectangle

d) Square

e) Kite

(ii) Diagonals are perpendicular in

a) rhombus

b) Square

c) Kite

(iii) Diagonals are equal to each other in

a) rectangle.

b) square

Question 6

Adjacent sides of a rectangle are in the ratio 5: 12, if the perimeter of the rectangle is 34cm, find the length of the diagonal.

Solution:

Given the adjacent sides of a rectangle are in the ratio 5:12.

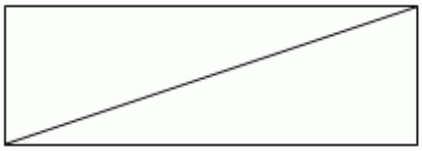
Therefore let the sides be 5x and 12x.

Then $5x + 12x + 5x + 12x = 34$

$$34x = 34$$

$$x = 1\text{cm}$$

Hence the sides are 12cm and 5cm.



The length of the diagonal = $\sqrt{(5^2 + 12^2)}$) (In a right angled triangle applying Pythagoras theorem)

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

$= \sqrt{169} = 13\text{cm}.$

Therefore the length of the diagonal is 13cm.

Question 7

The opposite angles of a parallelogram are $(3x + 5)^o$ and $(61 - x)^o$. Find the measure of four angles.

Solution:

$(3x + 5) = (61 - x)$ (Opposite angles of a parallelogram are equal)

$3x + x = 61 - 5$

$4x = 56^o$

$x = \frac{56^o}{4}$

$x = 14^o$

$3x + 5 = 3(14) + 5 = 42 + 5 = 47^o$

$61 - x = 61 - 14 = 47^o$

Angle adjacent to one of the above angle $= 180^o - 47^o$

$= 133^o$ (Sum of adjacent angles in a parallelogram is 180^o)

Fourth angle $= 133^o$ (Opposite angles of a parallelogram are equal)

Therefore the four angles in a parallelogram are 47^o, 133^o, 47^o and 133^o

Question 8

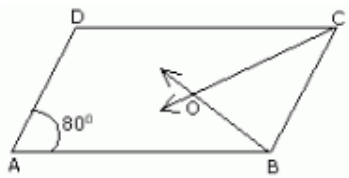
ABCD is a ||gm with $\angle A = 80^0$. The internal bisectors of $\angle B$ and $\angle C$ meet at O. Find the measure of the three angles of Δ BCO.

Solution:

$\angle C = \angle A$ (Opposite angles of a ||gm are equal)

$\angle C = 800$ (Given $\angle C = 80^{0)}$

$\angle OCB = \frac{1}{2}\angle C = \frac{1}{2} \times 80 = 40^0$



$\angle B = 180^0 - \angle A$ (Sum of interior angles on the same side of the transversal is 180^0)

$= 180^0 - 80^0$

$= 100^0$

$\angle CBO = \frac{1}{2}\angle B = \frac{1}{2} \times 100^\circ = 50^0$ $\angle BOC = 180^0 - (\angle OBC + \angle CBO)$ (Angle sum of a Δ)

$= 180^0 - (40^0 + 50^0)$

$= 180^0 - 90^0$

$= 90^0$

∴ The Three angles of the triangle BCO namely $\angle OCB$, $\angle CBO$, $\angle BOC$ are 40^0, 50^0 and 900 respectively.

Question 9

Find the measure of all four angles of a parallelogram whose consecutive angles are in the ratio 1 : 3.

Solution:

Given consecutive angles of a parallelogram are in the ratio 1:3

Therefore, the two consecutive angles be x and 3x.

$x + 3x = 180^0$ (sum of the interior angles on the same side of the transversal is 180^0)

$4x = 180^0$

$x = 45^0$

Therefore the two consecutive angles are 45^0 and $3(45^0) = 135^0$.

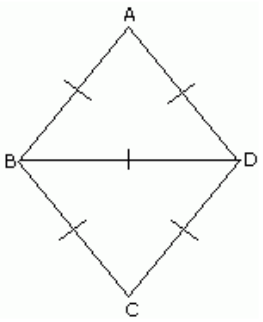
Since the opposite angles of a parallelogram are equal. The measures of all four angles of a parallelogram are 45^0, 45^0, 135^0 and 135^0.

Question 10

A diagonal and a side of a rhombus are of equal length. Find the measure of the angles of the rhombus.

Solution:

Let ABCD be the rhombus.



AB = BC = DC = DA (sides of a rhombus are equal)

But AB = BD (Given)

∴ AB = BC = CD = DA = BD

Since in Δ ABD all the sides are equal. Δ ABD is an equilateral Δ .

Similarly Δ BCD is also an equilateral.

\ ∠ A = ∠ ABD = ∠ ADB = ∠ DBC = ∠ C = ∠ CDB = 60^0

∴ ∠ B = ∠ ABD + ∠ DDC = 60^0 + 60^0 = 120^0

and ∠ D = ∠ ADB + ∠ CDB = 60^0 + 60^0 = 120^0

∴ The angles of the rhombus are 60^0, 120^0, 60^0 and 120^0.