

Polygons Ex 14A

Q1.

Answer :

Exterior angle of an n -sided polygon = $\left(\frac{360}{n}\right)^{\circ}$

(i) For a pentagon: $n = 5$

$$\therefore \left(\frac{360}{n}\right) = \left(\frac{360}{5}\right) = 72^{\circ}$$

(ii) For a hexagon: $n = 6$

$$\therefore \left(\frac{360}{n}\right) = \left(\frac{360}{6}\right) = 60^{\circ}$$

(iii) For a heptagon: $n = 7$

$$\therefore \left(\frac{360}{n}\right) = \left(\frac{360}{7}\right) = 51.43^{\circ}$$

(iv) For a decagon: $n = 10$

$$\therefore \left(\frac{360}{n}\right) = \left(\frac{360}{10}\right) = 36^{\circ}$$

(v) For a polygon of 15 sides: $n = 15$

$$\therefore \left(\frac{360}{n}\right) = \left(\frac{360}{15}\right) = 24^{\circ}$$

Q2.

Answer :

Each exterior angle of an n -sided polygon = $\left(\frac{360}{n}\right)^{\circ}$

If the exterior angle is 50° , then:

$$\begin{aligned}\frac{360}{n} &= 50 \\ \Rightarrow n &= 7.2\end{aligned}$$

Since n is not an integer, we cannot have a polygon with each exterior angle equal to 50° .

Q3.

Answer :

For a regular polygon with n sides:

$$\text{Each interior angle} = 180 - \{\text{Each exterior angle}\} = 180 - \left(\frac{360}{n}\right)$$

(i) For a polygon with 10 sides:

$$\text{Each exterior angle} = \frac{360}{10} = 36^\circ$$

$$\Rightarrow \text{Each interior angle} = 180 - 36 = 144^\circ$$

(ii) For a polygon with 15 sides:

$$\text{Each exterior angle} = \frac{360}{15} = 24^\circ$$

$$\Rightarrow \text{Each interior angle} = 180 - 24 = 156^\circ$$

Q4.

Answer :

$$\text{Each interior angle of a regular polygon having } n \text{ sides} = 180 - \left(\frac{360}{n}\right) = \frac{180n-360}{n}$$

If each interior angle of the polygon is 100° , then:

$$100 = \frac{180n-360}{n}$$

$$\Rightarrow 100n = 180n - 360$$

$$\Rightarrow 180n - 100n = 360$$

$$\Rightarrow 80n = 360$$

$$\Rightarrow n = \frac{360}{80} = 4.5$$

Since n is not an integer, it is not possible to have a regular polygon with each interior angle equal to 100° .

Q5.

Answer :

$$\text{Sum of the interior angles of an } n\text{-sided polygon} = (n-2) \times 180^\circ$$

(i) For a pentagon:

$$n = 5$$

$$\therefore (n-2) \times 180^\circ = (5-2) \times 180^\circ = 3 \times 180^\circ = 540^\circ$$

(ii) For a hexagon:

$$n = 6$$

$$\therefore (n-2) \times 180^\circ = (6-2) \times 180^\circ = 4 \times 180^\circ = 720^\circ$$

(iii) For a nonagon:

$$n = 9$$

$$\therefore (n-2) \times 180^\circ = (9-2) \times 180^\circ = 7 \times 180^\circ = 1260^\circ$$

(iv) For a polygon of 12 sides:

$$n = 12$$

$$\therefore (n-2) \times 180^\circ = (12-2) \times 180^\circ = 10 \times 180^\circ = 1800^\circ$$

Q6.

Answer :

$$\text{Number of diagonal in an } n\text{-sided polygon} = \frac{n(n-3)}{2}$$

(i) For a heptagon:

$$n = 7 \Rightarrow \frac{n(n-3)}{2} = \frac{7(7-3)}{2} = \frac{28}{2} = 14$$

(ii) For an octagon:

$$n = 8 \Rightarrow \frac{n(n-3)}{2} = \frac{8(8-3)}{2} = \frac{40}{2} = 20$$

(iii) For a 12-sided polygon:

$$n = 12 \Rightarrow \frac{n(n-3)}{2} = \frac{12(12-3)}{2} = \frac{108}{2} = 54$$

Q7.

Answer :

Sum of all the exterior angles of a regular polygon is 360° .

(i)

Each exterior angle = 40°

Number of sides of the regular polygon = $\frac{360}{40} = 9$

(ii)

Each exterior angle = 36°

Number of sides of the regular polygon = $\frac{360}{36} = 10$

(iii)

Each exterior angle = 72°

Number of sides of the regular polygon = $\frac{360}{72} = 5$

(iv)

Each exterior angle = 30°

Number of sides of the regular polygon = $\frac{360}{30} = 12$

Q8.

Answer :

Sum of all the interior angles of an n-sided polygon = $(n - 2) \times 180^\circ$

$$m\angle ADC = 180 - 50 = 130^\circ$$

$$m\angle DAB = 180 - 115 = 65^\circ$$

$$m\angle BCD = 180 - 90 = 90^\circ$$

$$m\angle ADC + m\angle DAB + m\angle BCD + m\angle ABC = (n - 2) \times 180^\circ = (4 - 2) \times 180^\circ = 2 \times 180^\circ = 360^\circ$$

$$\Rightarrow m\angle ADC + m\angle DAB + m\angle BCD + m\angle ABC = 360^\circ$$

$$\Rightarrow 130^\circ + 65^\circ + 90^\circ + m\angle ABC = 360^\circ$$

$$\Rightarrow 285^\circ + m\angle ABC = 360^\circ$$

$$\Rightarrow m\angle ABC = 75^\circ$$

$$\Rightarrow m\angle CBF = 180 - 75 = 105^\circ$$

$$\therefore x = 105$$

Q9.

Answer :

For a regular n-sided polygon:

$$\text{Each interior angle} = 180 - \left(\frac{360}{n}\right)$$

In the given figure:

$$n = 5$$

$$x^\circ = 180 - \frac{360}{5}$$

$$= 180 - 72$$

$$= 108^\circ$$

$$\therefore x = 108$$

Polygons Ex 14B

Q1.

Answer :

(a) 5

For a pentagon:

$$n = 5$$

$$\text{Number of diagonals} = \frac{n(n-3)}{2} = \frac{5(5-3)}{2} = 5$$

Q2.

Answer :

(c) 9

$$\text{Number of diagonals in an } n\text{-sided polygon} = \frac{n(n-3)}{2}$$

For a hexagon:

$$n = 6$$

$$\begin{aligned} \therefore \frac{n(n-3)}{2} &= \frac{6(6-3)}{2} \\ &= \frac{18}{2} = 9 \end{aligned}$$

Q3.

Answer :

(d) 20

For a regular n-sided polygon:

$$\text{Number of diagonals} = \frac{n(n-3)}{2}$$

For an octagon:

$$n = 8$$

$$\frac{8(8-3)}{2} = \frac{40}{2} = 20$$

Q4.

Answer :

(d) 54

For an n-sided polygon:

$$\text{Number of diagonals} = \frac{n(n-3)}{2}$$

$$\therefore n = 12$$

$$\Rightarrow \frac{12(12-3)}{2} = 54$$

Q5.

Answer :

(c) 9

$$\frac{n(n-3)}{2} = 27$$

$$\Rightarrow n(n-3) = 54$$

$$\Rightarrow n^2 - 3n - 54 = 0$$

$$\Rightarrow n^2 - 9n + 6n - 54 = 0$$

$$\Rightarrow n(n-9) + 6(n-9) = 0$$

$$\Rightarrow n = -6 \text{ or } n = 9$$

Number of sides cannot be negative.

$$\therefore n = 9$$

Q6.

Answer :

(b) 68°

Sum of all the interior angles of a polygon with n sides = $(n-2) \times 180^\circ$

$$\therefore (5-2) \times 180^\circ = x + x + 20 + x + 40 + x + 60 + x + 80$$

$$\Rightarrow 540 = 5x + 200$$

$$\Rightarrow 5x = 340$$

$$\Rightarrow x = 68^\circ$$

Q7.

Answer :

(b) 9

Each exterior angle of a regular n-sided polygon = $\frac{360}{n} = 40$

$$\Rightarrow n = \frac{360}{40} = 9$$

Q8.

Answer :

(c) 5

Each interior angle for a regular n-sided polygon = $180 - \left(\frac{360}{n}\right)$

$$180 - \left(\frac{360}{n}\right) = 108$$

$$\Rightarrow \left(\frac{360}{n}\right) = 72$$

$$\Rightarrow n = \frac{360}{72} = 5$$

Q9.

Answer :

(a) 8

Each interior angle of a regular polygon with n sides = $180 - \left(\frac{360}{n}\right)$

$$\Rightarrow 180 - \left(\frac{360}{n}\right) = 135$$

$$\Rightarrow \frac{360}{n} = 45$$

$$\Rightarrow n = 8$$

Q10.

Answer :

(b) 8

For a regular polygon with n sides:

$$\text{Each exterior angle} = \frac{360}{n}$$

$$\text{Each interior angle} = 180 - \frac{360}{n}$$

$$\therefore 180 - \frac{360}{n} = 3\left(\frac{360}{n}\right)$$

$$\Rightarrow 180 = 4\left(\frac{360}{n}\right)$$

$$\Rightarrow n = \frac{4 \times 360}{180} = 8$$

Q11.

Answer :

(c) 144°

$$\text{Each interior angle of a regular decagon} = 180 - \frac{360}{10} = 180 - 36 = 144^\circ$$

Q12.

Answer :

(b) 8 *right* \angle s

Sum of all the interior angles of a hexagon is $(2n - 4)$ right angles.

For a hexagon:

$$n = 6$$

$$\Rightarrow (2n - 4) \text{ right } \angle\text{s} = (12 - 4) \text{ right } \angle\text{s} = 8 \text{ right } \angle\text{s}$$

Q13.

Answer :

(a) 135°

$$(2n - 4) \times 90 = 1080$$

$$(2n - 4) = 12$$

$$2n = 16$$

$$\text{or } n = 8$$

$$\text{Each interior angle} = 180 - \frac{360}{n} = 180 - \frac{360}{8} = 180 - 45 = 135^\circ$$