Polygons Ex 14A

Q1.

Answer :

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

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

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

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

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

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

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

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

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

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

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

Q2.

Answer :

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

If the exterior angle is 50°, then:

$$\frac{360}{n} = 50$$
$$\Rightarrow n = 7.2$$

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:

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

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

(ii) For a polygon with 15 sides:

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

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

Q4.

Answer :

Each interior angle of a regular polygon having n 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 :

Sum of the interior angles of an n-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 :

Number of diagonal in an n-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^o.

(i)

$\text{Each exterior angle} = 40^o$

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

(ii)

$\text{Each exterior angle} = 36^o$

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

(iii)

$\text{Each exterior angle} = 72^o$

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

(iv)

$\text{Each exterior angle} = 30^o$

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

Q8.

Answer :

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

$m\angle ADC = 180 - 50 = 130^o$
$m\angle DAB = 180 - 115 = 65^o$
$m\angle BCD = 180 - 90 = 90^o$
$m\angle ADC + m\angle DAB + m\angle BCD + m\angle ABC = (n-2) \times 180^\circ = (4-2) \times 180^\circ = 2 \times 180^\circ = 360^\circ$
$\Rightarrow m\angle ADC + m\angle DAB + m\angle BCD + m\angle ABC = 360^\circ$
$\Rightarrow 130^o + 65^o + 90^o + m\angle ABC = 360^\circ$
$\Rightarrow 285^o + m\angle ABC = 360^o$
$\Rightarrow m\angle ABC = 75^o$
$\Rightarrow m\angle CBF = 180 - 75 = 105^o$
∴ x = 105

Q9.

Answer :

For a regular n-sided polygon:

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

In the given figure:

$n = 5$
$x^\circ = 180 - \frac{360}{5}$
$= 180 - 72$
$= 108^o$
∴ 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

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

For a hexagon:

$n = 6$

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

Q3.

Answer :

(d) 20

For a regular n-sided polygon:

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

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

Q5.

Answer :

(c) 9

$\frac{n(n-3)}{2} = 27$
$\Rightarrow n(n-3) = 54$
$\Rightarrow n^2 - 3n - 54 = 0$
$\Rightarrow n^2 - 9n + 6n - 54 = 0$
$\Rightarrow n(n-9) + 6(n-9) = 0$
$\Rightarrow n = -6\ or\ n = 9$
Number of sides cannot be negative.
$\therefore \mathrm{n} = 9$

Q6.

Answer :

(b) 68°
Sum of all the interior angles of a polygon with n sides = $(n-2) \times 180^\circ$

$\therefore (5-2) \times 180^o = x + x + 20 + x + 40 + x + 60 + x + 80$
$\Rightarrow 540 = 5x + 200$
$\Rightarrow 5x = 340$
$\Rightarrow x = 68^o$

Q7.

Answer :

(b) 9

$$\text{Each exterior angle of a regular n} - \text{sided polygon} = \frac{360}{n} = 40$$
$$\Rightarrow n = \frac{360}{40} = 9$$

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
$\text{Each interior angle of a regular polygon with n sides} = 180 - \left(\frac{360}{n}\right)$
$\Rightarrow 180 - \left(\frac{360}{n}\right) = 135$
$\Rightarrow \frac{360}{n} = 45$
$\Rightarrow n = 8$

Q10.

Answer :

(b) 8

For a regular polygon with n sides:

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

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

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

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

$\Rightarrow\ n=\frac{4\times360}{180}=8$

Q11.

Answer :

(c) 144°

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

Q12.

Answer :

(b) $8\ right\ \angle s$

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

For a hexagon:

$n=6$

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

Q13.

Answer :

(a) 135°

$(2n-4)\times90=1080$

$(2n-4)=12$

$2n=16$

$or\ n=8$

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