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 = $(n-2) \times 180^\circ$

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

Q9.

Answer :

For a regular n-sided polygon:

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

In the given figure:
$n = 5$
$x^\circ = 180 - \frac{360}{5}$
$= 180 - 72$
$= 108^o$
$\therefore$ 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

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.

$\therefore \text{n} = 9$

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

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

$\therefore 180 - \frac{360}{n} = 3\left(\frac{360}{n}\right)$
$\Rightarrow\ 180\ =\ 4\left(\frac{360}{n}\right)$
$\Rightarrow\ n = \frac{4 \times 360}{180} = 8$

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:
$n = 6$
$\Rightarrow (2n - 4)\ \text{right}\ \angle s = (12 - 4)\ \text{right}\ \angle s = 8\ \text{right}\ \angle s$

Q13.

Answer :

(a) 135°

$(2n - 4) \times 90 = 1080$
$(2n - 4) = 12$
$2n = 16$
$or\ n = 8$
$\text{Each interior angle} = 180 - \frac{360}{n} = 180 - \frac{360}{8} = 180 - 45 = 135^o$