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