UNDERSTANDING QUADRILATERALS

SUM OF THE MEASURES OF THE EXTERIOR ANGLES OF A POLYGON

Sum of the Measures of the Exterior Angles of a Polygon

We know that an exterior angle and the adjacent interior angle of a polygon form a linear pair.

Interior angle + Exterior angle = 180°

If the polygon has n sides (or vertices), then

Sum of all interior angles + Sum of all exterior angle = $n \times 180^\circ$ = (2n) right angles

or (2n - 4) right angles + sum of all exterior angles = (2n) right angles

or sum of all exterior angles = (2n) right angles - (2n - 4) right angles

= 4 right angles

$$= 4 \times 90^{\circ} = 360^{\circ}$$

Hence, Sum of all exterior angles of a polygon = 360°

Note : For a regular polygon of n-sides

(i) Each exterior angle
$$=\frac{360^{\circ}}{n}$$

(ii)
$$n = \frac{360^{\circ}}{each \ exterior \ angle}$$

Ex.1 Find the sum of all interior angles for a decagon.

Sol. ::
$$n = 10$$

 \therefore sum of angles = $(n - 2) 180^{\circ}$

$$= (10 - 2) 180 = 8 \times 180 = 1440^{\circ}$$

Ex.2 If the sum of all angles of a polygon is 720° then find number of sides.

Sol. : sum of angles =
$$(n - 2) 180^{\circ}$$

$$\Rightarrow 720^{\circ} = (n-2) \ 180^{\circ}$$
$$\Rightarrow n-2 = \frac{720}{180} = 4 \quad \Rightarrow n = 6$$

CLASS 8

Ex.3 If all sides are equal of a polygon of 15 sided then find value of each interior angle.

Sol.
$$\therefore$$
 n = 15
 \therefore each interior angle = $\frac{(n-2)180}{n}$
= $\left(\frac{15-2}{15}\right)180$ = 13 × 12 = 156°

Note :

- (1) Sum of all exterior angles is equal to 360°
- (2) Value of each exterior angle of regular polygon is $\frac{360}{n}$.
- (3) Number of Diagonals in polygon = $\frac{n(n-3)}{2}$
- (4) Simple curve can be bound or not Eg.



(5) Simple closed curve is not always circle

Eg.



Ex.4 Check whether 115° can an exterior angle of a regular polygon ?

Sol. : each exterior angle =
$$\frac{360}{n} = \frac{360}{115}$$

- ≠ natural number
- \therefore 115° can not be an exterior angle of a regular polygon.

CLASS 8

Ex.5 Find the number of diagonals if the sum of all interior angles is 900°.

Sol. :: sum of all interior angles

$$= (n - 2) 180^{\circ}$$
$$900 = (n - 2) 180^{\circ}$$
$$\Rightarrow n - 2 = \frac{900}{180} = 5$$
$$\Rightarrow n = 7$$

Now no. of diagonals = $\frac{7(7-3)}{2} = \frac{7(4)}{2} = 14$