

Tender Heart High School, Sec-33B, Chandigarh

Class - VI

Date - 25.11.24

Subject - Mathematics

Teacher - Ms. Sushma

Chapter - 19 Polygons

Curves:->

The figures traced out with the help of the sharp edge of a pencil without lifting the pencil are called curves.

Simple Closed Figure:->

A closed figure which does not intersect itself, is called a simple closed figure.

Polygons:->

A simple closed figure bounded by three or more line segments is called a polygon.

Number of Triangles contained in a Polygon:->

A polygon of n sides can be divided into $(n-2)$ triangles.

Regular Polygon:->

A polygon having all sides equal and all angles equal is called a regular polygon.

Convex Polygon:-> If each angle of a polygon is less than 180° , then it is called a convex polygon.

Concave Polygon:-> If at least one angle of a polygon is more than 180° , then it is called a concave polygon.

Interior and Exterior Angles of a Polygon.

Exterior angle + Adjacent interior angle = 180°

Sum of the interior angles of a polygon of n sides
= $(2n-4)$ right angles.

Ex 19A

Q: Find the sum of the interior angles of a:-

(i) nonagon

(ii) 16-sided polygon.

Soln: No. of sides in nonagon = 9 sides.

Sum of the interior angles of a polygon = $(2n-4)$ right angles

$$= (2 \times 9 - 4) \times 90$$

$$= (18 - 4) \times 90$$

$$= 14 \times 90$$

$$= 1260^\circ$$

(ii) No. of sides (n) = 16

Sum of the interior angles of a polygon = $(2n-4)$ right angles

$$= (2 \times 16 - 4) \times 90^\circ$$

$$= (32 - 4) \times 90$$

$$= 28 \times 90$$

$$= 2520^\circ$$

Q: Find the measure of each interior angle of a:

(i) regular decagon

(ii) regular 18-sided polygon.

Soln: A decagon has 10 sides

Sum of interior angles of a decagon.

$$= (2 \times 10 - 4) \text{ right angles}$$

$$= 16 \times 90^\circ = 1440^\circ$$

Since, the interior angles of a regular polygon are of the same measures, so we have each interior angle = $\frac{1440}{16}$

$$= 144^\circ$$

(ii) Sum of interior angle of a regular 18-sided polygon = $(2 \times 18 - 4) \times 90^\circ = 2880^\circ$

Since, the interior angle of a regular polygon are of the same measure,

so, we have each interior angle = $\frac{2880}{18}$

$$= 160^\circ$$

Ques Five of the angles of a hexagon are each 115° . Calculate the measure of the sixth angle.

Soln: → A hexagon has 6 sides.

Sum of interior angles of a hexagon.

$$= (2 \times 6 - 4) \times 90^\circ$$

$$= 8 \times 90^\circ$$

$$= 720^\circ$$

$$\text{Sixth angle} = 720^\circ - (115^\circ \times 5)$$

$$= 720^\circ - 575^\circ$$

$$= 145^\circ$$

Ques The angles of a heptagon are $(x+3)^\circ$, $(2x+5)^\circ$, $(x+8)^\circ$, $(3x+1)^\circ$, $(5x-6)^\circ$, $(2x+9)^\circ$ and $(x-5)^\circ$. Calculate x .

Soln: → In a heptagon, $n = 7$

So, Sum of its interior angles = $(2n-4) \times \text{right angles}$

$$= (2 \times 7 - 4) \times 90^\circ$$

$$= (14 - 4) \times 90^\circ$$

$$= 10 \times 90^\circ = 900^\circ$$

But sum of its angles are

$$= (x+3)^\circ + (x+5)^\circ + (x+8)^\circ + (3x+1)^\circ + (5x-6)^\circ + (2x+9)^\circ + (x-5)^\circ$$

$$= 15x + 26 - 11 = 15x + 15^\circ$$

$$\Rightarrow 15x + 15 = 900^\circ$$

$$15x = 900 - 15$$

$$15x = 885$$

$$x = \frac{885}{15}$$

$$x = 59^\circ$$

Q 7. An octagon has three equal angles each of measure 115° . If all the remaining angles have equal measure, find the measure of each of these remaining angles.

Soln: $\rightarrow$ Sum of angles of an octagon = $(2n-4) \times \text{rt angle}$

$$= (2 \times 8 - 4) \times 90^\circ$$

$$= (16 - 4) \times 90^\circ$$

$$= 12 \times 90^\circ = 1080^\circ$$

$$\text{Sum of three angles} = 115^\circ \times 3 = 345^\circ$$

$$\text{So, sum of remaining 5 angles } 1080^\circ - 345^\circ = 735^\circ$$

$$\text{So, the measure of each angle} = \frac{735}{5} = 147^\circ$$

Ques The sum of the interior angles of a polygon is 2160° . How many sides does this polygon have?

Soln:- The no. of sides of the polygon be n .

Then, sum of interior angles of the polygon
 $= (n-2) \times \text{right angles}$
 $= (n-2) \times 90^\circ$

$$\therefore, (n-2) \times 90 = 2160^\circ$$

$$(n-2) = 2160/90^\circ$$

$$(n-2) = 24$$

$$n = 24 + 2$$

$$n = 26$$

$$\boxed{n = 26}$$

Hence, the polygon has 26 sides.

Ques Find the measure of each exterior angle of a regular n -decagon.

Soln:- Each interior angle $= \frac{(2 \times 10 - 2) \times 90}{10}$

$$= \frac{(20 - 2) \times 90}{10}$$

$$= 18 \times 9 = 162^\circ$$

$$\begin{aligned} \text{Each exterior angle} &= 180^\circ - \text{Each interior angle} \\ &= 180^\circ - 162^\circ \\ &= 18^\circ \end{aligned}$$

So, each exterior angle of a regular decagon $= 18^\circ$.