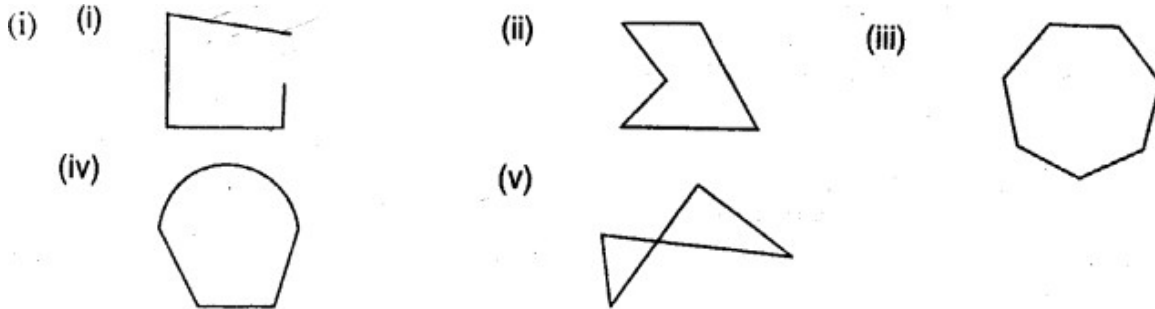


# Polygons

## EXERCISE 28 (A)

### Question 1.

State, which of the following are polygons :



### Solution:

Only figure (ii) and (iii) are polygons.

### Question 2.

Find the sum of interior angles of a polygon with :

- (i) 9 sides
- (ii) 13 sides
- (iii) 16 sides

### Solution:

(i) 9 sides

No. of sides  $n = 9$

$\therefore$  Sum of interior angles of polygon  $= (2n - 4) \times 90^\circ$

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

$$= 14 \times 90^\circ = 1260^\circ$$

(ii) 13 sides

No. of sides  $n = 13$

$\therefore$  Sum of interior angles of polygon  $= (2n - 4) \times 90^\circ = (2 \times 13 - 4) \times 90^\circ = 1980^\circ$

(iii) 16 sides

No. of sides  $n = 16$

$\therefore$  Sum of interior angles of polygon  $= (2n - 4) \times 90^\circ$

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

$$= (32 - 4) \times 90^\circ = 28 \times 90^\circ$$

$$= 2520^\circ$$

**Question 3.**

Find the number of sides of a polygon, if the sum of its interior angles is :

(i)  $1440^\circ$

(ii)  $1620^\circ$

**Solution:**

(i)  $1440^\circ$

Let no. of sides =  $n$

$\therefore$  Sum of interior angles of polygon =  $1440^\circ$

$\therefore (2n - 4) \times 90^\circ = 1440^\circ$

$$\Rightarrow 2n - 4 = \frac{1440^\circ}{90^\circ}$$

$$\Rightarrow 2(n - 2) = \frac{1440^\circ}{90^\circ}$$

$$\Rightarrow n - 2 = \frac{1440^\circ}{2 \times 90^\circ}$$

$$\Rightarrow n - 2 = 8$$

$$\Rightarrow n = 8 + 2$$

$$\Rightarrow n = 10$$

(ii)  $1620^\circ$

Let no. of sides =  $n$

$\therefore$  Sum of interior angles of polygon =  $1620^\circ$

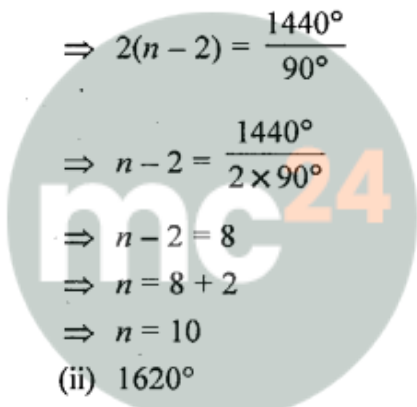
$\therefore (2n - 4) \times 90^\circ = 1620^\circ$

$$\Rightarrow 2(n - 2) = \frac{1620^\circ}{90^\circ}$$

$$\Rightarrow n - 2 = \frac{1620^\circ}{2 \times 90^\circ}$$

$$\Rightarrow n - 2 = 9$$

$$\Rightarrow n = 9 + 2 \Rightarrow n = 11$$



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**Question 4.**

Is it possible to have a polygon, whose sum of interior angles is  $1030^\circ$ .

**Solution:**

Let no. of sides be =  $n$

Sum of interior angles of polygon =  
 $1030^\circ$

$$\therefore (2n - 4) \times 90^\circ = 1030^\circ$$

$$\Rightarrow 2(n - 2) = \frac{1030^\circ}{90^\circ}$$

$$\Rightarrow (n - 2) = \frac{1030^\circ}{2 \times 90^\circ}$$

$$\Rightarrow (n - 2) = \frac{103}{18}$$

$$\Rightarrow n = \frac{103}{18} + 2$$

$$\Rightarrow n = \frac{139}{18}$$

Which is not a whole number. Hence it is not possible to have a polygon, the sum of whose interior angles is  $1030^\circ$ .

**Question 5.**

(i) If all the angles of a hexagon are equal, find the measure of each angle.

(ii) If all the angles of an octagon are equal, find the measure of each angle,



**Solution:**

(i) No. of sides of hexagon,  $n = 6$

Let each angle be  $= x^\circ$

$$\therefore \text{Sum of angles} = 6x^\circ$$

$$\therefore (2n - 4) \times 90^\circ = \text{Sum of angles}$$

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

$$(12 - 4) \times 90^\circ = 6x^\circ$$

$$\Rightarrow \frac{8 \times 90^\circ}{6} = x^\circ$$

$$\Rightarrow x = 120^\circ$$

$$\therefore \text{Each angle of hexagon} = 120^\circ$$

(ii) No. of sides of octagon  $n = 8$

Let each angle be  $= x^\circ$

$$\therefore \text{Sum of angles} = 8x^\circ$$

$$\therefore (2n - 4) \times 90^\circ = \text{Sum of angles}$$

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

$$12 \times 90^\circ = 8x^\circ$$

$$\Rightarrow x^\circ = \frac{90^\circ \times 12^\circ}{8} \Rightarrow x^\circ = 135^\circ$$

$$\therefore \text{Each angle of octagon} = 135^\circ$$

**Question 6.**

One angle of a quadrilateral is  $90^\circ$  and all other angles are equal ; find each equal angle.

**Solution:**

Let the angles of a quadrilateral be  $x^\circ$ ,  
 $x^\circ$ ,  $x^\circ$ , and  $90^\circ$

$$\therefore \text{Sum of interior angles of quadrilateral} = 360^\circ$$

$$\Rightarrow x^\circ + x^\circ + x^\circ + 90^\circ = 360^\circ$$

$$\Rightarrow 3x^\circ = 360^\circ - 90^\circ$$

$$\Rightarrow x = \frac{270^\circ}{3}$$

$$\Rightarrow x = 90^\circ$$

**Question 7.**

If angles of quadrilateral are in the ratio  $4 : 5 : 3 : 6$  ; find each angle of the quadrilateral.

**Solution:**

Let the angles of the quadrilateral be  $4x$ ,  
 $5x$ ,  $3x$  and  $6x$

$$\therefore 4x + 5x + 3x + 6x = 360^\circ$$

$$18x = 360^\circ$$

$$x = \frac{360^\circ}{18} = 20^\circ$$

$$\therefore \text{First angle} = 4x = 4 \times 20^\circ = 80^\circ$$

$$\text{Second angle} = 5x = 5 \times 20^\circ = 100^\circ$$

$$\text{Third angle} = 3x = 3 \times 20^\circ = 60^\circ$$

$$\text{Fourth angle} = 6x = 6 \times 20^\circ = 120^\circ$$

**Question 8.**

If one angle of a pentagon is  $120^\circ$  and each of the remaining four angles is  $x^\circ$ , find the magnitude of  $x$ .

**Solution:**

One angle of a pentagon =  $120^\circ$

Let remaining four angles be  $x$ ,  $x$ ,  $x$  and  $x$

Their sum =  $4x + 120^\circ$

But sum of all the interior angles of a pentagon =  $(2n - 4) \times 90^\circ$

$$= (2 \times 5 - 4) \times 90^\circ = 540^\circ$$

$$= 4x + 120^\circ = 540^\circ$$

$$\therefore 4x + 120^\circ = 540^\circ$$

$$4x = 540^\circ - 120^\circ$$

$$4x = 420$$

$$x = \frac{420}{4} \Rightarrow x = 105^\circ$$

$\therefore$  Equal angles are  $105^\circ$  (Each)

**Question 9.**

The angles of a pentagon are in the ratio  $5 : 4 : 5 : 7 : 6$ ; find each angle of the pentagon.

**Solution:**

Let the angles of the pentagon be  $5x$ ,  $4x$ ,  
 $5x$ ,  $7x$ ,  $6x$

Their sum =  $5x + 4x + 5x + 7x + 6x =$   
 $27x$

Sum of interior angles of a polygon

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

$$= (2 \times 5 - 4) \times 90^\circ = 540^\circ$$

$$\therefore 27x = 540 \Rightarrow \frac{540}{27} \Rightarrow x = 20^\circ$$

$$\therefore \text{Angles are } 5 \times 20^\circ = 100^\circ$$

$$4 \times 20^\circ = 80$$

$$5 \times 20^\circ = 100^\circ$$

$$7 \times 20^\circ = 140^\circ$$

$$6 \times 20^\circ = 120^\circ$$

**Question 10.**

Two angles of a hexagon are  $90^\circ$  and  $110^\circ$ . If the remaining four angles are equal, find each equal angle.

**Solution:**

Two angles of a hexagon are  $90^\circ$ ,  $110^\circ$

Let remaining four angles be  $x$ ,  $x$ ,  $x$  and  
 $x$

Their sum =  $4x + 200^\circ$

But sum of all the interior angles of a  
hexagon

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

$$= (2 \times 6 - 4) \times 90^\circ = 8 \times 90^\circ = 720^\circ$$

$$\therefore 4x + 200^\circ = 720^\circ$$

$$\Rightarrow 4x = 720^\circ - 200^\circ = 520^\circ$$

$$\Rightarrow x = \frac{520^\circ}{4} = 130^\circ$$

$\therefore$  Equal angles are  $130^\circ$  (each)