CHAPTER FIVE

Polygons

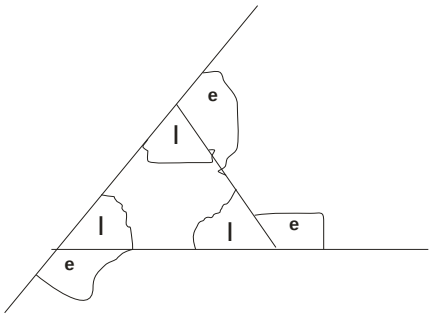
A polygon is a plane figure bounded by straight lines.

Polygon	
Number of sides	Name
3	Triangle
4	Quadrilateral
5	Pentagon
6	Hexagon
7	Heptagon
8	Octagon
9	Nonagon
10	Decagon

The interior and exterior angles of a polygon:

- The interior angles of a polygon are those angles, which lie within the polygon.

- The exterior angles of a polygon are those ones, which lie outside the polygon



Example:

I = interior angle.

e = exterior angle.

- For any polygon, the sum of the exterior angles = 360°

Q1) Calculate the value of each exterior angle of a regular decagon.

Soln

Decagon has 10 sides and as such has 10 exterior angles. But since the sum of the exterior angles of any polygon = 360°,

$=>$ 10 exterior angles = 360°,

$=>$ 1 exterior angle = $\frac{1}{10}\ x\ 360$ = 36°.

Each exterior angle = 36°.

Q2) Find the value of each exterior angle of a regular pentagon.

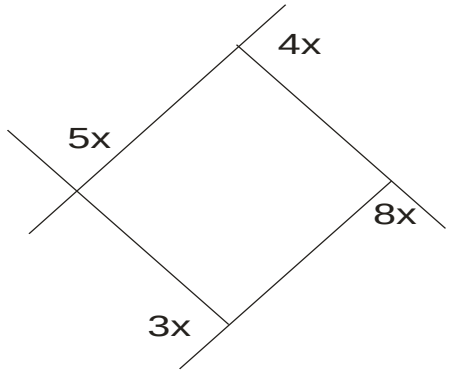
Soln

Since pentagon has 5 sides, then it has 5 exterior angles.

But since the sum of the exterior angles of a polygon = 360°,$=>$ 5 exterior angles = 360°, $=>$ 1 exterior angle = $\frac{1}{5}\ x\ 360° = 72$.

The value of each exterior angle of a pentagon = 72°.

Q3.



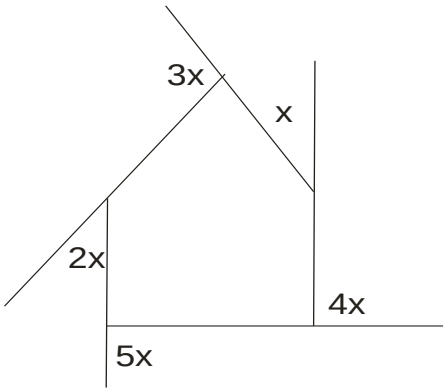
For the given figure, determine the value of x.

Soln

The given figure is a quadrilateral or a polygon. The angle marked $5x°, 4x°, 3x°$ and $8x°$ are the exterior angles, and since the sum of the exterior angles of a polygon = 360°, $=> 3x + 8x + 5x + 4x = 360°$,

$=>20x = 360, => x = 18°.$

Q4.



For the given figure, determine

a) the value of x.
b) the values of the angles marked $x, 2x, 3x, 4x \; and \; 5x$.

Soln

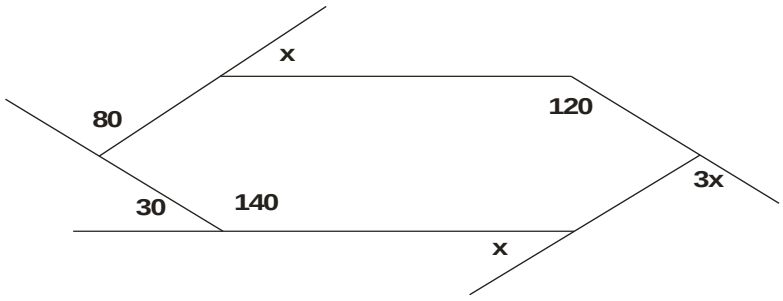
a) The given figure has five sides and as such it is a pentagon which is a polygon. The angles marked $x°, \; 2x°, \; 3x°, \; 4x°,$ and $5x°$ are the exterior angles. Since the sum of the exterior angles of a polygon = 360°, then $x° + 2x° + \; 3x° + \; 4x° \; + \; 5x° = 360°, => 15x° = 360° \; => x = \frac{360}{15} = 24°.$

b) i. the angle marked $x°$ = 24°.
ii. The angle marked $2x$ = 2(24) = 48°.

iii. The angle marked $3x = 3(24) = 72°$.

i. The angle marked $4x = 4(24) = 96°$.
ii. The angle marked $5x = 5(24) = 120°$.

Q5



For the given figure, determine the values of the angles marked x and $3x$.

Soln.

The given figure is a polygon and the angles marked , $x°$, $3x°$, 30° and 80° are the exterior angles. Since the sum of the exterior angles = 360°, $=> x° + x° + 3x° + 30° + 80° = 360°, => 5x + 110° = 360 => 5x = 360 - 110 = 250, => x = \frac{250}{5} = 50°$.

The value of the angle marked $x = 50°$, and that of the angle marked $3x = 3(50) = 150°$.