Section A [0.5 x 6 = 3]

Q1. State True or False:

A. A square is not a regular polygon. Mark True / **False.**

Answer: A polygon possessing equal sides and equal angles is called a regular polygon. A square is an example of a regular polygon with 4 equal sides and equal angles.

B. A rectangle is a regular polygon. Mark True / **False.**

Answer: Only Parallel or opposite sides are equal but a regular polygon must be all sides are the same or equal length. Hence, a Rectangle can never be a regular polygon. Note: Remember, a regular polygon should be both equilateral (all sides are the same length) and equiangular (all internal angles of the same measure)

C. The sum of all interior angles of a polygon is equal to 180°. Mark True / **False.**

Answer: The sum of the interior angles of quadrilaterals is always equal to 360 degrees. The sum of exterior angles of quadrilaterals is always equal to 360 degrees. Therefore, the sum of all angles of a quadrilateral is not 180 degrees.

D. The sum of measures of all interior angles of a hexagon is 720°. Mark True / False.
Answer: The sum of the interior angles of a hexagon is 720 degrees. You can have 6 triangles in a hexagon if you join vertices to the center. So on account six triangles 6*180degrees minus the angle at the center which is 360. or 180*6-360 = 720 degrees is the sum of the interior angles of a six-sided polygon or hexagon

E. The number of sides in a polygon can be a natural number or a fraction or a decimal number.. Mark True / **False**.

Answer: The number of sides in a polygon cannot be zero or a fraction.

So, The number of sides in a polygon is always a natural number.

F. The smallest number of sides of a polygon is 4. Mark True / **False.**

Answer: The smallest number of sides a polygon can have is three. A polygon with minimum number of sides is called a triangle (The smallest number of sides a polygon can have is three. The reason this is the smallest number of sides is because a polygon must both have straight sides, and all of those sides must be connected to form an enclosed figure. This is impossible to do with any less than three straight sides.)

Section B [1 x 2 = 2]

Q1. What is a regular polygon? State the name of a regular polygon of

(i) 3 sides

(ii) 4 sides

(iii) 6 sides

Answer: Regular Polygon: A regular polygon is an enclosed figure. In a regular polygon minimum sides are three.

(i) 3 sides

A regular polygon with 3 sides is known as an Equilateral triangle.

(ii) 4 sides

A regular polygon with 4 sides is known as Rhombus.

(iii) 6 sides

A regular polygon with 6 sides is known as a Regular hexagon.

Q2. Give an example of a geometrical shape that is not a polygon.

Answer: Circle is an example of a 2-D geometrical shape that is not a polygon.

Section C [1 x 6 = 6]

Q3. Find the sum of all the interior angles of a polygon having 13 sides.

Answer: We know that the sum of all the interior angles in a polygon = (n – 2) × 180°

Here, n = 13

Therefore, the sum of all interior angles = (13 – 2) × 180°

= 11 × 180°

= 1980°

Q4. The sum of all the interior angles of a polygon is 1440°. How many sides does the polygon have?

Answer: The formula for the sum of all the interior angles of a polygon is = (n – 2) × 180°

Given, the sum of interior angles of the given polygon is 1440

(n – 2) × 180 = 1440

n – 2 = 1440 / 180

n – 2 = 144 / 18 = 8

n – 2 = 8

n = 10

Q5. Find the exterior angle of a polygon with sides 6.

Answer:

Exterior angle = 360 / n

Given n = 6

Exterior angle = 360 / 6 = 60.

Q6. Is it possible to have a polygon, where the sum of whose interior angles is 9 right angles?

Answer: To calculate the number of sides of a polygon,

Number of sides = ½ [(sum of interior angles / 90) + 4]

= ½ ((9 × 90) / 90 + 4)

= ½ (9 + 4)

= ½ (13)

= 6.5

No, it is not possible to have a polygon where the sum of whose interior angles is 9 right angles, since we got the number of sides as 6.5.

Q7. Is it possible to have a polygon whose sum of interior angles is 910°?

Answer: We know that

Number of sides = ½ (sum of interior angles / 90 + 4)

n = ½ (910°/90° + 4)

n = ½ (10.11 + 4)

Since n is not a positive integer/whole number, (the value of n is in decimals), there cannot be a polygon whose interior angle is 910°.

Q8. Find the measure of each angle of a regular Nonagon.

Answer: The number of sides given is 9

Formula for each interior angle is ((2n – 4) × 90) / n

= [(2 × 9 – 4) × 90] / 9

= (14 × 90) / 9

= 1260 / 9

= 140°

Section D (Any 6 Questions only) [2 x 6 = 12]

Q9. Which polygon has both its interior and exterior angles the same?

Answer: We know that

Interior angle + Exterior angle = 180 degrees

If Interior angle = Exterior angle

Then Exterior angle + Exterior angle = 180 degrees

2 Exterior angle = 180 degrees

Exterior angle = 180 / 2

Exterior angle = 90.

But Interior angle = Exterior angle = 90 degrees

Number of sides n = 360 / (180 – interior angle)

n = 360 / (180 – 90)

n = 360 / 90

n = 4.

A polygon with 4 sides has both interior angles and exterior angles as same.

Q10. Calculate the sum of angles of a polygon with :
(i) 10 sides
(ii) 12 sides
(iii) 20 sides
(iv) 25 sides
Answer:

(i) No. of sides n = 10
sum of angles of polygon = $(n - 2) \times 180°$
$= (10 - 2) \times 180° = 1440°$
(ii) no. of sides n = 12
sum of angles = $(n - 2) \times 180°$
$= (12 - 2) \times 180° = 10 \times 180° = 1800°$
(iii) n = 20
Sum of angles of Polygon = $(n - 2) \times 180°$
$= (20 - 2) \times 180° = 3240°$
(iv) n = 25
Sum of angles of polygon = $(n - 2) \times 180°$
$= (25 - 2) \times 180° = 4140°$

Q11. The interior angles of a pentagon are in the ratio 4 : 5 : 6 : 7 : 5. Find each angle of the pentagon.

Answer:

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

Their sum = 4x + 5x + 6x + 7x + 5x = 21x

Sum of interior angles of a polygon = $(n-2) \times 180^\circ = (5-2) \times 180^\circ = 540^\circ$

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

$\therefore$ Angles are $4 \times 20^\circ = 80^\circ$

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

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

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

$5 \times 20 = 100^\circ$

Q12. The two angles of a hexagon are 120° and 160°. If the remaining four angles are equal, find each equal angle.

Answer:

Two angles of a hexagon are 120°, 160°

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

Their sum = 4x + 280°

But sum of all the interior angles of a hexagon

$= (6-2) \times 180^\circ$

$= 4 \times 180^\circ = 720^\circ$

$\therefore \quad 4x + 280^\circ = 720^\circ$

$\Rightarrow \quad 4x = 720^\circ - 280^\circ = 440^\circ \Rightarrow x = 110^\circ$

$\therefore$ Equal angles are 110° (each)

Q13. Find the number of sides in a regular polygon, if its each exterior angle is :
(i) 1/ 3 of a right angle
(ii) two-fifth of a right-angle.
Answer:

(i) Each exterior angle = $\frac{1}{3}$ of a right angle

$= \frac{1}{3} \times 90$

$= 30°$

Let number of sides = n

$$\therefore \quad \frac{360°}{n} = 30°$$

$$\therefore \quad n = \frac{360°}{30°}$$

$$n = 12$$

$$(ii) \quad \text{Each exterior angle} = \frac{2}{5} \text{ of a right-angle}$$

$$= \frac{2}{5} \times 90°$$

$$= 36°$$

$$\text{Let number of sides} = n$$

$$\therefore \quad \frac{360°}{n} = 36°$$

$$n = \frac{360°}{36°}$$

$$n = 10$$

Q14. The sum of the interior angles of a regular polygon is twice the sum of its exterior angles. Find the number of sides of the polygon.
Answer:

Let number of sides = n

Sum of exterior angles = 360°

Sum of interior angles = 360° x 2 = 720°

Sum of interior angles = (n – 2) x 180°

720° = (n – 2) x 180°

$n - 2 = \frac{720}{180}$

n – 2 = 4

n = 4 + 2

n = 6

Q15. Three of the exterior angles of a hexagon are 40°, 51 ° and 86°. If each of the remaining exterior angles is x°, find the value of x.

Answer:

Sum of exterior angles of a hexagon = 4 x 90° = 360°

Three angles are 40°, 51° and 86°

Sum of three angle = 40° + 51° + 86° = 177°

Sum of other three angles = 360° – 177° = 183°

Each angle is x°

3x = 183°

$x = \frac{183}{3}$

Hence x = 61

Q16. The ratio between an exterior angle and the interior angle of a regular polygon is 1 : 5. Find
(i) the measure of each exterior angle
(ii) the measure of each interior angle
(iii) the number of sides in the polygon.

Answer: From the question it is given that,

The ratio between an exterior angle and the interior angle of a regular polygon is 1: 5

Let us assume the exterior angle be y

And interior angle be 5y

We know that sum of interior and exterior angles is equal to 180o,

$y + 5y = 180^o$

$6y = 180^o$

$y = 180^o/6$

$y = 30^o$

(i) the measure of each exterior angle = $y = 30^o$

(ii) the measure of each interior angle = $5y = 5 \times 30^o = 150^o$

(iii) the number of sides in the polygon

The number of sides of a regular polygon whose each interior angles has a measure of 150^o

Let us assume the number of sides of the regular polygon be n,

Then, we know that $150^o = ((2n – 4)/n) \times 90^o$

$150^o/90^o = (2n – 4)/n$

$5/3 = (2n – 4)/n$

By cross multiplication,

3(2n – 4) = 5n

6n – 12 = 5n

By transposing we get,

6n – 5n = 12

n = 12

Therefore, the number of sides of a regular polygon is 12.

Q17. The ratio of the number of sides of two regular polygons is 1 : 2, and the ratio of the sum of their interior angles is 3 : 8. Find the number of sides of each polygon.

a) 4 and 8 b) 3 and 6
c) 5 and 10 d) 6 and 12

Answer:

Given: The sides of the two regular polygons are in the ratio 1:2.

Let the number of sides of the polygons be n and 2n respectively

The interior angles of these polygons are in the ratio 3:4.

The measure of each interior angle for a regular polygon with n sides is given by

$= \frac{\mathbf{n-2)\times 180^\circ}}{\boldsymbol{n}}$

Therefore, the measure of each interior angle of the given polygons will be $\frac{\mathbf{(n-2)\times 180^\circ}}{\boldsymbol{n}}$ and $\frac{\mathbf{(n-2)\times 180^\circ}}{\boldsymbol{2n}}$ respectively.

Also, the ratio of the interior angles is 3:4.

$\therefore \frac{\mathbf{(n-2)\times 180^\circ}}{\boldsymbol{n}} \div \frac{\mathbf{(n-2)\times 180^\circ}}{\boldsymbol{2n}} = \frac{3}{4}$

$\Rightarrow \frac{\mathbf{n-2}}{\boldsymbol{n-1}} = \frac{3}{4}$

⇒ 4n−8 = 3n−3

⇒ 4n−3n = 8−3

∴n=5

Therefore, the number of sides in each polygon is n and 2n, which is 5 and 10 respectively.