Section A [0.5 x 6 = 3]

Q1. Mark True or False:

A. A polygon having all sides equal and all angles equal is known as a regular polygon. Mark **True** / False.

Answer: A polygon having all sides equal and all angles equal is known as a regular polygon

B. Square is not a regular polygon. Mark True / **False.**

Answer: A polygon is defined as a closed planar figure with at least three straight lines. Polygons have special names, depending on the number of sides they have. A square is a polygon which has four equal sides and four equal angles (each measuring 90 ∘).

C. Rectangle is a regular polygon. Mark True / **False.**

Answer: In a rectangle only Parallel or opposite sides are equal but in a regular polygon, 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).

D. Rhombus is an irregular polygon. Mark True/**False.**

Answer: Now, by the properties of Rhombus, All the sides are equal, and opposite angles are equal, but for a regular polygon all the sides must be equal, and all the interior angles must be equal. Hence, Rhombus can never be a regular polygon.

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 a minimum number of sides is called a triangle.

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 Equilateral triangle.

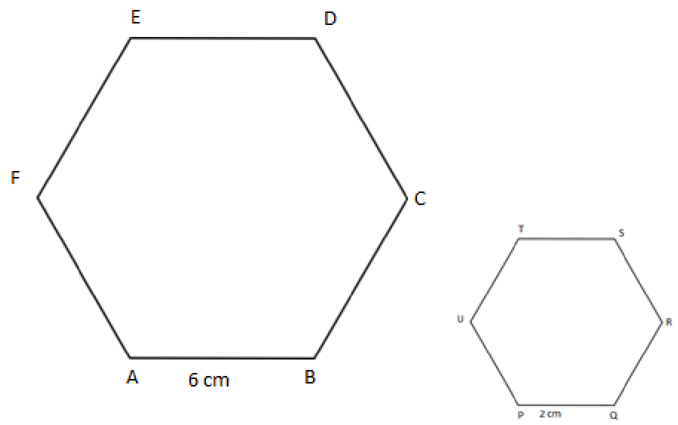
(ii) 4 sides

A regular polygon with 4 sides is known as Rhombus.

(iii) 6 sides

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

Q2. State whether the given statement is true or false.
Following regular hexagons are similar figures.



Answer: True

In similar figures, all the corresponding angles will be equal and all the corresponding sides will be in the same ratio (or proportion).
In the given two regular hexagons, all the interior angles are equal. Therefore, they are similar.

Section C (attempt any 7 questions) [1 x 7 = 7]

Q3: What is the measure of any exterior angle of a regular octagon?

Answer: Sum of the exterior angles of a polygon (irrespective of the number of sides) is 360∘. In the case of a regular octagon, the measure of all exterior angles will be equal. So, a measure of each exterior angle = $360^\circ / 8 = 45^\circ$.

Q4: What is the measure of the exterior angle of a regular hexagon?

Answer: The sum of the exterior angles of a polygon (irrespective of the number of sides) is 360∘ In the case of a regular hexagon, the measure of all exterior angles will be the same. So, a measure of each exterior angle = $360^\circ/6=60^\circ$

Q5: The measure of the exterior angle of an 18-sided regular polygon.

Answer: A measure of an exterior angle of an `n' sided regular polygon = $2 \times 180^0 / n$

Given, n = 18 Measure of exterior angle = 20^0

Q6. How many sides does a regular polygon have, if the measure of an exterior angle is 24°?

Answer: Let the number of sides of the polygon be n.
The sum of exterior angles of a regular polygon =360°
Hence, the number of sides
$=\frac{Sum\ of\ exterior\ angles}{Each\ interior\ angle} = \frac{360}{24} = 15$
Hence, the regular polygon has 15 sides.

Q7: Find the measure of the exterior angle of a regular pentagon and the exterior angle of a regular decagon. What is the ratio between these two angles?

Answer: We know that a pentagon has 5 sides and a decagon has 10.
Measure of each exterior angle of a regular pentagon
$=\frac{360}{5} = 72°$

Measure of each exterior angle of a regular decagon
$=\frac{360}{10} = 36°$

∴ Required ratio
$= \frac{72}{36}$

= 2:1

Q8. Prove that the interior angle of a regular five-sided polygon (pentagon) is three times the exterior angle of a regular decagon.

Answer:

One interior angle of a pentagon = $(n-2) \times \frac{180}{n}$

where n = 5

$= (5-2) \times \frac{180}{5} = 108$

The exterior angle of any polygon is 360.

One exterior angle of the decagon = $\frac{360}{10} = 36$

108 = 3 × 36

Therefore it's proved that one interior angle of the pentagon is three times the exterior angle of the decagon.

Q9. The interior angle of a regular pentagon is four times the exterior angle of a regular decagon. State whether the given statement is correct or not.

Answer: False

The interior angle of a regular pentagon

= $\frac{2n-4}{n}$ x 90^0

= $\frac{6}{5}$ x 90^0

An exterior angle of a regular decagon

=180° - $\frac{2n-4}{n}$ x 90^0

=180° - $\frac{16}{10}$ x 90^0

= 180° − 144° = 36°

So,108°= 3× 36°

It is three times the exterior angle of a regular decagon. Hence, the given statement is false.

Q10.Each interior angle of a regular octagon is equal to 135°. State whether the given statement is true or false.

Answer: True

The formula for finding the interior angle of a polygon = $\frac{2n-4}{n}$ × 90°

The interior angle of an octagon = $\frac{16-4}{8}$× 90° = 135°

So, the given statement is true.

Q11. Is it possible to have a regular polygon whose each interior angle is 170°
State true or false:

Answer: True
Let the number of polygon = n (which must be an integer)
The sum of all interior angles is n × 170^o
The sum of all interior angles of a polygon is 180^o(n−2)
=> n × 170^o =1 80^o (n − 2)
=> 10^on = 360^o
=> n = 36^o
Yes, there is a regular polygon whose each interior angle is 170^o

Q12: Is it possible to have a regular polygon whose each interior angle is :

(i) 170^o

(ii) 138^o

Answer:(i) No. of sides = n

each interior angle = 170^o

= $\frac{n-2}{n}$ x 180^0 = 170^o

180n − 360^o = 170n

180n − 170n = 360^o

10n = 360^o

n = 36

which is a whole number.

Hence it is possible to have a regular polygon Whose interior angle is 170^o .

(ii) Let no. of sides =138^o

∴$\frac{n-2}{n}$ x 180^0 = 138

= 180n − 360^o= 138n

= 180n − 138n = 360^o

42n = 360^o

= n = $\frac{360}{42}$

= n = $\frac{60}{7}$

which is not a whole number.

Hence it is not possible to have a regular polygon having an interior angle of 138^o.

Section D (Attempt any three questions only) [3 x 3 = 9]

Q13. Find the number of sides of a regular polygon if each of its interior angles is 168°.
Answer:

Each interior angle of a regular polygon = 168°

Let number of sides = n, then

$\frac{2n-4}{n} \times 90° = 168°$

$\frac{2n-4}{n} = \frac{168°}{90°} = \frac{28}{15}$

∴ 30n − 60 = 28n

⇒ 30n − 28n = 60

⇒ 2n = 60

⇒ n = $\frac{60}{2}$ = 30

∴ Number of sides of the polygon = 30

Q14. The angles of a hexagon are (2x + 5)°, (3x – 5)°, (x + 40)°, (2x + 20)°, (2x + 25)° and (2x + 35)°. Find the value of x.
Answer:

Number of sides in hexagon = 6.

Sum of interior angles = (2 × 6 − 4) × 90 = 720°

∴ (2x + 5) + (3x − 5) + (x + 40) + (2x + 20)

\+ (2x + 25) + (2x + 35) = 720

⇒ 12x + 120 = 720

⇒ 12x = 720 − 120

⇒ 12x = 600

⇒ x = 50.

Q15. Find the number of sides in a polygon if the sum of its interior angles is:
(i) 1260°
(ii) 1980°
(iii) 3420°
Answer:

(i) We know that,

Sum of measures of all interior angles of polygons = (2n – 4) × 90°

Given, interior angle = 1260°

1260 = (2n – 4) × 90°

1260/90 = 2n – 4

14 = 2n – 4

By transposing we get,

2n = 14 + 4

2n = 18

n = 18/2

n = 9

Therefore, the number of sides in a polygon is 9.

(ii) We know that,

Sum of measures of all interior angles of polygons = $(2n – 4) \times 90^o$

Given, interior angle = 1980^o

$1980 = (2n – 4) \times 90^o$

1980/90 = 2n – 4

22 = 2n – 4

By transposing we get,

2n = 22 + 4

2n = 26

n = 26/2

n = 13

Therefore, the number of sides in a polygon is 13.

(ii) We know that,

Sum of measures of all interior angles of polygons = $(2n – 4) \times 90^o$

Given, interior angle = 3420^o

$3420 = (2n – 4) \times 90^o$

3420/90 = 2n – 4

38 = 2n – 4

By transposing we get,

2n = 38 + 4

2n = 42

n = 42/2

n = 21

Therefore, the number of sides in a polygon is 21.

Q16. The exterior angles of a pentagon are in ratio 1: 2 : 3: 4: 5. Find all the interior angles of the pentagon.
Solution:-

From the question it is given that, the exterior angles of a pentagon are in ratio 1: 2 : 3: 4: 5.

We know that the sum of the exterior angles of the pentagon is equal to 360^o.

So, let us assume the angles of the pentagon be 1a, 2a, 3a, 4a and 5a.

$1a + 2a + 3a + 4a + 5a = 360^o$

$15a = 360^o$

$a = 360^o/15$

$a = 24^o$

Therefore, the angles of the pentagon are, $1a = 1 \times 24 = 24^o$

$2a = 2 \times 24 = 48^o$

$3a = 3 \times 24 = 72^o$

$4a = 4 \times 24 = 96^o$

$5a = 5 \times 24 = 120^o$

Then, the interior angles of the pentagon are, $180^o – 24^o = 156^o$

$180^o – 48^o = 132^o$

$180^o – 72^o = 108^o$

$180^o – 96^o = 84^o$

$180^o – 120^o = 60^o$