Exercise 14 A:

1. Find the measure of each exterior angle of a regular

(i) pentagon (ii) hexagon (iii) heptagon (iv) decagon

(v) polygon of 15 sides.

Answer:

(i) In Regular Pentagon, all sides are of the same size, and the measure of all interior angles is the same.

The sum of the interior angles of a pentagon is (n – 2) × 180° [n is the number of sides of a polygon)]

= (5 – 2) × 180°= 540°.

Each interior angle = 540/5 = 108^0

As we know the Sum of the Interior Angle and Exterior Angle is 180°

Exterior Angle + Interior Angle = 180°

Exterior Angle +108° =180°

So, Exterior Angle = 180°- 108°

=72°

(ii) In Regular hexagons, all sides are of the same size, and the measure of all interior angles is the same.

The sum of the interior angles of a hexagon

= (n – 2) × 180° [n is the number of sides of a polygon)]

= (6 – 2) × 180°= 720°

Each interior angle = 720/6 = 120°

As we know the Sum of the Interior Angle and Exterior Angle is 180°

Exterior Angle + Interior Angle = 180°

Exterior Angle +120° = 180° So, Exterior Angle =180°- 120° = 60°

(iii) In a Regular Heptagon, all sides are of the same size, and the measure of all interior angles is the same.

The sum of the interior angles of the heptagon is (n – 2) × 180° [n is the number of sides of a polygon)]

= (7 – 2) X 180°= 900°.

Each interior angle = 900/7 = 128.57^0

As we know the Sum of the Interior Angle and Exterior Angle is 180°

Exterior Angle + Interior Angle = 180°

Exterior Angle +128.57° =180°

So, Exterior Angle = 180°– 128.57°

=51.43°

(iv) In a Regular Decagon, all sides are the same size, and the measure of all interior angles is the same.

The sum of the interior angles of the decagon is

(n – 2) × 180° [n is the number of sides of a polygon)]

= (10 – 2) X 180°= 1440°.

Each interior angle = 1440/10 = 144^0

As we know the Sum of the Interior Angle and Exterior Angle is 180°

Exterior Angle + Interior Angle = 180°

Exterior Angle +144° =180°

So, Exterior Angle = 180°- 144°

=36°

(v) In a Regular Polygon of 15 sides, all sides are of the same size, and the measure of all interior angles is the same.

The sum of the interior angles of a polygon of 15 sides is (n – 2) × 180° [n is the number of sides of a polygon)]

(15 – 2) X 180°= 2340°.

Each interior angle = 2340/15 = 156^0

As we know the Sum of the Interior Angle and Exterior Angle is 180°

Exterior Angle + Interior Angle = 180°

Exterior Angle +156° =180°

So, Exterior Angle = 180°- 156°

=24°

2. Is it possible to have a regular polygon each of whose exterior angles is 50°?

Answer:

No, since $\frac{360}{50}$ is not a whole number

A sum of exterior angles of a regular polygon is 360°

When we divide the exterior angle by 360°, we get the number of exterior angles.

Since it is a regular polygon, number of exterior angles will be equal to the number to sides.

N = 360/50 = 7.2 [Number of sides of polygon]

7.2 is not an integer. So, it is not possible to have a regular polygon where each exterior angle is 50°.

3. Find the measure of each interior angle of a regular polygon having

(i) 10 sides (ii) 15 sides.

Answer

(i) In a Regular Polygon of 10 sides, all sides are the same size, and the measure of all interior angles is the same.

The sum of interior angles of a polygon of 10 sides is (n – 2) × 180° [n is the number of sides of a polygon)]

= (10 – 2) X 180°= 1440°.

Each interior angle = 1440/10

= 144^0

(ii) In a Regular Polygon of 15 sides, all sides are the same size, and the measure of all interior angles is the same.

The sum of interior angles of a polygon of 10 sides is (n – 2) × 180° [n is the number of sides of a polygon)]

= (15 – 2) X 180°= 2340°.

Each interior angle = 2340/15

= 156°

5. What is the sum of all interior angles of a regular

(i) pentagon (ii) hexagon

(iii) nonagon (iv) polygon of 12 sides

Answer:

(i) In Regular Pentagon, all sides are of the same size, and the measure of all interior angles is the same.

The sum of the interior angles of a regular pentagon is

= (n – 2) × 180° [n is the number of sides of a polygon)]

= (5 – 2) X 180°

= 540°.

(ii) In Regular hexagons, all sides are the same size, and the measure of all interior angles are the same.

The sum of the interior angles of a regular hexagon is

= (n – 2) × 180° [n is the number of sides of the polygon)]

= (6 – 2) X 180°

= 720°.

(iii) In Regular Nonagon, all sides are the same size, and the measure of all interior angles is the same.

The sum of the interior angles of a regular nonagon is

= (n – 2) × 180° [n is the number of sides of a polygon)]

= (9 – 2) X 180°

= 1260°.

(iv) In a Regular Polygon of 12 sides, all sides are the same size, and the measure of all interior angles is the same.

The sum of the interior angles of a regular polygon of 12 sides is

= (n – 2) × 180° [n is the number of sides of the polygon)]

= (12 – 2) X 180°

= 1800°.

6. What is the number of diagonals in a

(i) heptagon (ii) octagon

(iii) polygon of 12 sides

Answer:

(i) The number of diagonals in the Heptagon $= n\ x\ \frac{n-3}{2}$ [n represents several sides]

$= 7\ \text{x}\ \frac{7-3}{2}$

$= 7 \times \frac{4}{2}$

= 14

So, the number of diagonals in a heptagon is 14.

(ii) The number of diagonals in the Octagon = $\text{n x}\ \frac{\text{n}-3}{2}$ [n represents number of sides]

$= 7\ \text{x}\ \frac{8-3}{2}$

$= 8 \times \frac{5}{2}$

= 20

So, the number of diagonals in an octagon is 20.

(iii) The number of diagonals in a polygon of 12 sides is = $\text{n x}\ \frac{\text{n}-3}{2}$ [n represents a number of sides]

$= 12\ \text{x}\ \frac{12-3}{2}$

$= 12 \times \frac{9}{2}$

= 54

So, the number of diagonals in the polygon of 12 sides is 54.

7. Find the number of sides of a regular polygon whose each exterior angle measures:

(i) 40° (ii) 36° (iii) 72° (iv) 30°

Answer:

(i) No. of Sides = 360°/Exterior

Angle = 360/40 = 9

A number of sides is 9 of a regular polygon whose exterior angle is 40°.

(ii) No. of Sides = 360° / Exterior Angle

= 360/36

= 10

Number of sides is 10 of regular polygon whose exterior angle is 36°.

(iii) No. of Sides = 360° / Exterior Angle

= 360/72 = 5

The number of sides is 5 of a regular polygon whose exterior angle is 72°.

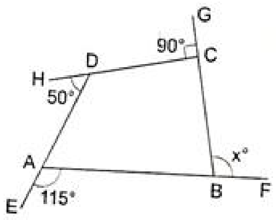
(iv) No. of Sides = 360° / Exterior Angle

= 360/30

= 12

Number of sides is 12 of a regular polygon whose exterior angle is 30°.

8. In the given figure, find the angle measure x.



Answer:

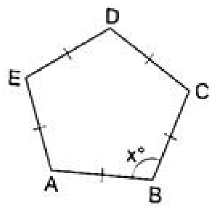
A sum of all the exterior angles = 360°

90° + 50°+ 115°+ x=360°

X = 360° - 90° - 50°- 115°

X = 105°

9. Find the angle measure *x* in the given figure.



Answer:

This is a regular pentagon, as all sides are of equal length.

AB = BC = CD = DE = EA

The sum of the interior angles of the polygon is

= (n – 2) × 180° [n is the number of sides of the polygon)]

= (5 – 2) X 180° [for pentagon n=5]

= 540°

Since it is a regular pentagon, It’s all interior angles will be equal.

Size of Interior Angle x = 540/5

= 108°

Exercise 14 B:

1. How many diagonals are there in a pentagon?

A. 5

B. 7

C. 6

D. 10

Answer: The number of diagonals in the Pentagon is

= $n \times \frac{n-3}{2}$ [n represents a number of sides]

$= 5 \times \frac{5-3}{2}$

$= 5 \times \frac{2}{2}$

= 5

So, the number of diagonals in a pentagon is 5.

2. How many diagonals are there in a hexagon?

A. 6

B. 8

C. 9

D. 10

Answer: The number of diagonals in a Hexagon is

= $n \times \frac{n-3}{2}$ [n represents the number of sides]

$= 6 \times \frac{6-3}{2}$

$= 6 \times \frac{3}{2}$

= 9

So, the Number of diagonals in a hexagon is 9.

3. How many diagonals are there in an octagon?

A. 8

B. 16

C. 18

D. 54

Answer: The number of diagonals in an Octagon is

$= n \times \frac{n-3}{2}$ [n represents a number of sides]

$= 8 \times \frac{(8-3)}{2}$

$= 8 \times \frac{5}{2}$

= 20
So, the number of diagonals in an octagon is 20.

4. How many diagonals are there in a polygon having 12 sides?

A. 12

B. 24

C. 36

D. 54

Answer: The number of diagonals in Polygon having 12 sides is

$= n \times \frac{n-3}{2}$ [n represents a number of sides]

$= 12 \times \frac{12-3}{2}$

$= 12 \times \frac{9}{2}$

= 54

So, the Number of diagonals in a polygon having 12 sides is 54.

5. A polygon has 27 diagonals. How many sides does it have?

A. 7

B. 8

C. 9

D. 12

Answer: Let x be the sides of a polygon.

No. of Diagonals = 27

According to the formula,

No. of Diagonals = $n \times \frac{n-3}{2}$

$27 = n \times \frac{n-3}{2}$

n (n - 3) = 54

$n^2 - 3n - 54 = 0$

(n + 6) (n - 9) = 0

n = -6 or 9

Since no of sides can't be negative.

So, No. of sides of a polygon will be 9.

6. The angles of a pentagon are x°, (x + 20)°. (x + 40)°, (x + 60)° and (x + 80)°. The smallest angle of the pentagon is

A. 75°

B. 68°

C. 78°

D. 85°

Answer: The sum of the interior angles of the pentagon is

= (n – 2) × 180° [n is the number of sides of the polygon)]

= (5 – 2) X 180°

= 540°

x + (x + 20) + (x + 40) + (x + 60) + (x + 80) = 540

5x + 200 = 540

5x = 340

X = 340 / 5

= 68°

So, the smallest angle of the pentagon is 68°

7. The measure of each exterior angle of a regular polygon is 40°. How many sides does it have?

A. 8

B. 9

C. 6

D. 10

Answer: Exterior Angle = 40°

No. of Sides = 360 / Exterior Angle

= 360 / 40

= 9

8. Each interior angle of a polygon is 108°. How many sides does it have?

A. 8

B. 6

C. 5

D. 7

Answer:

Interior Angle = 108°

Interior Angle + Exterior Angle = 180°

Exterior Angle = 180° - 108°

= 72°

No. of Sides = 360 / Exterior Angle

= 360 / 72

= 5

9. Each interior angle of a polygon is 135°. How many sides does it have?

A. 8

B. 7

C. 6

D. 10

Answer:

Interior Angle = 135°

Interior Angle + Exterior Angle = 180°

Exterior Angle = 180° - 135°

= 45°

No. of Sides = 360 / Exterior Angle

= 360 / 45

= 8

10. In a regular polygon, each interior angle is thrice the exterior angle. The number of sides of the polygon is

A. 6

B. 8

C. 10

D. 12

Answer: Let x be the exterior angle

Interior Angle = 3x

Interior Angle + Exterior Angle = 180°

4x = 180°

X= 180/4

= 45°

So, Exterior Angle = 45°

No. of Sides = 360 / Exterior Angle

= 360 / 45

= 8

11. Each interior angle of a regular decagon is

A. 60°

B. 120°

C. 144°

D. 180°

Answer: In a Regular Decagon, all sides are of the same size, and the measure of interior angles are the same. The sum of the interior angles of the decagon is
= (n – 2) × 180° [n is the number of sides of a polygon)]

= (10 – 2) X 180°

= 1440°.

Each interior angle = 1440/10 = 144°

12. The sum of all interior angles of a hexagon is

A. 6 right ∠s

B. 8 right ∠s

C. 9 right ∠s

D. 12 right ∠s

Answer: The sum of the interior angles of a hexagon is

= (n – 2) × 180° [n is the number of sides of a polygon)]

= (6 – 2) X 180°

= 720°.

1 right ∠s = 90°

So, 720°= 8 right ∠s

13. The sum of all interior angles of a regular polygon is 1080°. What is the measure of each of its interior angles?

A. 135°

B. 120°

C. 156°

D. 144°

Answer : The sum of the interior angles of a regular polygon is 1080°

= (n – 2) × 180° [n is the number of sides of a polygon)]

n - 2 = 1080° / 180°

n = 6 + 2

= 8

No. of Sides = 360 / Exterior Angle

8 = 360 / Exterior Angle

So, Exterior Angle = 360 / 8 = 45°

Exterior Angle + Interior Angle = 180°

Interior Angle = 180°- 45°

= 135°

14. The interior angle of a regular polygon exceeds its exterior angle by 108°. How many sides does the polygon have?

A. 16

B. 14

C. 12

D. 10

Answer: Let x be the exterior angle

Interior Angle = x + 108°

Interior Angle + Exterior Angle = 180°

X + (x + 108°) = 180°

2x= 180° - 108°

2x =72°

= 36°

So, Exterior Angle = 36°

No. of Sides = 360 / Exterior Angle

= 360 / 36

= 10

Space for rough work