Q1) Which of the following polynomials has (x + 1) as a factor?

- A)

  $x^4 + 3x^2 + 2x + 1$

- B)

  $x^3 + x^2 + x + 1$

- C)

  $x^3 - x^2 - \left(2+\sqrt{2}\right)x + \sqrt{2}$

- D)

  $2x^4 + 3x^2 + 2x + 4$

Answer:

B

Solution:

We know that if $p(x)$ is a polynomial of degree $n \geq 1$ and a is any real number, then $(x - a)$ is a factor of $p(x)$ if $p(a) = 0$.

Now, if $(x + 1)$ is a factor of the polynomial $p(x) = x^3 + x^2 + x + 1$, then $p(-1) = 0$.

$p(-1) = (-1)^3 + (-1)^2 + (-1) + 1 = -1 + 1 - 1 + 1 = 0$

Thus, the polynomial $p(x) = x^3 + x^2 + x + 1$ has $(x + 1)$ as a factor.

The correct answer is B.

Q2) Which of the following statements represents the **incorrect** Euclid's postulate?

- A) A line can be produced indefinitely if it is a terminated line.
- B) From the given two points, a straight line can be drawn from one point to the other.
- C) All the right angles are equal to one another.
- D) All the acute angles are equal to one another.

Answer:

D

Solution:

Euclid’s fourth postulate states that all the **right angles** are equal to one another, not all the acute angles.

Thus, the statement given in the alternative D is incorrect.

The correct answer is D.

Q3. Some statements are given below:

I. A straight line intersects two straight lines to form interior angles. These angles together measure less than two right angles on the same side of the line. When the two lines are produced indefinitely on both the sides, then they meet on that side on which the sum of the angles is less than two right angles.

II. A straight line intersects two straight lines to form interior angles. These angles together measure more than two right angles on the same side of the line. When the two lines are produced indefinitely on both the sides, then they meet on that side on which the sum of the angles is more than two right angles.

III. A straight line intersects two straight lines to form interior angles. On being measured together, these angles are equivalent to two right angles on the same side of the line. When the two lines are produced indefinitely on both the sides, then they meet on that side on which the sum of the angles is equal to two right angles.

IV. A straight line intersects two straight lines to form interior angles. These angles together measure greater than two right angles on the same side of the line. When the two lines are produced indefinitely on both the sides, then they do not meet on that side on which the sum of the angles is greater than two right angles.

Which pair of statements is correct?

- A) I and II
- B) II and III
- C) I and IV
- D) III and IV

Answer:

C

Solution:

According to Euclid’s Fifth Postulate:

If a straight line, falling on two straight lines, forms interior angles that together measure less than two right angles on the same side of it, then the two straight lines, when produced indefinitely

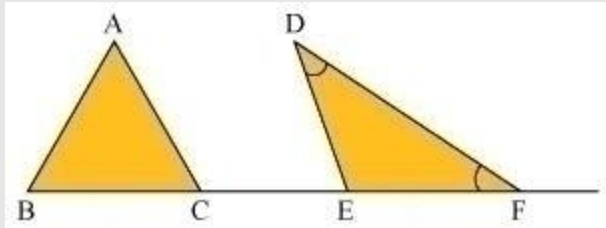
• meet on that side on which the sum of the angles is less than two right angles

• do not meet on that side on which the sum of the angles is greater than two right angle

Thus, the statements I and IV are correct.

The correct answer is C.

Q4) *Use the following information to answer the next question.*

The given figure shows two triangles ABC and DEF such that AC is parallel to DE. ∠EDF = 50° and ∠DFE = 30°.	

The measure of ∠ACB is

- A) 60°
- B) 80°
- C) 100°
- D) 120°

Answer:

B

Solution:

In ΔDEF, ∠DEF + ∠DFE + ∠EDF = 180°

∠DEF + 30° + 50° = 180°

∠DEF = 180° − 80°

∠DEF = 100°

Since AC is parallel to DE and BF is the transversal, ∠DEF and ∠ACE are corresponding angles.

Thus, ∠ACE = ∠DEF = 100°

∠ACE and ∠ACB form a linear pair.

∠ACE + ∠ACB = 180°.

∠ACB = 180° − ∠ACE

∠ACB = 180° − 100°

$\angle ACB = 80°$

The correct answer is B.

Q5) For what value of *a* will the expression (x + 3) be a factor of the polynomial $x\{(x+1)^2 + 8x\} + ax(x+1)$?

- A) 10
- B) 6
- C) −6
- D) −10

Answer:

D

Solution:

The given polynomial is: $p(x) = x\{(x+1)^2 + 8x\} + ax(x+1)$

It is given that (x + 3) is a factor of $p(x)$.

Therefore, by factor theorem, $p(-3) = 0$

$$\therefore (-3)\{(-3+1)^2 + 8(-3)\} + a(-3)(-3+1) = 0$$
$$\Rightarrow -3(4-24) + a(-3)(-2) = 0$$
$$\Rightarrow 60 + 6a = 0$$
$$\Rightarrow a = \frac{-60}{6} = -10$$

Thus, the required value of *a* is −10.

The correct answer is D.

Q6) If the area of a triangle is $12\sqrt{15}\ \text{cm}^2$ and its sides are in the ratio 2:3:4, then what is the perimeter of the triangle?

- A) 27 cm
- B) 36 cm
- C) 45 cm
- D) 54 cm

Answer:

B

Solution:

Let the sidesof the given triangle be represented by *a*, *b*,and *c*.

As the sides are in the ratio, 2:3:4, therefore, we have $a = 2x$, $b = 3x$, and $c = 4x$

$$s = \frac{a+b+c}{2} = \frac{2x+3x+4x}{2} = \frac{9x}{2}$$

$$\begin{aligned}\text{Area of the triangle} &= \sqrt{s(s-a)(s-b)(s-c)} \\ &= \sqrt{\frac{9x}{2}\left(\frac{9x}{2}-2x\right)\left(\frac{9x}{2}-3x\right)\left(\frac{9x}{2}-4x\right)} \\ &= \frac{3\sqrt{15}}{4}x^2\end{aligned}$$

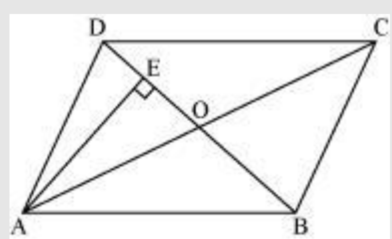
It is given that the area of the triangle is $12\sqrt{15}\ \text{cm}^2$.

$$\begin{aligned}&\therefore \frac{3\sqrt{15}}{4}x^2 = 12\sqrt{15}\ \text{cm}^2 \\ &\Rightarrow x^2 = 16\ \text{cm}^2 \\ &\Rightarrow x = 4\ \text{cm} \\ &\therefore a = 2x = 2\times 4\ \text{cm} = 8\ \text{cm} \\ &b = 3x = 3\times 4\ \text{cm} = 12\ \text{cm} \\ &c = 4x = 4\times 4\ \text{cm} = 16\ \text{cm}\end{aligned}$$

Therefore, perimeter of the triangle = $a + b + c$ = (8 + 12 + 16) cm = 36 cm

The correct answer is B.

Q7) *Use the following information to answer the next question.*

In the given figure, ABCD is a parallelogram, AB = 14 cm, BC = 25 cm, AC = 35 cm, and AE = 9.46 cm.	

The length of the diagonal BD is approximately

- A) 25.3 cm
- B) 28.5 cm
- C) 30.2 cm
- D) 32.4 cm

Answer:

C

Solution:

Consider ΔABC

Let *a* = AB = 14 cm, *b* = BC = 25 cm, and *c* = AC = 35 cm

$$\text{Semi-perimeter of } \Delta\text{ABC}, s = \frac{a+b+c}{2} = \frac{14+25+35}{2} \text{ cm} = 37 \text{ cm}$$

By Herons formula, area of ΔABC can be calculated as

$$\begin{aligned}\text{Area of } \Delta\text{ABC} &= \sqrt{s(s-a)(s-b)(s-c)} \\ &= \sqrt{37\times(37-14)(37-25)(37-35)} \\ &= \sqrt{37\times 23\times 12\times 2} \\ &= \sqrt{20424} \\ &= 142.91 \text{ cm}^2 \ \ (\text{approx.})\end{aligned}$$

It is observed that ΔABC and ΔABD lie on the same base AB and between the same parallels AB and CD.

∴Area of ΔABC = Area of ΔABD

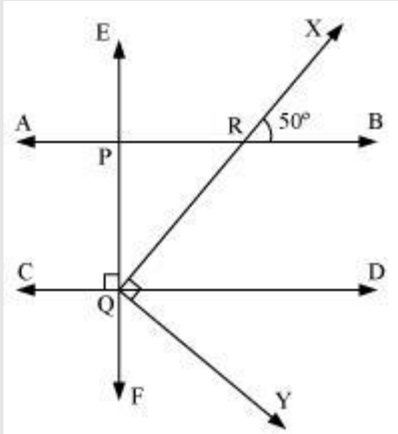
⇒ Area of ΔABD = 142.91 cm^2

$$\begin{aligned}&\Rightarrow \frac{1}{2}\times \text{BD}\times \text{AE} = 142.91 \text{ cm}^2 \\ &\Rightarrow \frac{1}{2}\times \text{BD}\times(9.46 \text{ cm}) = 142.91 \text{ cm}^2 \\ &\Rightarrow \text{BD} = \frac{142.91\times 2}{9.46} \\ &\Rightarrow \text{BD} = 30.2 \text{ cm} \ \ (\text{approx.})\end{aligned}$$

Thus, the length of the diagonal BD is approximately 30.2 cm.

The correct answer is C.

Q8) *Use the following information to answer the next question.*

In the given figure, AB‖CD.	

What is the measure of ∠FQY in the given figure?

- A) 35°
- B) 40°
- C) 45°
- D) 50°

Answer:

D

Solution:

We know that when two parallel lines are cut by a transversal, the pairs of corresponding angles are equal.

It is given that AB‖CD. Here, QX can be regarded as a transversal.

Then, ∠XRB and ∠RQD are corresponding angles.

$\therefore \angle XRB = \angle RQD = 50°$

$\angle RQY = \angle RQD + \angle DQY$

$\Rightarrow 90° = 50° + \angle DQY$

$\Rightarrow \angle DQY = 90° - 50° = 40°$

It is also given that CD and EF are perpendicular.

$\therefore \angle FQD = 90°$

$\Rightarrow \angle FQY + \angle DQY = 90°$

$\Rightarrow \angle FQY + 40° = 90°$

$\Rightarrow \angle FQY = 90° - 40° = 50°$

Thus, the measure of $\angle FQY$ is 50°.

The correct answer is D.