



## Algebra Questions for SSC Stenographer

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### Instructions

For the following questions answer them individually

#### Question 1

$$\sqrt{8 + \sqrt{57 + \sqrt{38 + \sqrt{108 + \sqrt{169}}}}}$$

- A 4
- B 6
- C 8
- D 10

Answer: A

#### Explanation:

Start from the root of 169 then second root will reduce to 11, third root will reduce to 7, fourth root will reduce to 8, and finally it reduce to value 4

#### Question 2

What is the value of  $\frac{(941+149)^2 + (941-149)^2}{(941 \times 941 + 149 \times 149)}$  ?

- A 10
- B 2
- C 1
- D 100

Answer: B

#### Explanation:

$$\text{Expression : } \frac{(941+149)^2 + (941-149)^2}{(941 \times 941 + 149 \times 149)}$$

$$= \frac{(941^2 + 149^2 + 2 \cdot 941 \cdot 149) + (941^2 + 149^2 - 2 \cdot 941 \cdot 149)}{941^2 + 149^2}$$

$$= \frac{2 \cdot (941^2 + 149^2)}{941^2 + 149^2}$$

$$= 2$$

#### Question 3

If  $a(2 + \sqrt{3}) = b(2 - \sqrt{3})$  then the value of  $1/(a^2 + 1) + 1/(b^2 + 1)$  is

- A -5
- B 1
- C 4
- D 9

Answer: B

#### Explanation:

$$\text{Let } a = (2 - \sqrt{3}) \text{ and } b = (2 + \sqrt{3})$$

$$a^2 = 7 - 4\sqrt{3}, \text{ and } b^2 = 7 + 4\sqrt{3}$$

$$\frac{1}{a^2+1} + \frac{1}{b^2+1} = \frac{(a)^2+(b)^2+2}{((a)^2+1)((b)^2+1)}$$

$$(a^2 + 1)(b^2 + 1) = (8 - 4\sqrt{3})(8 + 4\sqrt{3}) = 16(2 - \sqrt{3})(2 + \sqrt{3}) = 16$$

$$a^2 + b^2 + 2 = 16$$

$$\text{Thus } \frac{1}{a^2+1} + \frac{1}{b^2+1} = 1$$

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### Question 4

If  $a^2 + 1 = a$ , then the value of  $a^{12} + a^6 + 1$  is :

- A -3
- B 1
- C 2
- D 3

Answer: D

#### Explanation:

$$\text{Expression : } a^2 + 1 = a$$

$$\Rightarrow a^2 - a + 1 = 0$$

Multiplying by  $(a + 1)$  on both sides

$$\Rightarrow (a + 1)(a^2 - a + 1) = 0$$

$$\Rightarrow a^3 + 1^3 = 0$$

$$\Rightarrow a^3 = -1$$

$$\text{To find : } a^{12} + a^6 + 1$$

$$= (a^3)^4 + (a^3)^2 + 1$$

$$= (-1)^4 + (-1)^2 + 1$$

$$= 1 + 1 + 1 = 3$$

### Question 5

If  $a = \frac{2+\sqrt{3}}{2-\sqrt{3}}$  and  $b = \frac{2-\sqrt{3}}{2+\sqrt{3}}$ , then the value of  $a^2 + b^2 + a \times b$  is

- A 185
- B 195
- C 200
- D 175

Answer: B

#### Explanation:

$$a = \frac{2+\sqrt{3}}{2-\sqrt{3}} \text{ on rationalising we will get } a = (2 + \sqrt{3})^2$$

$b = \frac{2-\sqrt{3}}{2+\sqrt{3}}$  on rationalizing we will get  $b = (2 - \sqrt{3})^2$

now putting values of a and b in ,  $a^2 + b^2 + a \times b$

$$a^2 + b^2 + a \times b = 195$$

#### Question 6

If  $x + \frac{1}{x} = 99$ , find the value of  $\frac{100x}{2x^2+102x+2}$

A 1/6

B 1/2

C 1/3

D 1/4

Answer: C

#### Explanation:

Given :  $x + \frac{1}{x} = 99$

To find :  $\frac{100x}{2x^2+102x+2}$

$$= \frac{50x}{x^2+1+51x}$$

Dividing numerator and denominator by  $x$

$$= \frac{50}{x + \frac{1}{x} + 51}$$

Substituting value of  $(x + \frac{1}{x})$ , we get :

$$= \frac{50}{99+51} = \frac{50}{150}$$

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

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#### Question 7

If  $2x - 2(4 - x) < 2x - 3 < 3x + 3$ ; then x can take which of the following values?

A 2

B 3

C 4

D 5

Answer: A

#### Explanation:

Expression 1 :  $2x - 3 < 3x + 3$

$$\Rightarrow 3x - 2x > -3 - 3$$

$$\Rightarrow x > -6 \text{ -----(i)}$$

Expression 2 :  $2x - 2(4 - x) < 2x - 3$

$$\Rightarrow 4x - 8 < 2x - 3$$

$$\Rightarrow 4x - 2x < 8 - 3$$

$$\Rightarrow x < \frac{5}{2} \text{ ----(ii)}$$

Combining inequalities (i) and (ii), we get :  $-6 < x < \frac{5}{2}$

Thus, only value that  $x$  can take among the options = 2

$\Rightarrow$  Ans - (A)

### Question 8

If  $(x + y):(x - y) = 5:2$ , find value of  $(4x + 5y) / (x - 4y)$

A  $43/5$

B  $-5/43$

C  $-43/5$

D  $5/43$

Answer: C

Explanation:

Given :  $\frac{x+y}{x-y} = \frac{5}{2}$

$$\Rightarrow 2x + 2y = 5x - 5y$$

$$\Rightarrow 2y + 5y = 5x - 2x \Rightarrow 7y = 3x$$

$$\Rightarrow y = \frac{3x}{7}$$

To find :  $\frac{4x+5y}{x-4y}$

$$= [4x + 5(\frac{3x}{7})] \div [x - 4(\frac{3x}{7})]$$

$$= (4x + \frac{15x}{7}) \div (x - \frac{12x}{7})$$

$$= (\frac{43x}{7}) \div (\frac{-5x}{7})$$

$$= \frac{43x}{7} \times \frac{-7}{5x} = \frac{-43}{5}$$

$\Rightarrow$  Ans - (C)

### Question 9

Which of the following equations has the sum of its roots as 5?

A  $x^2 - 5x + 6 = 0$

B  $x^2 - 6x - 5 = 0$

C  $x^2 + 5x + 6 = 0$

D  $x^2 + 6x - 5 = 0$

Answer: A

Explanation:

Sum of roots in an equation :  $ax^2 + bx + c = 0$  is  $-\frac{b}{a}$

(A) :  $x^2 - 5x + 6 = 0$

$$\Rightarrow \text{Sum of roots} = -\frac{-5}{1} = 5$$

(B) :  $x^2 - 6x - 5 = 0$

$$\Rightarrow \text{Sum of roots} = -\frac{-6}{1} = 6$$

(C) :  $x^2 + 5x + 6 = 0$

=> Sum of roots =  $-\frac{5}{1} = -5$

(D) :  $x^2 + 6x - 5 = 0$

=> Sum of roots =  $-\frac{6}{1} = -6$

=> Ans - (A)

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### Question 10

$(2x + 5)^2 \times (4x - 1) - (3x^3 - 16x^2 + 25x - 21)$

A  $13x^3 + 92x^2 - 55x + 4$

B  $13x^3 - 92x^2 - 55x - 4$

C  $13x^3 + 92x^2 + 55x - 4$

D  $13x^3 - 92x^2 + 55x + 4$

Answer: C

#### Explanation:

Expression :  $(2x + 5)^2 \times (4x - 1) - (3x^3 - 16x^2 + 25x - 21)$

=  $[(4x^2 + 20x + 25) \times (4x - 1)] - (3x^3 - 16x^2 + 25x - 21)$

=  $[(16x^3 - 4x^2) + (80x^2 - 20x) + (100x - 25)] + (-3x^3 + 16x^2 - 25x + 21)$

=  $(16x^3 - 3x^3) + (80x^2 - 4x^2 + 16x^2) + (100x - 25x - 20x) + (-25 + 21)$

=  $13x^3 + 92x^2 + 55x - 4$

### Question 11

What is the value of  $299996 \times 300004$ ?

A 89999999984

B 89999699984

C 89999999884

D 89999999974

Answer: A

#### Explanation:

Expression :  $299996 \times 300004$

=  $(300000 - 4) \times (300000 + 4)$

=  $(300000)^2 - (4)^2$

=  $90000000000 - 16 = 89999999984$

=> Ans - (A)

### Question 12

If  $a+b = 8$  and  $ab = 15$ , then  $a^3 + b^3$  is

A 224

B 244

C 152

D 128

Answer: C

Explanation:

It is given that :  $(a + b) = 8$  and  $ab = 15$

Using the expression,  $(a^3 + b^3) = (a + b)(a^2 + b^2 - ab)$

$$= (8)(a^2 + b^2 - 15)$$

$$\text{Also, } (a^2 + b^2) = (a + b)^2 - 2ab$$

$$= 8[(a + b)^2 - 2ab] - 15$$

$$= 8[(8^2 - (2 \times 15)) - 15]$$

$$= 8(64 - 30 - 15) = 8 \times 19$$

$$= 152$$

=> Ans - (C)

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Question 13

If  $3x + 5(4 - 3x) > 2 - 4x < 3x - \frac{x}{3}$ ; then the value of x is

A 3

B 0

C 2

D -1

Answer: C

Explanation:

Expression 1 :  $3x + 5(4 - 3x) > 2 - 4x$

$$\Rightarrow 3x + 20 - 15x > 2 - 4x$$

$$\Rightarrow 12x - 4x < 20 - 2$$

$$\Rightarrow 8x < 18$$

$$\Rightarrow x < \frac{9}{4} \text{-----(i)}$$

Expression 2 :  $2 - 4x < 3x - \frac{x}{3}$

$$\Rightarrow 4x + 3x - \frac{x}{3} > 2$$

$$\Rightarrow \frac{20x}{3} > 2$$

$$\Rightarrow x > \frac{3}{10} \text{-----(ii)}$$

Combining inequalities (i) and (ii), we get :  $\frac{3}{10} < x < \frac{9}{4}$

The only value that  $x$  can take among the options = 2

=> Ans - (C)

Question 14

Simplify  $(b^5x^2a^3z^4) * (b^3x^2a^4z^5)/(a^2b^3z^2)$

- A  $b^5x^4a^5z^5$
- B  $b^5x^4a^5z^7$
- C  $b^5x^4a^4z^7$
- D  $b^4x^4a^5z^7$

Answer: B

Explanation:

Expression :  $(b^5x^2a^3z^4) * (b^3x^2a^4z^5)/(a^2b^3z^2)$

$$= (a)^{3+4}(b)^{5+3}(x)^{2+2}(z)^{4+5} \div a^2b^3z^2$$

$$= a^7b^8x^4z^9 \div a^2b^3z^2$$

$$= (a)^{7-2}(b)^{8-3}(x)^4(z)^{9-2}$$

$$= a^5b^5x^4z^7$$

=> Ans - (B)

Question 15

If  $xy = 56$  and  $x^2 + y^2 = 113$ , then what will be the value of  $(x + y)$ ?

- A 29
- B 21
- C 36
- D 15

Answer: D

Explanation:

Given :  $(x^2 + y^2) = 113$  and  $xy = 56$

Using  $(x + y)^2 = x^2 + y^2 + 2xy$

$$\Rightarrow (x + y)^2 = 113 + (2 \times 56)$$

$$\Rightarrow (x + y)^2 = 113 + 112 = 225$$

$$\Rightarrow (x + y) = \sqrt{225} = 15$$

=> Ans - (D)

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