# Algebra Questions for SSC CHSL and MTS

**Instructions**

For the following questions answer them individually

**Question 1**

If $a^2 + b^2 - c^2 = 0$, then the value of $\frac{2(a^6+b^6-c^6)}{3a^2b^2c^2}$ is:

**A**   3

**B**   1

**C**   0

**D**   2

   **Answer:** D

**Explanation:**

If a + b + c = 0 then $a^3 + b^3 + c^3 = 3abc$ so,

$a^6 + b^6 - c^6 = 3a^2b^2c^2$

$\frac{2(a^6+b^6-c^6)}{3a^2b^2c^2}$

= $\frac{2(3a^2b^2c^2)}{3a^2b^2c^2}$ = 2

**Question 2**

If $a + \frac{1}{a} = 5$ then $a^3 + \frac{1}{a^3}$ is:

**A**   110

**B**   10

**C**   80

**D**   140

   **Answer:** A

**Explanation:**

$a^3 + \frac{1}{a^3}$

= (a+\frac{1}{a})^3 - 3(a+\frac{1}{a})$$

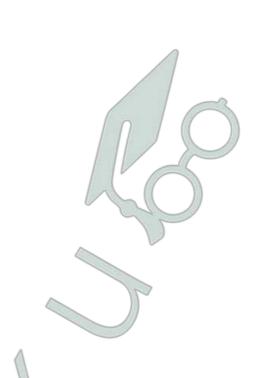$(\because (a + b)^3 = a^3 + b^3 + 3ab(a + b))$

= $5^3 - 3(5)$ = 110

**Question 3**

The coefficient of x in $(x - 3y)^3$ is :

**A**   $3y^2$

**B**   $27y^2$

**C**   $-27y^2$

**D**   $-3y^2$

   **Answer:** B

**Explanation:**

$(x - 3y)^3 = x^3 - (3y)^3 - 3x.3y(x - 3y)$

$((a - b)^3 = a^3 - b^3 - 3ab(a - b))$

= $x^3 - 27y^3 - 9xy(x - 3y)$

= $x^3 - 27y^3 - 9x^2y - 27xy^2$

The coefficient of x = $27y^2$

**Question 4**

Expand $\left(\frac{x}{3} + \frac{y}{5}\right)^3$

**A** $\frac{x^3}{27} + \frac{x^2y}{25} + \frac{xy^2}{25} + \frac{y^3}{125}$

**B** $\frac{x^3}{25} + \frac{x^2y}{15} + \frac{xy^2}{25} + \frac{y^3}{125}$

**C** $\frac{x^3}{27} + \frac{xy}{15} + \frac{xy^2}{25} + \frac{y^3}{125}$

**D** $\frac{x^3}{27} + \frac{x^2y}{15} + \frac{xy^2}{25} + \frac{y^3}{125}$

**Answer:** D

**Explanation:**

$\left(\frac{x}{3} + \frac{y}{5}\right)^3$

$(\because (a + b)^3 = a^3 + b^3 + 3ab(a + b))$

= $\left(\frac{x}{3}\right)^3 + \left(\frac{y}{5}\right)^3 + 3\left(\frac{x}{3}\right)\left(\frac{y}{5}\right)\left(\frac{x}{3} + \frac{y}{5}\right)$

= $\frac{x^3}{27} + \frac{y^3}{125} + \frac{xy}{5}\left(\frac{x}{3} + \frac{y}{5}\right)$

= $\frac{x^3}{27} + \frac{y^3}{125} + \frac{x^2y}{15} + \frac{xy^2}{25}$

**Question 5**

If $a^2 + b^2 + c^2 = 300$ and $ab + bc + ca = 50$, then what is the value of $a + b + c$ ? (Given that a, b and c are all positive.)

**A** 22

**B** 20

**C** 25

**D** 15

**Answer:** B

**Explanation:**

$(a + b + c)^2 = a^2 + b^2 + c^2 + 2(ab + bc + ca)$

$(a + b + c)^2 = 300 + 2(50)$

$(a + b + c)^2 = 400$

a + b + c = 20

**Question 6**

If x + y + z = 10 and xy + yz + zx = 15, then find the value of $x^3 + y^3 + z^3 — 3xyz$.

**A** 660

**B** 525

**C** 550

**D** 575

   **Answer:** C

**Explanation:**

$x^3 + y^3 + z^3 - 3xyz = (x + y + z)(x^2 + y^2 + z^2 - xy - yz - xz)$

x + y + z = 10
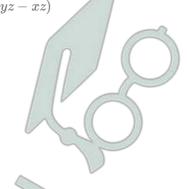
Taking square on both sides,

$(x + y + z)^2 = 100$

$x^2 + y^2 + z^2 + 2(xy + yz + xz) = 100$

$x^2 + y^2 + z^2 = 100 - 2 \times 15 = 00 - 30 = 70$

$x^3 + y^3 + z^3 - 3xyz = (10)(70 - 15) = 10 \times 55 = 550$

# SSC CHSL Previous Question papers (download pdf)

**Question 7**

If $x^2 - 4x + 4 = 0$, then the value of $16 \left( x^4 - \frac{1}{x^4} \right)$ is

**A** 127

**B** 255

**C** $\frac{127}{16}$

**D** $\frac{255}{16}$

   **Answer:** B

**Explanation:**

$x^2 - 4x + 4 = 0$

$x^2 - 2x - 2x + 4 = 0$

$x(x - 2) - 2(x - 2) = 0$

$(x - 2)(x - 2) = 0$

x = 2

now,

$16 \left( x^4 - \frac{1}{x^4} \right)$

$= 16 \left( 2^4 - \frac{1}{2^4} \right)$

$= 16 \left( 16 - \frac{1}{16} \right)$

$= 16^2 - 1 = 255$

**Question 8**

If $a^3 + \frac{1}{a^3} = 52$ then the value of $2 \left( a + \frac{1}{a} \right)$ is :

**A** 8

**B** 2

**C** 6

**D** 4

   **Answer:** A

**Explanation:**

$a^3 + \frac{1}{a^3} = 52$

$(a + \frac{1}{a})^3 - 3.a.\frac{1}{a}(a + \frac{1}{a}) = 52$

$(\because a^3 + b^3 = (a + b)^3 - 3ab(a + b))$

$(a + \frac{1}{a})^3 - 3(a + \frac{1}{a}) = 52$

From the option A) -

Put the value of $2(a + \frac{1}{a}) = 8$,

$(a + \frac{1}{a}) = 4$

L.H.S.,

$4^3 - 3 \times 4$ = 52

= R.H.S.

$\therefore$ The value of $2\left(a + \frac{1}{a}\right)$ is 8.

**Question 9**

If $b + c = ax, c + a = by, a + b = cz,$ **then the value** $\frac{1}{9}\left[\frac{1}{x+1} + \frac{1}{y+1} + \frac{1}{z+1}\right]$ **is:**

**A** $\frac{1}{9}$

**B** 1

**C** 0

**D** $\frac{1}{3}$

   **Answer:** A

**Explanation:**

$b + c = ax, c + a = by, a + b = cz$

x = $\frac{b+c}{a}$

y = $\frac{c+a}{b}$

z = $\frac{a+b}{c}$

Now,

$\frac{1}{9}\left[\frac{1}{x+1} + \frac{1}{y+1} + \frac{1}{z+1}\right]$

x + 1 = $\frac{b+c}{a}$ + 1 = $\frac{a+b+c}{a}$

y + 1 = $\frac{c + a}{b}+1 =\frac{a + b + c}{b}$

z + 1 = $\frac{a+b}{c}$ + 1 = $\frac{a+b+c}{c}$

$$= \frac{1}{9} \left[ \frac{\frac{1}{a+b+c}}{a} + \frac{\frac{1}{a+b+c}}{b} + \frac{\frac{1}{a+b+c}}{c} \right]$$

$$\frac{1}{9} \left[ \frac{a}{a+b+c} + \frac{b}{a+b+c} + \frac{c}{a+b+c} \right]$$

$$\frac{1}{9} \left[ \frac{a+b+c}{a+b+c} \right] = 1/9$$

**Question 10**

**Find the product of** $(a + b + 2c)(a^2 + b^2 + 4c^2 - ab - 2bc - 2ca)$

**A**   $a^3 + b^3 + 8c^3 - 2abc$

**B**   $a^3 + b^3 + 8c^3 - abc$

**C**   $a^3 + b^3 + 6c^3 - 6abc$

**D**   $a^3 + b^3 + 8c^3 - 6abc$

  **Answer:** D

**Explanation:**
$(a + b + 2c)(a^2 + b^2 + 4c^2 - ab - 2bc - 2ca)$
$= a^3 + b^3 + (2c)^3 - 3 \times a \times b \times 2c$
$(\because a^3 + b^3 + c^3 - 3abc = (a + b + c)(a^2 + b^2 + c^2 - ab - bc - ca))$
$= a^3 + b^3 + 8c^3 - 6abc$

**Question 11**

$25a^2 - 9$ **is factored as**

**A**   $(5a + 3)(5a - 3)$

**B**   $(5a + 1)(5a - 9)$

**C**   $(5a - 3)^2$

**D**   $(25a + 1)(a - 9)$

  **Answer:** A

**Explanation:**
$25a^2 - 9$

= $(5a)^2 - (3)^2$
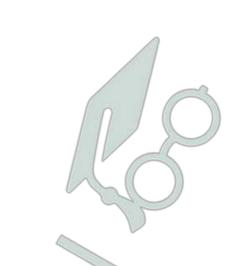= $(\because a^2 - b^2 = (a + b)(a - b))$

= (5a + 3)(5a - 3)

**Question 12**

**If** $a^4 + \frac{1}{a^4} = 50$, **then find the value of** $a^3 + \frac{1}{a^3}$

**A**   $\sqrt{2(1 + \sqrt{3})} + (-1 + 2\sqrt{13})$

**B**   $\sqrt{2(1 + \sqrt{3})}(3 - 2\sqrt{13})$

**C** $\sqrt{2(\sqrt{13}+1)}(3+2\sqrt{13})$

**D** $\sqrt{2(1-\sqrt{3})}(-1+2\sqrt{13})$

**Answer:** C

**Explanation:**

$a^4 + \frac{1}{a^4} = 50$

$a^4 + \frac{1}{a^4} + 2 = 50 + 2$

$(a^2 + \frac{1}{a^2})^2 = 52$

$(a^2 + \frac{1}{a^2}) = \sqrt{52}$

$a^2 + \frac{1}{a^2} + 2 = \sqrt{52} + 2$

$(a + \frac{1}{a})^2 = \sqrt{52} + 2$

$(a + \frac{1}{a}) = \sqrt{\sqrt{52} + 2}$

$a^3 + \frac{1}{a^3} = (a+b)^3 + 3ab(a+b)$

$= (\sqrt{\sqrt{52}+2})^3 + \sqrt{\sqrt{52}+2}$

$= (\sqrt{2\sqrt{13}+2})^3 + \sqrt{2\sqrt{13}+2}$

$= \sqrt{2\sqrt{13}+2}(1 + (\sqrt{2\sqrt{13}+2})^2)$

$= \sqrt{2\sqrt{13}+2}(1 + 2\sqrt{13} + 2)$

$= \sqrt{2(\sqrt{13}+1)}(3 + 2\sqrt{13})$

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**Question 13**

$(a+b-c+d)^2 - (a-b+c-d)^2 = ?$

**A** $4a(b+d-c)$

**B** $2a(a+b-c)$

**C** $2a(b+c-d)$

**D** $4a(b-d+c)$

**Answer:** A

**Explanation:**

$(a+b-c+d)^2 - (a-b+c-d)^2$

= [(a + b - c + d) + (a - b + c - d)][(a + b - c + d) - (a - b + c - d)]

$(\because a^2 - b^2 = (a+b)(a-b))$

= (2a)(2b-2c + 2d)

= 4a(b - c + d)

**Question 14**

**The value of** $27a^3 - 2\sqrt{2}b^3$ **is equal to:**

**A**   $(3a - \sqrt{2}b)(9a^2 - 2b^2 + 6\sqrt{2}ab)$

**B**   $(3a - \sqrt{2}b)(9a^2 + 2b^2 + 6\sqrt{2}ab)$

**C**   $(3a - \sqrt{2}b)(9a^2 + 2b^2 + 3\sqrt{2}ab)$

**D**   $(3a - \sqrt{2}b)(9a^2 - 2b^2 - 3\sqrt{2}ab)$

**Answer:** C

**Explanation:**

$27a^3 - 2\sqrt{2}b^3 = (3a - \sqrt{2}b)(9a^2 + 2b^2 + 6\sqrt{2}ab)$

$(\because a^3 - b^3 = (a - b)(a^2 + ab + b^2))$

here,

a = 3a

b = $\sqrt{2}b$

**Question 15**

If $x + 3y + 2 = 0$ then value of $x^3 + 27y^3 + 8 - 18xy$ is:

**A**   -2

**B**   2

**C**   1

**D**   0

**Answer:** D

**Explanation:**

$x + 3y + 2 = 0$

x + 3y = -2

Taking cube both sides,

$(x + 3y)^3 = -8$

$x^3 + 27y^3 + 3x.3y(x + 3y) = -8$

$x^3 + 27y^3 + 9xy(-2) = -8$

$x^3 + 27y^3 - 18xy = -8$

$x^3 + 27y^3 + 8 - 18xy$ = 0

# 18,000 SSC Free Solved Questions (Study Material)

**Question 16**

If $p + q = 7$ and $pq = 5$, then the value of $p^3 + q^3$ is:

**A**   34

**B**   238

**C**   448

**D**   64

**Answer:** B

**Explanation:**

$p^3 + q^3 = (p+q)^3 - 3pq(p+q)$

$= 7^3 - 3 \times 5(7)$

= 343 - 105 = 238

**Question 17**

If $30x^2 - 15x + 1 = 0$, then what is the value of $25x^2 + (36x^2)^{-1}$?

**A**  $\frac{9}{2}$

**B**  $6\frac{1}{4}$

**C**  $\frac{65}{12}$

**D**  $\frac{55}{12}$

   **Answer:** D

**Explanation:**

$30x^2 - 15x + 1 = 0$

Dividing by x,

$30x - 15 + \frac{1}{x} = 0$

$5x - 15/6 + \frac{1}{6x} = 0$

$5x + \frac{1}{6x} = 5/2$

taking square both side,

$(5x + \frac{1}{6x})^2 = 25/4$

$25x^2 + \frac{1}{36x^2} + 2 \times 5x \times \frac{1}{6x} = 25/4$

$25x^2 + \frac{1}{36x^2} = 25/4 - 5/3$

$25x^2 + \frac{1}{36x^2} = \frac{55}{12}$

**Question 18**

If a + b + c = 7 and ab + bc + ca = -6, then the value of $a^3 + b^3 + c^3 - 3abc$ is:

**A**  469

**B**  472

**C**  463

**D**  479

   **Answer:** A

**Explanation:**
We know that,

$a^3 + b^3 + c^3 - 3abc = (a+b+c)(a^2 + b^2 + c^2 - (ab + bc + ac))$

a + b + c = 7

Squaring both sides,

$(a+b+c)^2 = 49$

$a^2 + b^2 + c^2 + 2(ab + bc + ac) = 49$

$a^2 + b^2 + c^2 = 49 + 12 = 61$

$a^3 + b^3 + c^3 - 3abc = (a + b + c)(a^2 + b^2 + c^2 - (ab + bc + ac))$

= 7(61 - (-6)) = 7 × 67 = 469

# SSC CHSL Important Questions and Answers (Download PDF)

**Question 19**

The given table represents the revenue (in ₹ crores) of a company from the sale of four products A, B, C and D in 6 years. Study the table carefully and answer the question that follows.

| Years / Product | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 |
|---|---|---|---|---|---|---|
| A | 98 | 94 | 80 | 95 | 110 | 115 |
| B | 74 | 96 | 92 | 84 | 98 | 86 |
| C | 82 | 98 | 96 | 88 | 93 | 103 |
| D | 74 | 102 | 92 | 93 | 97 | 102 |

By what percentage is the total revenue of the company from the sale of products A, B and D in 2012 and 2013 more than the total revenue from the sale of product B in 2013 to 2016?(Correct to one decimal place)

**A** 44.5

**B** 31.2

**C** 43.6

**D** 45.4

**Answer:** D

**Explanation:**
Total revenue of the company from the sale of products A, B and D in 2012 and 2013 = 98 + 74 + 74 + 94 + 96 + 102 = 538

Total revenue from the sale of product B in 2013 to 2016 = 96 + 92 + 84 + 98 = 370

Required percentage = $\frac{538 - 370}{370} \times 100$ = 45.4%

**Question 20**

If $P = \frac{x^4 - 8x}{x^3 - x^2 - 2x}$, $Q = \frac{x^2 + 2x + 1}{x^2 - 4x - 5}$ and $R = \frac{2x^2 + 4x + 8}{x - 5}$, then $(P \times Q) \div R$ is equal to:

**A** $\frac{1}{2}$

**B** 1

**C** 2

**D** 4

**Answer:** A

**Explanation:**
$P = \frac{x^4 - 8x}{x^3 - x^2 - 2x}$

$Q = \frac{x^2 + 2x + 1}{x^2 - 4x - 5}$

= $\frac{(x + 1)^2}{x^2 - 4x - 5 + 9 - 9}$

$(P \times Q) \div R$

$$= \left( \frac{x^4-8x}{x^3-x^2-2x} \times \frac{x^2+2x+1}{x^2-4x-5} \right) \div \frac{2x^2+4x+8}{x-5}$$

$$= \frac{x^4-8x}{x^3-x^2-2x} \times \frac{x^2+2x+1}{x^2-4x-5} \times \frac{x-5}{2x^2+4x+8}$$

$$= \frac{x(x^3-8)}{x^3-x^2-2x} \times \frac{x^2+2x+1}{x^2-4x-5} \times \frac{x-5}{2(x^2+2x+4)}$$

$$= \frac{x(x-2)(x^2+2x-4)}{x(x^2-x-2)} \times \frac{(x+1)^2}{x^2-5x+x-5} \times \frac{x-5}{2(x^2+2x+4)}$$

$$= \frac{(x-2)}{(x^2-2x+x-2)} \times \frac{(x+1)^2}{(x+1)(x-5)} \times \frac{x-5}{2}$$

$$= \frac{(x-2)}{(x-2)(x+1)} \times \frac{(x+1)}{2}$$

$$= \frac{1}{2}$$