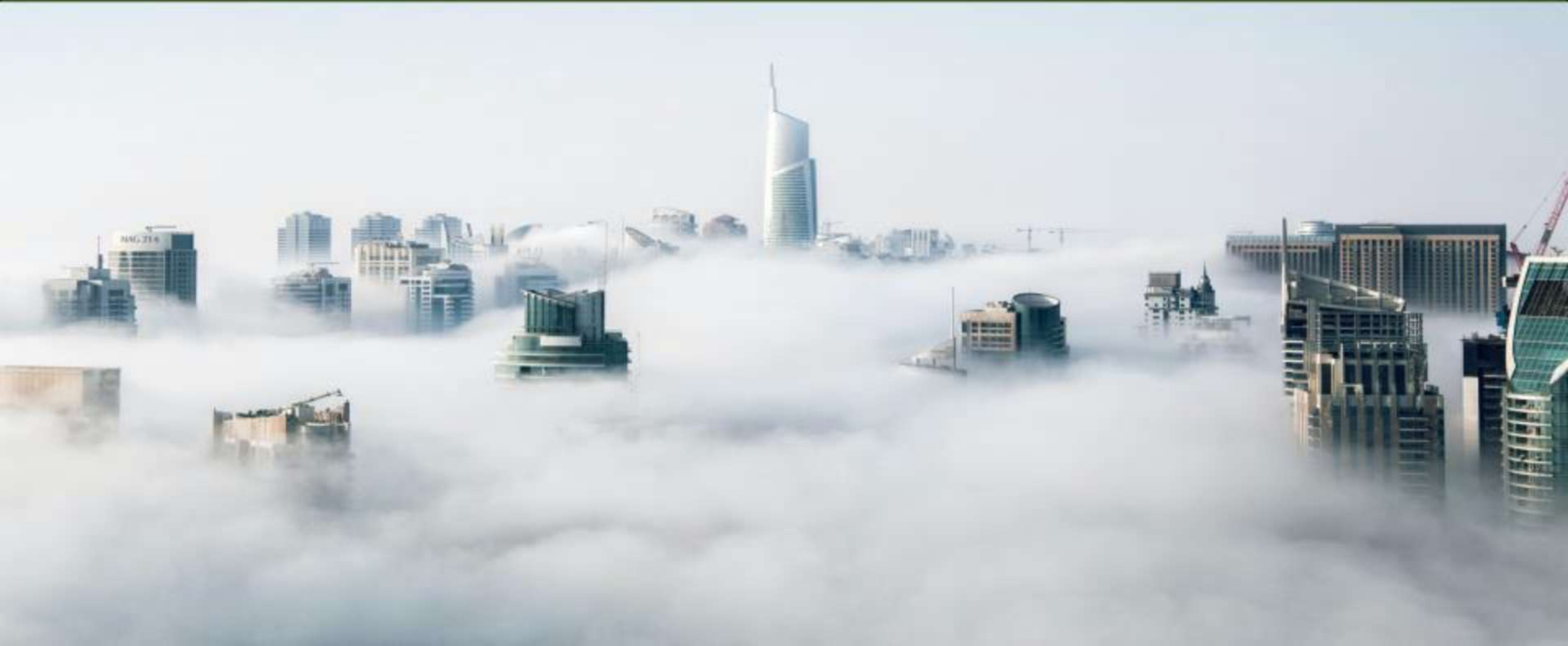
ALGEBRA

SHEET 03

Class notes by Aditya Ranjan

Concept of Symmetry



$x = y = z$

1. If $xy + yz + zx = 1$, then $\dfrac{1+y^2}{(x+y)(y+z)} = ?$

(a) 0 (b) 1

(c) 2 (d) 3

$x^2 + x^2 + x^2 = 1$

$\Rightarrow 3x^2 = 1$

find $\dfrac{1+x^2}{2x \times 2x} = \dfrac{1+x^2}{4x^2}$

$= \dfrac{1+\frac{1}{3}}{4 \times \frac{1}{3}} = \dfrac{\cancel{4/3}}{\cancel{4/3}} = 1$

put $x=y=z$

2. If $x^2 + y^2 + z^2 = xy + yz + zx$ then the value of

$$\frac{\cancel{15x^4}}{\cancel{15x^4}}$$

$$\frac{3x^4 + 7y^4 + 5z^4}{5x^2y^2 + 7y^2z^2 + 3z^2x^2}$$ is

(a) 2 (b) 1

(c) 0 (d) –1

$a=b=c$

3. If $a^2 + b^2 + c^2 = ab + bc + ca$ then $\frac{a+c}{b}$ is

(a) 0 (b) 2

(c) 1 (d) –1

$\frac{a+a}{a}$

$= \frac{2\cancel{a}}{\cancel{a}}$

$x = y = z$

$3\left(\frac{4x-3}{x}\right) = 0$

$\Rightarrow 4x - 3 = 0 \Rightarrow 4x = 3$

$\Rightarrow x = \frac{3}{4}$

4. If $\frac{4x-3}{x} + \frac{4y-3}{y} + \frac{4z-3}{z} = 0$ then $\frac{1}{x}+\frac{1}{y}+\frac{1}{z}$ is $= \frac{\cancel{3}\times 4}{\cancel{3}}$

(a) 9 (b) 3

(c) 4 (d) 6

$a=b=c$

$\left(\frac{2+a}{a}\right)\times 3 = 4$

$\Rightarrow 6+3a = 4a$

$\Rightarrow a=6$

5. If $\frac{2+a}{a}+\frac{2+b}{b}+\frac{2+c}{c}=4$ then the value of $\frac{(ab+bc+ca)}{abc}$ is $\frac{3\cancel{a^2}}{a\cancel{a^3}} = \frac{3}{a} = \frac{\cancel{3}}{\cancel{6}} = \frac{1}{2}$

(a) 2

(b) 1

(c) 0

(d) $\frac{1}{2}$

6. If $\frac{x+a^2+2c^2}{b+c}+\frac{x+b^2+2a^2}{c+a}+\frac{x+c^2+2b^2}{a+b}=0$, find x

(a) $a^2+b^2+c^2$ $3a^2$

(b) $-(a^2+b^2+c^2)$ $-3a^2$

(c) $a^2+2b^2+c^2$ $9a^2$

(d) $-(a^2+2b^2+c^2)$ $-4a^2$

$a=b=c$

$\left(\frac{x+3a^2}{2a}\right)\times 3=0$

$\Rightarrow x+3a^2=0 \Rightarrow x=-3a^2$

$\left(\frac{x-a^2}{2a^2}\right) \times \cancel{3} = \cancel{3}$

$\Rightarrow x - a^2 = 2a^2$

$\Rightarrow x = 3a^2$

7. If $\frac{x-a^2}{b^2+c^2} + \frac{x-b^2}{c^2+a^2} + \frac{x-c^2}{b^2+a^2} = 3$, find the value of x.

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

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

$a=b=c$

$3\cancel{a^2}=a^{\cancel{3}} \Rightarrow a=3$

8. If $bc + ca + ab = abc$ then

$$\frac{b+c}{bc(a-1)}+\frac{c+a}{ca(b-1)}+\frac{a+b}{ab(c-1)}=?$$

$=\frac{2a}{a^2(a-1)}\times 3$

$=\frac{\cancel{2}\times\cancel{3}\times\cancel{3}}{\cancel{9}\times\cancel{2}}=1$

(a) 0
(b) 1
(c) 2
(d) 3

$a=b=c$

$a^{\cancel{2}} = 2\cancel{a} \Rightarrow a=2$

9. If $a^2 = b + c$, $b^2 = c + a$, $c^2 = a + b$, then $\frac{1}{1+a} + \frac{1}{1+b} + \frac{1}{1+c}$

(a) 0 (b) 1
(c) 2 (d) 3

$= \left(\frac{1}{1+a}\right) \times 3$

$= \left(\frac{1}{1+2}\right) \times 3$

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

$a=b=c$

$\boxed{a+\frac{1}{a}=1}$

$a^3=-1$

***

10. If a, b, c are non zero, $a+\frac{1}{b}=1$ & $b+\frac{1}{c}=1$

a^3

then (i) abc is (ii) $c+\frac{1}{a}$ is $a+\frac{1}{a}$

(a) –1, 1 (b) 3, –1

(c) –3, 1 (d) 1, 1

$x = y = z$

$\boxed{a^x = (3x)^x}$

put $x = 1$

$a = 3$

11. If $a^x = (x + y + z)^y$, $a^y = (x + y + z)^z$ and $a^z = (x + y + z)^z$, then $x + y + z$ = ? $(a \neq 0)$

$1 + 1 + 1$

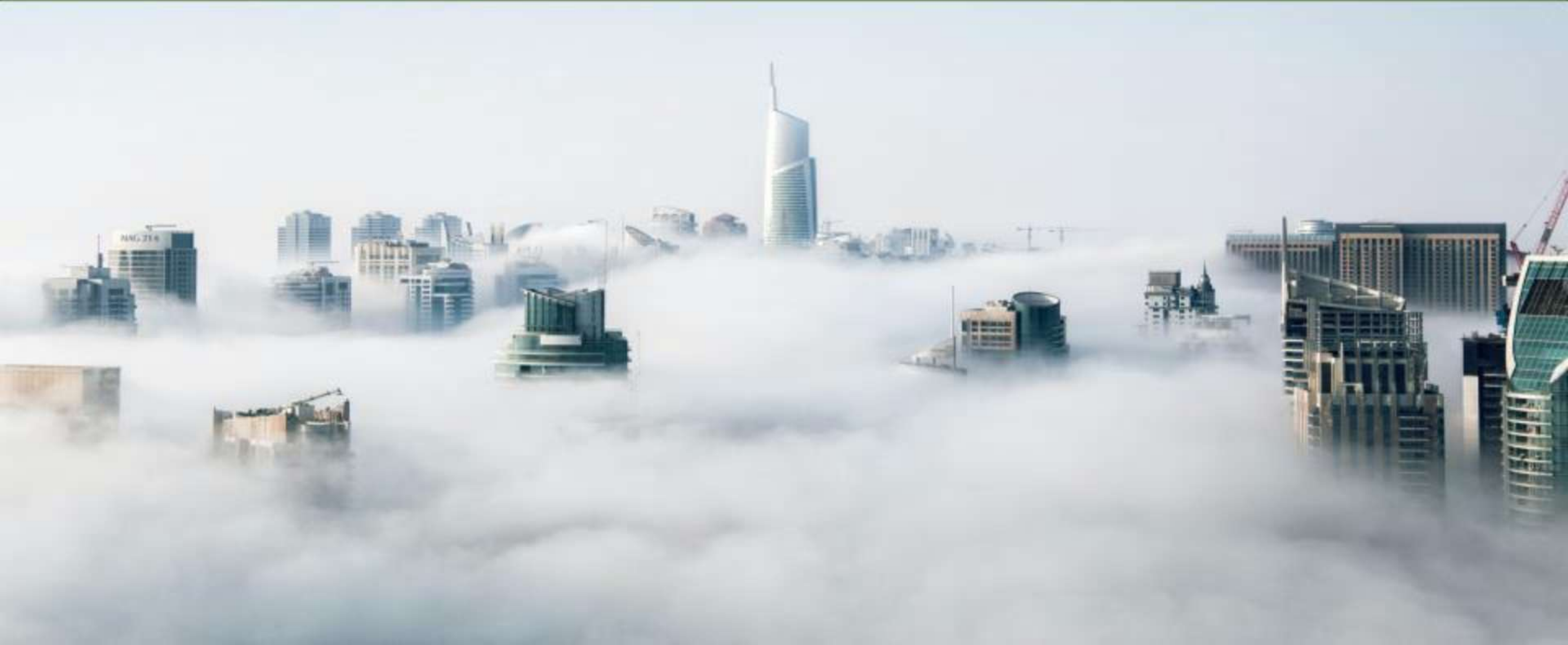
(a) 0

(b) 1

(c) a^3 27

(d) a 3

Concept of Value Putting



Case-I

$\boxed{a+b=5}$

$0+5$

$1+4$

$2+3$

$-1+6$

Case II $a+b=5$ & $a-b=1$

$3+2$ $\quad$ $3-2$

$\boxed{\text{Trick} = \text{no. of variable} - \text{no. of Eq}^n}$

Case I = $2-1=1$

Case II = $2-2=0$

$a+b+c=10$

$2+3+5$

$1+1+10$

$= V-E$

$= 3-1$

$= 2$

Concept of $a+b+c=0$

$(1,-1,0)$ & $(2,-1,-1)$

(1, -1, 0)

12. If $\overset{1}{a} + \overset{-1}{b} + \overset{0}{c} = 0$, then the value of $\dfrac{a^2 + b^2 + c^2}{a^2 - bc}$

(a) 0 (b) 1

(c) 2 (d) 3

$= \dfrac{a^2+b^2}{a^2}$

$= \dfrac{1+1}{1}$

(2, −1, −1)

2 −1 −1

12. If $a + b + c = 0$, then the value of $\dfrac{a^2 + b^2 + c^2}{a^2 - bc}$

(a) 0 (b) 1

(c) 2 (d) 3

$= \dfrac{4+1+1}{4-1}$

$= \dfrac{6}{3} = 2$

1 -1 0

13. If $a + b + c = 0$ then the value of $\frac{a^2 - bc}{b^2 - ca}$ is

(a) 0
(b) 1
(c) 2
(d) 3

1 −1 0

14. If $a + b + c = 0$ then the value of $\frac{a^2 + b^2 + \cancel{c^2}}{ab + \cancel{bc} + \cancel{ca}}$ is

(a) 2
(b) −2
(c) 0
(d) 4

$\frac{1+1}{-1}$

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

15. If $x + y + z = 0$ then $\dfrac{xyz}{(x+y)(y+z)(z+x)} = ?$

(a) -1 (b) 1

(c) $xy + yz + zx$ (d) None

16. If $\overset{1}{a} + \overset{-1}{b} + \overset{0}{c} = 0$

then $(a + b - c)^2 + (b + \cancel{c} - a)^2 + (\cancel{c} + a - b)^2 = ?$

(a) 0 (b) $8abc$ 0

8 (c) $4(a^2 + b^2 + \cancel{c^2})$ (d) $4(ab + \cancel{bc} + \cancel{ca})$ −4

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

$= 0 + 4 + 4$

$= 8$

17. If If $a + b + c = 0$, then

$$\left(\frac{a+b}{c}+\frac{b+c}{a}+\frac{c+a}{b}\right)\left(\frac{a}{b+c}+\frac{b}{c+a}+\frac{c}{a+b}\right)$$ is :

SSC CGL 6 June 2019 (Morning)

(a) 8 (b) 9

(c) – 3 (d) 0

18. If $\dfrac{x^3+1}{x+1} = \dfrac{x^3-1}{x-1}$, find x

(a) 1

(b) -1

(c) 0

(d) All of these

$b=0$
$a=1$

19. If $a + \overset{0}{\cancel{b}} = 1$, then $a^4 + \cancel{b^4} - a^3 - \cancel{b^3} - \cancel{2a^2b^2} + \cancel{ab}$ is

$1 - 1$

(a) 1
(b) 2
(c) 4
(d) 0 ✓

$y = 0$
$x = 1$

20. If $x + \cancel{y} = 1 + \cancel{xy}$, then $x^3 + \cancel{y^3} - \cancel{x^3y^3}$ is

(a) 0 (b) 1
(c) –1 (d) 2

21. If $\overset{0}{\cancel{x}} + y = 2a$, then the value of $\frac{a}{x-a} + \frac{a}{y-a}$ is

(a) 2 (b) 0

(c) 1 (d) –1

$= \frac{\cancel{a}}{-\cancel{a}} + \frac{\cancel{a}}{\cancel{a}}$

$= -1 + 1$

$b=0$
$a=1$

22. If $\overset{1}{a} + \overset{0}{b} = 1$, find $a^3 + \cancel{b^3} - \cancel{ab} - (a^2 - \cancel{b^2})^2$

(a) –1 (b) 1

(c) 0 (d) 2

$a^3 - (a^2)^2$

$= a^3 - a^4$

$= 1 - 1 = 0$

$b=0 \quad a^2=2$

$d=0 \quad c^2=1$

23. If $a^2 + b^2 = 2$ and $c^2 + d^2 = 1$, then $(\cancel{ad} - \cancel{bc})^2 + (ac + \cancel{bd})^2$ is

$(ac)^2 = a^2c^2 = 2\times 1$

(a) $\frac{4}{9}$

(b) $\frac{1}{2}$

(c) 1

(d) 2

24. If $a = \cancel{x} + y$, $b = \cancel{x} - y$, $c = \cancel{x} + 2y$

0

then $a^2 + b^2 + c^2 - ab - bc - ca$ is

$y^2 + y^2 + 4y^2 + y^2 + \cancel{2y^2} - \cancel{2y^2}$

(a) $4y^2$ (b) $5y^2$

(c) $6y^2$ (d) $7y^2$

$a=b=c=1$

then $x=y=z=2$

25. If $x = \frac{a}{b} + \frac{b}{a}$, $y = \frac{b}{c} + \frac{c}{b}$, $z = \frac{c}{a} + \frac{a}{c}$, then what is the value of $xyz - x^2 - y^2 - z^2 = ?$

(a) –4 (b) –2

(c) –1 (d) –6

$\cancel{8} - \cancel{4} - \cancel{4} \; -4$

26. If $a^3b = abc = 180$, a, b, c are positive integers, then the value of c is :

(a) 110
(b) 1
(c) 4
(d) 25

$a = 1$ $c = 1$
$b = 180$

(i) $\cancel{a}^{3}\cancel{b} = \cancel{a}\cancel{b}c \Rightarrow a^2 = c$ → $a = 1$, $c = 1$

a^2

(ii) $\boxed{abc = 180}$

$b = 180$

$b = b = 180$

26. If $a^3b = abc = 180$, a, b, c are positive integers, then the value of c is :

$a=1$ $c=1$

(a) 110 (b) 1
(c) 4 (d) 25

$a+b=1$, $a=1, b=0$

$ab = 1$

1×1

$a=1$ $x=2$ $y=0$

27. If $x = a+\frac{1}{a}$ and $y = a-\frac{1}{a}$ then $\sqrt{x^4+\cancel{y^4}-\cancel{2x^2y^2}}$ is equal to :

$= x^2$
$= 4$

SSC CGL 6 June 2019 (Morning)

(a) $16a^2$

(b) 8

(c) $\frac{8}{a^2}$

(d) 4

$p=0$
$x=2$

28. If $x = 2 - \cancel{p}$, then $x^3 + \cancel{6xp} + \cancel{p^3}$ is equal to :

SSC CGL 7 June 2019 (Morning)

(a) 12 (b) 6

(c) 8 (d) 4

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

* $a^3+8b^3+c^3-6abc=(a+2b+c)(a^2+4b^2+c^2-2ab-2bc-ac)$

* $a^3+b^3+8c^3-6abc=(a+b+2c)(a^2+b^2+4c^2-ab-2bc-2ac)$

29. **Find the product of**

$(a + b + 2c)((a^2 + b^2 + 4c^2 - ab - 2bc - 2ca)$.

SSC CGL 7 March 2020 (Evening)

$-3 \times a \times b \times 2c$

(a) $a^3 + b^3 + 8c^3 - 6abc$

(b) $a^3 + b^3 + 6c^3 - 6abc$

(c) $a^3 + b^3 + 8c^3 - 2abc$

(d) $a^3 + b^3 + 8c^3 - abc$

Find the product of

$(a+3b+2c)((a^2+9b^2+4c^2-3ab-6bc-2ca)$.

(a) $a^3+9b^3+8c^3+9abc$

(b) $a^3+27b^3+6c^3-18abc$

(c) $a^3+8b^3+8c^3+8abc$

(d) $a^3+27b^3+8c^3-18abc$

Questions based on Componendo & Dividendo

Componendo

$$\frac{a}{b} = \frac{c}{d}$$

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

Dividendo

$$\frac{a}{b} = \frac{c}{d}$$

$$\frac{a}{a-b} = \frac{c}{c-d}$$

Componendo & Dividendo

$$\frac{a}{b} = \frac{c}{d}$$

$$\Rightarrow \frac{a+b}{a-b} = \frac{c+d}{c-d}$$

$\frac{a}{b} = \frac{16}{3}$

$\frac{a+b}{a-b} = \frac{16+3}{16-3} = \frac{19}{13}$

30. If $\dfrac{a}{b} = \dfrac{16}{3}$, what is $\dfrac{a+b}{a-b}$

(a) $\dfrac{19}{13}$ (b) $\dfrac{17}{13}$

(c) $\dfrac{19}{26}$ (d) $\dfrac{21}{13}$

$$* \quad \frac{a}{b} = \frac{c}{d}$$

then, $\quad \dfrac{(a+b)}{(a-b)} = \dfrac{c+d}{c-d}$

C&D

$$\frac{(a+b)+(a-b)}{(a+b)-(a-b)} = \frac{(c+d)+(c-d)}{(c+d)-(c-d)}$$

$$\Rightarrow \quad \frac{\cancel{2}a}{\cancel{2}b} = \frac{\cancel{2}c}{\cancel{2}d} \Rightarrow \frac{a}{b} = \frac{c}{d}$$

0. $\frac{a}{b} = \frac{5}{3}$

$$\frac{a+b}{a-b} = \frac{5+3}{5-3} = \frac{8}{2}$$

$$\frac{\cancel{2}a}{\cancel{2}b} = \frac{\cancel{10}}{\cancel{6}} \frac{5}{3}$$

$$\frac{a}{b} = \frac{5}{3}$$

Q1. If $\frac{a}{b} = \frac{9}{7}$

find $\frac{a+b}{a-b} = \frac{\cancel{16}}{\cancel{2}} = \frac{\cancel{8}}{1}$

Q. If $\frac{a+b}{a-b} = \frac{16}{2}$

find $\frac{a}{b} = ?$

<u>Basic</u>

$\frac{a+b}{a-b} = \frac{16}{2}$

$\Rightarrow 2a+2b = 16a - 16b$

$18b = 14a$

$\Rightarrow \frac{9}{7}\,\frac{\cancel{18}}{\cancel{14}} = \frac{a}{b}$

$\frac{a+b}{a-b} = \frac{16}{2}$

$\Rightarrow \frac{a}{b} = \frac{9}{7}$

Q. If $\frac{a+b}{a-b} = \frac{7}{5}$

$\frac{a}{b} = \frac{6}{1}$

Q. $\frac{a+b}{a-b} = \frac{13}{7}$

$\frac{a}{b} = \frac{10}{3}$

Q. $\frac{a+b}{a-b} = \frac{19}{11}$

$\frac{a}{b} = \frac{15}{4}$

(1). $\dfrac{2a+3b}{2a-3b} = \dfrac{13}{7}$

$\dfrac{a}{b} =$

Ans $\dfrac{\cancel{2}a}{\cancel{3}b} = \dfrac{\cancel{10}\,5}{\cancel{3}}$

$\dfrac{a}{b} = \dfrac{5}{1}$

Q.

$$\frac{4a+3b}{4a-3b} = \frac{15}{13}$$

$$\frac{a}{b} = ?$$

Ans

$$\frac{{}^{2}\cancel{4}a}{3b} = \frac{\cancel{14}^{7}}{1}$$

$$\frac{a}{b} = \frac{21}{2}$$

$\frac{\cancel{4}a}{\cancel{9}b} = \frac{\cancel{4}c}{\cancel{9}d}$

$\frac{a}{b} = \frac{c}{d}$

31. If $\frac{4a+9b}{4a-9b} = \frac{4c+9d}{4c-9d}$ then the value of $\frac{a}{b}$ can be equal to :

(a) $\frac{c}{d}$ (b) 2

(c) $\frac{ab}{c}$ (d) $\frac{bc}{a}$

$$\frac{x}{\sqrt{5}} = \frac{3/\cancel{2}}{1/\cancel{2}}$$

$$\Rightarrow \frac{x}{\sqrt{5}} = 3$$

$$\Rightarrow x = 3\sqrt{5}$$

32. If $\dfrac{x+\sqrt{5}}{x-\sqrt{5}} = \dfrac{2}{1}$, find x

(a) $2\sqrt{5}$

(b) $3\sqrt{5}$

(c) $9\sqrt{5}$

(d) $6\sqrt{5}$

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

$\Rightarrow \frac{1+x}{1-x} = \frac{\cancel{2}a}{\cancel{2}b}$

33. If $\frac{x}{1} = \frac{a-b}{a+b}$, $\frac{y}{1} = \frac{b-c}{b+c}$, $\frac{z}{1} = \frac{c-a}{c+a}$, find

$$\left(\frac{1+x}{1-x}\right) \times \left(\frac{1+y}{1-y}\right) \times \left(\frac{1+z}{1-z}\right)$$

$\frac{\cancel{a}}{\cancel{b}} \times \frac{\cancel{b}}{\cancel{c}} \times \frac{\cancel{c}}{\cancel{a}}$

(a) 1 (b) $\frac{ab}{bc}$

(c) abc (d) 0

$$(a+b)^2 = \underbrace{a^2+b^2} + \underbrace{2ab}$$

$$\frac{(a^2+b^2)}{(2ab)} = \frac{16}{9}$$

$$\frac{a^2+b^2+2ab}{a^2+b^2-2ab} = \frac{25}{7}$$

$$\Rightarrow \frac{(a+b)^2}{(a-b)^2} = \frac{25}{7}$$

$$\Rightarrow \frac{a+b}{a-b} = \frac{5}{\sqrt{7}}$$

$$\frac{\cancel{2}a}{\cancel{2}b} = \frac{5+\sqrt{7}}{5-\sqrt{7}}$$

Q. $\dfrac{a^2+b^2}{2ab} = \dfrac{17}{8}$ $\qquad \dfrac{a}{b} = ?$

$$\Rightarrow \frac{a^2+b^2+2ab}{a^2+b^2-2ab} = \frac{25}{9}$$

$$\Rightarrow \frac{(a+b)^2}{(a-b)^2} = \frac{25}{9}$$

$$\Rightarrow \frac{a+b}{a-b} = \frac{5}{3}$$

$$\Rightarrow \frac{\cancel{2}a}{\cancel{2}b} = \frac{\cancel{8}\,4}{\cancel{2}}$$

$$\frac{a}{b} = \frac{4}{1}$$

34. If $\dfrac{x^3+3x}{3x^2+1} = \dfrac{189}{61}$, find the value of x

(a) 9
(b) 6
(c) 8
(d) 4

$$\frac{x^3+3x+3x^2+1}{x^3+3x-3x^2-1} = \frac{\cancel{250}}{\cancel{128}} = \frac{125}{64}$$

$$\Rightarrow \frac{(x+1)^3}{(x-1)^3} = \frac{125}{64}$$

$$\Rightarrow \frac{(x+1)}{(x-1)} = \frac{5}{4}$$

$$\Rightarrow \frac{\cancel{2x}}{\cancel{2}} = \frac{9}{1}$$

$$x = 9$$

35. If $\dfrac{a^3+3ab^2}{3a^2b+b^3} = \dfrac{x^3+3xy^2}{3x^2y+y^3}$, then $\dfrac{y}{b} = ?$

(a) $\dfrac{x}{a}$ (b) $\dfrac{x}{y}$

(c) $\dfrac{a}{b}$ (d) None of these

$$\Rightarrow \frac{a^3+3ab^2+3a^2b+b^3}{a^3+3ab^2-3a^2b-b^3} = \frac{x^3+3xy^2+3x^2y+y^2}{x^3+3xy^2-3x^2y-y^3}$$

$$\Rightarrow \frac{(a+b)^3}{(a-b)^3} = \frac{(x+y)^3}{(x-y)^3}$$

$$\Rightarrow \frac{a+b}{a-b} = \frac{x+y}{x-y}$$

$$\Rightarrow \frac{a}{b} = \frac{x}{y} \Rightarrow \frac{y}{b} = \frac{x}{a}$$

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

36. If $\dfrac{\sqrt{3+x}+\sqrt{3-x}}{\sqrt{3+x}-\sqrt{3-x}}=\dfrac{2}{1}$ then x is equal to–

(a) $\dfrac{5}{12}$

(b) $\dfrac{12}{5}$

(c) $\dfrac{5}{7}$

(d) $\dfrac{7}{5}$

$$\frac{\sqrt{3+x}}{\sqrt{3-x}}=\frac{3}{1}$$

$$\Rightarrow \frac{3+x}{3-x}=\frac{9}{1}$$

$$\Rightarrow \frac{3}{x}=\frac{\cancel{10}}{\cancel{8}}\ \frac{5}{4}$$

$$\Rightarrow x=\frac{12}{5}$$

$$\frac{a+b}{a-b}=\frac{\cancel{2}a}{\cancel{2}b}$$

37. If $\frac{x}{1} = \frac{\sqrt{m+3n}+\sqrt{m-3n}}{\sqrt{m+3n}-\sqrt{m-3n}}$, then find the value of $2mx - 3nx^2$ is :

(a) $3n$ (b) $3m$

(c) $2n$ (d) $2m$

$$\frac{x+1}{x-1} = \frac{\sqrt{m+3n}}{\sqrt{m-3n}}$$

$$\Rightarrow \frac{(x+1)^2}{(x-1)^2} = \frac{m+3n}{m-3n}$$

$$\Rightarrow \frac{(x+1)^2+(x-1)^2}{(x+1)^2-(x-1)^2} = \frac{m+\cancel{3n}+m-\cancel{3n}}{\cancel{m}+3n-\cancel{m}-(-3n)}$$

$$\Rightarrow \frac{x^2+1+\cancel{2x}+x^2+1-\cancel{2x}}{\cancel{x^2}+\cancel{1}+2x-\cancel{x^2}-\cancel{1}+2x} = \frac{\cancel{2}m}{3\cancel{6}n}$$

$$\Rightarrow \frac{\cancel{2}(x^2+1)}{\cancel{2}\cdot 2x} = \frac{m}{3n}$$

$$\Rightarrow 3nx^2+3n = 2xm$$

$$\Rightarrow 3n = 2xm - 3nx^2$$

37. If $\dfrac{x}{1} = \dfrac{\sqrt{m+3n}+\sqrt{m-3n}}{\sqrt{m+3n}-\sqrt{m-3n}}$, then find the value of $2mx - 3nx^2$ is :

(a) $3n$ (b) $3m$

(c) $2n$ (d) $2m$

$$\frac{x+1}{x-1} = \frac{\sqrt{m+3n}}{\sqrt{m-3n}}$$

$$\Rightarrow \frac{(x+1)^2}{(x-1)^2} = \frac{m+3n}{m-3n}$$

$$\Rightarrow \frac{\cancel{2}(x^2+1)}{2\,\cancel{4}\times x\times 1} = \frac{m}{3n}$$

$$\Rightarrow 3nx^2+3n = 2mx$$

$$\Rightarrow 3n = 2mx-3nx^2$$

* $(a+b)^2+(a-b)^2 = 2(a^2+b^2)$
* $(a+b)^2-(a-b)^2 = 4ab$

Value Putting

$x = \frac{4}{5}$

38. If $x = \frac{2ab}{b^2+1}$, find $\boxed{\frac{\sqrt{a+x}-\sqrt{a-x}}{\sqrt{a+x}+\sqrt{a-x}}}$

1×2

(a) b

(b) a

(c) $\frac{1}{a}$

(d) $\frac{1}{b}$ ✓

$$\frac{\sqrt{1+\frac{4}{5}}-\sqrt{1-\frac{4}{5}}}{\sqrt{1+\frac{4}{5}}+\sqrt{1-\frac{4}{5}}}$$

$$= \frac{\sqrt{\frac{9}{5}}-\sqrt{\frac{1}{5}}}{\sqrt{\frac{9}{5}}+\sqrt{\frac{1}{5}}} = \frac{\frac{3}{\cancel{\sqrt{5}}}-\frac{1}{\cancel{\sqrt{5}}}}{\frac{3}{\cancel{\sqrt{5}}}+\frac{1}{\cancel{\sqrt{5}}}} = \frac{\cancel{2}}{\cancel{4}}\,\frac{1}{2} = \frac{1}{b}$$

38. If $x = \dfrac{2ab}{b^2+1}$, find $\dfrac{\sqrt{a+x}-\sqrt{a-x}}{\sqrt{a+x}+\sqrt{a-x}}$

(a) b (b) a

(c) $\dfrac{1}{a}$ (d) $\dfrac{1}{b}$

$$x = \frac{2ab}{b^2+1} \Rightarrow \frac{x}{a} = \frac{2b}{b^2+1}$$

$$\Rightarrow \frac{a}{x} = \frac{b^2+1}{2b} \Rightarrow \frac{a+x}{a-x} = \frac{b^2+1+2b}{b^2+1-2b}$$

$$\Rightarrow \frac{a+x}{a-x} = \frac{(b+1)^2}{(b-1)^2} \Rightarrow \frac{\sqrt{a+x}}{\sqrt{a-x}} = \frac{(b+1)}{(b-1)}$$

$$\Rightarrow \frac{\sqrt{a+x}+\sqrt{a-x}}{\sqrt{a+x}-\sqrt{a-x}} = \frac{b}{1}$$

$$\Rightarrow \frac{\sqrt{a+x}-\sqrt{a-x}}{\sqrt{a+x}+\sqrt{a-x}} = \frac{1}{b}$$

If $x = \frac{2ab}{a+b}$ find $\frac{x+a}{x-a} + \frac{x+b}{x-b} \rightarrow$ 2

$$\frac{x}{a} = \frac{2b}{a+b} \qquad\qquad \frac{x}{b} = \frac{2a}{a+b}$$

$$\Rightarrow \boxed{\frac{x+a}{x-a} = \frac{3b+a}{b-a}} \qquad \Rightarrow \boxed{\frac{x+b}{x-b} = \frac{3a+b}{a-b}} \rightarrow \frac{-3a-b}{b-a}$$

$$\frac{3b+a}{b-a} + \frac{(-3a-b)}{b-a}$$

$$= \frac{2b-2a}{b-a} = \frac{2\cancel{(b-a)}}{\cancel{(b-a)}} = 2$$

① $x = \frac{2ab}{a+b}$ find $\frac{x+a}{x-a} + \frac{x+b}{x-b} = 2$

② $x = \frac{4ab}{a+b}$ find $\frac{x+2a}{x-2a} + \frac{x+2b}{x-2b} = 2$

③ $x = \frac{6ab}{a+b}$ find $\frac{x+3a}{x-3a} + \frac{x+3b}{x-3b} = 2$

④ $x = \frac{8ab}{a+b}$ find $\frac{x+4a}{x-4a} + \frac{x+4b}{x-4b} = 2$

⑤ $x = \frac{10ab}{a+b}$ find $\frac{x+5a}{x-5a} + \frac{x+5b}{x-5b} = 2$

39. If $x = \frac{4ab}{a+b}$, $(a \neq b)$, then value of

$$\frac{x+2a}{x-2a} + \frac{x+2b}{x-2b}$$ is :

(a) a (b) b

(c) $2ab$ (d) 2

40. If $x = \dfrac{8ab}{a+b}$, $a \neq b$ then value of

$$\frac{x+4a}{x-4a} + \frac{x+4b}{x-4b} \text{ is :}$$

(a) a
(b) b
(c) $2ab$
(d) 2

Q $x = \frac{12ab}{a+b}$ find $\frac{x+6a}{x-6a} + \frac{x+6b}{x-6b} = 2$

How to solve this form $\sqrt{a+\sqrt{b}}$

Q. $x^2 = 5+2\sqrt{6}$ find x

Ans

$x = \sqrt{5+2\sqrt{6}}$ → 2×3

$$\boxed{x = \sqrt{3}+\sqrt{2}}$$

Q $x = \sqrt{7+2\sqrt{12}}$ $= \sqrt{4}+\sqrt{3}$ $= 2+\sqrt{3}$

Q $x = \sqrt{6+2\sqrt{8}}$ $= \sqrt{4}+\sqrt{2}$ $= 2+\sqrt{2}$

Q $x = \sqrt{6+2\sqrt{5}}$ $= \sqrt{5}+1$

Q $x = \sqrt{7+2\sqrt{10}}$ $= \sqrt{5}+\sqrt{2}$

Q $x = \sqrt{9-2\sqrt{14}}$ $= \sqrt{7}-\sqrt{2}$

Q $x = \sqrt{13-2\sqrt{22}}$ $= \sqrt{11}-\sqrt{2}$

$\frac{1}{x} = \frac{2}{\sqrt{3}}$

$\Rightarrow \frac{1+x}{1-x} = \frac{2+\sqrt{3}}{2-\sqrt{3}}$

$\Rightarrow \frac{\sqrt{1+x}}{\sqrt{1-x}} = \frac{\sqrt{2+\sqrt{3}}}{\sqrt{2-\sqrt{3}}}$

$\Rightarrow \frac{\sqrt{1+x}}{\sqrt{1-x}} = \frac{\sqrt{4+2\sqrt{3}}}{\sqrt{4-2\sqrt{3}}}$

$\Rightarrow \frac{\sqrt{1+x}}{\sqrt{1-x}} = \frac{\sqrt{3}+1}{\sqrt{3}-1}$

$\Rightarrow = \frac{\cancel{2}\sqrt{3}}{\cancel{2}}$

41. If $x = \frac{\sqrt{3}}{2}$ then the value of

CGL mains 2018
" 2019
" 2020

$\left(\frac{\sqrt{1+x}+\sqrt{1-x}}{\sqrt{1+x}-\sqrt{1-x}}\right)$ is :

(a) $-\sqrt{3}$ (b) -1

(c) 1 (d) $\sqrt{3}$