



Algebra sheet-5

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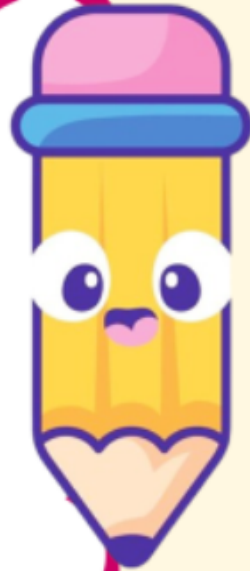


#

If, $a \in \text{real No.}$

तो $a^2 \geq 0$

$a^2 \neq -ve$



$$(+5)^2 = (-5)^2 = 25$$

$$(+ve)^2 = +ve$$

$$(-ve)^2 = +ve$$

$$(0)^2 = 0$$

**Multiple variables from
single Equation**



$x, y \text{ \& } z$
 $\in \text{real No's.}$

$$x^2 + y^2 + z^2 = 0$$

$$0 \quad 0 \quad 0$$

$$\Rightarrow x = y = z = 0$$

Example →

यदि

$$(x-2)^2 + (y-3)^2 + (z-5)^2 = 0$$

$$\downarrow$$

$$\downarrow$$

$$\downarrow$$

$$\Rightarrow x-2=0$$

$$x=2$$

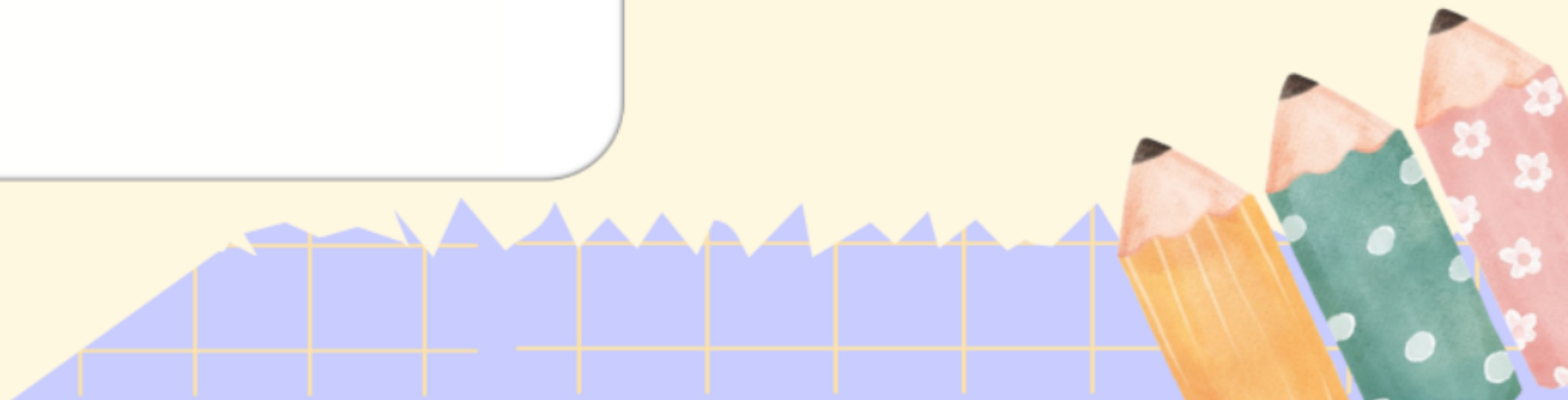
$$\Rightarrow y-3=0$$

$$y=3$$

$$\Rightarrow z-5=0$$

$$z=5$$

$$x^2 \geq 0$$



1. If $(a-11)^2 + (b-12)^2 + (c+7)^2 = 0$ then $\sqrt{a+b+c} = ?$

यदि $(a-11)^2 + (b-12)^2 + (c+7)^2 = 0$, तो $\sqrt{a+b+c} = ?$

[A] 2

↓

↓

[B] 3

[C] ± 4

[B] 4 ✓

$\sqrt{16}$
= 4

$a=11$

$b=12$

$c=-7$

2. If $(a + b - c - 7)^2 + (b + c - a - 10)^2 + (c + a - b - 19)^2 = 0$, then $\sqrt{a + b + c} = ?$

यदि $(a + b - c - 7)^2 + (b + c - a - 10)^2 + (c + a - b - 19)^2 = 0$, तो $\sqrt{a + b + c} = ?$

[A] $2\sqrt{2}$ ☐

[B] 5 ☐

[C] 6 ☒

[D] $\sqrt{2}$ ☐

$$a + b - c = 7$$

$$b + c - a = 10$$

$$c + a - b = 19$$

add

$$\sqrt{a + b + c} = \sqrt{36} = 6$$

3. If $(3x - 4y)^2 + (5y - 2z)^2 = 0$, then find $x : y : z = ?$

यदि $(3x - 4y)^2 + (5y - 2z)^2 = 0$, तो $x : y : z$ ज्ञात कीजिए।

[A] 8:6:15

[B] 4:3:5

[C] 8:3:5

[D] 8:3:15

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

$$5y = 2z \Rightarrow$$

Trick

x	y	z
4	3	
	2	
	5	
8 : 6 : 15		

4. If $\left(x^3 + \frac{1}{x^3} - k\right)^2 + \left(x + \frac{1}{x} - p\right)^2 + \left(x^2 + \frac{1}{x^2} - t\right)^2 = 0$, where k , p and t are real numbers and $x \neq 0$, then $\frac{k}{p}$ is equal to:

यदि $\left(x^3 + \frac{1}{x^3} - k\right)^2 + \left(x + \frac{1}{x} - p\right)^2 + \left(x^2 + \frac{1}{x^2} - t\right)^2 = 0$ हो, जहाँ k , p और t वास्तविक संख्याएँ हैं और $x \neq 0$ है, तो $\frac{k}{p}$ किसके बराबर होगा?

[A] t

[B] $t+1$

[C] $t-1$

[D] $t-2$

$$\frac{k}{p} = \frac{p^3 - 3p}{p} = (p^2 - 2) - 1 = t - 1$$

$$x^3 + \frac{1}{x^3} = k = p^3 - 3p$$

$$x + \frac{1}{x} = p$$

$$x^2 + \frac{1}{x^2} = t = p^2 - 2$$

6. If $x^2 + y^2 + z^2 = 2(5x + 6y + 4z) - 77$ then find the value of $2(x + y) - 3z$.

अगर $x^2 + y^2 + z^2 = 2(5x + 6y + 4z) - 77$, तो $2(x + y) - 3z$ का मान ज्ञात कीजिए।

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[A] 11

[C] 10

[B] 78

[D] 23

~~12~~ - 12 = 10

Basic

(N.V.V. Imp)

$$(x^2 - 10x + 25) + (y^2 - 12y + 36) + (z^2 - 8z + 16) = 0$$

$$(x-5)^2 + (y-6)^2 + (z-4)^2 = 0$$

$$x=5, \quad y=6, \quad z=4$$

6. If $x^2 + y^2 + z^2 = 2(5x + 6y + 4z) - 77$ then find the value of $2(x + y) - 3z$.

अगर $x^2 + y^2 + z^2 = 2(5x + 6y + 4z) - 77$, तो $2(x + y) - 3z$ का मान ज्ञात कीजिए।

SSC CHSL PRE 2025

[A] 11

[B] 78

[C] 10

[D] 23

Trick $\Rightarrow$

$$1 \cdot x^2 + 1 \cdot y^2 + 1 \cdot z^2 = 2(5x + 6y + 4z) - 77$$

$$x = \frac{5}{1}$$

$$y = \frac{6}{1}$$

$$z = \frac{4}{1}$$

7. If $a^2 + b^2 + c^2 + 189 = 6(a + 4b + 2c)$, then $\sqrt{ab + bc + ca}$ is equal to:

यदि $a^2 + b^2 + c^2 + 189 = 6(a + 4b + 2c)$ है, तो $\sqrt{ab + bc + ca}$ किसके बराबर है?

[RRB ALP CBT-1 2025]

$$= \sqrt{36 + 72 + 18} = \sqrt{126}$$

[A] $2\sqrt{14}$

[B] $2\sqrt{11}$

[C] $3\sqrt{11}$

[D] $3\sqrt{14}$

$$a^2 + b^2 + c^2 + 189 = 6(a + 4b + 2c)$$

9x19

$$a = 3$$

$$b = 12$$

$$c = 6$$

8. If $16x^2 + 9y^2 + 4z^2 = 24(x - y + z) - 61$, then the value of $(xy + 2z)$ is:

यदि $16x^2 + 9y^2 + 4z^2 = 24(x - y + z) - 61$ है, तो $(xy + 2z)$ का मान है:

[A] 1

[B] 2

[C] 3

[D] 5

$$\frac{3}{4}x - \frac{4}{3}y + 6 = 5$$

$$16x^2 + 9y^2 + 4z^2 = 2 \cdot (12x - 12y + 12z) - 61$$

$$x = \frac{12}{16} = \frac{3}{4}$$

$$y = -\frac{12}{9} = -\frac{4}{3}$$

$$z = \frac{12}{4} = 3$$

9. If $x^2 + 9y^2 + 4z^2 = 12(x - 2y + 2z) - 88$, then the value of $(x - 3y + z)$ is:
यदि $x^2 + 9y^2 + 4z^2 = 12(x - 2y + 2z) - 88$ है, तो $(x - 3y + z)$ का मान ज्ञात करें।

[A] 10

[B] 13 ✓

[C] 11

[D] 5

10. If $3x(3x-8) + y(y+1) + 4z^2 - 2z + 16\frac{1}{2} = 0$, then what is the value of $(6x + y + 2z)$?

यदि $3x(3x-8) + y(y+1) + 4z^2 - 2z + 16\frac{1}{2} = 0$ है, तो $(6x+y+2z)$ का मान क्या है?

[A] 2

[B] 6

[C] 8 ✓

[D] 4

$$9x^2 - 24x + y^2 + y + 4z^2 - 2z + 16\frac{1}{2} = 0$$

$$\begin{aligned} 9x^2 + y^2 + 4z^2 + 16\frac{1}{2} &= 24x - y - 2z \\ &= 2x(12 - \frac{y}{2} - z) \end{aligned}$$

$$x = \frac{12}{9} = \frac{4}{3}$$

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

$$z = \frac{1}{4}$$

$$8 - \frac{1}{2} + \frac{1}{2}$$

5. If $x^2 + y^2 - 10x + 26y + 194 = 0$, then the value of $x^2 + y^2$ is:

यदि $x^2 + y^2 - 10x + 26y + 194 = 0$, तो $x^2 + y^2$ का मान ज्ञात कीजिए।

[A] 190

[B] 194

[C] 198

[D] 200

(NTPC 2024)

$$(x^2 - 10x + 5^2) + (y^2 + 26y + 13^2) = 0$$

$$(x-5)^2 + (y+13)^2 = 0$$

$\downarrow$ $\downarrow$
 $x=5$ $y=-13$

11. If $10x^2 + y^2 + 6xy + 2x + 1 = 0$, then $3x+4y=?$
 यदि $\cancel{10x^2} + y^2 + 6xy + 2x + 1 = 0$ है, तो $3x+4y=?$

[A] 9

[B] 12

[C] 10

[D] 7

$-3+12$

$$(x^2 + 2x + 1) + (9x^2 + y^2 + 6xy) = 0$$

$$(x+1)^2 + (3x+y)^2 = 0$$

$$x = -1, \quad y = -3x = 3$$

12. If $9x^2 + 41y^2 + 4z^2 = 24xy + 20yz$, then find $x:y:z = ?$

यदि $9x^2 + 41y^2 + 4z^2 = 24xy + 20yz$ है, तो ज्ञात कीजिए कि $x:y:z = ?$

[A] ~~3:2:5~~

[B] 8:6:15

[C] ~~16:12:25~~

[D] ~~6:8:15~~

$$(3x)^2 - 2 \times 3x \times 4y + (4y)^2$$

$$(3x^2 - 24xy + 16y^2) + (4z^2 - 20yz + 25y^2) = 0$$

$$(3x - 4y)^2 + (2z - 5y)^2 = 0$$

$$\downarrow$$

$$3x = 4y$$

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

$$\downarrow$$

$$2z = 5y$$

$$\frac{z}{y} = \frac{5}{2}$$

13. If $8x^2 + 2y^2 + 18z^2 - 4xy - 6yz - 12zx = 0$, then find $x : y : z$.

यदि $8x^2 + 2y^2 + 18z^2 - 4xy - 6yz - 12zx = 0$ है, तो $x : y : z$ ज्ञात कीजिए।

[A] 2:3:5

[B] 7:6:4

[C] 3:6:2

[D] 3:4:5

HW

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

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

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

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

$$(a)^2 = (-a)^2$$

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



14. Write the expanded form of $(8a + 5b + 9c)^2$.

$(8a + 5b + 9c)^2$ को विस्तारित रूप में लिखिए।

[RRB JE 2024]

[A] $64a^2 + 25b^2 + 81c^2 + 84ab + 90bc + 144ac$

[B] $64a^2 + 25b^2 + 81c^2 + 80ab + 85bc + 144ac$

[C] $64a^2 + 25b^2 + 81c^2 + 80ab + 90bc + 144ac$ ✓

[D] $64a^2 + 25b^2 + 81c^2 + 80ab + 90bc + 154ac$

15. Write the expanded form of $(7a + 9b + 4c)^2$.

$(7a + 9b + 4c)^2$ को विस्तारित रूप में लिखिए?

(RRB NTPC GRADUATE LEVEL CBT-1 2026)

- ☒ [A] $49a^2 + 81b^2 + 16c^2 + 126ab + 72bc + 56ac$
- [B] $49a^2 + 81b^2 + 16c^2 + 126ab + 72bc + 66ac$
- [C] $49a^2 + 81b^2 + 16c^2 + 130ab + 72bc + 56ac$
- [D] $49a^2 + 81b^2 + 16c^2 + 126ab + 67bc + 56ac$

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

?

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

$$(ab + bc + ca) = \frac{(a + b + c)^2 - (a^2 + b^2 + c^2)}{2}$$

$$\frac{(a+b+c)^2 - (a^2+b^2+c^2)}{2} = (ab+bc+ca)$$



16. If $x + y + z = 16$ and $xy + yz + zx = 75$, what is the value of $x^2 + y^2 + z^2$?

यदि $x + y + z = 16$ और $xy + yz + zx = 75$, तो $x^2 + y^2 + z^2$ का मान क्या है?

(SSC CHSL PRE 2025)

[A] ~~106~~

[C] 156

[B] 121

[D] 108

$$= (x + y + z)^2 - 2(xy + yz + zx)$$

$$= 16^2 - 2 \times 75$$

$$= 106$$

17. If $a + b + c = 9$ and $ab + bc + ca = 23$, then $a^2 + b^2 + c^2 = ?$

यदि $a + b + c = 9$ और $ab + bc + ca = 23$ है, तो $a^2 + b^2 + c^2 = ?$

(RRB TECHNICIAN GRADE-3, 2024)

[A] 127

[C] 25

[B] 35 ✓

[D] 58

↓
 $9^2 - 2 \times 23 = 35$

18. If $(a + b + c)/2 = 16$ and $2ab + 2bc + 2ca = 120$, then what is the value of $4a^2 + 4b^2 + 4c^2$?
 यदि $(a + b + c)/2 = 16$ and $2ab + 2bc + 2ca = 120$, तो $4a^2 + 4b^2 + 4c^2$ का मान क्या है?

SSC CHSL TIER – I 2022

[A] 2828

[B] 3368

[C] 3616 ✓

[D] 3056

$$= 4 \times 904$$

$$a + b + c = 32$$

$$ab + bc + ca = 60$$

$$a^2 + b^2 + c^2 = 32^2 - 2 \times 60$$

$$\frac{1024}{-120} = 904$$

19. Given $a + b + c = 15$ and $a^2 + b^2 + c^2 = 83$, find $ab + bc + ca$.

यदि $a + b + c = 15$ और $a^2 + b^2 + c^2 = 83$ दिया गया है, तो $ab + bc + ca$ ज्ञात कीजिए।

(RRB GROUP - D 2025)

[A] 20

[B] 11

[C] 71

[D] 25

$$ab + bc + ca = \frac{(a + b + c)^2 - (a^2 + b^2 + c^2)}{2}$$

$$= \frac{15^2 - 83}{2}$$

$$= \frac{142}{2} = 71$$

20. **a, b, c are three positive numbers, such that $(a + b + c) = 20$, $a^2 + b^2 + c^2 = 152$.**

The value of $(ab + bc + ca)$ is equal to:

a, b, c तीन धनात्मक संख्याएं हैं इस प्रकार हैं कि $(a + b + c) = 20$, $a^2 + b^2 + c^2 = 152$ हैं।

$(ab + bc + ca)$ का मान बराबर है:

[A] 124

[B] 110

[C] 112

[D] 102

$$= \frac{20^2 - 152}{2}$$

$$= \frac{248}{2}$$

21. If $x + y + z = 0$ and $x^2 + y^2 + z^2 = 32$ then find the value of, $xy + yz + xz$.

यदि $x + y + z = 0$, और $x^2 + y^2 + z^2 = 32$, तो $xy + yz + xz$ का मान ज्ञात कीजिए।

SSC CHSL PRE 2025

[A] -16

[B] 16

[C] -32

[D] 32

$$= \frac{0^2 - 32}{2}$$

22. If $a + b - c = 12$ and $a^2 + b^2 + c^2 = 110$, then which of the following relations is correct?

यदि $(a + b - c)^2 = 12^2$ और $a^2 + b^2 + c^2 = 110$ है, तो निम्नलिखित में से कौन-सा संबंध सही है?

[A] $ab + bc + ca = 34$ [B] $ab + bc - ca = 17$

[C] $ab - bc + ca = 17$ [D] $ab - bc - ca = 17$

23. If $a^2+b^2+c^2=6.25$ and $(ab+bc+ca)=0.52$, what is the value of $(a+b+c)$, if $(a+b+c) < 0$?
 यदि $a^2+b^2+c^2=6.25$ और $(ab+bc+ca)=0.52$ है, तो $(a+b+c)$ का मान ज्ञात करें, यदि $(a+b+c) < 0$ है?

[A] ± 2.7 ✗

[B] -2.7

[C] -2.8

[D] ✗ ± 2.8

$$(a+b+c)^2 = 6.25 + 2 \times 0.52 = 7.29$$

$$a+b+c = -2.7$$