

$$(a+b+c) \cdot (ab+bc+ca) = a^2b+ab^2+b^2c+bc^2+c^2a+ca^2+3abc$$
$$= ab(a+b)+bc(b+c)+ca(c+a)+3abc$$

$$(a+b+c) \cdot (ab+bc+ca) - 3abc = ab(a+b)+bc(b+c)+ca(c+a)$$
$$= a^2b+ab^2+b^2c+bc^2+c^2a+ca^2$$

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

$$(a+b)(b+c)(c+a) = (a+b+c) \cdot (ab+bc+ca) - abc$$

37. If $a+b+c=8$ and $ab+bc+ca=5$, then $bc(b+c)+ca(c+a)+ab(a+b)+3abc=?$

यदि $a+b+c=8$ और $ab+bc+ca=5$ है, तो $bc(b+c)+ca(c+a)+ab(a+b)+3abc=?$

[A] 13

[B] 40

[C] 50

[D] 32

$\downarrow$
 $5 \times 8 = 40$

+1-पर $\rightarrow$ 2 eqⁿ
 a, b, c
but $c=0$

$$a+b=8$$
$$ab=5$$

38. If $a+b+c=6$ and $a^2+b^2+c^2=38$, then what is the value of $a(b^2+c^2)+b(c^2+a^2)+c(a^2+b^2)+3abc$?

यदि $a+b+c=6$ और $a^2+b^2+c^2=38$ है, तो $a(b^2+c^2)+b(c^2+a^2)+c(a^2+b^2)+3abc$ का मान ज्ञात कीजिए।

[A] 3

[B] -3

[C] 6

[D] -6

$$\begin{aligned} &= ab^2 + ba^2 \\ &= ab \cdot (b+a) \\ &= \downarrow \quad \downarrow \\ &= -1 \times 6 \\ &= -6 \end{aligned}$$

put $c=0$

$$a+b=6$$

$$a^2+b^2=38$$

$$ab = \frac{6^2 - 38}{2} = -1$$

39. If $ab+bc+ca=119$, $a^2+b^2+c^2=162$ and a, b & c are positive values then what is the value of $a^2(b+c)+b^2(c+a)+c^2(a+b)+3abc$?

यदि $ab+bc+ca=119$, $a^2+b^2+c^2=162$ और a, b और c धनात्मक हैं तो $a^2(b+c)+b^2(c+a)+c^2(a+b)+3abc$ का मान क्या है?

[A] 2380

[C] 2450

~~[B] 2499~~

~~[D] 1760~~

$$= (a+b+c) \cdot (ab+bc+ca)$$

$$= 20 \times 119$$

$$= 2380$$

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

$$= 162 + 2 \times 119$$

$$= 400$$

40. If $a+b+c=7$, $ab+bc+ca=25$ and $abc=13$ then $a^2b + b^2a + b^2c + c^2b + a^2c + c^2a = ?$
यदि $a+b+c=7$, $ab+bc+ca=25$ और $abc=13$ है, तो $a^2b + b^2a + b^2c + c^2b + a^2c + c^2a = ?$

[A] 136

[B] 162

[C] 127

[D] 144

$$= (a+b+c) \cdot (ab+bc+ca) - 3abc$$

$$= 7 \times 25 - 3 \times 13$$

$$= 175 - 39$$

$$= 136$$

41. What is the simplified value of $\frac{(x+y+z)(xy+yz+zx)-xyz}{(x+y)(y+z)(z+x)}$?

$\frac{(x+y+z)(xy+yz+zx)-xyz}{(x+y)(y+z)(z+x)}$ का सरलीकृत मान क्या है?

(SSC CGL Mains 2021)

[A] ~~z~~

①

[B] x

[C] ①

[D] y

put $z=0$

42. $ab(a - b) + bc(b - c) + ca(c - a)$ is equal to:

$ab(a - b) + bc(b - c) + ca(c - a)$ निम्नलिखित में से किसके बराबर है

[A] $(a + b)(b - c)(c - a)$

[B] $(a - b)(b - c)(c - a)$

[C] $(b - a)(b - c)(c - a) = -ab(b - a) = ab(a - b)$

[D] $(a - b)(b + c)(c - a)$

put $c = 0$

#



43. If $(a+b+c)=20$ & $\frac{1}{a} + \frac{1}{b} + \frac{1}{c} = 30$, then find the value of $\left(\frac{a}{b} + \frac{b}{a} + \frac{b}{c} + \frac{c}{b} + \frac{c}{a} + \frac{a}{c}\right)$?

यदि $(a+b+c)=20$ & $\frac{1}{a} + \frac{1}{b} + \frac{1}{c} = 30$ है, तो $\left(\frac{a}{b} + \frac{b}{a} + \frac{b}{c} + \frac{c}{b} + \frac{c}{a} + \frac{a}{c}\right)$ का मान ज्ञात कीजिये? $= 20 \times 30 - 3$

[A] 597

[B] 599

[c] 600

[D] cannot find

$$(a+b+c) \times \left(\frac{1}{a} + \frac{1}{b} + \frac{1}{c} \right) = 20 \times 30$$

$$1 + \frac{a}{b} + \frac{a}{c} + \frac{b}{a} + 1 + \frac{b}{c} + \frac{c}{a} + \frac{c}{b} + 1 = 20 \times 30$$

$(V \cdot V \cdot V \cdot V / \eta)$

#



44. If $a + \frac{1}{b} = 1$ and $b + \frac{1}{c} = 1$, then the value of $c + \frac{1}{a}$ is:

यदि $a + \frac{1}{b} = 1$ और $b + \frac{1}{c} = 1$ हो, तो $c + \frac{1}{a}$ का मान क्या होगा?

[A] 0

[B] 2

[C] 1

[D] 3

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

$$abc = -1$$

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

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

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

$$\frac{1}{c} = 1 - b$$

$$c = \frac{1}{1-b}$$

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

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

44. If $a + \frac{1}{b} = 1$ and $b + \frac{1}{c} = 1$, then the value of $c + \frac{1}{a}$ is:

यदि $a + \frac{1}{b} = 1$ और $b + \frac{1}{c} = 1$ हो, तो $c + \frac{1}{a}$ का मान क्या होगा?

[A] 0

[B] 2

[c] 1 ✓

[D] 3

per $b = -1$

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

(v.v.v.v.vimp)

1-चर $\log^n$
 एस्तो $\rightarrow a, b, c$

$$a-1=1 \Rightarrow a=2$$

$$-1 + \frac{1}{C} = 1 \Rightarrow C = \frac{1}{2}$$

45. If $\frac{A}{L} + \frac{M}{B} = 1$ & $\frac{B}{M} + \frac{N}{C} = 1$, Then find $\frac{L}{A} + \frac{C}{N}$?

यदि $\left(\frac{A}{L}\right) + \left(\frac{M}{B}\right) = 1$ & $\left(\frac{B}{M}\right) + \left(\frac{N}{C}\right) = 1$, तो $\left(\frac{L}{A}\right) + \left(\frac{C}{N}\right)$ ज्ञात कीजिए?

[A] 1

[C] M/B

[B] B/M

[D] 0

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

$$y + \frac{1}{z} = 1$$

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

46. If $a + \frac{3}{b} = 3$ and $b + \frac{1}{c} = 1$ then find $abc = ?$

यदि $a + \frac{3}{b} = 3$ और $b + \frac{1}{c} = 1$ है, तो abc ज्ञात कीजिए।

[A] 4

[C] 3

[B] -3

[D] -6

$$6x - 1x \frac{1}{2} = -3$$

$$\text{put } b = -1$$

$$a - 3 = 3 \Rightarrow a = 6$$

$$-1 + \frac{1}{c} = 1 \Rightarrow c = \frac{1}{2}$$

47. If $pq + 1 = q$ and $qr + 1 = r$, then $3r + \frac{3}{p} + 5pqr = ?$
यदि $pq + 1 = q$ और $qr + 1 = r$ है, तो $3r + \frac{3}{p} + 5pqr = ?$

[A] 2

[B] 8

[C] -2

[D] -4

$$\frac{3}{2} + \frac{3}{2} + 5 \times \cancel{2} \times \cancel{-1} \times \cancel{1} = -2$$

put $q = -1$

$$-p + 1 = -1$$

$$p = 2$$

$$-r + 1 = r$$

$$2r = 1$$

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

$$3 - 5 = -2$$

48. If $a + \frac{1}{b} = b + \frac{1}{c} = c + \frac{1}{a}$ (where $a \neq b \neq c$), then abc is equal to:

यदि $a + \frac{1}{b} = b + \frac{1}{c} = c + \frac{1}{a}$ (जहाँ $a \neq b \neq c$), तो abc किसके बराबर है?

(SSC CGL Mains 2016) (RRB NTPC GRADUATE LEVEL CBT-1 2026)

[A] +1

[B] -1

~~[C] +1 & -1~~

[D] None of these

$$1 = \frac{1}{a^2 b^2 c^2}$$

$$a^2 b^2 c^2 = 1$$

$$abc = \pm 1$$

~~$a - b = \frac{b - c}{bc}$~~

~~$b - c = \frac{c - a}{ac}$~~

~~$c - a = \frac{a - b}{ab}$~~

option से



49. Solve for x: $\frac{x-6}{2020} + \frac{x-5}{2021} + \frac{x-4}{2022} = 3$?

x का मान ज्ञात कीजिए: $\frac{x-6}{2020} + \frac{x-5}{2021} + \frac{x-4}{2022} = 3$?

[A] 2026

[B] 2020

[C] 2021

[D] 2022

$$1+1+1=3$$

50. If $\frac{m-a^2}{b^2+c^2} + \frac{m-b^2}{c^2+a^2} + \frac{m-c^2}{a^2+b^2} = 3$, then find the value of m?

यदि $\frac{m-a^2}{b^2+c^2} + \frac{m-b^2}{c^2+a^2} + \frac{m-c^2}{a^2+b^2} = 3$, तो m का मान ज्ञात कीजिए।

~~[A]~~ $a^2 + b^2 - c^2$

[B] $a^2 + b^2$

~~[C]~~ $a^2 + b^2 + c^2 = m$

[D] $a^2 - b^2 - c^2$

$$1+1+1=3$$

51. If $\frac{x-a^2}{b+c} + \frac{x-b^2}{c+a} + \frac{x-c^2}{a+b} = 4(a+b+c)$, then find the value of x?

यदि $\frac{x-a^2}{b+c} + \frac{x-b^2}{c+a} + \frac{x-c^2}{a+b} = 4(a+b+c)$, तो x का मान ज्ञात कीजिए?

☒ [A] $(a+b+c)^2$

☐ [B] $a^2 + b^2 + c^2$

☐ [C] $ab + bc + ca$

☐ [D] $a^2 + b^2 + c^2 - ab - bc - ca$

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

$$a+b+c + a+b+c + a+b+c$$

52. If $x^2 = y + z$, $y^2 = z + x$ and $z^2 = x + y$, then $\frac{1}{1+x} + \frac{1}{1+y} + \frac{1}{1+z} = ?$

यदि $x^2 = y + z$, $y^2 = z + x$ और $z^2 = x + y$ है, तो $\frac{1}{1+x} + \frac{1}{1+y} + \frac{1}{1+z} = ?$

[A] -1

[B] 1

[C] 2

[D] 0

53. If $a^2 = by + cz$, $b^2 = cz + ax$, $c^2 = ax + by$, then $\frac{1}{2} \left[\frac{x}{a+x} + \frac{y}{b+y} + \frac{z}{c+z} \right] = ?$

यदि $a^2 = by + cz$, $b^2 = cz + ax$, $c^2 = ax + by$, तो $\frac{1}{2} \left[\frac{x}{a+x} + \frac{y}{b+y} + \frac{z}{c+z} \right] = ?$

[A] 1

[B] $\frac{1}{2}$

[C] $a+b+c$

[D] 2

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

यदि $b+c=ax$, $c+a=by$, $a+b=cz$ है, तो $\frac{1}{9} \left[\frac{1}{x+1} + \frac{1}{y+1} + \frac{1}{z+1} \right]$ का मान क्या है?

[A] 0

[B] 1

[C] $\frac{1}{9}$

[D] $\frac{1}{3}$

55. If $a + b + c = abc$, then $\frac{(1-a^2)(1-b^2)}{ab} + \frac{(1-b^2)(1-c^2)}{bc} + \frac{(1-c^2)(1-a^2)}{ca} = ?$

यदि $a + b + c = abc$ है, तो $\frac{(1-a^2)(1-b^2)}{ab} + \frac{(1-b^2)(1-c^2)}{bc} + \frac{(1-c^2)(1-a^2)}{ca}$ का मान क्या है?

[A] 0

[B] 2

[C] 4

[D] 3

56. **Simplify the following expression:**

निम्नलिखित व्यंजक को हल कीजिए:

$$(3x + 17 - 2y)(3x - 17 - 2y)$$

[A] $9x^2 - 12xy + 4y^2 + 289$

[B] $9x^2 + 12xy + 4y^2 - 289$

[C] $9x^2 - 12xy + 4y^2 - 289$

[D] $9x^2 - 6xy + 4y^2 - 289$

57. The factors of $(a^2 + 4b^2 + 4b - 4ab - 2a - 8)$ are?
 $(a^2 + 4b^2 + 4b - 4ab - 2a - 8)$ गुणनखंड क्या होंगे?

(SSC CGL Mains 2014) (SSC CGL PRE 2022)

[A] $(a - 2b - 4)(a - 2b + 2)$

[B] $(a - b + 2)(a - 4b - 4)$

[C] $(a + 2b - 4)(a + 2b + 4)$

[D] $(a + 2b - 1)(a - 2b + 1)$

58. Complete factorization of $x^4 + 64$ is.

$x^4 + 64$ का पूर्ण गुणनखंडन है।

[A] $(x^2 + 8)^2$

[B] $(x^2 - 4x + 8)(x^2 - 4x - 8)$

[C] $(x^2 - 4x + 8)(x^2 - 4x + 8)$

[D] $(x^2 + 4x + 8)(x^2 - 4x + 8)$

59. $(4x^3y - 6x^2y^2 + 4xy^3 - y^4)$ can be expressed as:

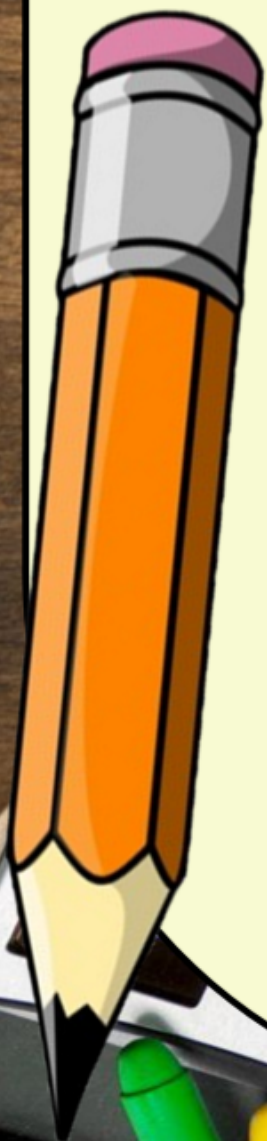
$(4x^3y - 6x^2y^2 + 4xy^3 - y^4)$ को निम्न रूप में व्यक्त किया जा सकता है:

[A] $(x-y)^4 - x^4$

[B] $(x+y)^4 - y^4$

[C] $x^4 - (x-y)^4$

[D] $(x+y)^4 - x^4$



60. If $ax + by + 1$ & $bx + ay = \frac{2ab}{a^2+b^2}$, then the value of x (in terms of a and b) is?

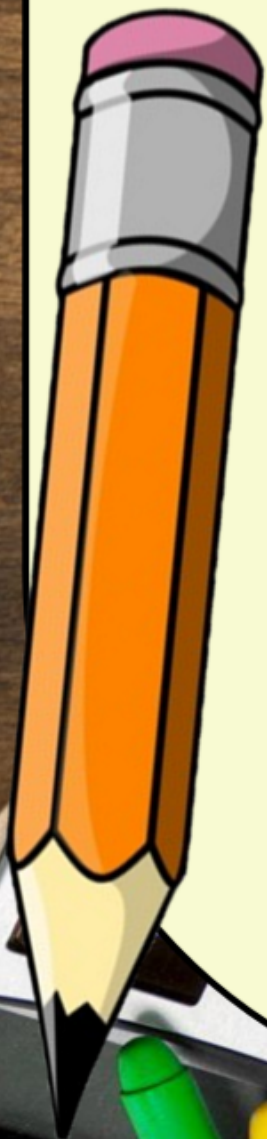
यदि $ax + by + 1$ & $bx + ay = \frac{2ab}{a^2+b^2}$, तो x का मान (a और b के संदर्भ में) क्या है?

[A] $\frac{2b}{a^2+b^2}$

[B] $\frac{a}{a^2+b^2}$

[D] $\frac{b}{a^2+b^2}$

[D] $\frac{2a}{a^2+b^2}$





symmetry $\Rightarrow$ put all variables equal

52. If $x^2 = y + z$, $y^2 = z + x$ and $z^2 = x + y$, then $\frac{1}{1+x} + \frac{1}{1+y} + \frac{1}{1+z} = ?$

यदि $x^2 = y + z$, $y^2 = z + x$ और $z^2 = x + y$ है, तो $\frac{1}{1+x} + \frac{1}{1+y} + \frac{1}{1+z} = ?$

[A] -1

[B] 1

[C] 2

[D] 0

$$= 3 \times \frac{1}{1+2} \\ = 1$$

put $x=y=z=2$

$$x^2 = 2x$$

$$x = 2$$

53. If $a^2 = by + cz$, $b^2 = cz + ax$, $c^2 = ax + by$, then $\frac{1}{2} \left[\frac{x}{a+x} + \frac{y}{b+y} + \frac{z}{c+z} \right] = ?$

यदि $a^2 = by + cz$, $b^2 = cz + ax$, $c^2 = ax + by$, तो $\frac{1}{2} \left[\frac{x}{a+x} + \frac{y}{b+y} + \frac{z}{c+z} \right] = ?$

[A] 1

✓ [B] $\frac{1}{2}$

[C] $a+b+c$

[D] 2

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

3 eqⁿ $\Rightarrow a, b, c, x, y, z$

but $x=y=z=1$

$$\left. \begin{array}{l} a^2 = b+c \\ b^2 = c+a \\ c^2 = a+b \end{array} \right\} \Rightarrow a=b=c=2$$

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

यदि $b+c=ax$, $c+a=by$, $a+b=cz$ है, तो $\frac{1}{9} \left[\frac{1}{x+1} + \frac{1}{y+1} + \frac{1}{z+1} \right]$ का मान क्या है?

[A] 0

[B] 1

[C] $\frac{1}{9}$ ✓

[D] $\frac{1}{3}$

~~$\frac{1}{9} \times 3 \times \frac{1}{2}$~~

put $a=b=c=1$

तो $x=y=z=2$

55. If $a + b + c = abc$, then $\frac{(1-a^2)(1-b^2)}{ab} + \frac{(1-b^2)(1-c^2)}{bc} + \frac{(1-c^2)(1-a^2)}{ca} = ?$

यदि $a + b + c = abc$ है, तो $\frac{(1-a^2)(1-b^2)}{ab} + \frac{(1-b^2)(1-c^2)}{bc} + \frac{(1-c^2)(1-a^2)}{ca}$ का मान क्या है?

[A] 0

[B] 2

[C] 4

[D] 3

put $a=b=c$

$$3a = a^3$$

$$3 = a^2$$

$$= \cancel{3} \times \frac{(1-3) \cdot (1-3)}{\cancel{3}} = 4$$



56. Simplify the following expression:

निम्नलिखित व्यंजक को हल कीजिए:

$$(3x + 17 - 2y)(3x - 17 - 2y)$$

[A] $9x^2 - 12xy + 4y^2 + 289$

[B] $9x^2 + 12xy + 4y^2 - 289$

[C] $9x^2 - 12xy + 4y^2 - 289$

[D] $9x^2 - 6xy + 4y^2 - 289$

$$= (3x - 2y)^2 - 17^2$$

$$(3x - 2y + 17)(3x - 2y - 17)$$

57. The factors of $(a^2 + 4b^2 + 4b - 4ab - 2a - 8)$ are?

$(a^2 + 4b^2 + 4b - 4ab - 2a - 8)$ गुणनखंड क्या होंगे?

(SSC CGL Mains 2014) (SSC CGL PRE 2022)

[A] $(a - 2b - 4)(a - 2b + 2)$

[B] $(a - b + 2)(a - 4b - 4)$

[C] $(a + 2b - 4)(a + 2b + 4)$

[D] $(a + 2b - 1)(a - 2b + 1)$

-8

but $a=b=0$

58. Complete factorization of $x^4 + 64$ is.

65 $= x^4 + 64$ का पूर्ण गुणनखंडन है।

~~[A] $(x^2 + 8)^2$~~

~~[B] $(x^2 - 4x + 8)(x^2 - 4x - 8)$~~

~~[C] $(x^2 - 4x + 8)(x^2 - 4x + 8)$~~

☒ [D] $(x^2 + 4x + 8)(x^2 - 4x + 8)$

5x5

but $x=1$

$13 \times 5 = 65$

59. $(4x^3y - 6x^2y^2 + 4xy^3 - y^4)$ can be expressed as:

~~$(4x^3y - 6x^2y^2 + 4xy^3 - y^4)$~~ को निम्न रूप में व्यक्त किया जा सकता है:

~~[A]~~ $(x-y)^4 - x^4$

~~[B]~~ $(x+y)^4 - y^4$

☒ [C] $x^4 - (x-y)^4$

~~[D]~~ $(x+y)^4 - x^4$

put $x=0$
 $-y^4$



60. If $ax + by = 1$ & $bx + ay = \frac{2ab}{a^2+b^2}$, then the value of x (in terms of a and b) is?

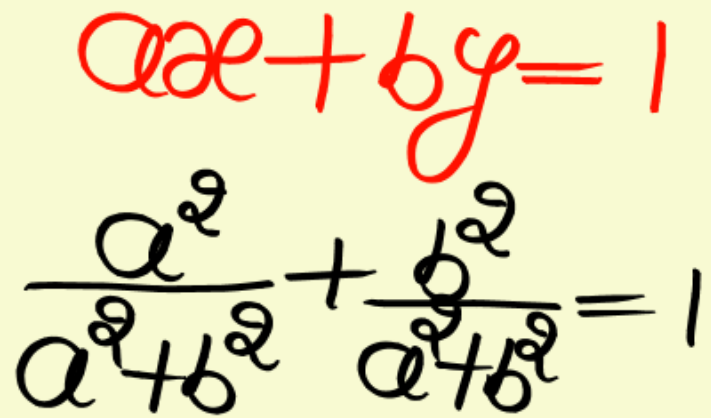
यदि $ax + by = 1$ & $bx + ay = \frac{2ab}{a^2+b^2}$, तो x का मान (a और b के संदर्भ में) क्या है?

[A] $\frac{2b}{a^2+b^2}$

[D] $\frac{b}{a^2+b^2}$

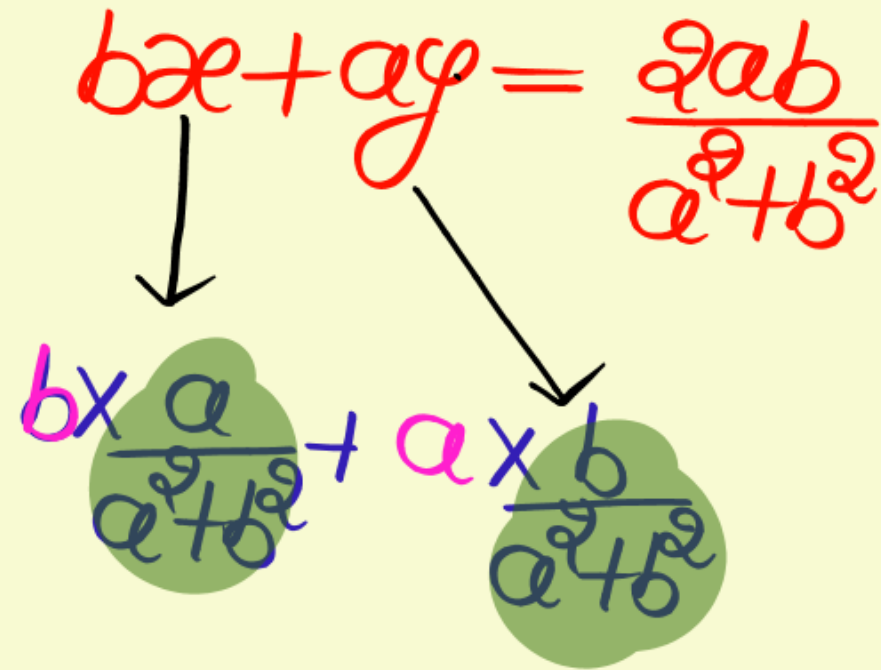
[B] $\frac{a}{a^2+b^2}$

[D] $\frac{2a}{a^2+b^2}$



Handwritten solution for the first equation:

$$ax + by = 1$$
$$\frac{a^2}{a^2+b^2} + \frac{b^2}{a^2+b^2} = 1$$



Handwritten solution for the second equation:

$$bx + ay = \frac{2ab}{a^2+b^2}$$

Arrows point from the equation to the following expression:

$$b \times \frac{a}{a^2+b^2} + a \times \frac{b}{a^2+b^2}$$