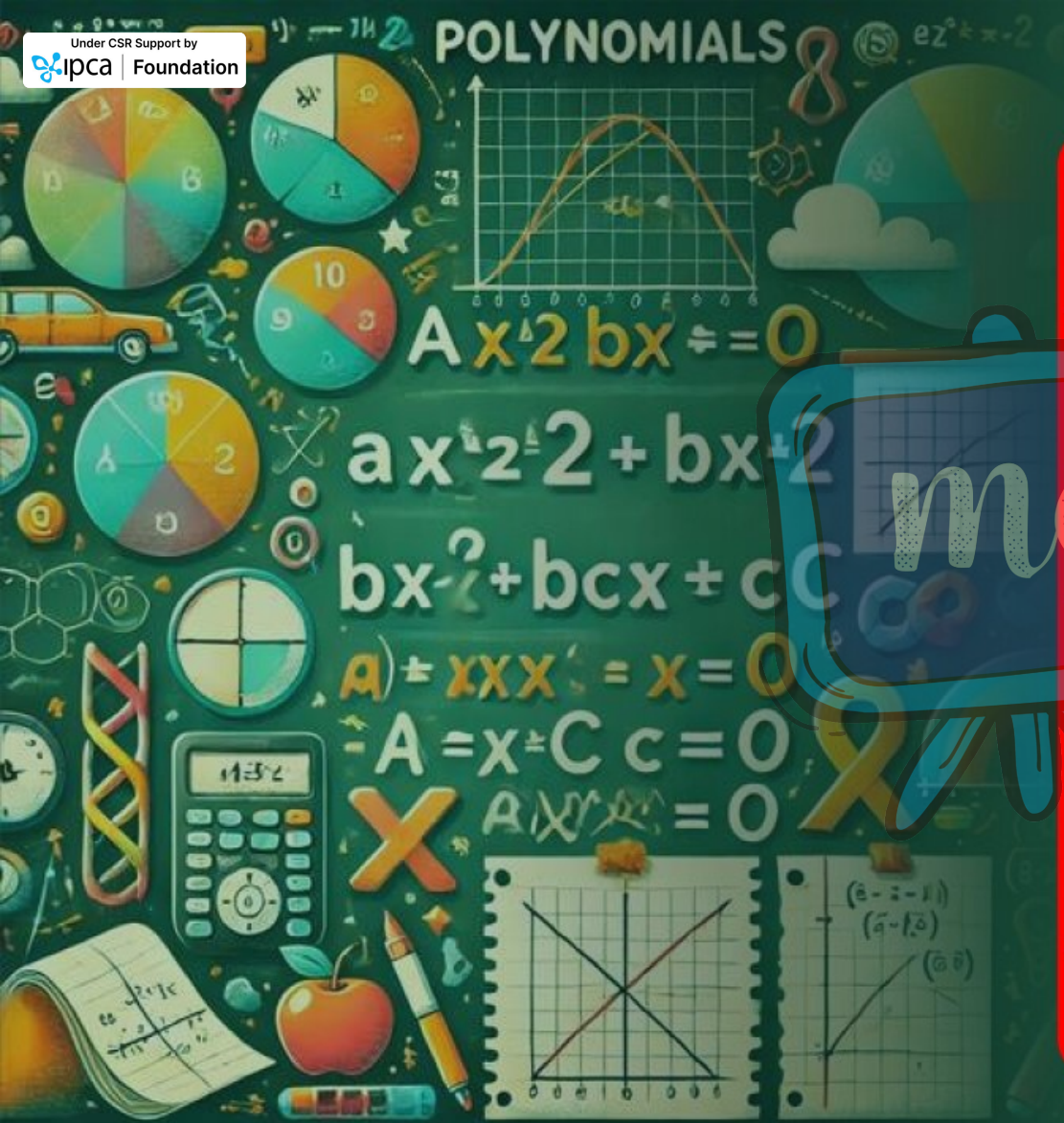
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कक्षा – 9

गणित

अध्याय – 2

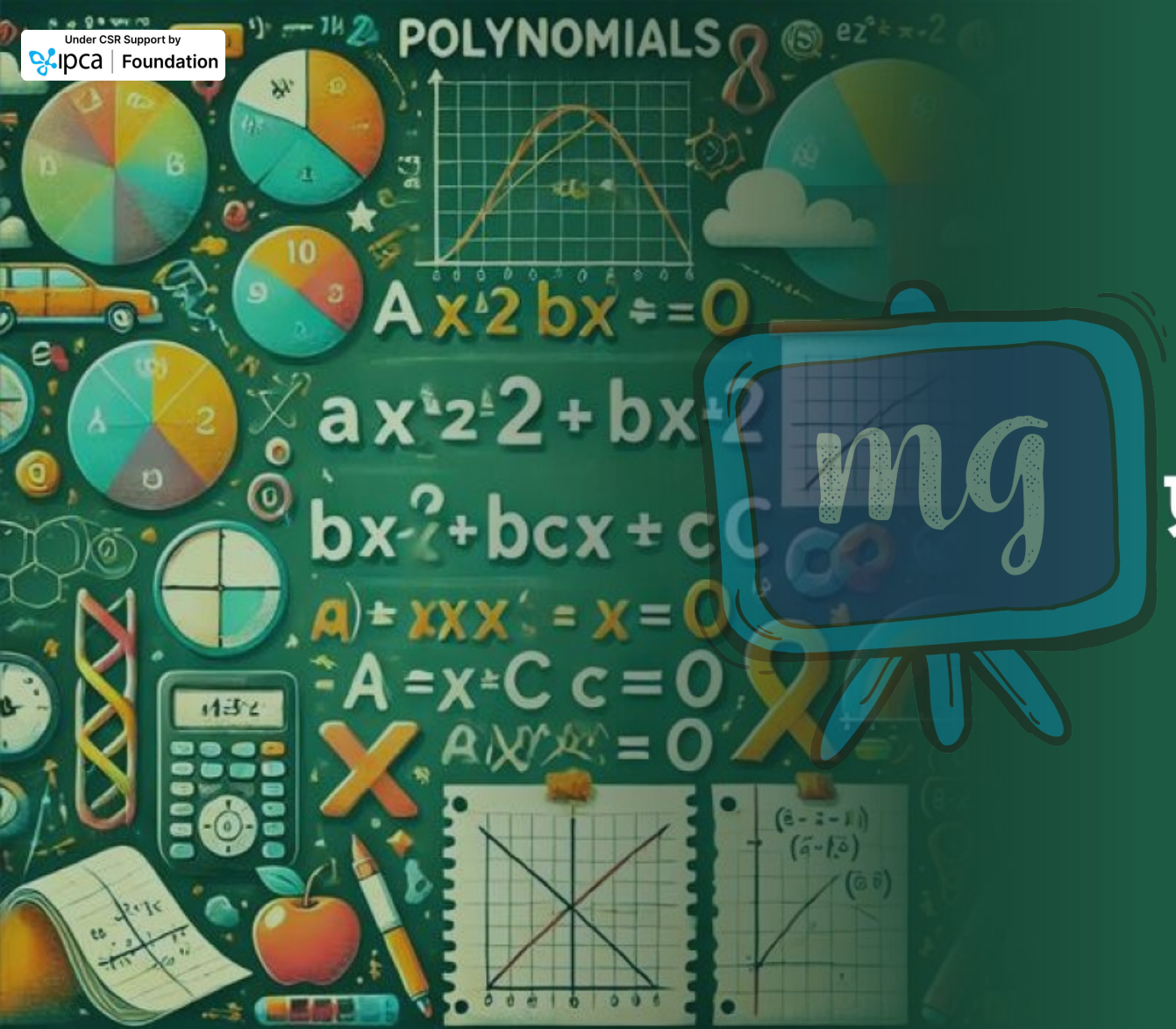
बहुपद

भाग – 11

प्रश्नावली 2.4 (प्रश्न : 1 से 4)

हर्ष गोयल

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प्रश्नावली 2.4

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1. उपयुक्त सर्वसमिकाओं का प्रयोग करके निम्नलिखित गुणनफल ज्ञात कीजिए:

(i) $(x + 4)(x + 10)$

$(x+a)(x+b)$

$= x^2 + (a+b)x + ab$

पहले

$a = 4, \ b = 10$

$(x+4)(x+10) = x^2 + (4+10)x + 4 \times 10$

$= x^2 + 14x + 40$

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(ii) $(x + 8)(x - 10)$

$(x+a)(x+b) = x^2 + (a+b)x + ab$

यहाँ $a = 8$, $b = -10$

$(x+8)(x-10) = x^2 + (8-10)x + 8x - 10$

$= x^2 - 2x - 80$

$(x+8)(x-10) = x^2 - 2x - 80$

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(iii) (3x + 4)(3x – 5)

$(x+a)(x+b)$

$= x^2 + (a+b)x + ab$

यहाँ

$x \to 3x$, $a = 4$, $b = -5$

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

$= 9x^2 - x - 20$

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(iv) $\left(y^2+\frac{3}{2}\right)\left(y^2-\frac{3}{2}\right)$

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

यहाँ

$x \to y^2$, $a = \frac{3}{2}$

$\left(y^2+\frac{3}{2}\right)\left(y^2-\frac{3}{2}\right) = (y^2)^2-\left(\frac{3}{2}\right)^2$

$= y^4-\frac{9}{4}$

Ans

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(v) $(3 - 2x)(3 + 2x)$

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

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

यहाँ $a = 3$, $x \to 2x$

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

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

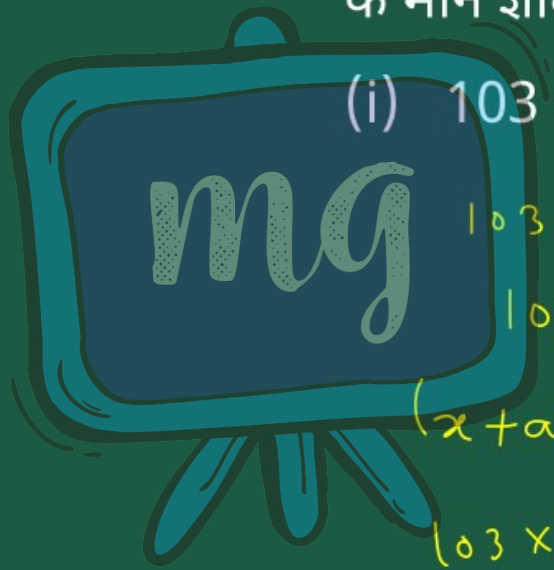
$(3-2x)(3+2x) = 9 - 4x^2$

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2. सीधे गुणा किए बिना निम्नलिखित गुणनफलों के मान ज्ञात कीजिए:

(i) 103×107



$103 = 100 + 3$

$107 = 100 + 7$

$(x+a)(x+b) = x^2 + (a+b)x + ab$

$103 \times 107 = (100+3)(100+7)$

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$(100+3)(100+7)$

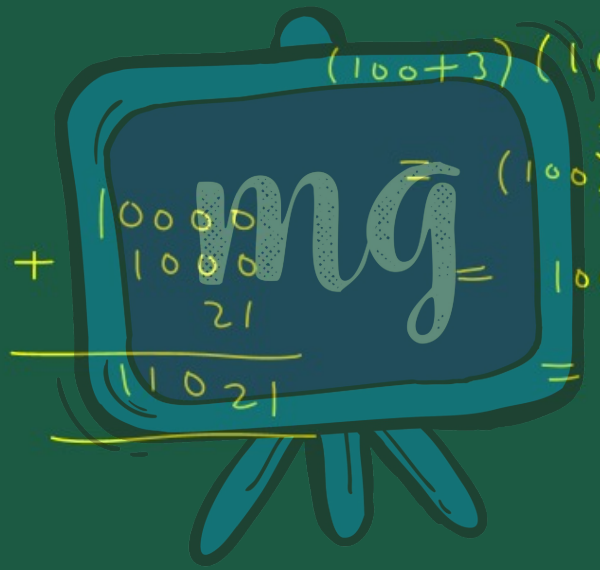
$\Rightarrow$ यहाँ $x = 100$, $a = 3$, $b = 7$

$(100+3)(100+7)$

$= (100)^2 + (3+7) \times 100 + 3 \times 7$

$= 10000 + 1000 + 21$

$= 11021$ Ans



10000
+ 1000
21
11021

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(ii) 95×96

$95 = 100 - 5$

$96 = 100 - 4$

$(x+a)(x+b) = x^2 + (a+b)x + ab$

$95 \times 96 = (100-5)(100-4)$

અહીં $x = 100$

$a = -5$

$b = -4$

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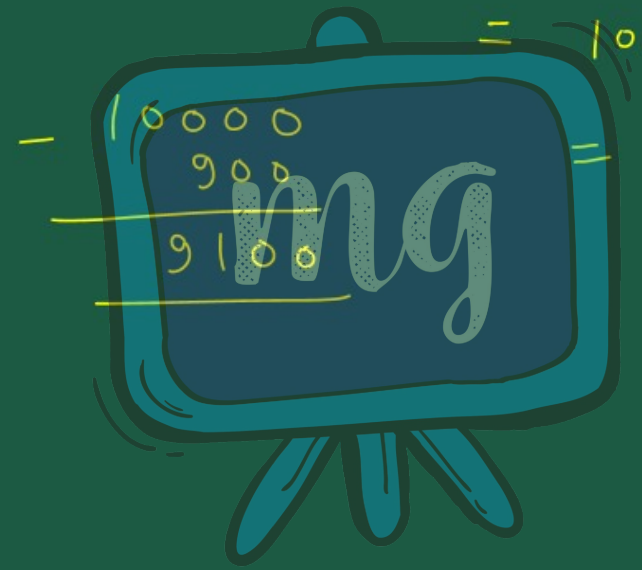
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$95 \times 96 = (100-5)(100-4)$

$= (100)^2 + (-5-4)100 + (-5 \times -4)$

$= 10000 - 900 + 20$

$= 9120$ Ans



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(iii) 104×96

$104 = 100 + 4$

$96 = 100 - 4$

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

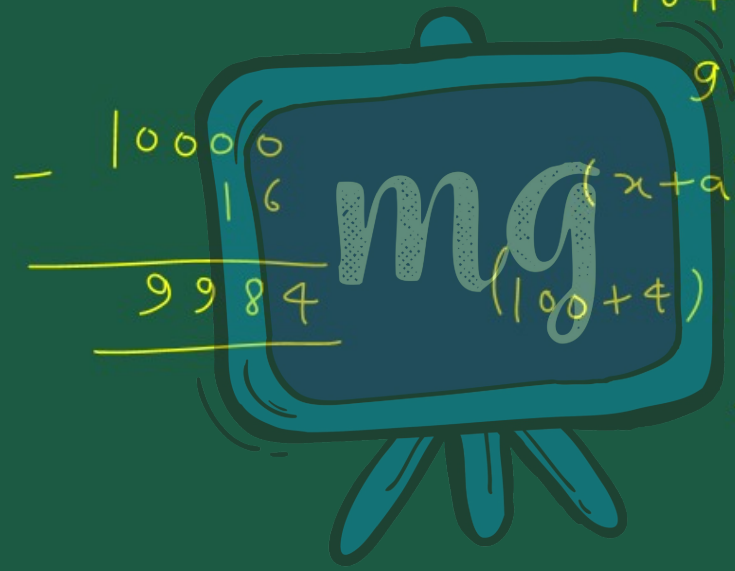
$(100+4)(100-4)$

$= (100)^2 - (4)^2$

$= 10000 - 16$

$= 9984$ Ans

$$\begin{array}{r} 10000 \\ -\quad 16 \\ \hline 9984 \\ \hline \end{array}$$



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3. उपयुक्त सर्वसमिकाएँ प्रयोग करके निम्नलिखित का गुणनखंडन कीजिए:

(i) $9x^2 + 6xy + y^2$

$x^2 \Rightarrow 9x^2$

$x \rightarrow 3x$

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

$9x^2 + 6xy + y^2$

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

$= (3x+y)^2$ (सर्वसमिका से)

$= (3x+y)(3x+y)$ Ans

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(ii) $4y^2 - 4y + 1$

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

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

$x^2 \rightarrow 4y^2$

$x \neq 2y$

$y^2 = 1$

$y = -1$

$4y^2 - 4y + 1$

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

$= (2y-1)^2$

$= (2y-1)(2y-1)$ Ans

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(iii) $x^2 - \frac{y^2}{100}$

$x^2 - y^2 = (x+y)(x-y)$

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

$x \to x$

$a \to \frac{y}{10}$

$x^2 - \frac{y^2}{100} = \left(x + \frac{y}{10}\right)\left(x - \frac{y}{10}\right)$

Ans

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4. उपयुक्त सर्वसमिकाओं का प्रयोग करके निम्नलिखित में से प्रत्येक का प्रसार कीजिए :

(i) $(x + 2y + 4z)^2$

$x \to x$

$y \to 2y$

$z \to 4z$

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

$(x+2y+4z)^2 = x^2 + (2y)^2 + (4z)^2 + 2x(2y) + 2(2y)(4z) + 2(4z)x$

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$$(x+2y+4z)^2 = x^2+4y^2+16z^2 + 4xy+16yz+8zx$$

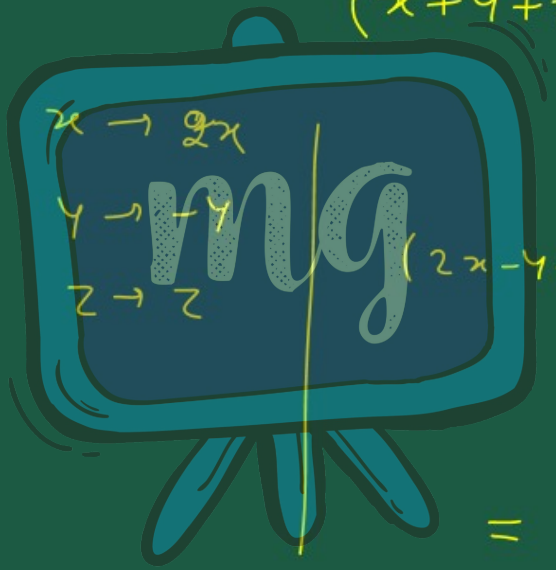


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(ii) $(2x - y + z)^2$

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



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

$$= 4x^2 + y^2 + z^2 - 4xy - 2yz + 4zx$$

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(iii) $(-2x + 3y + 2z)^2$

$x \to -2x$

$y \to 3y$

$z \to 2z$

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

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

$= 4x^2 + 9y^2 + 4z^2 - 12xy + 12yz - 8zx$

Ans

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(iv) $(3a - 7b - c)^2$

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

$x \to 3a$

$y \to -7b$

$z \to -c$

$(3a-7b-c)^2 = (3a)^2 + (-7b)^2 + (-c)^2 + 2(3a)(-7b) + 2(-7b)(-c) + 2(-c)(3a)$

$(3a-7b-c)^2 = 9a^2 + 49b^2 + c^2 - 42ab + 14bc - 6ac$

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

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

$x \to -2x$

$y \to 5y$

$z \to -3z$

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

$(-2x+5y-3z)^2 = 4x^2 + 25y^2 + 9z^2 - 20xy - 30yz + 12zx$

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(vi) $\left[\frac{1}{4}a-\frac{1}{2}b+1\right]^2$

$x \to \frac{1}{4}a$

$y \to -\frac{1}{2}b$

$z \to 1$

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

$\left(\frac{1}{4}a-\frac{1}{2}b+1\right)^2 = \left(\frac{1}{4}a\right)^2+\left(\frac{-1}{2}b\right)^2+(1)^2 + 2\left(\frac{1}{4}a\right)\left(\frac{-1}{2}b\right)+2\left(\frac{-1}{2}b\right)(1) + 2(1)\left(\frac{1}{4}a\right)$

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

