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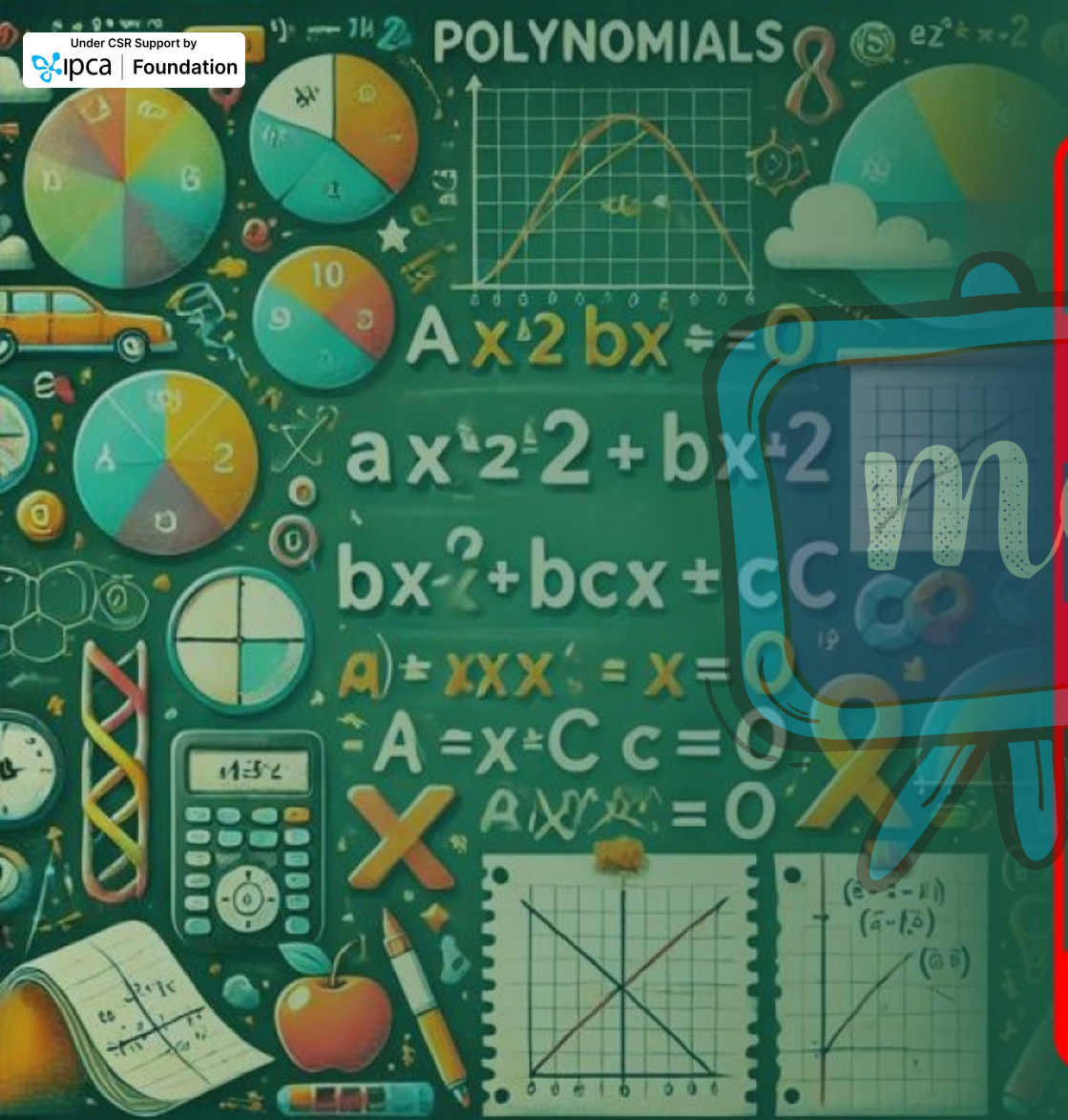

CLASS – 9

MATHS

Chapter - 2

Polynomials

Part – 14

Example (14–20)

Vikas Saini

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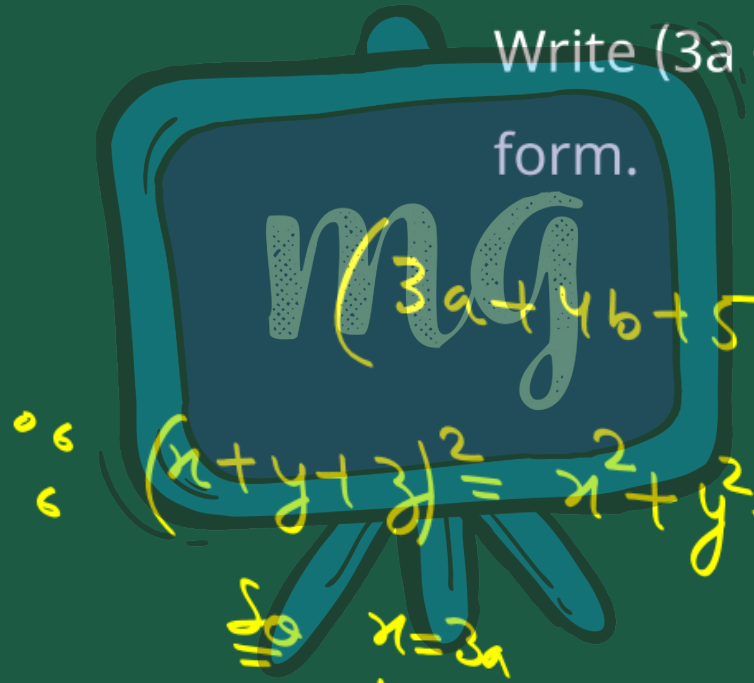
Example : 14

Write $(3a + 4b + 5c)^2$ in expanded form.



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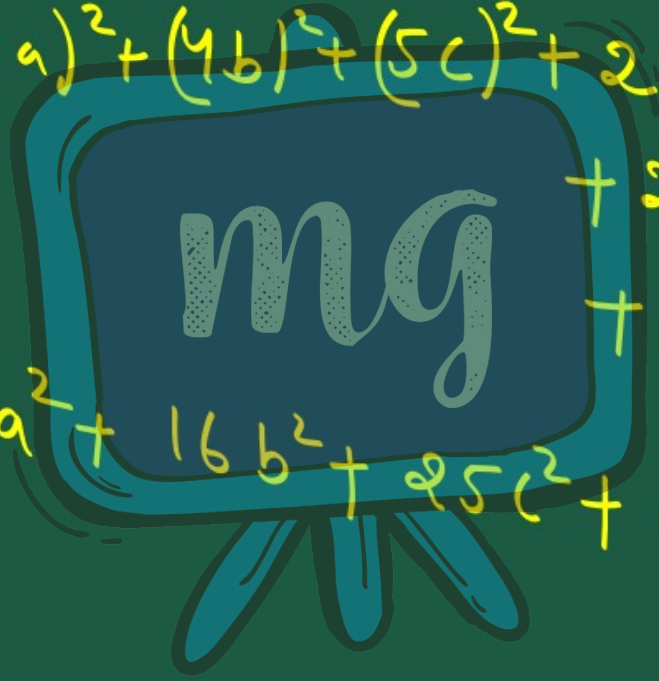
$$= (3a + 4b + 5c)^2$$

$$= (3a)^2 + (4b)^2 + (5c)^2 + 2 \times 3a \times 4b + 2 \times 4b \times 5c + 2 \times 5c \times 3a$$

$$= 9a^2 + 16b^2 + 25c^2 + 24ab + 40bc + 30ac$$



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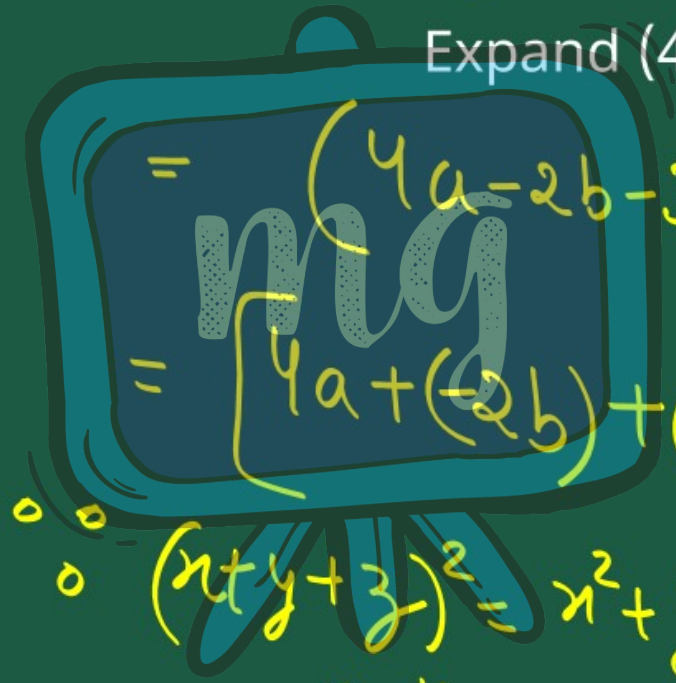
Example : 15

Expand $(4a - 2b - 3c)^2$.



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$$= (4a-2b-3c)^2$$

$$= (4a)^2+(-2b)^2+(-3c)^2+2\times 4a\times(-2b)+2\times(-2b)\times(-3c)+2\times(-3c)\times 4a$$

$$= 16a^2+4b^2+9c^2+(-16ab)+12bc+(-24ac)$$

$$= 16a^2+4b^2+9c^2-16ab+12bc-24ac$$

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Example : 16

Factorise $4x^2 + y^2 + z^2 - 4xy - 2yz + 4xz$.

$4 \times n \times y \quad 2 \times y \times 3$

$(2n)^2 + (y)^2 + (3)^2 + (-2 \times 2n \times y) + (-2 \times y \times 3) + 2 \times 2n \times 3$

$\therefore a^2 + b^2 + c^2 + 2ab + 2bc + 2ac$

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

$a = 2x \quad b = -y \quad c = z$

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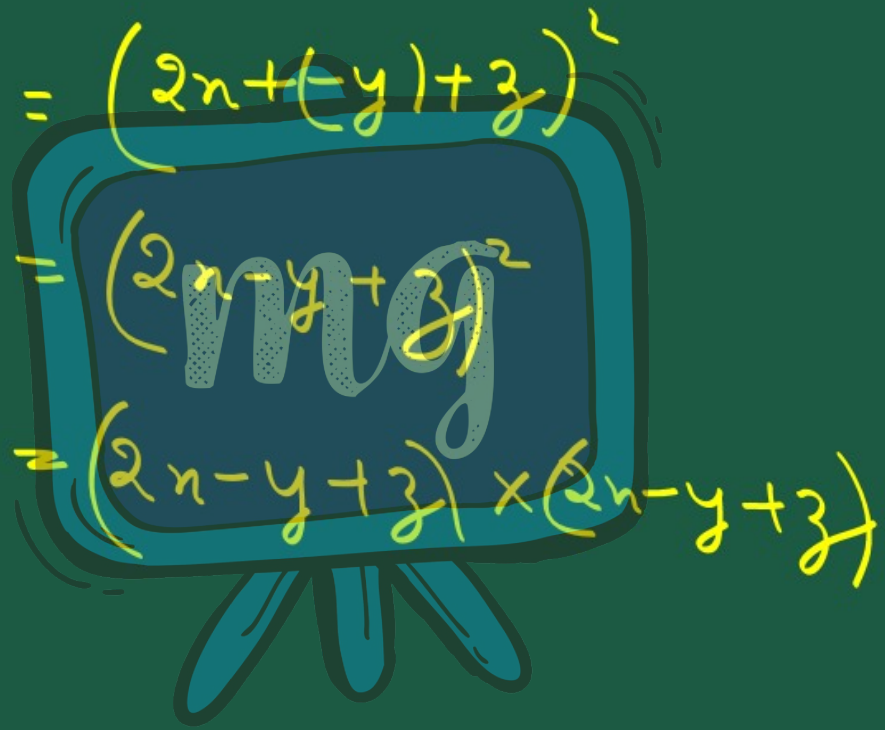

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Example : 17

Write the following cubes in the expanded form :

(i) $(3a + 4b)^3$

$\therefore (x+y)^3 = x^3+y^3+3x^2y+3xy^2$

$x = 3a$

$y = 4b$

$= (3a)^3 + (4b)^3 + 3 \times (3a)^2 \times 4b + 3 \times 3a \times (4b)^2$

$= 27a^3 + 64b^3 + 3 \times 9 \times a^2 \times 4 \times b + 3 \times 3a \times 16b^2$

$= 27a^3 + 64b^3 + 27a^2 \times 4b + 144ab^2$

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$$= 27a^3 + 64b^3 + 108a^2b + 144ab^2$$



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(ii) $(5p - 3q)^3$

$\therefore (x-y)^3 = x^3 - y^3 - 3x^2y + 3xy^2$

$x = 5p$

$y = 3q$

$= (5p)^3 - (3q)^3 - 3 \times (5p)^2 \times 3q + 3 \times 5p \times (3q)^2$

$= 125p^3 - 27q^3 - 3 \times 25p^2 \times 3q + 3 \times 5p \times 9q^2$

$= 125p^3 - 27q^3 - 225p^2q + 135pq^2$

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Example : 18

Evaluate each of the following using suitable identities:

(i) $(104)^3$

$= (100+4)^3$

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

$= (100)^3 + (4)^3 + 3\times(100)^2\times 4 + 3\times 100\times(4)^2$

$= 1000000 + 64 + 3\times 10000\times 4 + 3\times 100\times 16$

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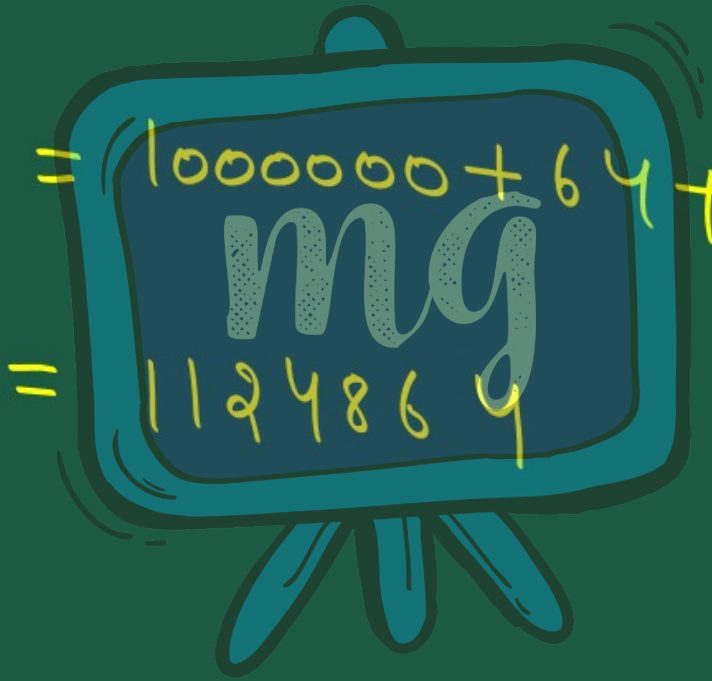
$= 1000000 + 64 + 3 \times 10000 \times 4 +$

$3 \times 100 \times 16$



$= 1000000 + 64 + 120000$

$+ 4800$

$= 1124864$

$$
\begin{array}{r}
1000000 \\
120000 \\
4800 \\
64 \\
\hline
1124864
\end{array}
$$

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(ii) $(999)^3$

$= (1000 - 1)^3$

$\because (x-y)^3 = x^3 - y^3 - 3xx^2xy + 3xxxy^2$

$x = 1000$

$y = 1$

$= (1000)^3 - (1)^3 - 3 \times (1000)^2 \times 1$

$+ 3 \times 1000 \times (1)^2$

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$$= 1000000000 - 1 - 3 \times 1000000 \times 1 + 3 \times 1000 \times 1$$

$$= 1000000000 - 1 - 3000000 + 3000$$

$$= 1000003000 - 3000001$$

$$= 997002999$$

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Example : 19

Factorise $8x^3 + 27y^3 + 36x^2y + 54xy^2$

$(2x)^3 = 4x^2$

$(3y)^3 = 9y^2$

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

$\therefore (a+b)^3 = a^3+b^3+3\times a^2\times b+3\times a\times b^2$

$a = 2x$

$b = 3y$

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

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

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Example : 20

Factorise : $8x^3 + y^3 + 27z^3 - 18xyz$

$2x \times y \times 3z$

$3 \times 6xyz$

$= 18xyz$

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

$a^3 + b^3 + c^3 - 3 \times a \times b \times c$

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

$a = 2x$

$b = y, \; c = 3z$

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$$= (2x+y+3z)\left((2x)^2+(y)^2+(3z)^2-2x\times y-y\times 3z-3z\times 2x\right)$$

$$= (2x+y+3z)\left(4x^2+y^2+9z^2-2xy-3yz-6xz\right)$$

