

EXERCISE 6.1

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1. Identify the terms, their coefficients for each of the following expressions:

(i) $7x^2yz - 5xy$

(ii) $x^2 + x + 1$

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

(iv) $9 - ab + bc - ca$

(v) $a/2 + b/2 - ab$

(vi) $0.2x - 0.3xy + 0.5y$

Solution:

(i) $7x^2yz - 5xy$

The given equation has two terms that are:

$7x^2yz$ and $-5xy$

The coefficient of $7x^2yz$ is 7

The coefficient of $-5xy$ is -5

(ii) $x^2 + x + 1$

The given equation has three terms that are:

x^2 , x , 1

The coefficient of x^2 is 1

The coefficient of x is 1

The coefficient of 1 is 1

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

The given equation has three terms that are:

$3x^2y^2$, $-5x^2y^2z^2$ and z^2

The coefficient of $3x^2y^2$ is 3

The coefficient of $-5x^2y^2z^2$ is -5

The coefficient of z^2 is 1

(iv) $9 - ab + bc - ca$

The given equation has four terms that are:

9, $-ab$, bc , $-ca$

The coefficient of 9 is 9

The coefficient of $-ab$ is -1

The coefficient of bc is 1

The coefficient of $-ca$ is -1

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(v) $\frac{a}{2} + \frac{b}{2} - ab$

The given equation has three terms that are:

$\frac{a}{2}, \frac{b}{2}, -ab$

The coefficient of $\frac{a}{2}$ is $\frac{1}{2}$

The coefficient of $\frac{b}{2}$ is $\frac{1}{2}$

The coefficient of $-ab$ is -1

(vi) $0.2x - 0.3xy + 0.5y$

The given equation has three terms that are:

$0.2x, -0.3xy, 0.5y$

The coefficient of $0.2x$ is 0.2

The coefficient of $-0.3xy$ is -0.3

The coefficient of $0.5y$ is 0.5

2. Classify the following polynomials as monomials, binomials, trinomials. Which polynomials do not fit in any category?

(i) $x+y$

(ii) 1000

(iii) $x+x^2+x^3+x^4$

(iv) $7+a+5b$

(v) $2b-3b^2$

(vi) $2y-3y^2+4y^3$

(vii) $5x-4y+3x$

(viii) $4a-15a^2$

(ix) $xy+yz+zt+tx$

(x) pqr

(xi) p^2q+pq^2

(xii) $2p+2q$

Solution:

(i) $x+y$

The given expression contains two terms x and y

$\therefore$ It is Binomial

(ii) 1000

The given expression contains one term 1000

$\therefore$ It is Monomial

(iii) $x+x^2+x^3+x^4$

The given expression contains four terms

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∴ It belongs to none of the categories

(iv) $7+a+5b$

The given expression contains three terms

∴ It is Trinomial

(v) $2b-3b^2$

The given expression contains two terms

∴ It is Binomial

(vi) $2y-3y^2+4y^3$

The given expression contains three terms

∴ It is Trinomial

(vii) $5x-4y+3x$

The given expression contains three terms

∴ It is Trinomial

(viii) $4a-15a^2$

The given expression contains two terms

∴ It is Binomial

(ix) $xy + yz + zt + tx$

The given expression contains four terms

∴ It belongs to none of the categories

(x) pqr

The given expression contains one term

∴ It is Monomial

(xi) p^2q+pq^2

The given expression contains two terms

∴ It is Binomial

(xii) $2p+2q$

The given expression contains two terms

∴ It is Monomial

EXERCISE 6.2

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1. Add the following algebraic expressions:

(i) $3a^2b, -4a^2b, 9a^2b$

(ii) $2/3a, 3/5a, -6/5a$

(iii) $4xy^2 - 7x^2y, 12x^2y - 6xy^2, -3x^2y + 5xy^2$

(iv) $3/2a - 5/4b + 2/5c, 2/3a - 7/2b + 7/2c, 5/3a + 5/2b - 5/4c$

(v) $11/2xy + 12/5y + 13/7x, -11/2y - 12/5x - 13/7xy$

(vi) $7/2x^3 - 1/2x^2 + 5/3, 3/2x^3 + 7/4x^2 - x + 1/3, 3/2x^2 - 5/2x - 2$

Solution:

(i) $3a^2b, -4a^2b, 9a^2b$

Let us add the given

expression $3a^2b + (-4a^2b) +$

$9a^2b$

$3a^2b - 4a^2b + 9a^2b$

$3a^2b$

(ii) $2/3a, 3/5a, -6/5a$

Let us add the given

expression $2/3a + 3/5a + (-$

$6/5a)$

$2/3a + 3/5a - 6/5a$

Let us take LCM for 3 and 5 which is 15

$(2 \times 5)/(3 \times 5)a + (3 \times 3)/(5 \times 3)a - (6 \times 3)/(5 \times 3)a$

$10/15a + 9/15a - 18/15a$

$(10a + 9a - 18a)/15$

$a/15$

(iii) $4xy^2 - 7x^2y, 12x^2y - 6xy^2, -3x^2y + 5xy^2$

Let us add the given expression

$4xy^2 - 7x^2y + 12x^2y - 6xy^2 - 3x^2y + 5xy^2$

Upon rearranging

$4x^2 + 12x^2y - 3x^2y - 7x^2y - 6xy^2 + 5xy^2$

$3xy^2 + 2x^2y$

(iv) $3/2a - 5/4b + 2/5c, 2/3a - 7/2b + 7/2c, 5/3a + 5/2b - 5/4c$

Let us add the given expression

$3/2a - 5/4b + 2/5c + 2/3a - 7/2b + 7/2c + 5/3a + 5/2b - 5/4c$

Upon rearranging

$3/2a + 2/3a + 5/3a - 5/4b - 7/2b + 5/2b + 2/5c + 7/2c - 5/4c$

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By taking LCM for (2 and 3 is 6), (4 and 2 is 4), (5, 2 and 4 is 20)

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$$(9a+4a+10a)/6 + (-5b-14b+10b)/4 + (8c+70c-25c)/20$$

$$23a/6 - 9b/4 + 53c/20$$

$$(v) 11/2xy + 12/5y + 13/7x, -11/2y - 12/5x - 13/7xy$$

Let us add the given expression

$$11/2xy + 12/5y + 13/7x + -11/2y - 12/5x - 13/7xy$$

Upon rearranging

$$11/2xy - 13/7xy + 13/7x - 12/5x + 12/5y - 11/2y$$

By taking LCM for (2 and 7 is 14), (7 and 5 is 35), (5 and 2 is 10)

$$(11xy-12xy)/14 + (65x-84x)/35 + (24y-55y)/10$$

$$51xy/14 - 19x/35 - 31y/10$$

$$(vi) 7/2x^3 - 1/2x^2 + 5/3, 3/2x^3 + 7/4x^2 - x + 1/3, 3/2x^2 - 5/2x - 2$$

Let us add the given expression

$$7/2x^3 - 1/2x^2 + 5/3 + 3/2x^3 + 7/4x^2 - x + 1/3 + 3/2x^2 - 5/2x - 2$$

Upon rearranging

$$7/2x^3 + 3/2x^3 - 1/2x^2 + 7/4x^2 + 3/2x^2 - x - 5/2x + 5/3 + 1/3 - 2$$

$$10/2x^3 + 11/4x^2 - 7/2x + 0/6$$

$$5x^3 + 11/4x^2 - 7/2x$$

2. Subtract:

$$(i) -5xy \text{ from } 12xy$$

$$(ii) 2a^2 \text{ from } -7a^2$$

$$(iii) 2a-b \text{ from } 3a-5b$$

$$(iv) 2x^3 - 4x^2 + 3x + 5 \text{ from } 4x^3 + x^2 + x + 6$$

$$(v) 3/2y^3 - 2/7y^2 - 5 \text{ from } 1/3y^3 + 5/7y^2 + y - 2$$

$$(vi) 3/2x - 5/4y - 7/2z \text{ from } 2/3x + 3/2y - 4/3z$$

$$(vii) x^2y - 4/5xy^2 + 4/3xy \text{ from } 2/3x^2y + 3/2xy^2 - 1/3xy$$

$$(viii) ab/7 - 35/3bc + 6/5ac \text{ from } 3/5bc - 4/5ac$$

Solution:

$$(i) -5xy \text{ from } 12xy$$

Let us subtract the given expression

$$12xy - (-5xy)$$

$$5xy + 12xy$$

$$17xy$$

$$(ii) 2a^2 \text{ from } -7a^2$$

Let us subtract the given expression

$$2a^2 + (-7a^2)$$

$$-2a^2 + 7a^2$$

$$-9a^2$$

(iii) $2a-b$ from $3a-5b$

Let us subtract the given expression

$$-(2a - b) + (3a - 5b)$$

$$-2a + b + 3a - 5b$$

$$a - 4b$$

(iv) $2x^3 - 4x^2 + 3x + 5$ from $4x^3 + x^2 + x + 6$

Let us subtract the given expression

$$-(2x^3 - 4x^2 + 3x + 5) + (4x^3 + x^2 + x + 6)$$

$$-2x^3 + 4x^2 - 3x - 5 + 4x^3 + x^2 + x + 6$$

$$2x^3 + 5x^2 - 2x + 1$$

(v) $3/2y^3 - 2/7y^2 - 5$ from $1/3y^3 + 5/7y^2 + y - 2$

Let us subtract the given expression

$$1/3y^3 + 5/7y^2 + y - 2 - 2/3y^3 + 2/7y^2 + 5$$

Upon rearranging

$$1/3y^3 - 2/3y^3 + 5/7y^2 + 2/7y^2 + y - 2 + 5$$

By grouping similar expressions we get,

$$-1/3y^3 + 7/7y^2 + y + 3$$

$$-1/3y^3 + y^2 + y + 3$$

(vi) $3/2x - 5/4y - 7/2z$ from $2/3x + 3/2y - 4/3z$

Let us subtract the given expression

$$2/3x + 3/2y - 4/3z - (3/2x - 5/4y - 7/2z)$$

Upon rearranging

$$2/3x - 3/2x + 3/2y + 5/4y - 4/3z + 7/2z$$

By grouping similar expressions we get,

LCM for (3 and 2 is 6), (2 and 4 is 4), (3 and 2 is 6)

$$(4x-9x)/6 + (6y+5y)/4 + (-8z+21z)/6$$

$$-5x/6 + 11y/4 + 13z/6$$

(vii) $x^2y - 4/5xy^2 + 4/3xy$ from $2/3x^2y + 3/2xy^2 - 1/3xy$

Let us subtract the given expression

$$2/3x^2y + 3/2xy^2 - 1/3xy - (x^2y - 4/5xy^2 + 4/3xy)$$

Upon rearranging

$$2/3x^2y - x^2y + 3/2xy^2 + 4/5xy^2 - 1/3xy - 4/3xy$$

By grouping similar expressions we get,

LCM for (3 and 1 is 3), (2 and 5 is 10), (3 and 3 is 3)
 $-1/3x^2y + 23/10xy^2 - 5/3xy$

(viii) $ab/7 - 35/3bc + 6/5ac$ from $3/5bc - 4/5ac$

Let us subtract the given expression

$$3/5bc - 4/5ac - (ab/7 - 35/3bc + 6/5ac)$$

Upon rearranging

$$3/5bc + 35/3bc - 4/5ac - 6/5ac - ab/7$$

By grouping similar expressions we get,

LCM for (5 and 3 is 15), (5 and 5 is 5)

$$(9bc + 175bc)/15 + (-4ac - 6ac)/5 - ab/7$$

$$184bc/15 + -10ac/5 - ab/7$$

$$-ab/7 + 184bc/15 - 2ac$$

3. Take away:

(i) $6/5x^2 - 4/5x^3 + 5/6 + 3/2x$ from $x^3/3 - 5/2x^2 + 3/5x + 1/4$

(ii) $5a^2/2 + 3a^3/2 + a/3 - 6/5$ from $1/3a^3 - 3/4a^2 - 5/2$

(iii) $7/4x^3 + 3/5x^2 + 1/2x + 9/2$ from $7/2 - x/3 - x^2/5$

(iv) $y^3/3 + 7/3y^2 + 1/2y + 1/2$ from $1/3 - 5/3y^2$

(v) $2/3ac - 5/7ab + 2/3bc$ from $3/2ab - 7/4ac - 5/6bc$

Solution:

(i) $6/5x^2 - 4/5x^3 + 5/6 + 3/2x$ from $x^3/3 - 5/2x^2 + 3/5x + 1/4$

Let us subtract the given expression

$$1/3x^3 - 5/2x^2 + 3/5x + 1/4 - (6/5x^2 - 4/5x^3 + 5/6 + 3/2x)$$

Upon rearranging

$$1/3x^3 + 4/5x^3 - 5/2x^2 - 6/5x^2 + 3/5x - 3/2x + 1/4 - 5/6$$

By grouping similar expressions we get,

LCM for (3 and 5 is 15), (2 and 5 is 10), (5 and 2 is 10), (4 and 6 is 24)

$$17/15x^3 - 37/10x^2 - 9/10x - 14/24$$

$$17/15x^3 - 37/10x^2 - 9/10x - 7/12$$

(ii) $5a^2/2 + 3a^3/2 + a/3 - 6/5$ from $1/3a^3 - 3/4a^2 - 5/2$

Let us subtract the given expression

$$1/3a^3 - 3/4a^2 - 5/2 - (5/2a^2 + 3/2a^3 + a/3 - 6/5)$$

Upon rearranging

$$1/3a^3 - 3/2a^3 - 3/4a^2 - 5/2a^2 - a/3 - 5/2 + 6/5$$

By grouping similar expressions we get,

LCM for (3 and 2 is 6), (4 and 2 is 4), (2 and 5 is 10)

$$(2a^3 - 9a^3)/6 - (3a^2 - 10a^2)/4 - a/3 + (-25+12)/10$$

$$-7/6a^3 - 13/4a^2 - a/3 - 13/10$$

(iii) $7/4x^3 + 3/5x^2 + 1/2x + 9/2$ from $7/2 - x/3 - x^2/5$

Let us subtract the given expression

$$7/2 - x/3 - 1/5x^2 - (7/4x^3 + 3/5x^2 + 1/2x + 9/2)$$

Upon rearranging

$$-7/4x^3 - 1/5x^2 - 3/5x^2 - x/3 - x/2 + 7/2 - 9/2$$

By grouping similar expressions we get,

LCM for (3 and 2 is 6)

$$-7/4x^3 - 4/5x^2 - (2x-3x)/6 + (7-9)/2$$

$$-7/4x^3 - 4/5x^2 - 5/6x - 1$$

(iv) $y^3/3 + 7/3y^2 + 1/2y + 1/2$ from $1/3 - 5/3y^2$

Let us subtract the given expression

$$1/3 - 5/3y^2 - (1/3y^3 + 7/3y^2 + 1/2y + 1/2)$$

Upon rearranging

$$-1/3y^3 - 5/3y^2 - 7/3y^2 - 1/2y + 1/3 - 1/2$$

By grouping similar expressions we get,

LCM for (3 and 3 is 3), (3 and 2 is 6)

$$-1/3y^3 + (-5y^2 - 7y^2)/3 - 1/2y + (2-3)/6$$

$$-1/3y^3 - 12/3y^2 - 1/2y - 1/6$$

(v) $2/3ac - 5/7ab + 2/3bc$ from $3/2ab - 7/4ac - 5/6bc$

Let us subtract the given expression

$$3/2ab - 7/4ac - 5/6bc - (2/3ac - 5/7ab + 2/3bc)$$

Upon rearranging

$$3/2ab + 5/7ab - 7/4ac - 2/3ac - 5/6bc - 2/3bc$$

By grouping similar expressions we get,

LCM for (2 and 7 is 14), (4 and 3 is 12), (6 and 3 is 6)

$$(21ab+10ab)/14 - (21ac-8ac)/12 - (5bc-4bc)/6$$

$$31/14ab - 29/12ac - 3/2bc$$

4. Subtract $3x - 4y - 7z$ from the sum of $x - 3y + 2z$ and $-4x + 9y - 11z$.

Solution:

The sum of $x - 3y + 2z$ and $-4x + 9y - 11z$ is

$$(x - 3y + 2z) + (-4x + 9y - 11z)$$

Upon rearranging

$$x - 4x - 3y + 9y + 2z - 11z$$

$$-3x + 6y - 9z$$

Now, Let us subtract the given expression from $-3x + 6y - 9z$

$$(-3x + 6y - 9z) - (3x - 4y - 7z)$$

Upon rearranging

$$-3x - 3x + 6y + 4y - 9z + 7z$$

$$-6x + 10y - 2z$$

5. Subtract the sum of $3l - 4m - 7n^2$ and $2l + 3m - 4n^2$ from the sum of $9l + 2m - 3n^2$ and $-3l + m + 4n^2$

Solution:

Sum of $3l - 4m - 7n^2$ and $2l + 3m - 4n^2$

$$3l - 4m - 7n^2 + 2l + 3m - 4n^2$$

Upon rearranging

$$3l + 2l - 4m + 3m - 7n^2 - 4n^2$$

$$5l - m - 11n^2 \text{ equation (1)}$$

Sum of $9l + 2m - 3n^2$ and $-3l + m + 4n^2$

$$9l + 2m - 3n^2 + (-3l + m + 4n^2)$$

Upon rearranging

$$9l - 3l + 2m + m - 3n^2 + 4n^2$$

$$6l + 3m + n^2 \text{ equation (2)}$$

Let us subtract equation (i) from (ii), we get

$$6l + 3m + n^2 - (5l - m - 11n^2)$$

Upon rearranging

$$6l - 5l + 3m + m + n^2 + 11n^2$$

$$l + 4m + 12n^2$$

6. Subtract the sum of $2x - x^2 + 5$ and $-4x - 3 + 7x^2$ from 5.

Solution:

Sum of $2x - x^2 + 5$ and $-4x - 3 + 7x^2$ is

$$2x - x^2 + 5 + (-4x - 3 + 7x^2)$$

$$2x - x^2 + 5 - 4x - 3 + 7x^2$$

Upon rearranging

$$-x^2 + 7x^2 + 2x - 4x + 5 - 3$$

$$6x^2 - 2x + 2 \text{ equation (i)}$$

Let us subtract equation (i) from 5 we get,

$$5 - (6x^2 - 2x + 2)$$

$$5 - 6x^2 + 2x - 2$$

$$3 + 2x - 6x^2$$

7. Simplify each of the following:

(i) $x^2 - 3x + 5 - \frac{1}{2}(3x^2 - 5x + 7)$

(ii) $[5 - 3x + 2y - (2x - y)] - (3x - 7y + 9)$

(iii) $\frac{11}{2}x^2y - \frac{9}{4}xy^2 + \frac{1}{4}xy - \frac{1}{14}y^2x + \frac{1}{15}yx^2 + \frac{1}{2}xy$

(iv) $(\frac{1}{3}y^2 - \frac{4}{7}y + 11) - (\frac{1}{7}y - 3 + 2y^2) - (\frac{2}{7}y - \frac{2}{3}y^2 + 2)$

(v) $-\frac{1}{2}a^2b^2c + \frac{1}{3}ab^2c - \frac{1}{4}abc^2 - \frac{1}{5}cb^2a^2 + \frac{1}{6}cb^2a - \frac{1}{7}c^2ab + \frac{1}{8}ca^2b$

Solution:

(i) $x^2 - 3x + 5 - \frac{1}{2}(3x^2 - 5x + 7)$

Upon rearranging

$$x^2 - \frac{3}{2}x^2 - 3x + \frac{5}{2}x + 5 - \frac{7}{2}$$

By grouping similar expressions we get,

LCM for (1 and 2) is 2)

$$(\frac{2x^2 - 3x^2}{2} - \frac{(6x + 5x)}{2} + \frac{(10 - 7)}{2})$$

$$-\frac{1}{2}x^2 - \frac{1}{2}x + \frac{3}{2}$$

(ii) $[5 - 3x + 2y - (2x - y)] - (3x - 7y + 9)$

$$5 - 3x + 2y - 2x + y - 3x + 7y - 9$$

Upon rearranging

$$-3x - 2x - 3x + 2y + y + 7y + 5 - 9$$

By grouping similar expressions we get,

$$-8x + 10y - 4$$

(iii) $\frac{11}{2}x^2y - \frac{9}{4}xy^2 + \frac{1}{4}xy - \frac{1}{14}y^2x + \frac{1}{15}yx^2 + \frac{1}{2}xy$

Upon rearranging

$$\frac{11}{2}x^2y + \frac{1}{15}x^2y - \frac{9}{4}xy^2 - \frac{1}{14}xy^2 + \frac{1}{4}xy + \frac{1}{2}xy$$

By grouping similar expressions we get,

LCM for (2 and 15 is 30), (4 and 14 is 56), (4 and 2 is 4)

$$(\frac{165x^2y + 2x^2y}{30} + \frac{(-126xy^2 - 4xy^2)}{56} + \frac{(xy + 2xy)}{4})$$

$$\frac{167}{30}x^2y - \frac{130}{56}xy^2 + \frac{3}{4}xy$$

$$\frac{167}{30}x^2y - \frac{65}{28}xy^2 + \frac{3}{4}xy$$

(iv) $(\frac{1}{3}y^2 - \frac{4}{7}y + 11) - (\frac{1}{7}y - 3 + 2y^2) - (\frac{2}{7}y - \frac{2}{3}y^2 + 2)$

Upon rearranging

$$\frac{1}{3}y^2 - 2y^2 - \frac{2}{3}y^2 - \frac{4}{7}y - \frac{1}{7}y - \frac{2}{7}y + 11 + 3 - 2$$

By grouping similar expressions we get,

LCM for (3, 1 and 3) is 3), (7, 7 and 7) is 7)

$$(\frac{y^2 - 6y^2 + 2y^2}{3} - \frac{(4y - y - 2y)}{7} + 12)$$

$$-\frac{3}{3}y^2 - \frac{7}{7}y + 12$$

$$-y^2 - y + 12$$

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$$(v) -\frac{1}{2}a^2b^2c + \frac{1}{3}ab^2c - \frac{1}{4}abc^2 - \frac{1}{5}cb^2a^2 + \frac{1}{6}cb^2a - \frac{1}{7}c^2ab + \frac{1}{8}ca^2b$$

Upon rearranging

$$-\frac{1}{2}a^2b^2c - \frac{1}{5}a^2b^2c + \frac{1}{3}ab^2c + \frac{1}{6}ab^2c - \frac{1}{4}abc^2 - \frac{1}{7}abc^2 + \frac{1}{8}a^2bc$$

By grouping similar expressions we get,

LCM for (2 and 5 is 10), (3 and 6 is 6), (4 and 7 is 28)

$$-\frac{7}{10}a^2b^2c + \frac{1}{2}ab^2c - \frac{11}{28}abc^2 + \frac{1}{8}a^2bc$$

EXERCISE 6.3

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Find each of the following products:

1. $5x^2 \times 4x^3$

Solution:

Let us simplify the given expression

$$5 \times x \times x \times 4 \times x \times x \times x$$

$$5 \times 4 \times x^{1+1+1+1+1}$$

$$20 \times x^5$$

$$20x^5$$

2. $-3a^2 \times 4b^4$

Solution:

Let us simplify the given expression

$$-3 \times a^2 \times 4 \times b^4$$

$$-12 \times a^2 \times b^4$$

$$-12a^2b^4$$

3. $(-5xy) \times (-3x^2yz)$

Solution:

Let us simplify the given expression

$$(-5) \times (-3) \times x \times x^2 \times y \times y \times z$$

$$15 \times x^{1+2} \times y^{1+1} \times z$$

$$15x^3y^2z$$

4. $1/2xy \times 2/3x^2yz^2$

Solution:

Let us simplify the given expression

$$1/2 \times 2/3 \times x \times x^2 \times y \times y \times z^2$$

$$1/3 \times x^{1+2} \times y^{1+1} \times z^2$$

$$1/3x^3y^2z^2$$

5. $(-7/5xy^2z) \times (13/3x^2yz^2)$

Solution:

Let us simplify the given expression

$$-7/5 \times 13/3 \times x \times x^2 \times y^2 \times y \times z \times z^2$$

$$-91/15 \times x^{1+2} \times y^{2+1} \times z^{1+2}$$

$$-91/15x^3y^3z^3$$

6. $(-24/25x^3z) \times (-15/16xz^2y)$

Solution:

Let us simplify the given expression

$$-24/25 \times -15/16 \times x^3 \times x \times z \times z^2 \times y$$

$$18/20 \times x^{3+1} \times z^{1+2} \times y$$

$$9/10x^4z^3y$$

7. $(-1/27a^2b^2) \times (9/2a^3b^2c^2)$

Solution:

Let us simplify the given expression

$$-1/27 \times 9/2 \times a^2 \times a^3 \times b^2 \times b^2 \times c^2$$

$$-1/6 \times a^{2+3} \times b^{2+2} \times c^2$$

$$-1/6a^5b^4c^2$$

8. $(-7xy) \times (1/4x^2yz)$

Solution:

Let us simplify the given expression

$$-7 \times 1/4 \times x \times y \times x^2 \times y \times z$$

$$-7/4 \times x^{1+2} \times y^{1+1} \times z$$

$$-7/4x^3y^2z$$

9. $(7ab) \times (-5ab^2c) \times (6abc^2)$

Solution:

Let us simplify the given expression

$$7 \times -5 \times 6 \times a \times a \times a \times b \times b^2 \times b \times c \times c^2$$

$$210 \times a^{1+1+1} \times b^{1+2+1} \times c^{1+2}$$

$$210a^3b^4c^3$$

10. $(-5a) \times (-10a^2) \times (-2a^3)$

Solution:

Let us simplify the given expression

$$(-5) \times (-10) \times (-2) \times a \times a^2 \times a^3$$

$$-100 \times a^{1+2+3}$$

$$-100a^6$$

11. $(-4x^2) \times (-6xy^2) \times (-3yz^2)$

Solution:

Let us simplify the given expression

$$(-4) \times (-6) \times (-3) \times x^2 \times x \times y^2 \times y \times z^2$$

$$-72 \times x^{2+1} \times y^{2+1} \times z^2$$

$$-72x^3y^3z^2$$

12. $(-2/7a^4) \times (-3/4a^2b) \times (-14/5b^2)$

Solution:

Let us simplify the given expression

$$-2/7 \times -3/4 \times -14/5 \times a^4 \times a^2 \times b \times b^2$$

$$-6/10 \times a^{4+2} \times b^{1+2}$$

$$-3/5a^6b^3$$

13. $(7/9ab^2) \times (15/7ac^2b) \times (-3/5a^2c)$

Solution:

Let us simplify the given expression

$$7/9 \times 15/7 \times -3/5 \times a \times a \times a^2 \times b^2 \times b \times c^2 \times c$$

$$-a^{1+1+2} \times b^{2+1} \times c^{2+1}$$

$$-a^4b^3c^3$$

14. $(4/3u^2vw) \times (-5uvw^2) \times (1/3v^2wu)$

Solution:

Let us simplify the given expression

$$4/3 \times -5 \times 1/3 \times u^2 \times u \times u \times v \times v \times v^2 \times w \times w^2 \times w$$

$$-20/9 \times u^{2+1+1} \times v^{1+1+2} \times w^{1+2+1}$$

$$-20/9u^4v^4w^4$$

15. $(0.5x) \times (1/3xy^2z^4) \times (24x^2yz)$

Solution:

Let us simplify the given expression

$$0.5 \times 1/3 \times 24 \times x \times x \times y^2 \times y \times x^2 \times z^4 \times z$$

$$12/3 \times x^{1+1+2} \times y^{2+1} \times z^{4+1}$$

$$4x^4 \times y^3 \times z^5$$

$$4x^4y^3z^5$$

16. $(4/3pq^2) \times (-1/4p^2r) \times (16p^2q^2r^2)$

Solution:

Let us simplify the given expression

$$4/3 \times 1/4 \times 16 \times p \times p^2 \times p^2 \times q^2 \times q^2 \times r \times r^2$$

$$-16/3 \times p^{1+2+2} \times q^{2+2} \times r^{1+2}$$

$$-16/3p^5q^4r^3$$

17. $(2.3xy) \times (0.1x) \times (0.16)$

Solution:

Let us simplify the given expression

$$2.3 \times 0.1 \times 0.16 \times x \times x \times y$$

$$0.0368 \times x^{1+1} \times y$$

$$0.0368x^2y$$

Express each of the following products as a monomials and verify the result in each case for $x=1$:

18. $(3x) \times (4x) \times (-5x)$

Solution:

Let us simplify the given expression

$$3 \times 4 \times -5 \times x \times x \times x$$

$$-60 \times x^{1+1+1}$$

$$-60x^3$$

19. $(4x^2) \times (-3x) \times (4/5x^3)$

Solution:

Let us simplify the given expression

$$4 \times -3 \times 4/5 \times x^2 \times x \times x^3$$

$$-48/5 \times x^{2+1+3}$$

$$-485x^6$$

20. $(5x^4) \times (x^2)^3 \times (2x)^2$

Solution:

Let us simplify the given expression

$$5 \times x^4 \times x^6 \times 4 \times x^2$$

$$5 \times 4 \times x^4 \times x^6 \times x^2$$

$$20 \times x^{4+6+2}$$

$$20x^{12}$$

21. $(x^2)^3 \times (2x) \times (-4x) \times (5)$

Solution:

Let us simplify the given expression

$$x^6 \times 2 \times x \times -4 \times x \times 5$$

$$2 \times -4 \times 5 \times x^6 \times x \times x$$

$$-40 \times x^{6+1+1}$$

$$-40x^8$$

22. Write down the product of $-8x^2y^6$ and $-20xy$ verify the product for $x = 2.5$, $y = 1$

Solution:

Let us simplify the given expression

$$-8 \times -20 \times x^2 \times x \times y^6 \times y$$

$$160 \times x^{2+1} \times y^{6+1}$$

$$160x^3y^7$$

Now let us verify when, $x = 2.5$ and $y = 1$

$$\text{For } 160x^3y^7$$

$$160 (2.5)^3 \times (1)^7$$

$$16 \times 15.625$$

$$250$$

For $-8x^2y^6$ and $-20xy$

$$-8 \times 2.5^2 \times 1^6 \times -20 \times 1 \times 2.5$$

$$250$$

Hence, the given expression is verified.

23. Evaluate $(3.2x^6y^3) \times (2.1x^2y^2)$ when $x = 1$ and $y = 0.5$

Solution:

Let us simplify the given expression

$$3.2 \times 2.1 \times x^6 \times x^2 \times y^3 \times y^2$$

$$6.72 \times x^{6+2} \times y^{3+2}$$

$$6.72x^8y^5$$

Now let us substitute when, $x = 1$ and $y = 0.5$

$$\text{For } 6.72x^8y^5$$

$$6.72 \times 1^8 \times 0.5^5$$

$$0.21$$

24. Find the value of $(5x^6) \times (-1.5x^2y^3) \times (-12xy^2)$ when $x = 1$, $y = 0.5$

Solution:

Let us simplify the given expression

$$5 \times -1.5 \times -12 \times x^6 \times x^2 \times x \times y^3 \times y^2$$

$$90 \times x^{6+2+1} \times y^{3+2}$$

$$90x^9y^5$$

Now let us substitute when, $x = 1$ and $y = 0.5$

$$\text{For } 90x^9y^5$$

$$90 \times (1)^9 \times (0.5)^5$$

$$2.8125$$

$$45/16$$

25. Evaluate $(2.3a^5b^2) \times (1.2a^2b^2)$ when $a = 1$ and $b = 0.5$

Solution:

Let us simplify the given expression

$$2.3a^5b^2 \times 1.2a^2b^2$$

$$2.3 \times 1.2 \times a^5 \times a^2 \times b^2 \times b^2$$

$$2.76 \times a^{5+2} \times b^{2+2}$$

$$2.76a^7b^4$$

Now let us substitute when, $a = 1$ and $b = 0.5$

$$\text{For } 2.76 a^7 b^4$$

$$2.76 (1)^7 (0.5)^4$$

$$2.76 \times 1 \times 0.0025$$

$$0.1725$$

$$6.9/40$$

26. Evaluate $(-8x^2y^6) \times (-20xy)$ for $x = 2.5$ and $y = 1$

Solution:

Let us simplify the given expression

$$-8 \times -20 \times x^2 \times x \times y^6 \times y$$

$$160x^{2+1}y^{6+1}$$

$$160x^3y^7$$

Now let us substitute when, $x = 2.5$ and $y = 1$

$$160x^3y^7$$

$$160 \times (2.5)^3 \times (1)^7$$

$$2500$$

Express each of the following products as a monomials and verify the result for $x = 1$, $y = 2$:

27. $(-xy^3) \times (yx^3) \times (xy)$

Solution:

Let us simplify the given expression

$$-x \times y^3 \times y \times x^3 \times x \times y$$

$$-x^{1+3+1} \times y^{3+1+1}$$

$$-x^5y^5$$

Now let us substitute when, $x = 1$ and $y = 2$

$$-x^5y^5$$

$$-1^5 \times 2^5$$

$$-32$$

28. $(1/8x^2y^4) \times (1/4x^4y^2) \times (xy) \times 5$

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Solution:

Let us simplify the given expression

$$1/8 \times 1/4 \times 5 \times x^2 \times x^4 \times x \times y^4 \times y^2 \times y$$

$$5/32 \times x^{2+4+1} \times y^{4+2+1}$$

$$5/32x^7y^7$$

Now let us substitute when, $x = 1$ and $y = 2$

$$5/32 \times 1^6 \times 2^6$$

$$5/32 \times 64$$

$$5 \times 2$$

$$10$$

$$29. (2/5a^2b) \times (-15b^2ac) \times (-1/2c^2)$$

Solution:

Let us simplify the given expression

$$2/5 \times -15 \times -1/2 \times a^2 \times a \times b \times b^2 \times c \times c^2$$

$$3 \times a^{2+1} \times b^{1+2} \times c^{1+2}$$

$$3a^3b^3c^3$$

$$30. (-4/7a^2b) \times (-2/3b^2c) \times (-7/6c^2a)$$

Solution:

Let us simplify the given expression

$$-4/7 \times -2/3 \times -7/6 \times a^2 \times a \times b \times b^2 \times c \times c^2$$

$$-4/9 \times a^{2+1} \times b^{2+1} \times c^{1+2}$$

$$-4/9a^3b^3c^3$$

$$31. (4/9abc^3) \times (-27/5a^3b^2) \times (-8b^3c)$$

Solution:

Let us simplify the given expression

$$4/9 \times -27/5 \times -8 \times a \times a^3 \times b \times b^2 \times b^3 \times c^3 \times c$$

$$96/5 \times a^{1+3} \times b^{1+2+3} \times c^{3+1}$$

$$96/5a^4b^6c^4$$

Evaluate each of the following when $x = 2$, $y = -1$.

$$32. (2xy) \times (x^2y/4) \times (x^2) \times (y^2)$$

Solution:

Let us simplify the given expression

$$2 \times 1/4 \times x \times x^2 \times x^2 \times y \times y^2 \times y$$

$$1/2x^{1+2+2}y^{1+2+1}$$

$$1/2x^5y^4$$

Now let us substitute when, $x = 2$ and $y = -1$

For $1/2x^3y^4$

$$1/2 \times (2)^5 \times (-1)^4$$

$$1/2 \times 32 \times 1$$

$$16$$

$$33. (3/5x^2y) \times (-15/4xy^2) \times (7/9x^2y^2)$$

Solution:

Let us simplify the given expression

$$3/5 \times -15/4 \times 7/9 \times x^2 \times x \times x^2 \times y \times y^2 \times y^2$$

$$-7/4 \times x^{2+1+2} \times y^{1+2+2}$$

$$7/4x^5y^5$$

Now let us substitute when, $x = 2$ and $y = -1$

For $-7/4x^5y^5$

$$-7/4 \times (2)^5 \times (-1)^5$$

$$-7/4 \times 32 \times -1$$

$$56$$

EXERCISE 6.4

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Find the following products:

1. $2a^3(3a + 5b)$

Solution:

Let us simplify the given expression

$$2a^3(3a + 5b)$$

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

$$6a^{3+1} + 10a^3b$$

$$6a^4 + 10a^3b$$

2. $-11a(3a + 2b)$

Solution:

Let us simplify the given expression

$$-11a(3a + 2b)$$

$$(-11a \times 3a) + (-11a \times 2b)$$

$$-33a^2 - 22ab$$

3. $-5a(7a - 2b)$

Solution:

Let us simplify the given expression

$$-5a(7a - 2b)$$

$$(-5a \times 7a) - (-5a \times 2b)$$

$$-35a^2 + 10ab$$

4. $-11y^2(3y + 7)$

Solution:

Let us simplify the given expression

$$-11y^2(3y + 7)$$

$$(-11y^2 \times 3y) + (-11y^2 \times 7)$$

$$-33y^3 - 77y^2$$

5. $\frac{6x}{5}(x^3 + y^3)$

Solution:

Let us simplify the given expression

$$\frac{6}{5}x(x^3 + y^3)$$

$$(\frac{6}{5}x \times x^3) + (\frac{6}{5}x \times y^3)$$

$$\frac{6}{5}x^4 + \frac{6}{5}xy^3$$

6. $xy(x^3 - y^3)$

Solution:

Let us simplify the given expression

$$xy(x^3 - y^3)$$

$$(xy \times x^3) - (xy \times y^3)$$

$$x^4y - xy^4$$

7. $0.1y(0.1x^5 + 0.1y)$

Solution:

Let us simplify the given expression

$$0.1y(0.1x^5 + 0.1y)$$

$$(0.1y \times 0.1x^5) + (0.1y \times 0.1y)$$

$$0.01x^5y + 0.01y^2$$

8. $(-7/4ab^2c - 6/25a^2c^2)(-50a^2b^2c^2)$

Solution:

Let us simplify the given expression

$$(-7/4ab^2c - 6/25a^2c^2)(-50a^2b^2c^2)$$

$$(-7/4ab^2c \times -50a^2b^2c^2) - (6/25a^2c^2 \times -50a^2b^2 \times c^2)$$

$$350/4a^3b^4c^3 + 12a^4b^2c^4$$

$$175/2a^3b^4c^3 + 12a^4b^2c^4$$

9. $-8/27xyz(3/2xyz^2 - 9/4xy^2z^3)$

Solution:

Let us simplify the given expression

$$-8/27xyz(3/2xyz^2 - 9/4xy^2z^3)$$

$$(-8/27xyz \times 3/2xyz^2) - (-8/27xyz \times 9/4xy^2z^3)$$

$$-4/9x^2y^2z^3 + 2/3x^2y^3z^4$$

10. $-4/27xyz(9/2x^2yz - 3/4xyz^2)$

Solution:

Let us simplify the given expression

$$-4/27xyz(9/2x^2yz - 3/4xyz^2)$$

$$(-4/27xyz \times 9/2x^2yz) - (-4/27xyz \times 3/4xyz^2)$$

$$-2/3x^3y^2z^2 + 1/9x^2y^2z^3$$

11. $1.5x(10x^2y - 100xy^2)$

Solution:

Let us simplify the given expression

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$$\begin{aligned} & 1.5x (10x^2y - 100xy^2) \\ & (1.5x \cdot 10x^2y) - (1.5x \times 100xy^2) \\ & 15x^3y - 150x^2y^2 \end{aligned}$$

12. $4.1xy (1.1x - y)$ **Solution:**

Let us simplify the given expression

$$\begin{aligned} & 4.1xy (1.1x - y) \\ & (4.1xy \times 1.1x) - (4.1xy \times y) \\ & 4.51x^2y - 4.1xy^2 \end{aligned}$$

13. $250.5xy (xz + y/10)$ **Solution:**

Let us simplify the given expression

$$\begin{aligned} & 250.5xy (xz + y/10) \\ & (250.5xy \times xz) + (250.5xy \times y/10) \\ & 250.5x^2yz + 25.05xy^2 \end{aligned}$$

14. $7/5x^2y (3/5xy^2 + 2/5x)$ **Solution:**

Let us simplify the given expression

$$\begin{aligned} & 7/5x^2y (3/5xy^2 + 2/5x) \\ & (7/5x^2y \times 3/5xy^2) + (7/5x^2y \times 2/5x) \\ & 21/25x^3y^3 + 14/25x^3y \end{aligned}$$

15. $4/3a (a^2 + b^2 - 3c^2)$ **Solution:**

Let us simplify the given expression

$$\begin{aligned} & 4/3a (a^2 + b^2 - 3c^2) \\ & (4/3a \times a^2) + (4/3a \times b^2) - (4/3a \times 3c^2) \\ & 4/3a^3 + 4/3ab^2 - 4ac^2 \end{aligned}$$

16. Find the product $24x^2 (1-2x)$ and evaluate its value for $x = 3$ **Solution:**

Let us simplify the given expression

$$\begin{aligned} & 24x^2 (1 - 2x) \\ & (24x^2 \times 1) - (24x^2 \times 2x) \\ & 24x^2 - 48x^3 \end{aligned}$$

Now let us evaluate the expression when $x = 3$

$$\begin{aligned} &24x^2 - 48x^3 \\ &24 \times (3)^2 - 48 \times (3)^3 \\ &24 \times (9) - 48 \times (27) \\ &216 - 1296 \\ &-1080 \end{aligned}$$

17. Find the product $-3y(xy+y^2)$ and evaluate its value for $x = 4$ and $y = 5$

Solution:

Let us simplify the given expression

$$\begin{aligned} &-3y(xy+y^2) \\ &(-3y \times xy) + (-3y \times y^2) \\ &-3xy^2 - 3y^3 \end{aligned}$$

Now let us evaluate the expression when $x = 4$ and $y = 5$

$$\begin{aligned} &-3xy^2 - 3y^3 \\ &-3 \times (4) \times (5)^2 - 3 \times (5)^3 \\ &-300 - 375 \\ &-675 \end{aligned}$$

18. Multiply $-3/2x^2y^3$ by $(2x-y)$ and verify the answer for $x = 1$ and $y = 2$

Solution:

Let us simplify the given expression

$$\begin{aligned} &-3/2x^2y^3 \text{ by } (2x-y) \\ &(-3/2x^2y^3 \times 2x) - (-3/2x^2y^3 \times y) \\ &-3x^3y^3 + 3/2x^2y^4 \end{aligned}$$

Now let us evaluate the expression when $x = 1$ and $y = 2$

$$\begin{aligned} &-3x^3y^3 + 3/2x^2y^4 \\ &-3 \times (1)^3 \times (2)^3 + 3/2 \times (1)^2 \times (2)^4 \\ &-3 \times (8) + 3(8) \\ &-24+24 \\ &0 \end{aligned}$$

19. Multiply the monomial by the binomial and find the value of each for $x = -1$, $y = 0.25$ and $z = 0.005$:

- (i) $15y^2(2-3x)$
- (ii) $-3x(y^2+z^2)$
- (iii) $z^2(x-y)$
- (iv) $xz(x^2+y^2)$

Solution:

- (i) $15y^2(2-3x)$

Let us simplify the given expression

$$30y^2 - 45xy^2$$

By evaluating the values in the expression $x = -1$, $y = 25/100$ and $z = 5/1000$

$$30 \times (25/100)^2 - 45 \times (-1) \times (25/100)^2$$

$$30 (1/16) + 45 (1/16)$$

$$15/8 + 45/16$$

$$(30+45)/16$$

$$75/16$$

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

Let us simplify the given expression

$$-3xy^2 + -3xz^2$$

By evaluating the values in the expression $x = -1$, $y = 25/100$ and $z = 5/1000$

$$-3 \times (-1) \times (25/100)^2 - 3 \times (-1) \times (5/1000)^2$$

$$(3 \times 25 \times 25/100 \times 100) + (3 \times 5 \times 5/1000 \times 1000)$$

$$3/16 + 3/40000$$

$$39/200$$

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

Let us simplify the given expression

$$z^2x - z^2y$$

By evaluating the values in the expression $x = -1$, $y = 25/100$ and $z = 5/1000$

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

$$(5/1000)^2 (-1 - 25/100)$$

$$(1/40000) (-100 - 25/100)$$

$$(1/40000) (-125/100)$$

$$(1/40000) (-5/4)$$

$$-5/160000$$

$$-1/32000$$

(iv) $xz(x^2 + y^2)$

Let us simplify the given expression

$$x^3z + xzy^2$$

By evaluating the values in the expression $x = -1$, $y = 25/100$ and $z = 5/1000$

$$x^3z + xzy^2$$

$$(-1)^3 \times (5/1000) + (-1) \times (5/1000) \times (25/100)^2$$

$$-1/200 - 1/16 \times 1/200$$

$$-1/200 - 1/3200$$

By taking LCM as 3200

$$\begin{aligned} &(-16 - 1)/3200 \\ &-17/3200 \end{aligned}$$

20. Simplify:

(i) $2x^2(x^3 - x) - 3x(x^4 + 2x) - 2(x^4 - 3x^2)$

(ii) $x^2y(x^2 - 2x) + 2xy(x^3 - x^4)$

(iii) $3a^2 + 2(a+2) - 3a(2a+1)$

(iv) $x(x+4) + 3x(2x^2 - 1) + 4x^2 + 4$

(v) $a(b-c) - b(c-a) - c(a-b)$

(vi) $a(b-c) + b(c-a) + c(a-b)$

(vii) $4ab(a-b) - 6a^2(b-b^2) - 3b^2(2a^2 - a) + 2ab(b-a)$

(viii) $x^2(x^2 + 1) - x^3(x + 1) - x(x^3 - x)$

(ix) $2a^2 + 3a(1 - 2a^3) + a(a + 1)$

(x) $a^2(2a - 1) + 3a + a^3 - 8$

(xi) $3/2x^2(x^2 - 1) + 1/4x^2(x^2 + x) - 3/4x(x^3 - 1)$

(xii) $a^2b(a-b^2) + ab^2(4ab - 2a^2) - a^3b(1-2b)$

(xiii) $a^2b(a^3 - a + 1) - ab(a^4 - 2a^2 + 2a) - b(a^3 - a^2 - 1)$

Solution:

(i) $2x^2(x^3 - x) - 3x(x^4 + 2x) - 2(x^4 - 3x^2)$

Let us simplify the given expression

$$2x^5 - 2x^3 - 3x^5 - 6x^2 - 2x^4 + 6x^2$$

By grouping similar expressions we get,

$$2x^5 - 3x^5 - 2x^3 - 2x^4 - 6x^2 + 6x^2$$

$$-x^5 - 2x^4 - 2x^3$$

(ii) $x^3y(x^2 - 2x) + 2xy(x^3 - x^4)$

Let us simplify the given expression

$$x^5y - 2x^4y + 2x^4y - 2x^5y$$

By grouping similar expressions we get,

$$-x^5y - 2x^5y$$

$$-x^5y$$

(iii) $3a^2 + 2(a+2) - 3a(2a+1)$

Let us simplify the given expression

$$3a^2 + 2a + 4 - 6a^2 - 3a$$

By grouping similar expressions we get,

$$3a^2 - 6a^2 + 2a - 3a + 4$$

$$-3a^2 - a + 4$$

(iv) $x(x+4) + 3x(2x^2-1) + 4x^2 + 4$

Let us simplify the given expression

$$x^2 + 4x + 6x^3 - 3x + 4x^2 + 4$$

By grouping similar expressions we get,

$$6x^3 + 5x^2 + x + 4$$

(v) $a(b-c) - b(c-a) - c(a-b)$

Let us simplify the given expression

$$ab - ac - bc + ab - ca + bc$$

By grouping similar expressions we get,

$$2ab - 2ac$$

(vi) $a(b-c) + b(c-a) + c(a-b)$

Let us simplify the given expression

$$ab - ac + bc - ab + ac - bc$$

By grouping similar expressions we get,

$$0$$

(vii) $4ab(a-b) - 6a^2(b-b^2) - 3b^2(2a^2-a) + 2ab(b-a)$

Let us simplify the given expression

$$4a^2b - 4ab^2 - 6a^2b + 6a^2b^2 - 6a^2b^2 + 3ab^2 + 2ab^2 - 2a^2b$$

By grouping similar expressions we get,

$$4a^2b - 6a^2b - 2a^2b - 4ab^2 + 3ab^2 + 2ab^2 + 6a^2b^2 - 6a^2b^2 - 4a^2b + ab^2$$

(viii) $x^2(x^2+1) - x^3(x+1) - x(x^3-x)$

Let us simplify the given expression

$$x^4 + x^2 - x^4 - x^3 - x^4 + x^2$$

By grouping similar expressions we get,

$$x^4 - x^4 - x^4 - x^3 + x^2 + x^2$$

$$-x^4 - x^3 + 2x^2$$

(ix) $2a^2 + 3a(1-2a^3) + a(a+1)$

Let us simplify the given expression

$$2a^2 + 3a - 6a^4 + a^2 + a$$

By grouping similar expressions we get,

$$-6a^4 + 3a^2 + 4a$$

(x) $a^2(2a-1) + 3a + a^3 - 8$

Let us simplify the given expression

$$2a^3 - a^2 + 3a + a^3 - 8$$

By grouping similar expressions we get,

$$3a^3 - a^2 + 3a - 8$$

(xi) $\frac{3}{2}x^2(x^2 - 1) + \frac{1}{4}x^2(x^2 + x) - \frac{3}{4}x(x^3 - 1)$

Let us simplify the given expression

$$\frac{3}{2}x^4 - \frac{3}{2}x^2 + \frac{1}{4}x^4 + \frac{1}{4}x^3 - \frac{3}{4}x^4 + \frac{3}{4}x$$

By grouping similar expressions we get,

$$\frac{3}{2}x^4 + \frac{1}{4}x^4 - \frac{3}{4}x^4 - \frac{3}{2}x^2 + \frac{1}{4}x^3 + \frac{3}{4}x$$

$$\frac{4}{4}x^4 + \frac{1}{4}x^3 - \frac{3}{2}x^2 + \frac{3}{4}x$$

$$x^4 + \frac{1}{4}x^3 - \frac{3}{2}x^2 + \frac{3}{4}x$$

(xii) $a^2b(a-b^2) + ab^2(4ab - 2a^2) - a^3b(1-2b)$

Let us simplify the given expression

$$a^3b - a^2b^3 + 4a^2b^3 - 2a^3b^2 - a^3b + 2a^3b^2$$

By grouping similar expressions we get,

$$-a^2b^3 + 4a^2b^3$$

$$3a^2b^3$$

(xiii) $a^2b(a^3 - a + 1) - ab(a^4 - 2a^2 + 2a) - b(a^3 - a^2 - 1)$

Let us simplify the given expression

$$a^5b - a^3b + a^2b - a^5b + 2a^3b - 2a^2b - ba^3 + a^2b + b$$

By grouping similar expressions we get,

$$a^5b - a^5b - a^3b + 2a^3b - ba^3 + a^2b - 2a^2b + a^2b + b$$

$$b$$

EXERCISE 6.5

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Multiply:**1. $(5x + 3)$ by $(7x + 2)$** **Solution:**

Now let us simplify the given expression

$$(5x + 3) \times (7x + 2)$$

$$5x(7x + 2) + 3(7x + 2)$$

$$35x^2 + 10x + 21x + 6$$

$$35x^2 + 31x + 6$$

2. $(2x + 8)$ by $(x - 3)$ **Solution:**

Now let us simplify the given expression

$$(2x + 8) \times (x - 3)$$

$$2x(x - 3) + 8(x - 3)$$

$$2x^2 - 6x + 8x - 24$$

$$2x^2 + 2x - 24$$

3. $(7x + y)$ by $(x + 5y)$ **Solution:**

Now let us simplify the given expression

$$(7x + y) \times (x + 5y)$$

$$7x(x + 5y) + y(x + 5y)$$

$$7x^2 + 35xy + xy + 5y^2$$

$$7x^2 + 36xy + 5y^2$$

4. $(a - 1)$ by $(0.1a^2 + 3)$ **Solution:**

Now let us simplify the given expression

$$(a - 1) \times (0.1a^2 + 3)$$

$$a(0.1a^2 + 3) - 1(0.1a^2 + 3)$$

$$0.1a^3 + 3a - 0.1a^2 - 3$$

$$0.1a^3 - 0.1a^2 + 3a - 3$$

5. $(3x^2 + y^2)$ by $(2x^2 + 3y^2)$ **Solution:**

Now let us simplify the given expression

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

$$\begin{aligned} & 3x^2 \times (2x^2 + 3y^2) + y^2 \times (2x^2 + 3y^2) \\ & 6x^4 + 9x^2y^2 + 2x^2y^2 + 3y^4 \\ & 6x^4 + 11x^2y^2 + 3y^4 \end{aligned}$$

6. $(\frac{3}{5}x + \frac{1}{2}y)$ by $(\frac{5}{6}x + 4y)$

Solution:

Now let us simplify the given expression

$$\begin{aligned} & (\frac{3}{5}x + \frac{1}{2}y) \times (\frac{5}{6}x + 4y) \\ & \frac{3}{5}x \times (\frac{5}{6}x + 4y) + \frac{1}{2}y \times (\frac{5}{6}x + 4y) \\ & \frac{15}{30}x^2 + \frac{12}{5}xy + \frac{5}{12}xy + \frac{4}{2}y^2 \\ & \frac{1}{2}x^2 + \frac{169}{60}xy + 2y^2 \end{aligned}$$

7. $(x^6 - y^6)$ by $(x^2 + y^2)$

Solution:

Now let us simplify the given expression

$$\begin{aligned} & (x^6 - y^6) \times (x^2 + y^2) \\ & x^6 \times (x^2 + y^2) - y^6 \times (x^2 + y^2) \\ & x^8 + x^6y^2 - x^2y^6 - y^8 \end{aligned}$$

8. $(x^2 + y^2)$ by $(3a + 2b)$

Solution:

Now let us simplify the given expression

$$\begin{aligned} & (x^2 + y^2) \times (3a + 2b) \\ & x^2 \times (3a + 2b) + y^2 \times (3a + 2b) \\ & 3ax^2 + 3ay^2 + 2bx^2 + 2by^2 \end{aligned}$$

9. $(-3d - 7f)$ by $(5d + f)$

Solution:

Now let us simplify the given expression

$$\begin{aligned} & (-3d - 7f) \times (5d + f) \\ & -3d(5d + f) - 7f(5d + f) \\ & -15d^2 - 3df - 35df - 7f^2 \\ & -15d^2 - 38df - 7f^2 \end{aligned}$$

10. $(0.8a - 0.5b)$ by $(1.5a - 3b)$

Solution:

Now let us simplify the given expression

$$\begin{aligned} & (0.8a - 0.5b) \times (1.5a - 3b) \\ & 0.8a(1.5a - 3b) - 0.5b(1.5a - 3b) \end{aligned}$$

$$1.2a^2 - 2.4ab - 0.75ab + 1.5b^2$$

$$1.2a^2 - 3.15ab + 1.5b^2$$

11. $(2x^2y^2 - 5xy^2)$ by $(x^2 - y^2)$

Solution:

Now let us simplify the given expression

$$(2x^2y^2 - 5xy^2) \times (x^2 - y^2)$$

$$2x^2y^2(x^2 - y^2) - 5xy^2(x^2 - y^2)$$

$$2x^4y^2 - 5x^3y^2 - 2x^2y^4 + 5xy^4$$

12. $(x/7 + x^2/2)$ by $(2/5 + 9x/4)$

Solution:

Now let us simplify the given expression

$$(x/7 + x^2/2) \times (2/5 + 9x/4)$$

$$x/7 (2/5 + 9x/4) + x^2/2 (2/5 + 9x/4)$$

$$2x/35 + (9x^2)/28 + x^2/5 + (9x^3)/8$$

$$9/8x^3 + 73/140x^2 + 2/35x$$

13. $(-a/7 + a^2/9)$ by $(b/2 - b^2/3)$

Solution:

Now let us simplify the given expression

$$(-a/7 + a^2/9) \times (b/2 - b^2/3)$$

$$-a/7 (b/2 - b^2/3) + a^2/9 (b/2 - b^2/3)$$

$$-ab/14 + ab^2/21 + a^2b/18 - a^2b^2/27$$

14. $(3x^2y - 5xy^2)$ by $(1/5x^2 + 1/3y^2)$

Solution:

Now let us simplify the given expression

$$(3x^2y - 5xy^2) \times (1/5x^2 + 1/3y^2)$$

$$3x^2y (1/5x^2 + 1/3y^2) - 5xy^2 (1/5x^2 + 1/3y^2)$$

$$3/5x^4y + 3/3x^2y^3 - x^3y^2 + 5/3xy^4$$

$$3/5x^4y + x^2y^3 - x^3y^2 + 5/3xy^4$$

15. $(2x^2 - 1)$ by $(4x^3 + 5x^2)$

Solution:

Now let us simplify the given expression

$$(2x^2 - 1) \times (4x^3 + 5x^2)$$

$$2x^2(4x^3 + 5x^2) - 1(4x^3 + 5x^2)$$

$$8x^5 + 10x^4 - 4x^3 - 5x^2$$

16. $(2xy + 3y^2)$ by $(3y^2 - 2)$ **Solution:**

Now let us simplify the given expression

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

$$2xy(3y^2 - 2) + 3y^2(3y^2 - 2)$$

$$6xy^3 - 4xy + 9y^4 - 6y^2$$

Find the following products and verify the results for $x = -1$, $y = -2$:**17. $(3x - 5y)(x + y)$** **Solution:**

Now let us simplify the given expression

$$(3x - 5y) \times (x + y)$$

$$(3x - 5y) \times (x + y)$$

$$x(3x - 5y) + y(3x - 5y)$$

$$3x^2 - 5xy + 3xy - 5y^2$$

$$3x^2 - 2xy - 5y^2$$

Let us substitute the given values $x = -1$ and $y = -2$, then

$$(3x - 5y) \times (x + y)$$

$$[3(-1) - 5(-2)] \times [(-1) + (-2)]$$

$$(-3 + 10) \times (-1 - 2)$$

$$7 \times -3$$

$$-21$$

$$3x^2 - 2xy - 5y^2$$

$$3(-1)^2 - 2(-1)(-2) - 5(-2)^2$$

$$3 - 4 - 20$$

$$-21$$

 $\therefore$ the given expression is verified.**18. $(x^2y - 1)(3 - 2x^2y)$** **Solution:**

Now let us simplify the given expression

$$(x^2y - 1) \times (3 - 2x^2y)$$

$$x^2y(3 - 2x^2y) - 1(3 - 2x^2y)$$

$$3x^2y - 2x^4y^2 - 3 + 2x^2y$$

$$5x^2y - 2x^4y^2 - 3$$

Let us substitute the given values $x = -1$ and $y = -2$, then

$$(x^2y - 1) \times (3 - 2x^2y)$$

$$\begin{aligned}
 & [(-1)^2(-2) - 1] \times [3 - 2(-1)^2(-2)] \\
 & (-2 - 1) \times (3 + 4) \\
 & -3 \times 7 \\
 & -21
 \end{aligned}$$

$$\begin{aligned}
 & 5x^2y - 2x^4y^2 - 3 \\
 & [-2(-1)^4(-2)^2 + 5(-1)^2(2) - 3] \\
 & -8 - 10 - 3 \\
 & -21
 \end{aligned}$$

$\therefore$ the given expression is verified.

19. $(\frac{1}{3}x - y^2/5)(\frac{1}{3}x + y^2/5)$

Solution:

Now let us simplify the given expression

$$(\frac{1}{3}x - y^2/5) \times (\frac{1}{3}x + y^2/5)$$

$$(\frac{1}{3}x)^2 - (y^2/5)^2$$

$$(\frac{1}{3}x - y^2/5)(\frac{1}{3}x + y^2/5)$$

$$\frac{1}{9}x^2 - \frac{1}{25}y^4$$

Let us substitute the given values $x = -1$ and $y = -2$, then

$$(\frac{1}{3}x - y^2/5) \times (\frac{1}{3}x + y^2/5)$$

$$(\frac{1}{3}(-1) - (-2)^2/5) \times (\frac{1}{3}(-1) + (-2)^2/5)$$

$$(-17/15) \times (7/15)$$

$$-119/225$$

$$\frac{1}{9}x^2 - \frac{1}{25}y^4$$

$$\frac{1}{9}(-1)^2 - \frac{1}{25}(-2)^4$$

$$\frac{1}{9} - 16/25$$

$$-119/225$$

$\therefore$ the given expression is verified.

Simplify:

20. $x^2(x + 2y)(x - 3y)$

Solution:

Now let us simplify the given expression

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

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

$$x^2(x^2 - xy - 6y^2)$$

$$x^4 - x^3y - 6x^2y^2$$

21. $(x^2 - 2y^2)(x + 4y)x^2y^2$

Solution:

Now let us simplify the given expression

$$\begin{aligned} & (x^2 - 2y^2)(x + 4y)x^2y^2 \\ & (x^3 + 4x^2y - 2xy^2 - 8y^3) \times x^2y^2 \\ & x^5y^2 + 4x^4y^3 - 2x^3y^4 - 8x^2y^5 \end{aligned}$$

22. $a^2b^2(a + 2b)(3a + b)$

Solution:

Now let us simplify the given expression

$$\begin{aligned} & a^2b^2(a + 2b)(3a + b) \\ & a^2b^2(3a^2 + ab + 6ab + 2b^2) \\ & a^2b^2(3a^2 + 7ab + 2b^2) \\ & 3a^4b^2 + 7a^3b^3 + 2a^2b^4 \end{aligned}$$

23. $x^2(x - y)y^2(x + 2y)$

Solution:

Now let us simplify the given expression

$$\begin{aligned} & x^2(x - y)y^2(x + 2y) \\ & x^2y^2(x^2 + 2xy - xy - 2y^2) \\ & x^2y^2(x^2 + xy - 2y^2) \\ & x^4y^2 + x^3y^3 - 2x^2y^4 \end{aligned}$$

24. $(x^3 - 2x^2 + 5x - 7)(2x - 3)$

Solution:

Now let us simplify the given expression

$$\begin{aligned} & (x^3 - 2x^2 + 5x - 7)(2x - 3) \\ & 2x^4 - 4x^3 + 10x^2 - 14x - 3x^3 + 6x^2 - 15x + 21 \\ & 2x^4 - 7x^3 + 16x^2 - 29x + 21 \end{aligned}$$

25. $(5x + 3)(x - 1)(3x - 2)$

Solution:

Now let us simplify the given expression

$$\begin{aligned} & (5x + 3)(x - 1)(3x - 2) \\ & (5x^2 - 2x - 3)(3x - 2) \\ & 15x^3 - 6x^2 - 9x - 10x^2 + 4x + 6 \\ & 15x^3 - 16x^2 - 5x + 6 \end{aligned}$$

26. $(5 - x)(6 - 5x)(2 - x)$

Solution:

Now let us simplify the given expression

$$\begin{aligned}& (5 - x)(6 - 5x)(2 - x) \\& (x^2 - 7x + 10)(6 - 5x) \\& -5x^3 + 35x^2 - 50x + 6x^2 - 42x + 60 \\& 60 - 92x + 41x^2 - 5x^3\end{aligned}$$

27. $(2x^2 + 3x - 5)(3x^2 - 5x + 4)$

Solution:

Now let us simplify the given expression

$$\begin{aligned}& (2x^2 + 3x - 5)(3x^2 - 5x + 4) \\& 6x^4 + 9x^3 - 15x^2 - 10x^3 - 15x^2 + 25x + 8x^2 + 12x - 20 \\& 6x^4 - x^3 - 22x^2 + 37x - 20\end{aligned}$$

28. $(3x - 2)(2x - 3) + (5x - 3)(x + 1)$

Solution:

Now let us simplify the given expression

$$\begin{aligned}& (3x - 2)(2x - 3) + (5x - 3)(x + 1) \\& 6x^2 - 9x - 4x + 6 + 5x^2 + 5x - 3x - 3 \\& 11x^2 - 11x + 3\end{aligned}$$

29. $(5x - 3)(x + 2) - (2x + 5)(4x - 3)$

Solution:

Now let us simplify the given expression

$$\begin{aligned}& (5x - 3)(x + 2) - (2x + 5)(4x - 3) \\& 5x^2 + 10x - 3x - 6 - 8x^2 + 6x - 20x + 15 \\& -3x^2 - 7x + 9\end{aligned}$$

30. $(3x + 2y)(4x + 3y) - (2x - y)(7x - 3y)$

Solution:

Now let us simplify the given expression

$$\begin{aligned}& (3x + 2y)(4x + 3y) - (2x - y)(7x - 3y) \\& 12x^2 + 9xy + 8xy \\& 12x^2 + 9xy + 8xy + 6y^2 - 14x^2 + 6xy + 7xy - 3y^2 \\& -2x^2 + 3y^2 + 30xy\end{aligned}$$

31. $(x^2 - 3x + 2)(5x - 2) - (3x^2 + 4x - 5)(2x - 1)$

Solution:

Now let us simplify the given expression

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$$\begin{aligned}& (x^2 - 3x + 2)(5x - 2) - (3x^2 + 4x - 5)(2x - 1) \\& 5x^3 - 15x^2 + 10x - 2x^2 + 6x - 4 - (6x^3 + 8x^2 - 10x - 3x^2 - 4x + 5) \\& 5x^3 - 6x^3 - 15x^2 - 2x^2 - 5x^2 + 16x + 14x - 4 - 5 \\& -x^3 - 22x^2 + 30x - 9\end{aligned}$$

$$32. (x^3 - 2x^2 + 3x - 4)(x - 1) - (2x - 3)(x^2 - x + 1)$$

Solution:

Now let us simplify the given expression

$$\begin{aligned}& (x^3 - 2x^2 + 3x - 4)(x - 1) - (2x - 3)(x^2 - x + 1) \\& x^4 - 2x^3 + 3x^2 - 4x - x^3 + 2x^2 - 3x + 4 - (2x^3 - 2x^2 + 2x - 3x^2 + 3x - 3) \\& x^4 - 3x^3 + 5x^2 - 7x + 4 - 2x^3 + 5x^2 - 5x + 3 \\& x^4 - 5x^3 + 10x^2 - 12x + 7\end{aligned}$$

EXERCISE 6.6

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1. Write the following squares of binomials as trinomials:

(i) $(x + 2)^2$

(ii) $(8a + 3b)^2$

(iii) $(2m + 1)^2$

(iv) $(9a + 1/6)^2$

(v) $(x + x^2/2)^2$

(vi) $(x/4 - y/3)^2$

(vii) $(3x - 1/3x)^2$

(viii) $(x/y - y/x)^2$

(ix) $(3a/2 - 5b/4)^2$

(x) $(a^2b - bc^2)^2$

(xi) $(2a/3b + 2b/3a)^2$

(xii) $(x^2 - ay)^2$

Solution:

(i) $(x + 2)^2$

Let us express the given expression in trinomial

$$x^2 + 2(x)(2) + 2^2$$

$$x^2 + 4x + 4$$

(ii) $(8a + 3b)^2$

Let us express the given expression in trinomial

$$(8a)^2 + 2(8a)(3b) + (3b)^2$$

$$64a^2 + 48ab + 9b^2$$

(iii) $(2m + 1)^2$

Let us express the given expression in trinomial

$$(2m)^2 + 2(2m)(1) + 1^2$$

$$4m^2 + 4m + 1$$

(iv) $(9a + 1/6)^2$

Let us express the given expression in trinomial

$$(9a)^2 + 2(9a)(1/6) + (1/6)^2$$

$$81a^2 + 3a + 1/36$$

(v) $(x + x^2/2)^2$

Let us express the given expression in trinomial

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Algebraic Expressions and Identities

$$(x)^2 + 2(x)(x^2/2) + (x^2/2)^2$$

$$x^2 + x^3 + 1/4x^4$$

(vi) $(x/4 - y/3)^2$

Let us express the given expression in trinomial

$$(x/4)^2 - 2(x/4)(y/3) + (y/3)^2$$

$$1/16x^2 - xy/6 + 1/9y^2$$

(vii) $(3x - 1/3x)^2$

Let us express the given expression in trinomial

$$(3x)^2 - 2(3x)(1/3x) + (1/3x)^2$$

$$9x^2 - 2 + 1/9x^2$$

(viii) $(x/y - y/x)^2$

Let us express the given expression in trinomial

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

$$x^2/y^2 - 2 + y^2/x^2$$

(ix) $(3a/2 - 5b/4)^2$

Let us express the given expression in trinomial

$$(3a/2)^2 - 2(3a/2)(5b/4) + (5b/4)^2$$

$$9/4a^2 - 15/4ab + 25/16b^2$$

(x) $(a^2b - bc^2)^2$

Let us express the given expression in trinomial

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

$$a^4b^2 - 2a^2b^2c^2 + b^2c^4$$

(xi) $(2a/3b + 2b/3a)^2$

Let us express the given expression in trinomial

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

$$4a^2/9b^2 + 8/9 + 4b^2/9a^2$$

(xii) $(x^2 - ay)^2$

Let us express the given expression in trinomial

$$(x^2)^2 - 2(x^2)(ay) + (ay)^2$$

$$x^4 - 2x^2ay + a^2y^2$$

2. Find the product of the following binomials:

(i) $(2x + y)(2x + y)$

(ii) $(a + 2b)(a - 2b)$

(iii) $(a^2 + bc)(a^2 - bc)$

(iv) $(4x/5 - 3y/4)(4x/5 + 3y/4)$

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

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

(vii) $(x^4 + 2/x^2)(x^4 - 2/x^2)$

(viii) $(x^3 + 1/x^3)(x^3 - 1/x^3)$

Solution:

(i) $(2x + y)(2x + y)$

Let us find the product of the given expression

$$2x(2x + y) + y(2x + y)$$

$$4x^2 + 2xy + 2xy + y^2$$

$$4x^2 + 4xy + y^2$$

(ii) $(a + 2b)(a - 2b)$

Let us find the product of the given expression

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

$$a^2 - 2ab + 2ab - 4b^2$$

$$a^2 - 4b^2$$

(iii) $(a^2 + bc)(a^2 - bc)$

Let us find the product of the given expression

$$a^2(a^2 - bc) + bc(a^2 - bc)$$

$$a^4 - a^2bc + bca^2 - b^2c^2$$

$$a^4 - b^2c^2$$

(iv) $(4x/5 - 3y/4)(4x/5 + 3y/4)$

Let us find the product of the given expression

$$4x/5(4x/5 + 3y/4) - 3y/4(4x/5 + 3y/4)$$

$$16/25x^2 + 12/20yx - 12/20xy - 9y^2/16$$

$$16/25x^2 - 9/16y^2$$

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

Let us find the product of the given expression

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

$$4x^2 - 6x/y + 6x/y - 9/y^2$$

$$4x^2 - 9/y^2$$

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

Let us find the product of the given expression

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

$$4a^6 - 2a^3b^3 + 2a^3b^3 - b^6$$

$$4a^6 - b^6$$

(vii) $(x^4 + 2/x^2)(x^4 - 2/x^2)$

Let us find the product of the given expression

$$x^4(x^4 - 2/x^2) + 2/x^2(x^4 - 2/x^2)$$

$$x^8 - 2x^2 + 2x^2 - 4/x^4$$

$$(x^8 - 4/x^4)$$

(viii) $(x^3 + 1/x^3)(x^3 - 1/x^3)$

Let us find the product of the given expression

$$x^3(x^3 - 1/x^3) + 1/x^3(x^3 - 1/x^3)$$

$$x^6 - 1 + 1 - 1/x^6$$

$$x^6 - 1/x^6$$

3. Using the formula for squaring a binomial, evaluate the following:

(i) $(102)^2$

(ii) $(99)^2$

(iii) $(1001)^2$

(iv) $(999)^2$

(v) $(703)^2$

Solution:

(i) $(102)^2$

We can express 102 as $100 + 2$

So, $(102)^2 = (100 + 2)^2$

Upon simplification we get,

$$(100 + 2)^2 = (100)^2 + 2(100)(2) + 2^2$$

$$= 10000 + 400 + 4$$

$$= 10404$$

(ii) $(99)^2$

We can express 99 as $100 - 1$

So, $(99)^2 = (100 - 1)^2$

Upon simplification we get,

$$(100 - 1)^2 = (100)^2 - 2(100)(1) + 1^2$$

$$= 10000 - 200 + 1$$

$$= 9801$$

(iii) $(1001)^2$

We can express 1001 as $1000 + 1$

So, $(1001)^2 = (1000 + 1)^2$

Upon simplification we get,

$$\begin{aligned}(1000 + 1)^2 &= (1000)^2 + 2(1000)(1) + 1^2 \\ &= 1000000 + 2000 + 1 \\ &= 1002001\end{aligned}$$

(iv) $(999)^2$

We can express 999 as $1000 - 1$

So, $(999)^2 = (1000 - 1)^2$

Upon simplification we get,

$$\begin{aligned}(1000 - 1)^2 &= (1000)^2 - 2(1000)(1) + 1^2 \\ &= 1000000 - 2000 + 1 \\ &= 998001\end{aligned}$$

(v) $(703)^2$

We can express 700 as $700 + 3$

So, $(703)^2 = (700 + 3)^2$

Upon simplification we get,

$$\begin{aligned}(700 + 3)^2 &= (700)^2 + 2(700)(3) + 3^2 \\ &= 490000 + 4200 + 9 \\ &= 494209\end{aligned}$$

4. Simplify the following using the formula: $(a - b)(a + b) = a^2 - b^2$:

(i) $(82)^2 - (18)^2$

(ii) $(467)^2 - (33)^2$

(iii) $(79)^2 - (69)^2$

(iv) 197×203

(v) 113×87

(vi) 95×105

(vii) 1.8×2.2

(viii) 9.8×10.2

Solution:

(i) $(82)^2 - (18)^2$

Let us simplify the given expression using the formula $(a - b)(a + b) = a^2 - b^2$

We get,

$$\begin{aligned}(82)^2 - (18)^2 &= (82 - 18)(82 + 18) \\ &= 64 \times 100 \\ &= 6400\end{aligned}$$

(ii) $(467)^2 - (33)^2$

Let us simplify the given expression using the formula $(a - b)(a + b) = a^2 - b^2$

We get,

$$\begin{aligned}(467)^2 - (33)^2 &= (467 - 33)(467 + 33) \\ &= (434)(500) \\ &= 217000\end{aligned}$$

(iii) $(79)^2 - (69)^2$

Let us simplify the given expression using the formula $(a - b)(a + b) = a^2 - b^2$

We get,

$$\begin{aligned}(79)^2 - (69)^2 &= (79 + 69)(79 - 69) \\ &= (148)(10) \\ &= 1480\end{aligned}$$

(iv) 197×203

We can express 203 as $200 + 3$ and 197 as $200 - 3$

Let us simplify the given expression using the formula $(a - b)(a + b) = a^2 - b^2$

We get,

$$\begin{aligned}197 \times 203 &= (200 - 3)(200 + 3) \\ &= (200)^2 - (3)^2 \\ &= 40000 - 9 \\ &= 39991\end{aligned}$$

(v) 113×87

We can express 113 as $100 + 13$ and 87 as $100 - 13$

Let us simplify the given expression using the formula $(a - b)(a + b) = a^2 - b^2$

We get,

$$\begin{aligned}113 \times 87 &= (100 + 13)(100 - 13) \\ &= (100)^2 - (13)^2 \\ &= 10000 - 169 \\ &= 9831\end{aligned}$$

(vi) 95×105

We can express 95 as $100 - 5$ and 105 as $100 + 5$

Let us simplify the given expression using the formula $(a - b)(a + b) = a^2 - b^2$

We get,

$$\begin{aligned}95 \times 105 &= (100 - 5)(100 + 5) \\&= (100)^2 - (5)^2 \\&= 10000 - 25 \\&= 9975\end{aligned}$$

(vii) 1.8×2.2

We can express 1.8 as $2 - 0.2$ and 2.2 as $2 + 0.2$

Let us simplify the given expression using the formula $(a - b)(a + b) = a^2 - b^2$

We get,

$$\begin{aligned}1.8 \times 2.2 &= (2 - 0.2)(2 + 0.2) \\&= (2)^2 - (0.2)^2 \\&= 4 - 0.04 \\&= 3.96\end{aligned}$$

(viii) 9.8×10.2

We can express 9.8 as $10 - 0.2$ and 10.2 as $10 + 0.2$

Let us simplify the given expression using the formula $(a - b)(a + b) = a^2 - b^2$

We get,

$$\begin{aligned}9.8 \times 10.2 &= (10 - 0.2)(10 + 0.2) \\&= (10)^2 - (0.2)^2 \\&= 100 - 0.04 \\&= 99.96\end{aligned}$$

5. Simplify the following using the identities:

(i) $((58)^2 - (42)^2)/16$

(ii) $178 \times 178 - 22 \times 22$

(iii) $(198 \times 198 - 102 \times 102)/96$

(iv) $1.73 \times 1.73 - 0.27 \times 0.27$

(v) $(8.63 \times 8.63 - 1.37 \times 1.37)/0.726$

Solution:

(i) $((58)^2 - (42)^2)/16$

Let us simplify the given expression using the formula $(a - b)(a + b) = a^2 - b^2$

We get,

$$\begin{aligned}((58)^2 - (42)^2)/16 &= ((58 - 42)(58 + 42))/16 \\&= ((16)(100))/16 \\&= 100\end{aligned}$$

(ii) $178 \times 178 - 22 \times 22$

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Let us simplify the given expression using the formula $(a - b)(a + b) = a^2 - b^2$

We get,

$$\begin{aligned}178 \times 178 - 22 \times 22 &= (178)^2 - (22)^2 \\&= (178-22)(178+22) \\&= 200 \times 156 \\&= 31200\end{aligned}$$

(iii) $(198 \times 198 - 102 \times 102)/96$

Let us simplify the given expression using the formula $(a - b)(a + b) = a^2 - b^2$

We get,

$$\begin{aligned}(198 \times 198 - 102 \times 102)/96 &= ((198)^2 - (102)^2)/96 \\&= ((198-102)(198+102))/96 \\&= (96 \times 300)/96 \\&= 300\end{aligned}$$

(iv) $1.73 \times 1.73 - 0.27 \times 0.27$

Let us simplify the given expression using the formula $(a - b)(a + b) = a^2 - b^2$

We get,

$$\begin{aligned}1.73 \times 1.73 - 0.27 \times 0.27 &= (1.73)^2 - (0.27)^2 \\&= (1.73-0.27)(1.73+0.27) \\&= 1.46 \times 2 \\&= 2.92\end{aligned}$$

(v) $(8.63 \times 8.63 - 1.37 \times 1.37)/0.726$

Let us simplify the given expression using the formula $(a - b)(a + b) = a^2 - b^2$

We get,

$$\begin{aligned}(8.63 \times 8.63 - 1.37 \times 1.37)/0.726 &= ((8.63)^2 - (1.37)^2)/0.726 \\&= ((8.63-1.37)(8.63+1.37))/0.726 \\&= (7.26 \times 10)/0.726 \\&= 72.6/0.726 \\&= 100\end{aligned}$$

6. Find the value of x, if:

(i) $4x = (52)^2 - (48)^2$

(ii) $14x = (47)^2 - (33)^2$

(iii) $5x = (50)^2 - (40)^2$

Solution:

(i) $4x = (52)^2 - (48)^2$

Let us simplify to find the value of x by using the formula $(a - b)(a + b) = a^2 - b^2$

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$$\begin{aligned}4x &= (52)^2 - (48)^2 \\4x &= (52 - 48)(52 + 48) \\4x &= 4 \times 100 \\4x &= 400 \\x &= 100\end{aligned}$$

(ii) $14x = (47)^2 - (33)^2$
Let us simplify to find the value of x by using the formula $(a - b)(a + b) = a^2 - b^2$
 $14x = (47)^2 - (33)^2$
 $14x = (47 - 33)(47 + 33)$
 $14x = 14 \times 80$
 $x = 80$

(iii) $5x = (50)^2 - (40)^2$
Let us simplify to find the value of x by using the formula $(a - b)(a + b) = a^2 - b^2$
 $5x = (50)^2 - (40)^2$
 $5x = (50 - 40)(50 + 40)$
 $5x = 10 \times 90$
 $5x = 900$
 $x = 180$

7. If $x + 1/x = 20$, find the value of $x^2 + 1/x^2$.

Solution:

We know that $x + 1/x = 20$

So when squaring both sides, we get

$$\begin{aligned}(x + 1/x)^2 &= (20)^2 \\x^2 + 2 \times x \times 1/x + (1/x)^2 &= 400 \\x^2 + 2 + 1/x^2 &= 400 \\x^2 + 1/x^2 &= 398\end{aligned}$$

8. If $x - 1/x = 3$, find the values of $x^2 + 1/x^2$ and $x^4 + 1/x^4$.

Solution:

We know that $x - 1/x = 3$

So when squaring both sides, we get

$$\begin{aligned}(x - 1/x)^2 &= (3)^2 \\x^2 - 2 \times x \times 1/x + (1/x)^2 &= 9 \\x^2 - 2 + 1/x^2 &= 9 \\x^2 - 1/x^2 &= 9 + 2 \\x^2 + 1/x^2 &= 11\end{aligned}$$

Now again when we square on both sides we get,

$$(x^2 - 1/x^2)^2 = (11)^2$$

$$x^4 - 2 \times x^2 \times 1/x^2 + (1/x^2)^2 = 121$$

$$x^4 - 2 + 1/x^4 = 121$$

$$x^4 - 1/x^4 = 121 + 2$$

$$x^4 - 1/x^4 = 123$$

$$\therefore x^2 - 1/x^2 = 11$$

$$x^4 - 1/x^4 = 123$$

9. If $x^2 + 1/x^2 = 18$, find the values of $x + 1/x$ and $x - 1/x$.

Solution:

$$\text{We know that } x^2 + 1/x^2 = 18$$

When adding 2 on both sides, we get

$$x^2 + 1/x^2 + 2 = 18 + 2$$

$$x^2 + 1/x^2 + 2 \times x \times 1/x = 20$$

$$(x + 1/x)^2 = 20$$

$$x + 1/x = \sqrt{20}$$

When subtracting 2 from both sides, we get

$$x^2 + 1/x^2 - 2 \times x \times 1/x = 18 - 2$$

$$(x - 1/x)^2 = 16$$

$$x - 1/x = \sqrt{16}$$

$$x - 1/x = 4$$

10. If $x + y = 4$ and $xy = 2$, find the value of $x^2 + y^2$

Solution:

$$\text{We know that } x + y = 4 \text{ and } xy = 2$$

Upon squaring on both sides of the given expression, we get

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

$$x^2 + y^2 + 2xy = 16$$

$$x^2 + y^2 + 2(2) = 16 \quad (\text{since } xy=2)$$

$$x^2 + y^2 + 4 = 16$$

$$x^2 + y^2 = 16 - 4$$

$$x^2 + y^2 = 12$$

11. If $x - y = 7$ and $xy = 9$, find the value of $x^2 + y^2$

Solution:

$$\text{We know that } x - y = 7 \text{ and } xy = 9$$

Upon squaring on both sides of the given expression, we get

$$\begin{aligned}(x - y)^2 &= 7^2 \\ x^2 + y^2 - 2xy &= 49 \\ x^2 + y^2 - 2(9) &= 49 \quad (\text{since } xy=9) \\ x^2 + y^2 - 18 &= 49 \\ x^2 + y^2 &= 49 + 18 \\ x^2 + y^2 &= 67\end{aligned}$$

12. If $3x + 5y = 11$ and $xy = 2$, find the value of $9x^2 + 25y^2$

Solution:

We know that $3x + 5y = 11$ and $xy = 2$

Upon squaring on both sides of the given expression, we get

$$\begin{aligned}(3x + 5y)^2 &= 11^2 \\ (3x)^2 + (5y)^2 + 2(3x)(5y) &= 121 \\ 9x^2 + 5y^2 + 2(15xy) &= 121 \quad (\text{since } xy=2) \\ 9x^2 + 5y^2 + 2(15(2)) &= 121 \\ 9x^2 + 5y^2 + 60 &= 121 \\ 9x^2 + 5y^2 &= 121 - 60 \\ 9x^2 + 5y^2 &= 61\end{aligned}$$

13. Find the values of the following expressions:

(i) $16x^2 + 24x + 9$ when $x = 7/4$

(ii) $64x^2 + 81y^2 + 144xy$ when $x = 11$ and $y = 4/3$

(iii) $81x^2 + 16y^2 - 72xy$ when $x = 2/3$ and $y = 3/4$

Solution:

(i) $16x^2 + 24x + 9$ when $x = 7/4$

Let us find the values using the formula $(a + b)^2 = a^2 + b^2 + 2ab$

$$\begin{aligned}(4x)^2 + 2(4x)(3) + 3^2 \\ (4x + 3)^2\end{aligned}$$

Evaluating when $x = 7/4$

$$\begin{aligned}[4(7/4) + 3]^2 \\ (7 + 3)^2 \\ 100\end{aligned}$$

(ii) $64x^2 + 81y^2 + 144xy$ when $x = 11$ and $y = 4/3$

Let us find the values using the formula $(a + b)^2 = a^2 + b^2 + 2ab$

$$(8x)^2 + 2(8x)(9y) + (9y)^2 = (8x + 9y)^2$$

Evaluating when $x = 11$ and $y = 4/3$

$$\begin{aligned}[8(11) + 9(4/3)]^2 \\ (88 + 12)^2\end{aligned}$$

$$(100)^2$$

$$10000$$

(iii) $81x^2 + 16y^2 - 72xy$ when $x = \frac{2}{3}$ and $y = \frac{3}{4}$

Let us find the values using the formula $(a + b)^2 = a^2 + b^2 + 2ab$

$$(9x)^2 + (4y)^2 - 2(9x)(4y)$$

$$(9x - 4y)^2$$

Putting $x = \frac{2}{3}$ and $y = \frac{3}{4}$

$$[9(\frac{2}{3}) - 4(\frac{3}{4})]^2$$

$$(6 - 3)^2$$

$$3^2$$

$$9$$

14. If $x + \frac{1}{x} = 9$ find the value of $x^4 + \frac{1}{x^4}$.

Solution:

We know that $x + \frac{1}{x} = 9$

So when squaring both sides, we get

$$(x + \frac{1}{x})^2 = (9)^2$$

$$x^2 + 2 \times x \times \frac{1}{x} + (\frac{1}{x})^2 = 81$$

$$x^2 + 2 + \frac{1}{x^2} = 81$$

$$x^2 + \frac{1}{x^2} = 81 - 2$$

$$x^2 + \frac{1}{x^2} = 79$$

Now again when we square on both sides we get,

$$(x^2 + \frac{1}{x^2})^2 = (79)^2$$

$$x^4 + 2 \times x^2 \times \frac{1}{x^2} + (\frac{1}{x^2})^2 = 6241$$

$$x^4 + 2 + \frac{1}{x^4} = 6241$$

$$x^4 + \frac{1}{x^4} = 6241 - 2$$

$$x^4 + \frac{1}{x^4} = 6239$$

$$\therefore x^4 + \frac{1}{x^4} = 6239$$

15. If $x + \frac{1}{x} = 12$ find the value of $x - \frac{1}{x}$.

Solution:

We know that $x + \frac{1}{x} = 12$

So when squaring both sides, we get

$$(x + \frac{1}{x})^2 = (12)^2$$

$$x^2 + 2 \times x \times \frac{1}{x} + (\frac{1}{x})^2 = 144$$

$$x^2 + 2 + \frac{1}{x^2} = 144$$

$$x^2 + \frac{1}{x^2} = 144 - 2$$

$$x^2 + 1/x^2 = 142$$

When subtracting 2 from both sides, we get

$$x^2 + 1/x^2 - 2 \times x \times 1/x = 142 - 2$$

$$(x - 1/x)^2 = 140$$

$$x - 1/x = \sqrt{140}$$

16. If $2x + 3y = 14$ and $2x - 3y = 2$, find value of xy . [Hint: Use $(2x+3y)^2 - (2x-3y)^2 = 24xy$]

Solution:

We know that the given equations are

$$2x + 3y = 14 \dots \text{equation (1)}$$

$$2x - 3y = 2 \dots \text{equation (2)}$$

Now, let us square both the equations and subtract equation (2) from equation (1), we get,

$$(2x + 3y)^2 - (2x - 3y)^2 = (14)^2 - (2)^2$$

$$4x^2 + 9y^2 + 12xy - 4x^2 - 9y^2 + 12xy = 196 - 4$$

$$24xy = 192$$

$$xy = 8$$

$\therefore$ the value of xy is 8.

17. If $x^2 + y^2 = 29$ and $xy = 2$, find the value of

(i) $x + y$

(ii) $x - y$

(iii) $x^4 + y^4$

Solution:

(i) $x + y$

We know that

$$x^2 + y^2 = 29$$

$$x^2 + y^2 + 2xy - 2xy = 29$$

$$(x + y)^2 - 2(2) = 29$$

$$(x + y)^2 = 29 + 4$$

$$x + y = \pm \sqrt{33}$$

(ii) $x - y$

We know that

$$x^2 + y^2 = 29$$

$$x^2 + y^2 + 2xy - 2xy = 29$$

$$(x - y)^2 + 2(2) = 29$$

$$(x - y)^2 + 4 = 29$$

$$(x - y)^2 = 25$$

$$(x - y) = \pm 5$$

(iii) $x^4 + y^4$

We know that

$$x^2 + y^2 = 29$$

Squaring both sides, we get

$$(x^2 + y^2)^2 = (29)^2$$

$$x^4 + y^4 + 2x^2y^2 = 841$$

$$x^4 + y^4 + 2(2)^2 = 841$$

$$x^4 + y^4 = 841 - 8$$

$$x^4 + y^4 = 833$$

18. What must be added each of the following expression to make it a whole square?

(i) $4x^2 - 12x + 7$

(ii) $4x^2 - 20x + 20$

Solution:

(i) $4x^2 - 12x + 7$

$$(2x)^2 - 2(2x)(3) + 3^2 - 3^2 + 7$$

$$(2x - 3)^2 - 9 + 7$$

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

$\therefore 2$ must be added to the expression to make it a whole square.

(ii) $4x^2 - 20x + 20$

$$(2x)^2 - 2(2x)(5) + 5^2 - 5^2 + 20$$

$$(2x - 5)^2 - 25 + 20$$

$$(2x - 5)^2 - 5$$

$\therefore 5$ must be added to the expression to make it a whole square.

19. Simplify:

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

(ii) $(2x - 1)(2x + 1)(4x^2 + 1)(16x^4 + 1)$

(iii) $(7m - 8n)^2 + (7m + 8n)^2$

(iv) $(2.5p - 1.5q)^2 - (1.5p - 2.5q)^2$

(v) $(m^2 - n^2m)^2 + 2m^3n^2$

Solution:

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

B7 grouping the values

$$(x^2 - y^2)(x^2 + y^2)(x^4 + y^4)$$

$$\begin{aligned} & [(x^2)^2 - (y^2)^2] (x^4 + y^4) \\ & (x^4 - y^4) (x^4 - y^4) \\ & [(x^4)^2 - (y^4)^2] \\ & x^8 - y^8 \end{aligned}$$

(ii) $(2x - 1)(2x + 1)(4x^2 + 1)(16x^4 + 1)$
Let us simplify the expression by grouping
 $[(2x)^2 - (1)^2] (4x^2 + 1)(16x^4 + 1)$
 $(4x^2 - 1)(4x^2 + 1)(16x^4 + 1)$
 $[(4x^2)^2 - (1)^2] (16x^4 + 1)$
 $(16x^4 - 1)(16x^4 + 1)$
 $[(16x^4)^2 - (1)^2]$
 $256x^8 - 1$

(iii) $(7m - 8n)^2 + (7m + 8n)^2$
Upon expansion
 $(7m)^2 + (8n)^2 - 2(7m)(8n) + (7m)^2 + (8n)^2 + 2(7m)(8n)$
 $(7m)^2 + (8n)^2 - 112mn + (7m)^2 + (8n)^2 + 112mn$
 $49m^2 + 64n^2 + 49m^2 + 64n^2$
By grouping the similar expression we get,
 $98m^2 + 64n^2 + 64n^2$
 $98m^2 + 128n^2$

(iv) $(2.5p - 1.5q)^2 - (1.5p - 2.5q)^2$
Upon expansion
 $(2.5p)^2 + (1.5q)^2 - 2(2.5p)(1.5q) - (1.5p)^2 - (2.5q)^2 + 2(1.5p)(2.5q)$
 $6.25p^2 + 2.25q^2 - 2.25p^2 - 6.25q^2$
By grouping the similar expression we get,
 $4p^2 - 6.25q^2 + 2.25q^2$
 $4p^2 - 4q^2$
 $4(p^2 - q^2)$

(v) $(m^2 - n^2m)^2 + 2m^3n^2$
Upon expansion using $(a + b)^2$ formula
 $(m^2)^2 - 2(m^2)(n^2m) + (n^2m)^2 + 2m^3n^2$
 $m^4 - 2m^3n^2 + (n^2m)^2 + 2m^3n^2$
 $m^4 + n^4m^2 - 2m^3n^2 + 2m^3n^2$
 $m^4 + m^2n^4$

20. Show that:

(i) $(3x + 7)^2 - 84x = (3x - 7)^2$

(ii) $(9a - 5b)^2 + 180ab = (9a + 5b)^2$

(iii) $(4m/3 - 3n/4)^2 + 2mn = 16m^2/9 + 9n^2/16$

(iv) $(4pq + 3q)^2 - (4pq - 3q)^2 = 48pq^2$

(v) $(a - b)(a + b) + (b - c)(b + c) + (c - a)(c + a) = 0$

Solution:

(i) $(3x + 7)^2 - 84x = (3x - 7)^2$

Let us consider LHS $(3x + 7)^2 - 84x$ By using the formula $(a + b)^2 = a^2 + b^2 + 2ab$

$$(3x)^2 + (7)^2 + 2(3x)(7) - 84x$$

$$(3x)^2 + (7)^2 + 42x - 84x$$

$$(3x)^2 + (7)^2 - 42x$$

$$(3x)^2 + (7)^2 - 2(3x)(7)$$

$$(3x - 7)^2 = \text{R.H.S}$$

Hence, proved

(ii) $(9a - 5b)^2 + 180ab = (9a + 5b)^2$

Let us consider LHS $(9a - 5b)^2 + 180ab$ By using the formula $(a + b)^2 = a^2 + b^2 + 2ab$

$$(9a)^2 + (5b)^2 - 2(9a)(5b) + 180ab$$

$$(9a)^2 + (5b)^2 - 90ab + 180ab$$

$$(9a)^2 + (5b)^2 + 90ab$$

$$(9a)^2 + (5b)^2 + 2(9a)(5b)$$

$$(9a + 5b)^2 = \text{R.H.S}$$

Hence, proved

(iii) $(4m/3 - 3n/4)^2 + 2mn = 16m^2/9 + 9n^2/16$

Let us consider LHS $(4m/3 - 3n/4)^2 + 2mn$

$$(4m/3)^2 + (3n/4)^2 - 2mn + 2mn$$

$$(4m/3)^2 + (3n/4)^2$$

$$16/9m^2 + 9/16n^2 = \text{R.H.S}$$

Hence, proved

(iv) $(4pq + 3q)^2 - (4pq - 3q)^2 = 48pq^2$

Let us consider LHS $(4pq + 3q)^2 - (4pq - 3q)^2$

$$(4pq)^2 + (3q)^2 + 2(4pq)(3q) - (4pq)^2 - (3q)^2 + 2(4pq)(3q)$$

$$24pq^2 + 24pq^2$$

$$48pq^2 = \text{RHS}$$

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Hence, proved

$$(v) (a - b)(a + b) + (b - c)(b + c) + (c - a)(c + a) = 0$$

Let us consider LHS $(a - b)(a + b) + (b - c)(b + c) + (c - a)(c + a)$

By using the identity $(a - b)(a + b) = a^2 - b^2$

We get,

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

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

$$0 = \text{R.H.S}$$

Hence, proved

EXERCISE 6.7

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1. Find the following products:

(i) $(x + 4)(x + 7)$

(ii) $(x - 11)(x + 4)$

(iii) $(x + 7)(x - 5)$

(iv) $(x - 3)(x - 2)$

(v) $(y^2 - 4)(y^2 - 3)$

(vi) $(x + 4/3)(x + 3/4)$

(vii) $(3x + 5)(3x + 11)$

(viii) $(2x^2 - 3)(2x^2 + 5)$

(ix) $(z^2 + 2)(z^2 - 3)$

(x) $(3x - 4y)(2x - 4y)$

(xi) $(3x^2 - 4xy)(3x^2 - 3xy)$

(xii) $(x + 1/5)(x + 5)$

(xiii) $(z + 3/4)(z + 4/3)$

(xiv) $(x^2 + 4)(x^2 + 9)$

(xv) $(y^2 + 12)(y^2 + 6)$

(xvi) $(y^2 + 5/7)(y^2 - 14/5)$

(xvii) $(p^2 + 16)(p^2 - 1/4)$

Solution:

(i) $(x + 4)(x + 7)$

Let us simplify the given expression

$$x(x + 7) + 4(x + 7)$$

$$x^2 + 7x + 4x + 28$$

$$x^2 + 11x + 28$$

(ii) $(x - 11)(x + 4)$

Let us simplify the given expression

$$x(x + 4) - 11(x + 4)$$

$$x^2 + 4x - 11x - 44$$

$$x^2 - 7x - 44$$

(iii) $(x + 7)(x - 5)$

Let us simplify the given expression

$$x(x - 5) + 7(x - 5)$$

$$x^2 - 5x + 7x - 35$$

$$x^2 + 2x - 35$$

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(iv) $(x - 3)(x - 2)$

Let us simplify the given expression

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

$$x^2 - 2x - 3x + 6$$

$$x^2 - 5x + 6$$

(v) $(y^2 - 4)(y^2 - 3)$

Let us simplify the given expression

$$y^2(y^2 - 3) - 4(y^2 - 3)$$

$$y^4 - 3y^2 - 4y^2 + 12$$

$$y^4 - 7y^2 + 12$$

(vi) $(x + 4/3)(x + 3/4)$

Let us simplify the given expression

$$x(x + 3/4) + 4/3(x + 3/4)$$

$$x^2 + 3x/4 + 4x/3 + 12/12$$

$$x^2 + 3x/4 + 4x/3 + 1$$

$$x^2 + 25x/12 + 1$$

(vii) $(3x + 5)(3x + 11)$

Let us simplify the given expression

$$3x(3x + 11) + 5(3x + 11)$$

$$9x^2 + 33x + 15x + 55$$

$$9x^2 + 48x + 55$$

(viii) $(2x^2 - 3)(2x^2 + 5)$

Let us simplify the given expression

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

$$4x^4 + 10x^2 - 6x^2 - 15$$

$$4x^4 + 4x^2 - 15$$

(ix) $(z^2 + 2)(z^2 - 3)$

Let us simplify the given expression

$$z^2(z^2 - 3) + 2(z^2 - 3)$$

$$z^4 - 3z^2 + 2z^2 - 6$$

$$z^4 - z^2 - 6$$

(x) $(3x - 4y)(2x - 4y)$

Let us simplify the given expression

$$\begin{aligned} & 3x(2x - 4y) - 4y(2x - 4y) \\ & 6x^2 - 12xy - 8xy + 16y^2 \\ & 6x^2 - 20xy + 16y^2 \end{aligned}$$

(xi) $(3x^2 - 4xy)(3x^2 - 3xy)$
Let us simplify the given expression
 $3x^2(3x^2 - 3xy) - 4xy(3x^2 - 3xy)$
 $9x^4 - 9x^3y - 12x^3y + 12x^2y^2$
 $9x^4 - 21x^3y + 12x^2y^2$

(xii) $(x + 1/5)(x + 5)$
Let us simplify the given expression
 $x(x + 1/5) + 5(x + 1/5)$
 $x^2 + x/5 + 5x + 1$
 $x^2 + 26/5x + 1$

(xiii) $(z + 3/4)(z + 4/3)$
Let us simplify the given expression
 $z(z + 4/3) + 3/4(z + 4/3)$
 $z^2 + 4/3z + 3/4z + 12/12$
 $z^2 + 4/3z + 3/4z + 1$
 $z^2 + 25/12z + 1$

(xiv) $(x^2 + 4)(x^2 + 9)$
Let us simplify the given expression
 $x^2(x^2 + 9) + 4(x^2 + 9)$
 $x^4 + 9x^2 + 4x^2 + 36$
 $x^4 + 13x^2 + 36$

(xv) $(y^2 + 12)(y^2 + 6)$
Let us simplify the given expression
 $y^2(y^2 + 6) + 12(y^2 + 6)$
 $y^4 + 6y^2 + 12y^2 + 72$
 $y^4 + 18y^2 + 72$

(xvi) $(y^2 + 5/7)(y^2 - 14/5)$
Let us simplify the given expression
 $y^2(y^2 - 14/5) + 5/7(y^2 - 14/5)$
 $y^4 - 14/5y^2 + 5/7y^2 - 2$

$$y^4 - 73/35y^2 - 2$$

$$(xvii) (p^2 + 16)(p^2 - 1/4)$$

Let us simplify the given expression

$$p^2(p^2 - 1/4) + 16(p^2 - 1/4)$$

$$p^4 - 1/4p^2 + 16p^2 - 4$$

$$p^4 + 63/4p^2 - 4$$

2. Evaluate the following:

(i) 102×106

(ii) 109×107

(iii) 35×37

(iv) 53×55

(v) 103×96

(vi) 34×36

(vii) 994×1006

Solution:

(i) 102×106

We can express 102 as $100 + 2$ and 106 as $100 + 6$

Now let us simplify

$$\begin{aligned} 102 \times 106 &= (100 + 2)(100 + 6) \\ &= 100(100 + 6) + 2(100 + 6) \\ &= 10000 + 600 + 200 + 12 \\ &= 10812 \end{aligned}$$

(ii) 109×107

We can express 109 as $100 + 9$ and 107 as $100 + 7$

Now let us simplify

$$\begin{aligned} 109 \times 107 &= (100 + 9)(100 + 7) \\ &= 100(100 + 7) + 9(100 + 7) \\ &= 10000 + 700 + 900 + 63 \\ &= 11663 \end{aligned}$$

(iii) 35×37

We can express 35 as $30 + 5$ and 37 as $30 + 7$

Now let us simplify

$$\begin{aligned} 35 \times 37 &= (30 + 5)(30 + 7) \\ &= 30(30 + 7) + 5(30 + 7) \\ &= 900 + 210 + 150 + 35 \end{aligned}$$

$$= 1295$$

(iv) 53×55

We can express 53 as $50 + 3$ and 55 as $50 + 5$

Now let us simplify

$$\begin{aligned} 53 \times 55 &= (50 + 3)(50 + 5) \\ &= 50(50 + 5) + 3(50 + 5) \\ &= 2500 + 250 + 150 + 15 \\ &= 2915 \end{aligned}$$

(v) 103×96

We can express 103 as $100 + 3$ and 96 as $100 - 4$

Now let us simplify

$$\begin{aligned} 103 \times 96 &= (100 + 3)(100 - 4) \\ &= 100(100 - 4) + 3(100 - 4) \\ &= 10000 - 400 + 300 - 12 \\ &= 10000 - 112 \\ &= 9888 \end{aligned}$$

(vi) 34×36

We can express 34 as $30 + 4$ and 36 as $30 + 6$

Now let us simplify

$$\begin{aligned} 34 \times 36 &= (30 + 4)(30 + 6) \\ &= 30(30 + 6) + 4(30 + 6) \\ &= 900 + 180 + 120 + 24 \\ &= 1224 \end{aligned}$$

(vii) 994×1006

We can express 994 as $1000 - 6$ and 1006 as $1000 + 6$

Now let us simplify

$$\begin{aligned} 994 \times 1006 &= (1000 - 6)(1000 + 6) \\ &= 1000(1000 + 6) - 6(1000 + 6) \\ &= 1000000 + 6000 - 6000 - 36 \\ &= 999964 \end{aligned}$$