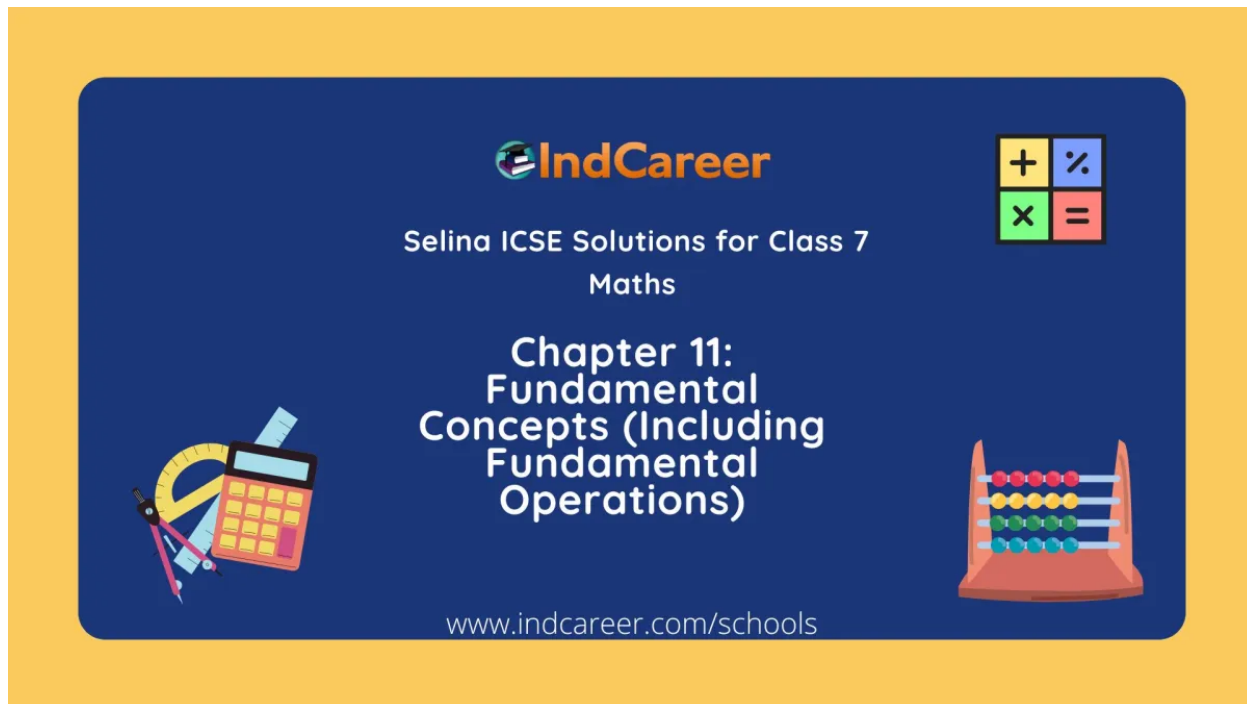


Selina Class 7 ICSE Solutions Mathematics : Chapter 11- Fundamental Concepts (Including Fundamental Operations)



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Chapter 11- Fundamental Concepts (Including Fundamental Operations)

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Selina Class 7 ICSE Solutions Mathematics : Chapter 11- Fundamental Concepts (Including Fundamental Operations)

Selina 7th Maths Chapter 11, Class 7 Maths Chapter 11 solutions

Exercise 11A page: 121

1. Separate constant terms and variable terms from the following:

8, x, 6xy, 6 + x, $-5xy^2$, $15az^2$, $32z/xy$, $y^2/3x$

Solution:

The constant term is 8.

The variable terms are x, 6xy, 6 + x, $-5xy^2$, $15az^2$, $32z/xy$, $y^2/3x$.

2. For each expression, given below, state whether it is a monomial, binomial or trinomial:

(i) $2x \div 15$

(ii) $ax + 9$

(iii) $3x^2 \times 5x$

(iv) $5 + 2x - 3b$

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(v) $2y - 7z/3 \div x$

(vi) $3p \times q \div z$

(vii) $12z \div 5x + 4$

(viii) $12 - 5z - 4$

(ix) $a^3 - 3ab^2 \times c$

Solution:

(i) $2x \div 15 = 2x/15$

It has one term and hence it is a monomial.

(ii) $ax + 9$

It has two terms and hence it is a binomial.

(iii) $3x^2 \times 5x = 15x^3$

It has one term and hence it is a monomial.

(iv) $5 + 2x - 3b$

It has three terms and hence it is a trinomial.

(v) $2y - 7z/3 \div x = 2y - 7z/3x$

It has two terms and hence it is a binomial.

(vi) $3p \times q \div z = 3pq/z$

It has one term and hence it is a monomial.

(vii) $12z \div 5x + 4 = 12z/5x + 4$

It has two terms and hence it is a binomial.

(viii) $12 - 5z - 4 = 8 - 5z$

It has two terms and hence it is a binomial.

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(ix) $a^3 - 3ab^2 \times c = a^3 - 3ab^2c$

It has two terms and hence it is a binomial.

3. Write the coefficient of:

(i) xy in $-3axy$

(ii) z^2 in p^2yz^2

(iii) mn in $-mn$

(iv) 15 in $-15p^2$

Solution:

(i) xy in $-3axy$

The coefficient of xy in $-3axy = -3a$

(ii) z^2 in p^2yz^2

The coefficient of z^2 in $p^2yz^2 = p^2y$

(iii) mn in $-mn$

The coefficient of mn in $-mn = -1$

(iv) 15 in $-15p^2$

The coefficient of 15 in $-15p^2 = -p^2$

4. For each of the following monomials, write its degree:

(i) $7y$

(ii) $-x^2y$

(iii) xy^2z

(iv) $-9y^2z^3$

(v) $3m^3n^4$

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(vi) $-2p^2q^3r^4$

Solution:

(i) The degree of $7y$ is 1.

(ii) The degree of $-x^2y = 2 + 1 = 3$

(iii) The degree of $xy^2z = 1 + 2 + 1 = 4$

(iv) The degree of $-9y^2z^3 = 2 + 3 = 5$

(v) The degree of $3m^3n^4 = 3 + 4 = 7$

(vi) The degree of $-2p^2q^3r^4 = 2 + 3 + 4 = 9$

5. Write the degree of each of the following polynomials:

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

(ii) $p^3q^2 - 6p^2q^5 + p^4q^4$

(iii) $-8mn^6 + 5m^3n$

(iv) $7 - 3x^2y + y^2$

(v) $3x - 15$

(vi) $2y^2z + 9yz^3$

Solution:

(i) The degree of $3y^3 - x^2y^2 + 4x$ is 4

x^2y^2 is the term which has the highest degree.

(ii) The degree of $p^3q^2 - 6p^2q^5 + p^4q^4$ is 8

p^4q^4 is the term which has the highest degree.

(iii) The degree of $-8mn^6 + 5m^3n$ is 7

$-8mn^6$ is the term which has the highest degree.

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(iv) The degree of $7 - 3x^2y + y^2$ is 3

$-3x^2y$ is the term which has the highest degree.

(v) The degree of $3x - 15$ is 1

$3x$ is the term which has the highest degree.

(vi) The degree of $2y^2z + 9yz^3$ is 4

$9yz^3$ is the term which has the highest degree.

6. Group the like terms together:

(i) $9x^2$, xy , $-3x^2$, x^2 and $-2xy$

(ii) ab , $-a^2b$, $-3ab$, $5a^2b$ and $-8a^2b$.

(iii) $7p$, $8pq$, $-5pq$, $-2p$ and $3p$

Solution:

(i) $9x^2$, xy , $-3x^2$, x^2 and $-2xy$

$9x^2$, $-3x^2$ and x^2 are like terms

xy and $-2xy$ are like terms.

(ii) ab , $-a^2b$, $-3ab$, $5a^2b$ and $-8a^2b$

$-a^2b$, $5a^2b$ and $-8a^2b$ are like terms

ab and $-3ab$ are like terms.

(iii) $7p$, $8pq$, $-5pq$, $-2p$ and $3p$

$7p$, $-2p$ and $3p$ are like terms

$8pq$ and $-5pq$ are like terms.

7. Write the numerical coefficient of each of the following:

(i) y

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(ii) $-y$

(iii) $2x^2y$

(iv) $-8xy^3$

(v) $3py^2$

(vi) $-9a^2b^3$

Solution:

(i) The numerical coefficient of y is 1.

(ii) The numerical coefficient of $-y$ is -1 .

(iii) The numerical coefficient of $2x^2y$ is 2.

(iv) The numerical coefficient of $-8xy^3$ is -8 .

(v) The numerical coefficient of $3py^2$ is 3.

(vi) The numerical coefficient of $-9a^2b^3$ is -9 .

8. In $-5x^3y^2z^4$; write the coefficient of:

(i) z^2

(ii) y^2

(iii) yz^2

(iv) x^3y

(v) $-xy^2$

(vi) $-5xy^2z$

Also, write the degree of the given algebraic expression.

Solution:

(i) The coefficient of z^2 is $-5x^3y^2z^2$.

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(ii) The coefficient of y^2 is $-5x^3z^4$.

(iii) The coefficient of yz^2 is $-5x^3yz^2$.

(iv) The coefficient of x^3y is $-5yz^4$.

(v) The coefficient of $-xy^2$ is $5x^2z^4$.

(vi) The coefficient of $-5xy^2z$ is x^2z^3 .

So the degree of the given algebraic expression = $3 + 2 + 4 = 9$.

Exercise 11B page: 125

1. Fill in the blanks:

(i) $8x + 5x = \dots\dots$

(ii) $8x - 5x = \dots\dots$

(iii) $6xy^2 + 9xy^2 = \dots\dots$

(iv) $6xy^2 - 9xy^2 = \dots\dots$

(v) The sum of $8a$, $6a$ and $5b = \dots\dots$

(vi) The addition of 5 , $7xy$, 6 and $3xy = \dots\dots$

(vii) $4a + 3b - 7a + 4b = \dots\dots\dots$

(viii) $-15x + 13x + 8 = \dots\dots\dots$

(ix) $6x^2y + 13xy^2 - 4x^2y + 2xy^2 = \dots\dots\dots$

(x) $16x^2 - 9x^2 = \dots\dots\dots$ and $25xy^2 - 17xy^2 = \dots\dots\dots$

Solution:

(i) $8x + 5x = 13x$

(ii) $8x - 5x = 3x$

(iii) $6xy^2 + 9xy^2 = 15xy^2$

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(iv) $6xy^2 - 9xy^2 = -3xy^2$

(v) The sum of $8a$, $6a$ and $5b = 14a + 5b$

It can be written as

$$8a + 6a + 5b = 14a + 5b$$

(vi) The addition of 5 , $7xy$, 6 and $3xy = 11 + 10xy$

It can be written as

$$5 + 7xy + 6 + 3xy = 11 + 10xy$$

(vii) $4a + 3b - 7a + 4b = 7b - 3a$

It can be written as

$$4a + 3b - 7a + 4b = (4 - 7)a + (3 + 4)b$$

$$= -3a + 7b$$

(viii) $-15x + 13x + 8 = 8 - 2x$

It can be written as

$$-15x + 13x + 8 = (-15 + 13)x + 8 = -2x + 8$$

(ix) $6x^2y + 13xy^2 - 4x^2y + 2xy^2 = 2x^2y + 15xy^2$

It can be written as

$$6x^2y + 13xy^2 - 4x^2y + 2xy^2 = (6 - 4)x^2y + (13 + 2)xy^2$$

$$= 2x^2y + 15xy^2$$

(x) $16x^2 - 9x^2 = 7x^2$ and $25xy^2 - 17xy^2 = 8xy^2$

2. Add:

(i) $-9x$, $3x$ and $4x$

(ii) $23y^2$, $8y^2$ and $-12y^2$

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(iii) $18pq$, $-15pq$ and $3pq$

Solution:

(i) $-9x$, $3x$ and $4x$

It can be written as

$$= -9x + 3x + 4x$$

So we get

$$= -9x + 7x$$

$$= -2x$$

(ii) $23y^2$, $8y^2$ and $-12y^2$

It can be written as

$$= 23y^2 + 8y^2 - 12y^2$$

So we get

$$= 31y^2 - 12y^2$$

$$= 19y^2$$

(iii) $18pq$, $-15pq$ and $3pq$

It can be written as

$$= 18pq - 15pq + 3pq$$

So we get

$$= 3pq + 3pq$$

$$= 6pq$$

3. Simplify:

(i) $3m + 12m - 5m$

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(ii) $7n^2 - 9n^2 + 3n^2$

(iii) $25zy - 8zy - 6zy$

(iv) $-5ax^2 + 7ax^2 - 12ax^2$

(v) $-16am + 4mx + 4am - 15mx + 5am$

Solution:

(i) $3m + 12m - 5m$

It can be written as

$$= 15m - 5m$$

So we get

$$= 10m$$

(ii) $7n^2 - 9n^2 + 3n^2$

It can be written as

$$= (7 + 3) n^2 - 9n^2$$

So we get

$$= 10n^2 - 9n^2$$

$$= n^2$$

(iii) $25zy - 8zy - 6zy$

It can be written as

$$= 25zy - 14zy$$

So we get

$$= 11zy$$

(iv) $-5ax^2 + 7ax^2 - 12ax^2$

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It can be written as

$$= (-5 - 12) ax^2 + 7ax^2$$

So we get

$$= -17ax^2 + 7ax^2$$

$$= -10ax^2$$

$$(v) -16am + 4mx + 4am - 15mx + 5am$$

It can be written as

$$= (-16 + 4 + 5) am + (4 - 15) mx$$

So we get

$$= -7am - 11mx$$

4. Add:

(i) $a + b$ and $2a + 3b$

(ii) $2x + y$ and $3x - 4y$

(iii) $-3a + 2b$ and $3a + b$

(iv) $4 + x$, $5 - 2x$ and $6x$

Solution:

(i) $a + b$ and $2a + 3b$

It can be written as

$$= a + b + 2a + 3b$$

So we get

$$= a + 2a + b + 3b$$

$$= 3a + 4b$$

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(ii) $2x + y$ and $3x - 4y$

It can be written as

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

So we get

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

$$= 5x - 3y$$

(iii) $-3a + 2b$ and $3a + b$

It can be written as

$$= -3a + 2b + 3a + b$$

So we get

$$= -3a + 3a + 2b + b$$

$$= 3b$$

(iv) $4 + x$, $5 - 2x$ and $6x$

It can be written as

$$= 4 + x + 5 - 2x + 6x$$

So we get

$$= x - 2x + 6x + 4 + 5$$

$$= 5x + 9$$

5. Find the sum of:

(i) $3x + 8y + 7z$, $6y + 4z - 2x$ and $3y - 4x + 6z$

(ii) $3a + 5b + 2c$, $2a + 3b - c$ and $a + b + c$

(iii) $4x^2 + 8xy - 2y^2$ and $8xy - 5y^2 + x^2$

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(iv) $9x^2 - 6x + 7$, $5 - 4x$ and $6 - 3x^2$

(v) $5x^2 - 2xy + 3y^2$, $-2x^2 + 5xy + 9y^2$ and $3x^2 - xy - 4y^2$

Solution:

(i) $3x + 8y + 7z$, $6y + 4z - 2x$ and $3y - 4x + 6z$

It can be written as

$$= 3x + 8y + 7z + 6y + 4z - 2x + 3y - 4x + 6z$$

By further calculation

$$= 3x - 2x - 4x + 8y + 6y + 3y + 7z + 4z + 6z$$

So we get

$$= 3x - 6x + 17y + 17z$$

$$= -3x + 17y + 17z$$

(ii) $3a + 5b + 2c$, $2a + 3b - c$ and $a + b + c$

It can be written as

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

By further calculation

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

So we get

$$= 6a + 9b + 3c - c$$

$$= 6a + 9b + 2c$$

(iii) $4x^2 + 8xy - 2y^2$ and $8xy - 5y^2 + x^2$

It can be written as

$$= 4x^2 + 8xy - 2y^2 + 8xy - 5y^2 + x^2$$

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By further calculation

$$= 4x^2 + x^2 + 8xy + 8xy - 2y^2 - 5y^2$$

So we get

$$= 5x^2 + 16xy - 7y^2$$

(iv) $9x^2 - 6x + 7$, $5 - 4x$ and $6 - 3x^2$

It can be written as

$$= 9x^2 - 6x + 7 + 5 - 4x + 6 - 3x^2$$

By further calculation

$$= 9x^2 - 3x^2 - 6x - 4x + 7 + 5 + 6$$

So we get

$$= 6x^2 - 10x + 18$$

(v) $5x^2 - 2xy + 3y^2$, $-2x^2 + 5xy + 9y^2$ and $3x^2 - xy - 4y^2$

It can be written as

$$= 5x^2 - 2xy + 3y^2 - 2x^2 + 5xy + 9y^2 + 3x^2 - xy - 4y^2$$

By further calculation

$$= 5x^2 - 2x^2 + 3x^2 - 2xy + 5xy - xy + 3y^2 + 9y^2 - 4y^2$$

So we get

$$= 6x^2 + 2xy + 8y^2$$

6. Find the sum of:

(i) x and $3y$

(ii) $-2a$ and $+5$

(iii) $-4x^2$ and $+7x$

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(iv) $+4a$ and $-7b$

(v) x^3 , $3x^2y$ and $2y^2$

(vi) 11 and $-by$

Solution:

(i) x and $3y$

The sum of x and $3y$ is $x + 3y$.

(ii) $-2a$ and $+5$

The sum of $-2a$ and $+5$ is $-2a + 5$.

(iii) $-4x^2$ and $+7x$

The sum of $-4x^2$ and $+7x$ is $-4x^2 + 7x$.

(iv) $+4a$ and $-7b$

The sum of $+4a$ and $-7b$ is $+4a - 7b$.

(v) x^3 , $3x^2y$ and $2y^2$

The sum of x^3 , $3x^2y$ and $2y^2$ is $x^3 + 3x^2y + 2y^2$.

(vi) 11 and $-by$

The sum of 11 and $-by$ is $11 - by$.

7. The sides of a triangle are $2x + 3y$, $x + 5y$ and $7x - 2y$. Find its perimeter.

Solution:

It is given that

Sides of a triangle are $2x + 3y$, $x + 5y$ and $7x - 2y$

We know that

Perimeter = Sum of all three sides of a triangle

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Substituting the values

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

By further calculation

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

So we get

$$= 10x + 8y - 2y$$

$$= 10x + 6y$$

8. The two adjacent sides of a rectangle are $6a + 9b$ and $8a - 4b$. Find its perimeter.

Solution:

It is given that

Sides of a rectangle are $6a + 9b$ and $8a - 4b$

So length = $6a + 9b$ and breadth = $8a - 4b$

We know that

$$\text{Perimeter} = 2 (\text{length} + \text{breadth})$$

Substituting the values

$$= 2 (6a + 9b + 8a - 4b)$$

By further calculation

$$= 2 (14a + 5b)$$

So we get

$$= 28a + 10b$$

9. Subtract the second expression from the first:

(i) $2a + b$, $a + b$

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(ii) $-2b + 2c$, $b + 3c$

(iii) $5a + b$, $-6b + 2a$

(iv) $a^3 - 1 + a$, $3a - 2a^2$

(v) $p + 2$, 1

Solution:

(i) $2a + b$, $a + b$

It can be written as

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

So we get

$$= 2a + b - a - b$$

$$= 2a - a + b - b$$

$$= a$$

(ii) $-2b + 2c$, $b + 3c$

It can be written as

$$= (-2b + 2c) - (b + 3c)$$

So we get

$$= -2b + 2c - b - 3c$$

$$= -2b - b + 2c - 3c$$

$$= -3b - c$$

(iii) $5a + b$, $-6b + 2a$

It can be written as

$$= (5a + b) - (-6b + 2a)$$

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So we get

$$= 5a + b + 6b - 2a$$

$$= 5a - 2a + b + 6b$$

$$= 3a + 7b$$

(iv) $a^3 - 1 + a$, $3a - 2a^2$

It can be written as

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

So we get

$$= a^3 - 1 + a - 3a + 2a^2$$

$$= a^3 + 2a^2 + a - 3a - 1$$

$$= a^3 + 2a^2 - 2a - 1$$

(v) $p + 2$, 1

It can be written as

$$= p + 2 - 1$$

So we get

$$= p + 1$$

10. Subtract:

(i) $4x$ from $8 - x$

(ii) $-8c$ from $c + 3d$

(iii) $-5a - 2b$ from $b + 6c$

(iv) $4p + p^2$ from $3p^2 - 8p$

(v) $5a - 3b + 2c$ from $4a - b - 2c$

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Solution:

(i) $4x$ from $8 - x$

It can be written as

$$= (8 - x) - 4x$$

By further calculation

$$= 8 - x - 4x$$

$$= 8 - 5x$$

(ii) $-8c$ from $c + 3d$

It can be written as

$$= (c + 3d) - (-8c)$$

By further calculation

$$= c + 3d + 8c$$

$$= 9c + 3d$$

(iii) $-5a - 2b$ from $b + 6c$

It can be written as

$$= (b + 6c) - (-5a - 2b)$$

By further calculation

$$= b + 6c + 5a + 2b$$

$$= 5a + 3b + 6c$$

(iv) $4p + p^2$ from $3p^2 - 8p$

It can be written as

$$= (3p^2 - 8p) - (4p + p^2)$$

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By further calculation

$$= 3p^2 - 8p - 4p - p^2$$

$$= 2p^2 - 12p$$

(v) $5a - 3b + 2c$ from $4a - b - 2c$

It can be written as

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

By further calculation

$$= 4a - b - 2c - 5a + 3b - 2c$$

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

11. Subtract $-5a^2 - 3a + 1$ from the sum of $4a^2 + 3 - 8a$ and $9a - 7$.

Solution:

We know that

Sum of $4a^2 + 3 - 8a$ and $9a - 7$ can be written as

$$= 4a^2 + 3 - 8a + 9a - 7$$

By further calculation

$$= 4a^2 + a - 4$$

Here

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

By further calculation

$$= 4a^2 + 5a^2 + a + 3a - 4 - 1$$

So we get

$$= 9a^2 + 4a - 5$$

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12. By how much does $8x^3 - 6x^2 + 9x - 10$ exceed $4x^3 + 2x^2 + 7x - 3$?

Solution:

We know that

$$8x^3 - 6x^2 + 9x - 10 \text{ exceed } 4x^3 + 2x^2 + 7x - 3$$

It can be written as

$$= (8x^3 - 6x^2 + 9x - 10) - (4x^3 + 2x^2 + 7x - 3)$$

By further calculation

$$= 8x^3 - 6x^2 + 9x - 10 - 4x^3 - 2x^2 - 7x + 3$$

So we get

$$= 8x^3 - 4x^3 - 6x^2 - 2x^2 + 9x - 7x - 10 + 3$$

$$= 4x^3 - 8x^2 + 2x - 7$$

13. What must be added to $2a^3 + 5a - a^2 - 6$ to get $a^2 - a - a^3 + 1$?

Solution:

The answer can be obtained by subtracting $2a^3 + 5a - a^2 - 6$ from $a^2 - a - a^3 + 1$

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

It can be written as

$$= -a^3 + a^2 - a + 1 - 2a^3 - 5a + a^2 + 6$$

By further calculation

$$= -a^3 - 2a^3 + a^2 + a^2 - a - 5a + 1 + 6$$

$$= -3a^3 + 2a^2 - 6a + 7$$

14. What must be subtracted from $a^2 + b^2 + 2ab$ to get $-4ab + 2b^2$?

Solution:

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The answer can be obtained by subtracting $-4ab + 2b^2$ from $a^2 + b^2 + 2ab$

$$= a^2 + b^2 + 2ab - (-4ab + 2b^2)$$

It can be written as

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

By further calculation

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

$$= a^2 - b^2 + 6ab$$

15. Find the excess of $4m^2 + 4n^2 + 4p^2$ over $m^2 + 3n^2 - 5p^2$.

Solution:

The answer can be obtained by subtracting $m^2 + 3n^2 - 5p^2$ from $4m^2 + 4n^2 + 4p^2$

$$= (4m^2 + 4n^2 + 4p^2) - (m^2 + 3n^2 - 5p^2)$$

It can be written as

$$= 4m^2 + 4n^2 + 4p^2 - m^2 - 3n^2 + 5p^2$$

By further calculation

$$= 4m^2 - m^2 + 4n^2 - 3n^2 + 4p^2 + 5p^2$$

$$= 3m^2 + n^2 + 9p^2$$

Exercise 11C page: 129

1. Multiply:

(i) $3x$, $5x^2y$ and $2y$

(ii) 5 , $3a$ and $2ab^2$

(iii) $5x + 2y$ and $3xy$

(iv) $6a - 5b$ and $-2a$

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(v) $4a + 5b$ and $4a - 5b$

Solution:

(i) $3x$, $5x^2y$ and $2y$

$$\text{Product} = 3x \times 5x^2y \times 2y$$

We can write it as

$$= 3 \times 5 \times 2 \times x \times x^2 \times y \times y$$

So we get

$$= 30x^3y^2$$

(ii) 5 , $3a$ and $2ab^2$

$$\text{Product} = 5 \times 3a \times 2ab^2$$

We can write it as

$$= 5 \times 3 \times 2 \times a \times ab^2$$

So we get

$$= 30a^2b^2$$

(iii) $5x + 2y$ and $3xy$

$$\text{Product} = 3xy (5x + 2y)$$

We can write it as

$$= 3xy \times 5x + 3xy \times 2y$$

So we get

$$= 15x^2y + 6xy^2$$

(iv) $6a - 5b$ and $-2a$

$$\text{Product} = -2a (6a - 5b)$$

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We can write it as

$$= -2a \times 6a + 2a \times 5b$$

So we get

$$= -12a^2 + 10ab$$

(v) $4a + 5b$ and $4a - 5b$

$$\text{Product} = (4a + 5b)(4a - 5b)$$

So we get

$$= 16a^2 - 25b^2$$

$$\begin{array}{r} 4a + 5b \\ \times 4a - 5b \\ \hline 16a^2 + 20ab \\ - 20ab - 25b^2 \\ \hline 16a^2 - 25b^2 \end{array}$$

2. Copy and complete the following multiplications:

$$\begin{array}{r} \text{(i)} \quad 3a + 2b \\ \times -3xy \\ \hline \end{array}$$

$$\begin{array}{r} \text{(ii)} \quad 9x - 5y \\ \times -3xy \\ \hline \end{array}$$

$$\begin{array}{r} \text{(iii)} \quad 3xy - 2x^2 - 6x \\ \times -5x^2y \\ \hline \end{array}$$

$$\begin{array}{r} \text{(iv)} \quad a + b \\ \times a + b \\ \hline \end{array}$$

$$\begin{array}{r} \text{(v)} \quad ax - b \\ \times 2ax + 2b^2 \\ \hline \end{array}$$

Solution:

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$$\begin{array}{llll}
 \text{(i)} \quad \begin{array}{r} 3a + 2b \\ x - 3xy \\ \hline -9axy - 6bxy \end{array} & \text{(ii)} \quad \begin{array}{r} 9x - 5y \\ x - 3xy \\ \hline -27x^2y + 15xy^2 \end{array} & \text{(iii)} \quad \begin{array}{r} 3xy - 2x^2 - 6x \\ x - 5x^2y \\ \hline -15x^3y^2 + 10x^4y + 30x^3y \end{array} & \text{(iv)} \quad \begin{array}{r} a + b \\ x a + b \\ \hline a^2 + ab \\ ab + b^2 \\ \hline a^2 + 2ab + b^2 \end{array} \\
 \text{(v)} \quad \begin{array}{r} ax - b \\ x 2ax + 2b^2 \\ \hline 2a^2x^2 - 2abx + 2ab^2x - 2b^3 \end{array} & & &
 \end{array}$$

3. Evaluate:

(i) $(c + 5)(c - 3)$

(ii) $(3c - 5d)(4c - 6d)$

(iii) $(\frac{1}{2}a + \frac{1}{2}b)(\frac{1}{2}a - \frac{1}{2}b)$

(iv) $(a^2 + 2ab + b^2)(a + b)$

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

Solution:

(i) $(c + 5)(c - 3)$

It can be written as

$$= c(c - 3) + 5(c - 3)$$

By further calculation

$$= c^2 - 3c + 5c - 15$$

$$= c^2 + 2c - 15$$

(ii) $(3c - 5d)(4c - 6d)$

It can be written as

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$$= 3c (4c - 6d) - 5d (4c - 6d)$$

By further calculation

$$= 12c^2 - 18cd - 20cd + 30d^2$$

$$= 12c^2 - 38cd + 30d^2$$

$$(iii) (1/2a + 1/2b) (1/2a - 1/2b)$$

It can be written as

$$= 1/2a (1/2a - 1/2b) + 1/2b (1/2a - 1/2b)$$

By further calculation

$$= 1/4a^2 - 1/4ab + 1/4ab - 1/4b^2$$

$$= 1/4a^2 - 1/4b^2$$

$$(iv) (a^2 + 2ab + b^2) (a + b)$$

It can be written as

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

By further calculation

$$= a^3 + 2a^2b + ab^2 + a^2b + 2ab^2 + b^3$$

$$= a^3 + b^3 + 3a^2b + 3ab^2$$

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

It can be written as

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

By further calculation

$$= 12x^4 - 6x^3 + 18x^2 - 9x - 4x^3 + 2x^2 - 6x + 3$$

$$= 12x^4 - 6x^3 - 4x^3 + 18x^2 + 2x^2 - 9x - 6x + 3$$

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So we get

$$= 12x^4 - 10x^3 + 20x^2 - 15x + 3$$

4. Evaluate:

(i) $(a + b)(a - b)$.

(ii) $(a^2 + b^2)(a + b)(a - b)$, using the result of (i).

(iii) $(a^4 + b^4)(a^2 + b^2)(a + b)(a - b)$, using the result of (ii).

Solution:

(i) $(a + b)(a - b)$.

It can be written as

$$= a(a - b) + b(a - b)$$

By further calculation

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

$$= a^2 - b^2$$

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

Substituting the result of (i)

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

It can be written as

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

So we get

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

$$= a^4 - b^4$$

(iii) $(a^4 + b^4)(a^2 + b^2)(a + b)(a - b)$

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Substituting the result of (ii)

$$= (a^4 + b^4) (a^4 - b^4)$$

It can be written as

$$= a^4 (a^4 - b^4) + b^4 (a^4 - b^4)$$

By further calculation

$$= a^8 - a^4b^4 + a^4b^4 - b^8$$

$$= a^8 - b^8$$

5. Evaluate:

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

(ii) $(3x - 2y) (4x + 3y) (8x - 5y)$

(iii) $(a + 5) (3a - 2) (5a + 1)$

(iv) $(a + 1) (a^2 - a + 1)$ and $(a - 1) (a^2 + a + 1)$; and then: $(a + 1) (a^2 - a + 1) + (a - 1) (a^2 + a + 1)$

(v) $(5m - 2n) (5m + 2n) (25m^2 + 4n^2)$

Solution:

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

It can be written as

$$= 3x (4x + 3y) - 2y (4x + 3y)$$

By further calculation

$$= 12x^2 + 9xy - 8xy - 6y^2$$

So we get

$$= 12x^2 + xy - 6y^2$$

(ii) $(3x - 2y) (4x + 3y) (8x - 5y)$

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Substituting result of (i)

$$= (12x^2 + xy - 6y^2) (8x - 5y)$$

It can be written as

$$= 8x (12x^2 + xy - 6y^2) - 5y (12x^2 + xy - 6y^2)$$

By further calculation

$$= 96x^3 + 8x^2y - 48xy^2 - 60x^2y - 5xy^2 + 30y^3$$

So we get

$$= 96x^3 + 8x^2y - 60x^2y - 48xy^2 - 5xy^2 + 30y^3$$

$$= 96x^3 - 52x^2y - 53xy^2 + 30y^3$$

$$(iii) (a + 5) (3a - 2) (5a + 1)$$

It can be written as

$$= a (3a - 2) + 5 (3a - 2) (5a + 1)$$

By further calculation

$$= (3a^2 - 2a + 15a - 10) (5a + 1)$$

So we get

$$= (3a^2 + 13a - 10) (5a + 1)$$

We can write it as

$$= 5a (3a^2 + 13a - 10) + 1 (3a^2 + 13a - 10)$$

By further calculation

$$= 15a^3 + 65a^2 - 50a + 3a^2 + 13a - 10$$

$$= 15a^3 + 68a^2 - 37a - 10$$

$$(iv) (a + 1) (a^2 - a + 1) \text{ and } (a - 1) (a^2 + a + 1); \text{ and then: } (a + 1) (a^2 - a + 1) + (a - 1) (a^2 + a + 1)$$

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Consider

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

It can be written as

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

By further calculation

$$= a^3 - a^2 + a + a^2 - a + 1$$

So we get

$$= a^3 + 1$$

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

It can be written as

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

By further calculation

$$= a^3 + a^2 + a - a^2 - a - 1$$

So we get

$$= a^3 - 1$$

Here

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

$$= a^3 + 1 + a^3 - 1$$

$$= 2a^3$$

$$(v) (5m - 2n) (5m + 2n) (25m^2 + 4n^2)$$

It can be written as

$$= [5m (5m + 2n) - 2n (5m + 2n)] (25m^2 + 4n^2)$$

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By further calculation

$$= (25m^2 + 10mn - 10mn - 4n^2) (25m^2 + 4n^2)$$

So we get

$$= (25m^2 - 4n^2) (25m^2 + 4n^2)$$

We can write it as

$$= 25m^2 (25m^2 + 4n^2) - 4n^2 (25m^2 + 4n^2)$$

By multiplying the terms

$$= 625m^4 + 100m^2n^2 - 100m^2n^2 - 16n^4$$

$$= 625m^4 - 16n^4$$

6. Multiply:

(i) mn^4 , m^3n and $5m^2n^3$

(ii) $2mnpq$, $4mnpq$ and $5mnpq$

(iii) $pq - pm$ and p^2m

(iv) $x^3 - 3y^3$ and $4x^2y^2$

(v) $a^3 - 4ab$ and $2a^2b$

Solution:

(i) mn^4 , m^3n and $5m^2n^3$

It can be written as

$$= 5m^2n^3 \times mn^4 \times m^3n$$

By further calculation

$$= 5m^{(2+1+3)} n^{(3+4+1)}$$

$$= 5m^6n^8$$

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(ii) $2mnpq$, $4mnpq$ and $5mnpq$

It can be written as

$$= 5mnpq \times 2mnpq \times 4mnpq$$

By further calculation

$$= 5 \times 2 \times 4 m^{(1+1+1)} n^{(1+1+1)} p^{(1+1+1)} q^{(1+1+1)}$$

$$= 40m^3n^3p^3q^3$$

(iii) $pq - pm$ and p^2m

It can be written as

$$= p^2m \times (pq - pm)$$

So we get

$$= p^3qm - p^3m^2$$

(iv) $x^3 - 3y^3$ and $4x^2y^2$

It can be written as

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

By further calculation

$$= 4x^5y^2 - 12x^2y^5$$

(v) $a^3 - 4ab$ and $2a^2b$

It can be written as

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

By further calculation

$$= 2a^5b - 8a^3b^2$$

7. Multiply:

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

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

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

(iv) $(2x - 3y)(2x - 3y)$

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

Solution:

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

It can be written as

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

By further calculation

$$= 4x^2 + 6xy + 6xy + 9y^2$$

$$= 4x^2 + 12xy + 9y^2$$

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

It can be written as

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

By further calculation

$$= 4x^2 + 6xy - 6xy - 9y^2$$

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

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

It can be written as

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

By further calculation

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$$= 4x^2 - 6xy + 6xy - 9y^2$$

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

(iv) $(2x - 3y)(2x - 3y)$

It can be written as

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

By further calculation

$$= 4x^2 - 6xy - 6xy + 9y^2$$

$$= 4x^2 - 12xy + 9y^2$$

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

It can be written as

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

By further calculation

$$= -4x^2 + 6xy + 6xy - 9y^2$$

$$= -4x^2 + 12xy - 9y^2$$

Exercise 11D page: 132

1. Divide:

(i) $-16ab^2c$ by $6abc$

(ii) $25x^2y$ by $-5y^2$

(iii) $8x + 24$ by 4

(iv) $4a^2 - a$ by $-a$

(v) $8m - 16$ by -8

Solution:

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(i) $-16ab^2c$ by $6abc$

We can write it as

$$= -16ab^2c / 6abc$$

$$= -8/3 b$$

(ii) $25x^2y$ by $-5y^2$

We can write it as

$$= 25x^2y / -5y^2$$

$$= -5 x^2/y$$

(iii) $8x + 24$ by 4

We can write it as

$$= (8x + 24)/4$$

Separating the terms

$$= 8x/4 + 24/4$$

$$= 2x + 6$$

(iv) $4a^2 - a$ by $-a$

We can write it as

$$= (4a^2 - a) / -a$$

Separating the terms

$$= 4a^2/-a - a/-a$$

$$= -4a + 1$$

(v) $8m - 16$ by -8

We can write it as

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$$= (8m - 16) / -8$$

Separating the terms

$$= 8m / -8 - 16 / -8$$

$$= -m + 2$$

2. Divide:

(i) $n^2 - 2n + 1$ by $n - 1$

(ii) $m^2 - 2mn + n^2$ by $m - n$

(iii) $4a^2 + 4a + 1$ by $2a + 1$

(iv) $p^2 + 4p + 4$ by $p + 2$

(v) $x^2 + 4xy + 4y^2$ by $x + 2y$

Solution:

(i) $n^2 - 2n + 1$ by $n - 1$

$$\begin{array}{r} n-1 \overline{) n^2-2n+1} \\ \underline{n^2-n} \\ -n+1 \\ \underline{-n+1} \\ 0 \end{array}$$

$$n^2 - 2n + 1 \text{ by } n - 1 = n - 1$$

(ii) $m^2 - 2mn + n^2$ by $m - n$

$$\begin{array}{r} m-n \overline{) m^2-2mn+n^2} \\ \underline{m^2-mn} \\ -mn+n^2 \\ \underline{-mn+n^2} \\ 0 \end{array}$$

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$$m^2 - 2mn + n^2 \text{ by } m - n = m - n$$

(iii) $4a^2 + 4a + 1$ by $2a + 1$

$$\begin{array}{r} 2a+1 \\ 2a+1 \overline{) 4a^2+4a+1} \\ \underline{4a^2+2a} \\ 2a+1 \\ \underline{2a+1} \\ 0 \end{array}$$

$$4a^2 + 4a + 1 \text{ by } 2a + 1 = 2a + 1$$

(iv) $p^2 + 4p + 4$ by $p + 2$

$$\begin{array}{r} p+2 \\ p+2 \overline{) p^2+4p+4} \\ \underline{p^2+2p} \\ 2p+4 \\ \underline{2p+4} \\ 0 \end{array}$$

$$p^2 + 4p + 4 \text{ by } p + 2 = p + 2$$

(v) $x^2 + 4xy + 4y^2$ by $x + 2y$

$$\begin{array}{r} x+2y \\ x+2y \overline{) x^2+4xy+4y^2} \\ \underline{x^2+2xy} \\ 2xy+4y^2 \\ \underline{2xy+4y^2} \\ 0 \end{array}$$

$$x^2 + 4xy + 4y^2 \text{ by } x + 2y = x + 2y$$

3. The area of a rectangle is $6x^2 - 4xy - 10y^2$ square unit and its length is $2x + 2y$ unit. Find its breadth.

Solution:

It is given that

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Area of a rectangle = $6x^2 - 4xy - 10y^2$ square unit

Length = $2x + 2y$ unit

We know that

Breadth = Area/ Length

So we get

$$= (6x^2 - 4xy - 10y^2) / (2x + 2y)$$

$$= 3x - 5y \text{ units}$$

$$\begin{array}{r} 3x - 5y \\ 2x + 2y \overline{) 6x^2 - 4xy - 10y^2} \\ \underline{6x^2 + 6xy} \\ - 10xy - 10y^2 \\ \underline{- 10xy - 10y^2} \\ 0 \end{array}$$

4. The area of a rectangular field is $25x^2 + 20xy + 3y^2$ square unit. If its length is $5x + 3y$ unit, find its breadth. Hence, find its perimeter.

Solution:

It is given that

Area of a rectangular field = $25x^2 + 20xy + 3y^2$ square unit

Length = $5x + 3y$ unit

We know that

Breadth = Area/ Length

So we get

$$= (25x^2 + 20xy + 3y^2) / (5x + 3y)$$

$$= 5x + y \text{ units}$$

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$$\begin{array}{r}
 5x + y \\
 5x + 3y \overline{) 25x^2 + 20xy + 3y^2} \\
 \underline{25x^2 + 15xy} \\
 5xy + 3y^2 \\
 \underline{5xy + 3y^2} \\
 0
 \end{array}$$

Now the perimeter of the rectangular field = 2 (length + breadth)

Substituting the values

$$= 2 (5x + 3y + 5x + y)$$

So we get

$$= 2 (10x + 4y)$$

$$= 20x + 8y$$

5. Divide:

(i) $2m^3n^5$ by $-mn$

(ii) $5x^2 - 3x$ by x

(iii) $10x^3y - 9xy^2 - 4x^2y^2$ by xy

(iv) $3y^3 - 9ay^2 - 6ab^2y$ by $-3y$

(v) $x^5 - 15x^4 - 10x^2$ by $-5x^2$

Solution:

(i) $2m^3n^5$ by $-mn$

It can be written as

$$= 2m^3n^5 / -mn$$

$$= -2m^2n^4$$

(ii) $5x^2 - 3x$ by x

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It can be written as

$$= (5x^2 - 3x) / x$$

Separating the terms

$$= 5x^2/x - 3x/x$$

$$= 5x - 3$$

(iii) $10x^3y - 9xy^2 - 4x^2y^2$ by xy

It can be written as

$$= (10x^3y - 9xy^2 - 4x^2y^2) / xy$$

Separating the terms

$$= 10x^3y/xy - 9xy^2/xy - 4x^2y^2/xy$$

$$= 10x^2 - 9y - 4xy$$

(iv) $3y^3 - 9ay^2 - 6ab^2y$ by $-3y$

It can be written as

$$= (3y^3 - 9ay^2 - 6ab^2y) / -3y$$

Separating the terms

$$= 3y^3/-3y - 9ay^2/-3y - 6ab^2y/-3y$$

$$= -y^2 + 3ay + 2ab^2$$

(v) $x^5 - 15x^4 - 10x^2$ by $-5x^2$

It can be written as

$$= (x^5 - 15x^4 - 10x^2) / -5x^2$$

Separating the terms

$$= x^5/-5x^2 - 15x^4/-5x^2 - 10x^2/-5x^2$$

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

Exercise 11E page: 133

Simplify:

1. $x/2 + x/4$

Solution:

$$x/2 + x/4$$

Taking LCM

$$= (2x + x)/4$$

$$= 3x/4$$

2. $a/10 + 2a/5$

Solution:

$$a/10 + 2a/5$$

Taking LCM

$$= (a + 4a)/10$$

$$= 5a/10$$

$$= a/2$$

3. $y/4 + 3y/5$

Solution:

$$y/4 + 3y/5$$

Taking LCM

$$= (5y + 12y)/20$$

$$= 17y/20$$

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4. $\frac{x}{2} - \frac{x}{8}$

Solution:

$$\frac{x}{2} - \frac{x}{8}$$

Taking LCM

$$= \frac{(4x - x)}{8}$$

$$= \frac{3x}{8}$$

5. $\frac{3y}{4} - \frac{y}{5}$

Solution:

$$\frac{3y}{4} - \frac{y}{5}$$

Taking LCM

$$= \frac{(15y - 4y)}{20}$$

$$= \frac{11y}{20}$$

6. $\frac{2p}{3} - \frac{3p}{5}$

Solution:

$$\frac{2p}{3} - \frac{3p}{5}$$

Taking LCM

$$= \frac{(10p - 9p)}{15}$$

$$= \frac{p}{15}$$

7. $\frac{k}{2} + \frac{k}{3} + \frac{2k}{5}$

Solution:

$$\frac{k}{2} + \frac{k}{3} + \frac{2k}{5}$$

Here the LCM of 2, 3 and 5 is 30

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$$= (15k + 10k + 12k)/ 30$$

$$= 37k/30$$

8. $2x/5 + 3x/4 - 3x/5$

Solution:

$$2x/5 + 3x/4 - 3x/5$$

Here the LCM of 5 and 4 is 20

$$= (8x + 15x - 12x)/ 20$$

$$= 11x/20$$

9. $4a/7 - 2a/3 + a/7$

Solution:

$$4a/7 - 2a/3 + a/7$$

Here the LCM of 3 and 7 is 21

$$= (12a - 14a + 3a)/ 21$$

$$= a/21$$

10. $2b/5 - 7b/15 + 13b/3$

Solution:

$$2b/5 - 7b/15 + 13b/3$$

Here the LCM of 3, 5 and 15 is 15

$$= (6b - 7b + 65b)/ 15$$

$$= 64b/15$$

11. $6k/7 - (8k/9 - k/3)$

Solution:

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$$6k/7 - (8k/9 - k/3)$$

Here the LCM of 7, 9 and 3 is 63

$$= [54k - (56k - 21k)]/ 63$$

By further calculation

$$= (54k - 35k)/ 63$$

$$= 19k/63$$

$$\mathbf{12. \ 3a/8 + 4a/5 - (a/2 + 2a/5)}$$

Solution:

$$3a/8 + 4a/5 - (a/2 + 2a/5)$$

Here the LCM of 8, 5 and 2 is 40

$$= [15a + 32a - (20a + 16a)]/ 40$$

By further calculation

$$= (47a - 36a)/ 40$$

$$= 11a/40$$

$$\mathbf{13. \ x + x/2 + x/3}$$

Solution:

$$x + x/2 + x/3$$

Taking LCM

$$= (6x + 3x + 2x)/ 6$$

$$= 11x/6$$

$$\mathbf{14. \ y/5 + y - 19y/15}$$

Solution:

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$$y/5 + y - 19y/15$$

Here the LCM of 5 and 15 is 15

$$= (3y + 15y - 19y)/15$$

So we get

$$= -y/15$$

$$15. x/5 + (x + 1)/2$$

Solution:

$$x/5 + (x + 1)/2$$

Here the LCM of 5 and 2 is 10

$$= (2x + 5x + 5)/10$$

$$= (7x + 5)/10$$

Exercise 11F page: 136

Enclose the given terms in brackets as required:

$$1. x - y - z = x - (\dots\dots\dots)$$

$$2. x^2 - xy^2 - 2xy - y^2 = x^2 - (\dots\dots\dots)$$

$$3. 4a - 9 + 2b - 6 = 4a - (\dots\dots\dots)$$

$$4. x^2 - y^2 + z^2 + 3x - 2y = x^2 - (\dots\dots\dots)$$

$$5. -2a^2 + 4ab - 6a^2b^2 + 8ab^2 = -2a (\dots\dots\dots)$$

Solution:

$$1. x - y - z = x - (y + z)$$

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

$$3. 4a - 9 + 2b - 6 = 4a - (9 - 2b + 6)$$

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

$$5. -2a^2 + 4ab - 6a^2b^2 + 8ab^2 = -2a (a - 2b + 3ab^2 - 4b^2)$$

Simplify:

$$6. 2x - (x + 2y - z)$$

Solution:

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

We can write it as

$$= 2x - x - 2y + z$$

So we get

$$= x - 2y + z$$

$$7. p + q - (p - q) + (2p - 3q)$$

Solution:

$$p + q - (p - q) + (2p - 3q)$$

We can write it as

$$= p + q - p + q + 2p - 3q$$

So we get

$$= 2p - q$$

$$8. 9x - (-4x + 5)$$

Solution:

$$9x - (-4x + 5)$$

We can write it as

$$= 9x + 4x - 5$$

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So we get

$$= 13x - 5$$

9. $6a - (-5a - 8b) + (3a + b)$

Solution:

$$6a - (-5a - 8b) + (3a + b)$$

We can write it as

$$= 6a + 5a + 8b + 3a + b$$

So we get

$$= 6a + 5a + 3a + 8b + b$$

$$= 14a + 9b$$

10. $(p - 2q) - (3q - r)$

Solution:

$$(p - 2q) - (3q - r)$$

We can write it as

$$= p - 2q - 3q + r$$

So we get

$$= p - 5q + r$$

11. $9a(2b - 3a + 7c)$

Solution:

$$9a(2b - 3a + 7c)$$

We can write it as

$$= 18ab - 27a^2 + 63ca$$

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12. $-5m (-2m + 3n - 7p)$

Solution:

$$-5m (-2m + 3n - 7p)$$

We can write it as

$$= 10m^2 - 15mn + 35mp$$

13. $-2x (x + y) + x^2$

Solution:

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

We can write it as

$$= -2x^2 - 2xy + x^2$$

So we get

$$= -x^2 - 2xy$$

14. $b (2b - 1/b) - 2b (b - 1/b)$

Solution:

$$b (2b - 1/b) - 2b (b - 1/b)$$

We can write it as

$$= 2b^2 - 1 - 2b^2 + 2$$

So we get

$$= 1$$

15. $8 (2a + 3b - c) - 10 (a + 2b + 3c)$

Solution:

$$8 (2a + 3b - c) - 10 (a + 2b + 3c)$$

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We can write it as

$$= 16a + 24b - 8c - 10a - 20b - 30c$$

So we get

$$= 6a + 4b - 38c$$

Exercise 11B page: 125

1. Fill in the blanks:

(i) $8x + 5x = \dots\dots$

(ii) $8x - 5x = \dots\dots$

(iii) $6xy^2 + 9xy^2 = \dots\dots$

(iv) $6xy^2 - 9xy^2 = \dots\dots$

(v) The sum of $8a$, $6a$ and $5b = \dots\dots$

(vi) The addition of 5 , $7xy$, 6 and $3xy = \dots\dots$

(vii) $4a + 3b - 7a + 4b = \dots\dots\dots$

(viii) $-15x + 13x + 8 = \dots\dots\dots$

(ix) $6x^2y + 13xy^2 - 4x^2y + 2xy^2 = \dots\dots\dots$

(x) $16x^2 - 9x^2 = \dots\dots$ and $25xy^2 - 17xy^2 = \dots\dots\dots$

Solution:

(i) $8x + 5x = 13x$

(ii) $8x - 5x = 3x$

(iii) $6xy^2 + 9xy^2 = 15xy^2$

(iv) $6xy^2 - 9xy^2 = -3xy^2$

(v) The sum of $8a$, $6a$ and $5b = 14a + 5b$

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It can be written as

$$8a + 6a + 5b = 14a + 5b$$

(vi) The addition of 5, $7xy$, 6 and $3xy = 11 + 10xy$

It can be written as

$$5 + 7xy + 6 + 3xy = 11 + 10xy$$

(vii) $4a + 3b - 7a + 4b = 7b - 3a$

It can be written as

$$4a + 3b - 7a + 4b = (4 - 7)a + (3 + 4)b$$

$$= -3a + 7b$$

(viii) $-15x + 13x + 8 = 8 - 2x$

It can be written as

$$-15x + 13x + 8 = (-15 + 13)x + 8 = -2x + 8$$

(ix) $6x^2y + 13xy^2 - 4x^2y + 2xy^2 = 2x^2y + 15xy^2$

It can be written as

$$6x^2y + 13xy^2 - 4x^2y + 2xy^2 = (6 - 4)x^2y + (13 + 2)xy^2$$

$$= 2x^2y + 15xy^2$$

(x) $16x^2 - 9x^2 = 7x^2$ and $25xy^2 - 17xy^2 = 8xy^2$

2. Add:

(i) $-9x$, $3x$ and $4x$

(ii) $23y^2$, $8y^2$ and $-12y^2$

(iii) $18pq$, $-15pq$ and $3pq$

Solution:

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(i) $-9x$, $3x$ and $4x$

It can be written as

$$= -9x + 3x + 4x$$

So we get

$$= -9x + 7x$$

$$= -2x$$

(ii) $23y^2$, $8y^2$ and $-12y^2$

It can be written as

$$= 23y^2 + 8y^2 - 12y^2$$

So we get

$$= 31y^2 - 12y^2$$

$$= 19y^2$$

(iii) $18pq$, $-15pq$ and $3pq$

It can be written as

$$= 18pq - 15pq + 3pq$$

So we get

$$= 3pq + 3pq$$

$$= 6pq$$

3. Simplify:

(i) $3m + 12m - 5m$

(ii) $7n^2 - 9n^2 + 3n^2$

(iii) $25zy - 8zy - 6zy$

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(iv) $-5ax^2 + 7ax^2 - 12ax^2$

(v) $-16am + 4mx + 4am - 15mx + 5am$

Solution:

(i) $3m + 12m - 5m$

It can be written as

$$= 15m - 5m$$

So we get

$$= 10m$$

(ii) $7n^2 - 9n^2 + 3n^2$

It can be written as

$$= (7 + 3) n^2 - 9n^2$$

So we get

$$= 10n^2 - 9n^2$$

$$= n^2$$

(iii) $25zy - 8zy - 6zy$

It can be written as

$$= 25zy - 14zy$$

So we get

$$= 11zy$$

(iv) $-5ax^2 + 7ax^2 - 12ax^2$

It can be written as

$$= (-5 - 12) ax^2 + 7ax^2$$

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So we get

$$= -17ax^2 + 7ax^2$$

$$= -10ax^2$$

$$(v) -16am + 4mx + 4am - 15mx + 5am$$

It can be written as

$$= (-16 + 4 + 5) am + (4 - 15) mx$$

So we get

$$= -7am - 11mx$$

4. Add:

(i) $a + b$ and $2a + 3b$

(ii) $2x + y$ and $3x - 4y$

(iii) $-3a + 2b$ and $3a + b$

(iv) $4 + x$, $5 - 2x$ and $6x$

Solution:

(i) $a + b$ and $2a + 3b$

It can be written as

$$= a + b + 2a + 3b$$

So we get

$$= a + 2a + b + 3b$$

$$= 3a + 4b$$

(ii) $2x + y$ and $3x - 4y$

It can be written as

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

So we get

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

$$= 5x - 3y$$

(iii) $-3a + 2b$ and $3a + b$

It can be written as

$$= -3a + 2b + 3a + b$$

So we get

$$= -3a + 3a + 2b + b$$

$$= 3b$$

(iv) $4 + x$, $5 - 2x$ and $6x$

It can be written as

$$= 4 + x + 5 - 2x + 6x$$

So we get

$$= x - 2x + 6x + 4 + 5$$

$$= 5x + 9$$

5. Find the sum of:

(i) $3x + 8y + 7z$, $6y + 4z - 2x$ and $3y - 4x + 6z$

(ii) $3a + 5b + 2c$, $2a + 3b - c$ and $a + b + c$

(iii) $4x^2 + 8xy - 2y^2$ and $8xy - 5y^2 + x^2$

(iv) $9x^2 - 6x + 7$, $5 - 4x$ and $6 - 3x^2$

(v) $5x^2 - 2xy + 3y^2$, $-2x^2 + 5xy + 9y^2$ and $3x^2 - xy - 4y^2$

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Solution:

(i) $3x + 8y + 7z$, $6y + 4z - 2x$ and $3y - 4x + 6z$

It can be written as

$$= 3x + 8y + 7z + 6y + 4z - 2x + 3y - 4x + 6z$$

By further calculation

$$= 3x - 2x - 4x + 8y + 6y + 3y + 7z + 4z + 6z$$

So we get

$$= 3x - 6x + 17y + 17z$$

$$= -3x + 17y + 17z$$

(ii) $3a + 5b + 2c$, $2a + 3b - c$ and $a + b + c$

It can be written as

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

By further calculation

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

So we get

$$= 6a + 9b + 3c - c$$

$$= 6a + 9b + 2c$$

(iii) $4x^2 + 8xy - 2y^2$ and $8xy - 5y^2 + x^2$

It can be written as

$$= 4x^2 + 8xy - 2y^2 + 8xy - 5y^2 + x^2$$

By further calculation

$$= 4x^2 + x^2 + 8xy + 8xy - 2y^2 - 5y^2$$

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So we get

$$= 5x^2 + 16xy - 7y^2$$

(iv) $9x^2 - 6x + 7$, $5 - 4x$ and $6 - 3x^2$

It can be written as

$$= 9x^2 - 6x + 7 + 5 - 4x + 6 - 3x^2$$

By further calculation

$$= 9x^2 - 3x^2 - 6x - 4x + 7 + 5 + 6$$

So we get

$$= 6x^2 - 10x + 18$$

(v) $5x^2 - 2xy + 3y^2$, $-2x^2 + 5xy + 9y^2$ and $3x^2 - xy - 4y^2$

It can be written as

$$= 5x^2 - 2xy + 3y^2 - 2x^2 + 5xy + 9y^2 + 3x^2 - xy - 4y^2$$

By further calculation

$$= 5x^2 - 2x^2 + 3x^2 - 2xy + 5xy - xy + 3y^2 + 9y^2 - 4y^2$$

So we get

$$= 6x^2 + 2xy + 8y^2$$

6. Find the sum of:

(i) x and $3y$

(ii) $-2a$ and $+5$

(iii) $-4x^2$ and $+7x$

(iv) $+4a$ and $-7b$

(v) x^3 , $3x^2y$ and $2y^2$

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(vi) 11 and $-by$

Solution:

(i) x and $3y$

The sum of x and $3y$ is $x + 3y$.

(ii) $-2a$ and $+5$

The sum of $-2a$ and $+5$ is $-2a + 5$.

(iii) $-4x^2$ and $+7x$

The sum of $-4x^2$ and $+7x$ is $-4x^2 + 7x$.

(iv) $+4a$ and $-7b$

The sum of $+4a$ and $-7b$ is $+4a - 7b$.

(v) x^3 , $3x^2y$ and $2y^2$

The sum of x^3 , $3x^2y$ and $2y^2$ is $x^3 + 3x^2y + 2y^2$.

(vi) 11 and $-by$

The sum of 11 and $-by$ is $11 - by$.

7. The sides of a triangle are $2x + 3y$, $x + 5y$ and $7x - 2y$. Find its perimeter.

Solution:

It is given that

Sides of a triangle are $2x + 3y$, $x + 5y$ and $7x - 2y$

We know that

Perimeter = Sum of all three sides of a triangle

Substituting the values

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

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By further calculation

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

So we get

$$= 10x + 8y - 2y$$

$$= 10x + 6y$$

8. The two adjacent sides of a rectangle are $6a + 9b$ and $8a - 4b$. Find its perimeter.

Solution:

It is given that

Sides of a rectangle are $6a + 9b$ and $8a - 4b$

So length = $6a + 9b$ and breadth = $8a - 4b$

We know that

$$\text{Perimeter} = 2 (\text{length} + \text{breadth})$$

Substituting the values

$$= 2 (6a + 9b + 8a - 4b)$$

By further calculation

$$= 2 (14a + 5b)$$

So we get

$$= 28a + 10b$$

9. Subtract the second expression from the first:

(i) $2a + b$, $a + b$

(ii) $-2b + 2c$, $b + 3c$

(iii) $5a + b$, $-6b + 2a$

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(iv) $a^3 - 1 + a$, $3a - 2a^2$

(v) $p + 2$, 1

Solution:

(i) $2a + b$, $a + b$

It can be written as

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

So we get

$$= 2a + b - a - b$$

$$= 2a - a + b - b$$

$$= a$$

(ii) $-2b + 2c$, $b + 3c$

It can be written as

$$= (-2b + 2c) - (b + 3c)$$

So we get

$$= -2b + 2c - b - 3c$$

$$= -2b - b + 2c - 3c$$

$$= -3b - c$$

(iii) $5a + b$, $-6b + 2a$

It can be written as

$$= (5a + b) - (-6b + 2a)$$

So we get

$$= 5a + b + 6b - 2a$$

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$$= 5a - 2a + b + 6b$$

$$= 3a + 7b$$

$$(iv) a^3 - 1 + a, 3a - 2a^2$$

It can be written as

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

So we get

$$= a^3 - 1 + a - 3a + 2a^2$$

$$= a^3 + 2a^2 + a - 3a - 1$$

$$= a^3 + 2a^2 - 2a - 1$$

$$(v) p + 2, 1$$

It can be written as

$$= p + 2 - 1$$

So we get

$$= p + 1$$

10. Subtract:

$$(i) 4x \text{ from } 8 - x$$

$$(ii) -8c \text{ from } c + 3d$$

$$(iii) -5a - 2b \text{ from } b + 6c$$

$$(iv) 4p + p^2 \text{ from } 3p^2 - 8p$$

$$(v) 5a - 3b + 2c \text{ from } 4a - b - 2c$$

Solution:

$$(i) 4x \text{ from } 8 - x$$

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It can be written as

$$= (8 - x) - 4x$$

By further calculation

$$= 8 - x - 4x$$

$$= 8 - 5x$$

(ii) $-8c$ from $c + 3d$

It can be written as

$$= (c + 3d) - (-8c)$$

By further calculation

$$= c + 3d + 8c$$

$$= 9c + 3d$$

(iii) $-5a - 2b$ from $b + 6c$

It can be written as

$$= (b + 6c) - (-5a - 2b)$$

By further calculation

$$= b + 6c + 5a + 2b$$

$$= 5a + 3b + 6c$$

(iv) $4p + p^2$ from $3p^2 - 8p$

It can be written as

$$= (3p^2 - 8p) - (4p + p^2)$$

By further calculation

$$= 3p^2 - 8p - 4p - p^2$$

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$$= 2p^2 - 12p$$

(v) $5a - 3b + 2c$ from $4a - b - 2c$

It can be written as

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

By further calculation

$$= 4a - b - 2c - 5a + 3b - 2c$$

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

11. Subtract $-5a^2 - 3a + 1$ from the sum of $4a^2 + 3 - 8a$ and $9a - 7$.

Solution:

We know that

Sum of $4a^2 + 3 - 8a$ and $9a - 7$ can be written as

$$= 4a^2 + 3 - 8a + 9a - 7$$

By further calculation

$$= 4a^2 + a - 4$$

Here

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

By further calculation

$$= 4a^2 + 5a^2 + a + 3a - 4 - 1$$

So we get

$$= 9a^2 + 4a - 5$$

12. By how much does $8x^3 - 6x^2 + 9x - 10$ exceed $4x^3 + 2x^2 + 7x - 3$?

Solution:

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We know that

$$8x^3 - 6x^2 + 9x - 10 \text{ exceed } 4x^3 + 2x^2 + 7x - 3$$

It can be written as

$$= (8x^3 - 6x^2 + 9x - 10) - (4x^3 + 2x^2 + 7x - 3)$$

By further calculation

$$= 8x^3 - 6x^2 + 9x - 10 - 4x^3 - 2x^2 - 7x + 3$$

So we get

$$= 8x^3 - 4x^3 - 6x^2 - 2x^2 + 9x - 7x - 10 + 3$$

$$= 4x^3 - 8x^2 + 2x - 7$$

13. What must be added to $2a^3 + 5a - a^2 - 6$ to get $a^2 - a - a^3 + 1$?

Solution:

The answer can be obtained by subtracting $2a^3 + 5a - a^2 - 6$ from $a^2 - a - a^3 + 1$

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

It can be written as

$$= -a^3 + a^2 - a + 1 - 2a^3 - 5a + a^2 + 6$$

By further calculation

$$= -a^3 - 2a^3 + a^2 + a^2 - a - 5a + 1 + 6$$

$$= -3a^3 + 2a^2 - 6a + 7$$

14. What must be subtracted from $a^2 + b^2 + 2ab$ to get $-4ab + 2b^2$?

Solution:

The answer can be obtained by subtracting $-4ab + 2b^2$ from $a^2 + b^2 + 2ab$

$$= a^2 + b^2 + 2ab - (-4ab + 2b^2)$$

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It can be written as

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

By further calculation

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

$$= a^2 - b^2 + 6ab$$

15. Find the excess of $4m^2 + 4n^2 + 4p^2$ over $m^2 + 3n^2 - 5p^2$.

Solution:

The answer can be obtained by subtracting $m^2 + 3n^2 - 5p^2$ from $4m^2 + 4n^2 + 4p^2$

$$= (4m^2 + 4n^2 + 4p^2) - (m^2 + 3n^2 - 5p^2)$$

It can be written as

$$= 4m^2 + 4n^2 + 4p^2 - m^2 - 3n^2 + 5p^2$$

By further calculation

$$= 4m^2 - m^2 + 4n^2 - 3n^2 + 4p^2 + 5p^2$$

$$= 3m^2 + n^2 + 9p^2$$

Exercise 11C page: 129

1. Multiply:

(i) $3x$, $5x^2y$ and $2y$

(ii) 5 , $3a$ and $2ab^2$

(iii) $5x + 2y$ and $3xy$

(iv) $6a - 5b$ and $-2a$

(v) $4a + 5b$ and $4a - 5b$

Solution:

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(i) $3x$, $5x^2y$ and $2y$

$$\text{Product} = 3x \times 5x^2y \times 2y$$

We can write it as

$$= 3 \times 5 \times 2 \times x \times x^2 \times y \times y$$

So we get

$$= 30x^3y^2$$

(ii) 5 , $3a$ and $2ab^2$

$$\text{Product} = 5 \times 3a \times 2ab^2$$

We can write it as

$$= 5 \times 3 \times 2 \times a \times ab^2$$

So we get

$$= 30a^2b^2$$

(iii) $5x + 2y$ and $3xy$

$$\text{Product} = 3xy (5x + 2y)$$

We can write it as

$$= 3xy \times 5x + 3xy \times 2y$$

So we get

$$= 15x^2y + 6xy^2$$

(iv) $6a - 5b$ and $-2a$

$$\text{Product} = -2a (6a - 5b)$$

We can write it as

$$= -2a \times 6a + 2a \times 5b$$

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So we get

$$= -12a^2 + 10ab$$

(v) $4a + 5b$ and $4a - 5b$

$$\text{Product} = (4a + 5b)(4a - 5b)$$

So we get

$$= 16a^2 - 25b^2$$

$$\begin{array}{r} 4a + 5b \\ \times 4a - 5b \\ \hline 16a^2 + 20ab \\ - 20ab - 25b^2 \\ \hline 16a^2 - 25b^2 \end{array}$$

2. Copy and complete the following multiplications:

$$\begin{array}{r} \text{(i)} \quad 3a + 2b \\ \times 3xy \\ \hline \end{array}$$

$$\begin{array}{r} \text{(ii)} \quad 9x - 5y \\ \times 3xy \\ \hline \end{array}$$

$$\begin{array}{r} \text{(iii)} \quad 3xy - 2x^2 - 6x \\ \times 5x^2y \\ \hline \end{array}$$

$$\begin{array}{r} \text{(iv)} \quad a + b \\ \times a + b \\ \hline \end{array}$$

$$\begin{array}{r} \text{(v)} \quad ax - b \\ \times 2ax + 2b^2 \\ \hline \end{array}$$

Solution:

<https://www.indcareer.com/schools/selina-class-7-icse-solutions-mathematics-chapter-11-fundamental-concepts-including-fundamental-operations/>

$$\begin{array}{llll}
 \text{(i)} \quad \begin{array}{r} 3a + 2b \\ x - 3xy \\ \hline -9axy - 6bxy \end{array} & \text{(ii)} \quad \begin{array}{r} 9x - 5y \\ x - 3xy \\ \hline -27x^2y + 15xy^2 \end{array} & \text{(iii)} \quad \begin{array}{r} 3xy - 2x^2 - 6x \\ x - 5x^2y \\ \hline -15x^3y^2 + 10x^4y + 30x^3y \end{array} & \text{(iv)} \quad \begin{array}{r} a + b \\ x a + b \\ \hline a^2 + ab \\ \hline ab + b^2 \\ \hline a^2 + 2ab + b^2 \end{array} \\
 \text{(v)} \quad \begin{array}{r} ax - b \\ x 2ax + 2b^2 \\ \hline 2a^2x^2 - 2abx + 2ab^2x - 2b^3 \end{array} & & &
 \end{array}$$

3. Evaluate:

(i) $(c + 5)(c - 3)$

(ii) $(3c - 5d)(4c - 6d)$

(iii) $(\frac{1}{2}a + \frac{1}{2}b)(\frac{1}{2}a - \frac{1}{2}b)$

(iv) $(a^2 + 2ab + b^2)(a + b)$

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

Solution:

(i) $(c + 5)(c - 3)$

It can be written as

$$= c(c - 3) + 5(c - 3)$$

By further calculation

$$= c^2 - 3c + 5c - 15$$

$$= c^2 + 2c - 15$$

(ii) $(3c - 5d)(4c - 6d)$

It can be written as

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$$= 3c (4c - 6d) - 5d (4c - 6d)$$

By further calculation

$$= 12c^2 - 18cd - 20cd + 30d^2$$

$$= 12c^2 - 38cd + 30d^2$$

$$(iii) (1/2a + 1/2b) (1/2a - 1/2b)$$

It can be written as

$$= 1/2a (1/2a - 1/2b) + 1/2b (1/2a - 1/2b)$$

By further calculation

$$= 1/4a^2 - 1/4ab + 1/4ab - 1/4b^2$$

$$= 1/4a^2 - 1/4b^2$$

$$(iv) (a^2 + 2ab + b^2) (a + b)$$

It can be written as

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

By further calculation

$$= a^3 + 2a^2b + ab^2 + a^2b + 2ab^2 + b^3$$

$$= a^3 + b^3 + 3a^2b + 3ab^2$$

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

It can be written as

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

By further calculation

$$= 12x^4 - 6x^3 + 18x^2 - 9x - 4x^3 + 2x^2 - 6x + 3$$

$$= 12x^4 - 6x^3 - 4x^3 + 18x^2 + 2x^2 - 9x - 6x + 3$$

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So we get

$$= 12x^4 - 10x^3 + 20x^2 - 15x + 3$$

4. Evaluate:

(i) $(a + b)(a - b)$.

(ii) $(a^2 + b^2)(a + b)(a - b)$, using the result of (i).

(iii) $(a^4 + b^4)(a^2 + b^2)(a + b)(a - b)$, using the result of (ii).

Solution:

(i) $(a + b)(a - b)$.

It can be written as

$$= a(a - b) + b(a - b)$$

By further calculation

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

$$= a^2 - b^2$$

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

Substituting the result of (i)

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

It can be written as

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

So we get

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

$$= a^4 - b^4$$

(iii) $(a^4 + b^4)(a^2 + b^2)(a + b)(a - b)$

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Substituting the result of (ii)

$$= (a^4 + b^4) (a^4 - b^4)$$

It can be written as

$$= a^4 (a^4 - b^4) + b^4 (a^4 - b^4)$$

By further calculation

$$= a^8 - a^4b^4 + a^4b^4 - b^8$$

$$= a^8 - b^8$$

5. Evaluate:

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

(ii) $(3x - 2y) (4x + 3y) (8x - 5y)$

(iii) $(a + 5) (3a - 2) (5a + 1)$

(iv) $(a + 1) (a^2 - a + 1)$ and $(a - 1) (a^2 + a + 1)$; and then: $(a + 1) (a^2 - a + 1) + (a - 1) (a^2 + a + 1)$

(v) $(5m - 2n) (5m + 2n) (25m^2 + 4n^2)$

Solution:

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

It can be written as

$$= 3x (4x + 3y) - 2y (4x + 3y)$$

By further calculation

$$= 12x^2 + 9xy - 8xy - 6y^2$$

So we get

$$= 12x^2 + xy - 6y^2$$

(ii) $(3x - 2y) (4x + 3y) (8x - 5y)$

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Substituting result of (i)

$$= (12x^2 + xy - 6y^2) (8x - 5y)$$

It can be written as

$$= 8x (12x^2 + xy - 6y^2) - 5y (12x^2 + xy - 6y^2)$$

By further calculation

$$= 96x^3 + 8x^2y - 48xy^2 - 60x^2y - 5xy^2 + 30y^3$$

So we get

$$= 96x^3 + 8x^2y - 60x^2y - 48xy^2 - 5xy^2 + 30y^3$$

$$= 96x^3 - 52x^2y - 53xy^2 + 30y^3$$

$$(iii) (a + 5) (3a - 2) (5a + 1)$$

It can be written as

$$= a (3a - 2) + 5 (3a - 2) (5a + 1)$$

By further calculation

$$= (3a^2 - 2a + 15a - 10) (5a + 1)$$

So we get

$$= (3a^2 + 13a - 10) (5a + 1)$$

We can write it as

$$= 5a (3a^2 + 13a - 10) + 1 (3a^2 + 13a - 10)$$

By further calculation

$$= 15a^3 + 65a^2 - 50a + 3a^2 + 13a - 10$$

$$= 15a^3 + 68a^2 - 37a - 10$$

$$(iv) (a + 1) (a^2 - a + 1) \text{ and } (a - 1) (a^2 + a + 1); \text{ and then: } (a + 1) (a^2 - a + 1) + (a - 1) (a^2 + a + 1)$$

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Consider

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

It can be written as

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

By further calculation

$$= a^3 - a^2 + a + a^2 - a + 1$$

So we get

$$= a^3 + 1$$

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

It can be written as

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

By further calculation

$$= a^3 + a^2 + a - a^2 - a - 1$$

So we get

$$= a^3 - 1$$

Here

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

$$= a^3 + 1 + a^3 - 1$$

$$= 2a^3$$

$$(v) (5m - 2n) (5m + 2n) (25m^2 + 4n^2)$$

It can be written as

$$= [5m (5m + 2n) - 2n (5m + 2n)] (25m^2 + 4n^2)$$

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By further calculation

$$= (25m^2 + 10mn - 10mn - 4n^2) (25m^2 + 4n^2)$$

So we get

$$= (25m^2 - 4n^2) (25m^2 + 4n^2)$$

We can write it as

$$= 25m^2 (25m^2 + 4n^2) - 4n^2 (25m^2 + 4n^2)$$

By multiplying the terms

$$= 625m^4 + 100m^2n^2 - 100m^2n^2 - 16n^4$$

$$= 625m^4 - 16n^4$$

6. Multiply:

(i) mn^4 , m^3n and $5m^2n^3$

(ii) $2mnpq$, $4mnpq$ and $5mnpq$

(iii) $pq - pm$ and p^2m

(iv) $x^3 - 3y^3$ and $4x^2y^2$

(v) $a^3 - 4ab$ and $2a^2b$

Solution:

(i) mn^4 , m^3n and $5m^2n^3$

It can be written as

$$= 5m^2n^3 \times mn^4 \times m^3n$$

By further calculation

$$= 5m^{(2+1+3)} n^{(3+4+1)}$$

$$= 5m^6n^8$$

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(ii) $2mnpq$, $4mnpq$ and $5mnpq$

It can be written as

$$= 5mnpq \times 2mnpq \times 4mnpq$$

By further calculation

$$= 5 \times 2 \times 4 m^{(1+1+1)} n^{(1+1+1)} p^{(1+1+1)} q^{(1+1+1)}$$

$$= 40m^3n^3p^3q^3$$

(iii) $pq - pm$ and p^2m

It can be written as

$$= p^2m \times (pq - pm)$$

So we get

$$= p^3qm - p^3m^2$$

(iv) $x^3 - 3y^3$ and $4x^2y^2$

It can be written as

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

By further calculation

$$= 4x^5y^2 - 12x^2y^5$$

(v) $a^3 - 4ab$ and $2a^2b$

It can be written as

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

By further calculation

$$= 2a^5b - 8a^3b^2$$

7. Multiply:

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

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

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

(iv) $(2x - 3y)(2x - 3y)$

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

Solution:

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

It can be written as

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

By further calculation

$$= 4x^2 + 6xy + 6xy + 9y^2$$

$$= 4x^2 + 12xy + 9y^2$$

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

It can be written as

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

By further calculation

$$= 4x^2 + 6xy - 6xy - 9y^2$$

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

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

It can be written as

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

By further calculation

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$$= 4x^2 - 6xy + 6xy - 9y^2$$

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

(iv) $(2x - 3y)(2x - 3y)$

It can be written as

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

By further calculation

$$= 4x^2 - 6xy - 6xy + 9y^2$$

$$= 4x^2 - 12xy + 9y^2$$

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

It can be written as

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

By further calculation

$$= -4x^2 + 6xy + 6xy - 9y^2$$

$$= -4x^2 + 12xy - 9y^2$$

Exercise 11D page: 132

1. Divide:

(i) $-16ab^2c$ by $6abc$

(ii) $25x^2y$ by $-5y^2$

(iii) $8x + 24$ by 4

(iv) $4a^2 - a$ by $-a$

(v) $8m - 16$ by -8

Solution:

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(i) $-16ab^2c$ by $6abc$

We can write it as

$$= -16ab^2c / 6abc$$

$$= -8/3 b$$

(ii) $25x^2y$ by $-5y^2$

We can write it as

$$= 25x^2y / -5y^2$$

$$= -5 x^2/y$$

(iii) $8x + 24$ by 4

We can write it as

$$= (8x + 24)/4$$

Separating the terms

$$= 8x/4 + 24/4$$

$$= 2x + 6$$

(iv) $4a^2 - a$ by $-a$

We can write it as

$$= (4a^2 - a) / -a$$

Separating the terms

$$= 4a^2/-a - a/-a$$

$$= -4a + 1$$

(v) $8m - 16$ by -8

We can write it as

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$$= (8m - 16) / -8$$

Separating the terms

$$= 8m / -8 - 16 / -8$$

$$= -m + 2$$

2. Divide:

(i) $n^2 - 2n + 1$ by $n - 1$

(ii) $m^2 - 2mn + n^2$ by $m - n$

(iii) $4a^2 + 4a + 1$ by $2a + 1$

(iv) $p^2 + 4p + 4$ by $p + 2$

(v) $x^2 + 4xy + 4y^2$ by $x + 2y$

Solution:

(i) $n^2 - 2n + 1$ by $n - 1$

$$\begin{array}{r} n-1 \overline{) n^2-2n+1} \\ \underline{n^2-n} \\ -n+1 \\ \underline{-n+1} \\ 0 \end{array}$$

$$n^2 - 2n + 1 \text{ by } n - 1 = n - 1$$

(ii) $m^2 - 2mn + n^2$ by $m - n$

$$\begin{array}{r} m-n \overline{) m^2-2mn+n^2} \\ \underline{m^2-mn} \\ -mn+n^2 \\ \underline{-mn+n^2} \\ 0 \end{array}$$

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$$m^2 - 2mn + n^2 \text{ by } m - n = m - n$$

(iii) $4a^2 + 4a + 1$ by $2a + 1$

$$\begin{array}{r} 2a+1 \\ 2a+1 \overline{) 4a^2+4a+1} \\ \underline{4a^2+2a} \\ 2a+1 \\ \underline{2a+1} \\ 0 \end{array}$$

$$4a^2 + 4a + 1 \text{ by } 2a + 1 = 2a + 1$$

(iv) $p^2 + 4p + 4$ by $p + 2$

$$\begin{array}{r} p+2 \\ p+2 \overline{) p^2+4p+4} \\ \underline{p^2+2p} \\ 2p+4 \\ \underline{2p+4} \\ 0 \end{array}$$

$$p^2 + 4p + 4 \text{ by } p + 2 = p + 2$$

(v) $x^2 + 4xy + 4y^2$ by $x + 2y$

$$\begin{array}{r} x+2y \\ x+2y \overline{) x^2+4xy+4y^2} \\ \underline{x^2+2xy} \\ 2xy+4y^2 \\ \underline{2xy+4y^2} \\ 0 \end{array}$$

$$x^2 + 4xy + 4y^2 \text{ by } x + 2y = x + 2y$$

3. The area of a rectangle is $6x^2 - 4xy - 10y^2$ square unit and its length is $2x + 2y$ unit. Find its breadth.

Solution:

It is given that

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Area of a rectangle = $6x^2 - 4xy - 10y^2$ square unit

Length = $2x + 2y$ unit

We know that

Breadth = Area/ Length

So we get

$$= (6x^2 - 4xy - 10y^2) / (2x + 2y)$$

$$= 3x - 5y \text{ units}$$

$$\begin{array}{r} 3x - 5y \\ 2x + 2y \overline{) 6x^2 - 4xy - 10y^2} \\ \underline{6x^2 + 6xy} \\ - 10xy - 10y^2 \\ \underline{- 10xy - 10y^2} \\ 0 \end{array}$$

4. The area of a rectangular field is $25x^2 + 20xy + 3y^2$ square unit. If its length is $5x + 3y$ unit, find its breadth. Hence, find its perimeter.

Solution:

It is given that

Area of a rectangular field = $25x^2 + 20xy + 3y^2$ square unit

Length = $5x + 3y$ unit

We know that

Breadth = Area/ Length

So we get

$$= (25x^2 + 20xy + 3y^2) / (5x + 3y)$$

$$= 5x + y \text{ units}$$

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$$\begin{array}{r}
 5x + y \\
 5x + 3y \overline{) 25x^2 + 20xy + 3y^2} \\
 \underline{25x^2 + 15xy} \\
 5xy + 3y^2 \\
 \underline{5xy + 3y^2} \\
 0
 \end{array}$$

Now the perimeter of the rectangular field = 2 (length + breadth)

Substituting the values

$$= 2 (5x + 3y + 5x + y)$$

So we get

$$= 2 (10x + 4y)$$

$$= 20x + 8y$$

5. Divide:

(i) $2m^3n^5$ by $-mn$

(ii) $5x^2 - 3x$ by x

(iii) $10x^3y - 9xy^2 - 4x^2y^2$ by xy

(iv) $3y^3 - 9ay^2 - 6ab^2y$ by $-3y$

(v) $x^5 - 15x^4 - 10x^2$ by $-5x^2$

Solution:

(i) $2m^3n^5$ by $-mn$

It can be written as

$$= 2m^3n^5 / -mn$$

$$= -2m^2n^4$$

(ii) $5x^2 - 3x$ by x

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It can be written as

$$= (5x^2 - 3x) / x$$

Separating the terms

$$= 5x^2/x - 3x/x$$

$$= 5x - 3$$

(iii) $10x^3y - 9xy^2 - 4x^2y^2$ by xy

It can be written as

$$= (10x^3y - 9xy^2 - 4x^2y^2) / xy$$

Separating the terms

$$= 10x^3y/xy - 9xy^2/xy - 4x^2y^2/xy$$

$$= 10x^2 - 9y - 4xy$$

(iv) $3y^3 - 9ay^2 - 6ab^2y$ by $-3y$

It can be written as

$$= (3y^3 - 9ay^2 - 6ab^2y) / -3y$$

Separating the terms

$$= 3y^3/-3y - 9ay^2/-3y - 6ab^2y/-3y$$

$$= -y^2 + 3ay + 2ab^2$$

(v) $x^5 - 15x^4 - 10x^2$ by $-5x^2$

It can be written as

$$= (x^5 - 15x^4 - 10x^2) / -5x^2$$

Separating the terms

$$= x^5/-5x^2 - 15x^4/-5x^2 - 10x^2/-5x^2$$

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

Exercise 11E page: 133

Simplify:

1. $x/2 + x/4$

Solution:

$$x/2 + x/4$$

Taking LCM

$$= (2x + x)/4$$

$$= 3x/4$$

2. $a/10 + 2a/5$

Solution:

$$a/10 + 2a/5$$

Taking LCM

$$= (a + 4a)/10$$

$$= 5a/10$$

$$= a/2$$

3. $y/4 + 3y/5$

Solution:

$$y/4 + 3y/5$$

Taking LCM

$$= (5y + 12y)/20$$

$$= 17y/20$$

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4. $x/2 - x/8$

Solution:

$$x/2 - x/8$$

Taking LCM

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

$$= 3x/8$$

5. $3y/4 - y/5$

Solution:

$$3y/4 - y/5$$

Taking LCM

$$= (15y - 4y)/20$$

$$= 11y/20$$

6. $2p/3 - 3p/5$

Solution:

$$2p/3 - 3p/5$$

Taking LCM

$$= (10p - 9p)/15$$

$$= p/15$$

7. $k/2 + k/3 + 2k/5$

Solution:

$$k/2 + k/3 + 2k/5$$

Here the LCM of 2, 3 and 5 is 30

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$$= (15k + 10k + 12k)/30$$

$$= 37k/30$$

8. $2x/5 + 3x/4 - 3x/5$

Solution:

$$2x/5 + 3x/4 - 3x/5$$

Here the LCM of 5 and 4 is 20

$$= (8x + 15x - 12x)/20$$

$$= 11x/20$$

9. $4a/7 - 2a/3 + a/7$

Solution:

$$4a/7 - 2a/3 + a/7$$

Here the LCM of 3 and 7 is 21

$$= (12a - 14a + 3a)/21$$

$$= a/21$$

10. $2b/5 - 7b/15 + 13b/3$

Solution:

$$2b/5 - 7b/15 + 13b/3$$

Here the LCM of 3, 5 and 15 is 15

$$= (6b - 7b + 65b)/15$$

$$= 64b/15$$

11. $6k/7 - (8k/9 - k/3)$

Solution:

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$$6k/7 - (8k/9 - k/3)$$

Here the LCM of 7, 9 and 3 is 63

$$= [54k - (56k - 21k)]/ 63$$

By further calculation

$$= (54k - 35k)/ 63$$

$$= 19k/63$$

$$\mathbf{12. \ 3a/8 + 4a/5 - (a/2 + 2a/5)}$$

Solution:

$$3a/8 + 4a/5 - (a/2 + 2a/5)$$

Here the LCM of 8, 5 and 2 is 40

$$= [15a + 32a - (20a + 16a)]/ 40$$

By further calculation

$$= (47a - 36a)/ 40$$

$$= 11a/40$$

$$\mathbf{13. \ x + x/2 + x/3}$$

Solution:

$$x + x/2 + x/3$$

Taking LCM

$$= (6x + 3x + 2x)/ 6$$

$$= 11x/6$$

$$\mathbf{14. \ y/5 + y - 19y/15}$$

Solution:

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$$y/5 + y - 19y/15$$

Here the LCM of 5 and 15 is 15

$$= (3y + 15y - 19y)/15$$

So we get

$$= -y/15$$

$$15. x/5 + (x + 1)/2$$

Solution:

$$x/5 + (x + 1)/2$$

Here the LCM of 5 and 2 is 10

$$= (2x + 5x + 5)/10$$

$$= (7x + 5)/10$$

Exercise 11F page: 136

Enclose the given terms in brackets as required:

$$1. x - y - z = x - (\dots\dots\dots)$$

$$2. x^2 - xy^2 - 2xy - y^2 = x^2 - (\dots\dots\dots)$$

$$3. 4a - 9 + 2b - 6 = 4a - (\dots\dots\dots)$$

$$4. x^2 - y^2 + z^2 + 3x - 2y = x^2 - (\dots\dots\dots)$$

$$5. -2a^2 + 4ab - 6a^2b^2 + 8ab^2 = -2a (\dots\dots\dots)$$

Solution:

$$1. x - y - z = x - (y + z)$$

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

$$3. 4a - 9 + 2b - 6 = 4a - (9 - 2b + 6)$$

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

$$5. -2a^2 + 4ab - 6a^2b^2 + 8ab^2 = -2a (a - 2b + 3ab^2 - 4b^2)$$

Simplify:

$$6. 2x - (x + 2y - z)$$

Solution:

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

We can write it as

$$= 2x - x - 2y + z$$

So we get

$$= x - 2y + z$$

$$7. p + q - (p - q) + (2p - 3q)$$

Solution:

$$p + q - (p - q) + (2p - 3q)$$

We can write it as

$$= p + q - p + q + 2p - 3q$$

So we get

$$= 2p - q$$

$$8. 9x - (-4x + 5)$$

Solution:

$$9x - (-4x + 5)$$

We can write it as

$$= 9x + 4x - 5$$

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So we get

$$= 13x - 5$$

9. $6a - (-5a - 8b) + (3a + b)$

Solution:

$$6a - (-5a - 8b) + (3a + b)$$

We can write it as

$$= 6a + 5a + 8b + 3a + b$$

So we get

$$= 6a + 5a + 3a + 8b + b$$

$$= 14a + 9b$$

10. $(p - 2q) - (3q - r)$

Solution:

$$(p - 2q) - (3q - r)$$

We can write it as

$$= p - 2q - 3q + r$$

So we get

$$= p - 5q + r$$

11. $9a(2b - 3a + 7c)$

Solution:

$$9a(2b - 3a + 7c)$$

We can write it as

$$= 18ab - 27a^2 + 63ca$$

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12. $-5m (-2m + 3n - 7p)$

Solution:

$$-5m (-2m + 3n - 7p)$$

We can write it as

$$= 10m^2 - 15mn + 35mp$$

13. $-2x (x + y) + x^2$

Solution:

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

We can write it as

$$= -2x^2 - 2xy + x^2$$

So we get

$$= -x^2 - 2xy$$

14. $b (2b - 1/b) - 2b (b - 1/b)$

Solution:

$$b (2b - 1/b) - 2b (b - 1/b)$$

We can write it as

$$= 2b^2 - 1 - 2b^2 + 2$$

So we get

$$= 1$$

15. $8 (2a + 3b - c) - 10 (a + 2b + 3c)$

Solution:

$$8 (2a + 3b - c) - 10 (a + 2b + 3c)$$

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We can write it as

$$= 16a + 24b - 8c - 10a - 20b - 30c$$

So we get

$$= 6a + 4b - 38c$$



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For any clarifications or questions you can write to **info@indcareer.com**

Postal Address

IndCareer.com
52, Shilpa Nagar,
Somalwada
Nagpur - 440015
Maharashtra, India

WhatsApp: +91 9561 204 888

Website: <https://www.indcareer.com>

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