EXERCISE 6.1 PAGE NO: 6.2

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:
$3x^2y$, $-5x^2y^2z^2$ and z^2
The coefficient of $3x^2y$ 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

(v) a/2 + b/2 - ab
The given equation has three terms that are:
a/2, b/2, -ab
The coefficient of a/2 is 1/2
The coefficient of b/2 is 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
∴ It is Binomial

(ii) 1000
The given expression contains one term 1000
∴ It is Monomial

(iii) $x+x^2+x^3+x^4$
The given expression contains four terms

∴ 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 Binomial

EXERCISE 6.2 PAGE NO: 6.5

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 – 137xy
(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
$3a^2b + (-4a^2b) + 9a^2b$
$3a^2b – 4a^2b + 9a^2b$
$8a^2b$

(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
(2×5)/(3×5)a + (3×3)/(5×3)a – (6×3)/(5×3)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
$12x^2y – 3x^2y – 7x^2y – 6xy^2 + 5xy^2 + 4xy^2$
$3xy^2 + 2x^2y$

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

(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 from 12xy
(ii) $2a^2$ from $-7a^2$
(iii) 2a-b from 3a-5b
(iv) $2x^3$ - $4x^2$ + 3x + 5 from $4x^3 + x^2$ + x + 6
(v) $2/3y^3 – 2/7y^2$ – 5 from $1/3y^3 + 5/7y^2$ + y – 2
(vi) 3/2x – 5/4y – 7/2z from 2/3x + 3/2y – 4/3z
(vii) $x^2y – 4/5xy^2$ + 4/3xy from $2/3x^2y + 3/2xy^2$ - 1/3xy
(viii) ab/7 -35/3bc + 6/5ac from 3/5bc – 4/5ac
Solution:
(i) -5xy from 12xy
Let us subtract the given expression
12xy - (- 5xy)
5xy + 12xy
17xy

(ii) $2a^2$ from $-7a^2$
Let us subtract the given expression
$(-7a^2) - 2a^2$
$-7a^2 - 2a^2$

$-9a^2$

(iii) 2a-b from 3a-5b
Let us subtract the given expression
(3a – 5b) - (2a – b)
3a - 5b - 2a + b
a – 4b

(iv) $2x^3 - 4x^2 + 3x + 5$ from $4x^3 + x^2 + x + 6$
Let us subtract the given expression
$(4x^3 + x^2 + x + 6) - (2x^3 – 4x^2 + 3x + 5)$
$4x^3 + x^2 + x + 6 - 2x^3 + 4x^2 – 3x – 5$
$2x^3 + 5x^2 – 2x + 1$

(v) $2/3y^3 – 2/7y^2 – 5$ 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
$1/3a^5 – 3/2a^3 – 3/4a^2 – 5/2a^2 – a/3 – 5/2 + 6/5$
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 $2l + 5m – 4n^2$
$3l – 4m – 7n^2 + 2l + 3m – 4n^2$
Upon rearranging
$3l + 2l – 4m + 3m – 7n^2 – 4n^2$
$5l - m – 11n^2$ ……..equation (1)
Sum of $9l + 2m – 3n^2$ and $-3l + m + 4n^2$
$9l + 2m – 3n^2 + (-3l + m + 4n^2)$
Upon rearranging
$9l – 3l + 2m + m – 3n^2 + 4n^2$
$6l + 3m + n^2$ …….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
$- x^2 + 7x^2 + 2x - 4x + 5 – 3$
$6x^2 -2x + 2$ ……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) $x^2 – 3x + 5 – 1/2(3x^2 - 5x + 7)$
(ii) [5 – 3x + 2y – (2x - y)] – (3x – 7y + 9)
(iii) $11/2x^2y – 9/4xy^2 + 1/4xy – 1/14y^2x + 1/15yx^2 + 1/2xy$
(iv) $(1/3y^2 – 4/7y + 11) – (1/7y – 3 + 2y^2) – (2/7y – 2/3y^2 + 2)$
(v) $-1/2a^2b^2c + 1/3ab^2c – 1/4abc^2 – 1/5cb^2a^2 + 1/6cb^2a – 1/7c^2ab + 1/8ca^2b$
Solution:
(i) $x^2 – 3x + 5 – 1/2(3x^2 - 5x + 7)$
Upon rearranging
$x^2 – 3/2x^2 – 3x + 5/2x + 5 – 7/2$
By grouping similar expressions we get,
LCM for (1 and 2 is 2)
$(2x^2 – 3x^2)/2 - (6x + 5x)/2 + (10-7)/2$
$-1/2x^2 – 1/2x + 3/2$

(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) $11/2x^2y – 9/4xy^2 + 1/4xy – 1/14y^2x + 1/15yx^2 + 1/2xy$
Upon rearranging
$11/2x^2y + 1/15x^2y – 9/4xy^2 – 1/14xy^2 + 1/4xy + 1/2xy$
By grouping similar expressions we get,
LCM for (2 and 15 is 30), (4 and 14 is 56), (4 and 2 is 4)
$(165x^2y + 2x^2y)/30 + (-126xy^2 – 4xy^2)/56 + (xy + 2xy)/4$
$167/30x^2y – 130/56xy^2 + 3/4xy$
$167/30x^2y – 65/28xy^2 + 3/4xy$

(iv) $(1/3y^2 – 4/7y + 11) – (1/7y – 3 + 2y^2) – (2/7y – 2/3y^2 + 2)$
Upon rearranging
$1/3y^2 – 2y^2 – 2/3y^2 – 4/7y – 1/7y – 2/7y + 11 + 3 – 2$
By grouping similar expressions we get,
LCM for (3, 1 and 3 is 3), (7, 7 and 7 is 7)
$(y^2 – 6y^2 + 2y^2)/3 - (4y – y – 2y)/7 + 12$
$-3/3y^2 – 7/7y + 12$
$-y^2 – y + 12$

(v) $-1/2a^2b^2c + 1/3ab^2c – 1/4abc^2 – 1/5cb^2a^2 + 1/6cb^2a – 1/7c^2ab + 1/8ca^2b$

Upon rearranging

$-1/2a^2b^2c – 1/5a^2b^2c + 1/3ab^2c + 1/6ab^2c – 1/4abc^2 – 1/7abc^2 + 1/8a^2bc$

By grouping similar expressions we get,

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

$-7/10a^2b^2c + 1/2ab^2c – 11/28abc^2 + 1/8a^2bc$

EXERCISE 6.3

PAGE NO: 6.13

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

$- 72 \times x^{2+1} \times y^{2+1} \times z^2$
$-72x^3y^3z^2$

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) × (0.1x) × (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) × (4x) × (-5x)
Solution:
Let us simplify the given expression
$3 \times 4 \times -5 \times x \times x \times x$
$-60 \times x^{1+1+1}$
$-60x^3$
Verification
LHS = $(3 \times 1) \times (4 \times 1) \times (-5 \times 1)$
$= 3 \times 4 \times - 5$
$= - 60$
RHS = $-60 (1)^3 = - 60$
Therefore, LHS = RHS.

19. $(4x^2) \times (-3x) \times (4/5x^3)$
Solution:
Let us simplify the given expression
$4 \times -3 \times 4/5 \times x^2 \times x \times x^3$
$-48/5 \times x^{2+1+3}$
$-48/5x^6$
Verification
LHS = $4 \times 1^2 \times - 3 \times 1 \times 4/5 \times 1^3$
$= - 48/5$
RHS = $- 48/5 \times 1^6 = - 48/5$
Therefore, LHS = RHS.

20. $(5x^4) \times (x^2)^3 \times (2x)^2$
Solution:
Let us simplify the given expression
$5 \times x^4 \times x^6 \times 4 \times x^2$
$5 \times 4 \times x^4 \times x^6 \times x^2$

$20 \times x^{4+6+2}$
$20x^{12}$
Verification
LHS = $(5 \times 1^4) \times (1^2)^3 \times (2 \times 1)^2$
= 5×4
= 20
RHS = $20 \times 1^{12} = 20$
Therefore, LHS = RHS.

21. $(x^2)^3 \times (2x) \times (-4x) \times (5)$
Solution:
Let us simplify the given expression
$x^6 \times 2 \times x \times -4 \times x \times 5$
$2 \times -4 \times 5 \times x^6 \times x \times x$
$-40 \times x^{6+1+1}$
$-40x^8$
Verification
LHS = $(1^2)^3 \times (2 \times 1) \times (-4 \times 1) \times 5$
= - 40
RHS = $- 40 \times 1^8 = - 40$
Therefore, LHS = RHS.

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
For $160x^3y^7$
$160\ (2.5)^3 \times (1)^7$
160×15.625
2500

For $-8x^2y^6$ and $-20xy$
$-8 \times 2.5^2 \times 1^6 \times -20 \times 1 \times 2.5$
2500
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

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

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

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

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
$5/32 \times 1^7 \times 2^7$
$5/32 \times 128$
5×4
20

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 $1/2x^5y^4$
$1/2 \times (2)^5 \times (-1)^4$
$1/2 \times 32 \times 1$
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 $-7/4x^5y^5$
$-7/4 \times (2)^5 (-1)^5$
$-7/4 \times 32 \times -1$
56

EXERCISE 6.4

PAGE NO: 6.21

Find the following products:

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

Solution:

Let us simplify the given expression

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

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

$-33a^2$ – 22ab

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

Solution:

Let us simplify the given expression

-5a (7a – 2b)

(-5a × 7a) – (-5a × 2b)

$-35a^2$ + 10ab

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

Solution:

Let us simplify the given expression

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

($-11y^2$ × 3y) + ($-11y^2$ × 7)

$-33y^3$ – $77y^2$

5. 6x/5(x^3 + y^3)

Solution:

Let us simplify the given expression

6/5x (x^3 + y^3)

(6/5x × x^3) + (6/5x × y^3)

$6/5x^4$ + $6/5xy^3$

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

$1.5x\ (10x^2y - 100xy^2)$
$(1.5x \times 10x^2y) - (1.5x \times 100xy^2)$
$15x^3y - 150x^2y^2$

12. 4.1xy (1.1x – y)
Solution:
Let us simplify the given expression
$4.1xy\ (1.1x - y)$
$(4.1xy \times 1.1x) - (4.1xy \times y)$
$4.51x^2y - 4.1xy^2$

13. 250.5xy (xz + y/10)
Solution:
Let us simplify the given expression
$250.5xy\ (xz + y/10)$
$(250.5xy \times xz) + (250.5xy \times y/10)$
$250.5x^2yz + 25.05xy^2$

14. $7/5x^2y\ (3/5xy^2 + 2/5x)$
Solution:
Let us simplify the given expression
$7/5x^2y\ (3/5xy^2 + 2/5x)$
$(7/5x^2y \times 3/5xy^2) + (7/5x^2y \times 2/5x)$
$21/25x^3y^3 + 14/25x^3y$

15. $4/3a\ (a^2 + b^2 - 3c^2)$
Solution:
Let us simplify the given expression
$4/3a\ (a^2 + b^2 - 3c^2)$
$(4/3a \times a^2) + (4/3a \times b^2) - (4/3a \times 3c^2)$
$4/3a^3 + 4/3ab^2 - 4ac^2$

16. Find the product $24x^2$ (1-2x) and evaluate its value for x = 3
Solution:
Let us simplify the given expression
$24x^2\ (1 - 2x)$
$(24x^2 \times 1) - (24x^2 \times 2x)$
$24x^2 - 48x^3$
Now let us evaluate the expression when x = 3

$24x^2 – 48x^3$
$24 \times (3)^2 – 48 \times (3)^3$
$24 \times (9) – 48 \times (27)$
$216 – 1296$
-1080

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
$-3y (xy+y^2)$
$(-3y \times xy) + (-3y \times y^2)$
$-3xy^2 – 3y^3$
Now let us evaluate the expression when x = 4 and y = 5
$-3xy^2 – 3y^3$
$-3 \times (4) \times (5)^2 – 3 \times (5)^3$
$-300 - 375$
-675

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
$-3/2x^2y^3$ by (2x-y)
$(-3/2x^2y^3 \times 2x) - (-3/2x^2y^3 \times y)$
$-3x^3y^3 + 3/2x^2y^4$
Now let us evaluate the expression when x = 1 and y = 2
$-3x^3y^3 + 3/2x^2y^4$
$-3 \times (1)^4 \times (2)^3 + 3/2 \times (1)^2 \times (2)^4$
$- 3 \times (8) + 3 (8)$
$-24+24$
0

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

(-16 -1)/3200
-17/3200

20. Simplify:
(i) $2x^2 (x^3 - x) – 3x (x^4 + 2x) – 2 (x^4 – 3x^2)$
(ii) $x^3y (x^2 - 2x) + 2xy (x^3 – x^4)$
(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) $3/2x^2 (x^2 - 1) + 1/4x^2 (x^2 + x) - 3/4x (x^3 - 1)$
Let us simplify the given expression
$3/2x^4 – 3/2x^2 + 1/4x^4 + 1/4x^3 – 3/4x^4 + 3/4x$
By grouping similar expressions we get,
$3/2x^4 + 1/4x^4 – 3/4x^4 – 3/2x^2 + 1/4x^3 + 3/4x$
$4/4x^4 + 1/4x^3 – 3/2x^2 + 3/4x$
$x^4 + 1/4x^3 – 3/2x^2 + 3/4x$

(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

PAGE NO: 6.30

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

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

$3x^2 \times (2x^2 + 3y^2) + y^2 \times (2x^2 + 3y^2)$
$6x^4 + 9x^2y^2 + 2x^2y^2 + 3y^4$
$6x^4 + 11x^2y^2 + 3y^4$

6. (3/5x + 1/2y) by (5/6x + 4y)
Solution:
Now let us simplify the given expression
$(3/5x + 1/2y) \times (5/6x + 4y)$
$3/5x \times (5/6x + 4y) + 1/2y \times (5/6x + 4y)$
$15/30x^2 + 12/5xy + 5/12xy + 4/2y^2$
$1/2x^2 + 169/60xy + 2y^2$

7. $(x^6 – y^6)$ by $(x^2 + y^2)$
Solution:
Now let us simplify the given expression
$(x^6 – y^6) \times (x^2 + y^2)$
$x^6 \times (x^2 + y^2) - y^6 \times (x^2 + y^2)$
$x^8 + x^6y^2 - x^2y^6 – y^8$

8. $(x^2 + y^2)$ by (3a + 2b)
Solution:
Now let us simplify the given expression
$(x^2 + y^2) \times (3a + 2b)$
$x^2 \times (3a + 2b) + y^2 \times (3a + 2b)$
$3ax^2 + 3ay^2 + 2bx^2 + 2by^2$

9. (- 3d - 7f) by (5d + f)
Solution:
Now let us simplify the given expression
$(- 3d - 7f) \times (5d + f)$
$-3d (5d + f) - 7f (5d + f)$
$- 15d^2 – 3df - 35df - 7f^2$
$- 15d^2 - 38df - 7f^2$

10. (0.8a – o.5b) by (1.5a – 3b)
Solution:
Now let us simplify the given expression
$(0.8a – 0.5b) \times (1.5a – 3b)$
$0.8a (1.5a – 3b) – 0.5b (1.5a – 3b)$

$1.2a^2 – 2.4ab – 0.75ab + 1.5b^2$
$1.2a^2 – 3.15ab + 1.5b^2$

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
$(x/7 + x^2/2) \times (2/5 + 9x/4)$
$x/7 (2/5 + 9x/4) + x^2/2 (2/5 + 9x/4)$
$2x/35 + (9 x^2)/28 + x^2/5 + (9 x^3)/8$
$9/8x^3 + 73/140x^2 + 2/35x$

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×-3

-21

$3x^2 – 2xy – 5y^2$

$3 (-1)^2 – 2 (-1) (-2) – 5 (-2)^2$

$3 – 4 – 20$

$- 21$

∴ 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

$(x^2y - 1) \times (3 – 2x^2y)$

$[(-1)^2 (-2) – 1] \times [3 – 2 (-1)^2 (-2)$

$(-2 – 1) \times (3 + 4)$
-3×7
-21

$5x^2y - 2x^4y^2 – 3$
$[-2 (-1)^4 (-2)^2 + 5 (-1)^2 (2) – 3]$
$- 8 – 10 – 3$
-21
∴ the given expression is verified.

19. $(1/3x – y^2/5) (1/3x + y^2/5)$
Solution:
Now let us simplify the given expression
$(1/3x – y^2/5) \times (1/3x + y^2/5)$
$(1/3x)^2 – (y^2/5)^2$
$(1/3x – y^2/5) (1/3x + y^2/5)$
$1/9x^2 – 1/25y^4$
Let us substitute the given values x = - 1 and y = - 2, then
$(1/3x – y^2/5) \times (1/3x + y^2/5)$
$(1/3(-1) – (-2)^2/5) \times (1/3(-1) + (-2)^2/5)$
$(-17/15) \times (7/15)$
$-119/225$

$1/9x^2 – 1/25y^4$
$1/9 (-1)^2 – 1/25 (-2)^4$
$1/9 -16/25$
$-119/225$
∴ 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

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

$(x^3 + 4x^2y – 2xy^2 – 8y^3) \times x^2y^2$

$x^5y^2 + 4x^4y^3 – 2x^3y^4 – 8x^2y^5$

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

Solution:

Now let us simplify the given expression

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

$a^2b^2 (3a^2 + ab + 6ab + 2b^2)$

$a^2b^2 (3a^2 + 7ab + 2b^2)$

$3a^4b^2 + 7a^3b^3 + 2a^2b^4$

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

Solution:

Now let us simplify the given expression

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

$x^2y^2 (x^2 + 2xy – xy – 2y^2)$

$x^2y^2 (x^2 + xy – 2y^2)$

$x^4y^2 + x^3y^3 – 2x^2y^4$

24. $(x^3 – 2x^2 + 5x - 7) (2x - 3)$

Solution:

Now let us simplify the given expression

$(x^3 – 2x^2 + 5x - 7) (2x - 3)$

$2x^4 – 4x^3 + 10x^2 – 14x – 3x^3 + 6x^2 – 15x + 21$

$2x^4 – 7x^3 + 16x^2 – 29x + 21$

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

Solution:

Now let us simplify the given expression

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

$(5x^2 – 2x – 3) (3x – 2)$

$15x^3 – 6x^2 – 9x – 10x^2 + 4x + 6$

$15x^3 – 16x^2 – 5x + 6$

26. $(5 - x) (6 – 5x) (2 - x)$

Solution:

Now let us simplify the given expression
$(5 - x) (6 – 5x) (2 - x)$
$(x^2 – 7x + 10) (6 – 5x)$
$-5x^3 + 35x^2 – 50x + 6x^2 – 42x + 60$
$60 – 92x + 41x^2 - 5x^3$

27. $(2x^2 + 3x - 5) (3x^2 - 5x + 4)$
Solution:
Now let us simplify the given expression
$(2x^2 + 3x - 5) (3x^2 - 5x + 4)$
$6x^4 + 9x^3 – 15x^2 – 10x^3 – 15x^2 + 25x + 8x^2 + 12x – 20$
$6x^4 – x^3 – 22x^2 + 37x - 20$

28. $(3x - 2) (2x - 3) + (5x - 3) (x + 1)$
Solution:
Now let us simplify the given expression
$(3x - 2) (2x - 3) + (5x - 3) (x + 1)$
$6x^2 – 9x – 4x + 6 + 5x^2 + 5x – 3x – 3$
$11x^2 – 11x + 3$

29. $(5x - 3) (x + 2) - (2x + 5) (4x - 3)$
Solution:
Now let us simplify the given expression
$(5x - 3) (x + 2) - (2x + 5) (4x - 3)$
$5x^2 + 10x – 3x – 6 – 8x^2 + 6x – 20x + 15$
$-3x^2 – 7x + 9$

30. $(3x + 2y) (4x + 3y) - (2x - y) (7x – 3y)$
Solution:
Now let us simplify the given expression
$(3x + 2y) (4x + 3y) - (2x - y) (7x – 3y)$
$12x^2 + 9xy + 8xy$
$12x^2 + 9xy + 8xy + 6y^2 – 14x^2 + 6xy + 7xy – 3y^2$
$-2x^2 + 3y^2 + 30xy$

31. $(x^2 - 3x + 2) (5x - 2) - (3x^2 + 4x - 5) (2x – 1)$
Solution:
Now let us simplify the given expression
$(x^2 - 3x + 2) (5x - 2) - (3x^2 + 4x - 5) (2x – 1)$

$5x^3 – 15x^2 + 10x – 2x^2 + 6x – 4 – (6x^3 + 8x^2 – 10x – 3x^2 – 4x + 5)$
$5x^3 – 6x^3 – 15x^2 – 2x^2 – 5x^2 + 16x + 14x – 4 – 5$
$– x^3 – 22x^2 + 30x – 9$

32. $(x^3 - 2x^2 + 3x - 4) (x - 1) - (2x – 3) (x^2 - x + 1)$
Solution:
Now let us simplify the given expression
$(x^3 - 2x^2 + 3x - 4) (x - 1) - (2x – 3) (x^2 - x + 1)$
$x^4 – 2x^3 + 3x^2 – 4x – x^3 + 2x^2 – 3x + 4 – (2x^3 – 2x^2 + 2x – 3x^2 + 3x – 3)$
$x^4 – 3x^3 + 5x^2 – 7x + 4 – 2x^3 + 5x^2 – 5x + 3$
$x^4 – 5x^3 + 10x^2 – 12x + 7$

EXERCISE 6.6 PAGE NO: 6.43

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

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

(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,
$(1000 + 1)^2 = (1000)^2 + 2\ (1000)\ (1) + 1^2$
$= 1000000 + 2000 + 1$
$= 1002001$

(iv) $(999)^2$
We can express 999 as 1000 - 1
So, $(999)^2 = (1000 - 1)^2$
Upon simplification we get,
$(1000 - 1)^2 = (1000)^2 – 2\ (1000)\ (1) + 1^2$
$= 1000000 – 2000 + 1$
$= 998001$

(v) $(703)^2$
We can express 700 as 700 + 3
So, $(703)^2 = (700 + 3)^2$
Upon simplification we get,
$(700 + 3)^2 = (700)^2 + 2\ (700)\ (3) + 3^2$
$= 490000 + 4200 + 9$
$= 494209$

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,

$(82)^2 – (18)^2 = (82 – 18) (82 + 18)$
$= 64 \times 100$
$= 6400$

(ii) $(467)^2 – (33)^2$
Let us simplify the given expression using the formula $(a – b) (a + b) = a^2 – b^2$
We get,
$(467)^2 – (33)^2 = (467 – 33) (467 + 33)$
$= (434) (500)$
$= 217000$

(iii) $(79)^2 – (69)^2$
Let us simplify the given expression using the formula $(a – b) (a + b) = a^2 – b^2$
We get,
$(79)^2 – (69)^2 = (79 + 69) (79 – 69)$
$= (148) (10)$
$= 1480$

(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,
$197 \times 203 = (200 – 3) (200 + 3)$
$= (200)^2 – (3)^2$
$= 40000 – 9$
$= 39991$

(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,
$113 \times 87 = (100 - 13) (100 + 13)$
$= (100)^2 – (13)^2$
$= 10000 – 169$
$= 9831$

(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,

$95 \times 105 = (100 - 5)(100 + 5)$

$= (100)^2 - (5)^2$

$= 10000 - 25$

$= 9975$

(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,

$1.8 \times 2.2 = (2 - 0.2)(2 + 0.2)$

$= (2)^2 - (0.2)^2$

$= 4 - 0.04$

$= 3.96$

(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,

$9.8 \times 10.2 = (10 - 0.2)(10 + 0.2)$

$= (10)^2 - (0.2)^2$

$= 100 - 0.04$

$= 99.96$

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,

$((58)^2 - (42)^2)/16 = ((58-42)(58+42)/16)$

$= ((16)(100)/16)$

$= 100$

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

Let us simplify the given expression using the formula $(a – b)(a + b) = a^2 – b^2$
We get,
$178 \times 178 – 22 \times 22 = (178)^2 – (22)^2$
$= (178-22)(178+22)$
$= 200 \times 156$
$= 31200$

(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,
$(198 \times 198 – 102 \times 102)/96 = ((198)^2 – (102)^2)/96$
$= ((198-102)(198+102))/96$
$= (96 \times 300)/96$
$= 300$

(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,
$1.73 \times 1.73 – 0.27 \times 0.27 = (1.73)^2 – (0.27)^2$
$= (1.73-0.27)(1.73+0.27)$
$= 1.46 \times 2$
$= 2.92$

(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,
$(8.63 \times 8.63 – 1.37 \times 1.37)/0.726 = ((8.63)^2 – (1.37)^2)/0.726$
$= ((8.63-1.37)(8.63+1.37))/0.726$
$= (7.26 \times 10)/0.726$
$= 72.6/0.726$
$= 100$

6. Find the value of x, if:
(i) $\mathbf{4x = (52)^2 – (48)^2}$
(ii) $\mathbf{14x = (47)^2 – (33)^2}$
(iii) $\mathbf{5x = (50)^2 – (40)^2}$
Solution:
(i) $4x = (52)^2 – (48)^2$
Let us simplify to find the value of x by using the formula $(a – b)(a + b) = a^2 – b^2$

$4x = (52)^2 – (48)^2$
$4x = (52 – 48) (52 + 48)$
$4x = 4 \times 100$
$4x = 400$
$x = 100$

(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
$(x + 1/x)^2 = (20)^2$
$x^2 + 2 \times x \times 1/x + (1/x)^2 = 400$
$x^2 + 2 + 1/x^2 = 400$
$x^2 + 1/x^2 = 398$

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
$(x - 1/x)^2 = (3)^2$
$x^2 - 2 \times x \times 1/x + (1/x)^2 = 9$
$x^2 - 2 + 1/x^2 = 9$
$x^2 + 1/x^2 = 9+2$
$x^2 + 1/x^2 = 11$

Now again when we square on both sides we get,
$(x^2 + 1/x^2)^2 = (11)^2$
$x^4 + 2 \times x^2 \times 1/x^2 + (1/x^2)^2 = 121$
$x^4 + 2 + 1/x^4 = 121$
$x^4 + 1/x^4 = 121-2$
$x^4 + 1/x^4 = 119$
$\therefore x^2 + 1/x^2 = 11$
$x^4 + 1/x^4 = 119$

9. If $x^2 + 1/x^2 = 18$, find the values of $x + 1/x$ and $x - 1/x$.
Solution:
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:
We know that $x + y = 4$ and $xy = 2$
Upon squaring on both sides of the given expression, we get
$(x + y)^2 = 4^2$
$x^2 + y^2 + 2xy = 16$
$x^2 + y^2 + 2 (2) = 16$ (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:
We know that $x - y = 7$ and $xy = 9$
Upon squaring on both sides of the given expression, we get

$(x - y)^2 = 7^2$
$x^2 + y^2 - 2xy = 49$
$x^2 + y^2 - 2 (9) = 49$ (since xy=9)
$x^2 + y^2 - 18 = 49$
$x^2 + y^2 = 49 + 18$
$x^2 + y^2 = 67$

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
$(3x + 5y)^2 = 11^2$
$(3x)^2 + (5y)^2 + 2(3x)(5y) = 121$
$9x^2 + 25y^2 + 2 (15xy) = 121$ (since xy=2)
$9x^2 + 25y^2 + 2(15(2)) = 121$
$9x^2 + 25y^2 + 60 = 121$
$9x^2 + 25y^2 = 121-60$
$9x^2 + 25y^2 = 61$

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 $y = ¾$
Solution:
(i) $16x^2 + 24x + 9$ when $x = 7/4$
Let us find the values using the formula $(a + b)^2 = a^2 + b^2 + 2ab$
$(4x)^2 + 2 (4x) (3) + 3^2$
$(4x + 3)^2$
Evaluating when $x = 7/4$
$[4 (7/4) + 3]^2$
$(7 + 3)^2$
100

(ii) $64x^2 + 81y^2 + 144xy$ when $x = 11$ and $y = 4/3$
Let us find the values using the formula $(a + b)^2 = a^2 + b^2 + 2ab$
$(8x)^2 + 2 (8x) (9y) + (9y)^2 (8x + 9y)$
Evaluating when $x = 11$ and $y = 4/3$
$[8 (11) + 9 (4/3)]^2$
$(88 + 12)^2$

$(100)^2$
10000

(iii) $81x^2 + 16y^2 - 72xy$ when x = 2/3 and y = ¾
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 = 2/3 and y = 3/4
$[9\ (2/3) – 4\ (3/4)]^2$
$(6 – 3)^2$
3^2
9

14. If x + 1/x = 9 find the value of $x^4 + 1/ x^4$.
Solution:
We know that x + 1/x = 9
So when squaring both sides, we get
$(x + 1/x)^2 = (9)^2$
$x^2 + 2 \times x \times 1/x + (1/x)^2 = 81$
$x^2 + 2 + 1/x^2 = 81$
$x^2 + 1/x^2 = 81 – 2$
$x^2 + 1/x^2 = 79$

Now again when we square on both sides we get,
$(x^2 + 1/x^2)^2 = (79)^2$
$x^4 + 2 \times x^2 \times 1/x^2 + (1/x^2)^2 = 6241$
$x^4 + 2 + 1/x^4 = 6241$
$x^4 + 1/x^4 = 6241- 2$
$x^4 + 1/x^4 = 6239$
$\therefore x^4 - 1/x^4 = 6239$

15. If x + 1/x = 12 find the value of x - 1/x.
Solution:
We know that x + 1/x = 12
So when squaring both sides, we get
$(x + 1/x)^2 = (12)^2$
$x^2 + 2 \times x \times 1/x + (1/x)^2 = 144$
$x^2 + 2 + 1/x^2 = 144$
$x^2 + 1/x^2 = 144 – 2$

$x^2 + 1/x^2 = 142$

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
$2x + 3y = 14$… equation (1)
$2x – 3y = 2$… equation (2)
Now, let us square both the equations and subtract equation (2) from equation (1), we get,
$(2x + 3y)^2 – (2x – 3y)^2 = (14)^2 – (2)^2$
$4x^2 + 9y^2 + 12xy – 4x^2 – 9y^2 + 12xy = 196 – 4$
$24 xy = 192$
$xy = 8$
∴ 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) $4x^2 - 12x + 7$
$(2x)^2 - 2\ (2x)\ (3) + 3^2 - 3^2 + 7$
$(2x - 3)^2 - 9 + 7$
$(2x - 3)^2 - 2$
∴ 2 must be added to the expression to make it a whole square.

(ii) $4x^2 - 20x + 20$
$(2x)^2 - 2\ (2x)\ (5) + 5^2 - 5^2 + 20$
$(2x - 5)^2 - 25 + 20$
$(2x - 5)^2 - 5$
∴ 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
$(x^2 - y^2)\ (x^2 + y^2)\ (x^4 + y^4)$

$[(x^2)^2 – (y^2)^2] (x^4 + y^4)$
$(x^4 – y^4) (x^4 – y^4)$
$[(x^4)^2 – (y^4)^2]$
$x^8 – y^8$

(ii) $(2x - 1) (2x + 1) (4x^2 + 1) (16x^4 + 1)$
Let us simplify the expression by grouping
$[(2x)^2 – (1)^2] (4x^2 + 1) (16x^4 + 1)$
$(4x^2 – 1) (4x^2 + 1) (16x^4 + 1) 1$
$[(4x^2)^2 – (1)^2] (16x^4 + 1) 1$
$(16x^4 – 1) (16x^4 + 1) 1$
$[(16x^4)^2 – (1)^2] 1$
$256x^8 – 1$

(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
$(m^2)^2 – 2 (m^2) (n^2) (m) + (n^2m)^2 + 2m^3n^2$
$m^4 – 2m^3n^2 + (n^2m)^2 + 2m^3n^2$
$m^4 + n^4m^2 – 2m^3n^2 + 2m^3n^2$
$m^4 + m^2n^4$

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 $(a + b)^2 = a^2 + b^2 + 2ab$
$(3x)^2 + (7)^2 + 2 (3x) (7) – 84x$
$(3x)^2 + (7)^2 + 42x – 84x$
$(3x)^2 + (7)^2 – 42x$
$(3x)^2 + (7)^2 – 2 (3x) (7)$
$(3x – 7)^2$ = 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 $(a + b)^2 = a^2 + b^2 + 2ab$
$(9a)^2 + (5b)^2 – 2 (9a) (5b) + 180ab$
$(9a)^2$ 6 $(5b)^2 – 90ab + 180ab$
$(9a)^2 + (5b)^2 + 9ab$
$(9a)^2 + (5b)^2 + 2 (9a) (5b)$
$(9a + 5b)^2$ = R.H.S
Hence, proved

(iii) $(4m/3 – 3n/4)^2 + 2mn = 16m^2/9 + 9n^2/16$
Let us consider LHS $(4m/3 – 3n/4)^2 + 2mn$
$(4m/3)^2 + (3n/4)^2 – 2mn + 2mn$
$(4m/3)^2 + (3n/4)^2$
$16/9m^2 + 9/16n^2$ = R.H.S
Hence, proved

(iv) $(4pq + 3q)^2 – (4pq - 3q)^2 = 48pq^2$
Let us consider LHS $(4pq + 3q)^2 – (4pq - 3q)^2$
$(4pq)^2 + (3q)^2 + 2 (4pq) (3q) – (4pq)^2 – (3q)^2 + 2(4pq)(3q)$
$24pq^2 + 24pq^2$
$48pq^2$ = RHS

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 = R.H.S
Hence, proved

EXERCISE 6.7

PAGE NO: 6.47

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)
$x^2 – 5x + 7x – 35$
$x^2 + 2x – 35$

(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

$3x (2x – 4y) – 4y (2x – 4y)$
$6x^2 – 12xy – 8xy + 16y^2$
$6x^2 – 20xy + 16y^2$

(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
102 × 106 = (100 + 2) (100 + 6)
= 100 (100 + 6) + 2 (100 + 6)
= 10000 + 600 + 200 + 12
= 10812

(ii) 109 × 107
We can express 109 as 100 + 9 and 107 as 100 + 7
Now let us simplify
109 × 107 = (100 + 9) (100 + 7)
= 100 (100 + 7) + 9 (100 + 7)
= 10000 + 700 + 900 + 63
= 11663

(iii) 35 × 37
We can express 35 as 30 + 5 and 37 as 30 + 7
Now let us simplify
35 × 37 = (30 + 5) (30 + 7)
= 30 (30 + 7) + 5 (30 + 7)
= 900 + 210 + 150 + 35

= 1295

(iv) 53 × 55
We can express 53 as 50 + 3 and 55 as 50 + 5
Now let us simplify
53 × 55 = (50 + 3) (50 + 5)
= 50 (50 + 5) + 3 (50 + 5)
= 2500 + 250 + 150 + 15
= 2915

(v) 103 × 96
We can express 103 as 100 + 3 and 96 as 100 - 4
Now let us simplify
103 × 96 = (100 + 3) (100 - 4)
= 100 (100 - 4) + 3 (100 - 4)
= 10000 - 400 + 300 - 12
= 10000 – 112
= 9888

(vi) 34 × 36
We can express 34 as 30 + 4 and 36 as 30 + 6
Now let us simplify
34 × 36 = (30 + 4) (30 + 6)
= 30 (30 + 6) + 4 (30 + 6)
= 900 + 180 + 120 + 24
= 1224

(vii) 994 × 1006
We can express 994 as 1000 - 6 and 1006 as 1000 + 6
Now let us simplify
994 × 1006 = (1000 - 6) (1000 + 6)
= 1000 (1000 + 6) - 6 (1000 + 6)
= 1000000 + 6000 - 6000 - 36
= 999964