EXERCISE 20(A)

1. Fill in the following blanks, when:
x = 3, y = 6, z = 18, a = 2, b = 8, c = 32 and d = 0.
(i) x + y = …….
(ii) y – x = …….
(iii) y / x = ……..
(iv) c ÷ b = ……..
(v) z ÷ x = ……..
Solution:
(i) x + y = ……..
The value of x + y is calculated as shown below
x + y = 3 + 6
= 9
∴ x + y = 9
(ii) y – x = ……..
The value of y – x is calculated as shown below
y – x = 6 – 3
= 3
∴ y – x = 3
(iii) y / x = ……..
The value of y / x is calculated as shown below
y / x= 6 / 3
= 2
∴ y / x = 2
(iv) c ÷ b = ……
The value of c ÷ b is calculated as shown below
c ÷ b = 32 ÷ 8
32 / 8 = 4
∴ c ÷ b = 4
(v) z ÷ x = …….
The value of z ÷ x is calculated as shown below
z ÷ x = 18 ÷ 3
= 6
∴ z ÷ x = 6

2. Find the value of:
(i) p + 2q + 3r, when p = 1, q = 5 and r = 2
(ii) 2a + 4b + 5c, when a = 5, b = 10 and c = 20
(iii) 3a – 2b, when a = 8 and b = 10

(iv) 5x + 3y – 6z, when x = 3, y = 5 and z = 4
(v) 2p – 3q + 4r – 8s, when p = 10, q = 8, r = 6 and s = 2
Solution:
(i) p + 2q + 3r, when p = 1, q = 5 and r = 2
The value of p + 2q + 3r is calculated as shown below
p + 2q + 3r = 1 + 2 × 5 + 3 × 2
= 1 + 10 + 6
= 17
Therefore, p + 2q + 3r = 17
(ii) 2a + 4b + 5c, when a = 5, b = 10 and c = 20
The value of 2a + 4b + 5c is calculated as shown below
2a + 4b + 5c = 2 × 5 + 4 × 10 + 5 × 20
= 10 + 40 + 100
= 150
Therefore, 2a + 4b + 5c = 150
(iii) 3a – 2b, when a = 8 and b = 10
The value of 3a – 2b is calculated as shown below
3a – 2b = 3 × 8 – 2 × 10
= 24 – 20
= 4
Therefore, 3a – 2b = 4
(iv) 5x + 3y – 6z, when x = 3, y = 5 and z = 4
The value of 5x + 3y – 6z is calculated as shown below
5x + 3y – 6z = 5 × 3 + 3 × 5 – 6 × 4
= 15 + 15 – 24
= 30 – 24
= 6
Therefore, 5x + 3y – 6z = 6
(v) 2p – 3q + 4r – 8s, when p = 10, q = 8, r = 6 and s = 2
The value of 2p – 3q + 4r – 8s is calculated as shown below
2p – 3q + 4r – 8s = 2 × 10 – 3 × 8 + 4 × 6 – 8 × 2
= 20 – 24 + 24 – 16
= 4
Therefore, 2p – 3q + 4r – 8s = 4

3. Find the value of:
(i) 4pq × 2r, when p = 5, q = 3 and r = 1 / 2
(ii) yx / z, when x = 8, y = 4 and z = 16
(iii) (a + b – c) / 2a, when a = 5, b = 7 and c = 2

Solution:

(i) 4pq × 2r, when p = 5, q = 3 and r = 1 / 2

The value of 4pq × 2r is calculated as below

4pq × 2r = 4 × 5 × 3 × 2 × (1 / 2)

= 4 × 5 × 3

= 60

∴ 4pq × 2r = 60

(ii) yx / z, when x = 8, y = 4 and z = 16

The value of yx / z is calculated as below

yx / z = (4 × 8) / 16

= 32 / 16

= 2

∴ yx / z = 2

(iii) (a + b – c) / 2a, when a = 5, b = 7 and c = 2

The value of (a + b – c) / 2a is calculated as below

(a + b – c) / 2a = (5 + 7 – 2) / (2 × 5)

= 10 / 10

= 1

4. If a = 3, b = 0, c = 2 and d = 1, find the value of:

(i) 3a + 2b – 6c + 4d

(ii) 6a – 3b – 4c – 2d

(iii) ab – bc + cd – da

(iv) abc – bcd + cda

(v) $a^2 + 2b^2 – 3c^2$

Solution:

(i) 3a + 2b – 6c + 4d

The value of 3a + 2b – 6c + 4d is calculated as shown below

3a + 2b – 6c + 4d = 3 × 3 + 2 × 0 – 6 × 2 + 4 × 1

On further calculation, we get

= 9 + 0 – 12 + 4

= 9 – 12 + 4

= 13 – 12

= 1

Therefore, 3a + 2b – 6c + 4d = 1

(ii) 6a – 3b – 4c – 2d

The value of 6a – 3b – 4c – 2d is calculated as shown below

6a – 3b – 4c – 2d = 6 × 3 – 3 × 0 – 4 × 2 – 2 × 1

On further calculation, we get

= 18 – 0 – 8 – 2
= 18 – 10
= 8
Therefore, 6a – 3b – 4c – 2d = 8
(iii) ab – bc + cd – da
The value of ab – bc + cd – da is calculated as shown below
ab – bc + cd – da = 3 × 0 – 0 × 2 + 2 × 1 – 1 × 3
On further calculation, we get
= 0 – 0 + 2 – 3
= 2 – 3
= - 1
Therefore, ab – bc + cd – da = - 1
(iv) abc – bcd + cda
The value of abc – bcd + cda is calculated as shown below
abc – bcd + cda = 3 × 0 × 2 – 0 × 2 × 1 + 2 × 1 × 3
On further calculation, we get
= 0 – 0 + 6
= 6
Therefore, abc – bcd + cda = 6
(v) $a^2 + 2b^2 – 3c^2$
The value of $a^2 + 2b^2 – 3c^2$ is calculated as shown below
$a^2 + 2b^2 – 3c^2 = (3)^2 + 2 \times (0)^2 – 3 \times (2)^2$
On further calculation, we get
= 9 + 0 – 12
= 9 – 12
= - 3
Therefore, $a^2 + 2b^2 – 3c^2$ = - 3

5. Find the value of $5x^2 – 3x + 2$, when x = 2
Solution:
The value of $5x^2 – 3x + 2$ when x = 2 is calculated as below
$5x^2 – 3x + 2 = 5 \times (2)^2 – 3 \times (2) + 2$
On simplification, we get
= 5 × 4 – 3 × 2 + 2
= 20 – 6 + 2
= 22 – 6
= 16
Hence, the value of $5x^2 – 3x + 2$ = 5 when x = 2 is 16

6. Find the value of $3x^3 – 4x^2 + 5x – 6$, when x = - 1

Solution:

The value of $3x^3 – 4x^2 + 5x – 6$ when x = -1 is calculated as below

$3x^3 – 4x^2 + 5x – 6 = 3 \times (- 1)^3 – 4 \times (- 1)^2 + 5 \times (- 1) – 6$

On simplification, we get

$= - 3 – 4 – 5 – 6$

$= - 18$

Hence, the value of $3x^3 – 4x^2 + 5x – 6$ when x = - 1 is – 18

7. Show that the value of $x^3 – 8x^2 + 12x – 5$ is zero, when x = 1

Solution:

The value of $x^3 – 8x^2 + 12x – 5 = 0$ when x = 1 is calculated as below

$x^3 – 8x^2 + 12x – 5 = (1)^3 – 8 \times (1)^2 + 12 \times (1) – 5$

On simplification, we get

$= 1 – 8 \times 1 + 12 \times 1 – 5$

$= 1 – 8 + 12 – 5$

$= 0$

The value of $x^3 – 8x^2 + 12x – 5 = 0$ when x = 1

Hence, proved

8. State true and false:

(i) The value of x + 5 = 6, when x = 1

(ii) The value of 2x – 3 = 1, when x = 0

(iii) (2x – 4) / (x + 1) = -1, when x = 1

Solution:

(i) The value of x + 5 = 6, when x = 1

The value of x + 5 = 6 for x = 1 is calculated as below

x + 5 = 6

Adding the value of x = 1, we get

1 + 5 = 6

6 = 6

Therefore, the given statement is true

(ii) The value of 2x – 3 = 1, when x = 0

The value of 2x – 3 = 1 for x = 0 is calculated as below

2x – 3 = 1

Adding the value of x = 0, we get

2(0) – 3 = 1

0 – 3 = 1

- 3 = 1

Therefore, the given statement is false
(iii) (2x – 4) / (x + 1) = -1, when x = 1
The value of (2x – 4) / (x + 1) = -1 for x = 1 is calculated as below
(2x – 4) / (x + 1) = -1
Adding x = 1, we get
2(1) – 4 / (1 + 1) = - 1
- 2 / 2 = - 1
- 1 = - 1
Therefore, the given statement is true

9. If x = 2, y = 5 and z = 4, find the value of each of the following:
(i) $x / 2x^2$
(ii) xz / yz
(iii) z^x
(iv) y^x
(v) $x^2y^2z^2 / xz$
Solution:
(i) $x / 2x^2$
The value of $x / 2x^2$ for x = 2, y = 5 and z = 4 is calculated as below
$x / 2x^2$
Now, adding x = 2, y = 5 and z = 4, we get
$x / 2x^2 = 2 / 2(2)^2$
On calculation, we get
= 2 / 8
= 1 / 4
(ii) xz / yz
The value of xz / yz for x = 2, y = 5 and z = 4 is calculated as below
xz / yz
Now, adding x = 2, y = 5 and z = 4, we get
xz / yz = (2) (4) / (5) (4)
On calculation, we get
= 8 / 20
= 2 / 5
(iii) z^x
The value of z^x for x = 2, y = 5 and z = 4 is calculated as below
Now, adding x = 2 and z = 4, we get
$z^x = (4)^2$
We get
= 4 × 4

= 16

(iv) y^x

The value of y^x for x = 2, y = 5 and z = 4 is calculated as below

Now, adding x = 2 and y = 5, we get

$y^x = (5)^2$

We get,

= 5 × 5

= 25

(v) $x^2y^2z^2 / xz$

The value of $x^2y^2z^2 / xz$ for x = 2, y = 5 and z = 4 is calculated as below

Now, adding x = 2, y = 5 and z = 4, we get

$x^2y^2z^2 / xz = (2)^2 \times (5)^2 \times (4)^2 / (2 \times 4)$

We get,

$= 2^{2-1} \times 5^2 \times 4^{2-1}$

= 2 × 5 × 5 × 4

= 200

10. If a = 3, find the values of a^2 and 2^a

Solution:

The value of a^2 and 2^a for a = 3 is calculated as below

$a^2 = 3^2$

= 3 × 3

= 9

$2^a = 2^3$

= 2 × 2 × 2

= 8

Hence, the values of $a^2 = 9$ and $2^a = 8$

11. If m = 2, find the difference between the values of $4m^3$ and $3m^4$.

Solution:

The difference between the values of $4m^3$ and $3m^4$ for m = 2 is calculated as below

$4m^3 = 4 \times (2)^3$

= 4 × 2 × 2 × 2

We get,

= 32

$3m^4 = 3 \times (2)^4$

= 3 × 2 × 2 × 2 × 2

We get,

= 48

Therefore, the difference of $4m^3$ and $3m^4$ is calculated as,

$3m^4 - 4m^3 = 48 - 32$

$= 16$

Hence, the difference between the given values is 16

EXERCISE 20(B)

1. Evaluate:
(i) (23 – 15) + 4
(ii) 5x + (3x + 7x)
(iii) 6m – (4m – m)
(iv) (9a – 3a) + 4a
(v) 35b – (16b + 9b)
Solution:
(i) (23 – 15) + 4
The value of the given expression (23 – 15) + 4 is calculated as follows
(23 – 15) + 4 = 8 + 4
We get,
= 12
Hence, the value of the given expression (23 – 15) + 4 = 12
(ii) 5x + (3x + 7x)
The value of the expression 5x + (3x + 7x) is calculated as follows
5x + (3x + 7x) = 5x + 10x
We get,
= 15x
Hence, the value of the expression 5x + (3x + 7x) = 15x
(iii) 6m – (4m – m)
The value of the expression 6m – (4m – m) is calculated as follows
6m – (4m – m) = 6m – 3m
We get,
= 3m
Hence, the value of the expression 6m – (4m – m) = 3m
(iv) (9a – 3a) + 4a
The value of the expression (9a – 3a) + 4a is calculated as follows
(9a – 3a) + 4a = 6a + 4a
We get,
= 10a
Hence, the value of the expression (9a – 3a) + 4a = 10a
(v) 35b – (16b + 9b)
The value of the expression 35b – (16b + 9b) is calculated as follows
35b – (16b + 9b) = 35b – 25b
We get,
= 10b
Hence, the value of the expression 35b – (16b + 9b) = 10b

2. Simplify:
(i) 12x – (5x + 2x)
(ii) 10m + (4n – 3n) – 5n
(iii) (15b – 6b) – (8b + 4b)
(iv) – (- 4a – 8a)
(v) x – (x – y) – (- x + y)
Solution:
(i) 12x – (5x + 2x)
The simplified form of the expression 12x – (5x + 2x) is calculated as below
12x – (5x + 2x) = 12x – 7x
We get,
= 5x
(ii) 10m + (4n – 3n) – 5n
The simplified form of the expression 10m + (4n – 3n) is calculated as below
10m + (4n – 3n) – 5n = 10m + n – 5n
We get,
= 10m – 4n
(iii) (15b – 6b) – (8b + 4b)
The simplified form of the expression (15b – 6b) – (8b + 4b) is calculated as below
(15b – 6b) – (8b + 4b) = 9b – 12b
We get,
= - 3b
(iv) – (- 4a – 8a)
The simplified form of the expression – (- 4a – 8a) is calculated as below
– (- 4a – 8a) = - (- 12a)
We get,
= 12a
(v) x – (x – y) – (- x + y)
The simplified form of the expression x – (x – y) – (- x + y) is calculated as below
x – (x – y) – (- x + y) = x – x + y + x – y
We get,
= x

3. Simplify:
(i) x – (y – z) + x + (y – z) + y – (z + x)
(ii) x – [y + {x – (y + x)}]
(iii) 4x + 3 (2x – 5y)
(iv) 2 (3a – b) – 5 (a – 3b)
(v) p + 2 $(q - r + p)$

Solution:

(i) x – (y – z) + x + (y – z) + y – (z + x)

The simplified form of the expression x – (y – z) + x + (y – z) + y – (z + x) is calculated as follows

x – (y – z) + x + (y – z) + y – (z + x) = x – y + z + x + y – z + y – z – x

We get,

= x + y – z

(ii) x – [y + {x – (y + x)}]

The simplified form of the expression x – [y + {x – (y + x)}] is calculated as follows

x – [y + {x – (y + x)}] = x – [y + {x – y – x}]

= x – [y + x – y – x]

= x – x + x – y + y

We get,

= x

(iii) 4x + 3 (2x – 5y)

The simplified form of the expression 4x + 3 (2x – 5y) is calculated as follows

4x + 3 (2x – 5y) = 4x + 6x – 15y

We get,

= 10x – 15y

(iv) 2 (3a – b) – 5 (a – 3b)

The simplified form of the expression 2 (3a – b) – 5 (a – 3b) is calculated as follows

2 (3a – b) – 5 (a – 3b) = 6a – 2b – 5a + 15b

We get,

= a + 13b

(v) p + 2 $(q - \overline{r + p})$

The simplified form of the expression p + 2 $(q - \overline{r + p})$ is calculated as follows,

p + 2 $(q - \overline{r + p})$ = p + 2 (q – r – p)

= p + 2q – 2r – 2p

W e get,

= 2q – 2r – p

EXERCISE 20(C)

1. Fill in the blanks:

(i) 2a + b – c = 2a + (……)

(ii) 3x – z + y = 3x – (……..)

(iii) 6p – 5x + q = 6p – (…….)

(iv) a + b – c + d = a + (……..)

(v) 5a + 4b + 4x – 2c = 4x – (……)

Solution:

(i) 2a + b – c = 2a + **(b – c)**

(ii) 3x – z + y = 3x – **(z – y)**

(iii) 6p – 5x + q = 6p – **(5x – q)**

(iv) a + b – c + d = a + **(b – c + d)**

(v) 5a + 4b + 4x – 2c = 4x – **(2x – 5a – 4b)**

2. Insert the bracket as indicated:

(i) x – 2y = - (……)

(ii) m + n – p = - (……..)

(iii) a + 4b – 4c = a + (……..)

(iv) a – 3b + 5c = a – (……..)

(v) $x^2 – y^2 + z^2 = x^2 – (……)$

Solution:

(i) x – 2y = **- (2y – x)**

(ii) m + n – p = **- (p – m – n)**

(iii) a + 4b – 4c = a + **(4b - 4c)**

(iv) a – 3b + 5c = a – **(3b – 5c)**

(v) $x^2 – y^2 + z^2 = x^2 –$ **$(y^2 – z^2)$**