EXERCISE 7.2

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1. Add the following:
(i) 3x and 7x
(ii) -5xy and 9xy

Solution:
(i) Given 3x and 7x
3x + 7x = (3 + 7) x
= 10x

(ii) Given -5xy and 9xy
-5xy + 9xy = (-5 + 9) xy
= 4xy

2. Simplify each of the following:
(i) $7x^3y + 9yx^3$
(ii) $12a^2b + 3ba^2$

Solution:
(i) Given $7x^3y + 9yx^3$
$7x^3y + 9yx^3 = (7 + 9)\ x^3y$
$= 16x^3y$

(ii) Given
$12a^2b + 3ba^2 = (12 + 3)\ a^2b$
$= 15a^2b$

3. Add the following:
(i) 7abc, -5abc, 9abc, -8abc
(ii) $2x^2y$, $-4x^2y$, $6x^2y$, $-5x^2y$

Solution:
(i) Given 7abc, -5abc, 9abc, -8abc
Consider 7abc + (-5abc) + (9abc) + (-8abc)
= 7abc – 5abc + 9abc – 8abc

= (7 – 5 + 9 – 8) abc [by taking abc common]
= (16 – 13) abc
= 3abc

(ii) Given $2x^2y$, $- 4x^2y$, $6x^2y$, $-5x^2y$
$2x^2y + (-4x^2y) + (6x^2y) + (-5x^2y)$
$= 2x^2y - 4x^2y + 6x^2y - 5x^2y$
$= (2- 4 + 6 - 5) x^2y$ [by taking $x^2 y$ common]
$= (8 - 9) x^2y$
$= -x^2y$

4. Add the following expressions:
(i) $x^3 -2x^2y + 3xy^2- y^3$, $2x^3- 5xy^2 + 3x^2y - 4y^3$
(ii) $a^4 - 2a^3b + 3ab^3 + 4a^2b^2 + 3b^4$, $- 2a^4 - 5ab^3 + 7a^3b - 6a^2b^2 + b^4$

Solution:
(i) Given $x^3 -2x^2y + 3xy^2- y^3$, $2x^3- 5xy^2 + 3x^2y - 4y^3$
Collecting positive and negative like terms together, we get
$= x^3 +2x^3 - 2x^2y + 3x^2y + 3xy^2 - 5xy^2 - y^3- 4y^3$
$= 3x^3 + x^2y - 2xy^2 - 5y^3$

(ii) Given $a^4 - 2a^3b + 3ab^3 + 4a^2b^2 + 3b^4$, $- 2a^4 - 5ab^3 + 7a^3b - 6a^2b^2 + b^4$
$= a^4 - 2a^3b + 3ab^3 + 4a^2b^2 + 3b^4 - 2a^4 - 5ab^3 + 7a^3b - 6a^2b^2 + b^4$
Collecting positive and negative like terms together, we get
$= a^4 - 2a^4- 2a^3b + 7a^3b + 3ab^3 - 5ab^3 + 4a^2b^2 - 6a^2b^2 + 3b^4 + b^4$
$= - a^4 + 5a^3b - 2ab^3 - 2a^2b^2 + 4b^4$

5. Add the following expressions:
(i) 8a – 6ab + 5b, –6a – ab – 8b and –4a + 2ab + 3b
(ii) $5x^3 + 7 + 6x - 5x^2$, $2x^2 – 8 - 9x$, $4x - 2x^2 + 3 x 3$, $3 x 3 - 9x - x^2$ and $x - x^2 - x^3 – 4$

Solution:
(i) Given 8a – 6ab + 5b, –6a – ab – 8b and –4a + 2ab + 3b
= (8a – 6ab + 5b) + (–6a – ab – 8b) + (–4a + 2ab + 3b)
Collecting positive and negative like terms together, we get
= 8a – 6a – 4a – 6ab – ab + 2ab + 5b – 8b + 3b
= 8a – 10a – 7ab + 2ab + 8b – 8b

= –2a – 5ab

(ii) Given $5x^3 + 7 + 6x - 5x^2$, $2x^2 – 8 - 9x$, $4x - 2x^2 + 3x^3$, $3x^3 - 9x - x^2$ and $x - x^2 - x^3 – 4$
= $(5x^3 + 7 + 6x - 5x^2) + (2x^2 – 8 - 9x) + (4x - 2x^2 + 3x^3) + (3x^3 - 9x - x^2) + (x - x^2 - x^3 - 4)$
Collecting positive and negative like terms together, we get
$5x^3 + 3x^3 + 3x^3 - x^3 - 5x^2 + 2x^2 - 2x^2 - x^2 - x^2 + 6x - 9x + 4x - 9x + x + 7 – 8 - 4$
= $10x^3 - 7x^2 - 7x – 5$

6. Add the following:
(i) x – 3y – 2z
5x + 7y – 8z
3x – 2y + 5z
(ii) 4ab – 5bc + 7ca
–3ab + 2bc – 3ca
5ab – 3bc + 4ca

Solution:
(i) Given x – 3y – 2z, 5x + 7y – 8z and 3x – 2y + 5z
= (x – 3y – 2z) + (5x + 7y – 8z) + (3x – 2y + 5z)
Collecting positive and negative like terms together, we get
= x + 5x + 3x – 3y + 7y – 2y – 2z – 8z + 5z
= 9x – 5y + 7y – 10z + 5z
= 9x + 2y – 5z

(ii) Given 4ab – 5bc + 7ca, –3ab + 2bc – 3ca and 5ab – 3bc + 4ca
= (4ab – 5bc + 7ca) + (–3ab + 2bc – 3ca) + (5ab – 3bc + 4ca)
Collecting positive and negative like terms together, we get
= 4ab – 3ab + 5ab – 5bc + 2bc – 3bc + 7ca – 3ca + 4ca
= 9ab – 3ab – 8bc + 2bc + 11ca – 3ca
= 6ab – 6bc + 8ca

7. Add $2x^2 - 3x + 1$ to the sum of $3x^2 - 2x$ and $3x + 7$.

Solution:
Given $2x^2 - 3x + 1$, $3x^2 - 2x$ and $3x + 7$
sum of $3x^2 - 2x$ and $3x + 7$
= $(3x^2 - 2x) + (3x + 7)$

$=3x^2 - 2x + 3x + 7$
$= (3x^2 + x + 7)$
Now, required expression $= 2x^2 - 3x + 1 + (3x^2 + x + 7)$
$= 2x^2 + 3x^2 - 3x + x + 1 + 7$
$= 5x^2 - 2x + 8$

8. Add $x^2 + 2xy + y^2$ to the sum of $x^2 - 3y^2$and $2x^2 - y^2 + 9$.

Solution:
Given $x^2 + 2xy + y^2$, $x^2 - 3y^2$and $2x^2 - y^2 + 9$.
First we have to find the sum of $x^2 - 3y^2$ and $2x^2 - y^2 + 9$
$= (x^2 - 3y^2) + (2x^2 - y^2 + 9)$
$= x^2 + 2x^2 - 3y^2 - y^2 + 9$
$= 3x^2 - 4y^2 + 9$
Now, required expression $= (x^2 + 2xy + y^2) + (3x^2 - 4y^2 + 9)$
$= x^2 + 3x^2 + 2xy + y^2 - 4y^2 + 9$
$= 4x^2 + 2xy - 3y^2 + 9$

9. Add $a^3 + b^3 - 3$ to the sum of $2a^3 - 3b^3 - 3ab + 7$ and $-a^3 + b^3 + 3ab - 9$.

Solution:
Given $a^3 + b^3 - 3$, $2a^3 - 3b^3 - 3ab + 7$ and $-a^3 + b^3 + 3ab - 9$.
First, we need to find the sum of $2a^3 - 3b^3 - 3ab + 7$ and $-a^3 + b^3 + 3ab - 9$.
$= (2a^3 - 3b^3 - 3ab + 7) + (-a^3 + b^3 + 3ab - 9)$
Collecting positive and negative like terms together, we get
$= 2a^3 - a^3 - 3b^3 + b^3 - 3ab + 3ab + 7 - 9$
$= a^3 - 2b^3 - 2$
Now, the required expression $= (a^3 + b^3 - 3) + (a^3 - 2b^3 - 2)$.
$= a^3 + a^3 + b^3 - 2b^3 - 3 - 2$
$= 2a^3 - b^3 - 5$

10. Subtract:
(i) $7a^2b$ from $3a^2b$
(ii) $4xy$ from $-3xy$

Solution:
(i) Given $7a^2b$ from $3a^2b$

$= 3a^2b - 7a^2b$
$= (3 - 7)\ a^2b$
$= -\ 4a^2b$

(ii) Given 4xy from -3xy
$= -3xy - 4xy$
$= -7xy$

11. Subtract:
(i) - 4x from 3y
(ii) - 2x from – 5y

Solution:
(i) Given - 4x from 3y
$= (3y) - (-4x)$
$= 3y + 4x$

(ii) Given - 2x from – 5y
$= (-5y) - (-2x)$
$= -5y + 2x$

12. Subtract:
(i) $6x^3 - 7x^2 + 5x - 3$ from $4 - 5x + 6x^2 - 8x^3$
(ii) $-x^2 - 3z$ from $5x^2 - y + z + 7$
(iii) $x^3 + 2x^2y + 6xy^2 - y^3$ from $y^3 - 3xy^2 - 4x^2y$

Solution:
(i) Given $6x^3 - 7x^2 + 5x - 3$ and $4 - 5x + 6x^2 - 8x^3$
$= (4 - 5x + 6x^2 - 8x^3) - (6x^3 - 7x^2 + 5x - 3)$
$= 4 - 5x + 6x^2 - 8x^3 - 6x^3 + 7x^2 - 5x + 3$
$= -\ 8x^3 - 6x^3 + 7x^2 + 6x^2 - 5x - 5x + 3 + 4$
$= -\ 14x^3 + 13x^2 - 10x + 7$

(ii) Given $-x^2 - 3z$ and $5x^2 - y + z + 7$
$= (5x^2 - y + z + 7) - (-\ x^2 - 3z)$
$= 5x^2 - y + z + 7 + x^2 + 3z$
$= 5x^2 + x^2 - y + z + 3z + 7$

$= 6x^2 - y + 4z + 7$

(iii) Given $x^3 + 2x^2y + 6xy^2 - y^3$ and $y^3 - 3xy^2 - 4x^2y$
$= (y^3 - 3xy^2 - 4x^2y) - (x^3 + 2x^2y + 6xy^2 - y^3)$
$= y^3 - 3xy^2 - 4x^2y - x^3 - 2x^2y - 6xy^2 + y^3$
$= y^3 + y^3 - 3xy^2 - 6xy^2 - 4x^2y - 2x^2y - x^3$
$= 2y^3 - 9xy^2 - 6x^2y - x^3$

13. From
(i) $p^3 - 4 + 3p^2$, take away $5p^2 - 3p^3 + p - 6$
(ii) $7 + x - x^2$, take away $9 + x + 3x^2 + 7x^3$
(iii) $1 - 5y^2$, take away $y^3 + 7y^2 + y + 1$
(iv) $x^3 - 5x^2 + 3x + 1$, take away $6x^2 - 4x^3 + 5 + 3x$

Solution:
(i) Given $p^3 - 4 + 3p^2$, take away $5p^2 - 3p^3 + p - 6$
$= (p^3 - 4 + 3p^2) - (5p^2 - 3p^3 + p - 6)$
$= p^3 - 4 + 3p^2 - 5p^2 + 3p^3 - p + 6$
$= p^3 + 3p^3 + 3p^2 - 5p^2 - p - 4 + 6$
$= 4p^3 - 2p^2 - p + 2$

(ii) Given $7 + x - x^2$, take away $9 + x + 3x^2 + 7x^3$
$= (7 + x - x^2) - (9 + x + 3x^2 + 7x^3)$
$= 7 + x - x^2 - 9 - x - 3x^2 - 7x^3$
$= -7x^3 - x^2 - 3x^2 + 7 - 9$
$= -7x^3 - 4x^2 - 2$

(iii) Given $1 - 5y^2$, take away $y^3 + 7y^2 + y + 1$
$= (1 - 5y^2) - (y^3 + 7y^2 + y + 1)$
$= 1 - 5y^2 - y^3 - 7y^2 - y - 1$
$= -y^3 - 5y^2 - 7y^2 - y$
$= -y^3 - 12y^2 - y$

(iv) Given $x^3 - 5x^2 + 3x + 1$, take away $6x^2 - 4x^3 + 5 + 3x$
$= (x^3 - 5x^2 + 3x + 1) - (6x^2 - 4x^3 + 5 + 3x)$
$= x^3 - 5x^2 + 3x + 1 - 6x^2 + 4x^3 - 5 - 3x$
$= x^3 + 4x^3 - 5x^2 - 6x^2 + 1 - 5$

$= 5x^3 - 11x^2 – 4$

14. From the sum of $3x^2 – 5x + 2$ and $– 5x^2 – 8x + 9$ subtract $4x^2 – 7x + 9$.

Solution:

First we have to add $3x^2 – 5x + 2$ and $– 5x^2 – 8x + 9$ then from the result we have to subtract $4x^2 – 7x + 9$.

$= \{(3x^2 - 5x + 2) + (- 5x^2 - 8x + 9)\} - (4x^2 - 7x + 9)$

$= \{3x^2 - 5x + 2 - 5x^2 - 8x + 9\} - (4x^2 - 7x + 9)$

$= \{3x^2 - 5x^2 - 5x - 8x + 2 + 9\} - (4x^2 - 7x + 9)$

$= \{- 2x^2 - 13x +11\} - (4x^2 - 7x + 9)$

$= - 2x^2 - 13x + 11 - 4x^2 + 7x – 9$

$= - 2x^2 - 4x^2 - 13x + 7x + 11 - 9$

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

15. Subtract the sum of $13x – 4y + 7z$ and $– 6z + 6x + 3y$ from the sum of $6x – 4y – 4z$ and $2x + 4y – 7$.

Solution:

First we have to find the sum of $13x – 4y + 7z$ and $– 6z + 6x + 3y$

Therefore, sum of $(13x – 4y + 7z)$ and $(–6z + 6x + 3y)$

$= (13x – 4y + 7z) + (–6z + 6x + 3y)$

$= (13x – 4y + 7z – 6z + 6x + 3y)$

$= (13x + 6x – 4y + 3y + 7z – 6z)$

$= (19x – y + z)$

Now we have to find the sum of $(6x – 4y – 4z)$ and $(2x + 4y – 7)$

$= (6x – 4y – 4z) + (2x + 4y – 7)$

$= (6x – 4y – 4z + 2x + 4y – 7)$

$= (6x + 2x – 4z – 7)$

$= (8x – 4z – 7)$

Now, required expression $= (8x – 4z – 7) – (19x – y + z)$

$= 8x – 4z – 7 – 19x + y – z$

$= 8x – 19x + y – 4z – z – 7$

$= –11x + y – 5z – 7$

16. From the sum of $x^2 + 3y^2 – 6xy$, $2x^2 – y^2 + 8xy$, $y^2 + 8$ and $x^2 – 3xy$ subtract $–3x^2 + 4y^2 – xy + x – y + 3$.

Solution:

First we have to find the sum of $(x^2 + 3y^2 - 6xy)$, $(2x^2 - y^2 + 8xy)$, $(y^2 + 8)$ and $(x^2 - 3xy)$

$=\{(x^2 + 3y^2 - 6xy) + (2x^2 - y^2 + 8xy) + (y^2 + 8) + (x^2 - 3xy)\}$

$=\{x^2 + 3y^2 - 6xy + 2x^2 - y^2 + 8xy + y^2 + 8 + x^2 - 3xy\}$

$= \{x^2 + 2x^2 + x^2 + 3y^2 - y^2 + y^2 - 6xy + 8xy - 3xy + 8\}$

$= 4x^2 + 3y^2 - xy + 8$

Now, from the result subtract the $-3x^2 + 4y^2 - xy + x - y + 3$.

Therefore, required expression $= (4x^2 + 3y^2 - xy + 8) - (-3x^2 + 4y^2 - xy + x - y + 3)$

$= 4x^2 + 3y^2 - xy + 8 + 3x^2 - 4y^2 + xy - x + y - 3$

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

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

17. What should be added to $xy - 3yz + 4zx$ to get $4xy - 3zx + 4yz + 7$?

Solution:

By subtracting $xy - 3yz + 4zx$ from $4xy - 3zx + 4yz + 7$, we get the required expression.

Therefore, required expression $= (4xy - 3zx + 4yz + 7) - (xy - 3yz + 4zx)$

$= 4xy - 3zx + 4yz + 7 - xy + 3yz - 4zx$

$= 4xy - xy - 3zx - 4zx + 4yz + 3yz + 7$

$= 3xy - 7zx + 7yz + 7$

18. What should be subtracted from $x^2 - xy + y^2 - x + y + 3$ to obtain $-x^2 + 3y^2 - 4xy + 1$?

Solution:

Let 'E' be the required expression. Then, we have

$x^2 - xy + y^2 - x + y + 3 - E = -x^2 + 3y^2 - 4xy + 1$

Therefore, $E = (x^2 - xy + y^2 - x + y + 3) - (-x^2 + 3y^2 - 4xy + 1)$

$= x^2 - xy + y^2 - x + y + 3 + x^2 - 3y^2 + 4xy - 1$

Collecting positive and negative like terms together, we get

$= x^2 + x^2 - xy + 4xy + y^2 - 3y^2 - x + y + 3 - 1$

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

19. How much is $x - 2y + 3z$ greater than $3x + 5y - 7$?

Solution:

By subtracting $x - 2y + 3z$ from $3x + 5y - 7$ we can get the required expression,

Required expression $= (x - 2y + 3z) - (3x + 5y - 7)$

= x – 2y + 3z – 3x – 5y + 7
Collecting positive and negative like terms together, we get
= x – 3x – 2y + 5y + 3z + 7
= –2x – 7y + 3z + 7

20. How much is $x^2 – 2xy + 3y^2$ less than $2x^2 – 3y^2 + xy$?

Solution:
By subtracting the $x^2 – 2xy + 3y^2$ from $2x^2 – 3y^2 + xy$ we can get the required expression,
Required expression = $(2x^2 - 3y^2 + xy) - (x^2 - 2xy + 3y^2)$
= $2x^2 - 3y^2 + xy - x^2 + 2xy - 3y^2$
Collecting positive and negative like terms together, we get
= $2x^2- x^2 - 3y^2 - 3y^2 + xy + 2xy$
= $x^2 - 6y^2 + 3xy$

21. How much does $a^2 – 3ab + 2b^2$ exceed $2a^2 – 7ab + 9b^2$?

Solution:
By subtracting $2a^2 – 7ab + 9b^2$ from $a^2 – 3ab + 2b^2$ we get the required expression
Required expression = $(a^2- 3ab + 2b^2) - (2a^2 - 7ab + 9b^2)$
= $a^2- 3ab + 2b^2 - 2a^2 + 7ab - 9b^2$
Collecting positive and negative like terms together, we get
= $a^2 - 2a^2 - 3ab + 7ab + 2b^2 - 9b^2$
= $- a^2 + 4ab - 7b^2$

22. What must be added to $12x^3 – 4x^2 + 3x – 7$ to make the sum $x^3 + 2x^2 – 3x + 2$?

Solution:
Let 'E' be the required expression. Thus, we have
$12x^3 - 4x^2 + 3x - 7 + E = x^3 + 2x^2 - 3x + 2$
Therefore, E = $(x^3 + 2x^2 - 3x + 2) - (12x^3 - 4x^2 + 3x - 7)$
= $x^3 + 2x^2 - 3x + 2 - 12x^3 + 4x^2 - 3x + 7$
Collecting positive and negative like terms together, we get
= $x^3- 12x^3+ 2x^2 + 4x^2 - 3x - 3x + 2 + 7$
= $- 11x^3 + 6x^2 - 6x + 9$

23. If $P = 7x^2 + 5xy – 9y^2$, $Q = 4y^2 – 3x^2 – 6xy$ and $R = –4x^2 + xy + 5y^2$, show that P + Q + R

= 0.

Solution:

Given $P = 7x^2 + 5xy - 9y^2$, $Q = 4y^2 - 3x^2 - 6xy$ and $R = -4x^2 + xy + 5y^2$

Now we have to prove P + Q + R = 0,

Consider $P + Q + R = (7x^2 + 5xy - 9y^2) + (4y^2 - 3x^2 - 6xy) + (- 4x^2 + xy + 5y^2)$

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

Collecting positive and negative like terms together, we get

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

$= 7x^2 - 7x^2 + 6xy - 6xy - 9y^2 + 9y^2$

$= 0$

24. If $P = a^2 - b^2 + 2ab$, $Q = a^2 + 4b^2 - 6ab$, $R = b^2 + b$, $S = a^2 - 4ab$ and $T = -2a^2 + b^2 - ab + a$. Find P + Q + R + S – T.

Solution:

Given $P = a^2 - b^2 + 2ab$, $Q = a^2 + 4b^2 - 6ab$, $R = b^2 + b$, $S = a^2 - 4ab$ and $T = -2a^2 + b^2 - ab + a$.

Now we have to find P + Q + R + S – T

Substituting all values we get

Consider $P + Q + R + S - T = \{(a^2 - b^2 + 2ab) + (a^2 + 4b^2 - 6ab) + (b^2 + b) + (a^2 - 4ab)\} - (- 2a^2 + b^2 - ab + a)$

$= \{a^2 - b^2 + 2ab + a^2 + 4b^2 - 6ab + b^2 + b + a^2 - 4ab\} - (- 2a^2 + b^2 - ab + a)$

$= \{3a^2 + 4b^2 - 8ab + b\} - (-2a^2 + b^2 - ab + a)$

$= 3a^2 + 4b^2 - 8ab + b + 2a^2 - b^2 + ab - a$

Collecting positive and negative like terms together, we get

$3a^2 + 2a^2 + 4b^2 - b^2 - 8ab + ab - a + b$

$= 5a^2 + 3b^2 - 7ab - a + b$