

FACTORISATION

Class-7 CBSE Math Worksheets with Solutions

Practice Question & worksheet for chapter 5

Example: Find the H.C.F. of

(i) $6ab^2$ and $9a^2b^2$

(ii) $15x^2y^3z^4$, $20x^3y^4z^5$ and $25x^4y^5z^6$

Solution:

(i) H.C.F. of $6ab^2$ and $9a^2b^2$

= (H.C.F. of 6 and 9) \times (H.C.F. of ab^2 and a^2b^2)

= $3ab^2$

(ii) H.C.F. of $15x^2y^3z^4$, $20x^3y^4z^5$ and $25x^4y^5z^6$

= (H.C.F. of 15, 20 and 25) \times ($x^2y^3z^4$, $x^3y^4z^5$ and $x^4y^5z^6$)

= $5x^2y^3z^4$

Example: Factorise:

(i) $4x^2y + 12y$

(ii) $3a^2b + 6ab - 24a$

(iii) $36a^3b - 60a^2bc$

(iv) $6xy^2 + 9x^2y - 24xy$

Solution:

(i) H.C.F. of $4x^2y$ and $12y$ is $4y$

So, $4y$ is a common factor of each term.

$\therefore 4x^2y + 12y = 4y(x^2 + 3)$

(ii) H.C.F. of $3a^2b$, $6ab$ and $24a$ is $3a$

$\therefore 3a^2b + 6ab - 24a = 3a(ab + 2b - 8)$

(iii) H.C.F. of $36a^3b$ and $60a^2bc$ is $12a^2b$.

$\therefore 36a^3b - 60a^2bc = 12a^2b(3a - 5c)$

(iv) H.C.F. of $6xy^2$, $9x^2y$ and $24xy$ is $3xy$.

$\therefore 6xy^2 + 9x^2y - 24xy = 3xy(2y + 3x - 8)$

Example: Factorise:

(i) $4x(a + 3b) - 7y(a + 3b)$

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

(iii) $9(x + 2y)^3 + 6(x + 2y)^2$

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

Solution:

- (i) $4x(a+3b) - 7y(a+3b) = (a+3b)(4x-7y)$
(ii) $a(a^3+2) - 2(a^3+2) = (a^3+2)(a-2)$
(iii) $9(x+2y)^3 + 6(x+2y)^2 = 3(x+2y)^2[3(x+2y)+2]$
 $= 3(x+2y)^2(3x+6y+2)$
(iv) $a(a-b)^3 + 3a^2b(a-b) = a(a-b)[(a-b)^2 + 3ab]$
 $= a(a-b)(a^2 - 2ab + b^2 + 3ab)$
 $= a(a-b)(a^2 + ab + b^2)$

Example: Factorise:

- (i) $a^2 - b + ab - a$
(ii) $xy - ba + by - xa$
(iii) $yx - ya - ax + a^2 + bx - ab$
(iv) $a^3 + a^2 + a + 1$

Solution:

- (i) $a^2 - b + ab - a = a^2 + ab - a - b$
 $= a(a+b) - 1(a+b) = (a+b)(a-1)$
(ii) $xy - ba + by - xa = xy - xa + by - ba$
 $= x(y-a) + b(y-a) = (y-a)(x+b)$
(iii) $yx - ya - ax + a^2 + bx - ab = y(x-a) - a(x-a) + b(x-a)$
 $= (x-a)(y-a+b)$
(iv) $a^3 + a^2 + a + 1 = a^2(a+1) + 1(a+1)$
 $= (a+1)(a^2+1)$

Example: Factorise:

- (i) $1+x+xy+x^2y$
(ii) $(x^2+2y)^2 - 4(x^2+2y) - y(x^2+2y) + 4y$

Solution:

- (i) $1+x+xy+x^2y = 1(1+x) + xy(1+x)$
 $= (1+x)(1+xy)$
(ii) $(x^2+2y)^2 - 4(x^2+2y) - y(x^2+2y) + 4y$
 $= (x^2+2y)[(x^2+2y)-4] - y[(x^2+2y)-4]$
 $= (x^2+2y)(x^2+2y-4) - y(x^2+2y-4)$
 $= (x^2+2y-4)(x^2+2y-y)$

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

Example: Factorise:

(i) $16 - 9(2x - 5y)^2$

(ii) $1 - 25(2 - 3a)^2$

(iii) $16(x + 6y)^2 - 9(x - 3y)^2$

Solution:

(i) $16 - 9(2x - 5y)^2 = (4)^2 - [3(2x - 5y)]^2$

$$= [4 + 3(2x - 5y)][4 - 3(2x - 5y)]$$

$$= (4 + 6x - 15y)(4 - 6x + 15y).$$

(ii) $1 - 25(2 - 3a)^2 = (1)^2 - [5(2 - 3a)]^2$

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

$$= (1 + 10 - 15a)(1 - 10 + 15a)$$

$$= (11 - 15a)(-9 + 15a).$$

(iii) $16(x + 6y)^2 - 9(x - 3y)^2 = [4(x + 6y)]^2 - [3(x - 3y)]^2$

$$= (4x + 24y)^2 - (3x - 9y)^2$$

$$= [(4x + 24y) + (3x - 9y)][(4x + 24y) - (3x - 9y)]$$

$$= (7x + 15y)(x + 33y).$$

Example: Factorise:

(i) $x^2 + 9x + 14$

(ii) $x^2 - 18x + 45$

(iii) $x^2 - 9x - 36$

Solution:

(i) $x^2 + 9x + 14 = x^2 + 7x + 2x + 14$

$$= x(x + 7) + 2(x + 7)$$

$$= (x + 7)(x + 2)$$

(ii) $x^2 - 18x + 45 = x^2 - 15x - 3x + 45$

$$= x(x - 15) - 3(x - 15)$$

$$= (x - 15)(x - 3)$$

(iii) $x^2 - 9x - 36 = x^2 - 12x + 3x - 36$

$$= x(x - 12) + 3(x - 12)$$

$$= (x - 12)(x + 3)$$

Example: Factorise: $(2a - 3b)^2 - 7(2a - 3b) - 30$

Solution: Putting $x = (2a - 3b)$, we get

$$(2a - 3b)^2 - 7(2a - 3b) - 30 = x^2 - 7x - 30$$

$$\begin{aligned}
&= x^2 - 10x + 3x - 30 \\
&= x(x - 10) + 3(x - 10) \\
&= (x - 10)(x + 3) \\
&= (2a - 3b - 10)(2a - 3b + 3) \quad [x = (2a - 3b)] \\
\therefore (2a - 3b)^2 - 7(2a - 3b) - 30 &= (2a - 3b - 10)(2a - 3b + 3)
\end{aligned}$$

Example: Factorise: $3x^2 + 11x + 10$

Solution: Find two numbers with sum = 11 and product = 30
Such numbers are 6 and 5.

$$\begin{aligned}
3x^2 + 11x + 10 &= 3x^2 + 6x + 5x + 10 \\
&= 3x(x + 2) + 5(x + 2) \\
&= (x + 2)(3x + 5) \\
\therefore 3x^2 + 11x + 10 &= (x + 2)(3x + 5)
\end{aligned}$$

Example: Factorise: $2x^2 + 9x - 18$

Solution: Find two numbers with sum = 9 and product = (2)(-18) = -36
Such numbers are 12 and -3.

$$\begin{aligned}
2x^2 + 9x - 18 &= 2x^2 + 12x - 3x - 18 \\
&= 2x(x + 6) - 3(x + 6) \\
&= (x + 6)(2x - 3) \\
\therefore 2x^2 + 9x - 18 &= (x + 6)(2x - 3)
\end{aligned}$$

Example: Factorise: $14x^2 - 23x + 8$

Solution: Find two numbers with sum = -23 and product = (14)(8) = 112
Such numbers are -16 and -7.

$$\begin{aligned}
14x^2 - 23x + 8 &= 14x^2 - 16x - 7x + 8 \\
&= 2x(7x - 8) - 1(7x - 8) \\
&= (7x - 8)(2x - 1) \\
\therefore 14x^2 - 23x + 8 &= (7x - 8)(2x - 1)
\end{aligned}$$

Example: Factorise: $12x^2 - x - 35$

Solution: Find two numbers with sum = -1 and product = (12)(-35) = -420
Such numbers are -21 and 20.

$$\begin{aligned}
12x^2 - x - 35 &= 12x^2 - 21x + 20x - 35 \\
&= 3x(4x - 7) + 5(4x - 7) \\
&= (4x - 7)(3x + 5) \\
\therefore 12x^2 - x - 35 &= (4x - 7)(3x + 5)
\end{aligned}$$

Example: Factorise: $15x^2 - 8x - 16$

Solution: Find two numbers with sum = -8 and product = (15)(-16) = -240
Such numbers are 12 and -20.

$$15x^2 - 8x - 16 = 15x^2 - 20x + 12x - 16$$

$$\begin{aligned}
 &= 5x(3x - 4) + 4(3x - 4) \\
 &= (3x - 4)(5x + 4) \\
 \therefore 15x^2 - 8x - 16 &= (3x - 4)(5x + 4)
 \end{aligned}$$

Example: Factorise: $8 - 18x - 5x^2$

Solution: Find two numbers with sum = -18 and product = $(8)(-5) = -40$
Such numbers are 2 and -20 .

$$\begin{aligned}
 8 - 18x - 5x^2 &= 8 - 20x + 2x - 5x^2 \\
 &= 4(2 - 5x) + x(2 - 5x) \\
 &= (2 - 5x)(4 + x) \\
 \therefore 8 - 18x - 5x^2 &= (2 - 5x)(4 + x)
 \end{aligned}$$

