Important Questions Class 8 Maths Chapter 12 Factorisation

Question 1: Find the common factors of the given term:

$6abc, 24ab^2, 12a^2b$

$10pq, 20qr, 30rp$

$3x^2y^3, 10x^3y^2, 6x^2y^2z$

Answer 1: (a) On factorising $6abc$, $24ab^2$ and $12a^2b$, we get

$6abc = 2 \times 3 \times a \times b \times c$

$24ab^2 = 2 \times 2 \times 2 \times 3 \times a \times b \times b$

$12a^2b = 2 \times 2 \times 3 \times a \times a \times b$

Hence, the common factors of $6abc$, $24ab^2$ and $12a^2b$ are 2, 3, a and b

Therefore, multiplying the common factors we get

$2 \times 3 \times a \times b = 6ab$

(b) On factorising 10pq, 20qr and 30rp, we get

$10pq = 2 \times 5 \times p \times q$

$20qr = 2 \times 2 \times 5 \times q \times r$

$30rp = 2 \times 3 \times 5 \times r \times p$

Hence, the common factors are 2 and 5

Therefore, multiplying the common factors we get

$2 \times 5 = 10$

(c) On factorising $3x^2y^3$, $10x^3y^2$, $6x^2y^2z$, we get

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

$10x^3y^2 = 2 \times 5 \times x \times x \times x \times y \times y$

$6x^2y^2z = 2 \times 3 \times x \times x \times y \times y \times z$

Hence, the common factors are x, x, y and y

Therefore, multiplying the common factors we get

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

Question 2: Factorise the following expressions

$ax^2y + bxy^2 + cxyz$

$z – 7 + 7xy – xyz$

Answer 2: (a) On factorising ax^2y, bxy^2 and cxyz, we get

$ax^2y = a + x + x + y$

$bxy^2 = b \times x \times y \times y$

$cxyz = c \times x \times y \times z$

Hence, the common factors are x and y

Therefore, $ax^2y + bxy^2 + cxyz = xy (ax + by + cz)$

(b) $z – 7 + 7xy – xyz$

=⟩ z -7 – z (xy) + 7 (xy)

=⟩ (z – 7) – xy (z – 7)

=⟩ (1 – xy) (z – 7)

Question 3: Factorise the following expressions.

$(l + m)^2 – 4lm$ (Hindi: Expand $(l + m)^2$ first)

$25m^2 + 30m + 9$

16x5 – $144x^3$

$(l + m)^2 – (l – m)^2$

Answer 3: (a) $(l + m)^2 – 4lm$

=) $l^2 + m^2 + 2lm – 4lm$

[Using $(x + y)^2 = x^2 + 2xy + y^2$]

=) $l^2 + m^2 – 2lm$

=) $(l – m)^2$

[Using $(x – y)^2 = x^2 – 2xy + y^2$]

(b) $25m^2 + 30m + 9$

=) $(5m)^2 + 2 \times 5m \times 3 + 3^2$

=) $(5m + 3)^2$

[Using $(x + y)^2 = x^2 + 2xy + y^2$]

(c) $16x5 – 144x^3$

=) $16x^3 (x^2 – 9)$

=) $16x^3 (x – 3) (x + 3)$. [Using $(x^2 – y^2) = (x + y)(x – y)$

(d) $(l + m)^2 – (l – m)^2$

=) $\{(l + m) – (l – m)\} \{(l + m) + (l – m)\}$.

[Using $x^2 – y^2 = (x + y) (x – y)$]

=) $(l + m – l + m) (l + m + l – m)$

=) $(2m) (2l)$

= $4ml$

Question 3: Factorise the following expressions:

$10ab + 4a + 5b + 2$

$a^4 – 2a^2b^2 + b^4$

$q^2 – 10q + 21$

Answer 3: (a) $10ab + 4a + 5b + 2$

=) $5b (2a + 1) + 2(2a + 1)$

=⟩ $(5b + 2)(2a + 1)$

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

=⟩ $(a^2)^2 - 2a^2b^2 + (b^2)^2$

=⟩ $(a^2 - b^2)^2$

=⟩ $\{(a - b)(a + b)\}^2$

=⟩ $(a - b)^2 (a + b)^2$

(c) $q^2 - 10q + 21$

Here we observe that,

$21 = -7 \times -3$ and $-7 + (-3) = -10$

=⟩ $q^2 - 10q + 21 = q^2 - 3q - 7q + 21$

=⟩ $q(q - 3) - 7(q - 3)$

=⟩ $(q - 7)(q - 3)$

Question 4: Carry out the following divisions.

$34x^3y^3z^3 \div 51xy^2z^3$

$(x^3 + 2x^2 + 3x) \div 2x$

$9x^2y^2(3z - 24) \div 27xy(z - 8)$

Answer 4: (a) $34x^3y^3z^3 / 51xy^2z^3$

$= 2 \times 17 \times x \times x \times x \times y \times y \times y \times z \times z \times z / 3 \times 17 \times x \times y \times y \times z \times z \times z$

$= 2x^2y / 3$

(b) $(x^3 + 2x^2 + 3x) = x(x^2 + 2x + 3)$

Therefore, $x(x^2 + 2x + 3) / 2x$

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

(c) $9x^2y^2(3z - 24) / 27xy(z - 8)$

$= 9x^2y^2 \times 3(z - 8) / 27xy(z - 8)$

$= xy$

Question 5: Divide the following as directed

$20(y + 4)(y^2 + 5y + 3) \div 5(y + 4)$

$39y^3 (50y^2 - 98) \div 26y^2(5y + 7)$

Answer 5: (a) $20(y + 4)(y^2 + 5y + 3) / 5(y + 4)$

$= 4(y^2 + 5y + 3)$

(b) In this case, first we have to factorise $50y^2 - 98$

$50y^2 - 98 = 2(25y^2 - 49) = 2(5y + 7)(5y - 7)$

Therefore, $39y^3(50y^2 - 98) / 26y^2 (5y + 7)$

$= 2 \times 3 \times 13 \times y^3 (5y + 7)(5y - 7) / 2 \times 13 \times y^2(5y + 7)$

$= 3y (5y - 7)$

Question 6: Find and correct the errors in the statement

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

Answer 6: L. H. S. $= (3x + 2)^2$

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

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

1. H. S. $= 3x^2 + 6x + 4$

Therefore, L. H. S. ≠ R. H. S.

Hence, correct statement is $(3x + 2)^2 = 9x^2 + 4 + 12x$

Question 7:Find and correct the errors in the statement

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

Answer 7: L. H. S. $= (2a + 3b)(a - b)$

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

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

$= 2a^2 + ab – 3b^2$

1. H. S. $= 2a^2 – 3b^2$

Therefore, L. H. S. ≠ R. H. S.

Hence, the correct statement is $(2a + 3b)(a – b) = 2a^2 + ab – 3b^2$

Question 8:Find and correct the errors in the statement

$(z + 5)^2 = z^2 + 25$

Answer 8: L. H. S. $= (z + 5)^2$

$(z + 5)^2 = z^2 + 10z + 25$

[Using identity $(a + b)^2 = a^2 + 2ab + b^2$]

1. H. S. $= z^2 + 25$

Hence, L. H. S. ≠ R. H. S.

Therefore, the correct statement is $(z + 5)^2 = z^2 + 10z + 25$

Question 9: Find and correct the errors in the statement

$3x / (3x + 2) = 1 / 2$

Answer 9: L. H. S. $= 3x / (3x + 2)$

1. H. S. $= 1 / 2$

Therefore, L. H. S. ≠ R. H. S.

Hence, $3x / (3x + 2) = 3x / (3x + 2)$

Question 10:Find and correct the errors in the statement

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

Answer 10: L. H. S. $= (7x + 5) / 5$

$= 7x/5 + 5/5$

$= 7x/5 + 1$

1. H. S. $= 7x$

Therefore, L. H. S. ≠ R. H. S.

Hence, the correct statement is $(7x + 5) / 5 = (7x/5) + 1$

Question 11: Factorise $4x^2 – 20x + 25$.

Answer 11: $4x^2 – 20x + 25$

$= (2x)^2 – 2 \times 2x \times 5 + (5)^2$

$= (2x – 5)^2$

[Using the identity $a^2 – 2ab + b^2 = (a – b)^2$]

Question 12: Verify that

$(3x + 5y)^2 – 30xy = 9x^2 + 25y^2$

Answer 12: L. H. S. $= (3x + 5y)^2 – 30xy$

$9x^2 + 30xy + 25y^2 – 30xy = 9x^2 + 25y^2$

1. H. S. $= 9x^2 + 25y^2$

Therefore, L. H. S. = R. H. S. (verified)

Question 13: Verify that

$(11pq + 4q)^2 – (11pq – 4q)^2 = 176pq^2$

Answer 13: L. H. S. $= (11pq + 4q)^2 – (11pq – 4q)^2$

$= 121p^2q^2 + 88pq^2 + 16q^2 – (121p^2q^2 – 88pq^2 + 16q^2)$

[Using identities $(a + b)^2 = (a^2 + 2ab + b^2)$

And $(a – b)^2 = (a^2 – 2ab + b^2)$]

$= 121p^2q^2 + 88pq^2 + 16q^2 – 121p^2q^2 + 88pq^2 – 16q^2$

$= 88pq^2 + 88pq^2$

$= 176pq^2$

1. H. S. $= 176pq^2$

Therefore, L. H. S. = R. H. S. (verified)

Question 14: The area of a rectangle is $x^2 + 12xy + 27y^2$ and its length is $(x + 9y)$. Find the breadth of the rectangle.

Answer 14: Area / Length

$= (x^2 + 12xy + 27y^2) / (x + 9y)$

$= x(x + 9y) + 3y(x + 9y) / (x + 9y)$

$= (x + 3y)(x + 9y) / (x + 9y)$

$= (x + 3y)$

Hence, the breadth of the rectangle is $(x + 3y)$

Question 15: Divide $15(y + 3)(y^2 – 16)$ by $5(y^2 – y – 12)$.

Answer 15: On factorising $15(y + 3)(y^2 – 16)$, we get $5 \times 3 \times (y + 3)(y – 4)(y + 4)$.

On factorising $5(y^2 – 4y + 3y – 12)$

$= 5(y – 4)(y + 3)$

Therefore, on dividing the first expression by second expression, we get

$15(y + 3)(y^2 – 16) / 5(y + 3)(y – 4)$

$= 3(y + 4)$

Question 16: Factorise $2ax^2 + 4axy + 3bx^2 + 2ay^2 + 6bxy + 3by^2$.

Answer 16: $2ax^2 + 4axy + 3bx^2 + 2ay^2 + 6bxy + 3by^2$

$= 2ax^2 + 4axy + 3bx^2 + 6bxy + 2ay^2 + 3by^2$

$= 2ax(x + 2y) + 3bx(x + 2y) + 2y^2(2a + 3b)$

$= x(2a + 3b)(x + 2y) + 2y^2(2a + 3b)$

$= (2a + 3b) [x(x + 2y) + 2y^2]$

$= (2a + 3b) (x^2 + 2y^2 + 2xy]$

Question 17: Factorise $4a^2 – 4ab + b^2$

Answer 17: $4a^2 – 4ab + b^2$

$= (2a)^2 – 2(2a)(b) + b^2$

$= (2a – b)^2$

[Using the identity $a^2 – 2ab + b^2 = (a – b)^2$]

Question 18: Factorise $3a^2b^3 – 27a^4b$

Answer 18: $3a^2b^3 – 27a^4b$

$= 3a^2b(b^2 – 9a^2)$

$= 3a^2b(b^2 – (3a)^2)$

$= 3a^2b(b + 3a)(b – 3a)$

[Using the identity $(a^2 – b^2) = (a + b)(a – b)$]

Question 19: Factorise $(4x^2 / 9) – (9y^2 / 16)$

Answer 19: $(4x^2 / 9) – (9y^2 / 16)$

$= (2x / 3)^2 – (3y / 4)^2$

$= [(2x / 3) + (3y / 4)][(2x / 3) – (3y / 4)]$

[Using the identity $(a^2 – b^2) = (a + b)(a – b)$]

Question 20: Factorise $1331x^3y – 11y^3x$

Answer 20: $1331x^3y – 11y^3x$

$= 11xy (121x^2 – y^2)$

$= 11xy [(11x)^2 – y^2]$

$= 11xy (11x – y)(11x + y)$

[Using the identity $(a^2 – b^2) = (a + b)(a – b)$]

Question 21: The area of a rectangle is $x^2 + 19x – 20$. Find the possible length and the breadth of the rectangle.

Answer 21: Area of Rectangle = length × breadth

$= x^2 + 19x – 20$

$= x^2 + 20x – x – 20$

$= x(x + 20) – 1(x + 20)$

$= (x – 1) (x + 20)$

Thus, the length and the breadth are $(x – 1)$ and $(x + 20)$

Question 22: Perform the following division:

$(3pqr – 6p^2q^2r^2) \div 3pq$

Answer $(3pqr – 6p^2q^2r^2) \div 3pq$

$= (3pqr – 6p^2q^2r^2) / 3pq$

$= 3pqr (1 – 2pqr) / 3pq$

$= r(1 – 2pqr)$

Question 23: Perform the following division:

$(x^3y)/9 – (xy^3)/16$

Answer 23: $(x^3y)/9 – (xy^3)/16$

$= xy(x^2/9 – y^2/16)$

$= xy [(x/3)^2 – (y/4)^2]$

$= xy (x/3 – y/4)(x/3 + y/4)$

[Using the identity $(a^2 – b^2) = (a + b)(a – b)$]

Question 24: The area of a rectangle is $x^2 + 7x + 12$. If the breadth is $(x + 3)$, find its length.

Answer 24: Area of Rectangle = Length × Breadth

=〉 $x^2 + 7x + 12$ = Length × $(x + 3)$

=〉 Length = $(x^2 + 7x + 12) / (x +3)$

=〉 Length = $(x^2 + 3x + 4x + 12) / (x + 3)$

=〉 Length = $x(x + 3) + 4(x + 3) / (x + 3)$

=⟩ Length = $(x + 3)(x + 4) / (x + 3)$

=⟩ Length = $(x + 4)$

Question 25: The area of a circle is given by the expression $\pi x^2 + 6\pi x + 9\pi$. Find the radius of the circle.

Answer 25: Area of a circle = πr^2

Where radius = r

Then, $\pi x^2 + 6\pi x + 9\pi = \pi r^2$

=⟩ $\pi(x^2 + 6x + 9) = \pi r^2$

=⟩ $(x^2 + 6x + 9) = r^2$

=⟩ $r^2 = (x^2 + 2.x.3 + 3^2)$

=⟩ $r^2 = (x + 3)^2$

Therefore, $r = x + 3$

Question 26: The sum of the first n natural numbers is given by the expression $n^2/2 + n/2$. Factorise this expression.

Answer 26: Given that the sum of the first n natural number = $n^2/2 + n/2 = n/2\ (n + 1)$

Question 27: The sum of $(x + 5)$ observations is $x^4 – 625$. Find the mean of the observations.

Answer 27: Mean = $(x^4 – 625) / (x + 5)$

Mean = $[(x^2)^2 – (25)^2] / (x + 5)$

Mean = $[(x^2 + 25)(x^2 – 5^2)] / (x + 5)$

Mean = $[(x^2 + 25)(x – 5)(x + 5)] / (x + 5)$

Mean = $(x^2 + 25)(x – 5)$

Question 28: The height of a triangle is $x^4 + y^4$ and its base is 14xy. Find the area of the triangle.

Answer 28: Area of the triangle = 1 /2 × height × base

=⟩ Area = $1/2 \times (x^4 + y^4) \times (14xy)$

=⟩ Area = $7xy (x^4 + y^4)$

Question 29: The cost of a chocolate is Rs (x + y) and Rohit bought (x + y) chocolates. Find the total amount paid by him in terms of x. If x = 10, find the amount paid by him.

Answer 29: The cost of chocolate = Rs $(x + y)$

No. of chocolates Rohit bought = $(x + y)$

Therefore, total amount he paid = Rs $(x + y)(x + y)$

= Rs $(x + y)^2$

If $x = 10$, then Rs $(10 + y)^2$

Question 30: The base of a parallelogram is (2x + 3 units) and the corresponding height is (2x – 3 units). Find the area of the parallelogram in terms of x. What will be the area of the parallelogram of x = 30 units?

Answer: Area of Parallelogram = Base × Height

Therefore, Area = $(2x + 3)(2x – 3)$

Area = $(2x)^2 – (3)^2 = 4x^2 – 9$

Putting $x = 30$ units, we get

Area = $4 \times (30)^2 – 9 = 4 \times 900 – 9 = 3600 – 9 = 3591$sq. units.

Question 31: The radius of a circle is 7ab – 7bc – 14ac. Find the circumference of the circle. (π = 22/7)

Answer 31: The circumference of the circle = $2\pi r$

Therefore, Circumference = $2\pi (7ab – 7bc – 14ac)$

Circumference = $2 \times 22/7 (7ab – 7bc – 14ac)$

= $2 \times 22 (ab – bc – 2ac)$

= $44(ab – bc – 2ac)$

Question 32: Factorise $p^4 + q^4 + p^2q^2$

Answer 32: $p^4 + q^4 + p^2q^2$

$= (p^2)^2 + (q^2)^2 + 2p^2q^2 – p^2q^2$

$= (p^2+ q^2)^2 – (pq)^2$

[Using the identity $a^2 + b^2 + 2ab = (a + b)^2$]

$= (p^2 + q^2 + pq)(p^2 + q^2 – pq)$

[Using the identity $a^2 – b^2 = (a + b)(a – b)$]

Question 33: Factorise the expression and divide them as directed:

$(2x^3 – 12x^2 + 16x) \div (x – 2)(x – 4)$

Answer 33: $(2x^3 – 12x^2 + 16x) / [(x – 2)(x – 4)]$

$= [2x (x^2 – 6x + 8)] / [(x – 2)(x – 4)]$

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

$= [2x \{x (x – 2) – 4 (x – 2)\}] / [(x – 2) (x – 4)]$

$= [2x (x – 4)(x – 2)] / [(x – 2) (x – 4)]$

$= 2x$

Question 34: Factorise $x^2 + 1/x^2 + 2 – 3x – 3/x$

Answer 34: $x^2 + 1/x^2 + 2 – 3x – 3/x$

$\Rightarrow x^2 + 1/x^2 + 2 – 3 (x + 1/x^2)$

$\Rightarrow (x + 1/x)^2 – 3 (x + 1/x^2)$

[Using the identity $a^2 + b^2 + 2ab = (a + b)^2$]

$\Rightarrow (x + 1/x) (x + 1/x – 3)$