Factorising & Expanding

Model Answers

Question 1

Factorise completely.

kp + 3k + mp + 3m

Answer:

First, we can group the terms: (kp + 3k) + (mp + 3m). Then, we can factor out the common factors in each group: k(p + 3) + m(p + 3).

Finally, we can factor out the common binomial: (k + m)(p + 3). So, the factorised form of the expression is (k + m)(p + 3).

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Question 2

Factorise completely.

2 15p + 24p

Answer:

To factorize the expression 2 15p + 24pt, we can first factor out the greatest common factor (GCF) of 15p and 24pt, which is 3p. This gives us:

*2 15p + 24pt = 3p(2 * 5p + 8t)*

Therefore, the completely factored form of 2 15p + 24pt is 3p(10p + 4t).

Question 3

(a) Find the value of $7p – 3q$ when $p = 8$ and $q = -5$

Answer:

*First, substitute the given values of p and q into the equation. So, 7p – 3q becomes 7*8 - 3*(-5)*
This simplifies to 56 + 15. So, 7p – 3q = 71 when p = 8 and q = -5.

(b.)Factorise completely.

3uv + 9v

Answer:

To factorise 3uv + 9vw completely, we can first factor out the greatest common factor, which is 3v. This gives us:
3uv + 9vw = 3v(u + 3w)

Therefore, 3uv + 9vw can be factored completely as 3v(u + 3w).

Question 4

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Factorise completely ax + bx + ay + by

Answer:

First, we can group the terms that have common factors. In this case, we can group the terms with 'x' and the terms with 'y': (ax + bx) + (ay + by)

Next, we can factor out the common factors. For the first group, 'x' is the common factor. For the second group, 'y' is the common factor: x(a + b) + y(a + b)

Finally, we can see that (a + b) is a common factor for both groups. So, we can factor out (a + b): (a + b)(x + y) So, ax + bx + ay + by is completely factorised as (a + b)(x + y)

Question 5

Factorise completely

$$p^2 x - 4q^2 x$$

Answer:

To factorise the expression $p^2 x - 4q^2 x$, we can take out the common factor x to get $x(p^2 - 4q^2)$.

The expression $p^2 - 4q^2$ is a difference of squares, which can be factored as $(p - 2q)(p + 2q)$ 1. Therefore, the complete factorisation of $p^2 x - 4q^2 x$ is $x(p - 2q)(p + 2q)$.

Question 6

Factorise completely.

$$2xy - 4yz$$

Answer:

First, we can see that both terms have a common factor of 2y. So, we can factor out 2y from both terms.
$2xy - 4yz = 2y(x - 2z)$ So, the factorised form of $2xy - 4yz$ is $2y(x - 2z)$.

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Question 7

Factorise

(a) $4x^2 - 9$

Answer:

First, we can see that this is a difference of squares. The difference of squares is a special case in factoring and it follows this rule: $a^2 - b^2 = (a - b)(a + b)$. In this case, a^2 is $4x^2$ and b^2 is 9.

Therefore, a is 2x (since $(2x)^2 = 4x^2$) and b is 3 (since $3^2 = 9$). So, we can factorise $4x^2 - 9$ as $(2x - 3)(2x + 3)$.

(b) $4x^2 - 9x$

Answer:

First, we can see that both terms have a common factor of 'x'. So, we can factor out 'x' from both terms.

$4x^2 - 9x = x(4x - 9)$ So, the factorised form of $4x^2 - 9x$ is $x(4x - 9)$.

(c) $4x^2 - 9x + 2$.

Answer:

*First, we need to find two numbers that multiply to (4*2)=8 and add to -9. Those numbers are -7 and -1.*

Next, we rewrite the middle term of the quadratic, -9x, as -7x -1x. So, $4x^2 - 9x + 2$ becomes $4x^2 - 7x - 1x + 2$. Now, we factor by grouping. The first two terms, $4x^2 - 7x$, have a common factor of x, and the last two terms, -1x +2, have no common factors. So, $4x^2 - 7x - 1x + 2$ becomes $x(4x - 7) - 1(4x - 7)$.

Finally, we factor out the common binomial term, (4x -7), to get the final factored form of the quadratic: $(4x - 7)(x - 1)$.

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Question 8

7ac + 14a,

Answer:

First, we can see that both terms in the expression have a common factor of 7a. So, we can factor out 7a from both terms.

This gives us: 7a(c + 2). So, 7ac + 14a = 7a(c + 2).

(b) $12ax^3 + 18xa^3$

Answer:

First, we can see that both terms have common factors. These are 6, x, and a^3. So, we can factor out these common factors:

$6xa^3(2x^2 + 3)$ So, $12ax^3 + 18xa^3$ simplifies to $6xa^3(2x^2 + 3)$.

Question 9

(a) Factorise completely $12x^2 - 3y^2$

Answer:

To factorize $12x^2 - 3y^2$ completely, we can first factor out the greatest common factor (GCF) of the two terms, which is 3. This gives us:

$12x^2 - 3y^2 = 3(4x^2 - y^2)$

Next, we can use the difference of squares formula to factor the expression $4x^2 - y^2$:

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

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Therefore, the complete factorization of $12x^2 - 3y^2$ is:

$12x^2 - 3y^2 = 3(2x + y)(2x - y)$

(b)

(i) Expand $(x - 3)^2$

Answer:

First terms: $x * x = x^2$ Outer terms: $x * -3 = -3x$ Inner terms: $-3 * x = -3x$ Last terms: $-3 * -3 = 9$ Now, combine like terms: $x^2 - 3x - 3x + 9 = x^2 - 6x + 9$ So, $(x - 3)^2$ expands to $x^2 - 6x + 9$

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(ii) x^2 - 6x +10 is to be written in the form $(x - p)^2 + q$.
Find the values of p and q.

Answer:

*First, we need to complete the square for the given quadratic equation. The general form of a quadratic equation is $ax^2 + bx + c$. In this case, a = 1, b = -6, and c = 10. The formula to complete the square is $(x - h)^2 + k$, where h = -b/2a and k = c - $(b^2/4a)$. So, let's calculate h and k. h = -(-6)/2*1 = 3 k = 10 - $((-6)^2/4*1)$ = 10 - 9 = 1*

Therefore, the equation $x^2 - 6x + 10$ can be written in the form $(x - p)^2 + q$ as $(x - 3)^2 + 1$. So, p = 3 and q = 1.

Question 10

Factorise completely

$2x – 4x^2$

Answer:

First, we can factor out the common factor of 2x from both terms

So, $2x – 4x^2 = 2x(1 - 2x)$.

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Question 11

Expand and simplify.

x(2x + 3) + 5(x – 7)

Answer:

*First, distribute x across the terms in the first parentheses: x * 2x = 2x^2 x * 3 = 3x So, x(2x + 3) simplifies to 2x^2 + 3x.*

*Next, distribute 5 across the terms in the second parentheses: 5 * x = 5x 5 * -7 = -35 So, 5(x – 7) simplifies to 5x - 35.*

Finally, combine like terms: 2x^2 + 3x + 5x - 35 = 2x^2 + 8x - 35. So, x(2x + 3) + 5(x – 7) simplifies to 2x^2 + 8x - 35.

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Question 12

Factorise completely.

$9x2 - 6x^2$

Answer:

First, we can factor out the common factor of $3x^2$ from both terms:

$3x^2(3 - 2) = 3x^2$.

Question 13

Factorise

$2x^2 - 5x - 3$

Answer:

We rewrite the middle term of the quadratic as the sum of the terms $-6x$ and x. So, $2x^2 - 5x - 3$ becomes $2x^2 - 6x + x - 3$. Now, we can factor by grouping. The first two terms have a common factor of $2x$, and the last two terms have a common factor of 1. So, $2x^2 - 6x + x - 3$ becomes $2x(x - 3) + 1(x - 3)$.

Finally, we can factor out the common binomial term $(x - 3)$ to get the final factored form of the quadratic: $2x^2 - 5x - 3 = (2x + 1)(x - 3)$.

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Question 14

Factorise

$14p2 + 21pq$

Answer:

First, we can see that both terms in the expression have a common factor of 7p. So, we can factor out 7p from both terms to get:

$7p(2p + 3q)$ So, $14p^2 + 21pq$ factorises to $7p(2p + 3q)$.

Question 15

Factorise completely

(a) $ax + ay + bx + by$

Answer:

First, we can factor out x from the first two terms and y from the last two terms: $ax + ay + bx + by = x(a + b) + y(a + b)$

Then, we can see that $(a + b)$ is a common factor in both terms, so we can factor that out: $x(a + b) + y(a + b) = (a + b)(x + y)$ So, the complete factorisation of $ax + ay + bx + by$ is $(a + b)(x + y)$.

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(b) $3(x – 1)2^2 + (x – 1)$

Answer:

First, we can see that $(x - 1)$ is a common factor in both terms. So, we can factor out $(x - 1)$ from both terms. This gives us: $(x - 1)(3(x - 1) + 1)$

Next, we can simplify the expression inside the parentheses. This gives us: $(x - 1)(3x - 3 + 1)$

Finally, we simplify the expression inside the parentheses to get the final answer. So, the factorized form of the expression is: $(x - 1)(3x - 2)$

Question 16

Factorise Completely.

$15a^3 – 5ab$

Answer:

First, we can see that both terms have a common factor of 5a. So, we can factor out 5a from both terms.

$15a^3 – 5ab = 5a(3a^2 - b)$ So, the factorised form of $15a^3 – 5ab$ is $5a(3a^2 - b)$.

Question 17

Factorise completely.

(a) a + b + at + bt

Answer:

First, we can group the terms as follows: (a + at) + (b + bt). Then, we can factor out the common factors from each group. From the first group, we can factor out 'a' and from the second group, we can factor out 'b'. So, the expression becomes: a(1 + t) + b(1 + t).

Finally, we can factor out the common factor (1 + t) from the whole expression. So, the completely factorised form of the expression a + b + at + bt is: (a + b)(1 + t).

(b) $x^2 – 2x – 24$

Answer:

First, we need to find two numbers that multiply to -24 and add to -2. Those numbers are -6 and 4. So, we can rewrite the expression as: $x^2 - 6x + 4x - 24$ Then, we can factor by grouping: x(x - 6) + 4(x - 6)

Finally, we can factor out the common binomial term to get the final answer: (x - 6)(x + 4)

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Question 18

Factorise completely.

$12xy - 3x^2$

Answer:

First, we can see that both terms have a common factor of 3x. So, we can factor out 3x from both terms to get:

$3x(4y - x)$ So, the factorised form of $12xy - 3x^2$ is $3x(4y - x)$.

Question 18

Factorise completely.

$ap + bp - 2a - 2b$

Answer:

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First, we can group the terms: $(ap + bp) - (2a + 2b)$. Then, we can factor out common factors from each group: $p(a + b) - 2(a + b)$.

Finally, we can factor out the common binomial $(a + b)$ to get: $(p - 2)(a + b)$. So, $ap + bp - 2a - 2b = (p - 2)(a + b)$.

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