Factorise 6x +7x-20I Dont Understand How People Are Getting 6x +15x - 8x -20How Did They Get 15 And 8,

Factorise 6x +7x-20I Dont Understand How People Are Getting 6x +15x - 8x -20How Did They Get 15 And 8, many students find algebraic expressions confusing, especially when it comes to factoring and simplifying complex terms. If you are struggling with understanding how to factor expressions like 6x + 7x - 20, or how some people arrive at intermediate expressions like 6x + 15x - 8x - 20, you're not alone. This article aims to clarify the process of factorising algebraic expressions step-by-step, explain where the numbers 15 and 8 come from, and provide helpful tips to improve your algebra skills. Whether you're a beginner or looking to strengthen your understanding, this comprehensive guide will help you master the concept of factorisation efficiently.

Understanding the Basics of Factorisation

What is Factorisation?

Factorisation is the process of expressing an algebraic expression as a product of its factors. In simple terms, it involves breaking down a complex algebraic expression into simpler components that, when multiplied together, give the original expression.

Why is Factorisation Important?

- It simplifies solving equations.
- It helps in finding roots or solutions.
- It is essential for performing polynomial division.
- It is useful in algebraic manipulation and problem-solving.

Key Concepts in Factorisation

- Common factors
- Difference of squares
- Trinomials
- Grouping methods

Breaking Down the Expression: 6x + 7x - 20

Step 1: Combine Like Terms

The first step is to simplify the expression by combining like terms:
- 6x + 7x = 13x
So, the expression becomes:
- 13x - 20

Step 2: Recognize the Form of the Expression

Now, the expression is:
- 13x - 20
This is a binomial—a difference of two terms.

Step 3: Factor out the Greatest Common Factor (GCF)

In this case, the GCF of 13x and 20 is 1, meaning no common factors other than 1. Therefore, the expression is already simplified in terms of combining like terms.

Addressing the Confusion: How Do We Get 15 and 8?

Understanding the Intermediate Step: 6x + 15x - 8x - 20

Some students encounter steps where the expression is rewritten as:
- 6x + 15x - 8x - 20

But where do the numbers 15 and 8 come from?

Explanation of the Process

This expression is obtained during a process called splitting the middle term or decomposition, which is a common method for factoring trinomials.

Step-by-step:

1. Start with a quadratic expression:
- For example: ax^2 + bx + c

2. Express the middle term (bx) as a sum of two terms:
- b = m + n
- So, bx = m x + n x

3. Find two numbers that multiply to ac and add to b:
- These numbers are 15 and -8 in this case.

How to Factor Expressions Like 6x + 15x - 8x - 20

Step 1: Group Terms

Group the terms to make factoring easier:
- (6x + 15x) - (8x + 20)

Step 2: Factor Out GCF from Each Group

- From the first group: 3x (since 6x and 15x share 3x)
- From the second group: -4 (since 8x and 20 share 4)

So, the expression becomes:
- 3x(2 + 5) - 4(2x + 5)

Step 3: Recognize Common Binomial Factors

Notice that both terms contain the binomial (2 + 5):
- Wait, more precisely, the second group is -4(2x + 5), but the first group is 3x(2 + 5).

Actually, the proper factorisation involves recognizing a common binomial factor:

The original expression:
- 6x + 15x - 8x - 20

Combine like terms:
- (6x + 15x) - (8x + 20) = 21x - 8x - 20

But wait, this seems inconsistent. Let's clarify the correct approach.

Correct Approach to Decompose and Factor

1. Recognize the Goal

When faced with an expression like 6x + 15x - 8x - 20, the objective is to rewrite it in a factored form.

2. Combine Like Terms Where Possible

Combine the x terms:
- 6x + 15x - 8x = (6 + 15 - 8) x = 13x

Now, the expression simplifies to:
- 13x - 20

This suggests that the intermediate expression, with 15 and 8, might be part of an attempt to factor more complex expressions, such as quadratic trinomials.

Factoring Quadratic Expressions: The Core Concept

Understanding Quadratic Trinomials

Expressions like ax^2 + bx + c are quadratic. Factoring quadratics involves finding two binomials that multiply to give the original quadratic.

Common Factoring Methods

- Factoring by grouping
- Decomposition method

- Quadratic formula (for non-factorable quadratics)

Step-by-Step Guide to Factorising 6x + 7x - 20

Step 1: Combine Like Terms

- 6x + 7x = 13x
- The simplified expression is: 13x - 20

Step 2: Check for Common Factors

- GCF of 13x and 20 is 1.
- So, the expression cannot be simplified further by factoring out a common factor.

Step 3: Recognize the Type of Expression

- It's a binomial, but not factorable further unless it's part of a quadratic.

When the Expression Is a Quadratic: Example

Suppose you are asked to factor:
- 6x^2 + 7x - 20

How to factor this quadratic?

Step 1: Find two numbers that multiply to a c (6 -20 = -120) and add to b (7).

- Factors of -120 that add to 7 are 15 and -8.

Because:
- 15 -8 = -120
- 15 + (-8) = 7

Step 2: Rewrite the middle term using these numbers:

- $6x^2 + 15x - 8x - 20$

Step 3: Factor by grouping:

- $(6x^2 + 15x) - (8x + 20)$

Factor each group:
- $3x(2x + 5) - 4(2x + 5)$

Now, factor out the common binomial:
- $(2x + 5)(3x - 4)$

This is the fully factored form of the quadratic.

Summary of Key Points in Factoring Algebraic Expressions

1. Combine like terms to simplify the expression.
2. Identify the form of the expression—binomial, trinomial, quadratic, etc.
3. Look for common factors to factor out first.
4. Use decomposition or grouping methods for quadratics.
5. When decomposing middle terms, find two numbers that multiply to ac and add to b.
6. Always check your factors by expanding back to ensure correctness.

Common Mistakes and How to Avoid Them

- Misidentifying the middle term's decomposition: Always verify the two numbers multiply correctly and

sum to the middle coefficient.
- Forgetting to factor out GCF first: Always check for the greatest common factor before attempting other methods.
- Confusing intermediate steps: Keep track of each step carefully, especially when splitting terms.

Practice Problems to Improve Your Factoring Skills

- Factor 8x^2 + 14x + 3
- Factor 9x^2 - 24x + 16
- Factor 12x^2 + 7x - 5
- Factor the expression: 6x + 15x - 8x

Frequently Asked Questions

How do I factorise the expression 6x + 7x - 20?

First, combine like terms: 6x + 7x = 13x. Then, the expression becomes 13x - 20. Since these are unlike terms, you can't factor them further unless there's a common factor. So, the expression is simplified as 13x - 20.

Where do the numbers 15 and 8 come from in the factorisation 6x + 15x - 8x - 20?

The numbers 15 and 8 are the coefficients obtained when splitting the middle terms during factorisation by grouping. They come from breaking down the middle term (like 7x) into two terms whose coefficients multiply to give the product of the first and last coefficients (6 and -20).

How can I understand the step where 6x + 7x - 20 becomes 6x + 15x - 8x - 20?

This step involves splitting the middle term 7x into two terms, 15x and -8x, such that their sum is 7x. This allows grouping terms for easier factorisation.

Why are 15 and 8 chosen in the factorisation process?

They're chosen because 15 and -8 add up to 7 (the original middle coefficient), and their product (15 -8 = -120) matches the product of the first and last coefficients (6 -20 = -120). This helps in splitting the middle term appropriately.

What is the general method to factor an expression like 6x + 7x - 20?

First, combine like terms if possible. Then, look for common factors. If not straightforward, split the middle term into two terms with coefficients that multiply to the product of the first and last coefficients and add to the middle coefficient. Use grouping to factor further.

Can you explain the process of splitting the middle term in factorisation?

Yes, splitting the middle term involves finding two numbers that multiply to give the product of the first and last coefficients and add to the middle coefficient. These numbers are then used to rewrite the expression, enabling factorisation by grouping.

Is there an alternative way to factor 6x + 7x - 20 without splitting the middle term?

Since 6x + 7x simplifies to 13x, and there's no common factor with -20, the expression cannot be factored further using grouping. You might consider factoring by substitution or quadratic methods if the expression is part of a larger equation.

Why is understanding the splitting of middle terms important in algebra?

Splitting middle terms is a key technique for factorising quadratic and higher degree expressions, making it easier to solve equations, simplify expressions, and understand the structure of algebraic expressions.

Additional Resources

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Mathematics, especially algebra, often presents learners with puzzles that seem straightforward but quickly become confusing when delving into the details. One such common conundrum involves the process of factorising algebraic expressions. A typical question that leaves many students scratching their heads is: "How do I factorise 6x + 7x - 20?" and more specifically, "How are the numbers 15 and 8 derived in the process of rewriting or factoring this expression?" This article aims to clarify these questions in a detailed yet accessible manner, providing insights into the reasoning behind the steps, common misconceptions, and practical strategies to master the art of factorisation.

Understanding the Basic Expression: 6x + 7x - 20

Before diving into the intricacies of factorisation, it's important to understand what the original expression entails.

What is the expression?

The algebraic expression is:

6x + 7x - 20

Here, 6x and 7x are like terms, meaning they both contain the variable x and can be combined, whereas -20 is a constant term.

Combining like terms

The first step in simplifying the expression is to combine the coefficients of the like terms:

$6x + 7x = (6 + 7)\ x = 13x$

Thus, the expression simplifies to:

$13x - 20$

This simplified form makes the next steps more straightforward.

Common Misconceptions: Why Do People Get 15 and 8?

Now, you might have encountered solutions or explanations where the expression is rewritten as:

$6x + 15x - 8x - 20$

and are puzzled about how the numbers 15 and 8 appeared in this context.

The confusion explained

- Where do 15 and 8 come from?
These numbers are often part of a factoring by grouping process or a decomposition method used to factor quadratic expressions or more complex polynomials. It's possible that some students or teachers are attempting to decompose the middle term or rewrite the expression to facilitate factoring.

- Are they derived from original coefficients?
Not directly. The numbers 15 and 8 are typically the result of splitting a middle term (or creating an equivalent expression) to factor it more easily.

Why do some solutions introduce these numbers?

This approach is often used in factoring quadratics or higher degree polynomials, especially when factoring trinomials like:

$ax^2 + bx + c$

which can be rewritten as:

(ax^2 + px) + (qx + c)

where p + q = b, and p q = a c

In our case, since the original is linear (not quadratic), the appearance of 15 and 8 suggests that someone might be attempting to factor an associated quadratic or reframe the expression for advanced methods.

Factorising the Expression: From 6x + 7x - 20 to a Simpler Form

Given that:

6x + 7x - 20

simplifies to:

13x - 20

the next step is to factor this expression.

Basic factorisation techniques

- Common factor (GCF):
Check if there is a common factor for both terms.

- Factoring out the GCF:
If a GCF exists, factor it out to simplify further.

In this case:

- The coefficients are 13 and -20, which do not share a common factor other than 1.
- The variable x appears only in the first term, so no common variable factor exists across both terms.

Therefore, 13x - 20 is already in its simplest factored form unless we interpret it as part of a larger quadratic or polynomial.

When Do You Need to Decompose or Introduce 15 and 8?

The numbers 15 and 8 often come into play when dealing with more complex algebraic expressions, especially quadratics. Here's an outline of when and why these numbers are introduced:

Factoring quadratics using decomposition

Suppose you have a quadratic:

$ax^2 + bx + c$

To factor it, you look for two numbers that multiply to a c and add to b.

For example:

$x^2 + 8x + 15$

- Find two numbers that multiply to 15 and add up to 8.

- Factors of 15: (1, 15), (3, 5)

- Which pair adds to 8?
$3 + 5 = 8$

- So, rewrite as:

$x^2 + 3x + 5x + 15$

- Group and factor:

$x(x + 3) + 5(x + 3) = (x + 3)(x + 5)$

In this process, 15 and 8 are the key numbers.

Note: The numbers 15 and 8 are not arbitrary in this context—they are derived from the coefficients of the quadratic expression.

How does this relate to your original question?

If you encountered an example like:

6x + 15x - 8x - 20

It's probably part of a process to:

- Combine terms: (6x + 15x) - (8x + 20)

- Or decompose the middle term for factorisation.

Step-by-Step Guide to Properly Factorise Expressions

To clarify the process and dispel confusion, here's a step-by-step guide on how to factor algebraic expressions effectively.

Step 1: Simplify the expression

Combine like terms where possible.

Example:

6x + 7x - 20

becomes

13x - 20

Step 2: Look for common factors

Check if all terms share a common factor.

- For 13x - 20, no common factor exists other than 1.

Step 3: Recognise the form of the expression

- If the expression is quadratic (ax^2 + bx + c), proceed with decomposition or quadratic formula.
- If linear (like 13x - 20), it might already be simplified, or you might need to solve for x.

Step 4: For quadratics, find two numbers

Find two numbers that:

- Multiply to a c
- Add to b

This guides the decomposition process.

Step 5: Write the expression as a product of factors

Use the numbers found to split the middle term or factor directly.

Applying These Concepts: An Example

Let's take an example quadratic:

x^2 + 8x + 15

Step 1: Find two numbers that multiply to 15 and add to 8.

- Factors of 15: 1, 15 and 3, 5

- 3 + 5 = 8

Step 2: Rewrite as:

x^2 + 3x + 5x + 15

Step 3: Group terms:

(x^2 + 3x) + (5x + 15)

Step 4: Factor each group:

x(x + 3) + 5(x + 3)

Step 5: Factor out common binomial:

$(x + 3)(x + 5)$

This method, known as decomposition, is fundamental in algebra and explains where numbers like 15 and 8 originate.

Summary and Practical Tips

- Always start by simplifying the expression—combine like terms.

- Recognize whether the expression is linear or quadratic.

- For quadratics, find two numbers that multiply to the product of the leading coefficient and constant term, and add to the middle coefficient.

- Use decomposition to split middle terms, which often introduces numbers like 15 and 8 when factoring quadratics.

- When dealing with linear expressions like $13x - 20$, no further factorisation is needed unless solving for x.

- Remember: the numbers 15 and 8 are not arbitrary; they result from specific factor pair relationships in quadratic expressions.

Conclusion: Clarifying the Confusion

The confusion surrounding how numbers like 15 and 8 appear in the process of factorising expressions often arises from conflating different methods—particularly the decomposition approach for quadratics—with the straightforward process of combining like terms in linear expressions. While the original expression $6x + 7x - 20$ simplifies directly to $13x - 20$, more complex expressions require a methodical approach involving finding specific number pairs that satisfy multiplication and addition conditions.

Understanding the origin of these numbers demystifies the process, providing clarity and confidence

in algebraic manipulation. Whether you're tackling quadratic trinomials or linear expressions, mastering these fundamental techniques will make factorisation more manageable and less confusing. Remember, each step is rooted in logical relationships between coefficients and constants, and with practice, the process becomes intuitive rather than mysterious.

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