



Comparing Expressions

i. Definition and Explanation

What are we doing when we "compare expressions"? Comparing algebraic expressions means determining the relationship between them for a specific value of the variable. We want to find out if one expression is greater than ($>$), less than ($<$), or equal to ($=$) the other.

An algebraic expression, like $2x + 5$, doesn't have a single value on its own. Its value depends on the value of the variable x . Therefore, we can't say that $2x + 5$ is always bigger than $3x - 1$. The relationship might change depending on what number we substitute for x .

The core process is:

- **Substitute:** Replace the variable in each expression with the given number.
- **Simplify:** Calculate the value of each expression.
- **Compare:** Use $<$, $>$, or $=$ to show the relationship between the two final values.

ii. Key Points and Important Terms

Algebraic Expression: A mathematical phrase that can contain numbers, variables (like x or y), and operation signs ($+$, $-$, \times , \div).

- **Example:** $5y - 10$

Variable: A letter used to represent a number that can change or is unknown.

- **Example:** In $4a + 7$, the variable is a .

Constant: A number that does not change.

- **Example:** In $4a + 7$, the constant is 7 .

Evaluate: To find the numerical value of an expression by substituting a number for the variable.

Order of Operations (PEMDAS/BODMAS): The rules you must follow to simplify an expression correctly.

- Parentheses (or Brackets)
- Exponents (or Orders)
- Multiplication and Division (from left to right)
- Addition and Subtraction (from left to right)



Comparison Symbols:

- $>$: Greater Than
- $<$: Less Than
- $=$: Equal To

iii. Detailed Examples with Solutions

Example 1: Basic Comparison

Compare the expressions $3x + 4$ and $5x - 2$ when $x = 3$.

Step 1: Evaluate the first expression.

Expression A: $3x + 4$

Substitute $x = 3$: $3(3) + 4$

Simplify: $9 + 4 = 13$

Step 2: Evaluate the second expression.

Expression B: $5x - 2$

Substitute $x = 3$: $5(3) - 2$

Simplify: $15 - 2 = 13$

Step 3: Compare the results.

The value of Expression A is 13.

The value of Expression B is 13.

Conclusion: $13 = 13$, so when $x = 3$, $3x + 4 = 5x - 2$.

Example 2: Comparison with a Negative Value

Compare the same expressions, $3x + 4$ and $5x - 2$, but this time when $x = -2$.

Step 1: Evaluate the first expression.

Expression A: $3x + 4$


Substitute $x = -2$: $3(-2) + 4$

Simplify: $-6 + 4 = -2$

Step 2: Evaluate the second expression.

Expression B: $5x - 2$

Substitute $x = -2$: $5(-2) - 2$



Simplify: $-10 - 2 = -12$

Step 3: Compare the results.

The value of Expression A is -2.

The value of Expression B is -12.

On a number line, -2 is to the right of -12, so it is greater.

Conclusion: $-2 > -12$, so when $x = -2$, $3x + 4 > 5x - 2$.

Notice how the relationship changed from $=$ to $>$ when we used a different value for x !

Example 3: Comparison with Exponents

Compare the expressions $a^2 + 5$ and $6a$ when $a = 4$.

Step 1: Evaluate the first expression.

Expression A: $a^2 + 5$

Substitute $a = 4$: $(4)^2 + 5$

Simplify: $16 + 5 = 21$

Step 2: Evaluate the second expression.

Expression B: $6a$

Substitute $a = 4$: $6(4)$

Simplify: 24

Step 3: Compare the results.

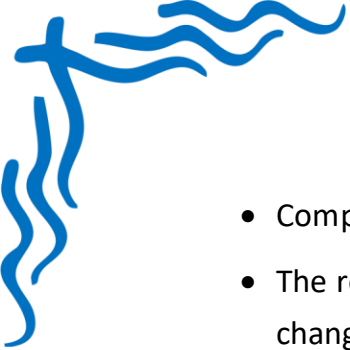
The value of Expression A is 21.

The value of Expression B is 24.

Conclusion: $21 < 24$, so when $a = 4$, $a^2 + 5 < 6a$.

iv. Summary of Main Concepts

- You cannot compare algebraic expressions without knowing the value of the variable.
- The process is to substitute the given value for the variable into both expressions.
- Always use the Order of Operations (PEMDAS) to evaluate each expression down to a single number.



- Compare the two resulting numbers using the symbols $>$, $<$, or $=$.
- The relationship between two expressions (which is greater, less, or equal) can change when the value of the variable changes.