

Name: _____

Date: _____

VARIABLES AND EXPRESSIONS

COMMON CORE ALGEBRA I



Algebra is the process of using the **properties of numbers** to manipulate **unknown** or **changing quantities**. These quantities are known as **variables** and are often represented using **letters** to distinguish them from numbers we do know (which we just use the numbers for). When we **group** (combine) numbers together we get what is known as an **expression**.

EXPRESSIONS

An **expression** is any combination of numbers that we know and ones that we don't (variables).

Exercise #1: Review **order of operations** by giving the value of each of the following purely **numerical expressions**. Do these without a calculator in order to review basic middle school number concepts.

(a) $3 \cdot 2 + 7$

(b) $8 - \frac{1}{2} \cdot 6 + 24 \div 6$

(c) $4(8 - 6) - 7(5 - 3)$

(d) $\frac{5^2 - 4^2 + 3}{1 - 5}$

(e) $(2 - 7)(5 - 3) + 3^2$

(f) $\frac{-16}{2} + 5 \cdot 2$

Knowing your order of operations is absolutely essential. Once we move past expressions that contain only numbers to ones that contain variables you need to be able to “read” an expression and understand what is being done to the variable.

Exercise #2: If the letter x represents some unknown quantity, explain the calculation that each of the following expressions involving x represents.

(a) $3x - 8$

(b) $\frac{x - 4}{2}$

(c) $4x^2 - 8$



If you can read an algebraic expression (i.e. one that contains variables), then you should also be able to **evaluate the expression**.

EVALUATING EXPRESSIONS

Finding the results of the calculations of an expression when all variable values are known.

Exercise #3: For each given expression, explain in steps what the calculation is doing and then find its value for the given variable values.

(a) Evaluate $4x - 7$ when $x = 5$. First explain what calculations are occurring in the expression and then find its value.

(b) Evaluate the expression $8 - 2x^2$ when $x = -3$. Show the calculations you do and the order in which you do them:

Calculation:

Explanation:

(c) Evaluate the expression $\frac{2(x+8)}{3} + 1$ for when $x = -2$. Show the steps in your calculation.

Exercise #4: What is the value of the expression $\frac{1}{2}x^2 - 2x - 3$ when $x = 4$?

(1) -3

(3) 3

(2) -8

(4) 7



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VARIABLES AND EXPRESSIONS
COMMON CORE ALGEBRA I HOMEWORK

FLUENCY

1. Using order of operations evaluate the following numerical expressions. Do not use a calculator for this section.

(a) $22 - 2 \cdot 6$

(b) $6 - \frac{1}{4} \cdot 16 + 21 \div 3$

(c) $(8 - 5)(5 - 3)^2$

2. Evaluate the following expressions for the values of x given. Show the steps in your calculation.

(a) $\frac{4(x-2)}{(x-1)}$ when $x = 0$

(b) $\frac{-3x^2 + 4}{4} - 1$ when $x = -2$

(c) $\frac{-2x}{4} + 4(x-1)$ when $x = 2$
 $\frac{4}{x^2 - 1}$

APPLICATIONS

3. Robert just got his first job and is saving 45 dollars a week. He also has 155 dollars saved from his birthday that just passed. To see how much money he will have in his bank account Robert came up with the following expression: $45w + 155$, where w is the number of weeks that he has been saving.

(a) Exactly how much will he have saved in 6 weeks?

(b) After his first **month** he had more than he expected to have due to interest the bank provided. This let Rob come up with a better expression, $\frac{w^2}{25} + 45w + 155$, where w is the number of **weeks**. How much will he have in 1 **year**?



REASONING

4. Input the following two expressions into your calculator and see what you get.

(a) $(-5)^2 + 2 * (3+1)$

(b) $-5^2 + 2 * 3+1$

(c) Explain what changed from the expression in (a) to (b) and why that changed your answer.

5. Andrew received a 95 on his last test and the only question he got wrong was the following.

- (a) Read through the question and Andrew's work. Find and circle his mistake. (b) Explain what he did wrong and what he should have done.

Evaluate: $x^2 - 2(x - 3)$ when $x = 3$.

Andrews work:

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

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

$$= 3^2 - 2(0)$$

$$= 9 - 2(0)$$

$$= 7(0)$$

$$= 0$$

(c) Using your knowledge and abilities show Andrew how to evaluate the expression correctly. State the correct value.

