



The GED Mathematics Test

Introduction to Algebra



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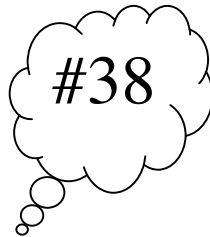
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GED

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Passing the GED Math Test

Algebra and money are essentially levelers: the first intellectually, the second effectively.
Simone Weil (1909 - 1943)

Video 38 Focus: how you use algebra to simplify equations and solve for variables.

You Will Learn From Video 38:

- How to use algebra to solve equations.
- How to simplify algebraic expressions.
- How to isolate variables as a rule for solving equations.
- The rules for operations with signed numbers.
- That algebra has a language of its own.



Words You Need to Know:

While viewing the video, put the letter of the meaning by the correct vocabulary word.

Answers are on page 21.

- | | |
|----------------------------|---|
| _____ 1. signed numbers | a. statement that two expressions are equal |
| _____ 2. algebra | b. letters used to substitute for numbers |
| _____ 3. variable | c. the set of positive and negative numbers |
| _____ 4. equation | d. the opposite operation as addition is to subtraction and multiplication is to division |
| _____ 5. inverse operation | e. branch of mathematics |



Points to Remember:

- Algebra is a branch of mathematics that uses rules to strategically solve for variables.
- You need to know some basic rules of algebra for the GED Math Test.
- Less than one-fourth of the GED Math Test must be solved with algebra.
- Some of the simple problems in algebra can be solved using basic arithmetic and logical thinking.
- Algebra can be fun!



Introduction to Algebra

Algebra is the branch of mathematics where the object is to use rules strategically to solve for variables. Algebra has a symbolic language that is used to express relationships. Many of the same rules and algorithms that we use in arithmetic we also use in algebra. However, in algebra, these rules are often used to solve **equations**. Equations are statements that two expressions are equal. An example of such an equation is:

$$3 \times 8 = \underline{\hspace{1cm}} \times 6$$

In algebra, we are trying to find out which solution will make both sides of the equation equal. We are trying to balance the equation. There are many solutions to this equation. A solution will be any number or expression that can fill the blank to make the right side of the equation equal to the left. The simplest solution is the number 4. However, we could also fill the blank with expressions such as $(2 + 2)$ or $(9 - 5)$. After we fill the blank we want to test to make sure that both sides of the equation are equal.

$$3 \times 8 = \underline{\hspace{1cm}} \times 6$$

$$3 \times 8 = 4 \times 6$$

$$24 = 24$$



In algebra, letters are used to stand for unknown numbers. These letters are called **variables**. A variable can stand for a single number or a complete expression. In the example above, we can replace the blank line with a letter to stand for the variable answers.

$$3 \times 8 = A \times 6$$

On the GED Math Test you will have to **simplify equations**, **solve for variables**, and **use operations with signed numbers**. There are many other skills that are associated with the branch of mathematics. However, if you are comfortable with these skills, you will be well on your way to answering most of the algebra questions correctly.

It is also important to understand the properties that allow you to manipulate an equation as you simplify or solve for variables. In this *Video Partners* workbook, you will learn about and practice with the following properties:

- Commutative properties of addition and multiplication
- Associative properties of addition and multiplication
- Distributive property of multiplication



Although algebra is more abstract than arithmetic, it is important not to be afraid of it. Algebra is full of step-by-step procedures. If you learn the steps one by one and then systematically apply them when you are simplifying or solving equations, you will be successful on the algebra questions on the GED Math Test. And remember, there are only about 10 algebra questions out of the 50 questions on the GED Math Test.



Balancing Equations

Equations are statements that two expressions are equal. In algebra, often some part of the equation is missing. The object of solving the equation is to discover what part(s) will balance the equation and make the two sides equal to one another.

Even though there are certain steps that are recommended to balance equations using the rules of algebra, it is often possible to balance equations just by using arithmetic skills. In this equation, it is easy to see that 4 is the only number that will make a true statement.

$$3 \times 8 = A \times 6$$

Using your arithmetic skills, find one number which will balance each of the following equations. Answers are on page 21.

$$3 \times 8 = \underline{\hspace{2cm}} + 6$$

$$8 \times 3 = 48 \div \underline{\hspace{2cm}}$$

$$\underline{\hspace{2cm}} - 12 = 6 \times 6$$

$$1,000 = \frac{B}{10}$$

$$4A = 24$$

$$25 = a^2$$

$$2 + 3 \times 5 = X - 3$$

$$(2 + 3)5 = 50/y$$

$$\underline{\hspace{2cm}} = 4^2$$

$$1/2 \times 1/3 = k/36$$

$$.2 + .2 = \underline{\hspace{2cm}} \%$$

$$1 \text{ dozen} = b \times 3$$

Variables

A **variable** is a letter or symbol used to represent an unknown quantity in an equation or formula. The value of a variable can change. Sometimes the value is dependent on other quantities and which quantities are known or unknown in the equation or formula. For example, the formula for finding the area of a rectangle is $A = LW$. If the area is known to be 24, there are several solutions for L and W. If $L = 6$, $W = 4$. If $L = 8$, $W = 3$. The solution for one variable is dependent on the value of the other.

Write at least three solutions for the variables in the following formulas:

Answers are on page 21.

$$\begin{aligned} A &= LW \\ A &= 12 \end{aligned}$$

$$\begin{aligned} A &= 1/2 BH \\ A &= 24 \end{aligned}$$

$$\begin{aligned} P &= 2L + 2W \\ P &= 36 \end{aligned}$$

$$\begin{aligned} V &= LWH \\ V &= 300 \end{aligned}$$

Often there is a single solution for a variable. Find the solution for the missing value in the formulas below:

$$A = LW$$

$$L = 10, W = 5$$

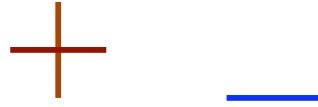
$$A = \underline{\hspace{2cm}}$$

$$C = \pi D$$

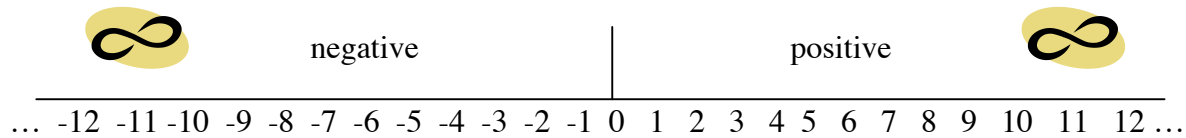
$$D = 3$$

$$C = \underline{\hspace{2cm}}$$

Operations with Signed Numbers

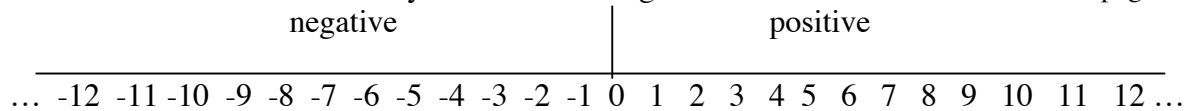


Before using the basic rules of algebra to solve for variables, it is essential to know how to perform the four operations, addition, subtraction, multiplication, and division, with positive and negative numbers. Positive numbers are those to the right of zero on the number line. Negative numbers have values less than zero and are found to the left of zero on the number line.



Remember, the number line is a representation of all numbers even though there is not enough space to write all of the whole numbers, fractions, decimals, etc. They are all theoretically sitting in their proper place on the number line. Also, the number line is infinite. It extends in both directions with no end.

Practice this exercise to review your understanding of the number line. Answers are on page 21.



On the number line above:

- | | |
|--|--|
| a. circle zero | f. draw a triangle around 10 |
| b. draw a box around -8 | g. add $7\frac{3}{4}$ in the correct place |
| c. add 4.5 in the correct place | h. add the next whole number to the left and right |
| d. put a star above -2 | i. add $-2\frac{1}{2}$ in the correct place |
| e. add $-\frac{1}{2}$ in the correct place | j. shade +9 |

There are special rules to add, subtract, multiply, and divide signed numbers. These rules are not difficult, but you must be able to perform these operations with confidence in order to succeed in algebra.

When solving algebraic equations, you must be able to move terms from one side of the equals sign to the other in order to isolate variables. In order to move terms, you will make use of the rules for **operations with signed numbers**. You will also be using **inverse operations** as well. *Inverse* operations are the *opposite* operations. Addition and subtraction are opposites, and multiplication and division are opposites. Later you will learn to eliminate terms using inverse operations.

However, before we follow the basic rules of algebra to solve equations, we must practice using the rules for operations with positive and negative numbers. Different math books explain the rules in slightly different ways, but the result is always the same. Read and practice the rules for each of the four operations, addition, subtraction, multiplication and division. When you find you are comfortable with these methods, then you will be ready for the basic rules of algebra.

Operations with Signed Numbers



Operation	The Rules
Addition	Checks and Bills
Subtraction	Change the sign of the number being subtracted. Checks and Bills
Multiplication	Multiply ignoring the signs. Give a sign to the answer: Like signs + Unlike signs -
Division	Divide ignoring the signs. Give a sign to the answer: Like signs + Unlike signs -

Addition - Checks and Bills



One way to think of the rules for adding signed (positive and negative) numbers is to just think of checks and bills. An illustration for checks and bills is found in postman stories.

Although my father, who was born in 1908, clearly remembers when the mail was delivered twice a day, that has not been the case since the 1950s. There is now only one delivery each day; and yet we still use the phrase, "I'll put it in the morning mail." Every day is a new day when analyzing postman stories.

Answers are on page 21.



Monday

On Monday the postman brought two checks, one for \$56.00 and one for \$10.00. Assuming you have no other money in the world, what is your financial situation after this delivery?

Tuesday

On Tuesday, the postman brought a check for \$25.00 and a bill for \$13.00. Assuming you have no other money in the world, what is your financial situation after this delivery?

Wednesday

On Wednesday, the postman brought two bills. One was for \$68.50, and the other was for \$16.00. Assuming you have no other money in the world, what is your financial situation after this delivery? _____

Thursday

On Thursday, the postman brought two checks and one bill. The checks were for \$24.75 and \$34.00. The bill was for \$100.00. Assuming you have no other money in the world, what is your financial situation after this delivery? _____

Friday

On Friday, the postman brought three checks and one bill. The checks were for \$14.00, \$39.50, and \$45.00. The bill was for \$64.00. Assuming you have no other money in the world, what is your financial situation after this delivery? _____

Saturday

On Saturday, the postman brought only bills. Alas, there were three of them. There was an electric bill for \$44.50, a magazine subscription for \$24.95, and a parking ticket for \$6.00. Assuming you have no other money in the world, what is your financial situation after this delivery? _____

There are no mail deliveries on Sunday.

Challenge problem: If every day were not a new day, how much money would you have or owe at the end of the week? _____

As adults experienced with money, we may have used different ways to arrive at the total each day. No matter what we did, including subtraction, we were still *adding* signed numbers as we completed this exercise. Continue to practice with some numerical problems:

Add (Checks and Bills):

Note: Any number without a sign is positive (a check).



$+36$	$- 8$	$+100$	-100	$+32$	60
$\underline{- 5}$	$\underline{-17}$	$\underline{- 25}$	$\underline{+ 25}$	$\underline{-17}$	$\underline{40}$

$\underline{-40}$	$+81$	$+3$	$(+17) + (+5) + (-6) + (-2) + 15 = \underline{\hspace{2cm}}$
$\underline{-60}$	$\underline{-36}$	$- 7$	
		$+8$	
		$\underline{- 2}$	$12 + (-17) + (+8) + (-75) + (-8) = \underline{\hspace{2cm}}$



During the holiday mail season, bills were mounting up for Carrie. She had placed many catalog orders that were arriving C.O.D. She kept her checkbook right by the front door so she would be ready to settle the bills and accept the items. On December 10th, she received C.O.D. orders for \$12.64, \$39.57, and \$19.11. She wrote checks for all of them. The same day, she received a gift check for \$50.00 from her Aunt Tilda. Did she spend more or come out ahead that day? How much? _____

Subtraction



The rules for subtracting signed numbers are completed in two steps:

1. Change the sign of the number being subtracted.
2. Add (Checks and Bills)

When you are subtracting (-4) from $(+16)$, you would first change the sign of the number being subtracted (-4) . Then add (checks and bills). In this case, you now have two checks.

Subtract:
$$\begin{array}{r} +16 \\ -4 \\ \hline \end{array} \longrightarrow \begin{array}{r} +16 \\ +4 \\ +20 \end{array}$$



Subtract: Answers are on page 22.

$\begin{array}{r} -12 \\ +3 \\ \hline \end{array}$	$\begin{array}{r} +16 \\ -5 \\ \hline \end{array}$	$\begin{array}{r} +38 \\ +2 \\ \hline \end{array}$	$\begin{array}{r} +19 \\ -6 \\ \hline \end{array}$	$\begin{array}{r} -37 \\ +5 \\ \hline \end{array}$	$\begin{array}{r} -85 \\ -50 \\ \hline \end{array}$
--	--	--	--	--	---

$\begin{array}{r} +8 \\ -3 \\ \hline \end{array}$	$\begin{array}{r} +3 \\ -8 \\ \hline \end{array}$	$\begin{array}{r} +50 \\ -2 \\ \hline \end{array}$	$\begin{array}{r} 75 \\ -60 \\ \hline \end{array}$	$\begin{array}{r} -75 \\ 60 \\ \hline \end{array}$	$\begin{array}{r} -75 \\ -60 \\ \hline \end{array}$
---	---	--	--	--	---

$(+6) - (-9) - (+3) - (+7) = \underline{\hspace{2cm}}$

$(-6) - (+9) - (30) - (-7) = \underline{\hspace{2cm}}$

Multiplication



The rules for multiplying signed numbers are completed in two steps:

1. Multiply ignoring the signs.
2. Give a sign to the answer: Like signs + Unlike signs -

Multiply: Answers are on page 22.

$(8) (-3)$ _____	$(-3) (-5)$ _____	$(+5) (-11)$ _____	$(+5) (-3)$ _____
$(-2) (-12)$ _____	$(+3) (-5)$ _____	$(+6) (+8)$ _____	$(-10) (-10)$ _____
$(-7) (+9)$ _____	$(-20) (+5)$ _____	$(-5) (20)$ _____	$(-9) (+6)$ _____



Division

The rules for dividing signed numbers are the same as multiplication and are completed in two steps:

1. Divide ignoring the signs.
2. Give a sign to the answer: Like signs + Unlike signs -

Divide:

Answers are on page 22.

$(+48) \div (-12)$	$(-25) \div (-5)$	$(+36) \div (-6)$	$(-24) \div (+6)$
<hr/>	<hr/>	<hr/>	<hr/>
$\frac{-10}{-2}$	$\frac{-76}{+4}$	$\frac{+64}{+8}$	$\frac{+50}{-25}$
			$\frac{+366}{-6}$

Mixed Practice



Add	Subtract	Multiply	Subtract	Add	Add	Subtract
$\frac{-16}{+4}$	$\frac{+12}{-7}$	$\frac{+50}{+8}$	$\frac{+38}{-6}$	$\frac{-17}{+5}$	$\frac{-12}{-50}$	$\frac{12}{-12}$

$(-35) \div (-7)$	$(-2) (+15)$	$(-5) (10)$	$(-18) (+6)$	$35/-7$
<hr/>	<hr/>	<hr/>	<hr/>	<hr/>

$(-100) \div (-20)$	$(+50) \div (-10)$	$(+9) (-7)$	$50 + (-3)$	$-100/4$
<hr/>	<hr/>	<hr/>	<hr/>	<hr/>



Measure Up

Calculator Permitted

An acre-foot is a measurement used for irrigation water. It is the amount of water that would cover an acre of land one foot deep. An acre is equal to 160 square rods. A square rod is equal to 30.25 square yards. Practice your unit conversion skills by answering the following questions.

Answers are on page 22.

How many square yards of water one foot deep are in two acre-feet? _____

How many *square feet* of water one foot deep are in an acre-foot? _____

Properties of Operations



Commutative Property of Addition and Multiplication

The **commutative property** is a law in mathematics that states that the order in which you add or multiply numbers does not affect the result; for example, $3 + 4 = 4 + 3$. In algebra you will use the commutative property.

$$a + b = b + a$$

$$ab = ba$$

Associative Property of Addition and Multiplication

The **associative property** is a law in mathematics that states that when you add or multiply more than two numbers, you can group the numbers in any order without affecting the result; for example $3 + (4 + 5) = (3 + 4) + 5$. You will use the associative property in algebra.

$$a + (b + c) = (a + b) + c$$

$$a(bc) = (ab)c$$

Distributive Property of Multiplication



The **distributive property** is a law in mathematics that states when a number is multiplied by a sum written in parentheses, you can find the result by multiplying the number outside the parentheses by each number in the parentheses and then adding. In other words, you are distributing the multiplier across all of the terms; for example, $4 \times (5+6) = 4 \times 5 + 4 \times 6 = 20 + 24 = 44$. You will use the distributive property in algebra.

$$a(b + c) = ab + ac$$

Practice identifying the law of mathematics that is used in each of the following expressions. Write commutative, associative, or distributive after each expression to show which law is modeled by the expression. Answers are on page 22.

$12 + 13 = 13 + 12$ _____

$5(c + d) = 5c + 5d$ _____

$10 \times 6 = 6 \times 10$ _____

$x(yz) = (xy)z$ _____

$10 + (8 + 9) = (10 + 8) + 9$ _____

$(2 \times 3) + (2 \times 4) = 2(3 + 4)$ _____

$xy = yx$ _____

$4 + 10 = 10 + 4$ _____

About Math and Life



Marina was excited about her new home business to wrap gifts and make gift baskets. She knew starting a new business would require patience. She had to do marketing and recruit a group of returning customers. She was prepared to have only a small profit or even take a loss the first year. She set up a spreadsheet to track her expenses and income. Working with this type of spreadsheet is like adding positive and negative numbers. You can think of the income as checks and the expenses as bills. Marina's spreadsheet appears below.



Excel Worksheet

Gifts by Marina 2005

Month	Income	Expenses						Total
		Paper	Tape	Ribbon	Office	Cards	Baskets	
January	18	150	10	35	75	100	300	670
February	225							
March	85							
April	46							
May	0	160						160
June	0			16				16
July	0							
August	0							
September	20	25					25	50
October	50							
November	250							
December	300							
Total	994	335	10	51	75	100	325	896

How much of a profit or loss did Marina show during the first year of her business?

Explain whether or not she met her goals and why.

Do you think that Marina will continue her business during the following year. Why or why not

Answers are on page 22.

Isolating Variables and Solving for Unknowns

An equation is a mathematical statement that two expressions are equal. Look at the equation below:



$$3x + 5 = 35$$

This equation states that $3x + 5$ is equal to 35. In order to solve the equation, you must find the value for the variable, x , that will make the equation true. Since an equation is like a balance scale, you can add or subtract the same quantity on both sides of the equation without upsetting the balance. You can also multiply or divide by the same quantity on both sides of the equation without upsetting the balance. *Remember that whatever you do on one side of the equation, you must do on the other side to maintain the balance.*

Isolating Variables

To solve an equation, you must first isolate the variable. In the equation above, the variable, x , is part of the term $3x$. So you want to isolate that term on the left side of the equals sign. In order to isolate that term, you must eliminate the other term, $+ 5$. To eliminate terms, use the **inverse operation**. An inverse operation is the opposite operation. Addition and subtraction are opposites. Multiplication and division are opposites. Subtract 5 from the left side to eliminate the $+ 5$. Remember, you also must subtract 5 from the other side.

$$\begin{array}{r} 3x + 5 = 35 \\ - 5 35 - 5 \\ \hline 3x = 30 \end{array}$$

Now the term with the variable, x , is *isolated* on the left side of the equals sign. In order to solve for the value of x , now eliminate the 3 from the term $3x$ by using the inverse operation of multiplication. Divide by 3. Then you must divide the right side by 3 as well.

$$\frac{3x}{3} = \frac{30}{3}$$

$$x = 10$$

Substitute 10 into the original equation to check your answer.

$$\begin{array}{l} 3x + 5 = 35 \\ 3(10) + 5 = 35 \\ 30 + 5 = 35 \\ 35 = 35 \end{array}$$



Solving for Unknowns

Practice these steps to solve for the unknown in the following equations:

- Use inverse operations to eliminate terms without variables (remember to keep the equation in balance by performing the same operation on both sides of the equals sign).
- Isolate the term with the variable on one side of the equals sign.
- Use inverse operations to eliminate numbers from the term with the variable leaving just the letter by itself (remember to keep the equation in balance by performing the same operation on both sides of the equals sign).
- After finding the value of the variable, plug it into the equation to check your work.

$$2x + 8 = 30$$

$$\begin{aligned} \text{a. } 2x + 8 &= 30 \\ 2x - 8 &= 30 - 8 \end{aligned}$$

$$\text{b. } 2x = 22$$

$$\begin{aligned} \text{c. } \frac{2x}{2} &= \frac{22}{2} \\ x &= 11 \end{aligned}$$

$$\begin{aligned} \text{d. } 2x + 8 &= 30 \\ 2(11) + 8 &= 30 \\ 22 + 8 &= 30 \\ 30 &= 30 \end{aligned}$$



Exercise:

Answers are on page 22.

$$x + 5 = 20$$

$$a - 12 = 48$$

$$\square 5 = 100$$

$$60/y = 12$$

$$2x - 8 = 32$$

$$2y - 6 = 22$$

$$5 = 3y - 28$$

$$4q = 48$$

$$\frac{20}{x} + 5 = 10$$

$$16 - z = 12$$

$$x + 25 = 100$$

$$48 + 2\triangle = 72$$

Measure Up - It's Just a Matter of Time



$$120 \text{ seconds} = \underline{\hspace{2cm}} \text{ minutes}$$

$$\underline{\hspace{2cm}} \text{ minutes} = 3 \text{ hours}$$

$$1 \text{ day} = \underline{\hspace{2cm}} \text{ hours}$$

$$1 \text{ century} = \underline{\hspace{2cm}} \text{ years}$$

$$3 \text{ decades} = \underline{\hspace{2cm}} \text{ years}$$

$$2 \text{ years} = \underline{\hspace{2cm}} \text{ days}$$

$$\underline{\hspace{2cm}} \text{ weeks} = 2 \text{ years}$$

$$3 \text{ weeks} = \underline{\hspace{2cm}} \text{ days}$$

$$3 \text{ days} = \underline{\hspace{2cm}} \text{ hours}$$

$$36 \text{ months} = \underline{\hspace{2cm}} \text{ years}$$

$$40 \text{ minutes} = \underline{\hspace{2cm}} \text{ hour}$$

$$3 \text{ months} = \underline{\hspace{2cm}} \text{ year}$$

Combining Like Terms

Sometimes an equation will contain terms that should be combined before solving the equation. Any **like terms** can be combined to simplify the process of solving the equation. In the equation below, there are examples of like terms that can be combined.

$$3x + 6 - 12 + 4 - x = 16$$

Before solving this equation, you can combine the terms that contain the variable, x . These are like terms because they contain the same variable. Remembering the rules for signed numbers, we know that $3x + (-x) = 2x$.

$$2x + 6 - 12 + 4 = 16$$

Now you can combine the numerical terms that are on the same side of the equals sign. In this equation, the two positive numbers can be combined to make $+10$. Add $+10$ to -12 , and you are left with -2 .

$$2x - 2 = 16$$

Now solve the equation using the steps on page 13.

Answer is on page 23.

Practice by combining like terms in the following expressions. Answers are on page 23.

$$5t - 6 + 2t + 3$$

$$2xy - xy + 13 + 3$$

$$x + x + 5 + 7 + 4x$$

$$26 - 35 + c + 5c + 100$$

$$3(2x - 4) + 6 - 2x$$

$$15\Delta + 16 + \Delta - 12$$

Now practice solving more complex equations by combining like terms and then following the other rules:

- Combine like terms on each side of the equals sign.
- Isolate the term with the variable on one side of the equals sign.
- Use inverse operations to solve for the variable.
- Check your answer.

$$12x + 13 = 74$$

$$6x + 7 = 37$$

$$x + x + 5 + 2x = 25$$

$$8y - 4y + 12 = 33$$

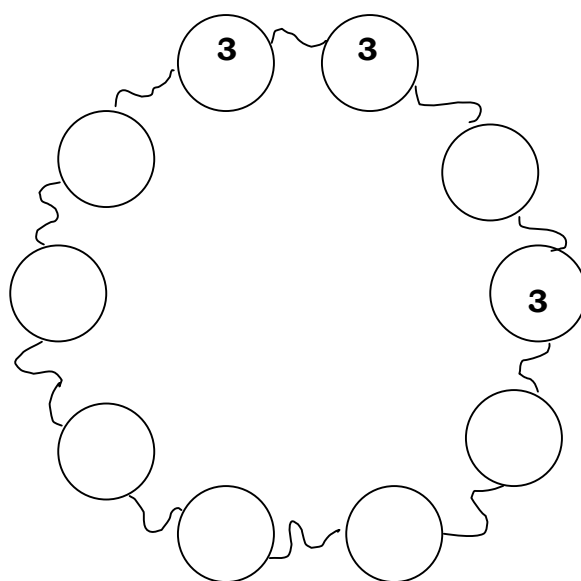
$$8(k - 3) = 5k + 3$$

$$5z + 4z - 10 = 35$$

Out into Space



Circle Up



Write four 1's and three 2's in the circles so that no three numbers that are next to each other have a sum that is divisible by three.

Answers are on page 23.

Circle Up courtesy of Alva Carlson, adapted from Ted Lewis

Evaluating Algebraic Expressions

In some algebra problems, the value of the variable(s) is given, and students are asked to evaluate or find the value of the expression. For example, if $a = 2$, the value of $a + 5 = 7$. To evaluate an algebraic expression, substitute the value of the variable(s) into the expression and perform the necessary operations.

If $a = 2$, then $a + 5 = \underline{\hspace{2cm}}$

$$2 + 5 = 7$$

If $x = 3$ and $y = 10$, evaluate the following expressions.

Answers are on page 23.

$x + y = \underline{\hspace{2cm}}$

$y - x = \underline{\hspace{2cm}}$

$xy = \underline{\hspace{2cm}}$

$y/x = \underline{\hspace{2cm}}$

$2x + 3y = \underline{\hspace{2cm}}$

$3(x + y) = \underline{\hspace{2cm}}$

$x^2 = \underline{\hspace{2cm}}$

$y^2 = \underline{\hspace{2cm}}$

$y^2 - x^2 = \underline{\hspace{2cm}}$

$(y^2)(x^2) = \underline{\hspace{2cm}}$

$xy + 15 = \underline{\hspace{2cm}}$

$x(y - x) = \underline{\hspace{2cm}}$

If $a = 6$, $b = 4$, and $c = 8$, evaluate the following expression: $ab + ac + b/c = \underline{\hspace{2cm}}$

Algebra Word Problems

Some word problems can be solved by setting up an algebraic equation and then solving for all or part of the answer. Sometimes word problems seem very confusing, and algebra will help you set them up for solution. Here is an example of such a problem:

This year Andrew is two years less than twice his brother's age. Their combined ages are equal to 22. How old are the boys?



Let x = the brother's age
Let $2x - 2$ = Andrew's age

Now set up the equation to solve for x , the brother's age.

$$\begin{array}{r} x + 2x - 2 = 22 \\ 3x - 2 = 22 \\ + 2 = 22 + 2 \\ 3x = 24 \\ \underline{3} \quad \underline{3} \\ x = 8 \end{array}$$



Andrew's brother is 8, so Andrew is 14.

It is important to practice setting up the proper equation to solve algebra word problems. You will definitely see algebra word problems on all forms of the GED Math Test. Practice setting up equations for the following questions.

Answers are on page 23.

1. Stan and Oliver have a lawn-mowing business. If Stan earns \$3.00 for every \$1.00 that Oliver earns, how much is Oliver's share for the day that they earned \$75.00?

2. The length of a rectangle is twice the width. If the perimeter of the rectangle is 24 inches, what is the length of the rectangle?

3. The swim team sold tickets to their skit night to earn money to go to the finals in another city that was 200 miles away. They sold four adult tickets for each child's ticket. If they sold 155 tickets, how many adults bought tickets?

4. Stella's sock drawer contains 30 pairs of socks. There are 3 times less 2 the number of pink socks than blue socks. How many pairs of pink socks and blue socks does Stella have?



Algebra Review



Answers are on page 24.

Add:

$$+3 + (-12) =$$

$$(-3) + (-4) =$$

$$(-6) + (4) + (-2) + (+8) + (-4) =$$

Subtract:

$$+3 - (-5) =$$

$$(-16) - (-35) =$$

$$(-4) - (+27) =$$

$$67 - (-60) =$$

Multiply:

$$(-3)(+6) =$$

$$(-6)(-3) =$$

$$(8)(+10) =$$

$$(9)(-7) =$$

Divide:

$$36/-12 =$$

$$\frac{100}{-25}$$

$$-225 \div -5 =$$

$$(-16)/(+4) =$$

If $a = 2$, $b = 6$, and $c = 7$, evaluate the following expressions:

$$ab - c = \underline{\hspace{2cm}}$$

$$a + b + c = \underline{\hspace{2cm}}$$

$$bc/a = \underline{\hspace{2cm}}$$

$$a + b - c = \underline{\hspace{2cm}}$$

$$a(b + c) = \underline{\hspace{2cm}}$$

$$c^2 - ab = \underline{\hspace{2cm}}$$

$$c + ab = \underline{\hspace{2cm}}$$

$$abc = \underline{\hspace{2cm}}$$

$$(-a)(c) = \underline{\hspace{2cm}}$$

$$b + a^2b^2 = \underline{\hspace{2cm}}$$

$$bc \div -a = \underline{\hspace{2cm}}$$

$$\frac{abc}{-a} = \underline{\hspace{2cm}}$$

Simplify by Combining Like Terms:

$$6x - 5x + 5 - 2$$

$$7xy + 4xy + x + y - 2y$$

$$3a^2 + a^2 - 2 + 8 - 4$$

$$s + 6 + 6s + 6 - 2s$$

Solve:

$$6k + 7 = 37$$

$$6x - 16 = 56$$

$$7(y - 2) = 21$$

$$11q + 12 = 9q - 32$$

Suki and Mei Li worked out at the gym together and jumped rope for aerobic exercise. Suki jumped for several minutes, but Mei Li was able to jump 12 minutes longer. Together they jumped for one hour and six minutes. How many minutes did Suki jump? Write an equation and solve it. Show your work.



Mei Li



STRATEGY SESSION



Analyze Method for Solution

For some of the questions on the GED Math Test, the answer choices will not be the solution, but rather the method to find the solution. About 10 of the 50 questions will require the test taker to choose the **method** for solving the problem.

Before taking the GED Math Test, it is important to practice writing **how** to solve problems. For example, look at the following sample question.

Bradley and Marcia walked to school each day in the morning. The walk was 12 blocks long. After school, Marcia took the same route home. Bradley walked four blocks to the dime store, back to the school, and home the same route as in the morning. How many blocks did the children walk *altogether*? What is the correct solution?

- 1) $(2 \times 12) + 12 + (4 + 4)$
- 2) $(12 + 12) - 8 + 12$
- 3) $(3)(12) - 8$
- 4) $(3)(12) + 8 \div 2$
- 5) $(4)12 + 8$



Use some of the other strategies that you know to select the best method to solve the problem.

- Look for key words.
- Remember order of operations.
- Keep in mind the properties of operations.
- Eliminate incorrect choices.

To answer the questions above, look at the key word *altogether*. It is italicized to show its importance. That word lets you know you are going to be adding. Therefore, choices 2), 3), and 4) are not correct because they use the operations of subtraction and division. Now analyze choices 1) and 5) to see which one best describes the situation in the problem. Choice 1) leaves out one of the 12-block legs of one of the children. Therefore 5) is the correct answer.

Often the problems that require algebra will just require that you choose the correct set-up for the equation, and you will not have to solve the equation to find the correct answer. Here is an example of an algebra problem.

Which of the following expressions could be used to find 212 plus the sum of $d - 4c$?

- 1) $(d - 4c) - 212$
- 2) $212 + (d - 4c)$
- 3) $-212 + (4c + d)$
- 4) $212 + 4cd$
- 5) $212(d - 4c)$

The key word is plus, so you know you must add. This time it is not pointed out as a key word. Only choices 2), 3), and 4) have addition. Of those, only choice 2) contains $d - 4c$. It is correct.

Practice choosing the correct method to solve each problem below. Underline the key words in each problem before you make a choice. Answers are on page 24.

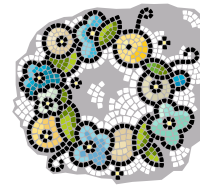
1. Belinda works for a factory that manufactures cameras. She can inspect 12 cameras in her 6 hour shift. Which expression shows how to find how many cameras (C) she could inspect if she increased her shift to 8 hours?

- 1) $C = (12)(6)$
- 2) $12/6 = C/8$
- 3) $C = (12)(8)$
- 4) $12(6 + 8) = C$
- 5) $C = 6(12)/8$



2. The Green Guys Landscapers were hired to make a circular garden for Mrs. Peters. She wanted the circle to be 12 feet across the center. Which expression shows how to find the measurement for the circumference of the new garden?

- 1) $(3.14)6$
- 2) $(3.14)6^2$
- 3) $(3.14)12$
- 4) $(3.14)12^2$
- 5) $(3.14)^2$



3. LuAnn and Billy had a backyard business making birdhouses. They bought the birdhouses and then painted and decorated them for sale. They bought each birdhouse for \$5.00 and sold each one for \$11.00. If they sold 40 houses last year, which expression shows how much money they made?

- 1) $(11 - 5)40$
- 2) $40(11 + 5)$
- 3) $(11 - 5) \div 40$
- 4) $(11 + 5) \div 40$
- 5) 11×40



4. Two angles of a scalene triangle measure 95 degrees and 50 degrees. Which expression could be used to find the measurement of the third angle?

- 1) $360 - (95 + 50)$
- 2) $360 - (95 - 50)$
- 3) $180 - (95 - 50)$
- 4) $180 - (95 + 50)$
- 5) $90 + 95 + 50$



Analyze Method for Solution

GED Exercise

1. If $x = 7$, and $y = 10$, what is the value of the expression $xy - (y + 2)$?

1) 71
2) 66
3) 58
4) 50
5) 5

2. Max has a brother who is four years more than twice his age. If their combined ages equal 37, how old is Max?

1) 29
2) 22
3) 15
4) 11
5) 10



Max

3. Which of the following expressions is the simplified form of $3t - 5t + 16 - 9$?

1) $8t + 25$
2) $2t + 25$
3) $8t + 7$
4) $15t - 7$
5) $-2t + 7$

4. Carl and Jim participated in a walkathon to raise money for a medical charity. Carl raised \$15 for every mile he walked. How many miles did he walk if he raised \$180.00?

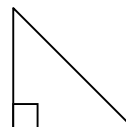
1) 10 miles
2) 11.5 miles
3) 12 miles
4) 15 miles
5) 17 miles



Carl

5. The geometry teacher drew a right triangle on the board and labeled one of the angles 50 degrees. What is the measure of the other two angles?

1) 90 degrees and 60 degrees
2) 40 degrees and 80 degrees
3) 40 degrees and 90 degrees
4) 90 degrees and 45 degrees
5) not enough information is given



6. Levi took three tests in his geography class and scored 85, 72, and 78. He needed to have an average of 80 to get a B in the class. What minimum score did he need on the fourth and last test?

1) 95
2) 91
3) 90
4) 89
5) 85

7. A grocer stocks cans of vegetables on a shelf. The peas are in cans that have a circular bottom with an area of 9.42 square inches and hold 56.52 cubic inches. How tall are the cans?

1) 3 inches
2) 6 inches
3) 9 inches
4) 10 inches
5) 11 inches



Answers and Explanations

Words You Need to Know

page 2

1. c.
2. e.
3. b.
4. a.
5. d.

Balancing Equations

page 4

18	2	48
B = 10,000	A = 6	a = 5
X = 20	y = 2	16
k = 6	40	b = 4

Variables

L = 12, W = 1	B = 6, H = 8	L = 10, W = 8	L = 15, W = 10, H = 2
L = 4, W = 3	B = 4, H = 12	L = 14, W = 4	L = 10, W = 7.5, H = 4
L = 6, W = 2	B = 3, H = 16	L = 11, W = 7	L = 10, W = 6, H = 5

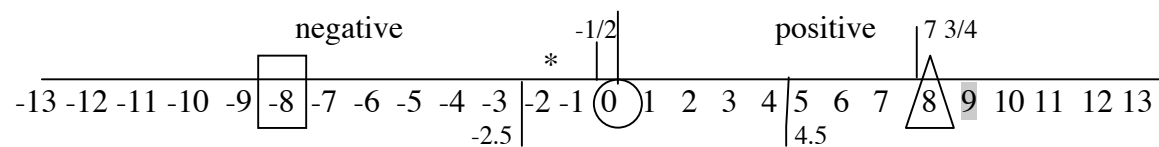
Other solutions are possible.

A = 50

C = 9.42

Operations with Signed Numbers

page 5



Operations with Sign Numbers

Addition - Checks and Bills

pages 6 and 7

Monday	\$66.00
Tuesday	\$12.00
Wednesday	owe \$84.50
Thursday	owe \$41.25
Friday	owe \$34.50
Saturday	\$75.45
Challenge	owe \$88.70

+31	-25	+75	-75	+15	100	
-100	+45	+2				+29
						-80

-\$21.32

Subtraction page 8

-15	+21	+36	+25	-42	-35
+11	+11	+52	+135	-135	-15
		+5			-38

Multiplication page 8

-24	+15	-55	-15
+24	-15	+48	+100
-63	-100	-100	-54

Division page 9

-4	+5	-6	-4	
+5	-19	+8	-2	-61

Mixed Practice page 9

-12	+19	+400	+44	-12	-62	+24
+5	-30	-50	-108	-5		
+5	-5	-63	-47	-25		

Measure Up page 9

9,680 square yards
43,560 square feet

Properties of Operations page 10

commutative property of addition	distributive property of multiplication
commutative property of multiplication	associative property of multiplication
associative property of addition	distributive property of multiplication
commutative property of multiplication	commutative property of addition

About Math and Life page 11

Marina made a profit of \$98.00
Marina met her goal because she was prepared to make only a small profit or even take a loss.
Answers will vary.

Solving for Unknowns page 13

$x = 15$	$a = 60$	$\square = 20$	$y = 5$
$x = 20$	$y = 14$	$y = 11$	$q = 12$
$x = 4$	$z = 4$	$x = 75$	$\triangle = 12$

Measure Up page 13

2	180	24
100	30	730
104	21	72
3	2/3	1/4

Combining Like Terms

page 14

$$\begin{aligned} 2x - 2 &= 16 \\ 2x &= 18 \\ x &= 9 \end{aligned}$$

$$\begin{aligned} 7t - 3 \\ 6c + 91 \end{aligned}$$

$$\begin{aligned} xy + 16 \\ 4x - 6 \end{aligned}$$

$$\begin{aligned} 6x + 12 \\ 16\Delta + 4 \end{aligned}$$

Solving Equations

page 14

$$\begin{aligned} 12x + 14 &= 74 \\ 12x &= 60 \\ x &= 5 \end{aligned}$$

$$\begin{aligned} 6x + 7 &= 37 \\ 6x &= 30 \\ x &= 5 \end{aligned}$$

$$\begin{aligned} x + x + 5 + 2x &= 25 \\ 4x + 5 &= 25 \\ 4x &= 20 \\ x &= 5 \end{aligned}$$

$$\begin{aligned} 8y - 4y + 13 &= 33 \\ 4y + 13 &= 33 \\ 4y &= 20 \\ y &= 5 \end{aligned}$$

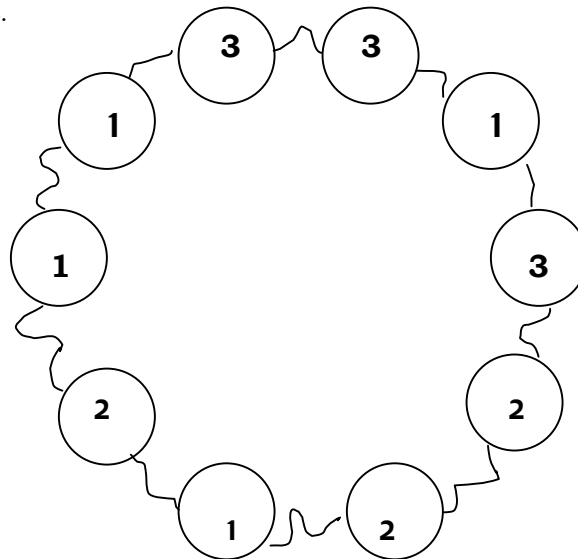
$$\begin{aligned} 8(k - 3) &= 5k + 3 \\ 8k - 24 &= 5k + 3 \\ 3k &= 27 \\ k &= 9 \end{aligned}$$

$$\begin{aligned} 5z + 4z - 10 &= 35 \\ 9z - 10 &= 35 \\ 9z &= 45 \\ z &= 5 \end{aligned}$$

Out into Space

page 15

Other solutions may be possible.



Evaluating Algebraic Expressions

page 15

$$\begin{aligned} 13 \\ 36 \\ 91 \end{aligned}$$

$$\begin{aligned} 7 \\ 39 \\ 900 \end{aligned}$$

$$\begin{aligned} 30 \\ 9 \\ 45 \end{aligned}$$

$$\begin{aligned} 3 \frac{1}{3} \\ 100 \\ 21 \\ 72 \frac{1}{2} \end{aligned}$$

Algebra Word Problems

page 16

$\$18.75$
8 inches
124
22 pink and 8 blue

Algebra Review

page 17

-9	-7	0
+8	+19	-31
+127		
-18	+18	80
-63		
-3	-4	45
-4		

5	15	21	1
26	37	19	84
-14	150	-21	-42
$x + 3$	$11xy + x + 3y$	$4a^2 + 2$	$5s + 12$
$k = 5$	$x = 12$	$y = 5$	$q = -10$

$x + x + 12 = 66$
 $2x + 12 = 66$
 $2x = 54$
 $x = 27$ Mei Li

$x + 12 = 39$

Suki jumped for 39 minutes.

Strategy Session

page 19

1. increased
2)
2. circumference
3)
3. how much money
1)
4. third angle
4)

GED Exercise

page 20

1. 3)
2. 4)
3. 5)
4. 3)
5. 3)
6. 5)
7. 2)