

GED MATH STUDY GUIDE

Last revision July 15, 2011

General Instructions

- If a student demonstrates that he or she is knowledgeable on a certain lesson or subject, you can have them do every other problem instead of every problem
- Always do the word problems at the end. These are the best problems to do within each lesson since they are most like what will be on the test
- A key to understanding math is organization and repetition. Encourage students to show their work in an organized manner in their notebooks. Scratch paper can be used but the students should be able to refer back to their notes if they forget how to do a certain type of problem.

Math Basics

- Lesson 1 - Whole Number Review
 - Student should be able to identify and round to place values
- Lesson 2 - Operations Review
 - Student should know how to perform long addition (including how to carry), subtraction (including how to borrow), multiplication (including placeholder use), and division (including remainders) by hand

Example 1: Solve $435 \div 25$

$\begin{array}{r} 25 \overline{)435} \end{array}$	$4 \div 25 = 0$ remainder 4	The first number of the dividend is divided by the divisor.
$\begin{array}{r} 0 \\ 25 \overline{)435} \end{array}$		The whole number result is placed at the top. Any remainders are ignored at this point.
$\begin{array}{r} 0 \\ 25 \overline{)435} \\ \underline{0} \end{array}$	$25 \times 0 = 0$	The answer from the first operation is multiplied by the divisor. The result is placed under the number divided into.
$\begin{array}{r} 0 \\ 25 \overline{)435} \\ \underline{0} \\ 4 \end{array}$	$4 - 0 = 4$	Now we take away the bottom number from the top number.
$\begin{array}{r} 0 \\ 25 \overline{)435} \\ \underline{0} \\ 43 \end{array}$		Bring down the next number of the dividend.

$\begin{array}{r} 0 \\ 25 \overline{)435} \\ \underline{0} \\ 43 \end{array}$	$43 \div 25 = 1 \text{ remainder } 18$	Divide this number by the divisor.
$\begin{array}{r} 01 \\ 25 \overline{)435} \\ \underline{0} \\ 43 \end{array}$		The whole number result is placed at the top. Any remainders are ignored at this point.
$\begin{array}{r} 01 \\ 25 \overline{)435} \\ \underline{0} \\ 43 \\ \underline{25} \end{array}$	$25 \times 1 = 25$	The answer from the above operation is multiplied by the divisor. The result is placed under the last number divided into.
$\begin{array}{r} 01 \\ 25 \overline{)435} \\ \underline{0} \\ 43 \\ \underline{25} \\ 18 \end{array}$	$43 - 25 = 18$	Now we take away the bottom number from the top number.
$\begin{array}{r} 01 \\ 25 \overline{)435} \\ \underline{0} \\ 43 \\ \underline{25} \\ 185 \end{array}$		Bring down the next number of the dividend.
$\begin{array}{r} 01 \\ 25 \overline{)435} \\ \underline{0} \\ 43 \\ \underline{25} \\ 185 \end{array}$	$185 \div 25 = 7 \text{ remainder } 10$	Divide this number by the divisor.
$\begin{array}{r} 017 \\ 25 \overline{)435} \\ \underline{0} \\ 43 \\ \underline{25} \\ 185 \end{array}$		The whole number result is placed at the top. Any remainders are ignored at this point.

$\begin{array}{r} 017 \\ 25 \overline{)435} \\ \underline{0} \\ 43 \\ \underline{25} \\ 185 \\ \underline{175} \end{array}$	$25 \times 7 = 175$	<p>The answer from the above operation is multiplied by the divisor. The result is placed under the number divided into.</p>
$\begin{array}{r} 017 \\ 25 \overline{)435} \\ \underline{0} \\ 43 \\ \underline{25} \\ 185 \\ \underline{175} \\ 010 \end{array}$	$185 - 175 = 10$	<p>Now we take away the bottom number from the top number.</p>
		<p>There is still 10 left over but no more numbers to bring down.</p>
$\begin{array}{r} 017 \text{ r } 10 \\ 25 \overline{)435} \\ \underline{0} \\ 43 \\ \underline{25} \\ 185 \\ \underline{175} \\ 010 \end{array}$		<p>With a long division with remainders the answer is expressed as 17 remainder 10 as shown in the diagram</p> <p style="text-align: right;">Answer: $435 \div 25 = \mathbf{17 R 10}$</p>

- Lesson 3 - Distance and Cost Formulas
 - o This is the student's first introduction to formulas. Student should understand how to use and manipulate cost and distance formulas
 - o Skip Part A
- Lesson 4 - Calculators on the GED
 - o Skip lesson 4 if student is familiar with calculator. Student should know how to use the following calculator functions:
 - o Percent
 - o Positive/negative button
 - o Fraction button
 - o Power/exponent
 - o Square root
- Lesson 5 - Filling in the Standard Grid
 - o Skip this lesson. This should have been explained prior to the Math pre-test.
- Lesson 6 - Problem Solving: Estimation

- o Point out key words to look for in problems: About, estimate, approximately, round
- o Also explain that sometimes problems require you to round numbers before performing calculations and sometimes problems require you to perform the calculation and then round your answer at the end
- o Skip Part B

- Lesson 7 - Problem solving: Set-Up Problems

Order of Operations □ **P**arentheses, **E**xponents, **M**ultiplication, **D**ivision, **A**ddition, **S**ubtraction

- o Use **P**lease **E**xcuse **M**y **D**ear **A**unt **S**ally or **PEMDAS** to remember
- o Multiplication and Division are from Left to Right AND Addition and Subtraction are from Left to Right

Example 1: $4(5 + 2) - 9/3$

Step 1: Parentheses $5 + 2 = 7$ □ $4(7) - 9/3$

Step 2: Multiplication $4 \times 7 = 28$ □ $28 - 9/3$

Step 3: Division $9/3 = 3$ □ $28 - 3$

Step 4: Subtraction $28 - 3 = 25$

The answer is **25**

Example 2: $125 - 7 + 8 \times 2$

Step 1: Multiplication $8 \times 2 = 16$ □ $125 - 7 + 16$

Step 2: Subtraction (Remember order of operations calls that we do addition and subtraction from left to right, so although **A** comes before **S** in **PEMDAS**, we must do subtraction first in this problem. The same rule holds true for multiplication and division)

$125 - 7 = 118$ □ $118 + 16$

Step 3: Addition $118 + 16 = 134$

The answer is **134**

Example 3: $\frac{5(2 + 6)}{4(7 - 2)}$

$\frac{5(2 + 6)}{4(7 - 2)}$

Calculate everything on top of the division bar and the bottom of the division bar separately, and then the last step will be to divide.

Step 1: Parentheses $2 + 6 = 8$ and $7 - 2 = 5$ □ $\frac{5(8)}{4(5)}$

Step 2: Multiplication (Note that number in front of a parentheses indicates multiplication)

$$5(8) = 40 \text{ and } 4(5) = 20 \square \underline{40}$$
$$20$$

Step 3: Division $40 \div 20 = 20$

The answer is **20**

Decimals and Fractions

- Lesson 1 - Decimal Basics
 - o Student should be able to identify and round to place values
 - o Students should be able to compare decimals and order decimals from least to greatest and greatest to least

Example 1: Write these numbers from greatest to least: 5.07, 5.985, 5.0003, 5.2

Step 1: Line the numbers vertically and in line by decimal point

5.07
5.985
5.000
3
5.2

Step 2: Add zeros to each number to match the maximum number of place values. Note that adding zeros after the decimal point does not change the value of the number

5.070
0
5.985
0
5.000
3

Step 3: Compare the numbers in each place value, moving from left to right, until you run out of numbers to compare.

Ones: $5 = 5 = 5 = 5 \square$ We must move to the next place value

Tenths: $0 = 0 < 2 < 9 \square$ 5.985 is the greatest number, 5.2 is the next greatest

Hundredths: $0 < 7 \square$ 5.07 is the next greatest, 5.0003 is the least

The answer is **5.985, 5.2, 5.07, 5.0003**

*Note that although some numbers may have more digits, this does not necessarily mean that the number is greater than a number with fewer digits

- Lesson 2 – Decimal Operations
 - Student should know how to perform long addition, subtraction, multiplication and division with decimals by hand
- Lesson 3 – Fraction Basics
 - Students should know how to go from mixed numbers to improper fractions and from improper fractions to mixed numbers. Students should also be able to reduce a fraction to its lowest term.
- Lesson 4 – Fraction Operations
- Lesson 5 – Solving Problems Using a Calculator
 - Skip this lesson
- Lesson 6 – Filling in the Answer Grid
 - Skip this lesson
- Lesson 7 – Problem Solving: Fraction and Decimal Equivalencies
 - Students should know how to go from decimals to fractions and from fractions to decimals.

Example 1: Convert 0.42 to a fraction

Notice that the last digit (2) is in the hundredth place. Simply place 42 over 100.

$$0.42 = \frac{42}{100} = \frac{21}{50}$$

Example 2: Convert $\frac{3}{5}$ to a decimal

5

You should know that a fraction is also a division problem. Simply divide numerator by the denominator:

$$3 \div 5 = 0.6$$

Ratio, Proportion, and Percent

- Lesson 1 – Using Ratio and Proportion to Solve Problems
 - Students should know how to write ratios and should know that proportions are setting two ratios equal to each other. Students should also know that in order to solve a proportion that you need to cross multiply.
- Lesson 2 – Understanding Percents
 - Percent means “per cent” or “per cent” or “out of a hundred.”

- Lesson 3 – Using the Percent Formula
 - Ignore the percent diagram/box unless it is easy for you to understand. Instead student should understand how to translate words to parts of an equation.
 - “What” or “a number” or “what amount” \square variable such as ‘y’
 - “is’ \square equal sign =
 - 10% \square 10 per cent or 10 out of 100 \square 10/100
 - “of” \square means to multiply, we use “x” as the multiplication sign

Example 1: What is 15% of 200?

What \square y is \square = 15% \square 15/100 of \square x 200 \square 200

$$y = (15/100) \times 200$$

$$y = 30$$

15% of 200 is 30

Example 2: 3 is what percent of 60?

3 \square 3 is \square = what \square y percent \square /100 of \square x 60 \square
60

$$3 = (y/100) \times 60$$

$$3 \times 100 = y \times 60$$

$$300 = 60y$$

$$y = 5$$

3 is 5% of 60

Example 3: 150 is 40% of what amount?

150 \square 150 is \square = 40% \square 40/100 of \square x what amount \square y

$$150 = (40/100) \times (y)$$

$$150 \times 100 = 40 \times (y)$$

$$15000 = 40y$$

$$y = 375$$

150 is 40% of 375

- Lesson 4 – Solving Problems Using a Calculator

- o Skip this lesson
- Lesson 5 – Simple Interest
 - o Sometimes when you borrow someone else’s money, they will charge you interest or extra money to use their money. Student should know how to use the simple interest formula (which will be provided on the given formula sheet during the GED test).
 - o Student should also remember that time needs to be written in terms of years, so months should be written as a fraction of a year (i.e. 3 months is 3/12)
 - o Also be careful to answer the question!! You may be asked for the interest charged for borrowing the money (use the interest formula $i = prt$), or the total amount that is needed to be paid back (principal + interest).
- Lesson 6 – Percent of Change
 - o This is used to determine how much change happened when one number changed to another number. A common percent of change problem is determining the change when an item of clothing goes on sale for say a certain percentage. When solving percent decrease or percent increase problems, always start with the original number, or the number before the change, and then subtract the final number, or the number after the change. Then divide the difference by the original number.
- Lesson 7 – Problem Solving
 - o Skip this lesson

Data Analysis

- Lessons 1-6
 - o Students should not spend too much time on this section, as there will not be many data analysis questions on the test. In general, students should know how to read and interpret data in graphs and tables.
 - o Students also should know how to calculate mean (average), median (middle number in set of numbers), and mode (most frequent number in set of numbers).

Measurement

- Lessons 1-4
 - o Students should not spend too much time on this section, as there will not be many measurement questions on the test. In general, students should know how to convert between units of measure.

Algebra

- Lessons 1 – The Number Line and Signed Numbers
 - o Positive plus positive equals positive $(+) + (+) = (+)$
 - o Negative plus negative equals negative $(-) + (-) = (-)$
 - o To add a positive and a negative number, subtract and take the sign of the largest number

Example 1: $9 + -3$

$$9 - 3 = 6$$

The largest number 9 is positive, so the answer is positive 6

- o Positive times/divided by positive equals positive $(+) \times (+) = (+)$
- o Negative times/divided by negative equals positive $(-) \times (-) = (+)$
- o Negative times/divided by positive equals negative $(-) \times (+) = (-)$

- o Also remember that subtracting is the same as adding a negative number.
You can use this to change any subtraction problem to an addition problem

Example 2: $4 - 1$

$$4 + -1 = 3$$

- o Also remember that two negatives side by side cancel each other out to equal a positive

Example 3: $18 - -10$

$$18 + 10 = 28$$

- Lessons 2 - Powers and Roots
 - o Any number raised to the 1 power is the number itself (i.e. $4^1 = 4$)
 - o Any number raised to the 0 power is 1 (i.e. $10^0 = 1$)
 - o Student should memorize the following squares:
 - $1^2 = 1$ $8^2 = 64$
 - $2^2 = 4$ $9^2 = 81$
 - $3^2 = 9$ $10^2 = 100$
 - $4^2 = 16$ $11^2 = 121$
 - $5^2 = 25$ $12^2 = 144$
 - $6^2 = 36$ $15^2 = 225$
 - $7^2 = 49$ $25^2 = 625$
 - o Square root is the "opposite" of squares. For example, $8^2 = 64$ so the square root of 64 is 8. This is why it is important to try to memorize the squares above.
 - o A number raised to a negative number is equal to a fraction with a numerator of 1.

Example 1: $(5)^{-2} = \frac{1}{(5)^2} = \frac{1}{5}$

- Lessons 3 - Scientific Notation
 - o Students should know how to write a number in scientific notation and convert from scientific notation to standard notation.

- Lessons 4 - The Order of Operations
 - o See instructions above on PEMDAS

- Lessons 5 – Algebraic Expressions
 - o Students should know how to go from words to numbers and expressions
 - o Students should also be able to identify “like” terms and how to simplify expressions by combining “like” terms

Example 1: Simplify this expression $10 + 3x + 5x^2 + 8x - y - 3$

We have two sets of “like” terms: $3x, 8x$ and $10, 3$

Rewrite expression grouping “like” terms: $(10 - 3) + (3x + 8x) + 5x^2 - y$

Subtract/add “like terms: $7 + 11x + 5x^2 - y$

This is the answer since there are no additional “like” terms to combine. Note that $5x^2$ and y did not have like terms so just leave those terms alone.

- o Students should also be able to distribute when simplifying expressions. When you see a number outside of a parentheses (i.e. $3(8y + 5)$) you need to distribute

Example 2: Simplify this expression $3(8y + 5)$

Distribute the 3 to both terms $\square 3 * 8y = 24y$ and $3 * 5 = 15$

$24y + 15$

- Lessons 6 – Algebraic Expressions and the Calculator
 - o Skip this lesson
- Lesson 7 – Equations
 - o Students should know how to solve equations by isolating the variable, or making sure the variable is by itself on one side of the equal sign
- Lessons 8 – Common Algebra Word Problems
 - o Skip this lesson
- Lessons 9 – Patterns and Functions
 - o Skip this lesson
- Lessons 10 – Function Applications
 - o Skip this lesson
- Lesson 11 – Inequalities
 - o Solve these just as you would solve equations with equal signs. Remember to flip the sign of the inequality if you multiply or divide by a negative number
- Lesson 12 – Quadratic Equations
 - o Students should be able to use FOIL and to factor quadratic expressions
- Lesson 13 – The Coordinate Plane

- o Students should be able to identify the ordered pair for a point in the coordinate plane. They should also be able to plot points on the coordinate plane if given an ordered pair.
- Lesson 14 - Linear Equations
 - o Students should be able to graph a given equation by picking values for “x” and solving for “y” Students should also understand that a point falls on a line in the coordinate plane if it satisfies the equation

Example 1: Will the graph of the equation $y = 3x + 1$ pass through the point (2,1)?

Plug in the values of x and y in the equation and see if the equation is true

Does $1 = 3(2) + 1$ □ Does $1 = 7$? □ NO, so $y = 3x + 1$ does NOT pass through point (2,1)

- Lesson 15 - Slope of a Line
 - o Students should be able identify slope by:
 - Using the slope formula
 - Using rise over run in the coordinate plane
 - Looking at an equation in $y = mx + b$ format (m is slope)
- Lesson 16 - Distance Between Points
 - o Students should be able to use the distance formula which is on the formula sheet
- Lesson 17 - Special Coordinate Grid Items
 - o Skip this lesson
- Lesson 18 - Problem Solving
 - o Skip this lesson

Geometry

- Lesson 1 - Points, Lines, and Angles
 - o A straight line is half of a circle, so it has a total of 180 degrees. If another line bisects a straight line, the two angles that it creates (called supplementary angles) have to add up to 180 degrees
 - o A right angle has 90 degrees. If another line bisects a right angle, the two angles that it creates (called complementary angles) have to add up to 90 degrees
- Lesson 2 - Parallel Lines and Transversals
 - o When a line passes through parallel lines it creates 8 different angles. A student should be able to find all 8 angles if given one angle given that vertical angles are equal and that angles at a straight line add up to 180 degrees. It doesn't matter if students remember what the angles are called
- Lesson 3 - Quadrilaterals
 - o Students should know that angles in quadrilaterals add up to 360 degrees

- Lesson 4 – Triangles
 - o Students should know that angles in triangles add up to 180 degrees. Students should also be able to identify sides and angles of equilateral and isosceles triangles
- Lesson 5 – Congruent and Similar Triangles
- Lesson 6 – Similar Triangle Applications
 - o From these two lessons, students should be able to set up ratios between similar triangles and solve for the missing part in the ratio
- Lesson 7 – Perimeter and Area
 - o Student should be able to use the formula sheet to solve for perimeter and area in quadrilaterals and triangles
- Lesson 8 – Circles
 - o Students should be able to use the formula sheet to solve for circumference and area of circles
 - o Remember that radius is half of diameter
- Lesson 9 – Volume
 - o Students should be able to use the formula sheet to solve for volumes of different figures
- Lesson 10 – Irregular Figures
 - o Students should be able to break irregular figures apart into familiar figures in order to solve for perimeter, area, and volume of irregular figures
- Lesson 11 – Pythagorean Relationship
 - o Students should be able to use the Pythagorean formula that is on the formula sheet to solve for the missing side in a right triangle
- Lesson 12 – Using the Formulas Page
 - o Skip this lesson
- Lesson 13 – Using the Calculator
 - o Skip this lesson
- Lesson 12 – Problem Solving
 - o Skip this lesson