Algebra 1 Summer Assignment

This assignment will help you to prepare for Algebra 1 by reviewing some of the things you learned in Middle School. If you cannot remember how to complete a specific problem, there is an example at the top of each page. If additional assistance is needed, please use the following websites:

http://www.purplemath.com/modules/index.htm

www.khanacademy.com

This assignment will be due the first day of school.

NAME: ____

Fractions:
Reducing

To reduce a simple fraction, follow the following three steps:

1. **Factor the numerator.**
2. **Factor the denominator.**
3. **Find the fraction mix that equals 1.**

Reduce $\frac{15}{6}$

First: Rewrite the fraction with the numerator and the denominator factored: $\frac{5 \, x \, 3}{2 \, x \, 3}$

Second: Find the fraction that equals 1. $\frac{5 \, x \, 3}{2 \, x \, 3}$ can be written $\frac{5}{2}$ x $\frac{3}{3}$ which in turn can be written $\frac{5}{2}$ x 1 which in turn can be written $\frac{5}{2}$.

Third: We have just illustrated that $\frac{15}{6} = \frac{5}{2}$ Although the left side of the equal sign does not look identical to the right side of the equal sign, both fractions are equivalent because they have the same value. Check it with your calculator. 15 ÷ 6 = 2.5 and 5 ÷ 2 = 2.5. This proves that the fraction $\frac{15}{6}$can be reduced to the equivalent fraction $\frac{5}{2}$.

Reduce:

1) $\frac{24}{36}$
2) $\frac{14}{18}$
3) $\frac{24}{36}$
4) $\frac{10}{50}$
5) $\frac{-36}{60}$

Operations with Fractions:
Addition and Subtraction

Two fractions can only be added or subtracted if they have the <u>same denominator</u>

For example, it is possible to add $\frac{3}{5}$ and $\frac{1}{5}$ because both fractions have 5 as the denominator.

In this case, we simply add the numerators to find the answer: $\frac{3}{5} + \frac{1}{5} = \frac{4}{5}$

If fractions do not have the same denominator, you need to find *equivalent* fractions which do

For example, it is not possible to add $\frac{3}{5}$ and $\frac{1}{4}$ without changing each fraction so that they have the same bottom number.

We can use *equivalent fractions* to rewrite each fraction with 20 as the denominator: $\frac{3}{5} = \frac{12}{20}$ and $\frac{1}{4} = \frac{5}{20}$

Now we can see that $\frac{3}{5} + \frac{1}{4} = \frac{12}{20} + \frac{5}{20} = \frac{17}{20}$

Add:

1) $11^1/_3 + 7^1/_6 =$ _____
2) $10^1/_5 + 16^3/_5 =$ _____
3) $1^1/_2 + 16^1/_4 =$ _____
4) $11^4/_5 + 3^1/_5 =$ _____
5) $2^4/_5 + 4^3/_5 =$ _____
6) $1^2/_3 + 16^3/_6 =$ _____
7) $6^1/_4 + 10^1/_3 =$ _____
8) $9^5/_6 + 15^1/_3 =$ _____

Subtract:

9) $13^1/_6 - 6^1/_3 =$ _____
10) $13^4/_5 - 11^1/_2 =$ _____
11) $18^4/_6 - 18^1/_3 =$ _____
12) $11^1/_6 - 4^5/_6 =$ _____
13) $3^3/_4 - 3^1/_2 =$ _____
14) $4^4/_5 - 2^3/_5 =$ _____
15) $2^5/_6 - 11^1/_3 =$ _____
16) $10^1/_2 - 6^5/_6 =$ _____

Operations with Fractions: Multiplication

There are 3 simple steps to multiply fractions

1. Multiply the top numbers (the *numerators*).
2. Multiply the bottom numbers (the *denominators*).
3. Simplify the fraction if needed.

$$\frac{1}{2} \times \frac{2}{5}$$

Step 1. Multiply the top numbers:

$$\frac{1}{2} \times \frac{2}{5} = \frac{1 \times 2}{} = \frac{2}{}$$

Step 2. Multiply the bottom numbers:

$$\frac{1}{2} \times \frac{2}{5} = \frac{1 \times 2}{2 \times 5} = \frac{2}{10}$$

Step 3. Simplify the fraction:

$$\frac{2}{10} = \frac{1}{5}$$

1) $^{1}/_{2}$ x $^{2}/_{4}$ = _____

2) $^{1}/_{3}$ x $^{1}/_{4}$ = _____

3) $^{2}/_{5}$ x $^{1}/_{2}$ = _____

4) $^{2}/_{5}$ x $^{1}/_{3}$ = _____

5) $^{4}/_{6}$ x $^{3}/_{5}$ = _____

6) $^{2}/_{3}$ x $^{5}/_{6}$ = _____

7) $^{1}/_{2}$ x $^{1}/_{4}$ = _____

8) $^{5}/_{6}$ x $^{3}/_{6}$ = _____

Operations with Fractions:
Division

There are 3 Steps to Divide Fractions:

Step 1. Turn the second fraction *(the one you want to divide by)* upside-down (this is now a reciprocal).

Step 2. Multiply the first fraction by that reciprocal

Step 3. Simplify the fraction (if needed)

$$\frac{1}{2} \div \frac{1}{6}$$

Step 1. Turn the second fraction upside-down (it becomes a **reciprocal**):

$$\frac{1}{6} \text{ becomes } \frac{6}{1}$$

Step 2. Multiply the first fraction by that **reciprocal**:

$$\frac{1}{2} \times \frac{6}{1} = \frac{1 \times 6}{2 \times 1} = \frac{6}{2}$$

Step 3. Simplify the fraction:

$$\frac{6}{2} = \mathbf{3}$$

1) $^1/_2 \div {}^4/_5$ = _____

2) $^3/_6 \div {}^1/_3$ = _____

3) $^1/_3 \div {}^4/_5$ = _____

4) $^1/_2 \div {}^1/_3$ = _____

5) $^1/_6 \div {}^3/_5$ = _____

6) $^1/_4 \div {}^2/_6$ = _____

7) $^2/_4 \div {}^1/_2$ = _____

8) $^4/_5 \div {}^1/_6$ = _____

9) $^1/_3 \div {}^2/_4$ = _____

10) $^1/_2 \div {}^3/_4$ = _____

Ratio

A ratio is a statement of how two numbers compare. We use ratios to make comparisons between two things. When we express ratios in words, we use the word "to" -- we say "the ratio of something to something else". Multiplying or dividing each term by the same nonzero number will give an equal ratio. For example, the ratio 2:4 is equal to the ratio 1:2. To tell if two ratios are equal, use a calculator and divide. If the division gives the same answer for both ratios, then they are equal.

Write each ratio in simplest form.

1. 63 to 14	2. 22:40	3. $\frac{12}{12}$	4. 8:13	5. 50 to 55
6. 60 to 60	7. 21:30	8. 20 to 60	9. 20:16	10. $\frac{26}{28}$

Write five equivalent ratios for each ratio.

1. 45:24	2. 4 to 34	3. 18 to 5
4. 8:4	5. 16 to 12	6. 11:20

To convert units of measurement
Write the conversion as a fraction (that equals one)
Multiply it out (leaving all units in the answer)
Cancel any units that are both top and bottom

Example: What is 60 mph (miles per hour) in m/s (meters per second) ?

$$\frac{60\text{ mile}}{\text{h}} \times \frac{1609\text{ m}}{\text{mile}} \times \frac{1\text{ h}}{3600\text{ s}} = \frac{60 \times 1609\ \cancel{\text{mile}} \cdot \text{m} \cdot \cancel{\text{h}}}{3600\ \cancel{\text{h}} \cdot \cancel{\text{mile}} \cdot \text{s}} = 26.82\text{ m/s}$$

Complete the unit conversions.

1. 78 feet to yards	2. 21 pints to cups
3. 7 mins to secs	4. 13 pounds to ounces
5. 11 quarts to pints	6. 12,320 yards to miles
7. 16,000 pounds to tons	8. 44 cups to quarts
9. 29 yards to feet	10. 900 secs to mins
11. 144 hours to days	12. 1095 days to years

Proportion

A proportion is a name we give to a statement that two ratios are equal. It can be written in two ways:

- two equal fractions, $\frac{a}{b} = \frac{c}{d}$

- using a colon, **a:b = c:d**

When two ratios are equal, then the cross products of the ratios are equal.

That is, for the proportion, **a:b = c:d , a** x **d = b** x **c**

Determine the missing value:

1. $\frac{15}{p} = \frac{20}{8}$	2. $\frac{s}{10} = \frac{84}{20}$	3. $\frac{3}{y} = \frac{9}{12}$
4. $\frac{4}{12} = \frac{v}{3}$	5. $\frac{12}{28} = \frac{p}{21}$	6. $\frac{20}{12} = \frac{f}{9}$
7. $\frac{5}{9} = \frac{z}{27}$	8. $\frac{1}{4} = \frac{4}{q}$	9. $\frac{4}{h} = \frac{1}{2}$

State whether the ratios are proportional:

1. $\frac{35}{20} = \frac{7}{4}$	2. $\frac{3}{8} = \frac{32}{12}$	3. $\frac{5}{13} = \frac{40}{48}$	4. $\frac{9}{24} = \frac{3}{8}$
5. $\frac{52}{28} = \frac{40}{16}$	6. $\frac{10}{9} = \frac{20}{18}$	7. $\frac{10}{45} = \frac{2}{9}$	8. $\frac{8}{9} = \frac{2}{36}$

Percents

Converting From Percent to Decimal

Percent means "per 100"

To convert from percent to decimal: divide by 100, and remove the "%" sign. (The easy way to divide by 100 is to move the decimal point 2 places to the left)

Example #1

Percent To Decimal

Answer
75%= 0.75

Example #2 Convert 8.5% to decimal

Move the decimal point two places to the left: 8.5 -> 0.85 -> 0.085
Answer **8.5% = 0.085**

Convert From Decimal to Percent

To convert from decimal to percentage, just multiply the decimal by 100, but remember to put the "%" sign so people know it is per 100.(The easy way to multiply by 100 is to move the decimal point 2 places to the right.)

Example #1

From Decimal To Percent

Answer
0.125%= 12.5%

Example #2: Convert 0.65 to percent
Move the decimal point two places to the right: 0.65 -> 6.5 -> 65.
Answer **0.65 = 65%**

Write each percent as a decimal

1. 11%	2. 9.2%	3. 850%
4. 47.7%	5. 70%	6. 89%
7. 93.6%	8. 50.2%	9. 130%

Write each decimal as a percent

1. 0.78	2. 0.0210	3. 5.8
4. 0.26	5. 1.40	6. 0.391
7. 0.06	8. 0.046	9. 0.7

Percents

Convert Fractions to Percents

Divide the top of the fraction by the bottom, multiply by 100 and add a "%" sign.

Example: What is $^5/_8$ as a percent?

5÷8 = 0.625

0.625 x 100 = **62.5%** (remember to put the "%" so people know it is "per 100")

Another Method

Because percent means "per 100", you can try to convert the fraction to $\frac{?}{100}$ form.

Follow these steps:

Step 1: Find a number you can multiply the bottom of the fraction by to get 100.

Step 2: Multiply both top and bottom of the fraction by that number.

Step 3. Then write down just the top number with the "%" sign.

Example: Express $\frac{3}{4}$ as a Percent

Step 1: We can multiply 4 by **25** to become 100

Step 2: Multiply top and bottom by 25:

Step 3: Write down 75 with the percent sign: $\frac{3}{4} \times \frac{25}{25} = \frac{75}{100} = 75\%$

Convert Percents to Fractions

Step 1: Write down the percent divided by 100.

Step 2: **If** the percent is **not** a whole number, then multiply both top and bottom by 10 for every number after the decimal point. (For example, if there is one number after the decimal, then use 10, if there are two then use 100, etc.)

Step 3: Simplify (or reduce) the fraction

Example: Express 11% as a fraction

11% = $\frac{11}{100}$ The percent is a whole number, so no need for step 2, and the fraction cannot be simplified further.

Example: Express 75% as a fraction

75% = $\frac{75}{100}$ The percent is a whole number, so no need for step 2, then simplify $\frac{75}{100} = \frac{3}{4}$

Write each percent as a fraction in simplest form

1. 74%	2. 470%	3. 30%
4. 78%	5. 38%	6. 680%
7. 52%	8. 20%	9. 80%

Write each fraction as a percent

1. $\frac{3}{10}$	2. $\frac{2}{5}$
3. $\frac{10}{8}$	4. $\frac{1}{2}$
5. $\frac{4}{5}$	6. $\frac{49}{50}$

Percentages

Percent of a Number To find the percent of a given number, convert the percent to a decimal and multiply.

Example: 30 percent of 400

1) Change 30% to a decimal by moving the decimal point 2 places to the left. 30% = 0.30
2) Multiply

0.30 x 400 = 120

Additional Examples:
100% of 58 -> 1.00 x 58 = 58 (One hundred percent of a number is just the number itself.)
200% of 24 -> 2.00 x 24 = 48 (Two hundred percent of a number is twice that number.)

Solve:

1) 25% of 20
2) 200% of 36
3) 56.25% of 16
4) 80% of 5
5) 12.5% of 16
6) 0.5% of 40
7) 56% of 25
8) 35% of 100
9) 75% of 8
10) 10% of 54
11) 100% of 23
12) 94% of 50

The Proportion Method

Since percent statements always involve three numbers, given any two of these numbers, we can find the third using the proportion above. Let's look at an example of this.

In this method, we write a proportion: $\frac{PART}{WHOLE} = \frac{\%}{100}$

The percent is always over 100 because that's what percent means. The "part over whole" is the definition of a fraction. In this case, the number following "of" is the whole. The advantage to the proportion method is that converting to a decimal is not needed. (The division by 100 takes care of that.)

Example: What number is 75% of 4? (*or* Find 75% of 4.)
The PERCENT *always* goes over 100. (It's a part of the whole 100%.)
4 appears with the word *of*: It's the WHOLE and goes on the bottom.

$$\frac{\text{part}}{4} = \frac{75}{100}$$

Cross Multiply to solve:

4 times 75 = 100 (*part*)
300 = 100 (*part*)
$\frac{300}{100} = \frac{100}{100}$ (*part*)
3 = (*part*) 75% of 4 = 3

Solve:

1. What is 40% of 164?
2. 90 is 75% of what?
3. 40 is what percent of 20?
4. What is 85% of 600?
5. What percent of 60 is 28?
6. 1.5 is what percent of 3?
7. 16% of what number is 12?
8. 3 is 20% of what number?
9. What is 5% of 34?
10. 20% of what number is 24?
11. 17 is what percent of 51?
12. 50% of 188 is what?
13. 63% of what is 315?
14. 25 is what percent of 300?

Integers

Adding Integers

1. If the integers have the same sign, add the two numbers and use their common sign

a. 62 + 14 = 76 b. -29 + -13 = -42

2. If the integers have different signs, find the difference between the two values and use the sign of the number that is the greater distance from zero.

a. 15 + -8 = +7 b. 9 + -30 = -21

Subtracting Integers

To subtract an integer, add its opposite

(-8) – (+9) = The opposite of +9 is –9. Change sign to opposite: (-8) + (-9) = -17 using integer addition rules

a. (+7) – (+4) = (+7) + (-4) = +3 b. (-3) – (+8) = (-3) + (-8) = -11

c. (+5) – (-6) = (+5) + (+6) = +11

OR

1. Change double negatives to a positive.
2. Get a sum of terms with like signs and keep the given sign, using the sign in front of the number as the sign of the number.
3. Find the difference when terms have different signs and use the sign of the larger numeral.

a. 7 – (-5) = 7 + 5 = 12 (a. Change double negatives to positive, use integer addition rules)

b. –5 – 9 = -14 (using the signs in front of the numbers, use only addition rules-signs are alike, add and keep the sign)

c. 6 – 7 = -1 (using the signs in front of the numbers, use addition rules-signs are different, subtract and take the sign of the largest numeral)

d. 6 – 7 + 3 – 4 – 2 = 9 – 13 = -4 (Get the sum of the terms with like signs, use addition rules)

1. -5 + -6 = 2. 9 + -4 =

3. -3 + 6 = 4. -4 + -4 =

5. -2 + 8 = 6. -7 - +1 =

7. -9 + 10 = 8. -8 + -5 =

9. 12 + 10 = 10. 13 + -17 =

11. -29 + -11 = 12. -36 - +24 =

13. 42 + -19 = 14. -33 - -42 =

15. 31 - -56 = 16. 65 + 15 =

17. -8 + 10 = 18. 7 + -18 =

19. 75 + -25 = 20. 33 + -22 =

21. 73 - 47 = 22. 86 + -58 =

23. 78 + -30 = 24. 100 + -50 =

Integers

Multiplying Integers

1. If the integers have the same sign, multiply the two numbers and the result is positive

a. 2 x 14 = 28 b. -9 x -2 = 18

2. If the integers have different signs, multiply the two numbers and the result is negative

a. 5 x -8 = -40 b. -9 x 3 = -27

Dividing Integers

1. If the integers have the same sign, divide the two numbers and the result is positive

a. 21 ÷ 3 = 7 b. -24 ÷ -6 = +4

2. If the integers have different signs, divide the two numbers and the result is negative

a. -46 ÷ 2 = -23 b. 99 ÷ -3 = -33

1. -5 x -6 =
2. 16 ÷ -4 =
3. -3 ÷ 6 =
4. -4 x -4 =
5. -2 x 8 =
6. -7 ÷ 1 =
7. 9 x 10 =
8. -8 x -5 =
9. -12 x -10 =
10. 3 x 17 =
11. -121 ÷ -11 =
12. -36 ÷ -2 =
13. 2 x -9 =
14. -33 x 2 =
15. 3 x 56 =
16. 16 x -5 =
17. -80 ÷ 10 =
18. 1 ÷ -18 =
19. 75 ÷ -25 =
20. 33 ÷ -3 =
21. 7 x -14 =
22. -6 x -8 =
23. -90 ÷ -30 =
24. 100 ÷ -50 =

Combining Like Terms

What are Like Terms?

The following are like terms because each term consists of a single variable, x, and a numeric coefficient.
`2x, 45x, x, 0x, -26x, -x`

Each of the following are like terms because they are all constants.
`15, -2, 27, 9043, 0.6`

What are Unlike Terms?

These terms are not alike since different variables are used.
`17x, 17z`

These terms are not alike since each y variable in the terms below has a different exponent.
$15y,\ 19y^2,\ 31y^5$

Although both terms below have an x variable, only one term has the y variable, thus these are not like terms either.
`19x, 14xy`

Examples - Simplify
Group like terms together first, and then simplify.

$\mathbf{2x^2 + 3x - 4 - x^2 + x + 9}$

$$\begin{aligned} &2x^2 + 3x - 4 - x^2 + x + 9 \\ &= (2x^2 - x^2) + (3x + x) + (-4 + 9) \\ &= \mathbf{x^2 + 4x + 5} \end{aligned}$$

$\mathbf{10x^3 - 14x^2 + 3x - 4x^3 + 4x - 6}$

$$\begin{aligned} &10x^3 - 14x^2 + 3x - 4x^3 + 4x - 6 \\ &= (10x^3 - 4x^3) + (-14x^2) + (3x + 4x) - 6 \\ &= \mathbf{6x^3 - 14x^2 + 7x - 6} \end{aligned}$$

Directions: *Simplify each expression below* by combining like terms.

1) $-6k + 7k$
2) $12r - 8 - 12$
3) $n - 10 + 9n - 3$
4) $-4x - 10x$
5) $-r - 10r$
6) $-2x + 11 + 6x$
7) $-v + 12v$
8) $x + 2 + 2x$
9) $5 + x + 2$
10) $2x^2 + 13 + x^2 + 6$
11) $2x + 3 + x + 6$
12) $2x^3 + 3x + x^2 + 4x^3$

Order of Operations

"Operations" means things like add, subtract, multiply, divide, squaring, etc. But, when you see an expression: $7 + (6 \times 5^2 + 3)$ ... what part should you calculate first?

Warning: Calculate them in the wrong order, and you will get a wrong answer !

So, long ago people agreed to follow rules when doing calculations, and they are:

First: Do things in Parentheses Example:

✓	$6 \times (5 + 3)$	=	6×8	=	**48**	
✗	$6 \times (5 + 3)$	=	$30 + 3$	=	33	(wrong)

Next: Exponents (Powers, Roots) Example:

✓	5×2^2	=	5×4	=	**20**	
✗	5×2^2	=	10^2	=	100	(wrong)

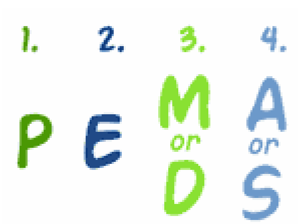
Then: Multiply or Divide before you Add or Subtract. Example:

✓	$2 + 5 \times 3$	=	$2 + 15$	=	**17**	
✗	$2 + 5 \times 3$	=	7×3	=	21	(wrong)

HINT: go left to right. Example:

✓	$30 \div 5 \times 3$	=	6×3	=	**18**	
✗	$30 \div 5 \times 3$	=	$30 \div 15$	=	2	(wrong)

Remember it by PEMDAS = "Please Excuse My Dear Aunt Sally"



After you have done "P" and "E", just go from left to right doing any "M" ***or*** "D" as you find them.

Then go from left to right doing any "A" ***or*** "S" as you find them.

Simplify:

1. $4+10 - (5+7) =$
2. $4 \times 2(4^2 + 6 =$
3. $3 \times 4^2 + 8 =$
4. $6(2+1) + 1^3 - 2 =$
5. $1 - (8^2 + 6) =$
6. $(10+2 - 3)^2 =$
7. $5 \times 4 + 9 =$
8. $18 - 7^2 + 5 =$
9. $7 + (6 \times 5^2 + 3) =$
10. $8 + 3(3 - 4) \div 2 =$

Distributive Property

In algebra, the use of parentheses is used to indicate operations to be performed. For example, the expression $4(2x-y)$ indicates that *4 times the binomial* $2x-y$ is $8x-4y$

Additional Examples:

1.$2(x+y) = 2x+2y$

2.$-3(2a+b-c) = -3(2a)-3(b)-3(-c)=-6a-3b+3c$

3. $3(2x+3y) = 3(2x)+3(2y)=6x+9y$

1. $3(4x + 6) + 7x =$

2. $7(2 + 3x) + 8 =$

3. $9 + 5(4x + 4) =$

4. $12 + 3(x + 8) =$

5. $3(7x + 2) + 8x =$

6. $6m + 3(2m + 5) + 7 =$

7. $5(m + 9) - 4 + 8m =$

8. $3m + 2(5 + m) + 5m =$

9. $6m + 14 + 3(3m + 7) =$

10. $4(2m + 6) + 3(3 + 5m) =$

Solving Equations

An equation is a mathematical statement that has two expressions separated by an equal sign. The expression on the left side of the equal sign has the same value as the expression on the right side. To *solve an equation* means to determine a numerical value for a variable that makes this statement true by isolating or moving everything except the variable to one side of the equation. To do this, combine like terms on each side, then add or subtract the same value from both sides. Next, clear out any fractions by multiplying **every** term by the denominator, and then divide every term by the same nonzero value. Remember to keep both sides of an equation equal, you must do exactly the same thing to each side of the equation.

Examples:

a. $x + 3 = 8$

$$\begin{array}{rcl} x + 3 &=& 8 \\ \underline{\quad -3} && \underline{-3} \\ x &=& 5 \end{array}$$

3 is being added to the variable, so to get rid of the added 3, we do the opposite, subtract 3.

b. $5x - 2 = 13$

$$\begin{array}{rcl} 5x - 2 &=& 13 \\ \underline{\quad +2} && \underline{+2} \\ 5x &=& 15 \\ \frac{5x}{5} &=& \frac{15}{5} \\ x &=& 3 \end{array}$$

First, undo the subtraction by adding 2.

Then, undo the multiplication by dividing by 5.

Solve

1.) $4x = -32$

2.) $-7x + 7 = -70$

3.) $5x + 1 = 26$

4.) $2x + 7 = 31$

5.) $-3x + 2 = -13$

6.) $8 + 7x = -15$

7.) $-3x = 18$

8.) $5x + 5 = 35$

Evaluating Expressions

Simplify the expression first. Then evaluate the resulting expression for the given value of the variable.

Example $3x + 5(2x + 6) =$ _____ if $x = 4$
$3x + 10x + 30 =$
$13x + 30 =$
$13(4) + 30 = \underline{82}$

1. $y + 9 - x =$ ____; if $x = 1$, and $y = 3$

2. $8 + 5(9 - 4x) =$ _____ if $x = 2$

3. $6(4x + 1) + x =$ _____ if $x = 5$

4. $8(2m + 1) + 3(5m + 3) =$ _____ if $m = 2$

5. $7(3 + 5m) + 2(m + 6) =$ _____ if $m = 2$

6. $2(4m + 5) + 2(4m + 1) =$ _____ if $m = 5$

7. $5(8 + m) + 2(m - 7) =$ ______ if $m = 3$

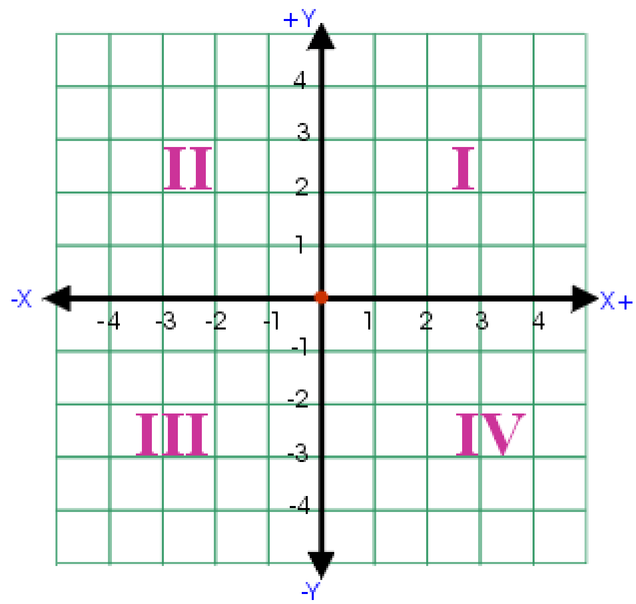
8. $y \div 2 + x =$ ____; if $x = -1$, and $y = 2$

The Coordinate Plane

This is a **coordinate plane**. It has two axes and four quadrants. The two number lines form the axes. The horizontal number line is called the **x-axis** and the vertical number line is called the **y-axis**.

The center of the coordinate plane is called the **origin**. It has the coordinates of (0,0).

Locations of points on the plane can be plotted when one coordinate from each of the axes are used. This set of x and y values are called **ordered pairs**.



State the quadrant or axis that each point lies in.

1) $J\,(5, 10)$ ________________

2) $G(-6, 8)$ ________________

3) $D(-8, -4)$ ________________

4) $A\,(-8, 1)$ ________________

5) $I\,(1, 9)$ ________________

6) $F\,(9, 0)$ ________________

7) $C\,(0, 5)$ ________________

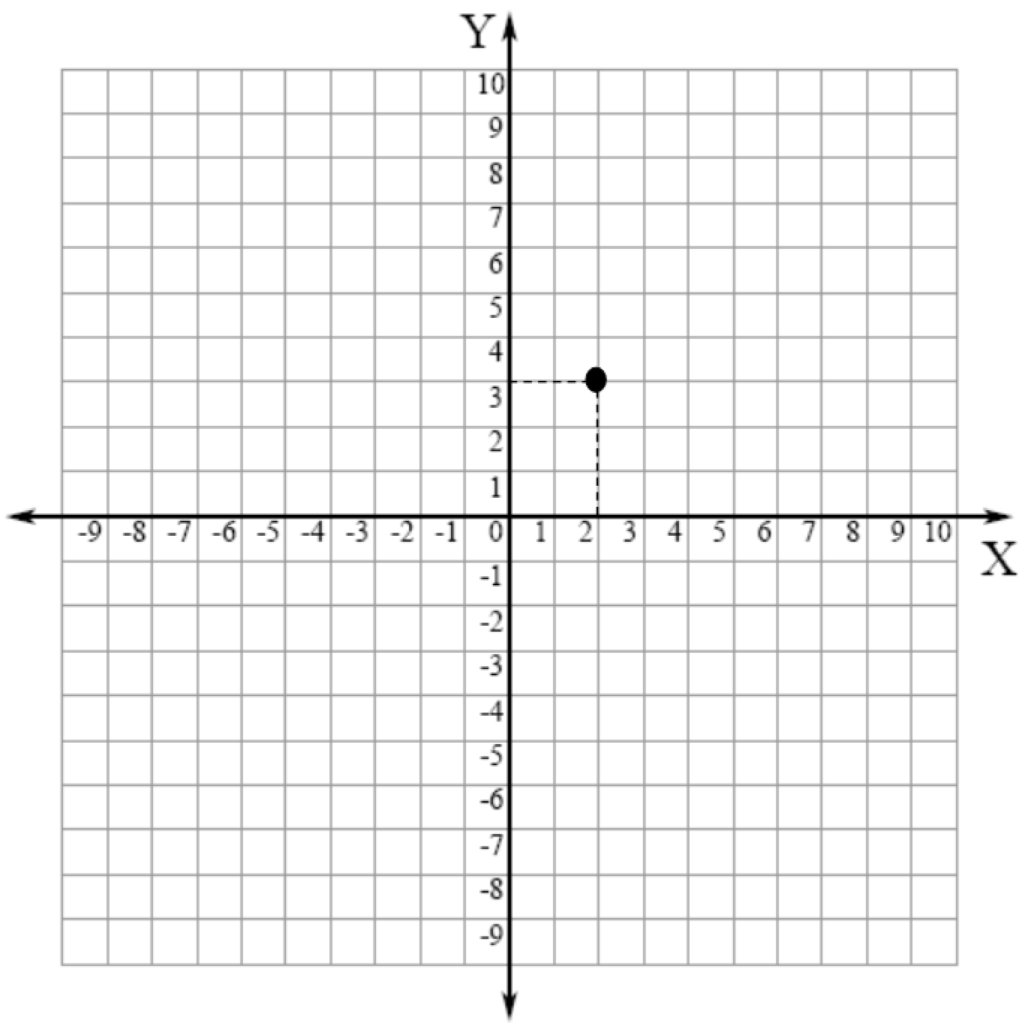
8) $H\,(6, -9)$ ________________

9) $E\,(6, 0)$ ________________

10) $B\,(1, 1)$ ________________

Plotting Points

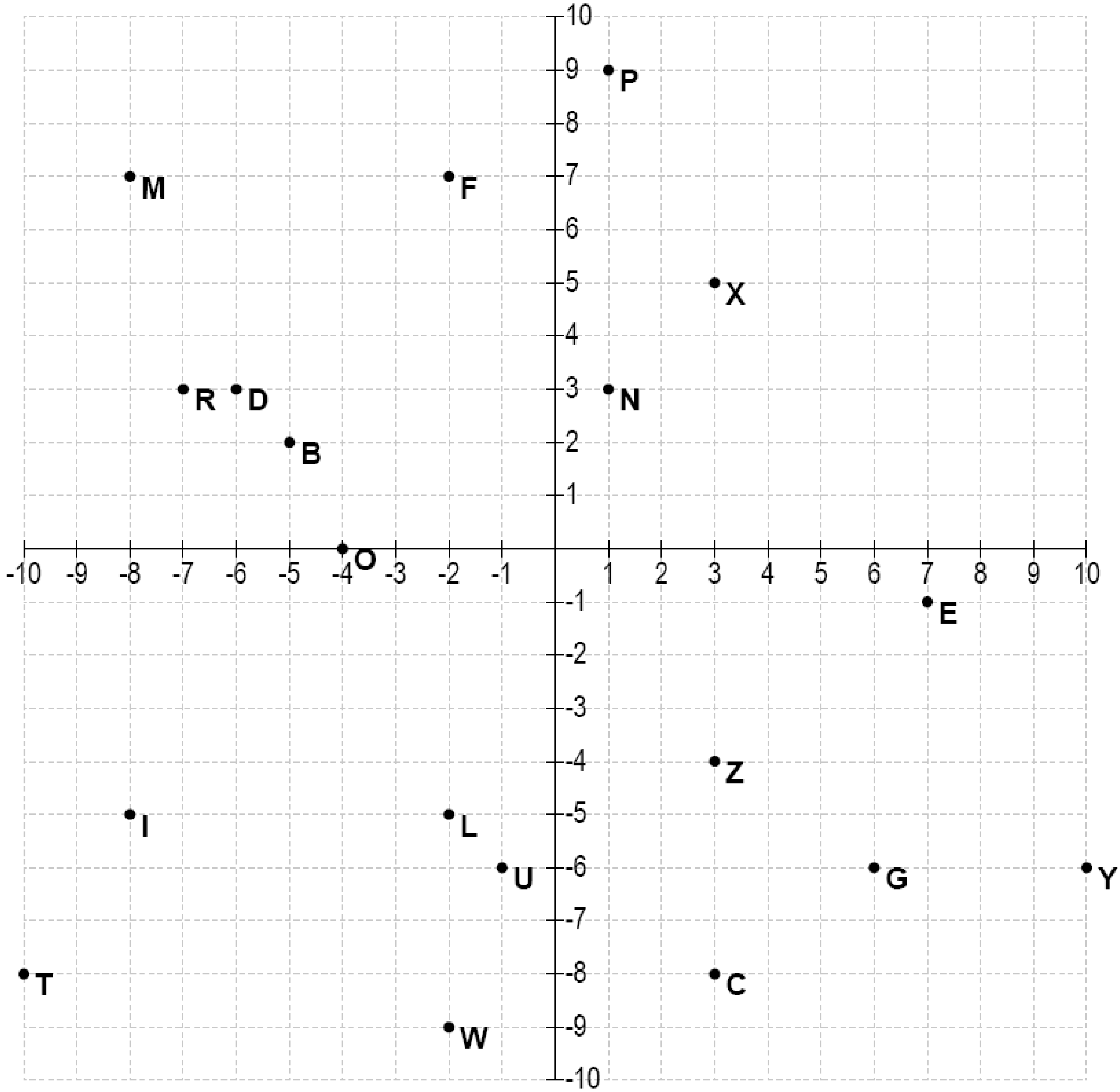
The first coordinate of a plotted point is called the '**x**' coordinate. The 'x' coordinate is the horizontal distance from the origin to the plotted point. The second coordinate of a plotted point is called the '**y**' coordinate. The 'y' coordinate is the vertical distance from the origin to the plotted point. So, to locate the point: (2, 3) on our graph below, we start at the origin and move 2 units horizontally and 3 units vertically. When locating points, **positive** 'x' values are to the **right** of the origin, while **negative** 'x' values are to the **left** of the origin. Also, positive 'y' values are above the origin, while negative 'y' values are below the origin.



Plot each of the points on the graph:

(1) Point D at (0, 10)	(5) Point E at (-4, -8)	(9) Point P at (-9, -10)
(2) Point J at (-1, 6)	(6) Point F at (5, 6)	(10) Point G at (-7, 9)
(3) Point O at (-8, 1)	(7) Point S at (-8, 2)	(11) Point Z at (-7, -5)
(4) Point B at (-9, -3)	(8) Point H at (6, 8)	(12) Point Y at (0, -8)

Plotting Points



Write the coordinates of each point:

1) Point L:	________	6) Point F:	________	11) Point N:	________	16) Point O:	________
2) Point U:	________	7) Point X:	________	12) Point D:	________	17) Point W:	________
3) Point B:	________	8) Point I:	________	13) Point Y:	________	18) Point T:	________
4) Point P:	________	9) Point G:	________	14) Point R:	________		
5) Point C:	________	10) Point M:	________	15) Point E:	________		

Tables of Values (T – Charts)

Any equation can be graphed using a table of values. A table of values is a graphic organizer or chart that helps you determine two or more points that can be used to create your graph.

In order to graph a line, you must have two points. For any given linear equation, there are an infinite number of solutions or points on that line. Every point on that line is a solution to the equation.

In a T – Chart:

- The first column is for the x coordinate. For this column, you can choose any number.
- The second column is for the y value. After substituting your x value into the equation, your answer is the y coordinate.
- The result of each row is an ordered pair. Your ordered pair is the x value and the y value. This is the point on your graph.

Example: Determine solutions to the equation $y = 3x + 2$

1) Draw a T-chart

x	y

2) Select values for x:

x	y
-1	
0	
1	

3) Evaluate the equation for each x value:

$y = 3x + 2$ $x = -1$
$y = 3(-1) + 2$
$y = -3 + 2$
$y = -1$

$y = 3x + 2$ $x = 0$
$y = 3(0) + 2$
$y = 0 + 2$
$y = 2$

$y = 3x + 2$ $x = -1$
$y = 3(1) + 2$
$y = 3 + 2$
$y = 5$

4) Complete the chart with the values:

x	y
-1	-1
0	2
1	5

Determine three solutions to each equation:

1. $y = 2x+1$

4. $y = -2x - 7$

2. $y = 3x – 6$

5. $3y = -24$

3. $y = -x -1$

6. $2y = 4x +10$