Name: _____ Date: _____

Lakelands Park Middle School

Algebra 1

Summer Packet

Dear Students,

Summer vacation is almost here and the start of the new school year is just around the corner. We want you to be prepared for the upcoming school year. It is important that you have a smooth transition to your new math class at the beginning of the school year. With this in mind, we are providing a practice workbook of previously taught skills for you to complete over the summer.

It is your responsibility to complete the workbook before the start of the school year. Please follow the directions for calculator use on each page. You should show all necessary work so that you and your teacher can both understand how you resolved the problems. If you have trouble on some of the information, seek assistance from a parent/guardian or other adult who may be able to assist you. We have also included some websites which may assist you in completing the workbook. Remember the goal is to work consistently throughout the summer and not to rush to finish the workbook quickly.

You will receive an answer key for the workbook upon your return from summer vacation. You will be expected to seek help from your teacher on any topics that you found challenging. You will be able to demonstrate your knowledge of these concepts on a pre-assessment which will be graded for accuracy.

We look forward to seeing you in the fall.

Sincerely,

LPMS Mathematics Department

Websites for additional support and practice:

Kahn Academy	https://www.khanacademy.org/
Xtra math	http://xtramath.org/
Learn Zillion	http://learnzillion.com/
Purple math	http://www.purplemath.com/
IXL	http://www.ixl.com/
Math is fun	http://www.mathisfun.com/

Squares and Square Roots

Hints/Guide:

Exponents are a way to represent repeated multiplication, so that 3^4 means 3 multiplied four times, or $3 \cdot 3 \cdot 3 \cdot 3$, which equals 81. In this example, 3 is the base and 4 is the power.

Roots are the base numbers that correspond to a given power, so the square (referring to the power of 2) root of 81 is 9 because $9 \cdot 9 = 81$ and the fourth root of 81 is 3 because $3 \cdot 3 \cdot 3 \cdot 3$ is 81.

$\sqrt[n]{x}$, where n is the root index and x is the radicand

Exercises: Evaluate.

1. $3^4 =$
2. $(-4)^3 =$
3. $-4^3 =$
4. $\sqrt{49} =$
5. $\sqrt{289} =$
6. $\sqrt[3]{64} =$
7. $(8-4)^2 =$
8. $(4-2)^2 (5-8)^3 =$
9. $5(8-3)^2 =$
10. $\sqrt{25-16} =$
11. $\sqrt{5(9 \bullet 125)} =$
12. $\sqrt{(8-4)(1+3)} =$
13. $\sqrt{45-4(3+6)} =$
14. $-\sqrt{14(16-2)} =$

Multiply and Divide Mixed Numbers

Hints/Guide:

To multiply mixed numbers, we can first convert the mixed numbers into improper fractions. This is done my multiplying the denominator by the whole number part of the mixed number and them adding the numerator to this product. This sum is the numerator of the improper fraction. The denominator of the improper fraction is the same as the denominator of the mixed number.

For example: $3\frac{2}{5}$ leads to $3 \cdot 5 + 2 = 17$, so $3\frac{2}{5} = \frac{17}{5}$.

Once the mixed numbers are converted into improper fractions, we multiply and simplify just as with regular fractions. For example: $5\frac{1}{5} \bullet 3\frac{1}{2} = \frac{26}{2} \bullet \frac{7}{2} = \frac{182}{10} = 18\frac{2}{10} = 18\frac{1}{5}$

To divide mixed numbers, we must convert to improper fractions then multiply by the reciprocal of the second fraction and simplify. For example: $2\frac{1}{2} \div 3\frac{1}{3} = \frac{5}{2} \div \frac{10}{3} = \frac{5}{2} \bullet \frac{3}{10} = \frac{15}{20} = \frac{3}{4}$

Exercises: Solve in lowest terms. No Calculators!

SHOW ALL WORK. Use a separate sheet of paper (if needed) and staple to this page.

1. $6\frac{2}{3} \bullet 7\frac{3}{7} =$

2. $3\frac{1}{3} \bullet 6\frac{4}{5} =$

3. $7\frac{1}{8} \bullet 6 =$

4. $4\frac{1}{4} \div \frac{5}{7} =$

5. $3\frac{2}{3} \div 4\frac{3}{7} =$

6. $\frac{3}{4} \div 2\frac{3}{11} =$

7. $6\frac{1}{5} \div 8\frac{2}{5} =$

8. $8\frac{2}{7} \div 7\frac{8}{9} =$

9. $6\frac{4}{7} \div 3\frac{3}{5} =$

Laws of Exponents

Hints/Guide:

There are certain rules when dealing with exponents that we can use to simplify problems. They are:

Adding powers	$a^m a^n = a^{m+n}$
Multiplying powers	$(a^m)^n = a^{mn}$
Subtracting powers	$\frac{a^m}{a^n} = a^{m-n}$
Negative powers	$a^{-n} = \frac{1}{a^n}$
To the zero power	$a^0 = 1$

Here are some examples of problems simplified using the above powers:

$4^3 \bullet 5^5 = 4^8$ $\quad (4^3)^3 = 4^9$ $\quad 4^5 \div 4^3 = 4^2$ $\quad 4^{-4} = \frac{1}{4^4} = \frac{1}{256}$ $\quad 4^0 = 1$

Exercises: Simplify the following problems using exponents (Do not multiply out).

1. $5^2 5^4 =$

2. $7^{-3} 7^5 =$

3. $(12^4)^3 =$

4. $(6^5)^2 =$

5. $5^9 \div 5^4 =$

6. $10^3 \div 10^{-5} =$

7. $7^{-3} =$

8. $3^{-4} =$

9. $124^0 =$

10. $-9^0 =$

11. $(3^5 \bullet 3^2)^3 =$

12. $5^3 \bullet 5^4 \div 5^7 =$

Integers I

Hints/Guide:

To add integers with the same sign (both positive or both negative), add their absolute values and use the same sign. To add integers of opposite signs, find the difference of their absolute values and then take the sign of the larger absolute value.

To subtract integers, add its additive inverse. For example, $6 - 11 = 6 + -11 = -5$

Exercises: Solve the following problems.

1. $(-4) + (-5) =$
2. $-9 - (-2) =$
3. $6 - (-9) =$
4. $(-6) - 7 =$
5. $7 - (-9) =$
6. $15 - 24 =$
7. $(-5) + (-8) =$
8. $-15 + 8 - 8 =$
9. $14 + (-4) - 8 =$
10. $14.5 - 29 =$
11. $-7 - 6.85 =$
12. $-8.4 - (-19.5) =$
13. $29 - 16 + (-5) =$
14. $-15 + 8 - (-19.7) =$
15. $45.6 - (-13.5) + (-14) =$
16. $-15.98 - 6.98 - 9 =$
17. $-7.24 + (-6.28) - 7.3 =$
18. $29.45 - 56.009 - 78.2 =$
19. $17.002 + (-7) - (-5.23) =$
20. $45.9 - (-9.2) + 5 =$

Summer Mathematics Packet

Integers II

Hints/Guide:

The rules for multiplying integers are:

Positive · Positive = Positive
Positive · Negative = Negative
Negative · Negative = Positive
Negative · Positive = Negative

The rules for dividing integers are the same as multiplying integers

Exercises: Solve the following problems.

1. $4 \cdot (-3) \cdot 6 =$
2. $5\ (-12) \cdot (-4) =$
3. $(4)(-2)(-3) =$
4. $\frac{(-5)(-6)}{-2} =$
5. $\frac{6(-4)}{8} =$
6. $\frac{-56}{2^3} =$
7. $6\ (-5 - (-6)) =$
8. $8\ (-4 - 6) =$
9. $-6\ (9 - 11) =$
10. $\frac{-14}{2} + 7 =$
11. $8 - \frac{-15}{-3} =$
12. $-3 + \frac{-12 \bullet (-5)}{4} =$
13. $\frac{-6 - (-8)}{-2} =$
14. $-7 + \frac{4 + (-6)}{-2} =$
15. $45 - 14\ (5 - (-3)) =$
16. $(-4 + 7)\ (-16 + 3) =$
17. $16 - (-13)\ (-7 + 5) =$
18. $\frac{4 + (-6) - 5 - 3}{-6 + 4} =$
19. $(-2)^3\ (-5 - (-6)) =$
20. $13\ (-9 + 17) + 24 =$

Solving Equations I

Hints/Guide:

The key in equation solving is to isolate the variable, to get the letter by itself. In one-step equations, we merely undo the operation - addition is the opposite of subtraction and multiplication is the opposite of division. Remember the golden rule of equation solving: If we do something to one side of the equation, we must do the exact same thing to the other side. Examples:

1. $x + 5 = 6$
   $-5 \quad -5$
   $x = 1$
   Check: $1 + 5 = 6$
   $6 = 6$

2. $t - 6 = 7$
   $+6 \quad +6$
   $t = 13$
   Check: $13 - 6 = 7$
   $7 = 7$

3. $\frac{4x}{4} = \frac{16}{4}$
   $x = 4$
   Check: $4(4) = 16$
   $16 = 16$

4. $6 \cdot \frac{r}{6} = 12 \cdot 6$
   $r = 72$
   Check: $72 \div 6 = 12$
   $12 = 12$

Exercises: Solve the following problems: No Calculators!
SHOW ALL WORK. Use a separate sheet of paper (if necessary) and staple to this page.

1. $x + 8 = -13$
2. $t - (-9) = 4$
3. $-4t = -12$
4. $\frac{r}{4} = 24$
5. $y - 4 = -3$
6. $h + 8 = -5$
7. $\frac{p}{8} = -16$
8. $-5k = 20$
9. $-9 - p = 17$

Solving Equations II

Hints/Guide:

The key in equation solving is to isolate the variable, to get the letter by itself. In two-step equations, we must undo addition and subtraction first, then multiplication and division. Remember the golden rule of equation solving: If we do something to one side of the equation, we must do the exact same thing to the other side. Examples:

1. $4x - 6 = -14$

$+6 \quad +6$

$\frac{4x}{4} = \frac{-8}{4}$

$x = -2$

Solve: $4(-2) - 6 = -14$

$-8 - 6 = -14$

$-14 = -14$

2. $\frac{x}{-6} - 4 = -8$

$+4 \quad +4$

$-6 \cdot \frac{x}{-6} = -4 \cdot -6$

$x = 24$

Solve: $(24/-6) - 4 = -8$

$-4 - 4 = -8$

$-8 = -8$

Exercises: Solve the following problems: No Calculators!

SHOW ALL WORK. Use a separate sheet of paper (if necessary) and staple to this page.

1. $-4t - 6 = 22$
2. $\frac{m}{-5} + 6 = -4$
3. $-4r + 5 = -25$
4. $\frac{x}{-3} + (-7) = 6$
5. $5g + (-3) = -12$
6. $\frac{y}{-2} + (-4) = 8$

Solving Equations III

Hints/Guide:

When solving equations that include basic mathematical operations, we must simplify the mathematics first, then solve the equations. For example:

$$5(4-3)+7x=4(9-6)$$
$$5(1)+7x=4(3)$$
$$5+7x=12$$
$$-5 \qquad -5$$
$$\frac{7x}{7}=\frac{7}{7}$$
$$x=1$$

Check: $5(4-3)+7(1)=4(9-6)$
$5+7=4(3)$
$12=12$

Exercises: Solve the following equations using the rules listed on the previous pages:
SHOW ALL WORK. Use a separate sheet of paper (if necessary) and staple to this page.

1. $4x+8-6=2(9-2)$
2. $\frac{t}{5}-7+31=8(6-4)$
3. $5(t-4)=9(7-3)$
4. $9-5(4-3)=-16+\frac{x}{3}$
5. $6t-9-3t=8(7-4)$
6. $7(6-(-8))=\frac{t}{-4}+2$
7. $7(3-6)=6(4+t)$
8. $4r+5r-6r=15+6$
9. $3(5+x)=5(7-(-2))$

Equations - Variables on Each Side

Hints/Guide:

As we know, the key in equation solving is to isolate the variable. In equations with variables on each side of the equation, we must combine the variables first by adding or subtracting the amount of one variable on each side of the equation to have a variable term on one side of the equation. Then, we must undo the addition and subtraction, then multiplication and division. Remember the golden rule of equation solving. Examples:

$$\begin{aligned} 8x - 6 &= 4x + 5 \\ -4x \quad &\quad -4x \\ 4x - 6 &= \quad 5 \\ +6 \quad &\quad +6 \\ \frac{4x}{4} &= \frac{11}{4} \\ x &= 2\frac{3}{4} \end{aligned}$$

$$\begin{aligned} 5 - 6t &= 24 + 4t \\ +6t \quad &\quad +6t \\ 5 \quad &= 24 + 10t \\ -24 \quad &\quad -24 \\ \frac{-19}{10} &= \frac{10t}{10} \\ -1\frac{9}{10} &= t \end{aligned}$$

Exercises: Solve the following problems: No Calculators!

SHOW ALL WORK. Use a separate sheet of paper (if necessary) and staple to this page.

1. $4r - 7 = 8r + 13$
2. $14 + 3t = 5t - 12$
3. $4x + 5 = 3x - 3$
4. $6y + 5 = 4y - 13$
5. $5x - 8 = 6 - 2x$
6. $7p - 8 = -4p + 6$

Inequalities

Hints/Guide:

In solving inequalities, the solution process is very similar to solving equalities. The goal is still to isolate the variable, to get the letter by itself. However, the one difference between equations and inequalities is that when solving inequalities, when we multiply or divide by a negative number, we must change the direction of the inequality. Also, since an inequality as many solutions, we can represent the solution of an inequality by a set of numbers or by the numbers on a number line.

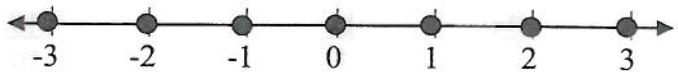
Inequality - a statement containing one of the following symbols:

$<$ is less than $>$ is greater than $\leq$ is less than or equal to

$\geq$ is greater than or equal to _ is not equal to

Examples:

1. Integers between -4 and 4.

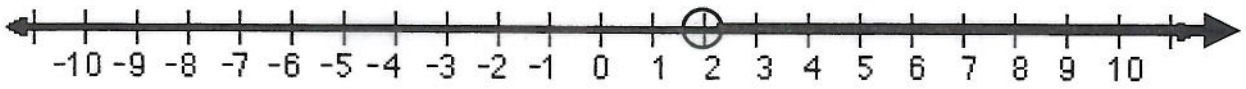


2. All numbers between -4 and 4.

3. The positive numbers.

So, to solve the inequality $-4x < -8$ becomes $\frac{-4x}{-4} < \frac{-8}{-4}$

and therefore $x > 2$ is the solution (this is because whenever we multiply or divide an inequality by a negative number, the direction of the inequality must change) and can be represented as:



Exercises: Solve the following problems: No Calculators!

1. $4x > 9$

2. $-5t \geq -15$

3. $\frac{x}{2} \geq 3$

4. $\frac{x}{-4} > 2$

Summer mathematics packet

Graphing linear equations in slope-intercept form and standard form.

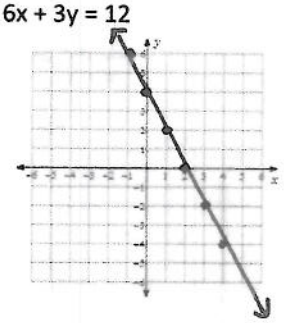
Hints/Guide:

The graph of an equation consists of all of the points that satisfy the equation. To graph a linear equation you can make a table of x and y values that satisfy the equation. You can then draw a line through the points after you graph them. This procedure works for any equation.

If the equation is in slope intercept form (y=mx+b), then you can graph the line by using the y-intercept (b), and the slope (m). First, you plot the y-intercept. Second, you go up and over from the y-intercept as described by the slope.

Ex. #1

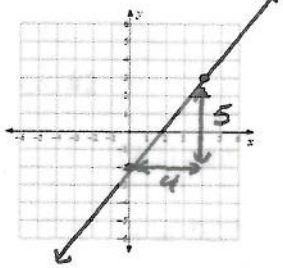
$6x + 3y = 12$



x	Y
-1	6
0	4
1	2
2	0
3	-2
4	-4

Ex. #2

$y = \frac{5}{4}x - 2$

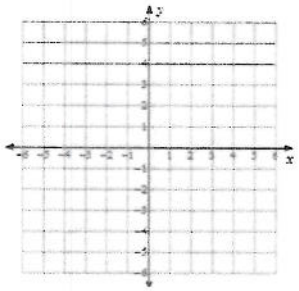


y-intercept = -2

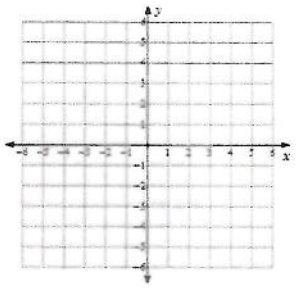
slope = $\frac{5}{4}$

Exercises: Graph the following linear equations using any method.

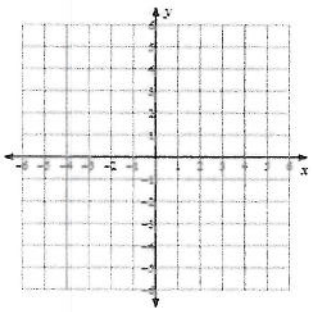
1) $6x - y = 3$



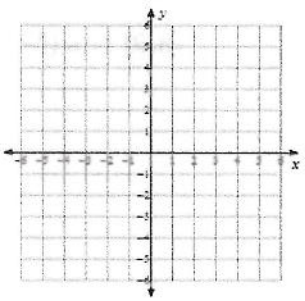
2) $x - 4y = 20$



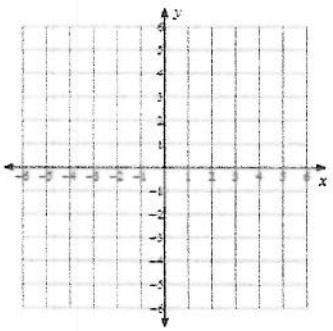
3) $y = \frac{3}{4}x + 1$



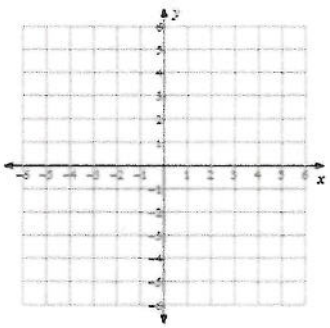
4) $y = -\frac{1}{3}x - 2$



5) $y = 3$



6) $y = -5x$

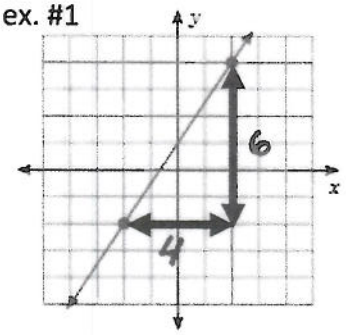


Slope- Determine slope and graph using slope-intercept form.

Hints/Guide:

Slope is the rate of change of a linear function. You can determine the slope of a line using any two points by beginning at one point and determining the vertical change (rise) divided by the horizontal change (run). This same procedure can be done algebraically by using the formula $m = \frac{y_2 - y_1}{x_2 - x_1}$.

ex. #1



$$\frac{Vertical\ change\ (rise)}{Horizontal\ change\ (run)}$$

$$m = \frac{6}{4} = \frac{3}{2}$$

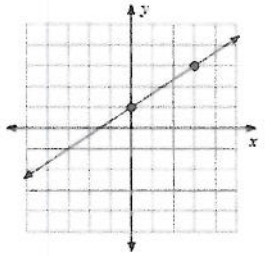
ex. #2

(7,1) and (9,-3)

$$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{-3-1}{9-7} = \frac{-4}{2} = -2$$

Exercises: Determine the slope of the line.

1.



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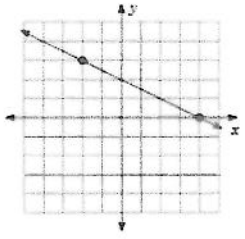

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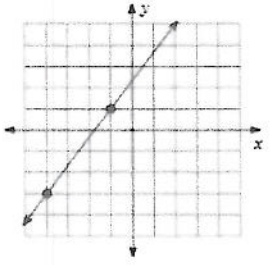

4. (2,-4) and (6,8)

5. (5,6) and (8,6)

6. (5,-8) and (3,2)