SUMMER MATH FUN
ALGEBRA 2

Dear Parents/Guardians and Students:

I hope you are all excited for summer break and the time to rest up and get refreshed so that you are ready for a challenging year of Algebra 2.

Below you will find the summer assignment questions. They have been broken up into 9 core topics. This assignment will be due on August 16, 2019.

I would suggest that you to try to **NOT** use a calculator to solve these problems. When you find yourself unable to answer a question, do not skip it – research it. That research can be in the form of a parent, a friend, free on-line help like KHAN academy. Khan academy is user-friendly and offers excellent explanations. Definitely check it out as a resource.

For the summer:

1. Complete the summer packet.
2. Create YOUR own account on KHAN academy.
   - If you do not have an email sign up for one on GMAIL.
   - After creating your KHAN academy account, please go to khanacademy.org/coaches and type in:

N3Q9BY95

This will enable me to see your progress and post assignments on KHAN academy You will also be able to add other coaches so other teachers can follow you if need be.

If a student needs assistance I will be available this summer for help from

9:00-11:00 on the follwing dates:

June 11, June 18, June 25, July 2, July 9, July 16, July 23, July 30, August 6 and August 8

If something comes up and I can not make it a particular day, I will have Fr. Black send an email and post on Facebook.

We will meet in the school library, please bring the summer packet and a pencil.

There is plenty of math to learn this year. It will be much easier to begin Geometry if all students remember what they learned in Algebra. Hopefully this packet will give you a jump-start to Geometry.

I am looking forward to a successful and productive 2019-2020 school year. Enjoy your summer and I look forward to seeing you in August. Go Saints!

Thanks,

Margaret Klee

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TOPIC 1 – Solving Equations

Equation Solving Procedure:

1. Multiply on both sides to clear the equation of fractions or decimals.
2. Distribute.
3. Collect like terms on each side, if necessary.
4. Get all terms with variables on one side and all constant terms on the other side.
5. Multiply or divide to solve for the variable.
6. Check all possible solutions in the original equation.

Example: $5(x-2)+7=3(x+1)-2$ Distribute.

$5x-10+7=3x+3-2$	Combine like terms. Simplify.
$5x-3=3x+1$	Move all terms with variables to one side.
$2x=4$	Divide to isolate the variable.
$x=2$	

Exercises: Solve each equation. Show all work.

1. $3(r-6)=-21$

2. $5(t+3)+9=-6$

3. $2(x+4)-20=-3(x-6)$

4. $a+(a-3)=a+2-(a+1)$

5. $4-(c+6)=3(c-5)+1$

6. $7-3(y-4)=2y-1$

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TOPIC 2 – Table of Properties

Please complete the following table of powers except for the shaded areas.

	x^1	x^2	x^3	x^4	x^5
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					
15					
20					
25					

TOPIC 3 – Exponents

Rules of Exponents

$a^0 = 1$ $a^1 = a$

Negative Exponents: $a^{-n} = \dfrac{1}{a^n}$

Product Rule: $a^m a^n = a^{m+n}$ *Quotient Rule:* $\dfrac{a^m}{a^n} = a^{m-n}$

Power Rule: $(a^m)^n = a^{mn}$ *Quotient to a Power:* $\left(\dfrac{a}{b}\right)^n = \dfrac{a^n}{b^n}$

Product to a Power: $(ab)^n = a^n b^n$

Exercises: Simplify using the Rules of Exponents.

1. $6^{-2} \bullet 6^{-3}$
2. $x^6 \bullet x^2 \bullet x$
3. $(4a)^3 \bullet (4a)^8$
4. $\dfrac{3^5}{3^2}$
5. $\dfrac{x^3}{x^8}$
6. $\dfrac{(2x)^5}{(2x)^5}$
7. $(x^3)^2$
8. $(-3y^2)^3$
9. $(2a^3b)^4$
10. $(3x^2)^3(-2x^5)^3$
11. $(2x^3y^{-2})^3$
12. $(2x)^2(-3x)^4$

Express using a positive exponent.

13. 5^{-3}
14. $\dfrac{1}{y^{-8}}$

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TOPIC 4 – Radicals

Roots or radicals are the opposite operation of applying exponents; you can "undo" a power with a radical, and a radical can "undo" a power. For instance, if you square 2, you get 4, and if you "take the square root of 4", you get 2. To simplify a square root, you "take out" anything that is a "perfect square"; that is, you take out front anything that has two copies of the same factor.

Ex.- $\sqrt{25x^2}$ = $\sqrt{5 \cdot 5 \cdot x \cdot x}$ = $5x$

To simplifying multiplied radicals,we use the fact that the product of two radicals is the same as the radical of the product, and vice versa.

$\sqrt{ab} = \sqrt{a}\sqrt{b}$ Ex.- $\sqrt{24}\sqrt{6} = \sqrt{144} = 12$

Just as with regular numbers, square roots can be added together. But you might not be able to simplify the addition all the way down to one number. Just as "you can't add apples and oranges", so also you cannot combine "unlike" radicals. To add radical terms together, they have to have the same radical part.

Ex.- $2\sqrt{3} + 3\sqrt{3} = 5\sqrt{3}$

Exercises: Simplify the radicals.

1. $\sqrt{9}$
2. $\sqrt{144}$
3. $\sqrt{196}$
4. $\sqrt{49}$
5. $\sqrt{25x^2}$
6. $\sqrt{27y^3}$
7. $\sqrt{64x^5}$
8. $\sqrt{12x^7y^6z}$

Multiply the radicals.

9. $\sqrt{2}\sqrt{8}$
10. $\sqrt{3}\sqrt{6}$
11. $\sqrt{6}\sqrt{15}\sqrt{10}$
12. $\sqrt{4x}\sqrt{5x^3}$
13. $\sqrt{5xy^2}\sqrt{15x^2y}$
14. $\sqrt{4x^4}\sqrt{16x^3}$

Add or subtract the radicals.

15. $\sqrt{3} + 3\sqrt{3}$
16. $\sqrt{9} + \sqrt{25}$
17. $\sqrt{5} + 2\sqrt{3} + 3\sqrt{5}$
18. $3\sqrt{4} - 2\sqrt{4}$
19. $\sqrt{9} - \sqrt{4}$
20. $\sqrt{8} + 5\sqrt{2}$

TOPIC 5 – Addition, Subtraction and Multiplication of Polynomials

- Only like terms can be added or subtracted.
- Like terms have the same variables with the same exponents.
- Only the coefficients (numbers) are added or subtracted.
- A subtraction sign in front of the parentheses changes each term in the parentheses to the opposite.
- Multiply the coefficients and use the rules of exponents for the variables.
- Remember: FOIL F – first O – outers I – inners L – last **OR** Box Method

Examples:

1) Add the polynomials.

$$\left(3x^2 - 2x + 2\right) + \left(5x^3 - 2x^2 + 3x - 4\right)$$

$$= 5x^3 + 3x^2 - 2x^2 - 2x + 3x + 2 - 4$$

$$= 5x^3 + x^2 + x - 2$$

2) Subtract the polynomials.

$$\left(9x^5 + x^3 - 2x^2 + 4\right) - \left(2x^5 + x^4 - 4x^3 - 3x^2\right)$$

$$= \left(9x^5 + x^3 - 2x^2 + 4\right) - 2x^5 - x^4 + 4x^3 + 3x^2$$

$$= 7x^5 - x^4 + 5x^3 + x^2 + 4$$

3) Multiply the polynomials.

$$\left(x^2 + 4\right)\left(x^2 + 2x - 3\right)$$

$$= x^2\left(x^2 + 2x - 3\right) + 4\left(x^2 + 2x - 3\right)$$

$$= x^4 + 2x^3 - 3x^2 + 4x^2 + 8x - 12$$

$$= x^4 + 2x^3 + x^2 + 8x - 12$$

Exercises: Add, subtract, or multiply the polynomials. Show all work.

1. $\left(3x + 2\right) + \left(-4x + 3\right)$

2. $\left(-6x + 2\right) + \left(x^2 + x - 3\right)$

3. $\left(6x + 1\right) - \left(-7x + 2\right)$

4. $\left(3x^2 - 5x + 4\right) - \left(x^2 + 8x - 9\right)$

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5. $-3x(x-1)$

6. $-4x(2x^3-6x^2-5x+1)$

7. $(x+5)(x-2)$

8. $(x-5)(2x-5)$

9. $(x-1)(x^2+x+1)$

10. $(x+5)^2$

TOPIC 6 – Factoring Polynomials

- Always look for the greatest common factor first.
- Don't forget to include the variable in the common factor.
- Factor into two parentheses, if possible.
- Check your answer by multiplying.

Examples:

Factor $15x^5 + 12x^4 + 27x^3 - 3x^2$

Question: What factor is common to the coefficients of 15, 12, 27, and 3?

Answer: 3

Question: What exponent is common to variables of x^5, x^4, x^3, and x^2?

Answer: x^2

= $3x^2(5x^3 - 4x^2 + 9x - 1)$

Factor $t^2 + 5t - 24$ Think: What multiplies to -24 and adds to +5?

= $(t-3)(t+8)$

Pairs of Factors	Sums of Factors
-1, 24	23
-2, 12	10
-3, 8	5
-4, 6	2

Exercises: Find the GCF from the lists of factors for each pair of numbers.

1. 12: 1, 2, 3, 4, 6, 12
   8: 1, 2, 3, 4, 6, 9, 18

2. 36:1, 2, 3, 4, 6, 9, 12, 18, 36
   54:1, 2, 3, 6, 9, 18, 27, 54

3. 8: 1, 2, 4 ,8
   12: 1, 2, 3, 4, 6, 12

Factor the polynomials. Show all work.

1. $21x + 35$ 2. $x^2 - 4x$ 3. $10x^2 - 5x$

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4. $x^2 + 5x + 6$

5. $y^2 - 81$

6. $x^2 - 8x + 15$

7. $x^2 + 2x - 15$

8. $2x^2 + 8x + 6$

9. $2x^2 - 7x - 4$

TOPIC 7 – Solving Systems of Equations by Substitution

- Solve one equation for one of the variables with a coefficient of 1.
- Substitute what the variable equals into the other equation of the original pair. (The new equation should now have only one variable.)

- Solve for that variable.
- Use that answer to solve for the other variable.
- Answers are ordered pairs: (x, y).

Example:

Solve $x - 2y = 6$

$3x + 2y = 4$.

Solve the first equation for x: $x = \mathbf{6 + 2y}$

Substitute your answer above into the second equation: $3\mathbf{(6 + 2y)} + 2y = 4$

Distribute: $18 + 6y + 2y = 4$

Combine like terms: $18 + 8y = 4$

Collect like terms to one side (subtract 18 from both sides): $8y = -14$

Isolate the variable (divide by 8 on both sides): $y = -\frac{14}{8}$ or $-\frac{7}{4}$

Substitute the y value into an original equation to solve for x: $x - 2\left(-\frac{7}{4}\right) = 6$

$$x - \left(-\frac{14}{4}\right) = 6$$

$$x = \frac{10}{4} \text{ or } \frac{5}{2}$$

The solution to the system of equations: $\left(\frac{5}{2}, -\frac{7}{4}\right)$

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Exercises: Solve the system of equations using the substitution method. Show all work.

1. $s + t = -4$

   $s - t = 2$

2. $x - y = 6$

   $x + y = -2$

3. $y - 2x = -6$

   $2y - x = 5$

4. $x - y = 5$

   $x + 2y = 7$

TOPIC 7 – Solving Systems of Equations by Elimination

Hints/Guide:

- Answers are ordered pairs (x, y).
- Eliminate one variable by adding the two equations together.
- Sometimes, one equation must be multiplied by a number to have a variable with the same coefficient and opposite sign.

Examples:

1. Solve $2x + 3y = 8$
$x + 3y = 7$

$2x + 3y = 8$

Multiply the equation by -1 to make the y coefficients opposite: $-x - 3y = -7$

Add the equations together and solve for x: $x + 0y = 1$

x = 1

Substitute the value of x into the original equation: $2(\mathbf{1}) + 3y = 8$

Solve the equation for y: $3y = 6$

y = 2

The solution for this system: **(1,2)**

2. Solve $3x + 6y = -6$
$5x - 2y = 14$

$3x + 6y = -6$

Multiply the second equation by 3 to make the y coefficients opposites: $15x - 6y = 42$

Add the equations together and solve for x: $18x + 0y = 36$

x = 2

Substitute the value of x into the original equation: $3(\mathbf{2}) + 6y = -6$

Solve the equation for y: $6y = -12$

y = -2

The solution for this system: **(2,-2)**

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Exercises: Solve the systems of equations by elimination. Show all work.

1. $x + y = 10$

   $x - y = 8$

2. $x - y = 7$

   $x + y = 3$

3. $3x - y = 8$

   $x + 2y = 5$

4. $4x - y = 1$

   $3x + y = 13$

TOPIC 8 – Quadratic Formula

:

- **Assume that the radical extends over the whole expression** $b^2 - 4ac$ **.**
- Equation must be in the form $ax^2 + bx + c$ = 0 (standard form) to begin.
- Try to factor first.
- If you cannot find factors, then use the quadratic formula.

Quadratic Formula

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

Example:

Solve $x^2 = 4x + 7$

Write the equation in standard form: $x^2 - 4x - 7 = 0$

Identify a, b, and c for the formula: a = 1, b = -4, c = -7

Substitute into the formula: $x = \frac{-(-4) \pm \sqrt{(-4)^2 - 4(1)(-7)}}{2(1)}$

Simplify: $x = \frac{4 \pm \sqrt{16 + 28}}{2}$

Separate into two solutions: $x = \frac{4 + \sqrt{44}}{2}$ and $x = \frac{4 - \sqrt{44}}{2}$

Solutions: $x = 5.32$ and $x = -1.32$

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Exercises: Solve using the quadratic formula. Show all work.

1. $x^2 - 4x = 21$

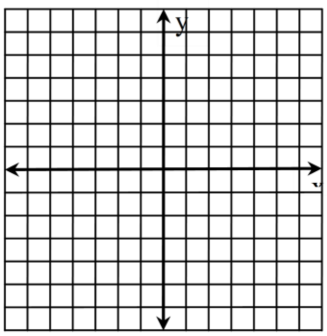
2. $x^2 = 6x - 9$

3. $3y^2 - 7y + 4 = 0$

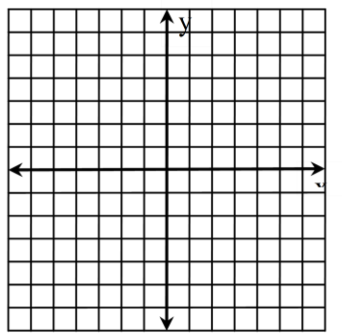
TOPIC 9: Graphing Funcitons

Use slope (m) and y-intercept (b) to graph the following linear equations y = mx + b.

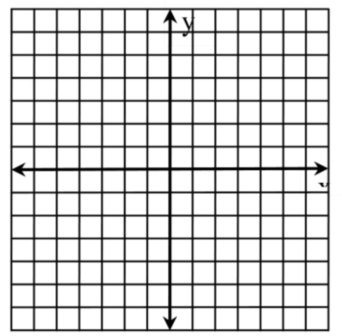
1. $y = x + 1$



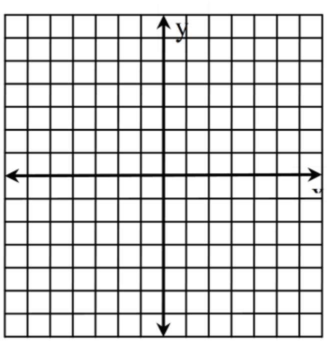
2 $y = 2x - 3$



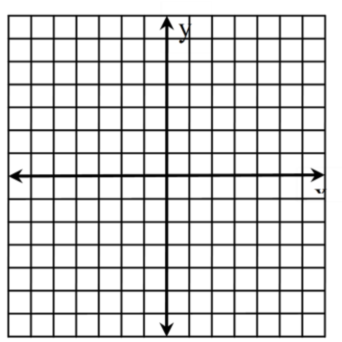
3. $y = 5x - 2.5$



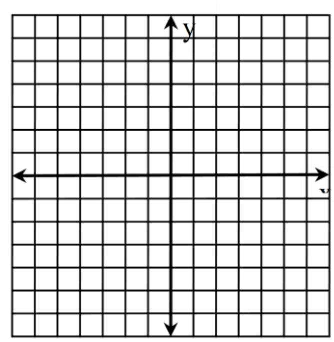
4. $y = -3x + 1$



5. $y = \frac{1}{4}x - 1$



6. $y = \frac{2}{3}x + 2$



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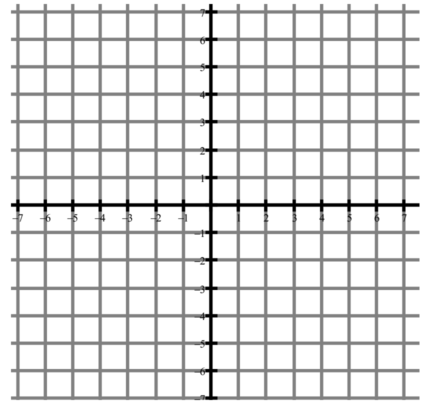
Graph using a table of values.

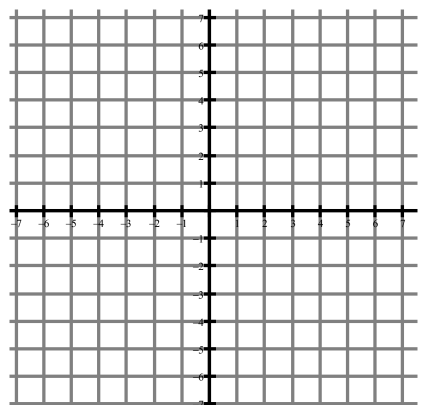
7. y = $|x|$

X	Y
-2	
-1	
0	
1	
2	



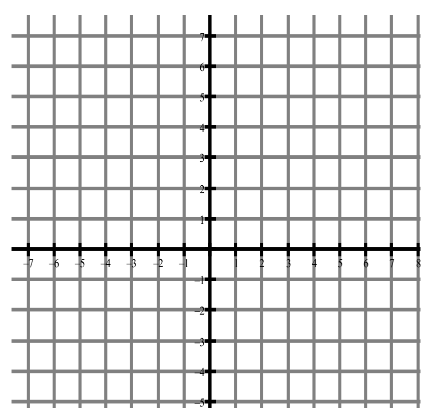
8. y = x^2

X	Y
-2	
-1	
0	
1	
2	



9. y = $\sqrt{x}$

X	Y
-1	
0	
1	
4	
9	



10. $y = 2^x$

X	Y
-1	
0	
1	
2	
3