BELLEVILLE HIGH SCHOOL

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"Strive, Achieve, Succeed"

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Dear Parents/Guardians and Students:

As a result of the implementation of the New Jersey Student Learning Standards (NJSLS), academic standards have become more rigorous and we would like our students to be able to demonstrate and communicate an in-depth understanding of the topics taught in mathematics. Our goal is not only to have the students master a particular skill, but also to be able to apply these skills in real-life situations.

In the summer time, many necessary mathematical skills are lost due to the absence of daily exposure. The loss of skills may result in a lack of success and unnecessary frustration for students as they begin the new school year. The purpose of this math assignment is to set the stage for instruction for the 2018-2019 school year.

For this reason, a summer packet has been prepared for all current eighth, ninth, tenth, and eleventh graders entering the following classes in September:

1. Algebra 1
2. Geometry A and H
3. Algebra 2 A and H
4. Pre-calculus A and H
5. Statistics A and H

Students can access the summer packets for their scheduled course at the Belleville school district's website: www.bellevilleschools.org. Packets can be downloaded and printed out. Work can be done neatly in the packet, with answers clearly labeled. Students may also attach their work, if they choose to do the problems from the packet on separate sheets of paper. Problems must be numbered, all work must be included, and answers must be labeled. If you are unable to access an Internet connection, a limited number of copies will be available at the main office in Belleville High School. Students may also visit the Belleville Public Library to utilize their computers.

The summer assignment will be collected on Thursday, September 6, 2018 and assessed as a quiz grade based on the level of completion. The first week of instruction will be dedicated to covering prerequisite skills required for each course as found in the packet.

Each packet reviews the necessary foundational skills for the course and is accompanied by a study guide that includes both relevant notes and completed examples. Additional help could be found at www.khanacademy.org and https://www.bellevillelearningacademy.com/ . Khan Academy is a free website for learning academic and real-world knowledge from tutorial videos. It is a great resource where you could find videos and examples from basic algebra through calculus. The Belleville Learning Academy provides student created content specific educational tutorials for peers.

Thank you very much for your support and cooperation. We look forward to working with you next year!

Sincerely,
The Belleville High School Mathematics Department

Algebra 2

Summer Packet: Reference Sheet

Order of Operations

https://www.khanacademy.org/math/pre-algebra/pre-algebra-arith-prop/pre-algebra-order-of-operations/v/introduction-to-order-of-operations

Example 3: Evaluate 9 - 5 ÷ (8 - 3) x 2 + 6 using the order of operations.

Solution:

Step 1:	9 - 5 ÷ **(8 - 3)** x 2 + 6	=	9 - 5 ÷ 5 x 2 + 6	Parentheses
Step 2:	9 - **5 ÷ 5** x 2 + 6	=	9 - 1 x 2 + 6	Division
Step 3:	9 - **1 x 2** + 6	=	9 - 2 + 6	Multiplication
Step 4:	**9 - 2** + 6	=	7 + 6	Subtraction
Step 5:	7 + 6	=	13	Addition

Evaluating Algebraic Expressions

One Variable: https://www.khanacademy.org/math/algebra/introduction-to-algebra/alg1-intro-to-variables/v/variables-and-expressions-1

Two Variable: https://www.khanacademy.org/math/algebra/introduction-to-algebra/alg1-substitution/v/evaluating-expressions-in-two-variables

Evaluate the following expression when $x = 2$, $y = -3$, and $z = -1$.

$2x + 3y - z$

All we need to do is replace each variable with the assigned number.

2(2) + 3(-3) – (-1)

Now simplify that junk.

4 + (-9) + 1

Last but not least, add everything up.

-5 + 1 = -4

Solving Linear Equations

https://www.khanacademy.org/math/algebra-home/alg-basic-eq-ineq/alg-old-school-equations/v/algebra-linear-equations-2

https://www.khanacademy.org/math/algebra-home/alg-basic-eq-ineq/alg-old-school-equations/v/algebra-linear-equations-3

Solve $5 + 4x - 7 = 4x - 2 - x$

This equation is all kinds of messy! Before I can solve, I'll need to combine the like terms on either side of the equation:

$$5 + 4x - 7 = 4x - 2 - x$$
$$(5 - 7) + 4x = (4x - 1x) - 2$$
$$-2 + 4x = 3x - 2$$

Now that I've simplified each side of the equation, I can do the solving:

$$\begin{array}{rcl} -2 + 4x & = & 3x - 2 \\ -3x & & -3x \\ \hline -2 + 1x & = & -2 \\ +2 & & +2 \\ \hline 1x & = & 0 \end{array}$$

Solving Linear Inequalities

https://www.khanacademy.org/math/algebra/one-variable-linear-inequalities/multi-step-inequalities/v/multi-step-inequalities

Example 1: Solve $6x - 4 \leq 2x + 12$.

$6x - 4 \leq 2x + 12$	Original inequality
$6x - 4 - 2x \leq 2x + 12 - 2x$	Subtract $2x$ from each side.
$4x - 4 \leq 12$	Simplify.
$4x - 4 + 4 \leq 12 + 4$	Add 4 to each side.
$4x \leq 16$	Simplify.
$\frac{4x}{4} \leq \frac{16}{4}$	Divide each side by 4.
$x \leq 4$	Simplify.

The solution is $\{x \mid x \leq 4\}$.

Example 2: Solve $3a - 15 > 4 + 5a$.

$3a - 15 > 4 + 5a$	Original inequality
$3a - 15 - 5a > 4 + 5a - 5a$	Subtract $5a$ from each side
$-2a - 15 > 4$	Simplify.
$-2a - 15 + 15 > 4 + 15$	Add 15 to each side.
$-2a > 19$	Simplify
$\frac{-2a}{-2} < \frac{19}{-2}$	Divide each side by -2 and change $>$ to $<$.
$a < -9\frac{1}{2}$	Simplify.

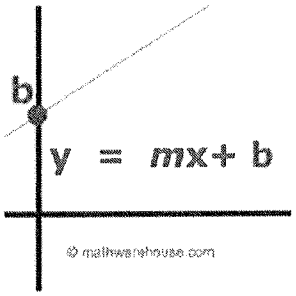
The solution is $\{a \mid a < -9\frac{1}{2}\}$.

Graphing Linear Equations

https://www.khanacademy.org/math/in-in-grade-9-ncert/in-in-chapter-4-linear-equations-in-two-variables/in-in-graph-of-a-linear-equation-in-two-variables/v/graphs-of-linear-equations

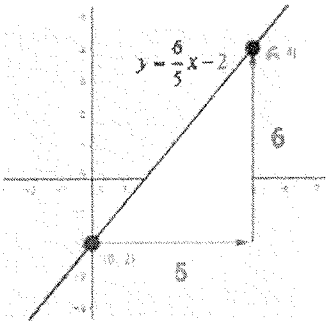
In general, the slope intercept form assumes the formula: $y = mx + b$

- m is the slope (lesson on slope)
  - mnemonic : 'm' means 'move'
- b is the y-intercept (lesson on the y-intercept)
  - mnemonic : 'b' means where the line begins



Slope-Intercept

1. Find the y-intercept and plot the point.
2. From the y-intercept, use the slope to find the second point and plot it.
3. Join the two points with a straight line.



Properties of Exponents

https://www.khanacademy.org/math/pre-algebra/pre-algebra-exponents-radicals/pre-algebra-exponent-properties/a/exponent-properties-review

https://www.khanacademy.org/math/in-in-class-7th-math-cbse/in-in-7th-powers-exponents/in-in-7th-exponents-powers-exponents-properties-1/v/exponent-properties-1

Properties of Integer Exponents

For n and m integers and a and b real numbers, we have the following.

1. $a^n a^m = a^{n+m}$	Product Rule	$a^4 a^3 = a^{3+3} = a^5$	
2. $(a^n)^m = a^{nm}$	Power of a Power Rule	$(a^4)^3 = a^{3 \cdot 3} = a^{12}$	
3. $(ab)^m = a^m b^m$	Power of a Product Rule	$(ab)^4 = a^4 b^4$	
$b \neq 0$ 4. $\left(\frac{a}{b}\right)^m = \frac{a^m}{b^m}$	Power of a Quotient Rule	$\left(\frac{a}{b}\right)^3 = \frac{a^3}{b^3}$	
5. $\frac{a^m}{a^n} = a^{m-n}$	Quotient Rule	$\frac{a^5}{a^2} = a^{5-2} = a^3$	
6. $a^0 = 1, a \neq 0$	Zero Exponent Rule		

Operations with Polynomials

https://www.khanacademy.org/test-prep/sat/sat-math-practice/new-sat-passport-advanced-mathematics/v/sat-math-p6-easier

https://www.khanacademy.org/test-prep/sat/sat-math-practice/new-sat-passport-advanced-mathematics/v/sat-math-p6-harder

Example		
Problem	Add. $(3x + 2y - 4z) + (45x - y + 75z)$	
	$3x + 2y - 4z$ $+ \quad 45x - y + 75z$	Write one polynomial below the other, making sure to line up like terms.
	$48x + y + 71z$	Combine like terms, paying close attention to the signs.
Answer	The sum is $48x + y + 71z$.	

Example		
Problem	Add. $(10ab + 15ac - 25bc + 5) + (4ab - 8bc - 12)$	
	$10ab + 15ac - 25bc + 5$ $+ \quad 4ab - 8bc - 12$	Write one polynomial below the other, making sure to line up like terms.
	$14ab + 15ac - 33bc - 7$	Combine like terms, paying close attention to the signs.
Answer	The sum is $14ab + 15ac - 33bc - 7$.	

Factoring Polynomials

https://www.youtube.com/watch?v=9S2wAkWsbe8

http://www.wtamu.edu/academic/anns/mps/math/mathlab/col_algebra/col_alg_tut7_factor.htm

TEXT: https://www.wikihow.com/Factor-Second-Degree-Polynomials-(Quadratic-Equations)

Simplifying Radicals

https://www.khanacademy.org/math/algebra/rational-exponents-and-radicals/alg1-simplify-square-roots/v/simplifying-square-root-expressions

Step 1: Find the prime factorization of the number inside the radical	$252 = 2\ 2\ 3\ 3\ 7$
Step 2: Determine the index of the radical. In this case, the index is two because it is a square root, which means we need two of a kind.	$\sqrt{252} = \sqrt{2\ 2\ 3\ 3\ 7}$
Step 3: Move each group of numbers or variables from inside the radical to outside the radical. In this case, the pair of 2's and 3's moved outside the radical	$2\ 3\sqrt{7}$
Step 4: Simplify the expressions both inside and outside the radical by multiplying.	$6\sqrt{7}$

Example 1 - Simplify: $\sqrt{98}+\sqrt{50}-\sqrt{18}$

Step 1: Simplify each radical.	$7\sqrt{2}+5\sqrt{2}-3\sqrt{2}$
Step 2: Add or subtract the radicals. Remember that we can only combine like radicals.	$9\sqrt{2}$

Systems of Equations

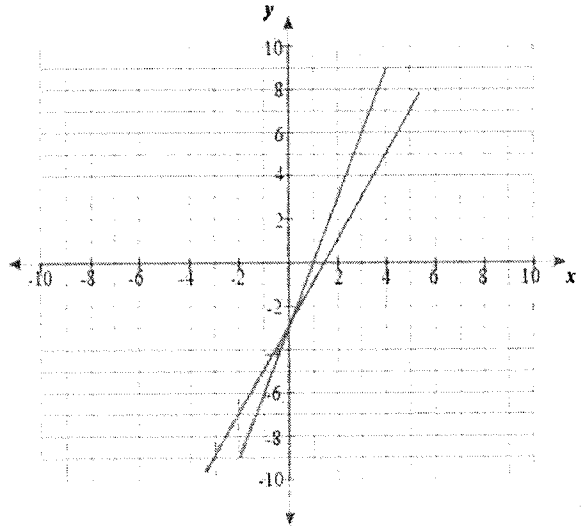
By Graphing

Solve this system of equations by graphing.

$y = 3x - 3$

$-4x + 2y = -6$

Let's start off by graphing our lines. One is in slope-intercept form, with $m = 3$ and $b = -3$, and the other is in standard form with intercepts of (1.5, 0) and (0, -3).



Jackpot. We have a clear intersection at the *y*-intercept, (0, -3). We already know they're both on the line, so we're done. If only we could catch breaks like that more often.

By Elimination

https://www.khanacademy.org/math/algebra/systems-of-linear-equations/equivalent-systems-of-equations/v/solving-systems-of-equations-by-multiplication

Solve this linear system using the elimination method.

$2x + 3y = 4$

$3x - 2y = 6$

Multiply the first equation by 2 and the second equation by 3, and then add them together to clear the equations of y.

$4x + 6y = 8$

$9x - 6y = 18$

Addition time:

$(4x + 9x) + (6y - 6y) = (18 + 8)$

$13x = 26$

$x = 2$

Plug $x = 2$ into one of the original equations and solve for the missing y.

$2x + 3y = 4$

$2(2) + 3y = 4$

$4 + 3y = 4$

$3y = 0$

$y = 0$

The solution is (2, 0). But now we gotta check it. Use $3x - 2y = 6$.

Does $3(2) - 2(0) = 6 - 0 = 6$?

Substitution Method

https://www.khanacademy.org/math/algebra/systems-of-linear-equations/solving-systems-of-equations-with-substitution/v/practice-using-substitution-for-systems

Solve this linear system of equations by the substitution method.

$-x + y = 3$

$2x - 2y = -6$

To use the substitution method, we need something to substitute. That's kind of obvious; why did we feel the need to point it out? Anyway, let's isolate y from the first equation.

$y = x + 3$

Now stick it in the second equation.

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

$(2x - 2x) - 6 = -6$

$0 = 0$

Zero always equals itself, so we have an infinite number of solutions. Every point on one line is also on the other.

HONORS

Absolute Value Equations

https://www.khanacademy.org/math/algebra-home/alg-absolute-value/alg-absolute-value-equations/v/absolute-value-equations-1

Example 1: Solve $|2x - 1| + 3 = 6$

Step 1: Isolate the absolute value	$\|2x - 1\| + 3 = 6$ $\|2x - 1\| = 3$	
Step 2: Is the number on the other side of the equation negative?	No, it's a positive number, 3, so continue on to step 3	
Step 3: Write two equations without absolute value bars	$2x - 1 = 3$	$2x - 1 = -3$
Step 4: Solve both equations	$2x - 1 = 3$ $2x = 4$ $x = 2$	$2x - 1 = -3$ $2x = -2$ $x = -1$

Solving Compound Inequalities

https://www.khanacademy.org/math/algebra/one-variable-linear-inequalities/compound-inequalities/v/compound-inequalities

$$-3 \leq 2x - 1 \leq 5$$

Get the x alone in the middle...

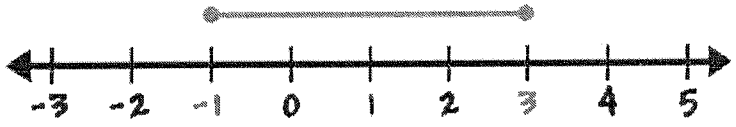
$$-3 \leq 2x - 1 \leq 5$$ ditch the -1

$$+1 \qquad +1 \quad +1$$

$$-2 \leq 2x \leq 6$$

$$\frac{-2}{2} \leq \frac{2x}{2} \leq \frac{6}{2}$$ ditch the 2

$$-1 \leq x \leq 3$$



$$[-1, 3]$$