What students need to know for…
MATH REASONING WITH APPLICATIONS 2018-2019   NAME: _____

This is a **MANDATORY** assignment that will be **GRADED**. It is due the first day of the course. Your teacher will determine how it will be counted (i.e. homework, quiz, etc.)

Students expecting to take Advanced Math Topics at Cambridge Rindge and Latin High School should demonstrate the ability to…

General:

- keep an organized notebook
- take good notes
- complete homework every night
- be active learners
    - ask questions and participate in class
    - seek help outside of class if needed
- work with others
- work with and without a calculator

Specific Math Skills:

1) Solve Linear Equations
2) Simplify Variable Expressions
3) Work with Percents
4) Familiar with Basic Finance (Interest and Interest Rates)
5) Problem Solving Skills
6) Real World Applications of Mathematics

Please complete this packet over the summer. It covers some of the basic skills and concepts that you will be required to use in Math Reasoning with Applications next year. It will be collected by your teacher who may count it as homework *or a* quiz*. You should not try to complete this in a day or all at once. Spread the work out over a few days.*

Each part contains a REVIEW with notes. You should carefully review before completing the practice that follows. Don't forget to use the reference sheet on page 2. **You should "Google" the topic if you are unsure how to complete the examples. Khanacademy.org has some good instructional videos.** *Good luck!*

-The CRLS Math Department

Number Sense & Operations

Finding Percent of
1. Change the percent to a decimal
2. Multiply the total amount by the decimal

Changing Fractions to Decimals
1. Divide the numerator by the denominator
2. Round to the nearest hundredth if needed

Changing Fractions to Percent
1. Divide the numerator by the denominator
2. Round to the nearest hundredth
3. Drop the decimal point
4. Add a percent sign

Solving Multi-Step Operations -- PEMDAS
1. Complete all computation inside the parenthesis, brackets, or absolute value
2. Carry out all exponents
3. Multiply or divide, from left to right
4. Add or subtract, from left to right

Distribution
1. Multiply the # or variable outside the parenthesis by each term inside the parenthesis
2. Check the signs (+/-)

Multiplying Exponents vs. Dividing Exponents

1. Add exponents	Subtract exponents
2. Multiply integers	Divide integers

Solving with Absolute Value
1. Set up two equations
2. One with a positive answer
3. One with a negative answer
4. Solve each equation

Multiplying by a Fraction
1. Multiply the numerator by all values
2. Divide this product by the denominator

Estimating the value of a Radical ($\sqrt{}$)
1. For a square root, find the closest square number.
2. Estimate the value (higher/lower)
3. If it's a cube root, find the closest cube number
4. Estimate this value.

Mulitplying Binomials
1. Use **FOIL** -- first, outside, inside, last
2. Use box method & combine like terms

Patterns, Relations, and Algebra

Solving Equations for One Variable
1. Distribute
2. Combine Like Terms
3. Get all the variables on the left side (+/-)
4. Get all number values on the right side (+/-)
5. Divide both sides by the coefficient
6. Remember, whatever you do to one side, you must do to the other

Using Proportional Relationships
1. Determine the Part to Whole relationship
2. Write a ratio for the KNOWN part to whole
3. Determine the second ratio -- given/missing information
4. Set up a proportion with X representing missing value in the UNKNOWN ratio

Properties of Proportions
1. If $\frac{a}{b} = \frac{c}{d}$, then ad = bc
2. product of the means = product of the extremes
   Cross multiply to solve for missing variable

Ratios used in Proportional Relationships
1. Part / Whole
2. Percent (%) / 100
3. # of degrees / 360
4. sample / total population
5. Part:Part

Solving Systems of Equations w/ Substitution
1) +/- the x term, move to the right side
2) ÷ by the coefficient of y (÷ by # with y)
3) Set the expressions equal to each other & solve for x.
4) Substitute x & solve for y.
5) Write solution as a coordinate pair (x , y).

Using the Equation of a Line/Slope(*m*)

$$y = mx + b \qquad\qquad m = \frac{y_2 - y_1}{x_2 - x_1}$$

$$y - y_1 = m(x - x_1)$$

Graphing: Begin with b, and move with m
Parallel Slopes: $m_1 = m_2$
Perpendicular slopes: $m_1 \cdot m_2 = -1, \quad m_1 = \dfrac{1}{-m_2}$

_REVIEW__:_ The steps for solving a linear equation and an example are below.

HOW TO SOLVE A LINEAR EQUATION

Steps	**Example: $4(x + 4) = 2x + 6$**
1.) <u>SIMPLIFY</u>, if necessary. (combine like terms / use distributive property)	1.) $4x + 16 = 2x + 6$
2.) Move the variables to one side.	2.) $4x + 16 = 2x + 6$ $\underline{ -2x -2x}$ $2X + 16 = 6$
3.) Move the constants (#'s) to the OTHER side.	3.) $2x + 16 = 6$ $\underline{ -16 = -16}$ $2x = -10$
4.) Get the variable by itself by using _opposite operations_.	4.) $\underline{2x} = \underline{-10}$ $ 2 2$ <u>_x = -5_</u>
5.) <u>CHECK</u> your solution by substituting it back into the equation. Simplify, and see if the equation is true.	5.) $4(x + 4) = 2x + 6$ $4(-5 + 4) = 2(-5) + 6$ $4(-1) = -10 + 6$ $-4 = -4$ **Since -4 = -4 is TRUE, then you know your solution is correct.**

PRACTICE: Solve <u>and</u> check each equation. Please circle or box your solutions.

1.) $4x - 3 = 3x + 4$

2.) $4(x + 1) = 2x - 2$

3.) $4.5 - y = 2(y - 5.7)$

CHECK: *CHECK:* *CHECK:*

4.) $4x - 10 = x + 3x - 2x$

5.) $5(n + 1) = n + 2$

6.) $x - 5 = -3x - 3$

CHECK: *CHECK:* *CHECK:*

Part 2: Simplifying Variable Expressions

REVIEW: The steps for evaluating a variable expression and an example are below.

HOW TO EVALUATE A VARIABLE EXPRESSION

Steps	_Example:_ Simplify $2x + 3y - 20$ for $x = 4, y = -6$
1.) SUBSTITUTE the given values for the appropriate variables.	1.) $2(4) + 3(-6) - 20$
2.) Follow the order of operations (PEMDAS) to SIMPLIFY.	2.) $8 - 18 - 20$ $-10 - 20$ **-30**

PRACTICE: Evaluate each expression. Please circle or box your answers.

1.) $2x^2 + x + 2$; for $x = 3$

2.) $\dfrac{gh}{g+h}$; for $g = 9, h = 15$

3.) $\dfrac{y}{5x} - z$; for $x = 2, y = 20, z = 1$

3.) $2y^2(x + y)$; for $x = 1, y = 5$

REVIEW: Some basic notes about percents are below.

PERCENTS

What does PERCENT MEAN?

out of 100
Example: 45% means 45 out of 100

What other ways can I express the value 25%?

1.) $\dfrac{25}{100} = \dfrac{1}{4}$
2.) a quarter or a fourth
3.) 0.25

What "rule" can I follow
to write a <u>percent </u>as a <u>decimal</u>?

move the decimal <u>2 places </u>to the <u>LEFT</u>
Examples: 35% = 0.35
10.5% = 0.105

What are some important percents
that I should be familiar with?

100% = the WHOLE
50% = HALF
25% = a QUARTER
75% = THREE QUARTERS
Greater than 100% = MORE than the whole

PRACTICE: Express each percent as a FRACTION and as a DECIMAL.

1.) 40%

2.) 25%

3.) 10%

4.) 5%

5.) 64%

6.) 15.5%

7.) 100%

8.) 125%

9.) 33.3%

Use mental math and reasoning in order to answer each question.

10.) Which is greater: 25% of 400 or 10% of 800?

11.) If 1 out of 10 students in a certain school smoke, what percent of these students is that?

12.) Is it possible to give a 110% effort? **Explain.**

Part 4: Simple Interest

REVIEW: Some basic notes about simple interest are below.

SIMPLE INTEREST FACTS

What is INTEREST?   the cost of borrowing money or the reward for investing money

What is PRINCIPAL?   the amount that is borrowed or invested

What is SIMPLE INTEREST?   it's calculated on the <u>original principal only</u>

How is simple interest calculated?   Use the formula: $I = prt$
I = interest
p = principal
r = interest rate per year (expressed as a decimal)
t = time, in years

<u>EXAMPLE:</u> $I = prt$
Calculate the interest for borrowing $= (500)(0.02)(2)$
$500 for 2 years at an interest rate $= 20$
of 2%.   <u>$20 of interest is accumulated.</u>

PRACTICE: Use the formula for simple interest to solve for the given variable.

1.) Find I when $r = 3\%$, $p = \$1,000$ and $t = 3$ years

2.) Find I when $r = 1.5\%$, $p = \$15,500$ and $t = 5$ years

3.) You put \$1,200 in a savings account. How much interest will be earned at a rate of 2.5% after 4 years? How much money will be in your account at this time?

4.) You are buying a car for \$14,000. You will take out a 5-year loan to pay for it. The interest rate is 1.9%. How much interest will you be charged? How much will your car actually cost?

5.) a.) If you are taking out a loan do you want the interest rate to be high or low? **Explain**.

   b.) If you are putting your money in a savings account do you want the interest rate to be high or low? **Explain**.

Part 5: Problem Solving

REVIEW: Below are some tips for solving word problems.
    1.) Read the problem carefully and circle or underline any important information.
    2.) WHAT is the problem asking you to find?
    3.) WHAT information is GIVEN to you in the problem?
    4.) Can you write a sentence or an equation to model the situation?
    5.) Is there an EQUATION or FORMULA you can use?
    6.) Once you get your answer, determine if your answer makes sense.
    7.) Write your answer as a sentence to be sure you understand the meaning of your answer.

PRACTICE: Solve each problem below. Use the tips from the review!
- Circle or underline any important information
- Identify what you are looking for
- Identify what you are given
- Write your answer as a sentence.

1.) In Louisiana the state sales tax is 4%. If you buy a $2,100 computer in Louisiana, how much tax will you pay? What will the total cost of your computer be?

2.) You received $41.60 in interest for a two-year investment at 6.5% simple interest. How much money did you invest?

3.) According to *USA Today,* children smile an average of 400 times a day.
    a.) About how many times does a child smile in a week?

    b.) About how many times do they smile in the month of September?