

Immaculate Conception High School  
College Algebra & Trigonometry  
Summer Review

This packet contains problems that we as a mathematics department feel you should know from previous math courses. It is important that you review these problems since they will appear throughout this course. We feel this will give you an advantage when beginning College Algebra & Trigonometry, and it will guide your teacher as to what you know and in what areas you may need extra help.

This packet must be completed prior to the beginning of the school year. It is recommended that you begin working on this review early August in order to better retain the material. Do your best on these problems, looking in old math books or old notes will help guide you. All work must be shown when working each problem. It is very important that you practice your basic skills without a calculator, so please avoid the use of one. You will be given a practice test on the 2<sup>nd</sup> day of school on this material, and you will not be allowed to use a calculator. You will then have a test on the review packet at the end of the first week and calculators will not be allowed. Calculators will be used throughout the course as needed. All arithmetic must be done by hand.

**Do all work on separate paper! Write the problems out and show all work. No Calculator Allowed! Write all answers in lowest terms. On the 3rd page of the review there are notes that may be helpful when working through this packet.**

<p>1. Identify each real number as natural, whole, integers, rational, irrational.</p> <p>a) <math>\sqrt{7}</math>      b) <math>-\frac{10}{2}</math></p> <p>c) 8            d) <math>\pi</math></p> <p>e) <math>\sqrt{16}</math>       f) 0</p> <p>h) <math>\frac{3}{4}</math>          i) -20</p>	<p>2. Find the prime factorization of the following numbers.</p> <p>a) 48          b) 121</p> <p>c) 32          d) 225</p> <p>d) 54</p>	<p>3. Write each fraction in lowest terms.</p> <p>a) <math>\frac{24}{48}</math>          b) <math>\frac{10}{15}</math></p> <p>c) <math>\frac{50}{125}</math>        d) <math>\frac{32}{54}</math></p>	<p>4. Write the improper fractions as a mixed number</p> <p>a) <math>\frac{64}{7}</math></p> <p>b) <math>\frac{48}{5}</math></p>
<p>5. Write the mix number as an improper fraction.</p> <p>a) <math>3\frac{2}{5}</math></p> <p>b) <math>12\frac{14}{20}</math></p>	<p>6. Find the product or quotient of each.</p> <p>a) <math>\frac{11}{25} \cdot \frac{30}{22}</math></p> <p>b) <math>\frac{12}{40} \div \frac{24}{10}</math></p> <p>c) <math>4\frac{3}{8} \cdot 2\frac{4}{8}</math></p> <p>d) <math>5\frac{4}{9} \div 3\frac{2}{3}</math></p>	<p>7. Find each sum or difference.</p> <p>a) <math>\frac{23}{45} + \frac{47}{75}</math></p> <p>b) <math>\frac{12}{13} - \frac{5}{26}</math></p> <p>c) <math>12\frac{5}{6} - 7\frac{7}{8}</math></p> <p>d) <math>5\frac{4}{9} + 8\frac{1}{3}</math></p>	<p>8. Write the fraction as a decimal.</p> <p>a) 9/16</p> <p>b) 151/200</p> <p>c) <math>2\frac{8}{16}</math></p>
<p>9. Convert each percent to a decimal.</p> <p>a) 27.5%</p> <p>b) 100%</p> <p>c) 56%</p>	<p>10. Convert each decimal to a percent.</p> <p>a) 0.0409</p> <p>b) 3.45</p> <p>c) 56.423</p>	<p>11. Evaluate each expression.</p> <p>a) <math>-2^4</math></p> <p>b) <math>(-2)^4</math></p> <p>c) <math>-2^5</math></p> <p>d) <math>(-2)^5</math></p>	<p>12. Square each number.</p> <p>a) 2      b) 3      c) 4</p> <p>d) 5      e) 6      f) 7</p> <p>g) 8      i) 9      h) 10</p>
<p>13. Add or Subtract.</p> <p>a) <math>234.5 + 34.56</math></p> <p>b) <math>12.023 - 11</math></p> <p>c) <math>0.23 + 1.46 - 0.046</math></p> <p>d) <math>689 - 79.832</math></p>	<p>14. Multiply or Divide.</p> <p>a) <math>1.464 \times .16</math></p> <p>b) <math>429.2 \div 0.3</math></p> <p>c) <math>23.45 \times 0.002</math></p> <p>d) <math>0.428 \div 0.2</math></p>	<p>15. Find the value of each expression.</p> <p>a) <math>6^2 \div 3^2 - 4 \cdot 3 - 2 \cdot 5</math></p> <p>b) <math>19 - 3[8(5 - 2) + 6]</math></p> <p>c) <math>\frac{2^2 + 5 \div 3}{9 \cdot 27 \div 3}</math></p> <p>d) <math>\left[\frac{-5}{8} - \left(\frac{-2}{5}\right)\right] - \left(\frac{3}{2} - \frac{11}{10}\right)</math></p>	<p>16. Evaluate each expression, if <math>p = -4</math>, <math>q = 8</math>, <math>r = -10</math></p> <p>a) <math>2p - 7q + r^2</math></p> <p>b) <math>\frac{-(p+2)^2 - 3r}{2 - q}</math></p> <p>c) <math>-p + [(-r + q) - 2q]</math></p> <p>d) <math>(-4 + r)(-p) - p^3</math></p>

<p>17. Evaluate each expression if <math>x = -4</math> &amp; <math>y = 2</math></p> <p>a) <math> 3x + 4y </math></p> <p>b) <math>\frac{ x +2 y }{5+x}</math></p> <p>c) <math>(-3 + x)(-y) -  y </math></p>	<p>18. Use the distributive property to simplify.</p> <p>a) <math>-(4b - 8)</math></p> <p>b) <math>n(2a - 4b + 6c)</math></p> <p>c) <math>-4x(3x - 4)</math></p>	<p>19. Use the distributive property and simplify each expression.</p> <p>a) <math>\frac{3}{8}\left(\frac{16}{9}y + \frac{32}{27}z - \frac{40}{9}\right)</math></p> <p>b) <math>4(2x + 5) + 7</math></p> <p>d) <math>7(5n - 2) - (6 - 11)</math></p> <p>e) <math>7r - (2r + 4)</math></p>	<p>20. Simplify each expression using the rules for exponents.</p> <p>a) <math>(-3m^4)(6m^2)(-4m^5)</math></p> <p>b) <math>-(3m^3n^0)^2</math></p> <p>c) <math>(-2x^3y)^2 \cdot (3xy^2z)^3</math></p>
<p>21. Simplify using the rules for exponents.</p> <p>a) <math>\left(\frac{-2m^2}{m}\right)^2</math>    b) <math>\frac{4x^3y^5}{18x^8y^2}</math></p> <p>c) <math>\frac{27a^{-2}b^2}{24a^{-4}b^{-3}}</math></p>	<p>22. Find the sum or difference.</p> <p>a) <math>(5x^2-4x+7)+(-4x^2+3x-5)</math></p> <p>b) <math>(12y^2-8y+6)-(-2y^2+4y-2)</math></p>	<p>23. Find the product.</p> <p>a) <math>(3r - 3)(2r + 4)</math></p> <p>b) <math>(2x - 3)^2</math></p> <p>c) <math>(5x - 3y)(5x + 3y)</math></p>	<p>24. Find the quotient.</p> <p>a) <math>\frac{-4x^7-14x^6+10x^4-14x^2}{-2x^2}</math></p>
<p>25. Factor out the greatest common factor.</p> <p>a) <math>24x^3 - 12x^2 + 4x</math></p> <p>b) <math>6x^2t + 8xt + 12t</math></p>	<p>26. Factor the trinomial completely using the box method or any method you know.</p> <p>a) <math>x^2 - 2x - 35</math></p> <p>b) <math>3x^2 + 14x + 8</math></p> <p>c) <math>8t^2 + 48t + 64</math></p>	<p>27. Factor the difference of two squares.</p> <p>a) <math>x^2 - 4</math></p> <p>b) <math>16y^2 - 81</math></p>	<p>28. Simplify each radical</p> <p>a) <math>\sqrt{16}</math></p> <p>b) <math>\sqrt{48}</math></p> <p>c) <math>\sqrt{27}</math></p>
<p>29. Solve the following equations.</p> <p>a) <math>7x + 8 = 1</math></p> <p>b) <math>6x - 3(5x + 2) = 4(1 - x)</math></p> <p>c) <math>\frac{3x}{4} + \frac{5x}{2} = 13</math></p>	<p>30. Solve the following formula equations.</p> <p>a) <math>d = rt</math> solve for <math>t</math></p> <p>b) <math>P = 2(L+W)</math> solve for <math>W</math></p>	<p>31. Solve the inequalities and graph on a number line.</p> <p>a) <math>x + 4(2x - 1) \geq x</math></p> <p>b) <math>4 \leq -2x + 3 &lt; 8</math></p> <p>c) <math>x + 1 &gt; 3</math> or <math>-4x + 1 &gt; 5</math></p>	<p>32. Find the slope of a line given two points. Use the slope formula!</p> <p>a) <math>(2, 5)</math> &amp; <math>(-1, 4)</math></p> <p>b) <math>(1, -1)</math> &amp; <math>(-3, 1)</math></p>
<p>33. Write the equation in slope-intercept form (<math>y = mx + b</math>) with the given information.</p> <p>a) <math>m = 5</math> and <math>b = -\frac{1}{3}</math></p> <p>b) <math>m = 0</math> and <math>b = 4</math></p>	<p>34. Write the equation in slope-intercept form with the given information.</p> <p>a) Through <math>(5, 8)</math> &amp; <math>m = -2</math>.</p> <p>b) Through <math>(2, -3)</math> &amp; <math>m = 0</math></p>	<p>35. Rewrite each equation in slope-intercept form. Hint: Solve for "y".</p> <p>a) <math>-2x + 4y = 16</math></p> <p>b) <math>-3y = 9x - 12</math></p>	<p>36. Answer the following questions.</p> <p>a) When two lines are parallel, what is true about their slopes?</p> <p>b) When two lines are perpendicular, what is true about their slopes?</p>

# Notes for College Algebra & Trigonometry

Here are some notes which will help you complete your summer review packet.

## Adding & Subtracting Fractions:

- Find the Least Common Denominator (LCD).
- Rewrite each fraction with the common denominator.
- Decide what number is needed to multiply the original denominator to get the common denominator and multiply the same number to the numerator. Do this for both fractions.
- For the final answer, carry the common denominator over and either add or subtract the numbers in the numerator.

Example:  $\frac{4}{24} + \frac{5}{16}$       The common denominator between 24 & 16 is 48.

$$\Rightarrow \frac{\quad}{48} + \frac{\quad}{48} \text{ Mult. the first fraction by 2 and the second one by 3.}$$

$$\Rightarrow \frac{8}{48} + \frac{15}{48} = \frac{23}{48} \text{ Now add the numerators together and carry over the denominator.}$$

## Multiplying Fractions:

- Use the cross cancel method (**Not cross multiplication**).
- Take the numerator of the first fraction and the denominator of the second fraction and reduce each by the greatest common factor. Now do the same with the numerator of the second and denominator of the first.
- Now multiply the numerators together and then the denominators together.

Example:  $\frac{4}{25} \cdot \frac{5}{16}$       The GCF of 4 & 16 is 4 and the GCF of 5 & 25 is 5.

$$\frac{1}{5} \cdot \frac{1}{4} = \frac{1}{20}$$

## Dividing Fractions:

- Change the division sign to multiplication.
- Do the reciprocal of the second fraction.
- Follow the steps from multiplying fractions.

Example:  $\frac{25}{81} \div \frac{5}{9} \Rightarrow \frac{25}{81} \cdot \frac{9}{5} \Rightarrow \frac{5}{9} \cdot \frac{1}{1} \Rightarrow \frac{5}{9}$

### Simplifying Exponents:

- $2^3$  - the 2 is called the base number and the 3 is the exponent.
- Take the base number and multiply it by itself the number of times the exponent number is.

Example:  $2^3 = 2 \cdot 2 \cdot 2 = 8$  Example:  $-2^3 = -2 \cdot 2 \cdot 2 = -8$  Example:  $(-2)^3 = -2 \cdot -2 \cdot -2 = -8$

### Simplify an expression:

- An expression is made up of number and variable terms separated by addition or subtraction.

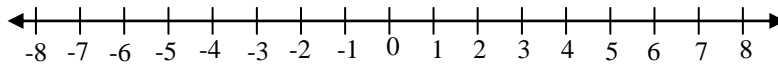
Example:  $2x + 3y - 8$

- To simplify an expression use PEMDAS which stands for parentheses, exponents, multiplication, division, addition and subtraction.

### Absolute Value:

- Absolute value is the distance from zero on a number line. Distance is always positive; therefore your answer will always be positive when taking the absolute value of a positive or negative number.

Example:  $|3| = 3$  and  $|-3| = 3$



3 & -3 are both 3 units from zero.

### Combining like terms in an expression:

- To combine terms, make sure to add and sub. the terms with the same variable and exponent.


Example:  $4x^2 - 6x + x - 9x^2 \Rightarrow$  Add the  $4x^2$  &  $-9x^2$  together. Then add the  $-6x$  &  $x$  together.

Answer:  $-5x^2 - 5x$

Example:  $(4x^2 + 3x - 2) - (9x^2 - 2x + 3) \Rightarrow$  First you must distribute the negative through the second polynomial and change the minus (negative sign) to an addition sign. When you do this each sign inside the second parentheses changes.  $(4x^2 + 3x - 2) + (-9x^2 + 2x - 3) = -5x^2 + 5x - 5$ .

### Distributive Property:

- The number on the outside of a set of parentheses must be multiplied by each number inside the parentheses.

Example:  $-3(2x - 4) \Rightarrow$    $-3(2x - 4) = -6x + 12$

## Exponent Properties:

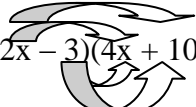
- Multiplying the same base you add the exponents - Example:  $(2z^4)(5z^5) = (2 * 5)(z^4 * z^5) = 10z^9$
- Power to power - Example:  $(2x^2yz^4)^3 = (2)^3(x^2)^3(y)^3(z^4)^3 = 8x^6y^3z^{12}$
- Dividing with the same base you subtract the exponents and the answer goes to the variable with the higher exponent - Example:  $\frac{5a^8}{25a^3} =$

Since the higher exponent is on the top then you subtract  $8 - 3$  to get 5 and the answer will be  $a^5$  on top and the 5 reduces into the 25, 5 times. So a  $\frac{a^5}{5}$  is your answer.

## Finding a product:

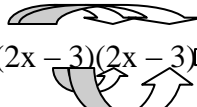
- Multiplying two binomials – Use the foil method (First, Outer, Inner, Last)

Example:  $(2x - 3)(4x + 10) \Rightarrow 8x^2 + 20x - 12x - 30 \Rightarrow 8x^2 + 8x - 30$



- Multiplying the same binomial – Write out the binomial twice and use the foil method.

Example:  $(2x - 3)^2 \Rightarrow (2x - 3)(2x - 3) \Rightarrow 4x^2 - 6x - 6x + 9 \Rightarrow 4x^2 - 12x + 9$



## Division:

Divide  $\frac{-25x^6 + 10x^4 - 15x^2}{-5x^2}$  : Divide  $-5x^2$  into every term in the numerator.

answer:  $5x^4 - 2x^2 + 3$

## Factoring Polynomials:

- Factor a GCF - Must find the greatest number that will factor into all the terms of the polynomial

Example:  $12x^4 - 36x^3 + 48x \Rightarrow 12x(x^3 - 3x^2 + 4)$

Find the GCF of 12, 36, 48 GCF: 12

Find the GCF of  $x^4, x^3, x$  GCF:  $x$  (always take the smallest exponent)

- Factor difference of squares - There are two terms which are perfect squares and a minus in between them.  $a^2 - b^2 \Rightarrow (a - b)(a + b)$

Example:  $36x^2 - y^2 \Rightarrow$  The perfect square of 36 is 6 and the perfect square of 1 is 1.  
The perfect square of  $x^2$  &  $y^2$  is  $x$  &  $y$ .

Therefore, the answer is  $(6x - y)(6x + y)$

- Factor a trinomial - A trinomial has three terms. Use the box method.

Example:  $4y^2 - 11y + 6$

Find two numbers that mult. to give  $4y^2$  and two number that mult. to get  $+6$ . To check if you are correct, you now need to mult. diagonally. Then take those two number and add them together. If you get the exact middle number, you are correct.

$4y^2$	$+6$
$4y$	$-3$
$y$	$-2$

$4y(-2) + y(-3) \longrightarrow -8y + (-3y) = -11y$  the middle term. The answer is the numbers added across.  
 $(4y - 3)(y - 2)$

- Factor Completely – First factor a GCF and then use the box method.

Example:  $30x^3 + 33x^2 - 18x \Rightarrow 3x(10x^2 + 11x - 6) \Rightarrow$  answer:  $3x(2x - 3)(5x + 2)$

### Exponents:

- Simplify rational exponents with positive exponents:

Exponent Properties:

**Negative exponent rule:**  $a^{-1} = \frac{1}{a^n}$  ; **Quotient rule:** if  $m$  is bigger than  $n$  use  $\frac{a^m}{a^n} = a^{m-n}$  or

if  $n$  is bigger than  $m$  use  $\frac{a^m}{a^n} = \frac{1}{a^{n-m}}$  ; **Product rule:**  $a^r \cdot a^s = a^{r+s}$  ; **Power rule:**  $(a^r b^s)^t = a^{rt} b^{st}$

Examples: a)  $\left(\frac{2}{5}\right)^{-3} = \frac{2^{-3}}{5^{-3}} = \frac{5^3}{2^3} = \frac{125}{8}$

b)  $3x^{-2}(4^{-1}x^5)^2 = 3x^{-2}(4^{-2}x^{10}) = \frac{3x^{10}}{4^2x^2} = \frac{3x^8}{16}$

### Slope Intercept Form:

- $y = mx + b$ ; where  $m$  = slope and  $b$  = the  $y$ -intercept.

example: If  $m = -1$  and  $b = 4$  then the equation is  $y = -x + 4$ .

example: Given  $m = 2$  and it passes through  $(4, 6)$  find the equation in slope intercept form.

You can substitute the  $m$  but you need to find  $b$ .

To find “ $b$ ” you substitute  $4$  in for  $x$ ,  $6$  in for  $y$  and  $2$  in for  $m$  and solve for  $b$ .

$6 = 2(4) + b$ ;  $b = -2$ . Therefore, the answer in slope intercept form is  $y = 2x - 2$ .

### Slope Formula:

- $m = \frac{y_2 - y_1}{x_2 - x_1}$  ; Given two points  $(-2, 7)$  &  $(1, -4)$  find the slope. Label each pair of points

$x_1, y_1, x_2, y_2$  then substitute into the formula.  $\frac{-4-7}{1-(-2)} = \frac{-11}{3} = m$