Lawrence Academy
Mathematics Department
Integrated Algebra and Geometry II and Honors
Summer Work 2020

This math packet needs to be completed by **ALL STUDENTS: NEW AND RETURNING**-entering **Integrated Algebra and Geometry II or Honors** in September 2020.

Please complete this mathematics work and bring it with you to your first day of classes in September. If after reviewing the summer work you feel that this is not the correct placement, please contact Theresa Ryan, Mathematics Department Chair, via email at teryan@lacademy.edu

Working with Fractions

1. Addition / Subtraction of fractions (requires common denominators)
2. Multiplication
3. Division

These links give examples and videos to review:

http://www.mathsisfun.com/fractions_addition.html
http://www.mathsisfun.com/fractions_subtraction.html.

http://www.mathsisfun.com/fractions_multiplication.html
http://www.mathsisfun.com/fractions_division.html

Perform the indicated operation. Simplify your answers.

1. $\frac{2}{4}+\frac{3}{4}$
2. $\frac{1}{12}+\frac{3}{9}$
3. $\frac{3}{7}+\frac{1}{6}$
4. $\frac{11}{24}-\frac{3}{12}$
5. $\frac{9}{10}-\frac{3}{7}$
6. $\frac{9}{13}\cdot\frac{2}{3}$
7. $\frac{3}{7}\cdot\frac{1}{2}$
8. $\frac{10}{15}\cdot\frac{9}{4}$
9. $\frac{14}{6}\div\frac{7}{12}$
10. $\frac{3}{4}\div\frac{2}{3}$

LINEAR CONCEPTS

1. Three types of linear equations
    a. General form: $ax + by = c$
    b. Slope-intercept form: $y = mx + b$
    c. Point-slope form: $y - y_1 = m(x - x_1)$

With general form, we graph those equations using intercept method. Find the x and y intercepts algebraically and graph. Check out this screencast:
Graphing Intercept Method

Slope-intercept form gives us a y-intercept (b) and a slope (m). To graph, we start at the y-intercept and use our slope from there.
Check out this screencast: Graphing Slope Intercept Equations

Point-slope form gives us a point (x_1, y_1) and a slope (m). To graph, we start with the given point and use our slope from there. This form is super important to understand!!
Check out this screencast: Graphing Point Slope Equations

Two "special" forms of lines
    d. vertical lines: ex) $x = 2$
    e. horizontal lines: ex) $y = 2$

Vertical lines have no slope or an undefined slope since they lack run in rise/run for slope.

Horizontal lines have a slope of zero since they lack rise in rise/run for slope.
Check out this screencast: Horizontal and Vertical Graphs

2. **Parallel and Perpendicular Lines**
    a. parallel lines have the same slope
    b. perpendicular lines have negative reciprocal slopes

3. **Systems of Equations**
    a. Graphically solving Check out this screencast: Solve Systems Graphically

    b. Solving using Substitution
    Check out this screencast: Solve Systems Using Substitution

To solve using substitution method:

1. Get one variable alone in one equation
2. Substitute that expression into the second equation for the variable you found alone
3. Solve
4. Use the variable you solved for to find the second variable
5. Write your solution as an ordered pair

    c. Solving using Elimination/addition
    Check out this screencast: Solve Systems Using Elimination

To solve using elimination/addition method:

1. Line up the two equations so that the terms with x, terms with y, the equal sign, and the constant all line up
2. Make one of the variables cancel by multiplying one or both equations by a number that creates cancellation
3. solve
4. Use the variable you solved for to find the second variable
5. Write your solution as an ordered pair

EXERCISES: Try these exercises that relate to the above topics reviewed.

Write the equation of the line for each of the following scenarios. Be sure to pick the best equation based on the information. The only time you should choose slope-intercept over point-slope is when you are given the y-intercept.

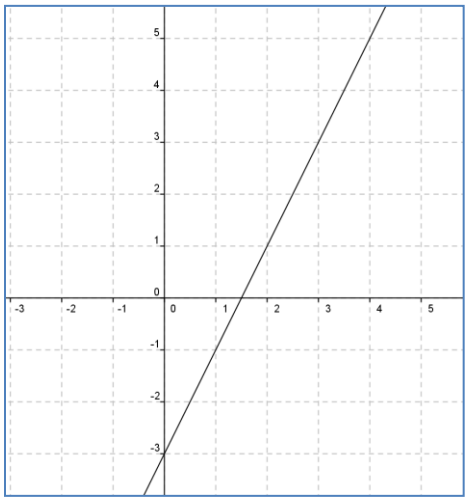
1. m = 3 Point (2, 7)
2. contains the points (2, 4) and (3, 5)
3. $m = -6$ and with the point (0, 3)
4. contains the point (0,2) with m= $\frac{4}{5}$
5. Is horizontal and contains the point $(-11, -4)$
6. the line perpendicular to $y = \frac{2}{5}x + 4$ passing through the point $(-3,7)$.
7. the line parallel to $y - 3x = 6$ passing through the point (-2, 5)

Graph the given equation. Label at least 3 points with their coordinates

8. $y - 2 = \frac{1}{3}(x - 1)$
9. $y = \frac{-3}{2}(x + 4) - 7$
10. $y = x + 3$
11. $y = \frac{-4}{7}x + 6$
12. $2x + 4y = 8$

Write the equation in point-slope form of the graph below.

13.



Solve the following systems by graphing method.

14. $y = x - 5$
    $2x + y = 4$

15. $\begin{cases} y - 1 = -\frac{1}{3}(x + 3) \\ y - 2 = -\frac{9}{8}(x + 6) \end{cases}$

Solve the following systems by substitution method.

16. $y = 3x - 2$
    $2x + y = 8$

17. $2x + 5y = -2$
    $4x + 3y = 10$

Solve the following systems by elimination method.

18. $x + 3y = 7$
    $-2x + 37 = 22$

19. $8x - 3y = 21$
    $4x + 5y = -9$

EXPONENT RULES

1. Product Rule
2. Quotient Rule
3. Power Rule
4. Zero Property
5. Negative Exponents

Product rule: when multiplying two terms with the same base, you add their exponents.
Ex) $x^2 * x^3 = x^{2+3} = x^5$

Quotient rule: when dividing two terms with the same base, you subtract their exponents.
Ex) $\frac{x^5}{x^2} = x^{5-2} = x^3$

Power Rule: when you take a term with a power and raise it to a power, you multiply the exponents.
Ex) $(x^5)^2 = x^{5*2} = x^{10}$

Zero Property: Anything raised to the zero is one.
Ex) $(2x^2yz^3)^0 = 1$

Negative Exponents: If a base is raised to a negative power, you make the power positive by taking the reciprocal of the base. You can also think of this as moving the base and exponent to the opposite side of the fraction.
Ex) $x^{-3} = \left(\frac{1}{x}\right)^3 = \frac{1}{x^3}$

Check out this screencast: Exponent Simplification Rules

EXERCISES: Try these exercises that relate to the above topics reviewed.

Simplify completely:

1. $x^2 * x^8$
2. $-6x^4 * 3x^4$
3. $\frac{x^{11}}{x^5}$
4. $\frac{15a^5b^2c^4}{25a^3b^3c^9}$
5. $2(x^2y)^0$
6. $\frac{6m^{-2}n^2}{2^{-2}m^4n^{-4}}$
7. $(-5x^{-2}y)(-2x^{-3}y^2)$
8. $\frac{x^{-3}}{x^{-7}}$
9. $\frac{2^4x^{-5}}{2^{-2}x^3}$
10. $(2xyz)^3$
11. $(3x^2y^3z^4)^3(2x^4y^2z^6)^2$
12. $(w^3x^{-4})^7(w^{-5}x^2)^{-3}$

FACTORING

1. **Greatest Common Factor**:
Check out this screencast: Factoing the GCF

2. **Difference of Squares**:
Ex) $x^2 - 9$ factors to $(x - 3)(x + 3)$

3. **Trinomials:**
Check out these screencasts: Factoring Trinomials AND FoolProof Factoring

EXERCISES: Try these exercises that relate to the above topics reviewed.

Factor out the GCF.

1. $2x + 4$
2. $x^2 - 3x$
3. $2ab + 4b$
4. $2x^2 - 6x$
5. $3rst^2 - 6t^3$
6. $16x^3y^4z^3 - 12xy^3z^2$
7. $4y^2 + 8y - 2xy$
8. $2x - 4y + 8z$

Factor each difference of squares.

1. $x^2 - 16$
2. $36 - a^2$
3. $25 - t^2$
4. $16x^2 - 9$
5. $r^2 - 25$
6. $9x^2 - 81$

Factor each trinomial.

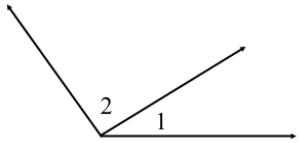
1. $x^2 + 8x + 7$
2. $a^2 + 6a + 5$
3. $x^2 - 5x - 6$
4. $a^2 + a - 90$
5. $2x^2 + 7x + 3$
6. $3a^2 - 8a + 4$
7. $2x^2 + 3x - 9$
8. $5w^2 - 9w - 2$

THE GEOMETRY OF ANGLES

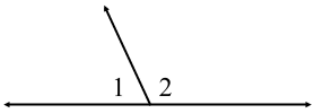
1. Angle properties
2. Triangle properties
3. Angles formed by parallel lines

Angle properties include vocabulary such as:

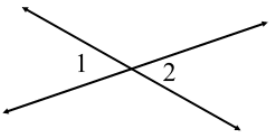
- **Adjacent angles**: angles that share a common vertex and common side
  Ex)



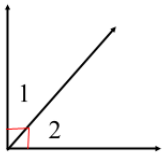
- **Linear pair of angles**: angles that share a common vertex and side and their uncommon side forms a line
  Ex)

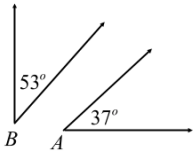


- **Vertical angles**: two angles formed by intersecting lines that share a common vertex but are not adjacent
  Ex)

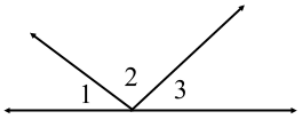


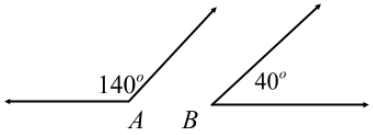
- **Complementary angles**: angles that add to 90 degrees
  Exs)



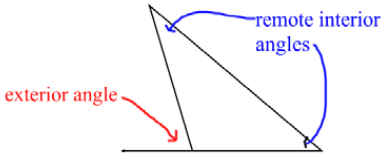


- **Supplementary angles**: angles that add to 180 degrees
  Exs)





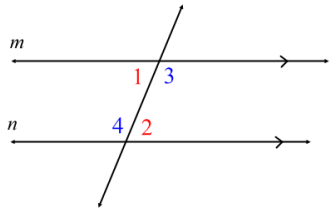
- **Triangle Angle Sum**: all angles in a triangle add to 180
- **Exterior Angle Property**: the measure of the exterior angle of a triangle equals the sum of the remote interior angles



▪**Isosceles Triangle Theorem**: the angles opposite the congruent sides are congruent
Site contains applets and definitions for the pairs of angles discussed above:
Isosceles Triangle Theorem

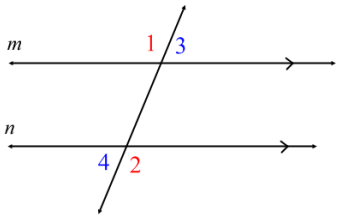
Angles formed by parallel lines are created by two or more parallel lines cut by a transversal, the angles include:

- **Alternate interior angles** (these angles are congruent)
  Ex) 1 and 2 are alternate interior and 3 and 4 are alternate interior



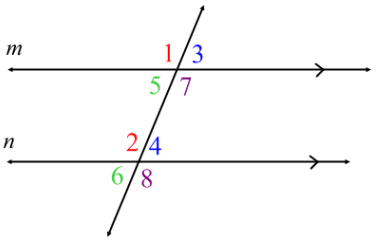
- **Alternate exterior angles** (these angles are congruent)

Ex) 1 and 2 are alternate exterior and 3 and 4 are alternate exterior



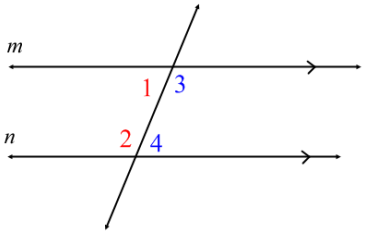
- **Corresponding angles** (these angles are congruent)

Ex) 1 and 2 are corresponding as well as 3 and 4, 5 and 6, 7 and 8



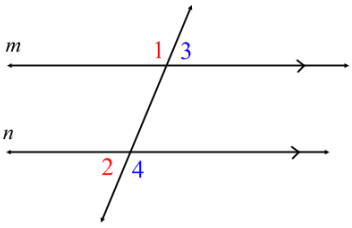
- **Same side interior angles** (these angles add to 180)

Ex) 1 and 2 are same side interior and 3 and 4 are same side interior



- **Same side exterior angles** (these angles add to 180)

Ex) 1 and 2 are same side exterior and 3 and 4 are same side exterior

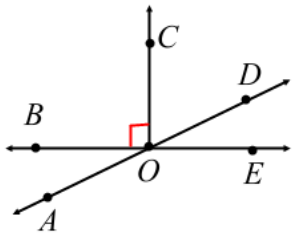


This shows good explanation of the angles, is interactive, and has examples for you to try: Angles

EXERCISES: Try these exercises that relate to the above topics reviewed.

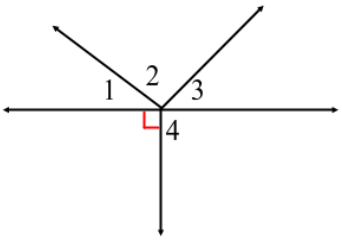
Use the diagram to name an angle described by each of the following.

1. Adjacent to $\angle AOB$
2. Adjacent to $\angle COD$
3. Complementary to $\angle DOE$
4. Supplementary to $\angle BOA$
5. Supplementary to $\angle COE$
6. Vertical to $\angle AOB$
7. Two sets of linear pairs.

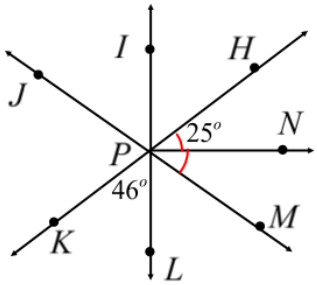


Use the diagram to answer the following.

8. If $m\angle 1 = 34$ and $m\angle 2 = 83$, $m\angle 3 =$?.
9. If $m\angle 1 + m\angle 4 = 146$, $m\angle 2 + m\angle 3 =$?.



Use the diagram to determine the measures of the following angles. Explain how you determined each measure.



10. $\angle JPK =$_____

11. $\angle LPM =$_____

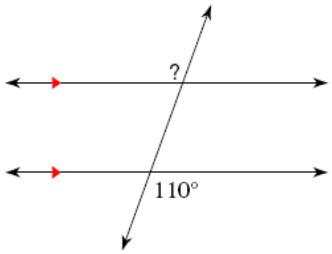
12. $\angle NPM =$_____

13. $\angle JPI =$_____

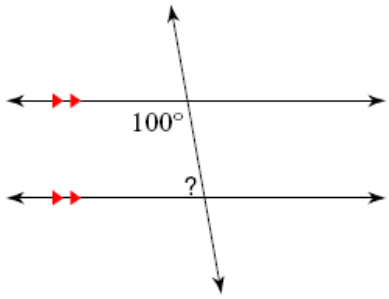
14. $\angle HPI =$_____

15. Find the measure of each angle.

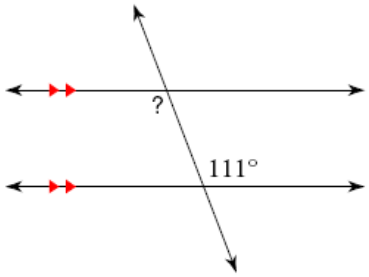
a.



b.



c.



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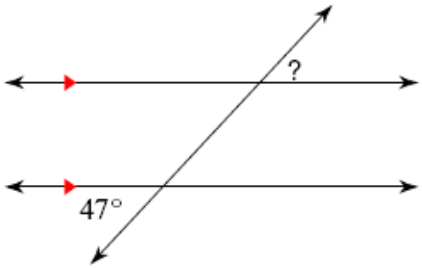

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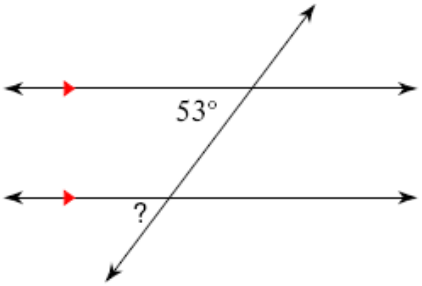

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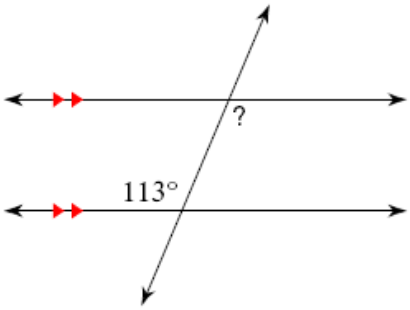
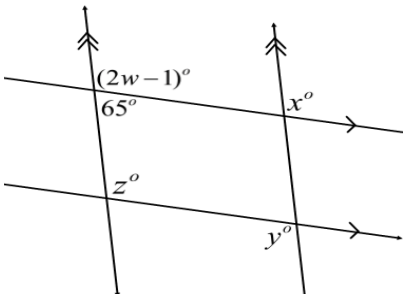
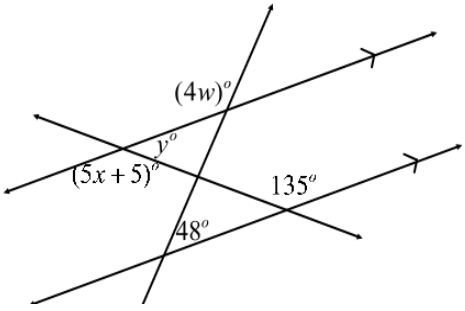


16. Solve for the missing variables.

a.

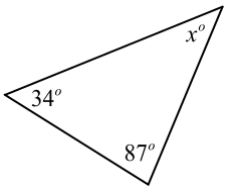


b.



17. Solve for the missing variables in each triangle.

a.



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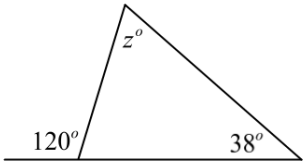

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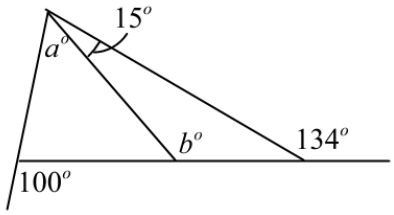

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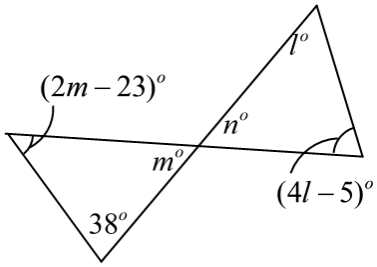

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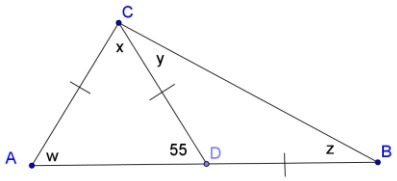

f.