2020 SUMMER PACKET

for students entering Honors Pre-Calculus

In order to hit the ground running this September, it is important to review the content relevant from your past years in mathematics. You can use any resource to assist you in completing this packet, but please know that **you** are responsible for all of the material in this review packet. Expect a quiz within the first week of school!

Sincerely,

Mr. Strey, Mr. Haugh, & Mr. Fusco

Online resources that you may find helpful:

- Khan Academy – www.khanacademy.org

  This website has video tutorials and practice exercises that cover every topicof mathematics. Simply search the name of the topic to find the resourcesavailable.

- Online Pre-Calculus textbook – www.phschool.com (code: aze-0643)

  Scroll through Chapter P of the textbook, which covers many of the topics you studied in Algebra courses.

- Online Algebra 2 textbook

Solving linear equations

1. $13x + 14 = 12x - 5$

2. $5x - (2x - 10) = 35$

3. $5 + \frac{x-2}{3} = \frac{x+3}{8}$

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

5. $\frac{x+1}{4} = \frac{1}{6} + \frac{2-x}{3}$

Solving formulas for a specified variable

6. $C = 2\pi r$, solve for r

7. $A = \frac{1}{2}h(a + b)$, solve for a

8. $B = \frac{F}{S-V}$, solve for S

9. $IR + Ir = E$, solve for I

Linear Equations

Use the following forms of linear equations to help you solve the exercises on the next page.

Slope-Intercept Form: $y = mx + b$

Standard Form: $Ax + By = C$

Point-Slope Form: $y - y_1 = m(x - x_1)$

Slope formula:

$$m = \frac{y_2 - y_1}{x_2 - x_1}$$

10. Convert $8x + 2y = 10$ to slope-intercept form. Then, identify its slope and y-intercept.

11. Find the slope of the line that passes through the points $(-5,2)$ and $(7,-2)$.

12. Write an equation in slope-intercept form that passes through $(-6,3)$ with a slope of $\frac{2}{5}$.

13. Write an equation in point-slope form that passes through $(-5,2)$ and $(6,-2)$.
Note: There are two possible equations.

14. Convert $y - 4 = \frac{7}{2}(x - 4)$ to slope-intercept form and standard form.

15. Write an equation in slope-intercept form that is parallel to $y = -3x + 4$ through the point $(-3,5)$.

16. Write an equation in slope-intercept form that is perpendicular to $y = 2x - 4$ through the point $(-4,2)$.

17. Write an equation in standard form that is perpendicular to $y = -\frac{3}{4}x + 2$ through the point $(6,-3)$.

18. Write an equation in slope-intercept form that is perpendicular to $y = x + 4$ through the point $(-5, -5)$.

Solving systems of linear equations (using substitution or elimination)

19. $\begin{cases} 2x - 3y = -4 \\ 2x + y = 4 \end{cases}$

20. $\begin{cases} 3x + 2y = 48 \\ 9x - 8y = -24 \end{cases}$

21. $\begin{cases} 2x = 9 + 3y \\ 4y = 8 - 3x \end{cases}$

22. $\begin{cases} 5x - 2y = 4 \\ -10x + 4y = 7 \end{cases}$

23. $\begin{cases} y + 2 = 3x \\ 15x - 5y = 10 \end{cases}$

Solving quadratic equations

24. $x^2 - 3x - 10 = 0$ (by factoring)

25. $3x^2 - 12x = 0$ (by factoring)

26. $x^2 = 8x - 15$ (by factoring)

27. $5x^2 = 45$ (by square roots)

28. $3(x - 4)^2 = 15$ (by square roots)

29. $3x^2 - 3x - 4 = 0$ (Quadratic Formula)

30. $3x^2 = 6x - 1$ (Quadratic Formula)

31. $x^2 + 36 = 13x$ (by factoring)

32. $2x^2 + 3x = 1$ (you choose method)

33. $4x^2 - 16 = 0$ (you choose method)

34. $2x^2 + 5x = 3$ (you choose method)

35. $2x^2 - 7x = 0$ (you choose method)

Simplifying Exponential Expressions

36. $(x^{-6})^4$

37. $\left(-\frac{4}{x}\right)^{-3}$

38. $\frac{8x^{20}}{2x^4}$

39. $(4x^3)^{-2}$

40. $\frac{24x^3y^5}{32x^7y^{-3}}$

41. $(-5x^4y)(-6x^7y^{11})$

42. $\left(\frac{5x^3}{y}\right)^{-2}$

43. $\left(-\frac{15a^4b^2}{5a^{10}b^{-3}}\right)^3$

44. $\left(\frac{3a^{-5}b^2}{12a^3b^{-4}}\right)^{-1}$

Factoring Polynomials

45. $9x^4 - 18x^3 + 27x^2$

46. $x(2x + 1) + 4(2x + 1)$

47. $x^3 - 2x^2 + 5x - 10$

48. $3x^3 - 2x^2 - 6x + 4$

49. $x^2 - 14x + 49$

50. $x^3 + 27$

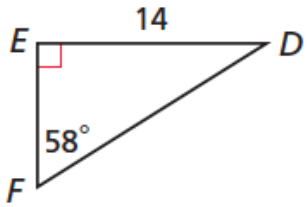
51. $27x^3 - 1$

52. $5x^3 - 45x$

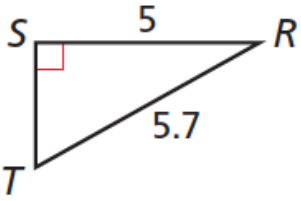
53. $y^5 - 81y$

Right Triangle Trigonometry

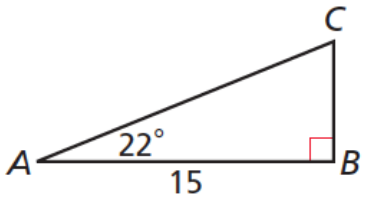
54. Find the missing side lengths EF and DF



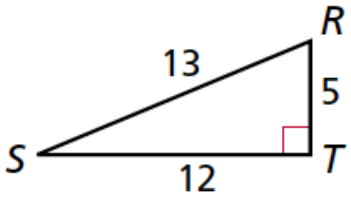
55. Find the missing angles $\angle T$ and $\angle R$



56. Solve the right triangle ΔABC.
(Note: "Solving a triangle" means to find all of its missing sides and angles.)



57. Solve the right triangle ΔRST.

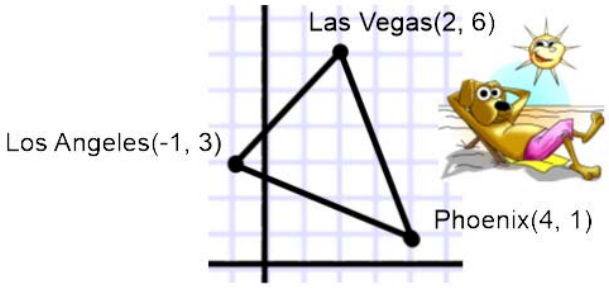


58. A contractor is building a wheelchair ramp for a doorway that is 1.2 ft above the ground. To meet ADA guidelines, the ramp will make an angle of 4.8° with the ground. To the nearest hundredth of a foot, what is the horizontal distance covered by the ramp?

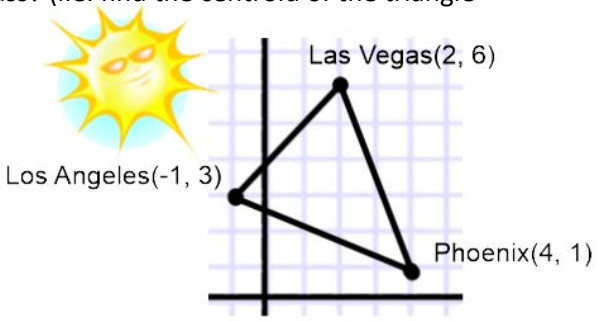
Sample test quality questions you should be able to answer in pre-calculus after finishing chapter 3 of Algebra 2.

The cities of Los Angeles, Las Vegas, and Phoenix make a triangle in the American Southwest and can be placed on a coordinate system as shown below.

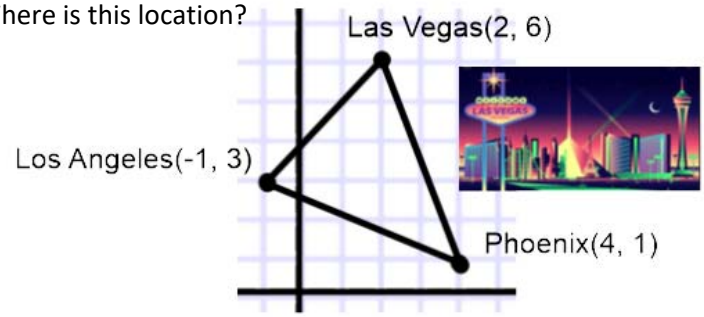
a. Each city has decided to "go clean" and has agreed to be powered by a new massive solar power array. On the coordinate system below, where should the solar plant be located so the power can be evenly distributed to each city? (i.e. find the circumcenter of the triangle – the center of the circle that goes through each vertex).



b. Since there are some cities between Los Angeles, Las Vegas and Phoenix management at the solar company decided to build the plant at the center of mass (gravity) of the three cities to evenly distribute the power. Where is this center of mass? (i.e. find the centroid of the triangle – the intersection of the three medians of the triangle)



c. Both Los Angeles and Las Vegas require more electricity than Phoenix due to their entertainment industries and tourism, so management at the solar power now thinks that the plant should be built closer to these two cities, at the orthocenter of the triangle (point of intersection of the three altitudes of the triangle). Where is this location?

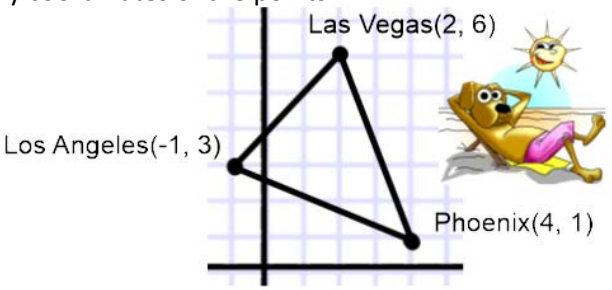


The following question can be answered after completing chapter 13 and 10 of Algebra 2.

The cities of Los Angeles, Las Vegas, and Phoenix make a triangle in the American Southwest and can be placed on a coordinate system as shown below.

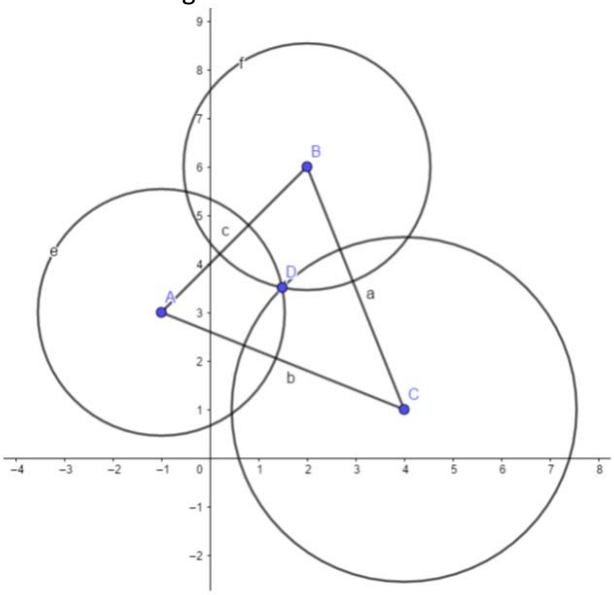
a. The incenter of a triangle can be found by finding the point of intersection of the angle bisectors. Where is the incenter of the triangle?

*formula for incenter $\left(\frac{a\cdot x_A+b\cdot x_B+c\cdot x_C}{a+b+c}, \frac{a\cdot y_A+b\cdot y_B+c\cdot y_C}{a+b+c}\right)$ where *a*, *b*, and *c* are the side lengths and $x_a, x_b, x_c, y_a, y_b, y_c$ are the x and y coordinates of the points



b. What is the area of the triangle formed between the three cities?

c. Each city has a radio tower whose range is the radius from the city center to the incenter of the triangle formed by connecting the three city centers. What is the probability that an alien who dropped out of the sky would land somewhere inside of the triangle where they would receive signals from two different cities?



Sample test quality question that you should be able to answer after studying chapter 4 of Algebra 2.

You and some classmates have are piloting a new S.T.E.M. class called "Ballistics." You are going to build a model catapult out of clothes pins or rubber bands, Popsicle sticks, tape, and paper to model and then predict the path of a projectile (m&m) by relating the vertical height of the projectile to its horizontal distance traveled.

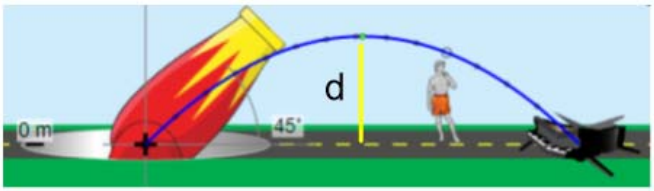
a) You begin by building the model and taking the following measurements:

Time, *t*, in sec	Distance, *y*, in inches
1.3	41
1.5	51
1.52	43

b) What was the average time your projectile traveled? _____

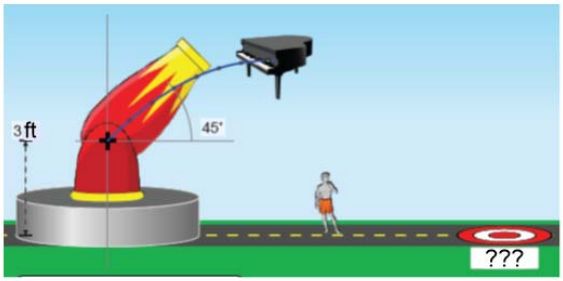
c) What was the average distance your projectile traveled? _____

d) Using the equation $= \frac{1}{2}(g)(t^2)$ to model the distance an object falls, where g is 9.8 m/s, and the length of time your projectile was ***FALLING*** for, find the maximum height your m&m reached. Assume the projectile was launched from the ground (0, 0)…***be careful of units!!!***



e. Assuming the projectile was launched from the ground (0, 0) find an equation in vertex form that relates the vertical height of your projectile (*y*) to the horizontal distance (*x*) that the projectile travels…***notice that you are now working with different variables than in question d***.

f. You now place your catapult on top of a table 36 inches off of the ground. Predict where your projectile will land (how far from its launch point), be careful of units!



Sample test quality question you should be able to answer after chapter 5 of Algebra 2.

As the chief operations officer for the Minnesota Loons soccer team you are in charge of game day operations. After careful study and market research you have determined that for every $8 increase in ticket price 100 fewer tickets are sold. Assuming that if tickets were free the Loons would fill Allianz Field to capacity of 19,400.

a. If *x = number of price increases*. Write an equation that models the number of tickets sold

b. Using your answer to part a, write an equation for the income from ticket sales.

c. You also receive income from concessions and merchandise. If these sales can be modeled by $20x(x + 50)(x + 30)$, write an equation that represents the ***total*** revenue from a Loons game.

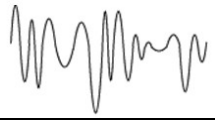
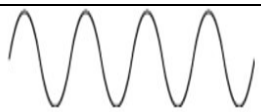
d. There are also expenses at a Loons game. If expenses for merchandise and staff can be modeled by $10x(10x - 20)(3x - 50)$, find an equation to model the profit for a Loons game.

e. Write an equation that can find the profit per ticket sold for a Loons game.

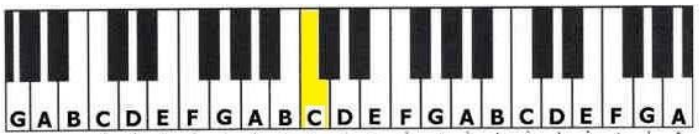
f. Use your graphing calculator to find the ticket price you should set to maximize the profit the Loons receive from each ticket sold? ***Remember, x does not stand for ticket price***.

The following questions can be answered after completing chapter 14 of Algebra 2.

There is a scientific difference between noise and pure musical tones.

A random jumble of sound waves is heard as noise.	
Regular, evenly spaced sound waves are heard as tones.	
The closer together the waves are the higher the tone that is heard.	
The greater the amplitude the louder the tone.	

Trigonometric equations can be used to describe the initial behavior of the vibrations that give us specific tones, or notes.



a. Write a *sine* equation that models the initial behavior of the vibrations of the note G above middle C given that it has amplitude 0.015 and a frequency of 392 hertz.

b. Write a *sine* equation that models the initial behavior of the vibrations of the note D above middle C given that it has amplitude 0.25 and a frequency of 294 hertz.

c. Based on your equations, which note is higher? Which note is louder? How do you know?

d. An amplifier shows the sound wave for middle c below, find the equation for middle c