

SUMMER ASSIGNMENT FOR FUNCTIONS/TRIGONOMETRY

Due September 6th

This summer assignment is designed to prepare you for Functions/Trigonometry. Nothing on the summer assignment is new. Everything is a review of topics students learned in Algebra I & II and Geometry. If you want to be successful during Functions/Trig, you *must* be able to understand and apply this information throughout next year. The assignment may be completed with another student but be certain that YOU understand how to complete every problem.

- **Neatly show all work for each problem, using a pencil.**
- Calculators are only necessary for #28 – 33, and should not be relied upon for the remainder of the assignment.
- During the second week of school, you will have a quiz covering all of the material from the summer assignment.

If you need to review these topics or see examples, we recommend the websites www.purplemath.com/modules/index.htm and www.khanacademy.com which lists many Algebra review topics. If, after reviewing, you need further assistance, please e-mail Mrs. Milhiser at milhisml@pwcs.edu with questions or to make arrangements to meet with a teacher. The assignment will count for extra credit on your marking period grade if completed correctly and on time.

Properties of Exponents:

$$ax^{-n} = \frac{a}{x^n} \quad (x^m)^n = x^{mn}$$

$$(x^m)(x^n) = x^{m+n} \quad x^0 = 1$$

PurpleMath Topics:

Beginning Algebra Topics:

- Exponents:
 - Basic Rules
 - Negative Exponents
- Simplifying with Exponents

Simplify the following expressions using the properties above. Leave no negative exponents.

1. $4w^{-1}$

5. $\frac{a^{-5}}{64p^{11}}$

2. $(3w^{-2})(5w^8)$

6. $\frac{64x^{-7}}{80y^{-2}t^5}$

3. $(2x^2y^{-1}z)^{-3}$

7. $\frac{12x^6y^{-3}z^5}{13x^{-4}y^{-4}z^8}$

4. $(22x^4)^0 \cdot (6x^0)^2$

Rational Exponents:

$$\sqrt[n]{x^m} = x^{\frac{m}{n}}$$

PurpleMath Topics:

Beginning Algebra Topic:

- Exponents:
Fractional Exponents

Simplify the following expressions using the property above. Express radicals as fractional exponents.

8. $\sqrt[3]{m}$

10. $\sqrt{t^5}$

9. $\sqrt[5]{n^4}$

11. $\frac{15}{5\sqrt{b^{-6}}}$

Complex Numbers:

$$\sqrt{-1} = i$$

PurpleMath Topic:

Advanced Algebra Topics:

- Complex Numbers

Simplify the following expressions using imaginary numbers.

12. $\sqrt{-25}$

14. i^2

13. $\sqrt{-8}$

Quadratic Formula:

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

PurpleMath Topic:

Intermediate Algebra Topics:

- Quadratic Formula

Solve the following quadratic equations using the quadratic formula. Simplify as much as possible.

15. $12y^2 - 1 = 2y$

17. $4w^2 + 11w = -6$

16. $c^2 + c + 72 = 0$

Factoring:

Always look for a greatest common factor *first*:

$$a^2b + ab = ab(a + 1)$$

Perfect Square Trinomials: $a^2 - 2ab + b^2 = (a - b)^2$

$$\text{or } a^2 + 2ab + b^2 = (a + b)^2$$

Difference of Squares: $a^2 - b^2 = (a - b)(a + b)$

Sum of Cubes: $a^3 + b^3 = (a + b)(a^2 - ab + b^2)$

Difference of Cubes: $a^3 - b^3 = (a - b)(a^2 + ab + b^2)$

PurpleMath Topics:

Beginning Algebra Topics:

- Simple Factoring

Intermediate Algebra Topics:

- Factoring Quadratics
- Solving Quadratic Equations
- Special Factoring Formulas

Solve the following equations using factoring. Show factored equation and give **all** solutions (real and imaginary).

18. $14x^2 - 7x = 0$

23. $x^4 - 256 = 0$

19. $x^2 - 9 = 0$

24. $p^3 - 2p^2 - 35p = 0$

20. $x^3 - 216 = 0$

25. $p^2 - 19p + 90 = 20$

21. $9x^2 - 12x + 4 = 0$

26. $12x^2 + 16x - 3 = 0$

22. $3x^3 + 1029 = 0$

27. $24n^2 - 78n - 21 = 0$

Pythagorean Theorem:

$$a^2 + b^2 = c^2$$

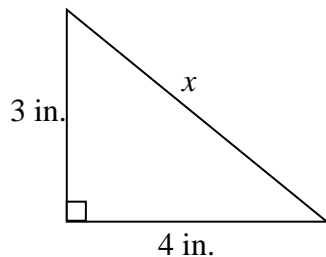
PurpleMath Topic:

...and the beginnings of trig:

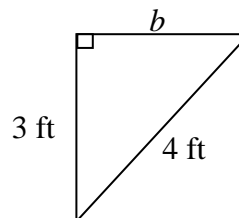
- Pythagorean Theorem

Solve for the unknown in each of the figures below. Give answers accurate to four decimal places.

28.



29.



Trigonometry:

$$\sin \theta = \frac{\textit{opposite}}{\textit{hypotenuse}}$$

$$\cos \theta = \frac{\textit{adjacent}}{\textit{hypotenuse}}$$

$$\tan \theta = \frac{\textit{opposite}}{\textit{adjacent}}$$

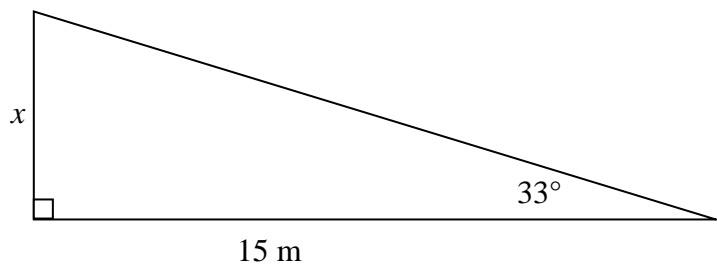
PurpleMath Topic:

...and the beginnings of trig:

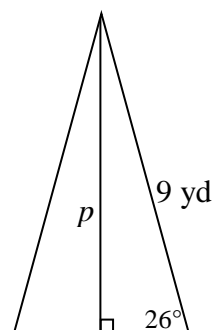
- Basic Trigonometric Ratios
- Inverses of Trigonometric Ratios
- Special Angle Values

Use the following right triangles to find the value of the unknown. Give answers accurate to four decimal places.

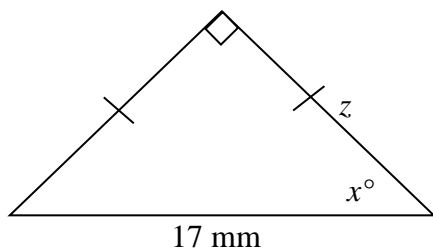
30.



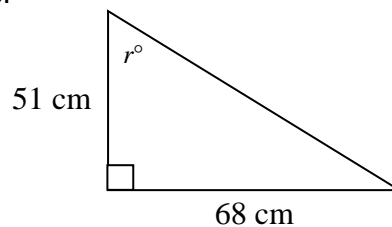
32.



31.



33.



Lines:

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

$$\text{midpoint: } \left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2} \right)$$

$$\text{equation of a line: } y = mx + b$$

PurpleMath Topics:

Beginning Algebra Topics:

- Slope of a Straight Line
- Midpoint Formula
- Straight-line Equations

For each of the following sets of points, find:

- the slope
- the equation of the line that fits these points
- the midpoint

34. $(-2, 8)$ $(6, 0)$

35. $(-5, -4)$ $(10, -8)$

36. $(0, 4)$ $(0, 3)$

Binomial Expansion:

$$(a+b)^2 = (a+b)(a+b) = a^2 + 2ab + b^2$$

Expand the following expressions.

37. $(8+x)^2$

PurpleMath Topic:

Beginning Algebra Topics:

- Polynomials: Multiplying

38. $(2x-4)^2$

Rational Expressions:

$$\text{If } f(x) = \frac{\frac{p(x)}{q(x)}}{\frac{r(x)}{s(x)}}, \text{ then } f(x) = \frac{p(x)}{q(x)} \cdot \frac{s(x)}{r(x)},$$

where $q(x) \neq 0$, $s(x) \neq 0$, $r(x) \neq 0$

PurpleMath Topics:

Advanced Algebra Topics:

- Rational Expressions: Simplifying
- Rational Expressions: Adding
- Rational Expressions: Multiplying
- Complex Fractions

Simplify the following rational functions. State any restrictions.

39. $\frac{x^2 - x - 6}{x^2 - 4x + 3}$

42. $\frac{3}{x+1} + \frac{x}{x-1}$

40. $\frac{2x^2 - 6x}{x^2 + 18x + 81} \cdot \frac{9x + 81}{x^2 - 9}$

43. $\frac{\frac{1}{x} - 1}{x - 1}$

41. $\frac{\frac{6x + 6y}{x - y}}{\frac{18}{5x - 5y}}$

Graphing:

Changes to the “outside” of $f(x)$ affect a graph vertically.

Changes to the “inside” of $f(x)$ affect a graph horizontally.

Domain is the set of possible x -values.

Range is the set of possible y -values.

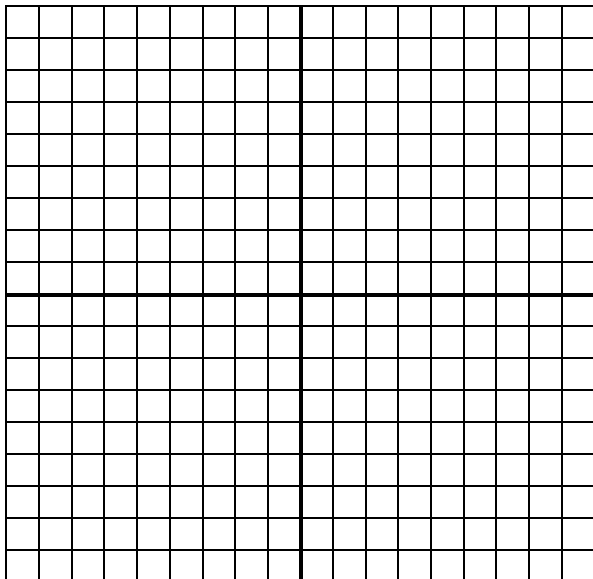
PurpleMath Topics:

Intermediate Algebra Topics:

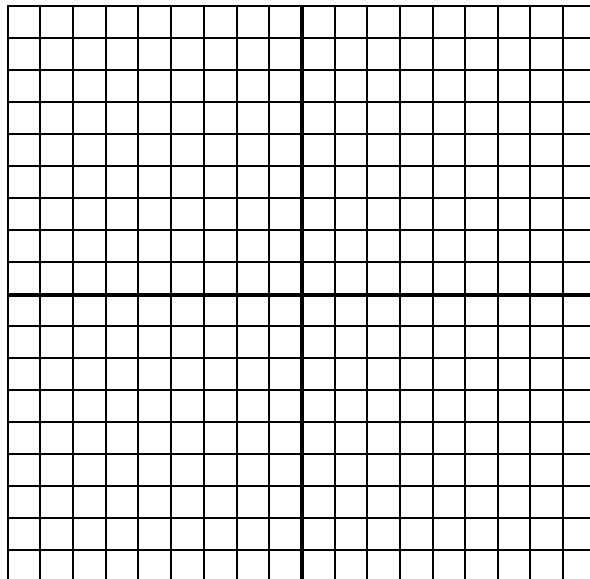
- Domain and Range
- Graphing Quadratic Equations

Graph the following functions. State the domain and range of each.

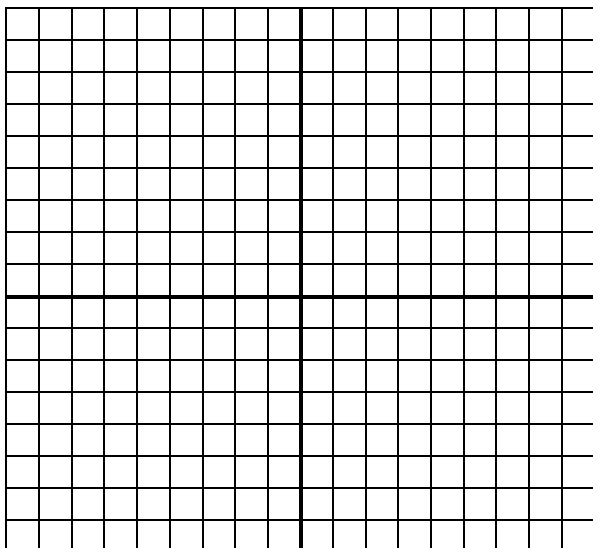
44. $f(x) = 2(x-3)^2$



46. $f(x) = \sqrt{2x}$



45. $f(x) = -x^2 + 4$



Systems of Equations:

The solution to a system of equations, $\begin{cases} f(x) \\ g(x) \end{cases}$,
is the point of intersection, (x, y) , of the functions.

PurpleMath Topics:

Advanced Algebra Topics:

- Solving Systems of Linear Equations
Sections:
Substitution (p. 4)
Elimination/addition (p. 5)

47. Solve the system using substitution:

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

48. Solve the system using elimination:

$$\begin{cases} 2m - n = -1 \\ 3m + 2n = 30 \end{cases}$$

Common Mistakes in Algebra

Decide whether each of the following simplifications is accurate. If it is not, correct the right side of the equation to make it true.

49. $3^2 \cdot 3^3 \stackrel{?}{=} 9^5$

53. $(-2x)^2 \stackrel{?}{=} -4x^2$

50. $(3a)^4 \stackrel{?}{=} 3a^4$

54. $2x^3 - 6x^2 + 2x \stackrel{?}{=} 2x(x^2 - 3x)$

51. $-2^4 \stackrel{?}{=} 16$

55. $(x^2 + 25) \stackrel{?}{=} (x - 5)(x + 5)$

52. $3x + 4y \stackrel{?}{=} 7xy$

56. $(x + 2)^2 \stackrel{?}{=} x^2 + 4$

$$57. \sqrt{432} \stackrel{?}{=} 12\sqrt{3}$$

$$65. \frac{5x+10}{20} \stackrel{?}{=} \frac{x+2}{4}$$

$$58. \sqrt{-x} \cdot \sqrt{-y} \stackrel{?}{=} \sqrt{xy}$$

$$66. \frac{2x-1}{1-2x} \stackrel{?}{=} -1$$

$$59. \sqrt{x^2+4} \stackrel{?}{=} x+2$$

$$67. \frac{2}{3x} - \frac{4}{3} \stackrel{?}{=} \frac{-2x}{3x}$$

$$60. \frac{-4 \pm \sqrt{10}}{2} \stackrel{?}{=} -2 \pm \sqrt{5}$$

$$68. a\left(\frac{x}{y}\right) \stackrel{?}{=} \frac{ax}{ay}$$

$$61. 3x^{-1} \stackrel{?}{=} \frac{1}{3x}$$

$$69. \frac{x^3 - 2x^2 + 4x - 8}{x^2 + x - 6} \stackrel{?}{=} \frac{x^2(x-2) + 2}{x+3}$$

$$62. \frac{x^2-1}{x+1} \stackrel{?}{=} x-1$$

$$70. \frac{x^3 - x^2 + x - 1}{x^4 - x^3 + 2x - 2} \stackrel{?}{=} \frac{x^2 + 1}{x^3 + 2}$$

$$63. \frac{2+x}{2} \stackrel{?}{=} x$$

$$71. \frac{\frac{x}{y}}{\frac{w}{z} + \frac{a}{b}} \stackrel{?}{=} \frac{x}{y} \left(\frac{z}{w} + \frac{b}{a} \right)$$

$$64. \frac{a}{x+b} \stackrel{?}{=} \frac{a}{x} + \frac{a}{b}$$