AP Precalculus Prerequisite Summer Assignment

This course is a culmination of all your previous mathematics courses. AP Precalculus covers the topics of both Advanced Algebra and Trigonometry and introduces students to the concepts of data modeling. To excel in this course, a commitment to nightly practice and good study skills are expected in addition to a strong understanding of Algebra and Basic Trigonometry.

After you have enjoyed your summer and before coming back to school in the fall, you are encouraged to refamiliarize yourself with some foundational concepts to ensure success in your first AP math class. There is always an adjustment period to the rigor and pace of the course, so solidifying your prerequisite math skills is important.

Considering the prerequisite knowledge for this course, the summer assignment will be as follows:

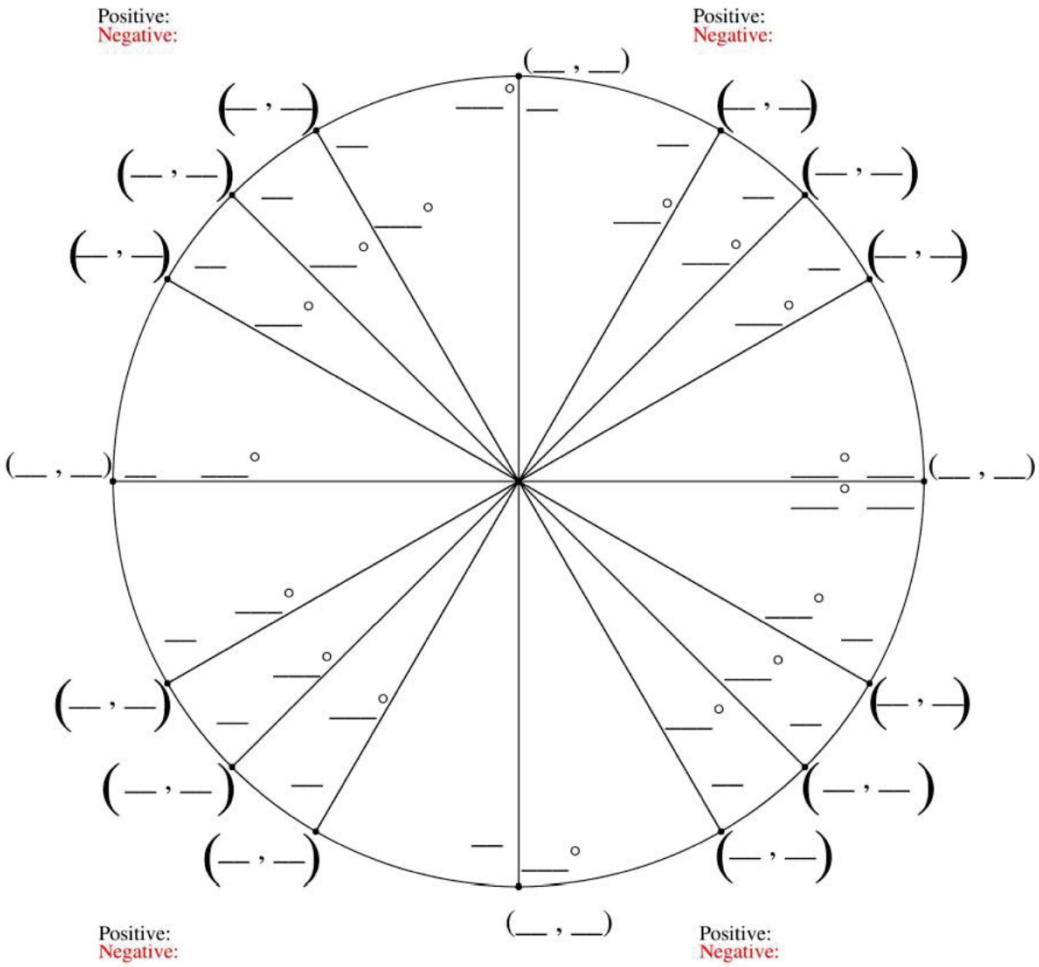
1. Watch the playlist of videos linked to familiarize yourself with the prerequisite knowledge of the course.

Review all 13 the prerequisites for AP Precalculus - YouTube

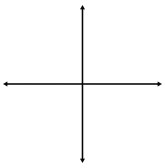
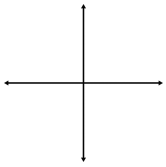
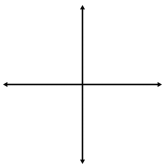
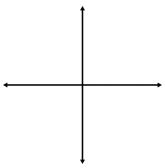
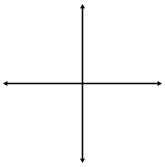
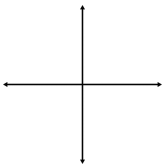
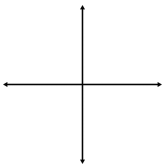
2. Complete and commit to memory the attached unit circle.

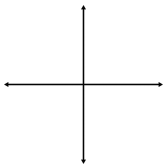
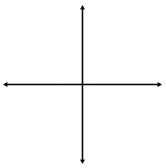
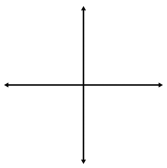
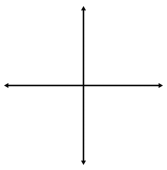
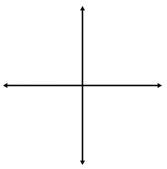
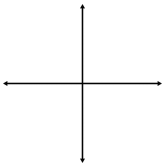
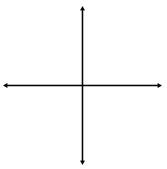
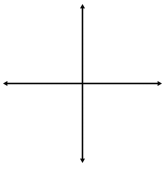
3. Complete the Attached Parent Function Library including Key Points and Domain and Ranges.

4. Do you really want a worksheet of practice problems? That is attached as well ☺ (solutions are at the end of the document.)



Library of Parent Functions

Function Family/ Parent Function	Key Points	Sketch of Graph	Domain	Range	Transformation Form $g(x) = af[b(x+c)] + d$
Linear $f(x) = x$	$(-1,-1)$ $(0,0)$ $(1,1)$				$g(x) = a[b(x+c)] + d$
Absolute Value $f(x) = \lvert x \rvert$	$(-1,1)$ $(0,0)$ $(1,1)$				$g(x) = a\lvert b(x+c) \rvert + d$
Quadratic $f(x) = x^2$	$(-2,4)$ $(-1,1)$ $(0,0)$ $(1,1)$ $(2,4)$				$g(x) = a\big(b(x+c)\big)^2 + d$
Cubic $f(x) = x^3$	$(-2,-8)$ $(-1,-1)$ $(0,0)$ $(1,1)$ $(2,8)$				$g(x) = a\big(b(x+c)\big)^3 + d$
Square Root $f(x) = \sqrt{x}$	$(0,0)$ $(1,1)$ $(4,2)$				$g(x) = a\sqrt{b(x+c)} + d$
Cube Root $f(x) = \sqrt[3]{x}$	$(-8,-2)$ $(-1,-1)$ $(0,0)$ $(1,1)$ $(8,2)$				$g(x) = a\sqrt[3]{b(x+c)} + d$
Reciprocal $f(x) = \frac{1}{x}$	VA: $x = 0$ HA: $y = 0$ $(-1,-1)$ $(0,0)$ $(1,1)$				$g(x) = \frac{a}{b(x+c)} + d$

Reciprocal Squared $\boldsymbol{f(x) = \frac{1}{x^2}}$	VA: $x = 0$ HA: $y = 0$ $(-1,1)$ $(0,0)$ $(1,1)$				$g(x) = \frac{a}{\big(b(x+c)\big)^2} + d$
Exponential $\boldsymbol{f(x) = 2^x}$**, with base 2**	HA: $y = 0$ $\left(-1, \frac{1}{2}\right)$ $(0,1)$ $(1,2)$				$g(x) = a(2)^{b(x+c)} + d$
Logarithmic $\boldsymbol{f(x) = \log_2 x}$	VA: $x = 0$ $\left(\frac{1}{2}, -1\right)$ $(1,0)$ $(2,1)$				$g(x) = a\log_2\big(b(x+c)\big) + d$
Natural Base Exponential $\boldsymbol{f(x) = e^x}$	HA: $y = 0$ $\left(-1, \frac{1}{e}\right)$ $(0,1)$ $(1, e)$ $*e \approx 2.718$				$g(x) = a(e)^{b(x+c)} + d$
Natural Logarithmic $\boldsymbol{f(x) = \ln x}$	VA: $x = 0$ $\left(\frac{1}{e}, -1\right)$ $(1,0)$ $(e,1)$ $*e \approx 2.718$				$g(x) = a\ln\big(b(x+c)\big) + d$
Sine $\boldsymbol{f(x) = \sin x}$	$(0,0)$ $\left(\frac{\pi}{2}, 1\right)$ $(\pi, 0)$ $\left(\frac{3\pi}{2}, -1\right)$ $(2\pi, 0)$				$g(x) = a\sin(b(x+c)) + d$
Cosine $\boldsymbol{f(x) = \cos x}$	$(0,1)$ $\left(\frac{\pi}{2}, 0\right)$ $(\pi, -1)$ $\left(\frac{3\pi}{2}, 0\right)$ $(2\pi, 1)$				$g(x) = a\cos(b(x+c)) + d$
Tangent $\boldsymbol{f(x) = \tan x}$	Asymptotes: $x = \frac{\pi}{2} + \pi k, k \epsilon \mathbb{Z}$ $\left(-\frac{\pi}{4}, -1\right)$ $(0,0)$ $\left(\frac{\pi}{4}, 1\right)$				$g(x) = a\tan(b(x+c)) + d$

Trigonometry/Precalculus Prerequisite Skills Review

The following exercises will give you an opportunity to refresh your prior knowledge and skills from Algebra and Geometry and Advanced Algebra, in preparation for Trig/Pre-calculus. For the following problems, write out your steps or show how you arrived at answers for each problem, then check your answers on the Answer Key provided. Keep these exercises in your notebook for quick reference.

Prerequisite Skills:
1. Order of operations with integers, fractions, and exponents.
2. Simplify exponents, including fractional and negative exponents.
3. Simplify radicals.
4. Solve equations including linear, literal, absolute value, quadratic, and radical.
5. Solve systems of linear equations.
6. Solve and graph linear and compound (system of) inequalities.
7. Determine slope, write linear equations in various forms, perpendicular and parallel lines.
8. Graph equations, functions, and inequalities and shifts/transformations from parent graphs.
9. Identify domain, range, and asymptotes.
10. Write and sketch inverse function and composition of functions.
11. Factoring including greatest common term, difference of squares, trinomials.
12. Operations with polynomials.
13. Basic Geometry concepts for triangles, polygons, and circles.
14. Area and Volume.
15. Right triangle concepts including basic trigonometry ratios and Pythagorean Theorem.

If you have difficulty with any of these topics, review your notes from prior classes. You can also look on the internet for tutorials on specific topics on websites such as www.purplemath.com , www.wtamu.edu/academic/anns/mps/math/mathlab , www.math.armstrong.edu/MathTutorial , or any other websites from you preferred search engine. Be persistent and resourceful until you find a tutorial that is helpful, understandable, and provides good examples with answers for you to follow. Don't accept just "getting an answer" as it is important that you understand how to successfully complete these types of review problems.

If you are still having questions about any of the above topics, please ask your teacher for assistance when school begins.

Part One: Order of Operations with Integers, Fractions, and Exponents.

Simplify the following algebraic and numeric expressions.

1. $7 + (9 - 3 \cdot 4)^2$

2. $\dfrac{\frac{2}{3} + \frac{1}{5}}{\frac{1}{2}}$

3. $-2^{-2} - (4 + 3 \cdot 5)$

4. $(5^{-1} + 3^0)(a^0)$

5. $(7x - 2y) - (3x + 5y)$

6. $(7x - 2y)(3x + 5y)$

7. $5[2(y + 1) - 5(y - 2)]$

8. $\left(\frac{x^2+2x-3}{x+2}\right)\left(\frac{x^2+2x}{x^2-1}\right)$

11. $\dfrac{y}{1+z} + \dfrac{1+z}{y}$

12. $\dfrac{1+\frac{1}{t}}{1-\frac{1}{t}}$

Part Two: Simplify exponents, including fractional and negative exponents.

Simplify without a calculator, giving answer in exact form (not decimal). In your answer, express all exponents as positive values and convert any fractional powers to radical form.

10. $\dfrac{\dfrac{5t^5}{8}}{\dfrac{15t^2}{12}}$

11. $\dfrac{8^{-\frac{1}{3}}}{16^{\frac{1}{2}}}$

12. $\left(\dfrac{x^2y^{-8}z^2}{xy^2z^{-6}}\right)^{-2}$

13. $x^4(-2x)^3(6x^0)^{-2}$

14. $\left(\left(\dfrac{3}{4}\right)^2+1\right)^{\frac{1}{2}}$

15. $72^{\frac{1}{2}}+98^{\frac{1}{2}}$

Part Three: Simplify radicals.

Find the exact value without your calculator (no decimal answers).

16. $3\sqrt{700}+2\sqrt{7}$

17. $\dfrac{4\sqrt{2}}{5}-\dfrac{3}{\sqrt{2}}$

18. $\sqrt{\dfrac{20}{27}}$

Part Four: Solving Equations.

Solve each equation algebraically; verify your solution by substituting in the original equation.

19. $3(x-7)+5=-2x-8$

20. $\frac{1}{4}+\frac{3}{8}y=\frac{3}{4}$

21. $\frac{x+1}{3}+\frac{x+2}{7}=5$

22. $z^2+z-12=0$

23. $x^2+3x=-1$

24. $(x+7)(x-1)=(x+1)^2$

25. $\sqrt{15-2x}=x$

26. $|1-4t|=5$

27. $\left|\frac{x}{3}+\frac{2}{5}\right|=2$

28. $2\pi-x=\frac{5\pi}{3};$ solve for x in terms of π.

29. $\frac{x}{a}+\frac{x}{b}=c;$ where $a\neq 0, b\neq 0, a\neq -b,$ solve for x.

30. $S=\frac{a}{1-r};$ solve for r.

Part Five: Solve systems of linear equations.

Find the solution to the system of equations.

31. $\begin{cases} 3b-a=-7 \\ 5a+6b=14 \end{cases}$

32. $\begin{cases} 3x+2y=22 \\ 9x-8y=-4 \end{cases}$

Part Six: Solve and graph linear and compound (system of) inequalities.

Show the solutions to the inequality by solving (#35), and graphing the solution for systems of linear inequalities (#33, #34).

33. $\begin{cases} 3x+5y \le 3 \\ 4y+x \ge 8 \end{cases}$

34. $\begin{cases} 9x+3y \ge -3 \\ 2x-3y \le -8 \end{cases}$

35. $-5 < 4-3x \le 2$

Part Seven: Determine slope, write linear equations in various forms, perpendicular and parallel lines.

36. Determine the slope between the points (4, -3) and (-6, 4).

37. Determine the slope of the line -2y – x = -2 .

38. Write in slope-intercept form the equation of the line containing the point (-1, 2) and parallel to the given line y = 2x + 4.

39. Write in slope-intercept form the equation of the line containing the point (4, 5) and perpendicular to the given line y = 6x – 1 .

Part Eight: Graphs of equations, functions, and inequalities and shifts/transformations from parent graphs.

You should know how to do these by looking at the equations and explaining the reason for your answers, but may use your graphing calculator to verify your answers.

40. From the parent graph of $y = x^2$, describe the shift to obtain the new graph of $y = (x-3)^2 + 4$.

41. From the parent graph of $y = \sin x$, describe the shift and transformation to obtain the new graph of $y = \sin(2x+\pi) - 2$.

42. State whether the given set of points is a relation or a function.

$\{(-1,2),(3,10),(-2,20),(3,11)\}$

Part Nine: Indentify domain, range, and asymptotes.

43. For the points given in problem #42 above, state the domain and range.

44. In what interval is the function $f(x)=\sqrt{x^2+5x+4}$ defined.

45. State the domain and range of the function $f(x)=\sqrt{25-x^2}$.

46. State the domain of the function $f(x)=\dfrac{x-7}{x^2-1}$. Then state its horizontal and vertical asymptotes, if any exist.

Part Ten: Write and sketch inverse function and find composition of functions.

47. Given $f(x)=\dfrac{1}{2}x-1$, find its inverse $f^{-1}(x)$. Sketch the graph of both.

48. Given $f(x)=-2x+\dfrac{1}{2}$, find its inverse $f^{-1}(x)$. Sketch the graph of both.

For #49 and 50 use the following: $f(x)=\dfrac{2}{x+4}$, $g(x)=x^2-2$

49. Find $f\circ g(x)$.

50. Find $g\circ f(x)$.

Part Eleven: Factoring including greatest common term, difference of squares, trinomials.

51. $9y^2-900$

52. $4xy^2-4xz^2$

53. x^2-7x+6

54. $12a^2+36a+27$

55. $3x^3-15x+2x^2y-10y$

Part Twelve: Operations involving polynomials.

Complete the indicated operation to simplify the polynomials. Rational answers should have a common denominator.

56. $\frac{x^2+6x+8}{x^2-4x+3}\cdot\frac{x^2-5x+4}{5x+10}$

57. $\frac{x^2+8x}{9x}\div\frac{x^2-64}{3x^2}$

58. $\frac{4}{x^2+5x+6}+\frac{2x}{x+2}$

59. $\frac{3}{x-1}-\frac{2}{x-2}$

Part Thirteen: Basic Geometry concepts for triangles, polygons, and circles.

60. If the vertex angle of an isosceles triangle measures 46°, what is the measure of its base angles?

61. If one angle of a parallelogram measures 32°, what are the measures of the remaining three angles?

62. What are the lengths of the missing sides of a $30^\circ - 60^\circ - 90^\circ$ triangle if the longer leg of the triangle is 18 centimeters?

63. The hypotenuse of a $30^\circ - 60^\circ - 90^\circ$ triangle is 3 inches. Find the measures of the other two sides.

64. What is the length of the hypotenuse of a $45^\circ - 45^\circ - 90^\circ$ triangle if one leg measures 9 centimeters?

65. The leg of a $45^\circ - 45^\circ - 90^\circ$ triangle is 4 centimeters. Find the measures of the other two sides.

66. If the radius of a circle is 6 centimeters, what is its exact circumference?

67. What are “shortcuts” for proving triangles are congruent? What are “shortcuts” for showing triangles are similar?

Part Fourteen: Area and Volume.

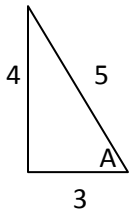
68. If the radius of a circle is 6 centimeters, what is its area?

69. What is the area of a triangle with base of 17 cm and altitude to the base of 4 cm?

70. If the base of a parallelogram is 15 inches and altitude to the base is one third of the base, what is the area of this parallelogram?

Part Fifteen: Right triangle concepts including basic trigonometry ratios and Pythagorean Theorem.

71. Use the right triangle shown here to state the trigonometric values for Sine, Cosine, and Tangent of angle A.

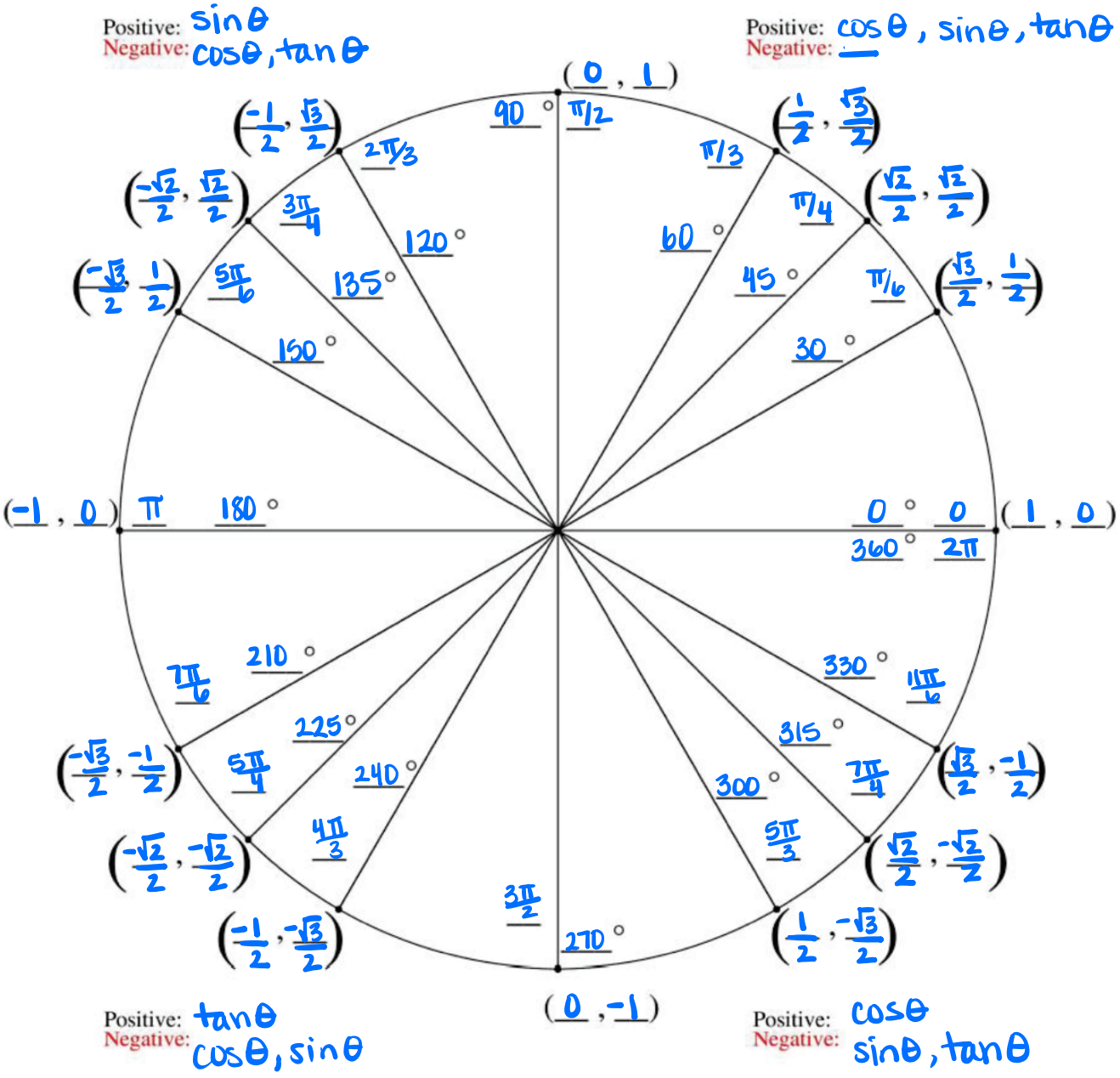


72. Use your calculator to find the measure of angle A above to the nearest tenth degree.

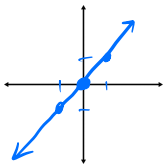
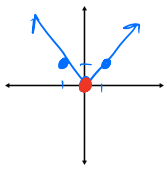
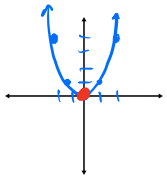
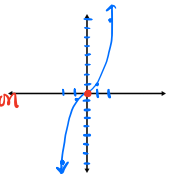
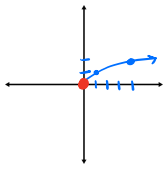
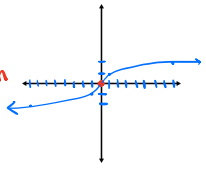
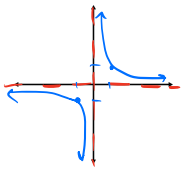
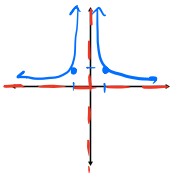
73. Knowing that $360^\circ = 2\pi$, state the measure of $30^\circ, 45^\circ, 60^\circ,$ and 90° in terms of π. Show your work to find these values.

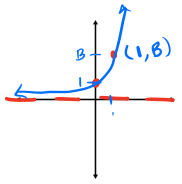
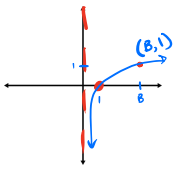
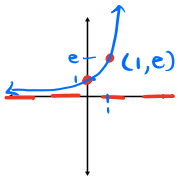
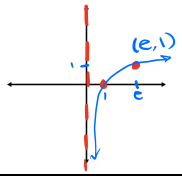
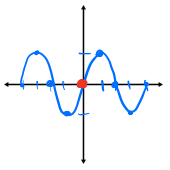
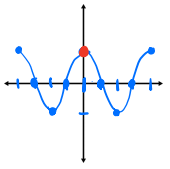
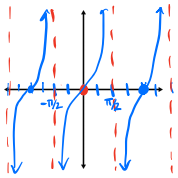
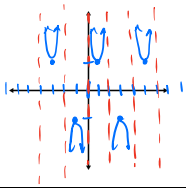
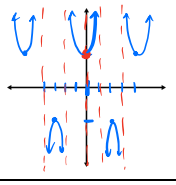
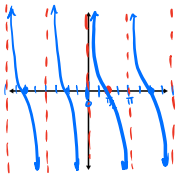
74. In a right triangle the two legs are measures of *4x* and *3x* with a hypotenuse measurement of *5x*. If the area of the triangle is 24 square units, find the Cosine of each acute angle.

75. Find the diagonal length of a television screen that is 30 inches wide and 20 inches long to the nearest hundredth of an inch.


Positive: sinθ
Negative: cosθ, tanθ
Positive: cosθ, sinθ, tanθ
Negative: —
Positive: tanθ
Negative: cosθ, sinθ
Positive: cosθ
Negative: sinθ, tanθ
(0, 1)
90°
π/2
(1/2, √3/2)
π/3
60°
(√2/2, √2/2)
π/4
45°
(√3/2, 1/2)
π/6
30°
(1, 0)
0°
0
360°
2π
(-1/2, √3/2)
2π/3
120°
(-√2/2, √2/2)
3π/4
135°
(-√3/2, 1/2)
5π/6
150°
(-1, 0)
π
180°
210°
7π/6
(-√3/2, -1/2)
225°
5π/4
(-√2/2, -√2/2)
240°
4π/3
(-1/2, -√3/2)
3π/2
270°
(0, -1)
300°
5π/3
(1/2, -√3/2)
315°
7π/4
(√2/2, -√2/2)
330°
11π/6
(√3/2, -1/2)

Library of Parent Functions

Function Family/ Parent Function	Key Points	Sketch of Graph	Domain	Range	Transformation Form $g(x) = af[b(x+c)] + d$
Linear $f(x) = x$	$(-1,-1)$ $(0,0)$ $(1,1)$		$(-\infty,\infty)$	$(-\infty,\infty)$	$g(x) = a[b(x+c)] + d$
Absolute Value $f(x) = \lvert x \rvert$	$(-1,1)$ $(0,0)$ * vertex $(1,1)$		$(-\infty,\infty)$	$[0,\infty)$	$g(x) = a\lvert b(x+c) \rvert + d$
Quadratic $f(x) = x^2$	$(-2,4)$ $(-1,1)$ $(0,0)$ * vertex $(1,1)$ $(2,4)$		$(-\infty,\infty)$	$[0,\infty)$	$g(x) = a\big(b(x+c)\big)^2 + d$
Cubic $f(x) = x^3$	$(-2,-8)$ $(-1,-1)$ $(0,0)$ * pt of inflection $(1,1)$ $(2,8)$		$(-\infty,\infty)$	$(-\infty,\infty)$	$g(x) = a\big(b(x+c)\big)^3 + d$
Square Root $f(x) = \sqrt{x}$	$(0,0)$ * "vertex" $(1,1)$ $(4,2)$		$[0,\infty)$	$[0,\infty)$	$g(x) = a\sqrt{b(x+c)} + d$
Cube Root $f(x) = \sqrt[3]{x}$	$(-8,-2)$ $(-1,-1)$ $(0,0)$ * pt of inflection $(1,1)$ $(8,2)$		$(-\infty,\infty)$	$(-\infty,\infty)$	$g(x) = a\sqrt[3]{b(x+c)} + d$
Reciprocal $f(x) = \dfrac{1}{x}$	VA: $x = 0$ HA: $y = 0$ $(-1,-1)$ ~~$(0,0)$~~ $(1,1)$		$\{x \mid x \neq 0\}$	$\{y \mid y \neq 0\}$	$g(x) = \dfrac{a}{b(x+c)} + d$
Rational $f(x) = \dfrac{1}{x^2}$	VA: $x = 0$ HA: $y = 0$ $(-1,1)$ ~~$(0,0)$~~ $(1,1)$		$\{x \mid x \neq 0\}$	$(0,\infty)$	$g(x) = \dfrac{a}{\big(b(x+c)\big)^2} + d$

Exponential $f(x) = B^x$, **with base B**	HA: $y = 0$ ~~$\left(-1, \frac{1}{B}\right)$~~ $(0,1)$ $(1, B)$		$(-\infty, \infty)$	$(0, \infty)$	$g(x) = a(B)^{b(x+c)} + d$
Logarithmic $f(x) = \log_B x$	VA: $x = 0$ ~~$\left(\frac{1}{B}, -1\right)$~~ $(1,0)$ $(B, 1)$		$(0, \infty)$	$(-\infty, \infty)$	$g(x) = a \log_B(b(x + c)) + d$
Natural Base Exponential $f(x) = e^x$	HA: $y = 0$ ~~$\left(-1, \frac{1}{e}\right)$~~ $(0,1)$ $(1, e)$ $*e \approx 2.718$		$(-\infty, \infty)$	$(0, \infty)$	$g(x) = a(e)^{b(x+c)} + d$
Natural Logarithmic $f(x) = \ln x$	VA: $x = 0$ ~~$\left(\frac{1}{e}, -1\right)$~~ $(1,0)$ $(e, 1)$ $*e \approx 2.718$		$(0, \infty)$	$(-\infty, \infty)$	$g(x) = a \ln(b(x + c)) + d$
Sine $f(x) = \sin x$	$(0,0)$ ✱ start point $\left(\frac{\pi}{2}, 1\right)$ $(\pi, 0)$ $\left(\frac{3\pi}{2}, -1\right)$ $(2\pi, 0)$		$(-\infty, \infty)$	$[-1, 1]$	✱ period $= \frac{2\pi}{b}$ $g(x) = a \sin(b(x + c)) + d$
Cosine $f(x) = \cos x$	$(0,1)$ ✱ start point $\left(\frac{\pi}{2}, 0\right)$ $(\pi, -1)$ $\left(\frac{3\pi}{2}, 0\right)$ $(2\pi, 1)$		$(-\infty, \infty)$	$[-1, 1]$	✱ period $= \frac{2\pi}{b}$ $g(x) = a \cos(b(x + c)) + d$
Tangent $f(x) = \tan x$	Asymptotes: $x = \frac{\pi}{2} + \pi k, k \in \mathbb{Z}$ $\left(-\frac{\pi}{4}, -1\right)$ $(0,0)$ ✱ center point $\left(\frac{\pi}{4}, 1\right)$		$\{x \mid x \neq \frac{\pi}{2} + \pi k\}$ $k \in \mathbb{Z}$	$(-\infty, \infty)$	$g(x) = a \tan(b(x + c)) + d$
Cosecant $f(x) = \csc x$	Asymptotes: $x = \pi k, k \in \mathbb{Z}$ $\left(\frac{\pi}{2}, 1\right)$ $\left(\frac{3\pi}{2}, -1\right)$		$\{x \mid x \neq \pi k\}$ $k \in \mathbb{Z}$	$(-\infty, -1] \cup [1, \infty)$	$g(x) = a \csc(b(x + c)) + d$
Secant $f(x) = \sec x$	Asymptotes: $x = \frac{\pi}{2} + \pi k, k \in \mathbb{Z}$ $(0,1)$ $(\pi, -1)$ $(2\pi, 1)$		$\{x \mid x \neq \frac{\pi}{2} + \pi k\}$ $k \in \mathbb{Z}$	$(-\infty, -1] \cup [1, \infty)$	$g(x) = a \sec(b(x + c)) + d$
Cotangent $f(x) = \cot x$	Asymptotes: $x = \pi k, k \in \mathbb{Z}$ $\left(\frac{\pi}{4}, 1\right)$ $\left(\frac{\pi}{2}, 0\right)$ ✱ center point $\left(\frac{\pi}{4}, -1\right)$		$\{x \mid x \neq \pi k\}$ $k \in \mathbb{Z}$	$(-\infty, \infty)$	$g(x) = a \cot(b(x + c)) + d$

Part One:

1. $7+(9-3\cdot4)^2$

$7+(9-12)^2$

$7+(-3)^2$

$7+9$

$\boxed{16}$

2. $\dfrac{\left(\frac{2}{3}+\frac{1}{5}\right)^{30}}{\left(\frac{1}{2}\right)^{30}} = \dfrac{20+6}{15} = \boxed{\dfrac{26}{15}}$

3. $-2^{-2}-(4+3\cdot5)$

$-\dfrac{1}{2^2}-(4+15)$

$-\dfrac{1}{4}-19$

$-\dfrac{1}{4}-\dfrac{76}{4}$

$\boxed{-\dfrac{77}{4}}$

4. $(5^{-1}+3^0)(a^0)$

$(\frac{1}{5}+1)(1)$

$\boxed{\frac{6}{5}}$

5. $(7x-2y)-(3x+5y)$

$7x-2y-3x-5y$

$\boxed{4x-7y}$

6. $(7x-2y)(3x+5y)$

$21x^2+35xy-6xy-10y^2$

$\boxed{21x^2+29xy-10y^2}$

7. $5[2(y+1)-5(y-2)]$

$5(2y+2-5y+10)$

$5(-3y+12)$

$\boxed{-15y+60}$

8. $\left(\dfrac{x^2+2x-3}{x+2}\right)\left(\dfrac{x^2+2x}{x^2-1}\right)$

$\dfrac{(x+3)(x-1)}{(x+2)} \cdot \dfrac{x(x+2)}{(x+1)(x-1)}$

$\boxed{\dfrac{x(x+3)}{(x+1)}}$

11. $\dfrac{y}{1+z}+\dfrac{1+z}{y}$

$\dfrac{y^2+(1+z)^2}{(1+z)y}$

$\boxed{\dfrac{y^2+z^2+2z+1}{y+zy}}$

12. $\dfrac{\left(1+\frac{1}{t}\right)\cdot t}{\left(1-\frac{1}{t}\right)t} = \boxed{\dfrac{t+1}{t-1}}$

Part 2:

10. $\dfrac{\left(\frac{5t^2}{8}\right)\cdot 24}{\left(\frac{15t^2}{12}\right)\cdot 24} = \dfrac{15t^2}{30t^2} = \boxed{\frac{1}{2}}$

11. $\dfrac{8^{-1/3}}{16^{1/2}} = \dfrac{1}{\sqrt{16}\cdot\sqrt[3]{8}} = \dfrac{1}{4\cdot 2} = \boxed{\frac{1}{8}}$

OR $\dfrac{(2^3)^{-1/3}}{(2^4)^{1/2}} = \dfrac{2^{-1}}{2^2} = 2^{-3} = \boxed{\frac{1}{8}}$

12. $\left(\dfrac{x^2y^{-8}z^2}{xy^2z^{-6}}\right)^{-2}$

$\left(\dfrac{xz^8}{y^{10}}\right)^{-2}$

$\left(\dfrac{y^{10}}{xz^8}\right)^{2}$

$\boxed{\dfrac{y^{20}}{x^2z^{16}}}$

13. $x^4(-2x)^3(6x^0)^{-2}$

$x^4\cdot -8x^3\cdot \frac{1}{36}$

$\boxed{-\dfrac{2x^7}{9}}$

14. $\left[\left(\frac{3}{4}\right)^2+1\right]^{1/2}$

$\left(\frac{9}{16}+1\right)^{1/2}$

$\left(\frac{25}{16}\right)^{1/2}$

$\boxed{\frac{5}{4}}$

15. $72^{1/2}+98^{1/2}$

$\sqrt{72}+\sqrt{98}$

$\sqrt{36\cdot 2}+\sqrt{49\cdot 2}$

$6\sqrt{2}+7\sqrt{2}$

$\boxed{13\sqrt{2}}$

Part 3:

16. $3\sqrt{700}+2\sqrt{7}$

$3\sqrt{100\cdot 7}+2\sqrt{7}$

$30\sqrt{7}+2\sqrt{7}$

$\boxed{32\sqrt{7}}$

17. $\dfrac{4\sqrt{2}}{5}-\dfrac{3}{\sqrt{2}}$

$\dfrac{4\cdot\sqrt{2}^2-3\cdot 5}{5\sqrt{2}}$

$\dfrac{8-15}{5\sqrt{2}}$

$\dfrac{-7}{5\sqrt{2}}$

$\boxed{\dfrac{-7\sqrt{2}}{10}}$

18. $\sqrt{\dfrac{20}{27}}$

$\dfrac{\sqrt{20}}{\sqrt{27}}$

$\dfrac{2\sqrt{5}\cdot\sqrt{3}}{3\sqrt{3}\cdot\sqrt{3}}$

$\boxed{\dfrac{2\sqrt{15}}{9}}$

Part 4:

19. $3(x-7)+5=-2x-8$

$3(x-7)=-2x-13$

$3x-21=-2x-13$

$5x=8$

$\boxed{x=\frac{8}{5}}$

20. $\left(\frac{1}{4}+\frac{3}{8}y=\frac{3}{4}\right)8$

$2+3y=6$

$3y=4$

$\boxed{y=\frac{4}{3}}$

21. $\left(\frac{x+1}{3}+\frac{x+2}{7}=5\right)21$

$7(x+1)+3(x+2)=105$

$7x+7+3x+6=105$

$10x=92$

$x=\frac{92}{10}$

$\boxed{x=\frac{46}{5}}$

22. $z^2+z-12=0$

$(z+4)(z-3)=0$

$\boxed{z=-4,3}$

23. $x^2+3x=-1$

$x^2+3x+1=0$

$x=\frac{-3\pm\sqrt{(3)^2-4(1)(1)}}{2(1)}$

$\boxed{x=\frac{-3\pm\sqrt{5}}{2}}$

24. $(x+7)(x-1)=(x+1)^2$

$x^2+6x-7=x^2+2x+1$

$4x=8$

$\boxed{x=2}$

25. $\sqrt{15-2x}=x$

$15-2x=x^2$

$0=x^2+2x-15$

$0=(x+5)(x-3)$

$\boxed{x=-5,3}$

26. $|1-4t|=5$

$1-4t=5$

$-4t=4$

$\boxed{t=-1}$

$-(1-4t)=5$

$1-4t=-5$

$-4t=-6$

$\boxed{t=\frac{3}{2}}$

27. $\left|\frac{x}{3}+\frac{2}{5}\right|=2$

$15\left(\frac{x}{3}+\frac{2}{5}=2\right)$

$5x+6=30$

$5x=24$

$\boxed{x=\frac{24}{5}}$

$-\left(\frac{x}{3}+\frac{2}{5}\right)=2$

$15\left(\frac{x}{3}+\frac{2}{5}=-2\right)$

$5x+6=-30$

$5x=-36$

$\boxed{x=\frac{-36}{5}}$

28. $2\pi-x=\frac{5\pi}{3}$

$2\pi-\frac{5\pi}{3}=x$

$\boxed{x=\frac{\pi}{3}}$

29. $\left(\frac{x}{a}+\frac{x}{b}=c\right)ab$

$bx+ax=abc$

$x(b+a)=abc$

$\boxed{x=\frac{abc}{b+a}}$

30. $S=\frac{a}{1-r}$

$1-r=\frac{a}{S}$

$-r=\frac{a}{S}-1$

$\boxed{r=1-\frac{a}{S} \text{ or } r=\frac{S-a}{S}}$

Part 5:

31. $\begin{cases} 3b - a = -7 \\ 5a + 6b = 14 \end{cases}$ $\xrightarrow{\cdot 5}$ $-5a + 15b = -35$

$+\ 5a + 6b = 14$

$21b = -21$

$b = -1$

$3(-1) - a = -7$

$-3 - a = -7$

$-a = -4$

$a = 4$

$a = 4$, $b = -1$

32. $\begin{cases} 3x + 2y = 22 \\ 9x - 8y = -4 \end{cases}$ $\xrightarrow{\cdot 4}$ $12x + 8y = 88$

$+\ 9x - 8y = -4$

$21x = 84$

$x = 4$

$3(4) + 2y = 22$

$12 + 2y = 22$

$2y = 10$

$y = 5$

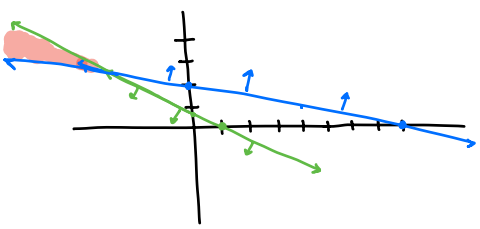
$(4, 5)$

Part 6:

33. $\begin{cases} 3x + 5y \le 3 \\ 4y + x \ge 8 \end{cases}$

$3x + 5y \le 3$: xint: $(1, 0)$, yint: $(0, 3/5)$

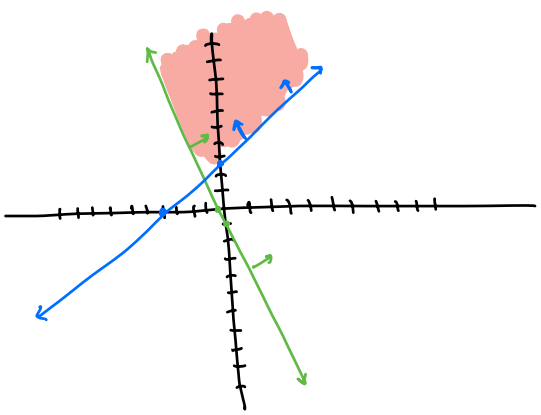
$4y + x \ge 8$: xint: $(8, 0)$, yint: $(0, 2)$



34. $\begin{cases} 9x + 3y \ge -3 \\ 2x - 3y \le -8 \end{cases}$

$9x + 3y \ge -3$: xint: $(-1/3, 0)$, yint: $(0, -1)$

$2x - 3y \le -8$: xint: $(-4, 0)$, yint: $(0, 8/3)$



35. $-5 < 4 - 3x \le 2$

$-5 < 4 - 3x$ AND $4 - 3x \le 2$

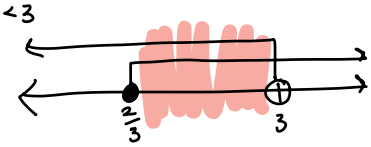
$-9 < -3x$

$3 > x$

$x < 3$

$-3x \le -2$

$x \ge \frac{2}{3}$



$\left[\frac{2}{3}, 3\right)$

Part 7:

36. $(4,-3)$ $(-6,4)$

$m = \frac{4+3}{-6-4}$

$\boxed{m = \frac{7}{-10}}$

37. $-2y - x = -2$

$-2y = -2 + x$

$y = 1 + \frac{-1}{2}x$

$\boxed{m = \frac{-1}{2}}$

38. $(-1,2)$ // to $y = 2x+4$

$m = 2$

$y - 2 = 2(x+1)$

$y - 2 = 2x + 2$

$\boxed{y = 2x + 4}$

39. $(4,5)$ $\perp$ to $y = 6x - 1$

$m_{\perp} = \frac{-1}{6}$

$y - 5 = -\frac{1}{6}(x-4)$

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

$y = -\frac{1}{6}x + \frac{2}{3} + \frac{15}{3}$

$\boxed{y = -\frac{1}{6}x + \frac{17}{3}}$

Part 8:

40. translated horizontally 3 units to right
translated vertically 4 units up

41. $y = \sin(2x + \pi) - 2$

$y = \sin\left(2\left(x + \frac{\pi}{2}\right)\right) - 2$

horizontally dilated by a scale factor of $1/2$., horizontally translated by $\pi/2$ to the left, vertically translated down 2 units.

42. Relation b/c $x = 3$ has 2 different outputs
$(3,10)$ and $(3,11)$

Part 9:

43. $\{(-1,2), (3,10), (-2,20), (3,11)\}$

$D: \{-2, -1, 3\}$

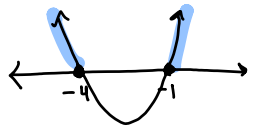
$R: \{2, 10, 11, 20\}$

44. $f(x) = \sqrt{x^2+5x+4}$

$x^2 + 5x + 4 \geq 0$

$(x+4)(x+1) \geq 0$

$x = -4$ $x = -1$



$\boxed{(-\infty, -4] \cup [-1, \infty)}$

45. $f(x) = \sqrt{25 - x^2}$

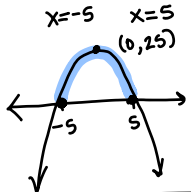
$D: 25 - x^2 \geq 0$

$-x^2 + 25 \geq 0$

$-(x^2 - 25) \geq 0$

$-(x+5)(x-5) \geq 0$

$x = -5$ $x = 5$



$\boxed{D: [-5, 5] \quad R: (-\infty, 25]}$

46. $f(x) = \frac{x-7}{x^2-1}$

$f(x) = \frac{x-7}{(x+1)(x-1)}$

$D: \{x \mid x \neq -1, 1\}$

HA: $y = 0$

VA: $x = 1$; $x = -1$

Part 10:

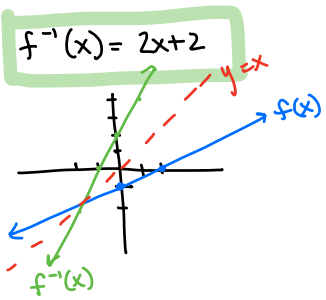
47. $f(x) = \frac{1}{2}x - 1$

$x = \frac{1}{2}y - 1$

$x + 1 = \frac{1}{2}y$

$2x + 2 = y$

$f^{-1}(x) = 2x + 2$



48. $f(x) = -2x + \frac{1}{2}$

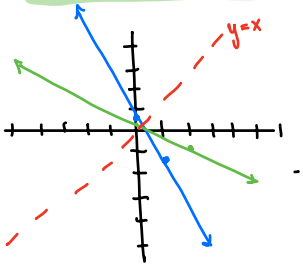
$x = -2y + \frac{1}{2}$

$2x = -4y + 1$

$2x - 1 = -4y$

$\frac{2x-1}{-4} = y$

$f^{-1}(x) = -\frac{1}{2}x + \frac{1}{4}$



$f(x) = \frac{2}{x+4}$ $\quad g(x) = x^2 - 4$

49. $f \circ g = f(g(x)) = \frac{2}{(x^2-4)+4}$

$= \boxed{\frac{2}{x^2}}$

50. $g \circ f = g(f(x)) = \left(\frac{2}{x+4}\right)^2 - 4$

$= \frac{4}{x^2+8x+16} - 4$

$= \frac{4 - 4(x^2+8x+16)}{x^2+8x+16}$

$= \frac{4 - 4x^2 - 32x - 64}{x^2+8x+16}$

$= \boxed{\frac{-4(x^2+8x+15)}{(x^2+8x+16)}}$

Part 11:

51. $9y^2 - 900$

$9(y^2 - 100)$

$\boxed{9(y+10)(y-10)}$

52. $4xy^2 - 4xz^2$

$4x(y^2 - z^2)$

$\boxed{4x(y+z)(y-z)}$

53. $x^2 - 7x + 6$

$\boxed{(x-6)(x-1)}$

54. $12a^2 + 36a + 27$

$3(4a^2 + 12a + 9)$

$\boxed{3(2a+3)^2}$

55. $3x^3 - 15x + 2x^2y - 10y$

$3x(x^2 - 5) + 2y(x^2 - 5)$

$\boxed{(x^2-5)(3x+2y)}$

Part 12:

56. $\frac{x^2+6x+8}{x^2-4x+3} \cdot \frac{x^2-5x+4}{5x+10}$

$\frac{(x+4)(x+2)}{(x-3)(x-1)} \cdot \frac{(x-4)(x-1)}{5(x+2)}$

$\boxed{\frac{x^2-16}{5x-15}}$

57. $\frac{x^2+8x}{9x} \div \frac{x^2-64}{3x^2}$

$\frac{x(x+8)}{3 \cdot 3x} \cdot \frac{3x^2}{(x+8)(x-8)}$

$\boxed{\frac{x^2}{3x-24}}$

58. $\frac{4}{x^2+5x+6} + \frac{2x}{x+2}$

$\frac{4}{(x+2)(x+3)} + \frac{2x(x+3)}{(x+2)(x+3)}$

$\frac{4+2x^2+6x}{(x+2)(x+3)}$

$\frac{2(x^2+3x+2)}{(x+2)(x+3)}$

$\frac{2(x+2)(x+1)}{(x+2)(x+3)}$

$\boxed{\frac{2x+2}{x+3}}$

59. $\frac{3}{x-1} - \frac{2}{x-2}$

$\frac{3(x-2)-2(x-1)}{(x-1)(x-2)}$

$\frac{3x-6-2x+2}{(x-1)(x-2)}$

$\boxed{\frac{x-4}{(x-1)(x-2)}}$

Part 13:

60. 

$\frac{180-46}{2} = \boxed{67°}$

61. 

180 − 32 = 148

$\boxed{32°, 148°, 148°}$

62. 

$x, x\sqrt{3}, 2x$

18

$18 = x\sqrt{3}$

$\frac{18}{\sqrt{3}} = x$

$\frac{18\sqrt{3}}{3} = x$

$x = 6\sqrt{3}$

$\boxed{6\sqrt{3}\text{ cm}}$
$\boxed{12\sqrt{3}\text{ cm}}$

63. 

$x, x\sqrt{3}, 2x$

$\frac{3}{2}, \frac{3\sqrt{3}}{2}, 3$

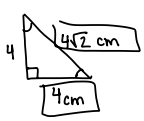
$\boxed{\frac{3}{2}\text{ in}, \frac{3\sqrt{3}}{2}\text{ in}}$

64. 

$x, x, x\sqrt{2}$

$9, 9, 9\sqrt{2}$

$\boxed{9\text{ cm}}$
$\boxed{9\sqrt{2}\text{ cm}}$

65. 

66. 

$C = 2\pi r$

$C = 2\pi(6)$

$\boxed{C = 12\pi\text{ cm}}$

67.

Part 14:

68. $r = 6$

$A = \pi r^2$

$A = \pi(6)^2$

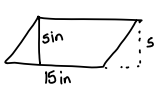
$\boxed{A = 36\pi\text{ cm}^2}$

69. 

$A = \frac{1}{2}bh$

$A = \frac{1}{2}(17)(4)$

$\boxed{A = 34\text{ cm}^2}$

70. 

$A = bh$

$A = 15 \cdot 5$

$\boxed{A = 75\text{ in}^2}$

Part 15:

SohCahToa

71. $\sin A = \frac{4}{5}$ $\cos A = \frac{3}{5}$ $\tan A = \frac{4}{3}$

72. $\sin A = \frac{4}{5}$

$A = \sin^{-1}\left(\frac{4}{5}\right)$

$\boxed{A = 53.13°}$

73. $30° = \frac{\pi}{6}$ rad

$45° = \frac{\pi}{4}$ rad

$60° = \frac{\pi}{3}$ rad

$90° = \frac{\pi}{2}$ rad

74. 

$A = \frac{1}{2}bh$

$24 = \frac{1}{2}(3x)(4x)$

$24 = 6x^2$

$4 = x^2$

$x = \pm 2$

$\boxed{x = 2}$

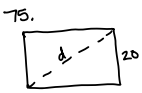


$\cos A = \frac{6}{10}$

$\boxed{\cos A = \frac{3}{5}}$

$\cos C = \frac{8}{10}$

$\boxed{\cos C = \frac{4}{5}}$

75. 

$d = \sqrt{(20)^2 + (30)^2}$

$\boxed{d = 36.056\text{ in.}}$