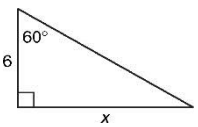
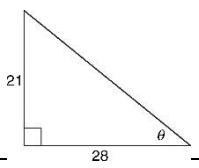
Algebra II Standards Guide

Graded Standard	Aligned Content Standards	Sample Problem
Sequences and Series		
1) Be able to deduce recursive and explicit formulas from a pattern and find the nth term in a sequence	F.IF.A.3, F.BF.A.1, F.BF.A.2, HS.M	Find the explicit formula for the pattern below and find the 17th term: -2, 4, -8, 16, -32…
2) Be able to use series to find the cumulative sum given the term of a sequence	F.IF.A.3, F.BF.A.1, F.BF.A.2, A.SSE.4, HS.M	$\sum_{1}^{12}(3+4k)$
Quadratic Functions		
3) Be able to graph quadratic functions including all important information (intercepts, maxima, minima, etc.)	F.IF.7, F.IF.7A, F.BF.3	Graph the function below and label intercepts, axis of symmetry and maxima/minima: $f(x) = -2x^2 + 8x + 5$
4) Be able to solve quadratic functions	F.IF.8A, A.REI.4, A.REI.4B, A.CED.2, A.CED.3, HS.M	Find the zeros of the function below: $f(x) = 2x^2 - 16x + 27$
Complex Numbers		
5) Be able to operate with complex numbers	N.CN.1, N.CN.2, N.CN.3	Simplify each expression below: a) $\lvert 2+3i \rvert$ b) $(4+i)+(-3i)$ c) $(7-5i)(-3+9i)$ d) $\frac{5-2i}{3+i}$ e) i^{27}
6) Be able to find all the roots (real and complex) of a function	N.CN.3, N.CN.7, N.CN.8, N.CN.9	Find all the roots of the equation below: $x^2 + 10x + 29$
Working with Polynomials		
7) Be able to use mathematical operations (addition, subtraction, multiplication, and division) to simplify polynomial functions	A.APR.1, A.APR.5	Simplify each expression: a) $(4x^2-2)(3x^2+1)$ b) $\frac{2x^3-10x^2+x-5}{x-5}$
8) Be able to identify and find all real and complex zeros of a polynomial function	A.APR.3, N.CN.9, A.APR.2, HS.M	Identify all the roots of the equation: $x^4 - 2x^3 - 14x^2 - 2x - 15 = 0$
9) Be able to graph polynomial functions including all important information (intercepts, maxima, minima, etc.)	F.IF.7C, F.BF.3, F.IF.4	Graph the function below and label intercepts and maxima/minima: $g(x) = x^3 + 2x^2 - 3x - 6$
Exponents and Logarithms		

10) Be able to find the inverse of a function	F.BF.4	Find the inverse of the function below: $f(x) = \frac{3x+1}{6}$
11) Be able to graph exponential and logarithmic functions	F.BF.3, F.IF.7E, F.LE.3, F.IF.4, F.BF.1	Graph the functions below: a) $f(x) = 5(2)^x$ b) $f(x) = 3 + \ln x$
12) Be able to solve exponential and logarithmic functions	F.LE.1, F.LE.4, F.BF.4, F.BF.5, HS.M	Solve and check each of the equations below: a) $3^{5x} = 27^{2x+1}$ b) $\log_5 x^3 = 15$
13) Be able to use properties of exponents and logarithms to simplify and expand expressions	F.BF.5, A.SSE.B.3, F.I.E.4	a) Express as a single logarithm: $2\log_2 a + \log_2 b - \frac{1}{2}\log_2 c$ b) Expand the expression: $\ln_3 \frac{c^2 d^3}{\sqrt[3]{w}}$
Rational		
14) Be able to perform mathematical operations (addition, subtraction, multiplication, and division) on rational expressions	A.APR.7	Simplify each expression: a) $\frac{x-1}{x^2-4} + \frac{3x}{x+2}$ b) $\frac{\frac{4x+16}{2x+6}}{\frac{x^2+2x-3}{x+4}}$
15) Be able to graph rational functions including all important information (asymptotes and zeros)	F.BF.3, IF.C.7.D	Graph the function below labeling asymptotes, holes and zeros: $f(x) = \frac{x-4}{x^2-5x+4}$
16) Be able to solve rational equations	A.APR.7, F.BF.3, IF.C.7.D	Find and check the solutions for the equation below: $\frac{2}{d+2} + \frac{8}{d-2} = \frac{14}{d^2-4}$
Radical Functions		
17) Be able to graph radical functions	F.BF.3, IF.C.7.B	Graph the equations below: a) $f(x) = 2\sqrt{x+1}$ b) $g(x) = \sqrt[3]{x} - 1$
18) Be able to simplify and solve radical equations	A.CED.1, A.REI.2	Solve and check your solutions to each equation below: a) $\sqrt{2x+5} = \sqrt{3x-1}$ b) $\sqrt[3]{x-6} = \sqrt[3]{3x+24}$ c) $4(x-3)^{\frac{1}{2}} = 8$
Familiarity with Functions		
19) Be able to graph and evaluate piecewise functions	F.IF.7.B, F.BF.3	For the function below: $f(x) = \begin{cases} -2x-3 \text{ when } x < 0 \\ 5 \text{ when } 0 \le x < 5 \\ x^2 - 8 \text{ when } x \ge 5 \end{cases}$ a) Evaluate when x = -2, 2, 5 b) Graph the function

<table>
<tr><td>20) Be able to create and evaluate composite functions by combining multiple functions</td><td>F.BF.1</td><td>Find each of the following composites and evaluate when x equals 2:
a) $(fh)(x)$
b) $\left(\frac{f}{g}\right)(x)$
c) $(f \circ g)(x)$</td></tr>
<tr><td>21) Be able to solve non-linear inequalities</td><td>A.REI.11, IF.C.7</td><td>Find the solutions to each inequality using a graph:
a) $x^2 + 3x - 14 \leq 14$
b) $2^{x-5} < 64$
c) $\left(\frac{6}{x+1}\right) < -3$</td></tr>
<tr><td>22) Be able to choose the appropriate parent function to create regression equations from data</td><td>A.CED.2, F.IF.4, F.IF.7, F.BF.1, F.BF.6, HS.M</td><td>Using the data below, find the equation that best models the and report your R^2:
<table><tr><td>x</td><td>0.10</td><td>0.37</td><td>0.82</td><td>1.45</td><td>2.26</td></tr><tr><td>y</td><td>0.32</td><td>0.55</td><td>0.92</td><td>1.18</td><td>1.44</td></tr></table></td></tr>
<tr><td colspan="3">Experimental Probability</td></tr>
<tr><td>23) Be able to use Permutations and Combinations to compute probability of compound events</td><td>S.CP.9, S.CP.7</td><td>Find the total number of possibilities:
a) The soccer team is silk-screening T-shirts. They have 4 different colors of T-shirts and 2 different colors of ink. How many different T-shirts can be made using one ink color on a T-shirt?
b) ${}_5P_4$
c) ${}_3C_2$</td></tr>
<tr><td>24) Be able to describe an event, its sample size, dependence and complements in terms of probability</td><td>S.CP.2, S.CP.3, S.CP.8, S.MD.6, S.CP.5</td><td>Determine the probability of each situation:
a) Rolling a 4 on a die, followed by another 4
b) Drawing a red card from a deck followed by a King without replacing
c) Drawing two red cards in a row with replacement</td></tr>
<tr><td>25) Be able to create and interpret a two-way frequency table</td><td>S.CP.4, S.CP.6</td><td>The table below shows the number of students who would drive to school if the school provided parking spaces.
<table><tr><td></td><td>Lower Class</td><td>Upper Class</td></tr><tr><td>Always</td><td>32</td><td>122</td></tr><tr><td>Sometimes</td><td>58</td><td>44</td></tr><tr><td>Never</td><td>24</td><td>120</td></tr></table>Create a table of joint and marginal relative frequencies</td></tr>
</table>

<table>
<tr><td colspan="3">Data Analysis</td></tr>
<tr><td>26) Be able to compare data using measures of center and spread</td><td>S.ID.2, S.ID.3, S.ID.4</td><td>Given the data set:
$\{19, 23, 17, 20, 25, 19, 15, 22\}$
a) Create a box-and-whisker plot
b) What is the standard deviation?
c) Are there any outliers? How do you know?</td></tr>
<tr><td>27) Be able to recognize and use proper sampling techniques to properly gather data</td><td>S.IC.1, S.IC.3</td><td>Given the situation below design a study to reach the goal and show proper sampling techniques:
a) A school wants to gauge teacher morale
b) A doctor wants to know whether a drug has an effect on his patients.</td></tr>
<tr><td>28) Be able to analyze distribution and test the significance of data as an estimate of the population</td><td>S.ID.9, S.IC.2, S.IC.4, S.IC.5, S.IC.9, S.MD.4</td><td>A school is testing a new curriculum in raising exam scores. The data below shows the two groups.
<table><tr><td>Control</td><td>Test</td></tr><tr><td>72</td><td>97</td></tr><tr><td>87</td><td>88</td></tr><tr><td>72</td><td>82</td></tr><tr><td>78</td><td>90</td></tr><tr><td>90</td><td>79</td></tr></table>Using the data above:
a) State the null hypothesis
b) Use a t-test to determine if there the treatment had an effect.</td></tr>
<tr><td colspan="3">Conics</td></tr>
<tr><td>29) Be able to derive and use the equations for a circle, parabola, ellipse and hyperbola</td><td>G.GPE.1, G.GPE.2, G.GPE.3</td><td>For each equation below, identify the conic section, complete the square to put in standard form and graph.
a) $y^2 + 8x + 2y + 57 = 0$
b) $x^2 + y^2 - 4x + 4y - 17 = 0$
c) $x^2 - 9y^2 + 2x + 18y - 17 = 0$
d) $x^2 + 4y^2 - 2x - 16y + 1 = 0$</td></tr>
<tr><td colspan="3">Trigonometry</td></tr>
<tr><td>30) Be able to use right triangle trigonometry to calculate angles and sides of triangles</td><td>G.SRT.6, G.SRT.7, G.SRT.8, F.TF.6, F.TF.7</td><td>Solve each triangle below:
a)
 

b)
 
</td></tr>
</table>

31) Be able to use radian measure and the Unit Circle to find exact values of angles	F.TF.1, F.TF.2, F.TF.3, F.TF.4	Convert each below: a) Convert $\frac{5\pi}{2}$ radians to degrees b) Convert $215°$ to radians Find the exact value of: c) $\cos\frac{2\pi}{3}$ d) $\sin 315°$ e) $\tan\frac{11\pi}{6}$