Grand County School District

Secondary Math PLC

Math 3 Exemplar

Table of Contents

Scope and Sequence Secondary Math III

1st Trimester

Unit 1: Polynomials
Apply and extend previous understandings of polynomial functions to factor, solve, graph and interpret new higher degree polynomials.

N.CN.8(+), N.CN.9(+), A.APR.1, A.APR.2, A.APR.3, A.APR.4, A.APR.5(+),A.APR.6, A.APR.7(+), F.IF.7, A.REI.11

Unit 2: Rational Functions
Apply and extend knowledge of polynomial functions and manipulation to add, subtract, multiply, divide, solve and graph rational expressions. Introduction to inverse variation.

A.REI.11, A.SSE.1, F.BF.1, F.BF.3

Unit 3: Radicals and Rational Exponents
Apply and extend previous understandings of radical and root expressions. Simplify, exact notation, manipulate radicals and solve rational exponent expression. Graph radicals.

F.BF.3

2nd Trimester

Unit 4: Exponential Expressions and Logarithms
Introduce exponential growth and decay, exponential expressions, logarithms, properties of both the inverse relationship involved in solving them. Use natural logs and introduction to patterns.

F.BF.1, F.BF.3, F.LE.4

Unit 5: Patterns
Introduction to Series and Sequence notation, Pythagorean Triples, Binomial Expansion, Pascal's Triangle, Infinite Series, Natural Symmetry and re-writing expressions.

A.SSE.1, A.SSE.2, A.SSE.4, A.APR.4, A.APR.5(+)

Unit 6: Functions
Use previous knowledge and understanding to discuss the nature of functions (polynomial, linear, absolute value, exponential, periodic).

A.CED.1, A.CED.2, A.CED.3, A.CED.4

Use operations between functions, including composition, inverse functions and inequalities and how they are used in the real world.

F.BF.4

Use the parent graphs of each family of functions (compare and contrast) and rules for the translations, dialations, reflections and transforms.

F.IF.7, F.IF.8, F.IF.9, F.IF.4, F.IF.5, F.IF.6, F.BF.1, F.BF.3

3rd Trimester

Unit 7: Trigonometry
Use previous experience with right triangles to extend knowledge of trigonometric functions. Introduce measure of rotation (unit circle) and to emphasize the connection between the unit circle and right triangles.

F.TF.1, F.FT.2, F.TF.3, F.TF.5

Define the area of a right triangle (half-square)

G.SRT.9(+)

Discuss and solve non-right triangles (Law of Sines and Cosines) and use the information to solve for the area of the triangle.

G.SRT.10(+), G.SRT.11(+)

Unit 8: Geometry
Apply and extend previous understandings of 2D and 3D shapes to cross-section and generation by rotation. Use parameters of shapes to improve modeling estimates and calculate density and introduce geometric design.

G.GMD.4, G.MG.1, G.MG.2, GMG.3

Unit 9: Statistics
Apply and extend previous knowledge of statistical methods to incorporate experiment design and analysis. Emphasis placed on normal distribution and sampling methods. Use probability to extend data analysis and inferences.

S.ID.4, S.IC.1, S.IC.2, S.IC.3, S.IC.4, S.IC.5, S.IC.6(+), S.MD.7(+)

Math 3 Scope and Sequence

Topic	Content	Skills	Standards	Time
Review	Quadratic equations, properties of exponents, simple geometery, right triangles	Solving, factoring, graphing equations. Solving right triangles and properties of simple 2D and 3D shapes, calculator review,		5 days
Polynomials	Perform arithmetic operations on polynomials	Add, subtract and multiply polynomials	A.APR.1 N.CN.8(+) N.CN.9(+)	1day
	Synthetic Substitution/Division	Divide polynomials using syntheitic division and polynomial long division	A.APR.6	1 day
	End Behavoir of polynomials	Graph behavoir using rules and observation of polynomial equations	A.APR.3 F.IF.7	1 day
	Understand the relationship between zeros and factors of polynomials	Factoring and solving high order (greater than quadratic) polynomial equations. [Factor by grouping, Sum/Difference of Cubes, U-sub, rational zeros and synthetic substitution, Descartes Rule of Signs, Fundamental Theorem of Algebra]. Use all to aid in explaining graphical representations for polynomial expressions	A.APR.2 A.APR.3 A.APR.4 F.IF.7 N.CN.8(+) N.CN.9(+)	10 days
Rational Functions	Inverse Variation	Recognize a rational expression, apply inverse variation structure to word problems, graph simple inverse variation relations.	A.SSE.1 F.IF.4 F.BF.1	2 days
	Graphically represent rational expressions	Graph linear rational expressions, understanding asymptotes	A.APR.6 A.APR.7	2 days
		Graph non-linear rational expressions, identitfy branches, asymptotes, intercepts, holes, understanding concept of limits	A.APR.7	4 days
	Re-write Rational Expressions	Simplifying rational expressions, multiplying and dividing to create a new expression	A.APR.6	2 days
		Add, subtract and solve rational expressions (understanding of an LCD)	A.REI.2 A.APR.7	4 days

Math 3 Scope and Sequence

Radicals and Rational Exponents	Radicals	Simplify radical expressions with coefficents and variables		1 day
	Operations with radicals	Add, Subtract, Multiply, and Divide radicals (square and cube roots)		2 days
	Graph radical expressions	graph square and cube root functions	F.BF.3	2 days
	Radical expressions	Solving radical expressions for a variable		1 day
	Rational Exponents	Review properties of exponents, operations with fractions, order of operations. Negative exponentsSimplify simple rational exponent expressions		2 days
	Solving rational exponent equations	solve for a variable given a rational exponent equation		2 days
Exponential Expressions and Logarithms	Graph exponential functions	Growth and Decay, Interest, compound interest		3 days
	Re-write exponential equations using logarithms	Relationship between exponentials and logs, idea of base	F.LE.4	1 day
	Evalute logs	properties of logs, expand and condense, using the calculator to evaluate	F.LE.4	3 days
	Solve problems with logarithms	Solve exponential expressions using logs, solve logarithmic expressions using exponentials	F.BF.5	2 days
Patterns	Structure of expressions	re-write polynomials, exponentials and rational functions using notation equvialences	A.SSE.2 A.SSE.4	2 days
	Patterns (well known and historical)	Pascal's Triangles, Pythagorean triples, Binomial Theorem, introduction to series	A.SSE.1 A.SSE.4	3 days
	Series and Sequences	Geometric vs Arithmetic, Infinite Series, Fibonoci Series	A.APR.4 A.APR.5(+)	4 days
Functions	Operations with functions	Add, subtract, multiply and divide polynomials, exponentials, radicals and logarithms. Compostion	F.BF.4	3 days

Math 3 Scope and Sequence

	Inverse Functions	Use composition to prove funtions are inverses	F.BF.4	2 days
	Parent functions	Recognize the behavoir of a function (graphically) intuitively. Identitify translations, dialations, transforms, reflextions for each function in equation form. Compare properties of functions.	F.IF.7, F.IF.8, F.IF.9, F.IF.4, F.IF.5, F.IF.6 F.BF.1 F.BF.3 A.CED.1 A.CED.2 A.CED.3 A.CED.4	7 days
	Average rate of change	Slope at any point along a non-linear graph, idea of continuous change along a graph	F.IF.6	3 days
	Solve systems of equations	graph a system of equations and analyze the graph for solutions. Solve systems by substitution	A.REI.11	3 days
Trigonmetry	Right Triangle Trigonometry	Review from Math 2, definition of the 6 Trig functions. Solve for the missing side, solve for a missing angle, inverse trig functions		6 days
	Unit Cirle	Measure of rotation, exact notation, radians to degrees conversion, coterminal angles, reference angles, special triangles	F.TF.1 F.TF.2 F.TF.3	8 days
	Periodic Functions	Define and identitify amplitude, period, frequency. Graph 3 main trig functions. Apply to periodic (cyclical) problems.	F.TF.5	4 days
Geometry	Area of triangles	Law of Sines, Law of Cosines, Area of a right triangle, area of non-right triangles. Perimeter of triangles	G.SRT.9 G.SRT.10 G.SRT.11	5 days

	Relationships between 2D and 3D objects	Volume, surface area, lateral area, perimeter and identity of solids. Cross-sections and 3D generation by rotation in a coordinate plane.	G.GMD.4	5 days
	Apply geometric content in modeling situations	Approximating shapes appropriately, including density and velocity definitions into each and solving design problems	G.MD.1 G.MD.2 G.MD.3	4 days
Statistic	Summerize, represent and interpret data on a single count or measurement variable	Use mean, median and mode appropriately to calculate IQR and Standard deviation. Compute and understand a normal distribution (standardized).	S.ID.4	3 days
	Understand and evaluate random processes underlying statistical data	Sampling methods and how each should be applied. Experiment parameters, outliers and their significance to analysis. Consistancy of models and processes. How to analyze bias.	S.IC.1 S.IC.2 S.IC.3 S.IC.4 S.IC.5 S.IC6	8 days

Utah CORE Math Curriculum Standards Map

Secondary III

Critical Areas	Clusters	Standard	Areas of Concern	Activities
Unit 1 Inferences and Conclusions From Data	**Summarize, represent, and interpret data on single count or measurement variable**. *While students may have heard of the normal distribution, it is unlikely that they will have prior experience using it to make specific estimates. Build on students' understanding of data distributions to help them see how the normal distribution uses area to make estimates of frequencies (which can be expressed as probabilities). Emphasize that only some data are well described by a normal distribution.*	**S.ID.4** Use the mean and standard deviation of a data set to fit it to a normal distribution and to estimate population percentages. Recognize that there are data sets for which such a procedure is not appropriate. Use calculators, spreadsheets, and tables to estimate areas under the normal curve	Review formulas for standard deviation Vocabulary Calculator use	Review statistical methods (mean, median, mode, IQR, Std Dev using data set) Discuss normal distribution as unique entity Bring example of a normal distribution to class (HW)
	Understand and evaluate random processes underlying statistical experiments. *For S.IC.2, include comparing theoretical and empirical results to evaluate the effectiveness of a treatment.*	**S.IC.1** Understand that statistics allows inferences to be made about population parameters based on a random sample from that population. **S.IC.2** Decide if a specified model is consistent with results from a given data-generating process, e.g., using simulation. For example, a model says a spinning	Sampling Methods Cross-curricular with science, health, social studies	Using class, develop instances where each sampling would be used. Mini-survey

		coin falls heads up with probability 0.5. Would a result of 5 tails in a row cause you to question the model?		
	Make inferences and justify conclusions from sample surveys, experiments, and observational studies. *In earlier grades, students are introduced to different ways of collecting data and use graphical displays and summary statistics to make comparisons. These ideas are revisited with a focus on how the way in which data is collected determines the scope and nature of the conclusions that can be drawn from that data. The concept of statistical significance is developed informally through simulation as meaning a result that is unlikely to have occurred solely as a result of random selection in sampling or random assignment in an experiment.* *For S.IC.4 and 5, focus on the variability of results from experiments—that is, focus on statistics as a way of dealing with, not eliminating, inherent randomness.*	**S.IC.3** Recognize the purposes of and differences among sample surveys, experiments, and observational studies; explain how randomization relates to each. **S.IC.4** Use data from a sample survey to estimate a population mean or proportion; develop a margin of error through the use of simulation models for random sampling. **S.IC.5** Use data from a randomized experiment to compare two treatments; use simulations to decide if differences between parameters are significant. **S.IC.6** Evaluate reports based on data	Cross-curricular work Formal write-up of processes Statistical reporting (not simply conclusions) Need sample/model of report	Write up of mini-survey Selection of School Survey project (groups) Formal write up
	Use probability to evaluate outcomes of decisions *Extend to more complex probability models. Include situations such as those involving quality control or diagnostic tests that yield both false positive and false negative results.*	**S.MD.6 (+)** Use probabilities to make fair decisions (e.g., drawing by lots, using a random number generator). **S.MD.7 (+)** Analyze decisions and strategies using probability concepts (e.g., product testing, medical testing, pulling a hockey goalie at the end of a game).	Cross-curricular	Review basic probability Integrate into School Survey results
Unit 2 Polynomials,	**Use complex numbers in polynomial**	**N.CN.8 (+)** Extend polynomial identities to the	Primarily review Proficiency with	REVIEW MATH II

Radical and Rational Relationships	**identities and equations**. *Build on work with quadratic equations in Secondary II. Limit to polynomials with real coefficients.*	complex numbers. For example, rewrite X^2+4 as $(x+2i)(x-2i)$. **N.CN.9 (+)** Know the Fundamental Theorem of Algebra; show that it is true for quadratic polynomials.	quadratics Include inequalities	
	Interpret the structure of expressions. *Extend to polynomial and rational expressions*.	**A.SSE.1** Interpret expressions that represent a quantity in terms of its context. a. Interpret parts of an expression, such as terms, factors, and coefficients. b. Interpret complicated expressions by viewing one or more of their parts as a single entity. For example, interpret $P(1+r)^n$ as the product of P and a factor not depending on P. **A.SSE.2** Use the structure of an expression to identify ways to rewrite it. For example, see X^4-y^4 as $(x^2)^2-(y^2)^2$, thus recognizing it as a difference of squares that can be factored as $(x^2-y^2)(x^2+y^2)$.	Vocabulary Patterns	
	Write expressions in equivalent forms to solve problems. *Consider extending A.SSE.4 to infinite geometric series in curricular implementations of this course description.*	**A.SSE.4** **Derive the formula** for the sum of a geometric series (when the common ratio is not 1), and use the formula to solve problems. For example, calculate mortgage payments. �	Recursive and explicit forms of equations	

	Perform arithmetic operations on polynomials. *Extend beyond the quadratic polynomials found in Secondary II.*	**A.APR.1** Understand that polynomials form a system analogous to the integers; namely, they are closed under the operations of addition, subtraction, and multiplication; add, subtract, and multiply polynomials.	Similar terms Concepts of set theory?? **Check SAGE for standard**	REVIEW MATH II
	Understand the relationship between zeros and factors of polynomials.	**A.APR.2** Know and apply the Remainder Theorem: For a polynomial p(x) and a number a, the remainder on division by x – a is p(a), so p(a) = 0 if and only if (x – a) is a factor of p(x). **A.APR.3** Identify zeros of polynomials when suitable factorizations are available, and use the zeros to construct a rough graph of the function defined by the polynomial.	Graphing Fundamental Theorem of Algebra	
	Use polynomial identities to solve problems. *This cluster has many possibilities for optional enrichment, such as relating the example in A.APR.4 to the solution of the system* $u^2 + v^2 = 1$, $v = t(u+1)$, *relating the Pascal triangle property of binomial coefficients to* $(x+y)^{n+1} = (x+y)(x+y)^n$, *deriving explicit formulas for the coefficients, or proving the binomial theorem by induction.*	**A.APR.4** Prove polynomial identities and use them to describe numerical relationships. For example, the polynomial identity $(x^2+ y^2)^2 = (x^2 – y^2)^2 + (2xy)^2$ can be used to generate Pythagorean triples. **A.APR.5 (+)** Know and apply the Binomial Theorem for the expansion of $(x + y)^n$ in powers of x and y for a positive integer n, where x and y are any numbers, with coefficients determined, for example, by Pascal's Triangle.	Patterns Pascal's Triangle Combinations & Permutations	
	Rewrite rational expressions. *The limitations on rational functions apply to the rational expressions in A.APR.6.* *A.APR.7 requires the general division*	**A.APR.6** Rewrite simple rational expressions in different forms; write a(x)/b(x) in the form q(x) + r(x)/b(x), where a(x), b(x), q(x), and r(x) are polynomials with the degree of r(x) less than the degree of b(x), using inspection, long division, or, for the more complicated examples, a computer	Synthetic division/substitut ion	

	algorithm for polynomials.	algebra system. **A.APR.7 (+)** Understand that rational expressions form a system analogous to the rational numbers, closed under addition, subtraction, multiplication, and division by a nonzero rational expression; add, subtract, multiply, and divide rational expressions.		
	Understand solving equations as a process of reasoning and explain the reasoning. *Extend to simple rational and radical equations*.	**A.REI.2** Solve simple rational and radical equations in one variable, and give examples showing how extraneous solutions may arise.	Applications Checking solutions in original solutions	
	Represent and solve equations and inequalities graphically. *Include combinations of linear, polynomial, rational, radical, absolute value, and exponential functions.*	**A.REI.11** Explain why the x-coordinates of the points where the graphs of the equations $y = f(x)$ and $y = g(x)$ intersect are the solutions of the equation $f(x) = g(x)$; find the solutions approximately, e.g., using technology to graph the functions, make tables of values, or find successive approximations. Include cases where f(x) and/or g(x) are linear, polynomial, rational, absolute value, exponential, and logarithmic functions.		
	Analyze functions using different representations. *Relate F.IF.7c to the relationship between zeros of quadratic functions and their factored forms.*	**F.IF.7** Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases. Graph polynomial functions, identifying zeros when suitable factorizations are available, and showing end behavior.		

Unit3: Trigonometry of General Triangles and Trigonometric Functions	**Apply trigonometry to general triangles.** *With respect to the general case of the Laws of Sines and Cosines, the definitions of sine and cosine must be extended to obtuse angles.*	**G.SRT.9 (+)** Derive the formula A = 1/2 ab sin(C) for the area of a triangle by drawing an auxiliary line from a vertex perpendicular to the opposite side. **G.SRT.10 (+)** Prove the Laws of Sines and Cosines and use them to solve problems. **G.SRT.11 (+)** Understand and apply the Law of Sines and the Law of Cosines to find unknown measurements in right and non-right triangles (e.g., surveying problems, resultant forces).	Oblique triangles Applications Problem solving methods – sketching, draw pictures, break sown to smaller tasks	
	Extend the domain of trigonometric functions using the unit circle.	**F.TF.1** Understand radian measure of an angle as the length of the arc on the unit circle subtended by the angle. **F.TF.2** Explain how the unit circle in the coordinate plane enables the extension of trigonometric functions to all real numbers, interpreted as radian measures of angles traversed counterclockwise around the unit circle. **F.TF.3** Use special triangles to determine geometrically the values of sine, cosine, tangent for $\pi/3$, $\pi/4$ and $\pi/6$, and use the unit circle to express the values of sine, cosine, and tangent for $\pi - x$, $\pi + x$, and $2\pi - x$ in terms of their values for x, where x is any real number.	Measurement of rotation: positive & negative angles Convert radians-degrees; degrees-radians for these triangles	

	Model periodic phenomena with trigonometric functions	**F.TF.5** Choose trigonometric functions to model periodic phenomena with specified amplitude, frequency, and midline. ⍰	Applications: music, sound, light, electricity Coordinate with science class (physical science and Physics)	

Unit 4: Mathematical Modeling	**Create equations that describe numbers or relationships.** *For A.CED.1, use all available types of functions to create such equations, including root functions, but constrain to simple cases. While functions used in A.CED.2, 3, and 4 will often be linear, exponential, or quadratic the types of problems should draw from more complex situations than those addressed in Secondary Mathematics I. For example, finding the equation of a line through a given point perpendicular to another line allows one to find the distance from a point to a line. Note that the example given for A.CED.4 applies to earlier instances of this standard, not to the current course*	**A.CED.1** Create equations and inequalities in one variable and use them to solve problems. Include equations arising from linear and quadratic functions, and simple rational and exponential functions. **A.CED.2** Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales. **A.CED.3** Represent constraints by equations or inequalities, and by systems of equations and/or inequalities, and interpret solutions as viable or non-viable options in a modeling context. For example, represent inequalities describing nutritional and cost constraints on combinations of different foods. **A.CED.4** Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations. For example, rearrange Ohm's law V = IR to highlight resistance R.	**Projects** – students research and present applications of all mathematics studied **Capstone Project??** Collect data, analyze data, model with graphs, draw conclusions Stories, using specific types of equations Lab reports Argumentative essays "Real world" use of complex numbers – research/report Solving formulas for specified quantities	

	Interpret functions that arise in applications in terms of a context. *Emphasize the selection of a model function based on behavior of data and context.*	**F.IF.4** For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship. Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicity. **F.IF.5** Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes. For example, if the function h(*n*) gives the number of person-hours it takes to assemble *n* engines in a factory, then the positive integers would be an appropriate domain for the function**.** **F.IF.6** Calculate and interpret the average rate of change of a function (presented symbolically or as a table) over a specified interval. Estimate the rate of change from a graph.	Introduced in Core 2 Extend/ reinforce Applications	

	Analyze functions using different representations. *Focus on applications and how key features relate to characteristics of a situation, making selection of a particular type of function model appropriate.*	**F.IF.7** Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases. a. Graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions. b. Graph exponential and logarithmic functions, showing intercepts and end behavior, and trigonometric functions, showing period, midline, and amplitude. **F.IF.8** Write a function defined by an expression in different but equivalent forms to reveal and explain different properties of the function. **F.IF.9** Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions). For example, given a graph of one quadratic function and an algebraic expression for another, say which has the larger maximum.	Know the "basic" functions and their graphs Parent graphs End-behavior; x- & y-intercepts; relative minimums and maximums; absolute min/max	
	Build a function that models a relationship between two quantities. *Develop models for more complex or sophisticated situations than in previous courses.*	**F.BF.1** Write a function that describes a relationship between two quantities. Combine standard function types using arithmetic operations. For example, build a function that models the temperature of a cooling body by adding a constant function to a decaying exponential, and relate these functions to the model.	Regression equations Scatter plots: decide type of function that best models the data	

	Build new functions from existing functions. *Use transformations of functions to find more optimum models as students consider increasingly more complex situations. For F.BF.3, note the effect of multiple transformations on a single function and the common effect of each transformation across function types. Include functions defined only by a graph.* *Extend F.BF.4a to simple rational, simple radical, and simple exponential functions; connect F.BF.4a to F.LE.4.*	**F.BF.3** Identify the effect on the graph of replacing f(x) by f(x) + k, kf(x), f(kx), and f(x + k) for specific values of k (both positive and negative); find the value of k given the graphs. Experiment with cases and illustrate an explanation of the effects on the graph using technology. Include recognizing even and odd functions from their graphs and algebraic expressions for them. **F.BF.4** Find inverse functions. a. Solve an equation of the form f(x) = c for a simple function f that has an inverse and write an expression for the inverse. For example, f(x) = $2x^3$ or f(x) = (x+1)/(x-1) for $x \neq 1$.	Symmetry All types of transformations Inverse functions vs. relations Notation	
	Construct and compare linear, quadratic, and exponential models and solve problems. *Consider extending this unit to include the relationship between properties of logarithms and properties of exponents, such as the connection between the properties of exponents and the basic logarithm property that log xy = log x + log y.*	**F.LE.4** For exponential models, express as a logarithm the solution to $ab^{ct} = d$ where a, c and d are numbers and the base b is 2, 10, or e; evaluate the logarithm using technology.		
	Visualize relationships between two-dimensional and three-dimensional objects.	**G.GMD.4** Identify the shapes of two-dimensional cross-sections of three-dimensional objects, and identify three-dimensional objects generated by rotations of two-dimensional objects.		

	Apply geometric concepts in modeling situations.	**G.MG.1** Use geometric shapes, their measures, and their properties to describe objects (e.g., modeling a tree trunk or a human torso as a cylinder). **G.MG.2** Apply concepts of density based on area and volume in modeling situations (e.g., persons per square mile, BTUs per cubic foot). **G.MG.3** Apply geometric methods to solve design problems (e.g., designing an object or structure to satisfy physical constraints or minimize cost; working with typographic grid systems based on ratios).	

Appendix A

1. What are the mean, variance, and standard deviation of these values?
52, 63, 65, 77, 80, 82
   a. Mean 85.5; variance 690.8333; standard deviation about 115.1389
   b. Mean $69.8\overline{3}$; variance 690.8333; standard deviation about 26.2837
   c. Mean $69.8\overline{3}$; variance 115.1389; standard deviation about 10.7303
   d. Mean $69.8\overline{3}$; variance 115.1389; standard deviation about 19.1898

2. What is the degree of the polynomial that generates the data shown?

x	-3	-2	-1	0	1	2	3
y	-1	-7	-3	5	11	9	-7

   a. 1
   b. 2
   c. 3
   d. 4

3. What is the quotient and remainder of $x^3 - 59x + 56$ divided by $x - 7$?
   a. $x - 50$, R -294
   b. $x^2 - 7x - 8$, R 112
   c. $x^2 + 7x - 8$, R 0
   d. $x - 64$, R 504

4. Which type of model best represents the set of values?

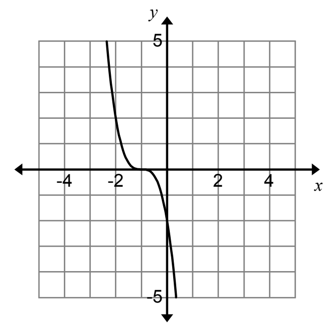
x	-2	-1	0	1	2
y	-17	4	1	-2	-5

   a. Linear
   b. Quadratic
   c. Cubic
   d. Quartic

5. What is the mean of the data set?

Day	8/1	8/2	8/3	8/4	8/5	8/6	8/7	8/8	8/9	8/10	8/11	8/12
Deliveries	14	15	19	15	15	16	19	20	21	29	16	17

   a. 12
   b. 15
   c. 16.5
   d. 18



6. Which statement describes the transformation of the parent function $y = x^3$?
   a. Reflection across the y-axis and a vertical translation 1 unit up.
   b. Horizontal translation 2 units to the left and a vertical translation 1 unit down.
   c. Vertical stretch by a factor of $\frac{1}{2}$, horizontal translation 1 to the unit right and vertical translation 2 units down.
   d. Reflection across the x-axis, vertical stretch by a factor of 2 and a horizontal translation 1 unit to the left.

7. What are the real and imaginary solutions of the polynomial equation $x^4 = 16$?
   a. $x = \pm 4$
   b. $x = \pm 256$
   c. $x = \pm 4$, $x = 4 \pm i$
   d. $x = \pm 4$, $x = \pm 4i$

8. What is the quotient and remainder of $3x^2 - 29x + 56$ divided by $x - 7$?
   a. $3x$, R -8
   b. $3x + 8$, R -56
   c. $3x - 8$, R 0
   d. $x - 8$, R $-15x$

9. Is $x^4 - 1$a factor of $P(x) = x^5 - 5x^4 - x - 5$?
   a. Yes; $(x^4 - 1)(x + 5)$
   b. Yes; $(x^4 - 1)(x + 5x)$
   c. Yes; $(x^4 - 1)(x - 5)$
   d. No

10. Given that $P(x) = x^5 - 3x^4 - 28x^3 + 5x + 20$, what is $P(-4)$?
    a. -344
    b. -256
    c. 0
    d. 40

11. How many times does the graph of $x^3 + 27$ cross the x axis?
    a. 0
    b. 1
    c. 2
    d. 3

12. A news reporter wants to determine what types of movies are most popular in her city. She surveys the first 20 people leaving a movie theater at 8:00 p.m. on a Friday. Which best describes the sampling method used in this situation?
    a. convenience sample
    b. random sample
    c. self-selected sample
    d. systematic sample

13. What is the factored form of $x^3 + x^2 - 6x$?
    a. $(x + 2)(x - 3)$
    b. $(x - 2)(x + 3)$
    c. $x(x - 2)(x + 3)$
    d. $x(x + 2)(x - 3)$

14. Here is an ordered list of tests scores for a chemistry class. What value is at the 55th percentile?
    a. 80
    b. 82
    c. 89
    d. 92

62	62	68	69	70
73	74	75	79	80
82	85	86	88	89
90	92	96	98	100

15. Write $9x^2 + 5x + 27 + 2x^3$ in standard form.
    a. $27 + 5x + 9x^2 + 2x^3$
    b. $9x^2 + 5x + 27 + 2x^3$
    c. $9x^2 + 5x + 2x^3 + 27$
    d. $2x^3 + 9x^2 + 5x + 27$

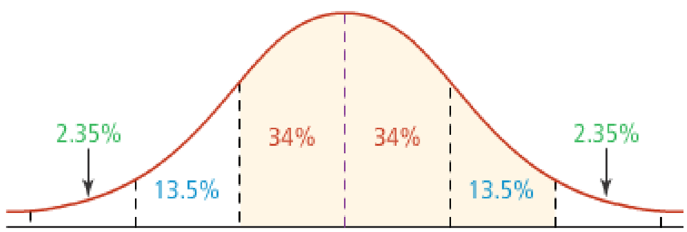
16. What are the real solutions of the equation $x^3 + x^2 = x - 1$?
    a. $x = -1.84$
    b. $x = -1$
    c. $x = 0.33$
    d. $x = 1$

17. Which number is a zero of $f(x) = x^3 + 6x^2 + 9x$ with multiplicity 1?
    a. -3
    b. 0
    c. 1
    d. 3

18. What is the relative minimum and relative maximum of $f(x) = 6x^3 - 5x + 12$?
    a. min = 0, max = 0
    b. min = -1.5, max = 12
    c. min = -5, max = 6
    d. min = 10.2, max = 13.8

19. A television network is interested in an upcoming election. Which of the polls is the least biased?
    a. a poll taken at a political convention
    b. a poll on a candidate's website
    c. a poll taken at a high school
    d. a phone poll of registered voters

20. Scores on an exam are distributed normally with a mean of 76 and a standard deviation of 10. Out of 180 tests, about how many students score above 96?
    a. 3
    b. 4
    c. 5
    d. 29



21. What is the standard deviation of the data set?

90	56	43	70	54	32	123	115	90	54	60

    a. 28.2
    b. 29.6
    c. 31.1
    d. 71.2

22. The mean number of pairs of shoes sold daily by a store is 36 with a standard deviation of 3. On what percent of days would you expect the store to sell 33 to 39 pairs of shoes?
    a. 50%
    b. 68%
    c. 81.5%
    d. 83%

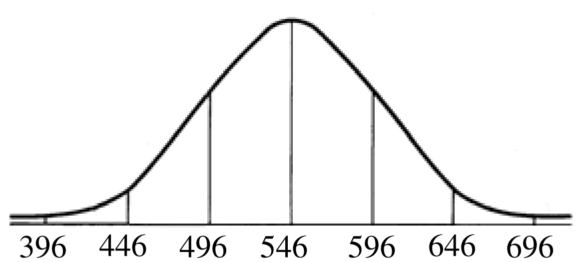
23. What is the simplified form of $(8g^2 + 6) + (3g^2 - 3)$?
    a. $11g^2 - 3$
    b. $11g^2 + 9$
    c. $5g^2 + 3$
    d. $11g^2 + 3$

24. Which polynomial function has an end behavior of up and down?
    a. $y = -6x^7 + 4x^2 - 3$
    b. $y = 6x^7 - 4x^2 + 3$
    c. $y = -7x^6 + 3x - 2$
    d. $y = 6x^6 - 3x + 3$

25. What is the product $(4a + 5b)(a - 2b)$?
    a. $4a^2 + 10b^2$
    b. $4a^2 + 3ab - 10b^2$
    c. $4a^2 - 3ab - 10b^2$
    d. $4a^2 - 3ab + 10b^2$

26. Which polynomial function has zeros at 3, -6 and 0?
    a. $x^2 - 3x - 18$
    b. $x^2 + 3x - 18$
    c. $x^3 + 3x^2 - 18$
    d. $x^3 - 3x^2 - 18$

27. What is the standard deviation for the normal distribution shown below?
    a. 50
    b. 60
    c. 100
    d. 546



28. What is the difference of $(7x^3 - 2x^2 + 4) - (3x^3 + 4x^2 - 5)$?
    a. $4x^3 - 2x^2 - 1$
    b. $4x^3 - 2x^2 + 1$
    c. $4x^3 - 6x^2 + 9$
    d. $8x^3 + 2x^2 - 9$

29. One of the roots of the equation $x^3 + x^2 - 2 = 0$ is 1. What are the other two roots?
    a. $-1 \pm i$
    b. $1 \pm 2i$
    c. $\pm 1 + 2i$
    d. $\pm 1 - i$

30. What are the real and imaginary solutions of $(x^2 - 64)(x^2 + 4)$?
    a. $x = -8, 8, -2i, 2i$
    b. $x = -4, 4, -2i, 2i$
    c. $x = -32, 32, -4i, 4i$
    d. $x = -2, 2, -8i, 8i$

1. What is the quotient of $\dfrac{\frac{1}{x+2}}{\frac{2x^2}{2x+4}}$?
   a. $\dfrac{1}{x^2}$
   b. $\dfrac{2}{x^2}$
   c. x^2
   d. $\dfrac{x+4}{x^2}$

2. What is the product of $\dfrac{2}{x^4}\bullet\dfrac{7}{x}$? State any excluded values.
   a. $\dfrac{14}{x^4}$, $x \neq 0$
   b. $\dfrac{14}{x^5}$, $x \neq 0$
   c. $\dfrac{14x^3-7}{x^4}$, $x \neq 0$
   d. $\dfrac{9}{x^4}$, $x \neq 0$

3. What is the solution of the rational equation $\dfrac{x+1}{x-2}=4$?
   a. x = -3
   b. x = -2
   c. x = 2
   d. x = 3

4. What is the real root of $\sqrt[3]{-64}$?
   a. -4
   b. 4
   c. -8
   d. $8i$

5. What is the simplest form of $\sqrt[3]{16x^7}$?
   a. $2x^2\sqrt[3]{2x}$
   b. $4x^3\sqrt[3]{x}$
   c. $2x^2\sqrt[3]{2x^4}$
   d. $4x^3\sqrt[3]{x}$

6. What are the solution(s) of $2(x+3)^{\frac{2}{3}} = 8$?
   a. x = -5, x = 1
   b. x = 5
   c. x = 5, x = -11
   d. x = 13

7. What function has a graph with a removable discontinuity at (5, -4)?
   a. $y=\dfrac{x-5}{x^2-x-20}$
   b. $y=\dfrac{x-5}{x^2+x-20}$
   c. $y=\dfrac{x+4}{x-5}$
   d. $y=\dfrac{x-5}{x+4}$

8. What is the simplified form of $\dfrac{15y^3}{5y^4}$? State any extraneous values.
   a. 10y; no restrictions
   b. $\dfrac{10}{y}$; $y \neq 0$
   c. $\dfrac{3}{y}$; $y \neq 0$
   d. 3y; $y \neq 1$

9. What is the product of $\frac{2x+10}{2x+6} \bullet (x^2+8x+15)$?

a. $2(x + 3)(x + 5)$

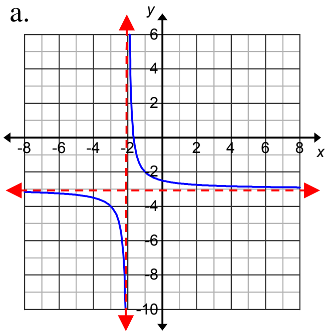
b. $\frac{x^2+10x+15}{2}$

c. $x^2 + 10x + 25$

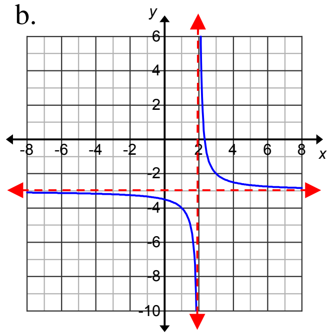
d. $\frac{x+3}{2x+3}$

10. What is the graph of $y = \frac{1}{x+2} - 3$?

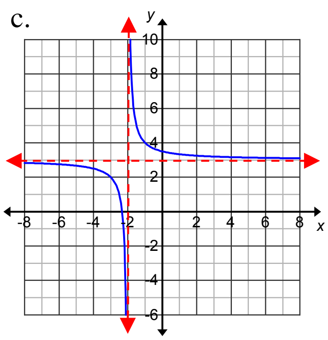
a.



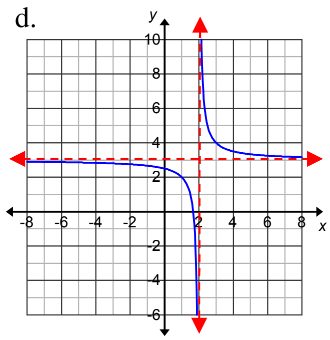
b.



c.



d.



11. Is the relationship between variables direct variation, inverse variation, or neither?

x	2	3	4	5
y	15	10	7.5	6

a. direct variation; $y = 30x$

b. direct variation; $y = \frac{30}{x}$

c. inverse variation; $y = \frac{30}{x}$

d. neither

12. What is the range and domain of $y = \frac{1}{(x-6)} + 4$?

a. The domain is the set of all real numbers except x = -4. The range is the set of all real numbers except y = 6.
b. The domain is the set of all real numbers except x = 4. The range is the set of all real numbers except y = 6.
c. The domain is the set of all real numbers except x = 6. The range is the set of all real numbers except y = -4.
d. The domain is the set of all real numbers except x = 6. The range is the set of all real numbers except y = 4.

13. What is the quotient of $\frac{x}{x-5} \div \frac{xy}{x^2-25}$?

a. $\frac{x^2 y}{x+5}$
b. $\frac{x+5}{y}$
c. $\frac{x-5}{y}$
d. $\frac{y}{x+5}$

14. What is the difference $\frac{6}{x-4} - \frac{8}{x-4}$?

a. $\frac{2}{x-4}$
b. $\frac{-2}{x-4}$
c. -2
d. $\frac{-2}{2x-8}$

15. What is the sum $\dfrac{3}{5z^4}+\dfrac{5}{3z^2}$?

a. $\dfrac{1}{z^6}$
b. $\dfrac{9+5z^2}{15z^4}$
c. $\dfrac{9+25z^2}{15z^4}$
d. $\dfrac{9+25z^2}{15z^6}$

16. What is the simplest form of $\dfrac{\sqrt{50x^6}}{\sqrt{2x^4}}$?

a. $25x^2$
b. $5x$
c. $5\sqrt{x^{\frac{3}{2}}}$
d. $5\sqrt{x^6}$

17. What is the simplest form of $3\sqrt[3]{5}+2\sqrt{5}$?

a. $5\sqrt[4]{5}$
b. $5\sqrt[3]{5}$
c. $5\sqrt{5}$
d. $3\sqrt[3]{5}+2\sqrt{5}$

18. What is the simplest form of $2\sqrt{72}-3\sqrt{32}$?

a. $2\sqrt{72}-3\sqrt{32}$
b. $24\sqrt{2}$
c. $-2\sqrt{2}$
d. 0

19. What is the product $(6-\sqrt{12})(6+\sqrt{12})$?

a. -12
b. 24
c. 36
d. 48

20. What is $((8x^{15})^{-\frac{1}{3}}$ in simplest form?
    a. $2x^5$
    b. $\dfrac{1}{8x^{12}}$
    c. $\dfrac{1}{2x^5}$
    d. $\dfrac{1}{2x^{12}}$

21. Let $g(x)=\dfrac{4}{x+2}$. What is $(g^{-1})(x)$?
    a. $g^{-1}(x)=\dfrac{4}{x}-2$
    b. $g^{-1}(x)=-\dfrac{4}{x}-4$
    c. $g^{-1}(x)=\dfrac{2}{x}-1$
    d. $g^{-1}(x)=\dfrac{2}{x}-2$

22. What is the inverse of the relation $y = 3x - 9$?
    a. $y=-3x+3$
    b. $y=\dfrac{1}{3}x+3$
    c. $y=\dfrac{x-3}{3}$
    d. $y=x+3$

23. Suppose x and y vary inversely, and $x = 4$ when $y = 8$. Which function models the inverse variation?
    a. $y=\dfrac{x}{32}$
    b. $y=\dfrac{32}{x}$
    c. $x=\dfrac{y}{32}$
    d. $\dfrac{x}{y}=32$

24. What is the simplest form of $\frac{7}{2+\sqrt{3}}$?

a. $-14 + 7\sqrt{3}$
b. $-14 - 7\sqrt{3}$
c. $17 + 7\sqrt{3}$
d. $14 - 7\sqrt{3}$

25. Solve $3(x+27)^{\frac{1}{2}} = 27$?
a. $x = 54$
b. $x = -54, x = 0$
c. $x = 0$
d. $x = 27$

26. What is the simplest form of $\frac{x^4-16}{x-2}$?

a. $x^3 - 2x^2 + 4x - 8$
b. $x^3 + 2x^2 + 4x + 8$
c. $x^3 + 8x^2 + 8x + 8$
d. $(x^2+4)(x^2-4)$

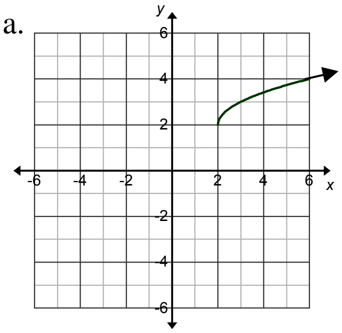
27. What is the simplified form of $\frac{2x-8}{x^2-2x-8}$? State any extraneous values.

a. $\frac{4}{x-4}$; $x \neq 4$
b. $\frac{2}{x-4}$; $x \neq -2$ and $x \neq 4$
c. $\frac{2}{x+2}$; $x \neq -2$
d. $\frac{2}{x+2}$; $x \neq -2$ and $x \neq 4$

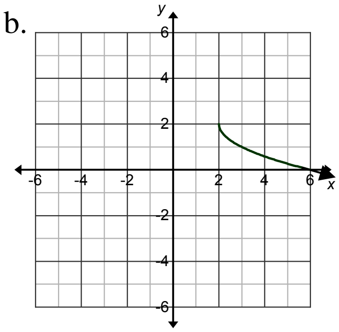
28. What is the inverse of $y = 2x - 8$?
a. $y = -2x + 4$
b. $y = 2x - 4$
c. $y = -\frac{1}{2}x - 4$
d. $y = \frac{1}{2}x + 4$

29. Which is the graph of $y = -\sqrt{x+2}+2$?

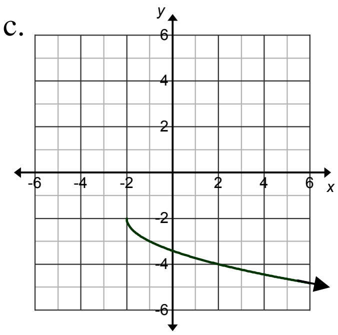
a.



b.



c.



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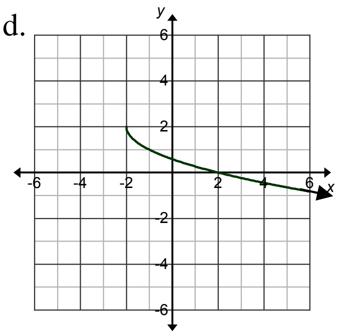
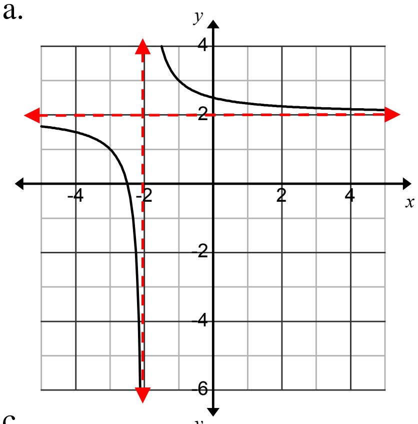
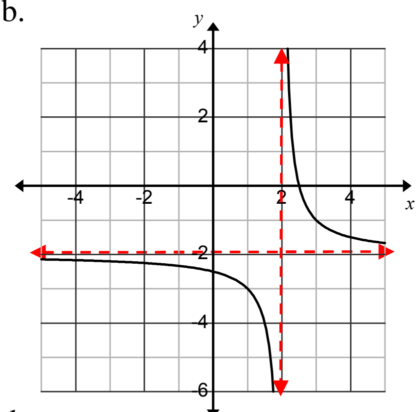


30. Which is the graph of $y = \frac{1}{x+2} - 2$?

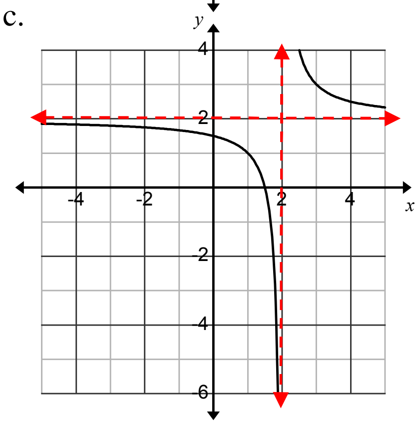
a.



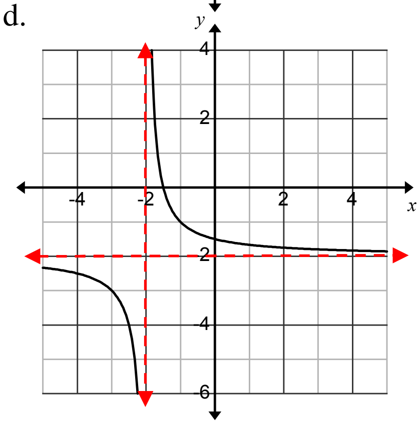
b.



c.



d.



1. What is the value of $\log_8 16$?
   a. $\frac{3}{4}$
   b. $\frac{4}{3}$
   c. 3
   d. 4

2. How do the graph of $y = \log_5(x-4)$ compare with the graph of the parent function $y = \log_5 x$?
   a. translated 4 units to the right
   b. translated 4 units up
   c. translated 4 units to the left
   d. translated 4 units down

3. What is $4\log_3 x + \log_3 3y$ written as a single logarithm?
   a. $\log_3(x^4 + y^7)$
   b. $\log_3 x^4 y^7$
   c. $\log_3(4x + 7y)$
   d. $\log_3(4x - 7y)$

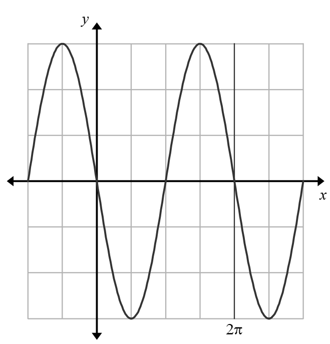
4. Which expression is the equivalent to $\log_7 16$?
   a. $\frac{\log 7}{\log 16}$
   b. $\frac{\log 16}{\log 10}$
   c. $\frac{\log_{16} 10}{\log_7 10}$
   d. $\frac{\log 16}{\log 7}$

5. If $2^{2x+3} = 32$, what is the value of x?
   a. $\frac{2}{3}$
   b. 1
   c. $\frac{4}{3}$
   d. 2

6. Write $\ln 7 + 2\ln 5$ as a single logarithm.
   a. ln 14
   b. ln 32
   c. ln 70
   d. ln 175

7. What is the solution of $e^{x-2} = 12$?
   a. $x = 2.30$
   b. $x = 2.42$
   c. $x = 4.48$
   d. $x = 4.97$

8. The equation of the graph is of the form $y = a\sin x$. What is the amplitude of the sine curve? What is the value of a?
   a. 2; 2
   b. -2; -2
   c. 3; -3
   d. 3; 3



9. Which of the following angles is not coterminal with the other three?
   a. -315°
   b. -45°
   c. 315°
   d. 405°

10. Which of the following functions represents decay growth and has a y-intercept of 4?

   a. $y = 4\left(\frac{4}{3}\right)^x$

   b. $y = \frac{1}{4}(4)^x$

   c. $y = \frac{1}{4}(0.95)^x$

   d. $y = 4\left(\frac{3}{4}\right)^x$

11. Suppose you deposit \$1500.00 in a savings account that pays interest at an annual rate of 4%. If no other money is added or withdrawn from the account, how much will be in the account after 5 years?
   a. \$1800.00
   b. \$1823.26
   c. \$1824.98
   d. \$8067.36

12. How does the graph of the function $y = 3^{(x+2)}$ compare to the parent function?
   a. The parent graph is translated 2 unit to the left, and the y-intercept remains 1.
   b. The parent graph is translated 2 unit to the right, and the y-intercept remains 1.
   c. The parent graph is translated 2 unit to the left, and the y-intercept becomes 9.
   d. The parent graph is translated 2 units to the right, and the y-intercept becomes 9.

13. At the beginning of 5th grade, your grandparents deposit \$2000.00 in a college fund in your name. The account pays 4% interest compounded continuously. If no other deposits are made, how much will be in your account after 10 years? Express your answer to the nearest dollar.
   a. \$2800
   b. \$2960
   c. \$2983
   d. \$5438

$$A = Pe^{(rt)}$$

14. For which value is the tangent function not defined?
    a. π
    b. $-\frac{\pi}{2}$
    c. $\frac{2\pi}{3}$
    d. -2π

15. In which quadrant is the cosine function negative?
    a. I and II
    b. I and IV
    c. II and III
    d. III and IV

16. Which function is the phase shift 3 units to the right for $y = \cos\theta$?
    a. $y = \cos\theta$
    b. $y = \cos\theta - 3$
    c. $y = \cos(\theta - 3)$
    d. $y = \cos(\theta + 3)$

17. Which function is a transformation of $y = \cos\theta$ by $\frac{\pi}{4}$ units down and π to the left?
    a. $y = -\frac{\pi}{4}\cos\pi\theta$
    b. $y = \cos(\theta + \pi) - \frac{\pi}{4}$
    c. $y = \cos\left(\theta - \frac{\pi}{4}\right) + \pi$
    d. $y = \pi\cos\left(-\frac{\pi}{4}\theta\right)$

18. What are the coordinates of the point where the terminal side of a 45° angle intersects the unit circle?

a. $\left(-\frac{\sqrt{2}}{2}, -\frac{\sqrt{2}}{2}\right)$

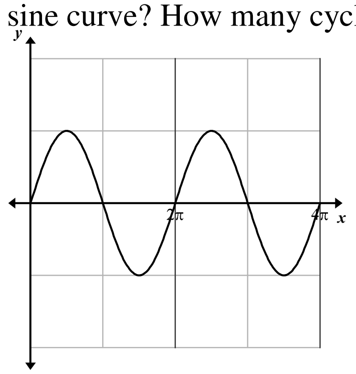
b. $\left(\frac{\sqrt{2}}{2}, \frac{\sqrt{2}}{2}\right)$

c. $\left(-\frac{\sqrt{2}}{2}, \frac{\sqrt{2}}{2}\right)$

d. $\left(\frac{\sqrt{2}}{2}, -\frac{\sqrt{2}}{2}\right)$

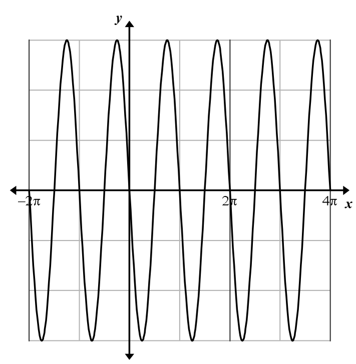
19. What is the period of this sine curve? How many cycles occur in the graph?

a. 2π, 4 cycles
b. π, 4 cycles
c. 4π, 2 cycles
d. 2π, 2 cycles



20. Which function represents the sine curve shown?

a. $y = -3\sin 2\theta$
b. $y = 3\sin \pi\theta$
c. $y = -3\sin\theta$
d. $y = 3\sin 2\pi\theta$

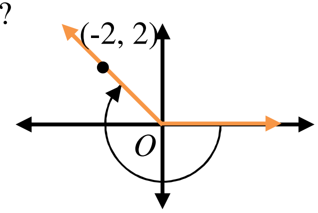


21. Which is equivalent to $-\cos(\theta + 2\pi)$

a. $\cos\theta$
b. $-\cos\pi\theta$
c. $\cos(\theta + \pi)$
d. $\cos(\theta + 2\pi)$

22. What is the degree of measure of an angle of π radians?
    a. 2°
    b. 9°
    c. 90°
    d. 180°

23. What is the measure of the angle?
    a. -275°
    b. -225°
    c. -135°
    d. -45°



24. Which equation is not true?
    a. $\tan\theta = \dfrac{\cos\theta}{\sin\theta}$
    b. $\sin^2\theta = 1 - \cos^2\theta$
    c. $\csc = \dfrac{1}{\sin\theta}$
    d. $\csc^2\theta = \cot^2\theta + 1$

25. Which sine function has amplitude of 2 and a period of 3π?
    a. $y = \dfrac{2}{3}\sin 2\theta$
    b. $y = \dfrac{3}{2}\sin\dfrac{2}{3}\theta$
    c. $y = 2\sin\dfrac{2}{3}\theta$
    d. $y = 2\sin 3\pi\theta$

26. What is the decimal value of the expression $\cot 16$? Use **radian mode**, round your answer to the nearest thousandth.
    a. 0.231
    b. 0.972
    c. 2.160
    d. 3.330

27. What is the exact value of $\csc\frac{\pi}{3}$?

a. $-\frac{2\sqrt{3}}{3}$

b. $-\frac{\sqrt{3}}{2}$

c. $\frac{\sqrt{3}}{2}$

d. $\frac{2\sqrt{3}}{3}$

28. The expression $\csc\theta\sin\theta+\cot^2\theta$ is equivalent to which of the following?

a. $\sin^2\theta$

b. $\cot^2\theta$

c. $\csc^2\theta$

d. $\cos^2\theta$

29. What is the solution of $16^{3x} = 8$?

a. $\frac{1}{4}$

b. $\frac{5}{12}$

c. 1

d. 4

30. What is cosine and sine of $\theta = 135°$?

a. $\cos\theta=\frac{\sqrt{3}}{2};\sin\theta=-\frac{\sqrt{3}}{2}$

b. $\cos\theta=\frac{\sqrt{2}}{2};\sin\theta=\frac{\sqrt{2}}{2}$

c. $\cos\theta=\frac{\sqrt{2}}{2};\sin\theta=-\frac{\sqrt{2}}{2}$

d. $\cos\theta=-\frac{\sqrt{2}}{2};\sin\theta=-\frac{\sqrt{2}}{2}$

1. In a mosaic there are 6, tiles in the first row, 13 tiles in the second row, 20 tiles in the third row, and 27 tiles in the fourth row. If the pattern continues how many tiles will there be in the 20^{th} row?
   a. 34
   b. 58
   c. 139
   d. 146

2. What is the 7^{th} term of the geometric sequence 2, 4, 8,…?
   a. 16
   b. 48
   c. 128
   d. 256

3. What is the sum of the finite arithmetic series 2 + 4 + 6 + 8 ….,+ 98?
   a. 2,000
   b. 2,450
   c. 2,500
   d. 5,000

4. What is the sum of the finite geometric series 5 + 8 + 11,…. + 26? $s_n = \frac{a_1(1-r^n)}{1-r}$
   a. 120
   b. 124
   c. 220
   d. 300

5. What is the cross section formed by a plane which intersect three faces of a cube?
   a. triangle
   b. square
   c. rectangle
   d. pentagon

6. What is the summation notation for the series 1 + 3 + 5 + … + 13?

   a. $\sum_{n=1}^{7}(2n+1)$

   b. $\sum_{n=1}^{7}(2n-1)$

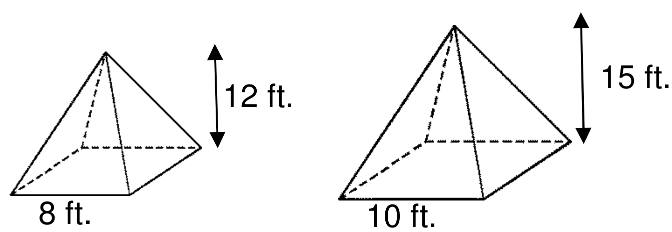
   c. $\sum_{n=1}^{8}(2n-1)$

   d. $\sum_{n=1}^{13}(2n-1)$

7. What is the sum of this series $\sum_{n=1}^{15}(n+3)$?

   a. 18
   b. 165
   c. 180
   d. 330

8. What is the ratio of the surface area of the two similar square pyramids?
   a. 4:5
   b. 8:10
   c. 16:25
   d. 64:125



9. Does the series $\frac{1}{4}+\frac{3}{8}+\frac{9}{16}+\ldots$converge or diverge? If it converges, what is the sum?

   a. The series converges, and the sum of the series is $\frac{2}{5}$.

   b. The series converges, and the sum of the series is $\frac{5}{2}$.

   c. The series converges, and the sum of the series is 2.

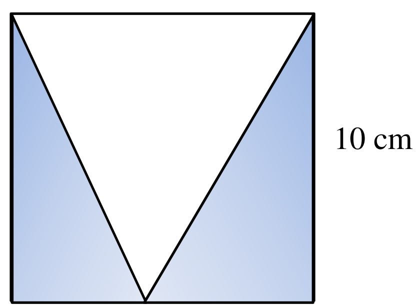
   d. The series diverges.

$$S=\frac{a_1}{1-r}$$

10. On Saturday a UTA train runs every 25 minutes. If a commuter arrives at a station at random time, what is the probability that the commuter will have to wait no more than 5 minutes for the train?
    a. 5%
    b. 20%
    c. 80%
    d. 95%

11. Which description best represents the locus of points in a plane equidistant from parallel lines $\overleftrightarrow{AB}$ and $\overleftrightarrow{CD}$?
    a. a circle with radius a
    b. a plane equidistant from lines $\overleftrightarrow{AB}$ and $\overleftrightarrow{CD}$
    c. a sphere with chords $\overleftrightarrow{AB}$ and $\overleftrightarrow{CD}$
    d. a line equidistant from and between $\overleftrightarrow{AB}$ and $\overleftrightarrow{CD}$

12. A triangle is inscribed in a square. Point G in the square selected at random. What is the probability that G lies in the shaded region?
    a. 25%
    b. 33.3%
    c. 50%
    d. 67.7%

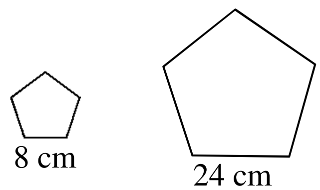


13. What are the first 5 terms of the sequence $a_n = 3^n - 1$?
    a. 2, 5, 8, 12, 15
    b. 2, 8, 26, 80, 242
    c. 1, 3, 9, 27, 81
    d. 3, 15, 63, 255, 1023

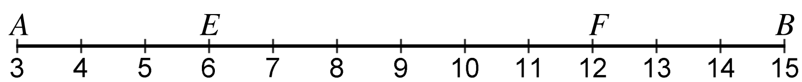
14. The 7^{th} and 9^{th} term of an arithmetic sequence are 150 and 112. What is the 10^{th} term?
    a. 135
    b. 113
    c. 97
    d. 93

15. Two similar figures have corresponding side in the ratio 6:8. What is the ratio of (larger to smaller) of their perimeters?
    a. 4:3
    b. 3:4
    c. 9:16
    d. 16:9

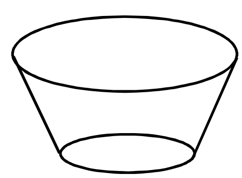
16. The area of the larger regular pentagon is about 135 cm^2. What is the best approximation for the area of the larger regular pentagon?
    a. 15 cm^2
    b. 24 cm^2
    c. 64 cm^2
    d. 72 cm^2



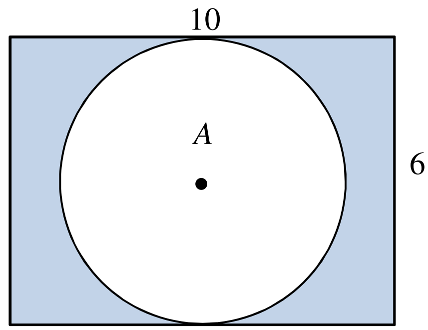
17. Point G on $\overline{AB}$ is chosen at random. What is the probability that is lies on $\overline{EB}$?
    a. $\frac{1}{4}$
    b. $\frac{2}{5}$
    c. $\frac{1}{2}$
    d. $\frac{3}{4}$



18. For the solid illustrated, what is the cross section formed by a horizontal plane?
    a. triangle
    b. circle
    c. trapezoid
    d. rectangle



19. A point in the circle A is chosen at random. Find the probability that the point lies in the shaded region.



a. 28.3%
b. 41.1%
c. 47.1%
d. 78.5%

20. A sequence has an explicit formula $a_n = 8n + 10$. What is a_{10} in the sequence?

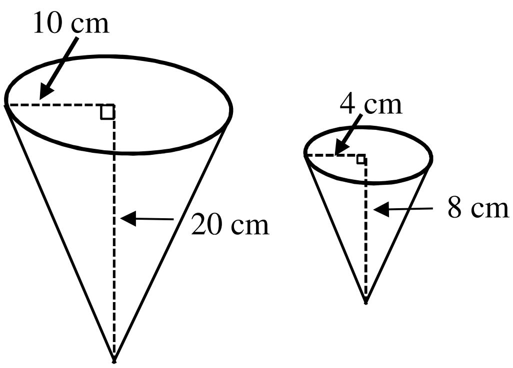
a. $a_{10} = 18$
b. $a_{10} = 80$
c. $a_{10} = 90$
d. $a_{10} = 108$

21. What is an explicit formula for the sequence 2, 4, 8, 16, 32?

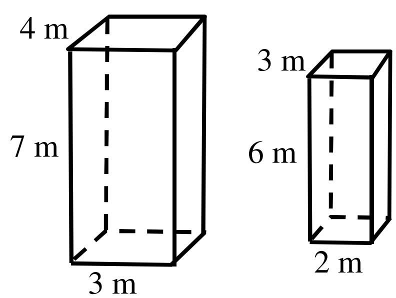
a. $a_n = 2^{n-1}$
b. $a_n = n^2$
c. $a_n = 2n^2$
d. $a_n = 2n - 1$

22. Which of the figures are similar?

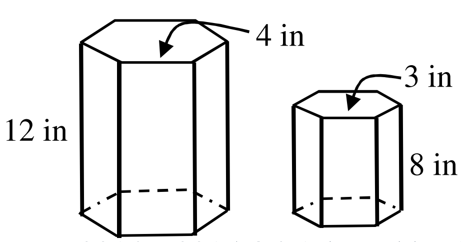
a.



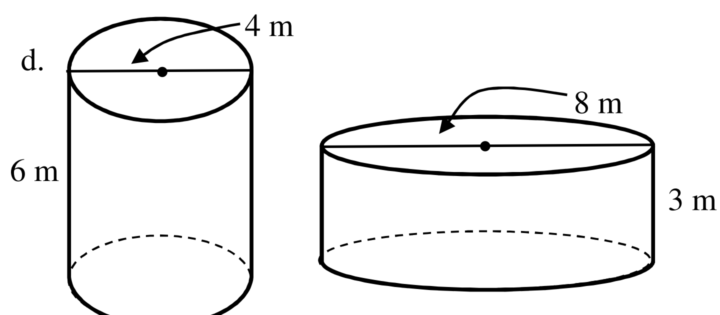
b.



c.



d.



23. In each successive round of a basketball tournament, the number of teams decreases by half. If the tournament starts with 16 teams which rule would predict the number of team in the *n*th round?
    a. $16 = (0.5)^n$
    b. $16 = (0.5)^{n-1}$
    c. $a_n = (16)(0.5)^{n-1}$
    d. $a_n = (16)^{n-1}$

24. What could be the missing terms of the geometric sequence 48, ___, 3?
    a. 4
    b. ±9
    c. ±12
    d. ±24

25. What is the expanded form of $(2y + 8)^3$
    a. $8y^3 + 512$
    b. $8y^3 + 96y^2 + 384y + 512$
    c. $8y^3 + 72y^2 + 96y + 512$
    d. $8y^3 + 108y^2 + 48y + 24$

1
1 1
1 2 1
1 3 3 1
1 4 6 4 1
1 5 10 10 5 1
1 6 15 20 15 6 1
1 7 21 35 35 21 7 1
1 8 28 56 70 56 28 8 1

26. Which term in the expansion $(3a + 2)^4$ has the coefficient 96?
    a. first
    b. second
    c. third
    d. fourth

1
1 1
1 2 1
1 3 3 1
1 4 6 4 1
1 5 10 10 5 1
1 6 15 20 15 6 1
1 7 21 35 35 21 7 1
1 8 28 56 70 56 28 8 1

27. Denver Colorado has an area of 154.9 square miles and a population of 634,235. To the nearest whole number, what is the population density of Denver?
    a. 3, 964 people per mi^2
    b. 4,049 people per mi
    c. 4, 094 people per mi
    d. 4,118 people per mi^2

28. Which sequence is an arithmetic sequence?
    a. 3, 6, 12, 24,…
    b. 7, 14, 28, 56,…
    c. 7, 10, 13, 17,…
    d. 6, 7, 9, 12,…

29. What are the missing term of the arithmetic sequence 24, __, __, 45,…?
    a. 31, 38
    b. 30, 39
    c. 32, 39
    d. 29, 37

30. The table shows the mass and volume of different types of dry wood. Which dry wood has the greatest density?
    a. White Ash
    b. Bigtooth Aspen
    c. Black Cherry
    d. Pacific Madrone

Wood	Mass (lb.)	Volume (ft^3)
White Ash	2176.58	34.1
Bigtooth Aspen	1170.38	19.8
Black Cherry	1530.64	42.4
Pacific Madrone	802.56	17.6

Appendix B

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Final Exam Part 1

Date________________ Period____

Simplify each expression.

1) $(3n - 5n^2 + 6n^4) - (4n^4 - 3n^2 - 4n)$

2) $(7p^4 + 5p^3 + 3p) - (p^3 - 6p^4 + 4p)$

Find each product.

3) $(5n + 3)(4n + 5)$

4) $(5m + 1)(7m + 8)$

Describe the end behavior of each function.

5) $f(x) = x^2 - 8x + 12$

6) $f(x) = x^3 - 4x^2 + 2$

Divide.

7) $(x^3 - 10x^2 + 5x + 9) \div (x - 1)$

8) $(2x^3 - 9x^2 - 44x + 72) \div (x - 7)$

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Factor each.

9) $y = x^3 + 2x^2 - x - 2$

10) $y = x^4 + 5x^3 + 2x^2 + 10x$

11) $y = x^4 - 12x^2 + 36$

12) $y = x^3 + 2x^2 + x + 2$

13) $y = x^2 + 7x + 12$

14) $y = x^2 - 5x + 6$

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State the possible number of real and imaginary zeros, the possible number of positive and negative zeros, and the possible rational zeros for each function. Then factor each and find all zeros.

15) $f(x) = 2x^2 - 7x - 12$

16) $f(x) = 3x^3 - 2x^2 - 6x + 4$

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17) $f(x) = 3x^4 + 10x^2 + 8$

18) $f(x) = 3x^5 - 6x^4 + 11x^3 - 22x^2 + 6x - 12$

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Final Exam Part 1

Date________________ Period____

Simplify each expression.

1) $(3n - 5n^2 + 6n^4) - (4n^4 - 3n^2 - 4n)$

$2n^4 - 2n^2 + 7n$

2) $(7p^4 + 5p^3 + 3p) - (p^3 - 6p^4 + 4p)$

$13p^4 + 4p^3 - p$

Find each product.

3) $(5n + 3)(4n + 5)$

$20n^2 + 37n + 15$

4) $(5m + 1)(7m + 8)$

$35m^2 + 47m + 8$

Describe the end behavior of each function.

5) $f(x) = x^2 - 8x + 12$

$f(x) \to +\infty$ as $x \to -\infty$
$f(x) \to +\infty$ as $x \to +\infty$

6) $f(x) = x^3 - 4x^2 + 2$

$f(x) \to -\infty$ as $x \to -\infty$
$f(x) \to +\infty$ as $x \to +\infty$

Divide.

7) $(x^3 - 10x^2 + 5x + 9) \div (x - 1)$

$x^2 - 9x - 4 + \frac{5}{x - 1}$

8) $(2x^3 - 9x^2 - 44x + 72) \div (x - 7)$

$2x^2 + 5x - 9 + \frac{9}{x - 7}$

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Factor each.

9) $y = x^3 + 2x^2 - x - 2$

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

10) $y = x^4 + 5x^3 + 2x^2 + 10x$

$y = x(x + 5)(x^2 + 2)$

11) $y = x^4 - 12x^2 + 36$

$y = (x^2 - 6)^2$

12) $y = x^3 + 2x^2 + x + 2$

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

13) $y = x^2 + 7x + 12$

$y = (x + 3)(x + 4)$

14) $y = x^2 - 5x + 6$

$y = (x - 3)(x - 2)$

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State the possible number of real and imaginary zeros, the possible number of positive and negative zeros, and the possible rational zeros for each function. Then factor each and find all zeros.

15) $f(x) = 2x^2 - 7x - 12$

Possible # of real zeros: 2 or 0
Possible # of imaginary zeros: 2 or 0
Possible # positive real zeros: 1
Possible # negative real zeros: 1
Possible rational zeros:
$\pm 1, \pm 2, \pm 3, \pm 4, \pm 6, \pm 12, \pm \frac{1}{2}, \pm \frac{3}{2}$
Factors to: $f(x) = 2x^2 - 7x - 12$
Zeros: $\left\{\frac{7 + \sqrt{145}}{4}, \frac{7 - \sqrt{145}}{4}\right\}$

16) $f(x) = 3x^3 - 2x^2 - 6x + 4$

Possible # of real zeros: 3 or 1
Possible # of imaginary zeros: 2 or 0
Possible # positive real zeros: 2 or 0
Possible # negative real zeros: 1
Possible rational zeros:
$\pm 1, \pm 2, \pm 4, \pm \frac{1}{3}, \pm \frac{2}{3}, \pm \frac{4}{3}$
Factors to: $f(x) = (3x - 2)(x^2 - 2)$
Zeros: $\left\{\frac{2}{3}, \sqrt{2}, -\sqrt{2}\right\}$

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17) $f(x) = 3x^4 + 10x^2 + 8$

Possible # of real zeros: 4, 2, or 0
Possible # of imaginary zeros: 4, 2, or 0
Possible # positive real zeros: 0
Possible # negative real zeros: 0
Possible rational zeros:
$\pm 1, \pm 2, \pm 4, \pm 8, \pm \frac{1}{3}, \pm \frac{2}{3}, \pm \frac{4}{3}, \pm \frac{8}{3}$
Factors to: $f(x) = (3x^2 + 4)(x^2 + 2)$
Zeros: $\left\{\frac{2i\sqrt{3}}{3}, -\frac{2i\sqrt{3}}{3}, i\sqrt{2}, -i\sqrt{2}\right\}$

18) $f(x) = 3x^5 - 6x^4 + 11x^3 - 22x^2 + 6x - 12$

Possible # of real zeros: 5, 3, or 1
Possible # of imaginary zeros: 4, 2, or 0
Possible # positive real zeros: 5, 3, or 1
Possible # negative real zeros: 0
Possible rational zeros:
$\pm 1, \pm 2, \pm 3, \pm 4, \pm 6, \pm 12, \pm \frac{1}{3}, \pm \frac{2}{3}, \pm \frac{4}{3}$
Factors to: $f(x) = (x - 2)(x^2 + 3)(3x^2 + 2)$
Zeros: $\left\{2, i\sqrt{3}, -i\sqrt{3}, \frac{i\sqrt{6}}{3}, -\frac{i\sqrt{6}}{3}\right\}$

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Final Exam Part 2

Date________________ Period____

Simplify.

1) $\sqrt[3]{135n^4}$

2) $(81r^4)^{\frac{1}{2}}$

Solve the equation for x.

3) $-10 + \sqrt{2x + 68} = -2$

Solve each equation.

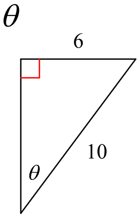
4) $(x + 5)^{\frac{3}{2}} = 512$

Convert each degree measure into radians and each radian measure into degrees.

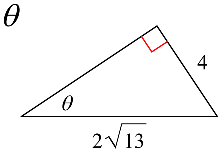
5) $190°$

Find the value of the trig function indicated.

6) $\sec \theta$



7) $\sin \theta$



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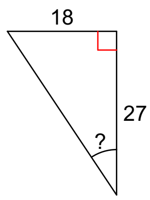
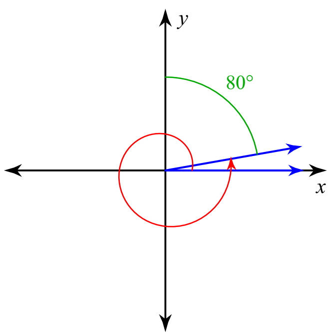
Find the measure of the indicated angle to the nearest degree.

8)



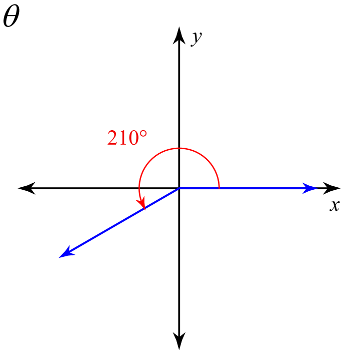
Find the measure of the angle.

9)



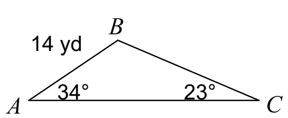
Find the exact value of each trigonometric function.

10) $\csc \theta$



Solve each triangle. Round your answers to the nearest tenth.

11)



A) $m\angle B = 123°$, $a = 21.1$ yd, $b = 30$ yd
B) $m\angle B = 123°$, $a = 18.9$ yd, $b = 30$ yd
C) $m\angle B = 123°$, $a = 23$ yd, $b = 30$ yd
D) $m\angle B = 123°$, $a = 20$ yd, $b = 30$ yd

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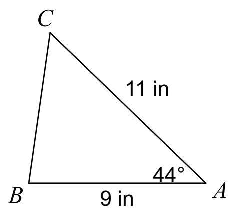
Find the area of each triangle to the nearest tenth.

12)



Evaluate each expression.

13) $\log_5 125$

14) $\log_4 \frac{1}{16}$

Find the inverse of each function.

15) $y = \log_4 4^x$

16) $y = 6^{\frac{x}{4}}$

Expand each logarithm.

17) $\log_2 (x \cdot y \cdot z^4)$

Condense each expression to a single logarithm.

18) $\log a + \log b + 3\log c$

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Solve each equation.

19) $\log_5 -4x - \log_5 3 = \log_5 29$

20) $\log_4 (x^2 + 7) + \log_4 8 = 3$

Solve each equation. Round your answers to the nearest ten-thousandth.

21) $3^{p-5} + 10 = 58$

22) $-0.2 \cdot 16^{2a} = -73$

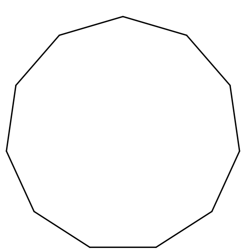
Find the inverse of each function.

23) $y = -\frac{4^x}{4}$

24) $y = \log x^3$

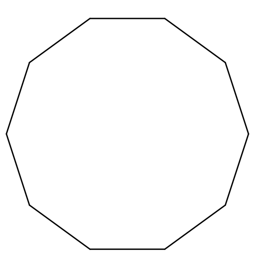
Find the interior angle sum for each polygon. Round your answer to the nearest tenth if necessary.

25)



Find the measure of one interior angle in each polygon. Round your answer to the nearest tenth if necessary.

26)



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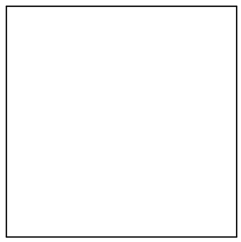
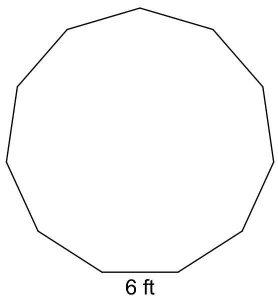
Find the measure of one exterior angle in each polygon. Round your answer to the nearest tenth if necessary.

27)



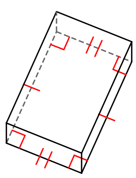
Find the area of each figure. Round your answer to the nearest tenth.

28)



Name each figure.

29)



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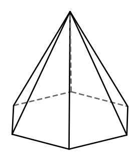
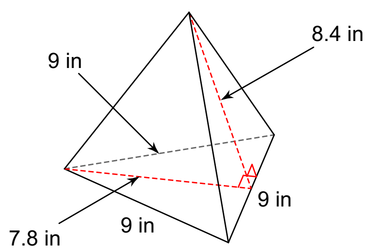
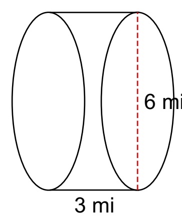


Find the surface area of each figure. Round your answers to the nearest hundredth, if necessary.

31)



32)



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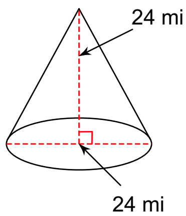
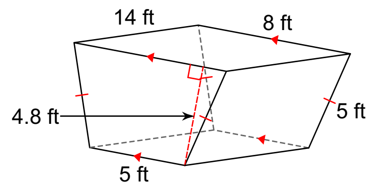
Find the volume of each figure. Round your answers to the nearest hundredth, if necessary.

33)

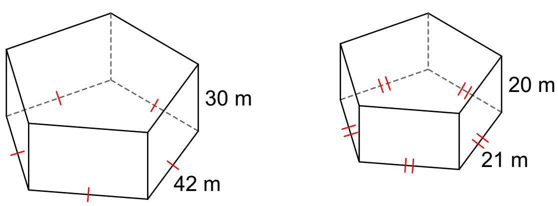


34)



Determine if each pair of solids is similar.

35)



The scale factor between two similar figures is given. The surface area and volume of the smaller figure are given. Find the surface area and volume of the larger figure.

36) scale factor = 1 : 5
SA = 1 m^2
V = 22 m^3

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Math 3B Name____ ID: 1

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Final Exam Part 2

Date________________ Period____

Simplify.

1) $\sqrt[3]{135n^4}$

$3n\sqrt[3]{5n}$

2) $(81r^4)^{\frac{1}{2}}$

$9r^2$

Solve the equation for x.

3) $-10 + \sqrt{2x + 68} = -2$

$\{-2\}$

Solve each equation.

4) $(x + 5)^{\frac{3}{2}} = 512$

$\{59\}$

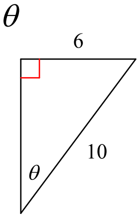
Convert each degree measure into radians and each radian measure into degrees.

5) $190°$

$\frac{19\pi}{18}$

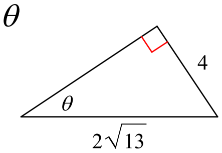
Find the value of the trig function indicated.

6) $\sec \theta$



$\frac{5}{4}$

7) $\sin \theta$



$\frac{2\sqrt{13}}{13}$

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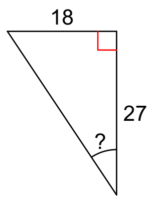
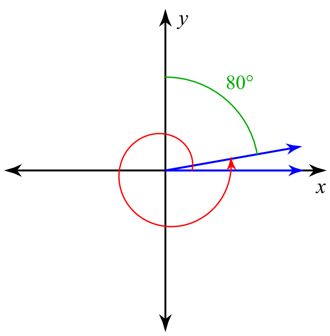
Find the measure of the indicated angle to the nearest degree.

8) 34°



Find the measure of the angle.

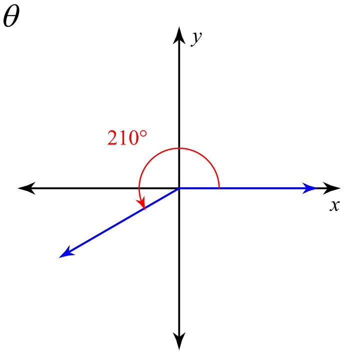
9)



370°

Find the exact value of each trigonometric function.

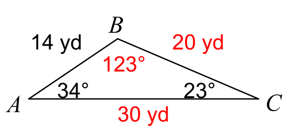
10) csc θ



−2

Solve each triangle. Round your answers to the nearest tenth.

11)



A) $m\angle B = 123°$, $a = 21.1$ yd, $b = 30$ yd
B) $m\angle B = 123°$, $a = 18.9$ yd, $b = 30$ yd
C) $m\angle B = 123°$, $a = 23$ yd, $b = 30$ yd
*D) $m\angle B = 123°$, $a = 20$ yd, $b = 30$ yd

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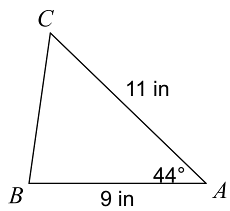
Find the area of each triangle to the nearest tenth.

12)



34.4 in²

Evaluate each expression.

13) $\log_5 125$

3

14) $\log_4 \frac{1}{16}$

-2

Find the inverse of each function.

15) $y = \log_4 4^x$

$y = x$

16) $y = 6^{\frac{x}{4}}$

$y = \log_6 x^4$

Expand each logarithm.

17) $\log_2 (x \cdot y \cdot z^4)$

$\log_2 x + \log_2 y + 4\log_2 z$

Condense each expression to a single logarithm.

18) $\log a + \log b + 3\log c$

$\log (bac^3)$

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Solve each equation.

19) $\log_5 -4x - \log_5 3 = \log_5 29$

$\left\{-\frac{87}{4}\right\}$

20) $\log_4 (x^2 + 7) + \log_4 8 = 3$

$\{1, -1\}$

Solve each equation. Round your answers to the nearest ten-thousandth.

21) $3^{p-5} + 10 = 58$

8.5237

22) $-0.2 \cdot 16^{2a} = -73$

1.064

Find the inverse of each function.

23) $y = -\frac{4^x}{4}$

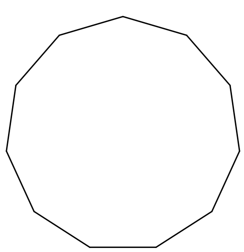
$y = \log_4 -4x$

24) $y = \log x^3$

$y = 10^{\frac{x}{3}}$

Find the interior angle sum for each polygon. Round your answer to the nearest tenth if necessary.

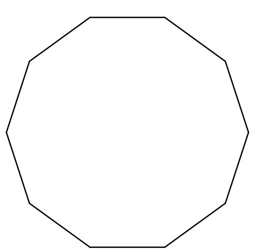
25)



1620°

Find the measure of one interior angle in each polygon. Round your answer to the nearest tenth if necessary.

26)



144°

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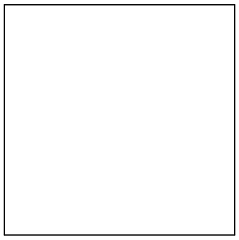
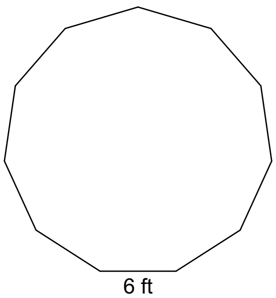
Find the measure of one exterior angle in each polygon. Round your answer to the nearest tenth if necessary.

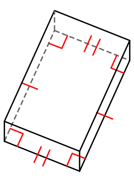
27)  90°

Find the area of each figure. Round your answer to the nearest tenth.

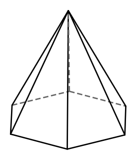
28) 

337.2 ft²

Name each figure.

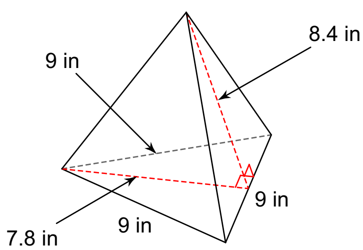
29) 

rectangular prism

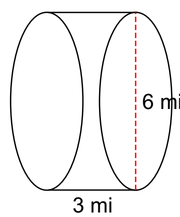
30) 

hexagonal pyramid

Find the surface area of each figure. Round your answers to the nearest hundredth, if necessary.

31) 

148.5 in²

32) 

113.1 mi²

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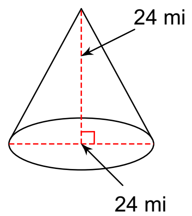
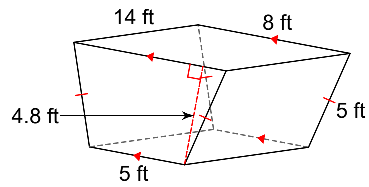
Find the volume of each figure. Round your answers to the nearest hundredth, if necessary.

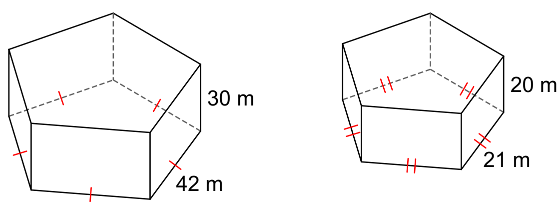
33) 

3619.11 mi³

34) 

436.8 ft³

Determine if each pair of solids is similar.

35) 

No

The scale factor between two similar figures is given. The surface area and volume of the smaller figure are given. Find the surface area and volume of the larger figure.

36) scale factor = 1 : 5
SA = 1 m^2
V = 22 m^3

SA = 25 m^2, V = 2750 m^3

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