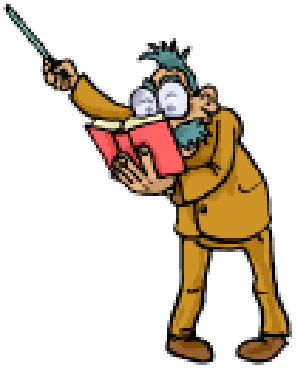
The

High School Math Teacher's Guide

for

Handling TAKS (TAAS II)

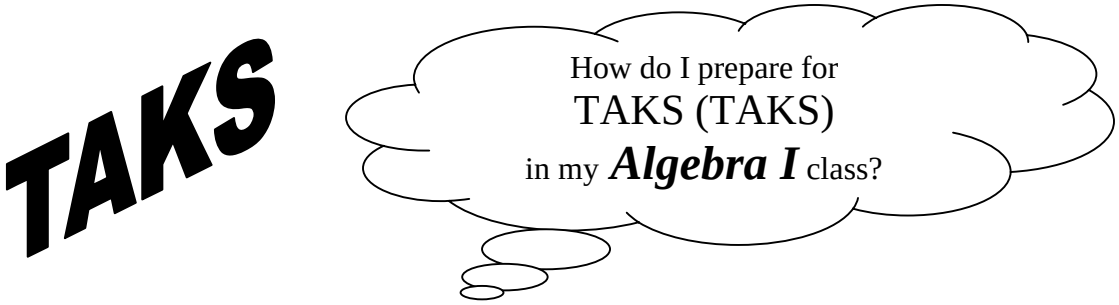


Provided by

REGION XIII
EDUCATION SERVICE CENTER

Dr. Pat Pringle, Executive Director ■ www.esc13.net
5701 Springdale ■ Austin, TX 78723 ■ (512) 919-5313

Ward Roberts, Math Specialist
Region XIII Education Service Center
Phone: (512) 919-5472
E-mail: ward.roberts@esc13.txed.net
Web site: www.esc13.net/math

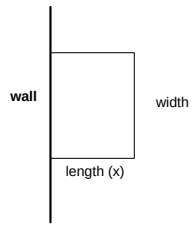


FACT:	The 9th & 10th grade TAKS will cover 8th grade TEKS on geometry, measurement, percent and probability.
QUESTION:	How can teachers incorporate reviews of this 8th grade material (such as geometry and probability) into their Algebra I classes?

Suggestions for Covering TAKS Objectives 6-9* in Algebra I

Algebra I Topic	TAKS Tie-in
Foundations for Functions • Collect and organize data [(b)(2) D]	Compare and contrast scatterplots with pie charts and bar graphs: • When do you use scatterplots? *When there is a dependence relationship (x and y)* • When do you use pie charts? *When you have only one-variable data* • When do you use bar graphs? *When you have numbers of things from several categories* ALSO: When is it appropriate to use mean, median, and mode? [TAKS Obj. 9]
Foundations for Functions • Transform and solve equations [(b)(4) A]	Include proportions ($\frac{a}{b} = \frac{c}{x}$) • Triangles (height, shadow) • Rates (paint 3 bookcases in 2 hours…) • Probability (On 100 rolls of a die, about how many times would you get 6?) Use geometric formulas • Area (Given *A* and *l*, find *w*.) • Volume (Given *V*, *l*, and *w*, find *h*) [TAKS Obj. 8 and Obj. 9]
Foundations for Functions • Simplify and factor expressions [(b)(4) A]	Use geometric formulas • Perimeter, surface area and volume (e.g., $2l + 2w = 2(l + w)$) • Related dimensions (The area of a rectangle whose length is 5 cm more than its width (w) is $A = lw = (w+5)w = w^2 + 5w$) [TAKS Obj. 8]

*Note: TAKS Objectives 1-5 (and 10) focus on Algebra I TEKS and would already be covered in the regular scope and sequence of the course.

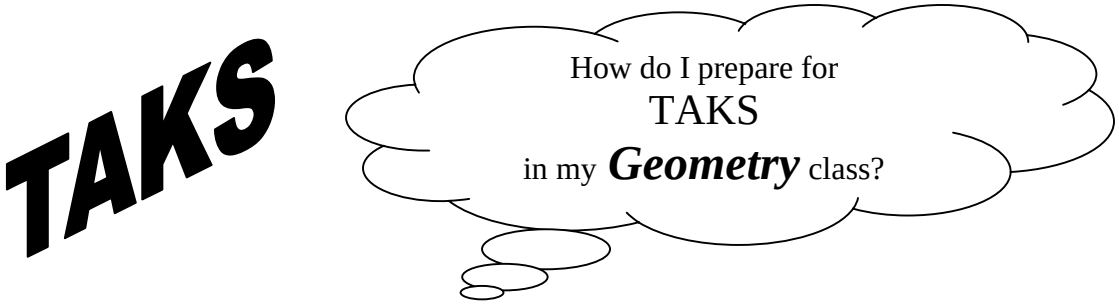
Algebra I Topic	TAKS Tie-in
Linear Equations • Describe how *m* and *b* affect graphs of $y=mx+b$ [(c)(2) C]	Use vocabulary of geometric transformations • Changing the slope (*m*) rotates the graph • Changing the sign of the slope can reflect the graph • Changing the intercept (*b*) translates the graph [TAKS Obj. 6]
Linear Equations • Write equations for lines [(c)(2) D]	Use the geometric implications of slope • Parallel and perpendicular lines [TAKS Obj. 7 (Exit)]
Linear Equations • Analyze situations and form linear equations [(c)(2) D; (c)(3) A]	Collect data pertaining to geometric figures For example, graph the relationships between: • The number of sides of a polygon and the sum of the angle measures [TAKS Obj. 6 (Exit)] • The measures of the two acute angles in a right triangle [TAKS Obj. 6 (Exit)] • The height and volume of a cylinder (when *r* remains constant) [TAKS Obj. 8]
Linear and Nonlinear Functions • Represent situations with direct and inverse variation [(c)(2) G; (d)(3) B]	Use proportions [TAKS Obj. 8] • Direct: If you travel 60 mph, graph distance (*y*) against time (*x*). • Inverse: If you must travel 60 miles, graph possible speeds or rates (*y*) against time (*x*). Use area and volume formulas [TAKS Obj. 8] • Direct: Graph possible widths and areas when *length* remains a constant 20 ft. • Inverse: Graph possible lengths and widths when *area* remains a constant 20 sq. ft.
Quadratic Equations • Describe the effects of *a* on graphs of $y=ax^2$ and *c* on graphs of $y=x^2+c$ [(d)(1) B, C]	Use vocabulary of geometric transformations • Changing the sign of "*a*" can reflect the graph • Changing the intercept (*c*) translates the graph [TAKS Obj. 6]
Quadratic Equations • Solve quadratic equations [(d)(2) A]	Use geometric formulas for equations • Circular area (A=50 sq. ft., what is radius?) • Rectangular area (If area is 35 cm^2 and length is 5 cm more than width, what are dimensions?) • Cylinder volume (V=60 cm^3, h=5 cm, find r) • Pythagorean Theorem ($x^2+4^2=5^2$) [TAKS Obj. 8]
Quadratic Equations • Analyze situations and form quadratic equations to solve problems [(d)(1) D; (d)(2) A-B]	Relate length and width to area • Farmer Joe has 30 ft of fencing to make a rectangular enclosure against a barn wall. What length and width will generate maximum area?  [TAKS Obj. 8]

Algebra I Topic	TAKS Tie-in
Quadratic Equations • Analyze situations and form quadratic equations to solve problems [(d)(1) D; (d)(2) A-B]	Use combinations, permutations and counting problems • How many games are required in a tournament where each team must play every other team exactly once? (Also called the "handshake" problem) Teams | 2 | 3 | 4 | 5 | 6 Games | 1 | 3 | 6 | 10 | 15 [TAKS Obj. 9]
Other Nonlinear Functions • Generate laws of exponents from patterns [(d)(3) A]	Use models of probability • Find probabilities for always getting heads after a coin is flipped once, twice, three times, etc. $(\frac{1}{2}, \frac{1}{4}, \frac{1}{8}, \ldots)$. • Using only the letters A, B, and C (with repetition), find how many codes can be made having one letter, two letters, three letters, etc. (3, 9, 27, …). [TAKS Obj. 9]
Other Nonlinear Functions • Analyze exponential growth and decay [(d)(3) C]	Use percents as rates of increase or decrease • The value of a $15,000 car decreases 20% annually. Track its value over a 6-year period. • • A money market account initially worth $5000 receives 4% annual interest. Track its value over a 6-year period. [TAKS Obj. 9]

Other Topics on TAKS That Are Hard to Place in Algebra I

Some time may need to be spent outside of the traditional Algebra scope and sequence to review the following topics:

Drawing three-dimensional solids [TAKS Obj. 7]
- Nets for 3-D objects
- Top, front, side and corner views



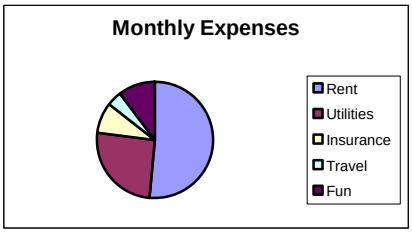
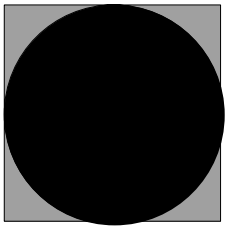
FACT:	The 9th, 10th, and 11th grade TAKS will cover Algebra I TEKS involving linear, quadratic and other functions as well as 8th grade TEKS over probability.
QUESTION:	How can teachers incorporate reviews of this Algebra I material into their Geometry classes?

Suggestions for Covering TAKS Objectives 1-5 & 9* in Geometry

Geometry Topic	TAKS Tie-in
Logic, Proof and Conjecture • Demonstrate mathematical proof [(b)(3) C]	Solve equations using the "statements/reasons" format of proofs Statement — Reason $2(x + 5) = 24$ — Given $2x + 10 = 24$ — Distributive Property $2x + 10 - 10 = 24 - 10$ — Add. Prop. Of Equality $2x = 14$ — Arithmetic (etc.) [TAKS Obj. 2 & 4]
Logic, Proof and Conjecture • Determine the truth of statements and their converses [(b)(3) A]	Use statements about equations and inequalities For example, a) determine the truth value of the statements below, b) write the converses of the statements, c) determine the truth value of the converses. • If $x = 7$, then $2(x+5) = 24$. • If $x = 5$, then $x^2 = 25$. • If $x \geq 0$, then $x = 2$ [TAKS Obj. 2]
Logic, Proof and Conjecture • Use inductive reasoning [(b)(3) D]	Generalize patterns in combination and counting problems • How many games are required in a tournament where each team must play every other team exactly once? (Also called the "handshake" problem) Teams: 2 — 3 — 4 — 5 — 6 Games: 1 — 3 — 6 — 10 — 15 [TAKS Obj. 9]

*Note: TAKS Objectives 6-8 focus on Geometry TEKS (from 8th grade and from high school) and would already be covered in the regular scope and sequence of the course.

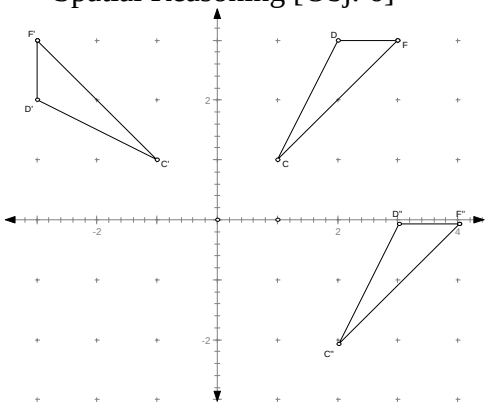
Geometry Topic	TAKS Tie-in
Geometric Patterns • Make generalizations about geometric properties of polygons and angle relationships [(c)(1) A]	Collect and graph data pertaining to geometric figures, then use an equation to model this data [TAKS Obj. 2, 3, 4 & 5] For example, graph the relationships between: • The number of sides of a polygon and the sum of the angle measures [Obj. 3 & 4] • The number of sides of a polygon and the number of diagonals [Obj. 5] • The measures of the two acute angles in a right triangle [Obj. 3 & 4]
Geometric Patterns • Use transformations [(c)(1) B]	Observe transformations on linear and quadratic equations • For equations of the form $y=mx+b$, changing m and b can rotate, reflect, or translate the graphs [TAKS Obj. 3] • For equations of the form $y=ax^2$ or $y=x^2+c$, changing a and c can reflect or translate the graphs [TAKS Obj. 5]
Dimensionality and Location • Use the two-dimensional coordinate system to represent lines, points, and segments [(d)(2) A] • Investigate relationships such as parallelism and perpendicularity [(d)(2) B]	Use linear equations to confirm geometric properties • Equations for lines from two points • Equal slopes and opposite reciprocal slopes [TAKS Obj. 3]
Dimensionality and Location • Use the distance formula [(d)(2) C]	Create quadratic equations using the distance formula with missing information • What points on the y-axis is a distance of 5 units from the point (4, 2)? $\sqrt{(4-0)^2+(2-y)^2}=5$ $16+(2-y)^2=25$ [TAKS Obj. 5]
Congruence and Size • Find perimeters, areas, surface areas, and volumes of shapes and solids [(e)(1) A, D]	Collect data, make graphs, and write equations for various geometric relationships linked to these formulas [TAAS Obj. 1 & 2] For example, graph the relationships between: • The radius of a circle and its perimeter [TAKS Obj. 3] or its area [Obj. 5] • The height and volume of a cylinder (when r remains constant) [TAKS Obj. 3] • Possible widths and areas when *length* remains a constant 20 ft. [TAKS Obj. 3] • Possible lengths and widths when *area* remains a constant 20 sq. ft. [TAKS Obj. 5] • The depth of the water in an inverted cone and its volume [TAKS Obj. 5]

Geometry Topic	TAKS Tie-in
Congruence and Size • Develop, extend and use the Pythagorean theorem [(e)(1) A, C]	Create quadratic equations about the sides of a right triangle • Find the side lengths of a right triangle with a hypotenuse of 10 ft. and with one leg twice as long as the other $x^2 + (2x)^2 = 10^2$ [TAKS Obj. 5]
Congruence and Size • Find areas of sectors and lengths of arcs on circles [(e)(1) B]	Relate sector area and arc length to the construction of pie graphs for the purpose of analyzing statistical data • Calculate the central angles used in making the pie graph below. Rent 500 Utilities 250 Insurance 85 Travel 40 Fun 100  [TAKS Obj. 9]
Congruence and Size • Find perimeters, areas, surface areas, and volumes of shapes and solids [(e)(1) A, D]	Relate areas of differently colored composite geometric shapes to random probability • If a dart is randomly thrown at (and lands on) the board below, what is the probability it will land in the lightly shaded region?  [TAAS Obj. 9]
Similarity and Shape • Use ratios to solve problems [(f)(1) B]	Include proportions ($\frac{a}{b} = \frac{c}{x}$) in other contexts • Slope (If line *l* and line *m* are parallel [have the same slope], then what is the *x*-coordinate of point Q?) [TAKS Obj. 3] • Probability (On 100 rolls of a die, about how many times would you get 6?) [TAKS Obj. 9]

TAKS

How do I prepare for
TAKS
in my ***Algebra II*** class?

Correlating the Algebra II Curriculum With the TAKS Objectives

Algebra II Topic	TAKS Correlation
Functions • Domain and range • Data and scatterplots • Interpretations and predictions [(b)(1) A-B]	TAKS Objectives • Properties of Functions [Obj. 2] • Properties of Functions [Obj. 2] • Functional Relationships [Obj. 1]
Systems • Graphical interpretations (intersection) • Forming and solving [(b)(3) A-C]	TAKS Objectives • Linear Functions [Obj. 3] • Using Linear Equations [Obj. 4]
Matrices • For solving systems of linear equations [(b)(2) A]	TAKS Objectives • Using Linear Equations [Obj. 4]
Matrices • For showing transformations on the coordinate plane $A = \begin{bmatrix} 1 & 1 \\ 2 & 3 \\ 3 & 3 \end{bmatrix}$ Example: If matrix A is used to represent ΔCDF (formed by vertices at points C(1,1), D(2,3), and F(3,3)), then multiplying A by $\begin{bmatrix} 0 & -1 \\ 1 & 0 \end{bmatrix}$ will rotate the triangle 90°, and adding A to $\begin{bmatrix} 1 & -3 \\ 1 & -3 \\ 1 & -3 \end{bmatrix}$ will slide the triangle right and down (see picture at right).	TAKS Objectives • Spatial Reasoning [Obj. 6] 

Note: Brackets in column 1 indicate Algebra II TEKS

Note: Brackets in column 2 indicate TAKS Exit level objectives.

Algebra II Topic	TAKS Correlation
Complex numbers • Adding, subtracting, multiplying [(b)(2) B]	TAKS Objectives • Properties of Functions [Obj. 2] ▪ *Simplifying and factoring expressions*
Quadratic Equations • Graphs and roots • Problems and solutions [(d)(1) A-C; (d)(3) A-D]	TAKS Objectives • Quadratic and Nonlinear Functions [Obj. 5]
Quadratic Equations • Pythagorean Theorem • Area and volume formulas Examples: 1. Find the side lengths of a right triangle with a hypotenuse of 10 ft. and with one leg twice as long as the other. $x^2 + (2x)^2 = 10^2$ 2. If the area of a circle is 50 square units, what is its perimeter?	TAKS Objectives • Measurement and Similarity [Obj. 8]
Quadratic Equations • Effects of *a*, *h*, and *k* on the graphs of $y = a(x-h)^2 + k$ [(d)(2) A-B]	TAKS Objectives • Spatial Reasoning [Obj. 6] ▪ *Reflections and translations*
Conic Sections • With connections to area, surface are and volume [(c)(2) A] Examples: 1. Find the volume of a cone with a height of 5 cm and a base diameter of 12 cm. 2. Find the area of the region given by the system $(x-2)^2 + (y-3)^2 = 16$ $x \geq 2$	TAKS Objectives • Measurement and Similarity [Obj. 8]
Conic Sections • Changing parameters to translate and rotate • Identifying symmetry [(c)(2) B-C]	TAKS Objectives • Spatial Reasoning [Obj. 6] ▪ *Reflections and translations*
Conic Sections • Deriving the equations	TAKS Objectives • Two- and Three-Dimensional Representations [Obj. 7] ▪ *Distance and midpoint formulas*
Conic Sections • Finding linear asymptotes and directrices	TAKS Objectives • Linear Functions [Obj. 3]

Algebra II Topic	TAKS Correlation
Conic Sections • Completing the square [(c)(2) E]	TAKS Objectives • Properties of Functions [Obj. 2] ▪ *Simplifying and factoring expressions*
Rational Functions • Direct and inverse variation [(e)(6)] Example 1: Use proportions ▪ Direct: If you travel 60 mph, graph distance (y) against time (x). ▪ Inverse: If you must travel 60 miles, graph possible speeds or rates (y) against time (x). Example 2: Use area and volume formulas ▪ Direct: Graph possible widths and areas when *length* remains a constant 20 ft. ▪ Inverse: Graph possible lengths and widths when *area* remains a constant 20 sq. ft.	TAKS Objectives • Measurement and Similarity [Obj. 8]
Exponential Functions [(f)(1-5)] • With probability <u>Examples:</u> ▪ Find probabilities for always getting heads after a coin is flipped once, twice, three times, etc. ($\frac{1}{2}, \frac{1}{4}, \frac{1}{8}, \ldots$). ▪ Using only the letters A, B, and C (with repetition), find how many codes can be made having one letter, two letters, three letters, etc. (3, 9, 27, …). • With percent increase and decrease <u>Examples:</u> ▪ A money market account initially worth \$5000 receives 4% annual interest. Track its value over a 6-year period. ▪ The value of a \$15,000 car decreases 20% annually. Track its value over a 6-year period.	TAKS Objectives: • Percents, Probability, and Statistics [Obj. 9]