

Practice 10 A

10. Solve the equation $x^2 + 3x - 4 = 0$ for x .

Work Space:

Answer:

$$x = 1$$

$$x^2 + 3x - 4 = 0$$

(A)

$$x^2 + 3x = 4$$

$$4x = 4$$

11. Solve $(2x - 6)(x + 4) = 0$ for x .

Work Space:

Answer:

$$(2x - 6)(x + 4) = 0$$

$$2x^2 + 2x - 24 = 0$$

$$2x^2 + 2x = 24$$

12. Solve $4 = \frac{15}{x+3}$ for x .

Work Space:

Answer:

$$x = \frac{3}{4}$$

$$4 = \frac{15}{x+3}$$

$$(x+3) = 15$$

$$x + 12 = 15$$

$$x = 15 - 12$$

10. Solve the equation $x^2 + 3x - 4 = 0$ for x .

Work Space:

$$(x + 4)(x - 1)$$

$$x^2 - 1 + 4x - 4$$

(A₂)

Answer:

$$x = -4, 1$$

11. Solve $(2x - 6)(x + 4) = 0$ for x .

Work Space:

$$2x^2 + 8x - 6x - 24$$

$$2x^2 + 2x - 24$$

$$(2x - 6)(x + 4)$$

Answer:

12. Solve $4 = \frac{15}{x+3}$ for x .

Work Space:

$$1 = \frac{15}{x}$$

Answer:

$$15$$

10. Solve the equation $x^2 + 3x - 4 = 0$ for x .

Work Space:

Answer:

$x = 1$

A3

11. Solve $(2x - 6)(x + 4) = 0$ for x .

Work Space:

Answer:

$x = 2$

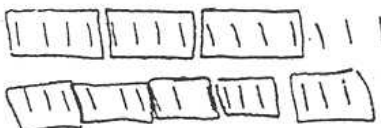
12. Solve $4 = \frac{15}{x+3}$ for x .

Work Space:

$4 \overline{) 15}$

Answer:

$x = 0.3$



10. Solve the equation $x^2 + 3x - 4 = 0$ for x .

Work Space:

$$x^2 + 3x - 4 = 0$$

$$+4 \quad +4$$

$$x^2 + 3x + 4 = 4$$

$$\frac{x^2}{3} = \frac{4}{3}$$

(A)

Answer:

$$\sqrt{1/3}$$

11. Solve $(2x - 6)(x + 4) = 0$ for x .

Work Space:

$$2x^2 + 6x - 6x - 24 = 0$$

$$\frac{2x^2}{2} = \frac{24}{2}$$

$$\sqrt{x^2} = \sqrt{12}$$

Answer:

$$\sqrt{12}$$

12. Solve $4 = \frac{15}{x+3}$ for x .

Work Space:

$$4 = \frac{15}{x+3}$$

$$1 = \frac{15}{x}$$

$$15 = x$$

Answer:

$$15$$

10. Solve the equation $x^2 + 3x - 4 = 0$ for x .

Work Space:

$$\begin{aligned} (x-1)(x+4) \\ x^2 - 1x - 4 + 4x \\ x^2 + 3x - 4 = 0 \\ (x-1)(x+4) = 0 \end{aligned}$$

Answer:

As

11. Solve $(2x-6)(x+4) = 0$ for x .

Work Space:

Answer:

12. Solve $4 = \frac{15}{x+3}$ for x .

Work Space:

Answer:

$$x = 12$$

Key for Practice Set A, Part 3

updated
Key for Part 3 Practice Set A

A_1	1
A_2	0
A_3	1
A_4	2
A_5	3
A_6	2
A_7	1
A_8	2
A_9	1
A_{10}	2

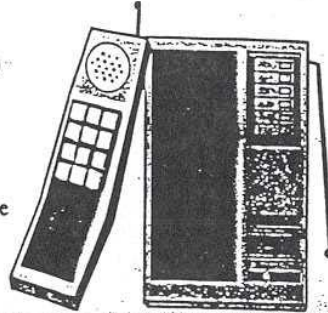
Five Sample Student Papers from Practice Set A, Part 3

A1

Selling by Telephone

452
473

Many companies sell their products through long-distance telephone calls to customers. For example, the *CD Club* sells music compact discs all across the country from its headquarters in New York. Sales calls made by the *CD Club* last an average of about 4 minutes apiece. The club has bids from three possible providers for their long-distance telephone service:



- 1) *Apple Communications* will charge \$0.35 for placing each call and then \$0.15 per minute of time used in the call.
- 2) *Bell Telephone* makes a fixed charge of \$260 per week for access to its long-distance lines, but charges only \$0.10 per minute of time used by the calls.
- 3) *Capital Long Distance Services* will make a fixed charge of \$600 per week for unlimited use of its long-distance lines.

Question: For the *CD Club* the problem is to choose the long-distance service that is least expensive for their business. What advice would you give about the phone company to choose and why?

250 calls
1000 min

Conclusions and Reasoning:

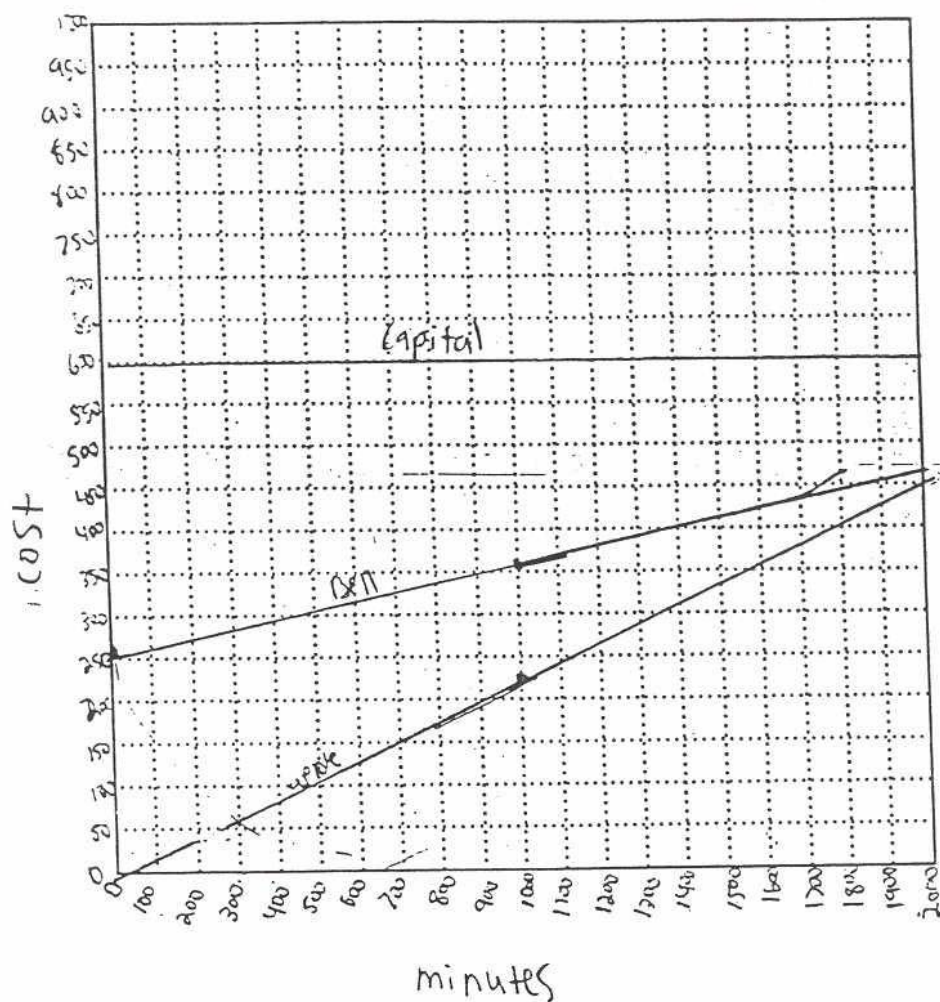
1) $0.35 + 0.15x$ $x = \#$ of min

2) $260 + 0.10x$

3) 600

on the graph next page
we used the Hypothetical Situation
that company 250 calls a week
which comes out to be 1000 min
a week under this situation apple is
by far the cheapest, but if the calls
were more than 2100 min then Bell
would be the better deal.

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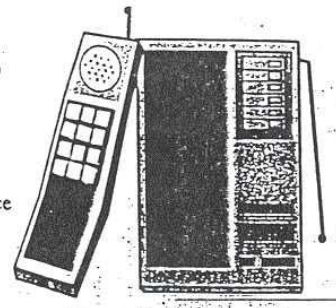
for 250 call (1000 min)

A 2

119
159

Selling by Telephone

Many companies sell their products through long-distance telephone calls to customers. For example, the *CD Club* sells music compact discs all across the country from its headquarters in New York. Sales calls made by the *CD Club* last an average of about 4 minutes apiece. The club has bids from three possible providers for their long-distance telephone service:



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Question: For the *CD Club* the problem is to choose the long-distance service that is least expensive for their business. What advice would you give about the phone company to choose and why?

Conclusions and Reasoning:

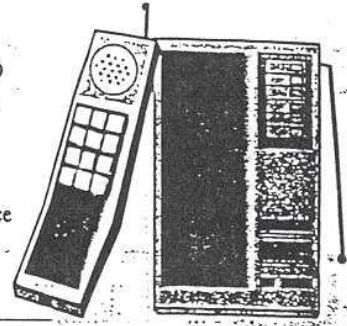
$$\begin{array}{r}
 11900 \\
 \times 0.0075 \\
 \hline
 89250
 \end{array}$$
 Apple \$ 89.25
 Apple Comm. \$ 6.05
 Because the others cost too much per week

A3.

316
321

Selling by Telephone

Many companies sell their products through long-distance telephone calls to customers. For example, the *CD Club* sells music compact discs all across the country from its headquarters in New York. Sales calls made by the *CD Club* last an average of about 4 minutes apiece. The club has bids from three possible providers for their long-distance telephone service:



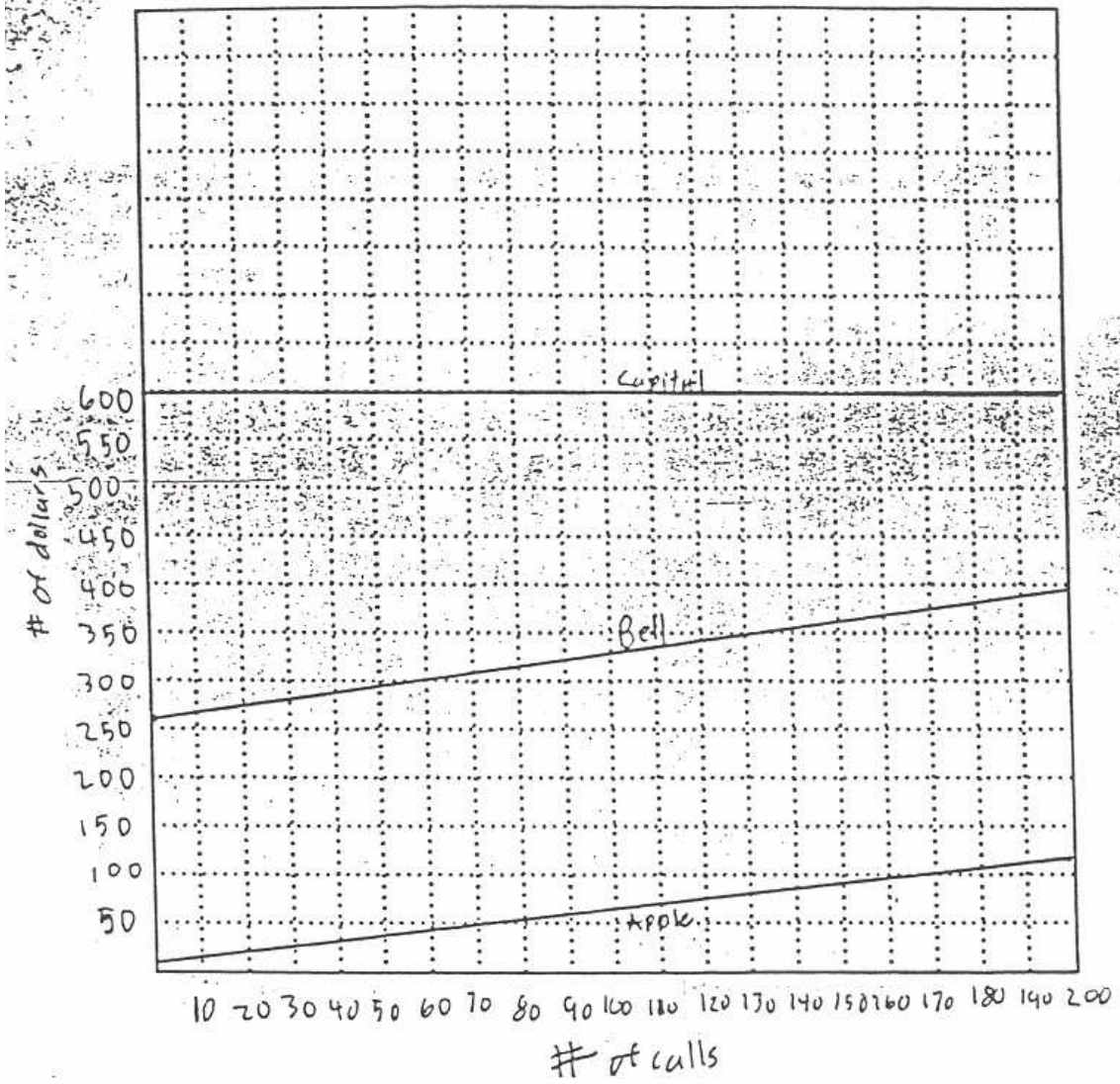
- 1) *Apple Communications* will charge \$0.35 for placing each call and then \$0.15 per minute of time used in the call.
- 2) *Bell Telephone* makes a fixed charge of \$260 per week for access to its long-distance lines, but charges only \$0.10 per minute of time used by the calls.
- 3) *Capital Long Distance Services* will make a fixed charge of \$600 per week for unlimited use of its long-distance lines.

Question: For the *CD Club* the problem is to choose the long-distance service that is least expensive for their business. What advice would you give about the phone company to choose and why?

Conclusions and Reasoning:

If they do an average of 200 calls a week then Apple Communications would be the cheapest. Bell would be the second best company and capital long distance would be the worst

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A4

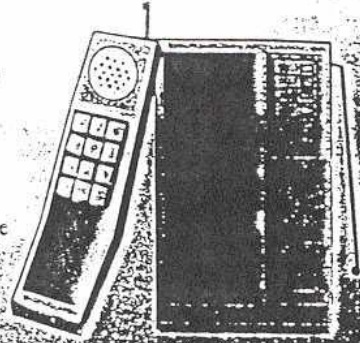
4.5

600 most 99

174

Selling by Telephone

Many companies sell their products through long-distance telephone calls to customers. For example, the *CD Club* sells music compact discs all across the country from its headquarters in New York. Sales calls made by the *CD Club* last an average of about 4 minutes apiece. The club has bids from three possible providers for their long-distance telephone service:



- 1) *Apple Communications* will charge \$0.35 for placing each call and then \$0.15 per minute of time used in the call. \$5 + 15¢
- 2) *Bell Telephone* makes a fixed charge of \$260 per week for access to its long-distance lines, but charges only \$0.10 per minute of time used by the calls. 260 + 10¢
- 3) *Capital Long Distance Services* will make a fixed charge of \$600 per week for unlimited use of its long-distance lines. 600

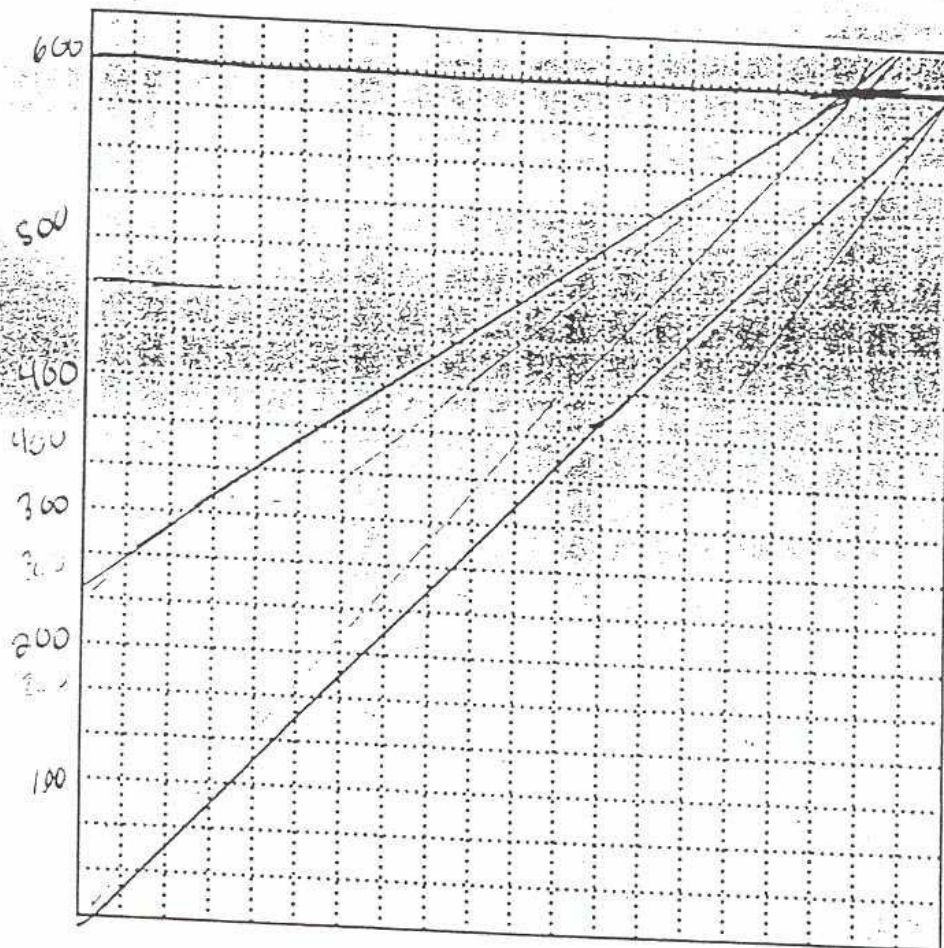
Question: For the *CD Club* the problem is to choose the long-distance service that is least expensive for their business. What advice would you give about the phone company to choose and why?

Conclusions and Reasoning:

The first company would be the best deal until 3998 minutes and if you talk more than that you should go with Plan 3 because at 3998 it is equal to \$600 after that it isn't equal

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cost in \$



minutes on ... machine

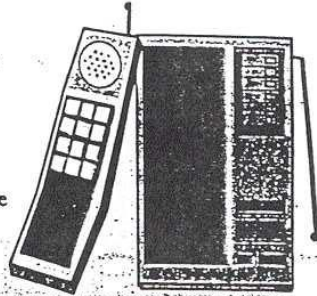
A5

383

442

Selling by Telephone

Many companies sell their products through long-distance telephone calls to customers. For example, the *CD Club* sells music compact discs all across the country from its headquarters in New York. Sales calls made by the *CD Club* last an average of about 4 minutes apiece. The club has bids from three possible providers for their long-distance telephone service:



- 1) *Apple Communications* will charge \$0.35 for placing each call and then \$0.15 per minute of time used in the call. .95
- 2) *Bell Telephone* makes a fixed charge of \$260 per week for access to its long-distance lines, but charges only \$0.10 per minute of time used by the calls.
- 3) *Capital Long Distance Services* will make a fixed charge of \$600 per week for unlimited use of its long-distance lines.

Question: For the *CD Club* the problem is to choose the long-distance service that is least expensive for their business. What advice would you give about the phone company to choose and why?

Conclusions and Reasoning:

$$\begin{cases} .35 + .15(x) = \\ 260 + .10(x) = \\ 600 \end{cases}$$

IF THERE ARE UNDER 474 CALLS PER WEEK
YOU WOULD USE APPLE COMMUNICATIONS
IF THERE ARE UNDER 850 CALLS PER WEEK
BUT OVER 474 YOU WOULD USE BELL TELEPHONE
IF THERE ARE OVER 850 CALLS PER WEEK
YOU WOULD USE CAPITAL LONG DISTANCE SERVICES

Appendix E: Detailed Description of IMP Modules

This appendix contains a parent handout prepared by Suburban High School mathematics teachers. The handout lists the IMP modules contained within each IMP text, and contains a detailed description of mathematics concepts and skills encountered in each module. Information in the handout was developed from Teacher's Guides for each IMP module, which are published by Key Curriculum Press.

THE INTEGRATED MATH PROGRAM

INTEGRATED MATH 1 TEXT

Patterns
The Game of Pig
The Overland Trail
The Pit and the Pendulum
Shadows

INTEGRATED MATH 2 TEXT

Solve It!
Is There Really a Difference?
Do Bees Build It Best?
Cookies
All About Alice

INTEGRATED MATH 3 TEXT

Fireworks
Orchard Hideout
Meadows or Malls?
Small World, Isn't It ?
Pennant Fever

INTEGRATED MATH 4 TEXT

High Dive
World of Functions
Know How
As the Cube Turns
Pollster's Dilemma

Integrated Math 1 Content

The course is divided into 5 units. The following is a summary of the concepts and skills students will encounter and practice in each unit.

1. PATTERNS

Students will:

- * analyze and create In-Out tables
- * use variables to express generalizations
- * find, analyze, and generalize patterns
- * work with order of operations for arithmetic
- * use a concrete model to understand and do arithmetic with positive and negative numbers
- * work with geometric concepts
- * write a calculator program to simulate an In-Out machine
- * develop proofs

2. THE GAME OF PIG

Students will:

- * develop and analyze strategies
- * express probability as a number between zero and one
- * calculate probabilities based on equally likely events and area models
- * decide whether events are independent
- * use "the long run" to develop the concept of expected value
- * calculate and interpret expected values
- * solve problems involving conditional probability
- * construct mathematical models for probabilistic situations
- * make and interpret frequency bar graphs
- * use simulations to estimate probabilities
- * compare the theoretical analysis of a situation with experimental results
- * write a calculator program to create a simulation
- * use a computer simulation to compare strategies

3. THE OVERLAND TRAIL

Students will:

- * create examples that fit a set of constraints
- * interpret ambiguous problems
- * find numbers that fit several conditions
- * compile and organize data
- * use data to make decisions
- * develop numerical algorithms
- * express algorithms in words and symbols
- * develop meaningful algebraic expressions
- * work with subscript notation

- * interpret graphs intuitively
- * use graphs to represent equations
- * understand the connections between situations, graphs, In-Out tables, and algebraic rules
- * make graphs from tabular information
- * find lines of best fit intuitively
- * use tables of information and lines of best fit to make predictions
- * graph and use zoom and trace facilities on a graphing calculator
- * solve equations for one variable in terms of others
- * combine two linear conditions
- * use the point of intersection of graphs to satisfy two conditions
- * work with rate problems

4. THE PIT AND THE PENDULUM

Students will:

- * perform scientific experiments
- * plan controlled experiments
- * formulate and refine conjectures
- * collect and analyze data
- * express results using bar graphs
- * calculate mean and standard deviation
- * analyze graphs of quadratic equations using computer software
- * use calculators to explore curve fitting
- * express mathematical ideas orally and in writing

5. SHADOWS

Students will:

- * plan controlled experiments
- * work in groups performing scientific experiments
- * formulate and refine conjectures
- * collect and analyze data
- * use calculators to explore curve fitting
- * discover criteria for polygons to be similar
- * rediscover the angle sum properties of polygons
- * discover the triangle inequality relationship and extend it to polygons
- * acquire intuition about angles by working with protractors
- * learn informal procedures for solving proportions
- * connect geometric pictures with proportions
- * apply properties of similar triangles to physical situations
- * learn the definitions of sine, cosine, and tangent to solve problems
- * express mathematical ideas orally and in writing

Integrated Math 2 Content

The course is divided into 5 units. The following is a summary of the concepts and skills students will encounter and practice in each unit.

1. SOLVE IT

Students will:

- develop equations to represent problem situations
- review substitution and order of operations
- understand the relationship between an algebraic rule, a table, and a graph
- review function notation
- recognize equations leading to straight line graphs
- represent real-life situations using functions
- create equivalent equations
- understand and use the distributive property
- identify and solve linear equations
- investigate how the parts of a linear function affect its graph
- define functions using expressions from equations
- use graphing calculators to solve a variety of equations

2. IS THERE REALLY A DIFFERENCE?

Students will:

- construct, and draw inferences from charts, tables, and graphs that summarize data from real-world situations
- understand that data snooping and hypothesis testing are two different activities
- design a statistical experiment to study a problem, conduct the experiment, and interpret and communicate the outcomes
- make hypotheses about larger populations by looking at sample data
- make null hypotheses to help evaluate the validity of and clarify hypotheses
- develop intuition about when differences in samples mean it is likely that the larger populations are different
- work with conditional probabilities
- calculate and interpret a chi-square statistic for given data to test if it fits a theoretical model
- calculate a chi-square statistic for given data about two populations
- use proportional reasoning to analyze the consequences of null hypothesis
- understand why chi-square statistics are calculated using a square and a proportion
- understand how a probability chart is associated with the chi-square statistic and what the probabilities mean
- use chi-square statistics to make decisions
- understand some limitations in applying a chi-square statistic to a situation
- express mathematical ideas orally and in writing

3. DO BEES BUILD IT BEST?

Students will:

- * gain an intuitive understanding of the concepts of area of 2- dimensional figures and surface area and volume of 3- dimensional figures
- * measure the area and volume of irregular shapes
- * discover formulas for area of triangles, rectangles, trapezoids, and regular polygons
- * write proofs
- * review triangle inequality
- * apply the Pythagorean Theorem
- * work with irrational numbers
- * create formulas to express generalizations in geometric situations
- * find the maximum of a function using a graphing calculator
- * review trigonometric functions
- * discover relationships that exist between perimeter and area of circles and regular polygons
- * discover formulas for the volume and area of prisms
- * understand that for a prism, maximizing volume for a fixed lateral surface area means maximizing area of the base
- * discover criteria for regular polygons to tessellate

4. COOKIES

Students will:

- express and interpret constraints using inequalities
- graph systems of inequalities
- see that setting a linear expression equal to different constants gives a family of parallel lines
- find the maximum of a linear function over a region
- realize that a system of two linear equations in two unknowns can have no solutions, one solution, or an infinite number of solutions
- recognize that different equations can have the same graph
- relate the idea of intersection of graphs to the idea of common solution of equations
- solve linear equations for one variable in terms of another
- use graphing calculators to draw feasible regions
- use graphing calculators to estimate points of intersection of graphs
- examine how the parameters in a problem can affect the nature of the solutions
- discover and describe the method of substitution for solving two equations
- create and solve problems by setting up and solving two equations
- make clear and convincing arguments
- recognize problems with inconsistent conditions
- study, and develop conclusions about, linear combinations
- create and solve linear programming problems with two variables

