Technology Applications in *Student Math Notes*

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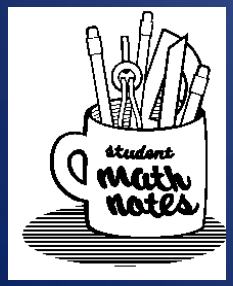
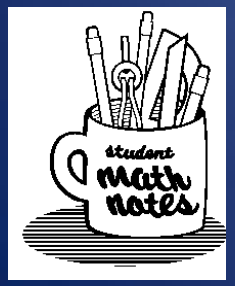


What is *Student Math Notes*?

Student Math Notes is an NCTM publication and is intended as a resource for grades 5-10 students, teachers, and teacher educators. Published five times each year, each issue develops a single mathematical theme that starts at the fifth grade level and ends by challenging high school students. The style is intended to interest students in the power and beauty of mathematics and to introduce teachers to new ideas that are within the reach of their students.



General Structure of *SMN*

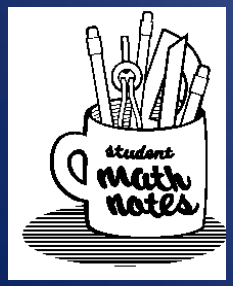
Introduction

Lesson - skills, concepts, and applications [which increase in difficulty progressively]

Extension

"Can You . . ."

"Did You Know . . ."



Goals of *SMN*

Stand-alone or replacement lessons

Link visual/concrete and abstract representations

Present new and innovative teaching ideas

But what about technology?

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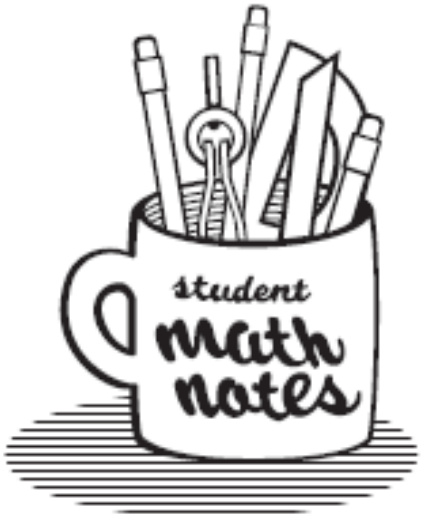


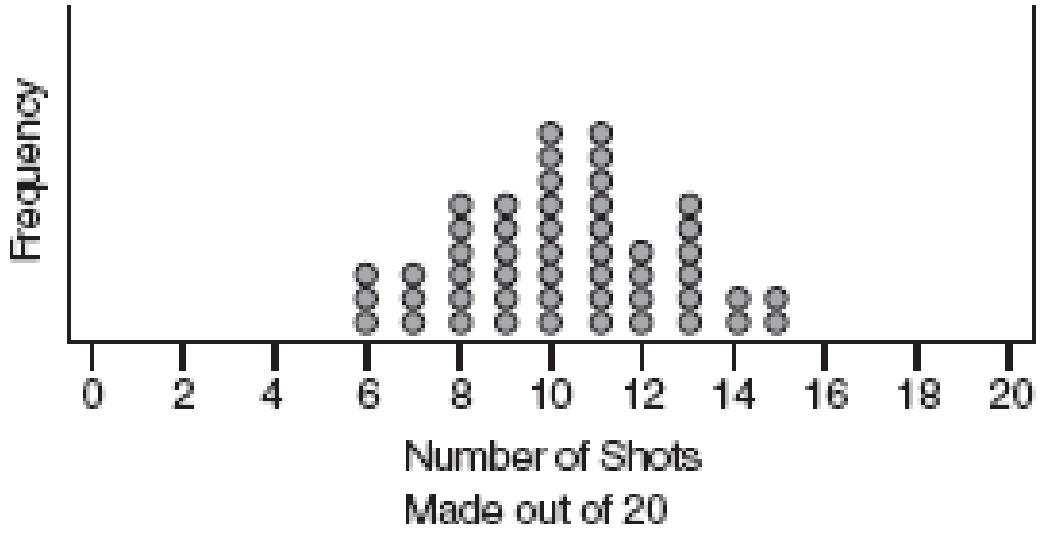
Over the Long Run

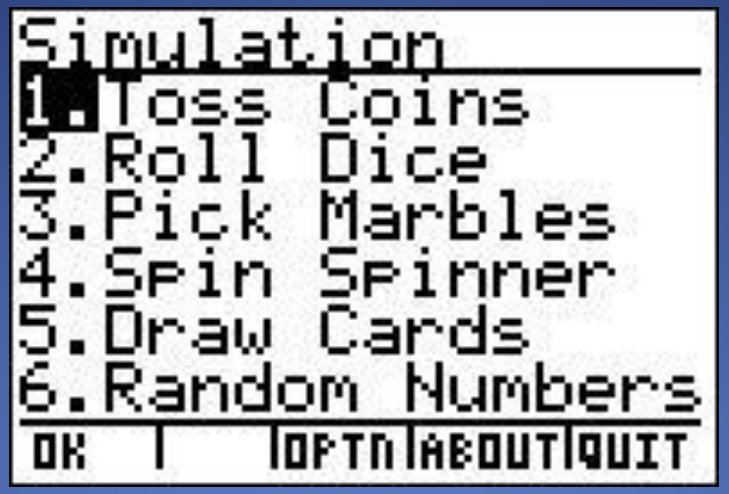
Max and Claire are trying out for the last remaining roster spot on the coed basketball team. The last tryout is a free-throw competition. When someone attempts a free-throw shot, we are not sure if they will make it or miss it. Only rarely does someone make all of his or her free throws in a game. Although we cannot always predict the outcome of a single shot, we can describe patterns over the long run.

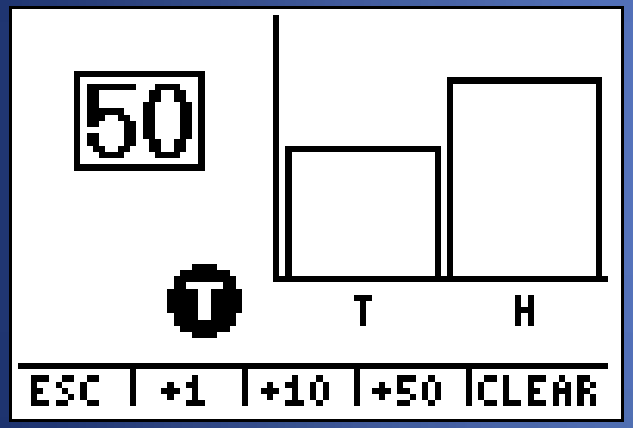
- Simulations
- Binomial model
- Law of large numbers
- Expected value

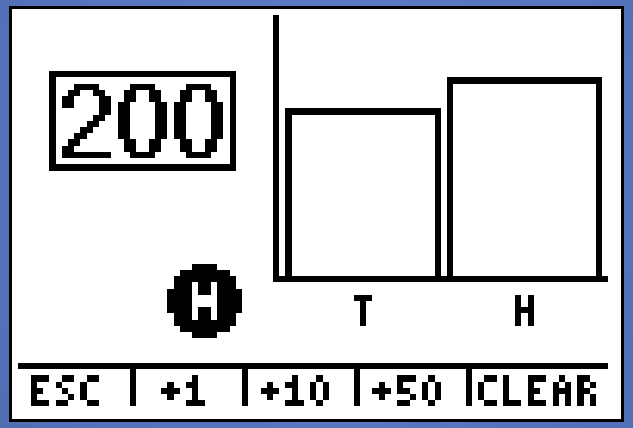
Collecting Data

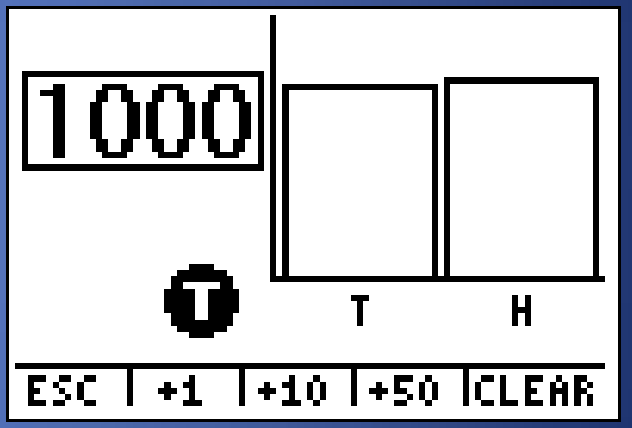
A group of students did the same simulation you did and completed 50 trials. Each dot in the dot plot below represents the result of one trial (one set of 20 shots). Add a dot to the dot plot to represent the result from each of your three trials. (If you made 11 shots in one trial, you would draw another dot above 11.) Your teacher may even want to enlarge this and have all your classmates add their results to it.

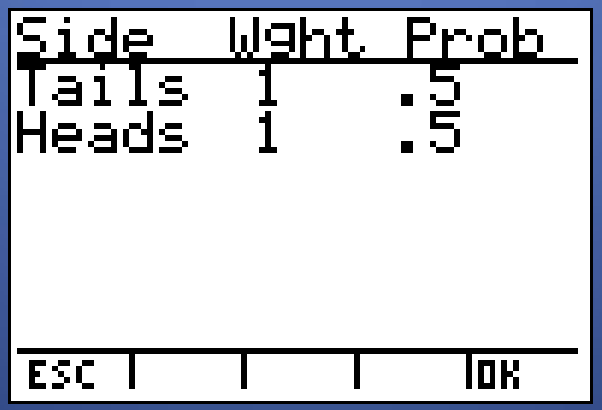



Simulation
1.Toss Coins
2.Roll Dice
3.Pick Marbles
4.Spin Spinner
5.Draw Cards
6.Random Numbers
OK
OPTN
ABOUT
QUIT


50
T
T
H
ESC
+1
+10
+50
CLEAR

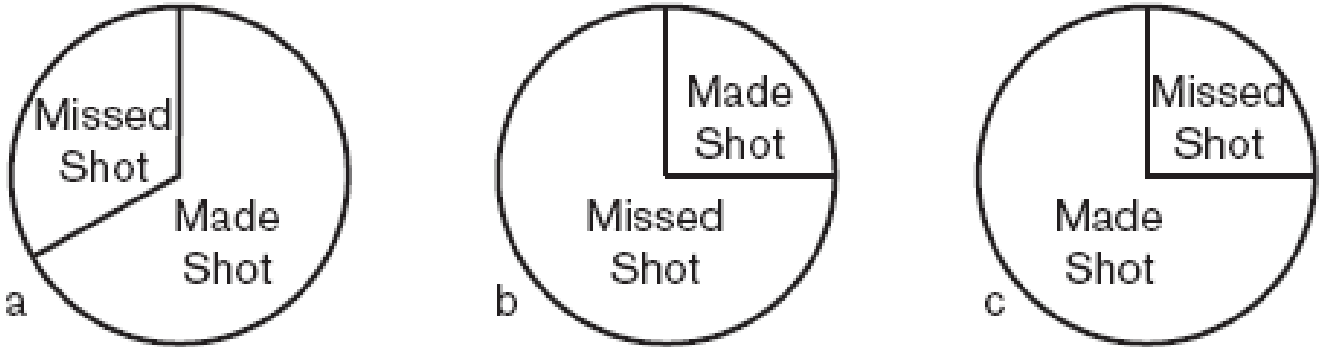

200
H
T
H
ESC
+1
+10
+50
CLEAR


1000
T
T
H
ESC
+1
+10
+50
CLEAR


Side Wght Prob
Tails 1 .5
Heads 1 .5
ESC
OK

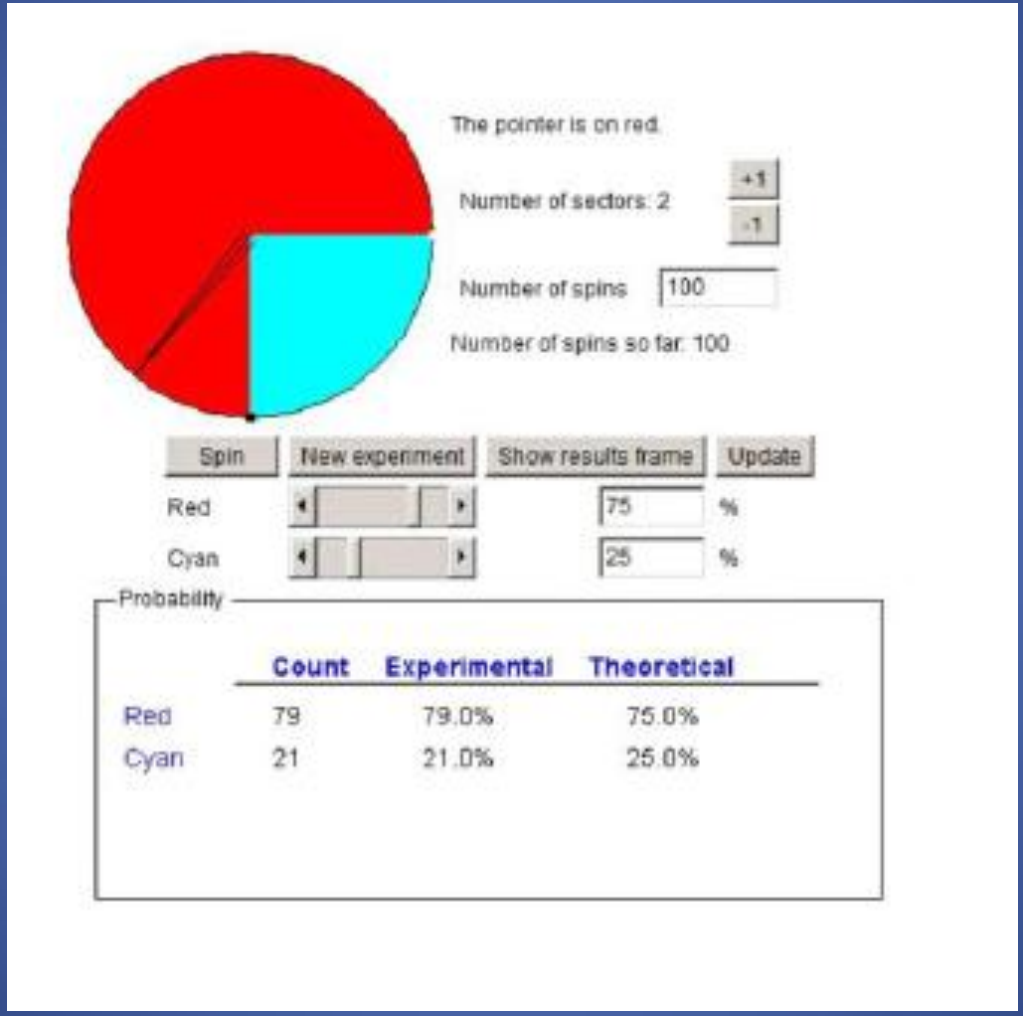
Spinner Simulation

As Max continues shooting, he keeps track of his successes and estimates that he makes about 75% of his shots. Since this is not "about half," a different tool must be used to simulate Max's shooting. We will use a paper clip to make a spinner for this simulation.



10. Which spinner would best simulate Max's free-throw shooting? _____ Explain your choice.

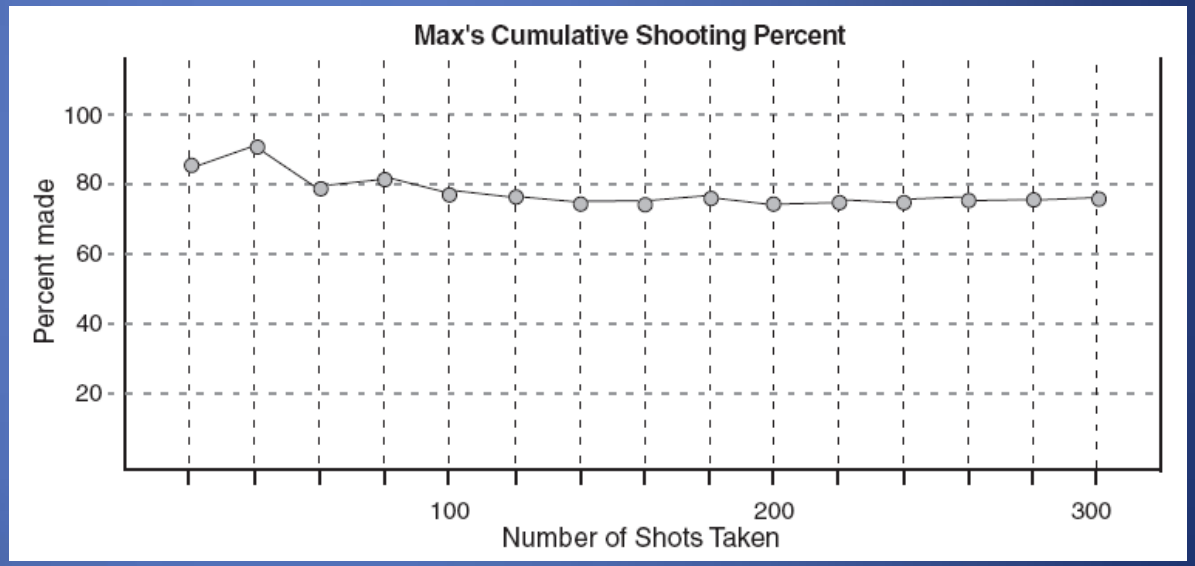
Spinner Simulation Applet



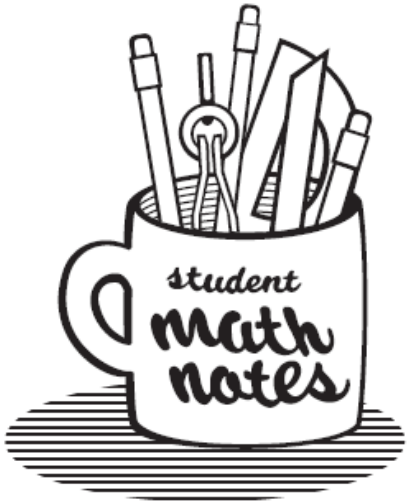
http://www.shodor.org/interactivate/activities/AdjustableSpinner/

Representations

Total Number of Shots	Total Number of Made Shots	Percent of Made Shots
20		
40		
60		
70		
80		
100		
120		
140		
160		
180		
200		
220		
240		
260		
280		
300		

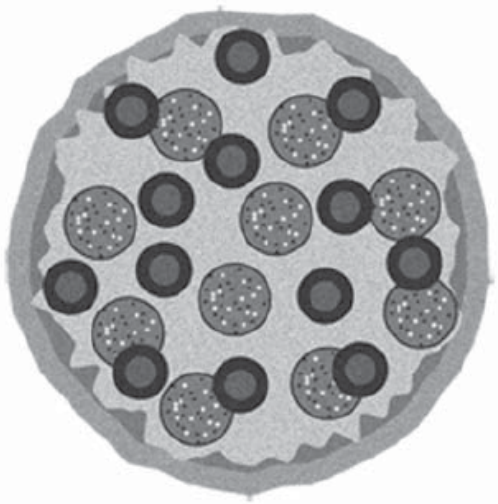


National Council of Teachers of Mathematics May/June 2007



Representing Possibilities

Representations in mathematics can take different forms and be used for different purposes. Different representations—such as tables, equations, and graphs—are helpful in visualizing information, understanding the mathematics, and making a problem easier to solve. The following scenarios provide opportunities to use these various forms of representations.

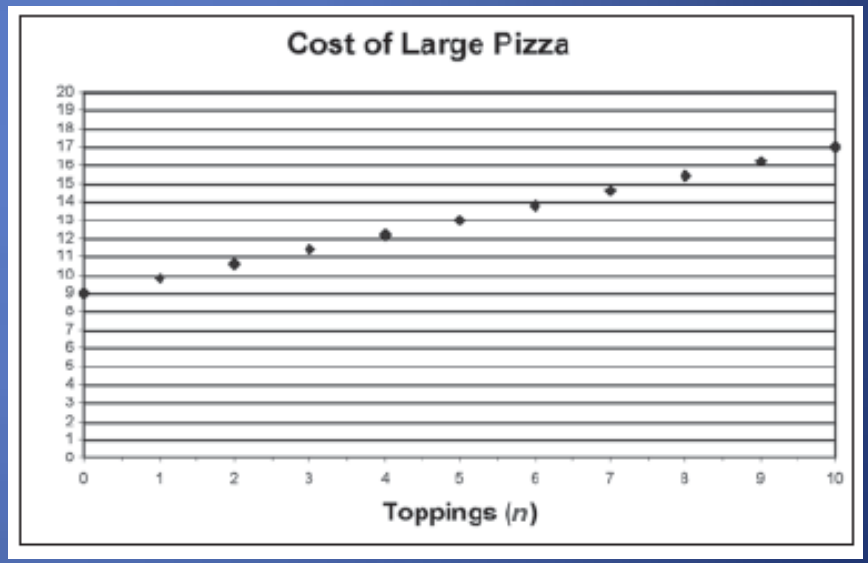


- Linear functions
- Fundamental Counting Principle
- Combinations
- Representation
- Area of a circle

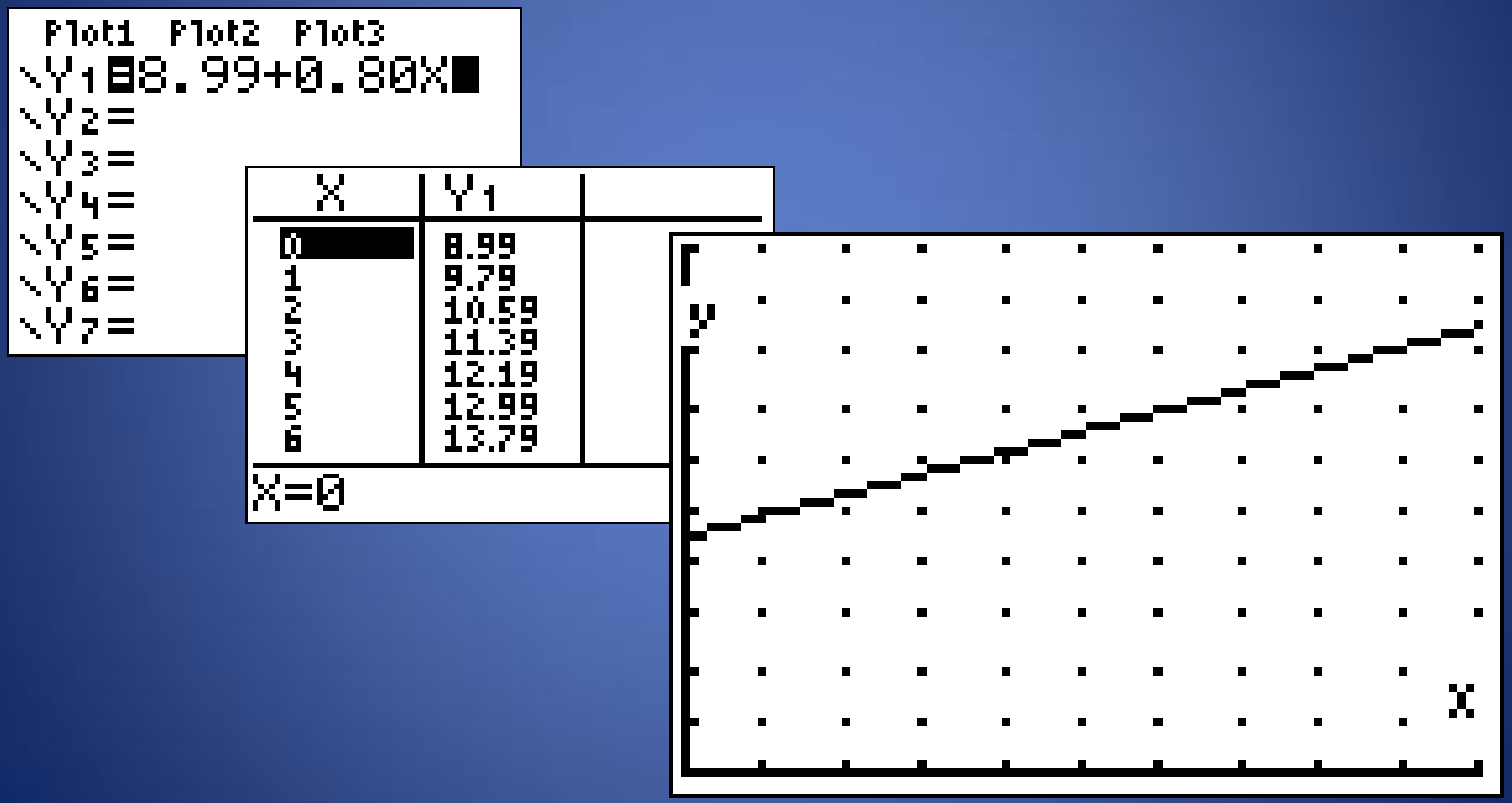
Multiple Representations

$$C = \$8.99 + n(\$0.80)$$

Number of Toppings	Calculations	Cost
0	\$8.99	\$8.99
1	\$8.99 + \$0.80	\$9.79
2	\$8.99 + 2(\$0.80)	\$10.59
3	\$8.99 + 3(\$0.80)	\$11.39
4	\$8.99 + 4(\$0.80)	\$12.19
5	\$8.99 + 5(\$0.80)	\$12.99
6	\$8.99 + 6(\$0.80)	\$13.79
7	\$8.99 + 7(\$0.80)	\$14.59
8	\$8.99 + 8(\$0.80)	\$15.39
9	\$8.99 + 9(\$0.80)	\$16.19
10	\$8.99 + 10(\$0.80)	\$16.99



Multiple Representations Graphing Calculator

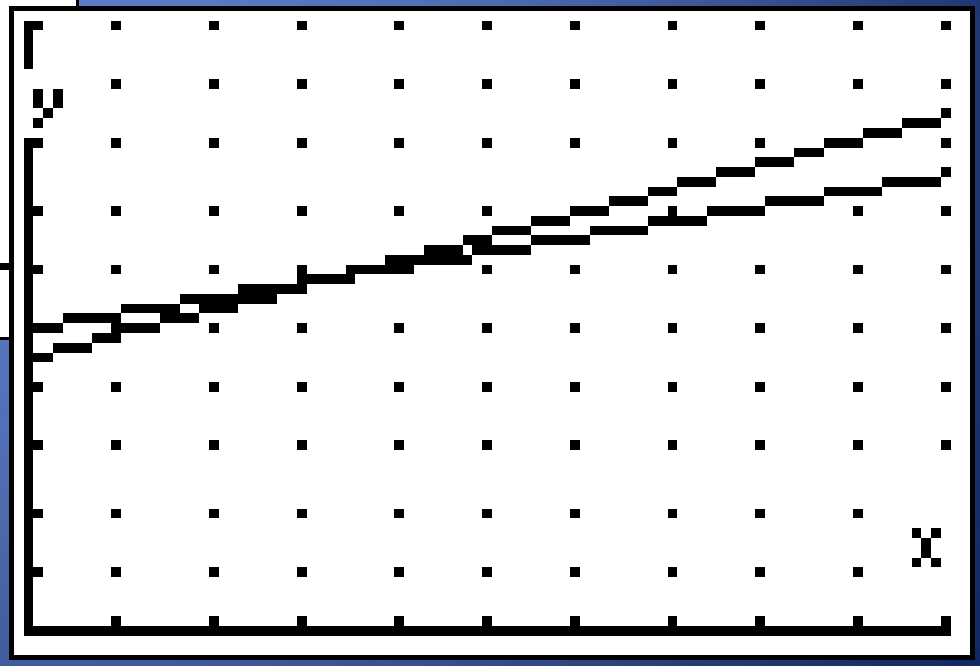


Multiple Representations Graphing Calculator

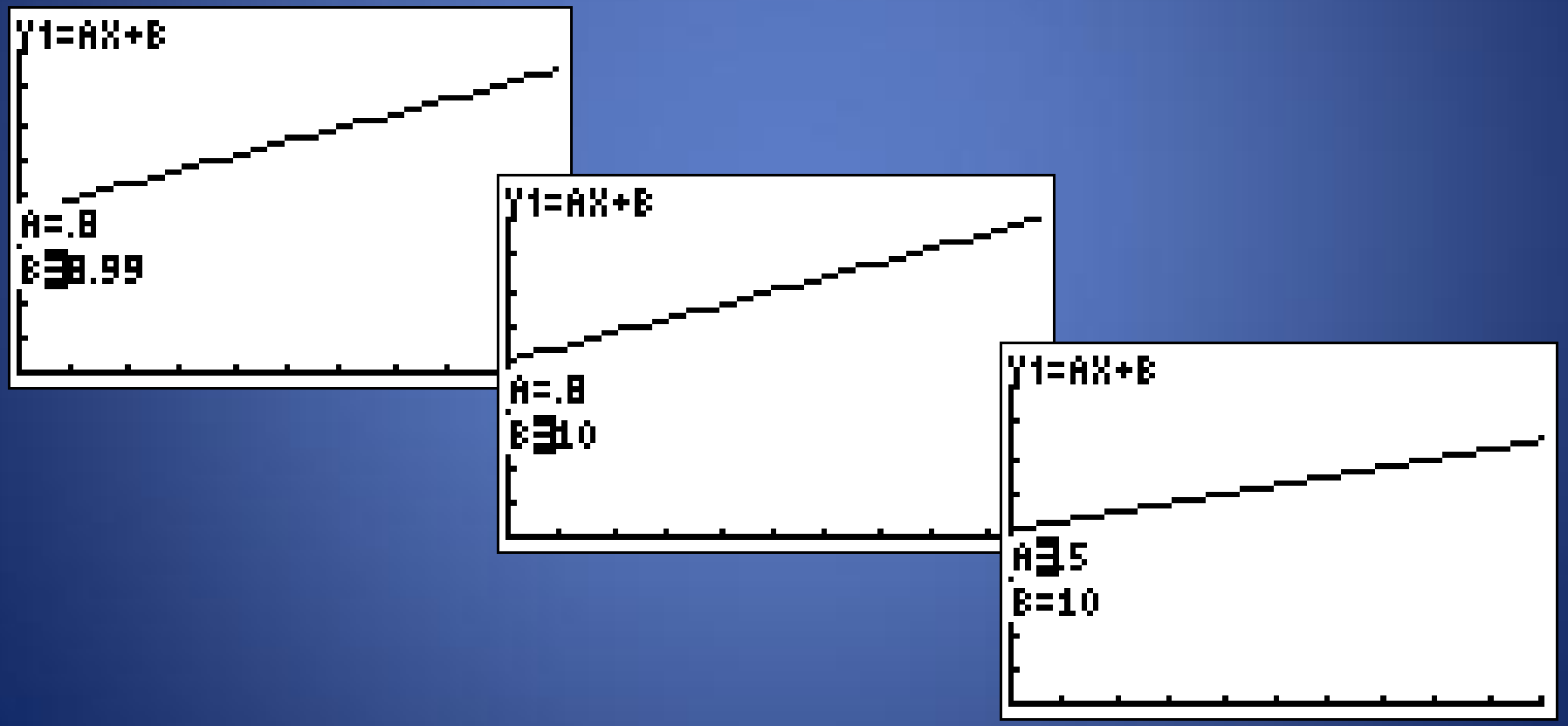
Plot1 Plot2 Plot3
\Y1=8.99+0.80X
\Y2=10+0.50X
\Y3=
\Y4=
\Y5=
\Y6=
\Y7=

X	Y1	Y2
0	8.99	10
1	9.79	10.5
2	10.59	11
3	11.39	11.5
4	12.19	12
5	12.99	12.5
6	13.79	13

X=0

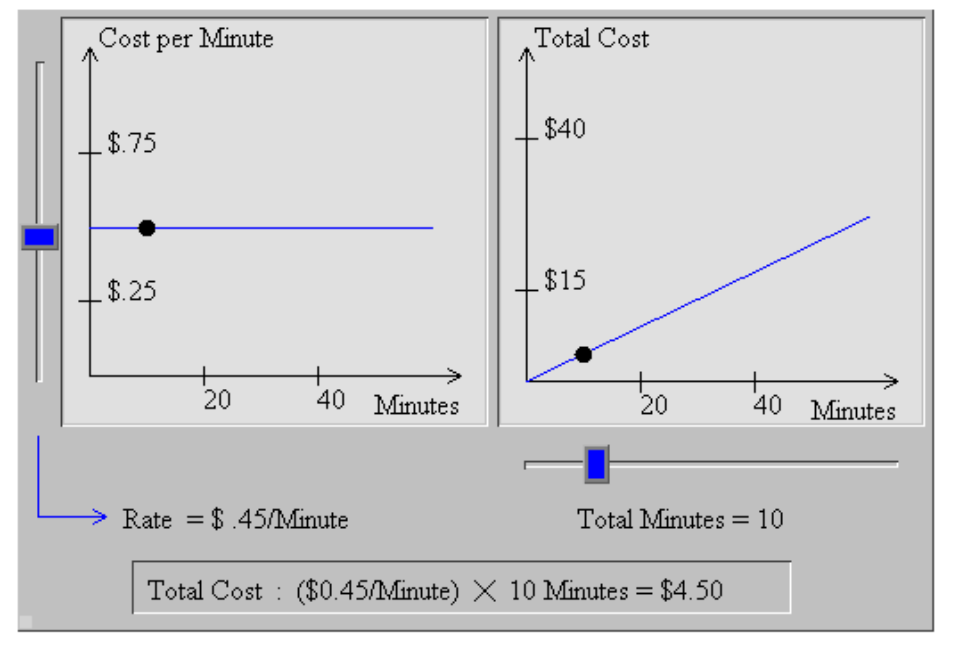


Multiple Representations Interactively on the Graphing Calculator



Multiple Representations Applet

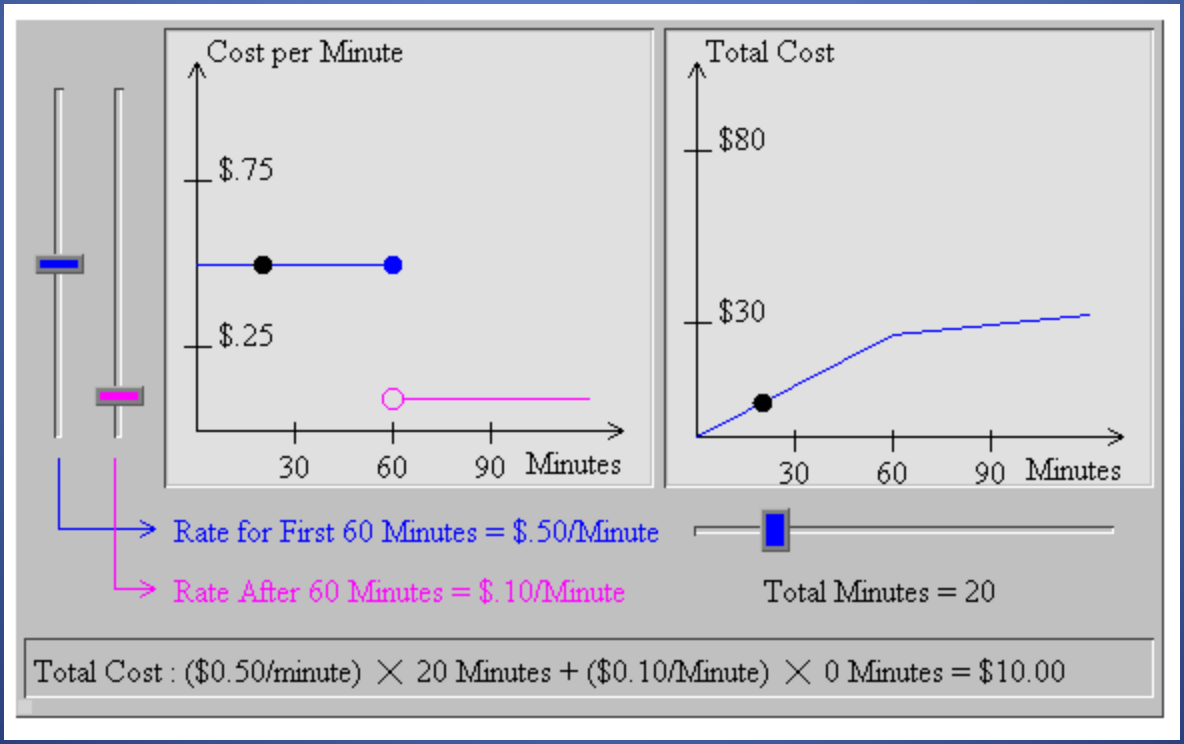
ChitChat, a cellular-phone-service provider, has no monthly fee for cellular-phone service but does charge a $0.45 per minute usage fee.



http://my.nctm.org/standards/document/eexamples/chap6/6.2/index.htm?#applet

Multiple Representations Applet

Quik-Talk advertises monthly cellular-phone service for $0.50 per minute for the first 60 minutes of calls, but only $0.10 per minute for each additional minute thereafter.



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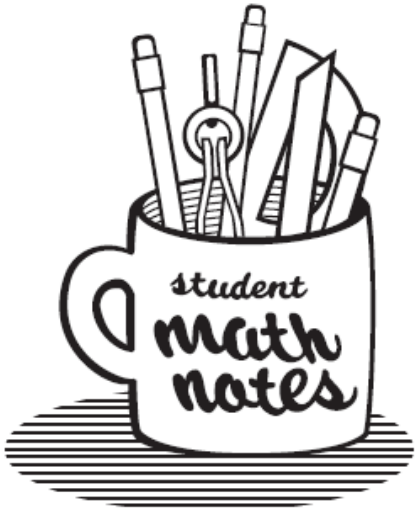


Explorations with a Paper Circle

Mathematical relationships can be found and explored in many situations. In honor of Pi Day, which occurs on March 14, this issue of *Student Math Notes* explores the circle. In the United States we write March 14, 2007, as 3/14/2007. The 3/14 suggests 3.14, which represents the first few digits of pi. If you drew circles of all different sizes, you would find that the circumference divided by the radius is the same value. This surprising discovery traces back to the Babylonians about 4000 years ago. Computers have been used to calculate the value of pi for hundreds of thousands of digits.

- Circles, triangles, and trapezoids
- Area relationships
- Surface area
- Fractions

Finding the Center of a Circle

Paper Folding Activity

Defining a Circle

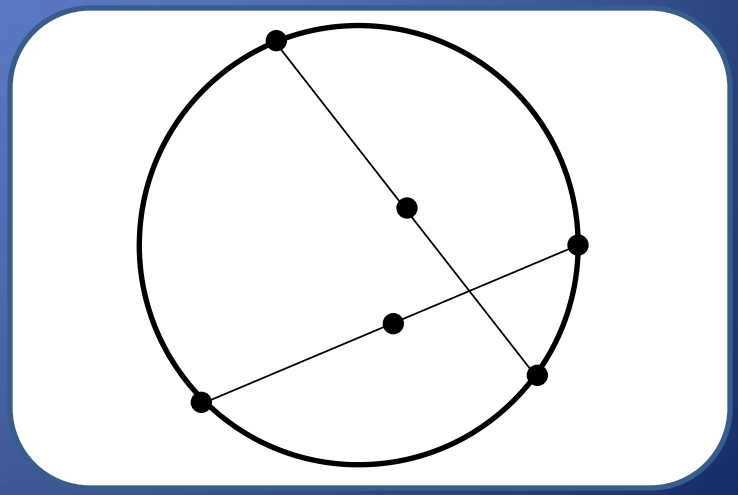
A **circle** is the set of all points in a plane that are equidistant from a point called the center. Find a circular object about the size of a salad plate to trace (do not use a compass to draw the circle). Trace and cut out the circle. (Make a few extra circles in case you have to start over.) A circle is two dimensional, while the paper circle is three dimensional; technically, it is a disk. For the purposes of this investigation, we will ignore its depth and refer to the disk as a circle.

1. Why does folding a circle in half locate the diameter of the circle?
2. What is the fewest number of folds necessary to determine the center of the circle?

Geometer's Sketchpad

How can we emulate "folding" in a dynamic drawing environment?

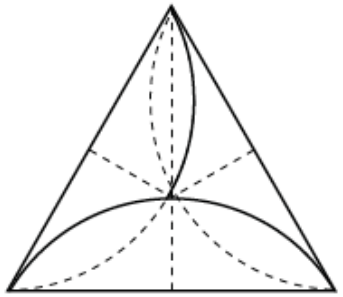
How do we use geometric definitions to help to determine the center of the circle?



“Constructing” on Paper vs. Virtually

Paper Folding

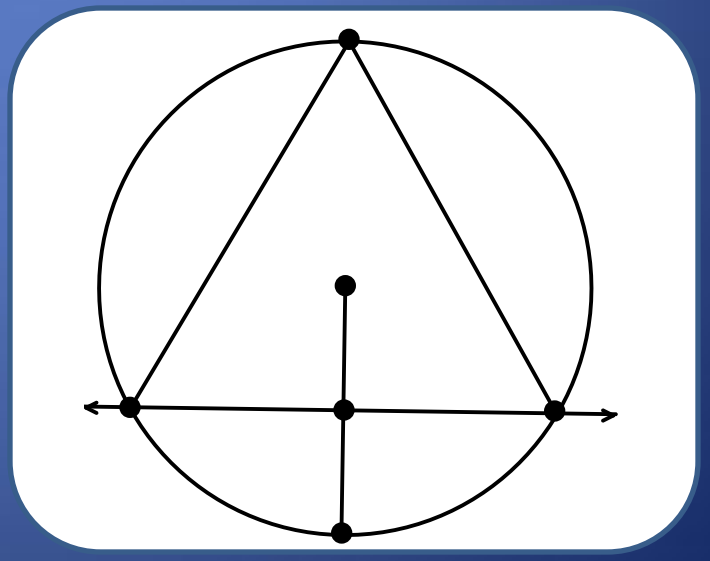
Hold the circle so that the folded section is toward you. Make two more folds (toward you) to complete the triangle that has the folded perpendicular bisector as one side. The folded circle should now look like this:



Geometer’s Sketchpad

In what ways can we “construct” an equilateral triangle inscribed in a circle?

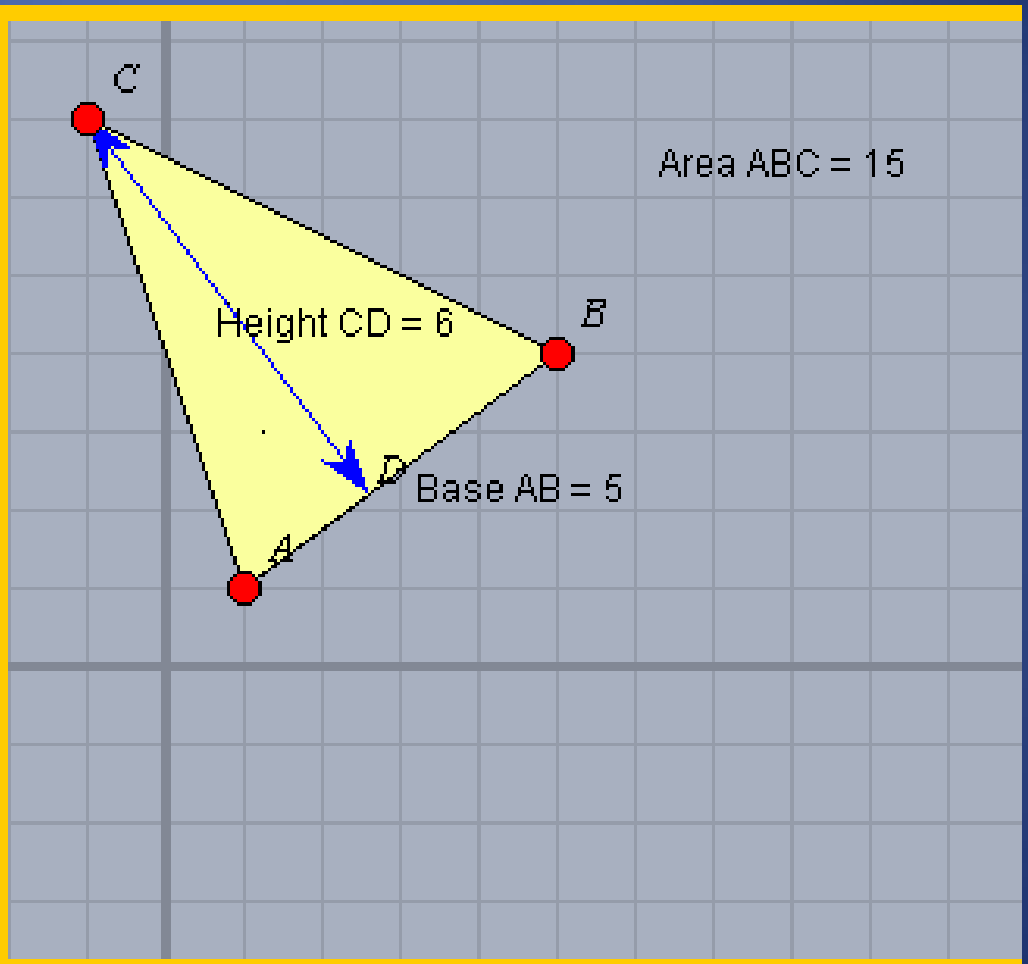
How does the chosen technique emphasize particular areas of mathematics?



Developing the Area of a Polygon

Areas of triangles
What is the connection between the lengths shown and the area?

Move point C to the left or right so that the height remains the same. What happens to the area?
What is the "formula" for the area of a triangle?



http://www.mathsnet.net/dynamic/cindy/triangle_area.html

Future Role of Technology in *SMN*

- Activity-based
- Online enhancements
- Wiki teacher pages

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The slides are available at

nolanmath.com