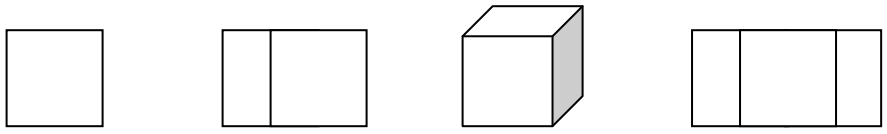
LESSON 6-2 CUBE VIEWS

"You may hold a cube and examine how it looks as you move it around."

"Try to hold the cube so that it looks like each of the following:"



A B C D

A. "Can you do all four? Why or why not?"

"An edge is a straight line. Can you show me an edge on the cube?"

"A face is a flat surface. Can you show me a face on the cube?"

"A vertex is a point where three or more lines intersect. Can you show me a vertex on the cube?"

B. "*Vertices* is the plural of *vertex*. One vertex, two _____."

C. "As you hold up the cube so it looks like A, B, and C, complete the table:"

View	Visible			Not visible		
	Edges	Faces	Vertices	Edges	Faces	Vertices
A	4			8		
B						
C						

"For example, View A has 4 edges visible and 8 edges not visible."

D. "Is the sum of visible and non-visible edges the same for all views?"

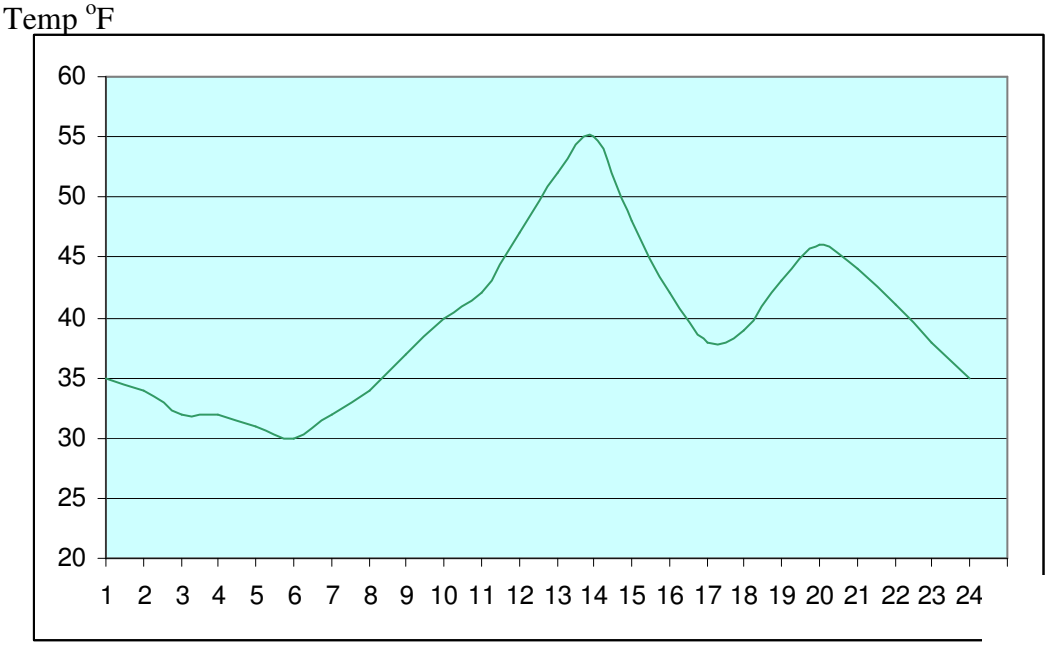
E. "Is the sum of visible and non-visible faces the same for all views?"

F. "Is the sum of visible and non-visible vertices the same for all views?"

"Correct the table as necessary."

LESSON 6-66 GRAPHING CURVES

"This graph shows the variance in temperature over the course of a day:"



A. "What was the temperature at 6 a.m.?"

B. "What was the hottest temperature of the day?"

C. "At what time was the temperature the hottest?"

D. "What was the coldest temperature of the day?"

E. "At what time was the temperature the coldest?"

F. "During which time periods was the temperature rising?"

G. "During which time periods was the temperature falling?"

H. "It got cloudy sometime during the day. When do you think that happened?"

LESSON 6-91 SUM OF THE ANGLES IN A TRIANGLE

A. “Draw a triangle on a blank sheet of paper.”

B. “Using a protractor, measure its three angles and put your results into this table.”

C. “What hypothesis can you make about the angles of a triangle?” Repeat steps A and B until the student can answer this question.

Triangle #	Angle 1	Angle 2	Angle 3	Notes
1				
2				
3				
4				

LESSON 6-93 PLAYING CARDS: COUNTING POINTS

A. “There is a card game where all 52 cards are dealt to four players. How many cards does each person get?”

B. “Each card has a point value as follows:”

Card	Point value
A	4
K	3
Q	2
J	1
2-10	0

- Legend: A=Ace K=King Q=Queen J=Jack -

C. “Does the suit make a difference in a card’s point value?”

Practice picking up 13 cards and determining the point value. Repeat until the student is competent.

D. “For any 13 cards, what is the maximum point value that one suit can have?”

E. “Name a strategy for arranging 13 cards to determine a point value most quickly.”

F. “How many points are in a deck of 52 cards? Describe your work using words and equations.”

G. “What is the average number of points that 13 cards picked up at random will contain? Describe your work using words and equations.”

LESSON 6-114 SOLVING FOR UNKNOWNS

A. “This is a problem we will solve together; you may take notes on what I’m about to say. I am thinking of a number. If I add 7 to it and then take away 5, I get 12. What is the number?”

“OK let’s talk about how you might go about answering this question.”

“First, you may tell me the facts.”

B. “Good! Let’s represent these facts using symbols. For example, you might represent the original number as x.

C. “Good! OK, let’s translate the first fact using our symbols. The first fact is: ‘I am thinking of a number.’ What are we calling this number?”

“Good! We start by writing x:”

x

“The next fact is that we add 7 to it. Hmmm, so far we have x plus 7:”

$x + 7$

“The next fact is to take away 5:”

$x + 7 - 5$

“And this gives twelve:”

$x + 7 - 5 = 12$

“The question is, ‘What is the number x?’ Do you think we have enough information to find out what x is?”

D. “First you may guess what x is by trial and error. Say we guessed that x was zero.

i. “What is zero plus seven minus five?”

ii. “Is that less than or greater than 12?”

iii. “What is your next guess?”

Repeat steps D)i through D)iii until the student gets the right answer.

E. “Let’s look at the equation to discover another way to find out what x is:”

$x + 7 - 5 = 12$

"If we could only find a way to put *x* by itself we could get our answer."

"Since this is an equation, we can add or subtract the same amount from both sides. What amount can we add to both sides?"

F. "You may do this and write the new equation."

G. "What amount can we subtract from both sides?"

H. "You may do this and write the new equation."

I. "True or false: When the number is minused, we add that number to both sides. When the number is plused, we subtract that number from both sides."

Repeat steps A through I for the following:

J. "I am thinking of a number. If I subtract 20 from it and then add 50, I get 50. What is the number?"

K. "I am thinking of a number. If I add 240 and then take away 800, I get 140. What is the number?"

LESSON 6-133 NETS AND SURFACE AREA

Place the flats for the cube and cone in the work area. Pick up the cube flat.

"This is what a cube looks like when it's flattened out. When flat, it is called a 'net'. Say with me: *net*."

A. "You may try to assemble this net back into a cube."

B. "Good! Now flatten out the cube again and trace it on a ShillerMath Graphsheet. Then count up the number of squares it covers as best as you can, and write your answer here:" _____

C. "What is the surface area for the cube?"

"The surface area tells us, for example, how much paint we'd need to cover the surface."

D. "Measure one edge of the cube and put your answer here:" _____

E. "What is the surface area of one side of the cube?" _____

F. "How many sides does a cube have?" _____

G. "What should the surface area be?" _____

H. "How far off was your answer to B?" _____

LESSON 6-145 RATIONAL NUMBERS

"A rational number is any number that can be written as a fraction of integers."

"For example, 10 is a rational number because it can be written as:"

$$\frac{10}{1}$$

"Two divided by three is also a rational number because it can be written as:

$$\frac{2}{3}$$

"Rational numbers can also be negative:"

"Negative one is a rational number because it can be written as:"

$$\frac{-1}{1}$$

"which is a fraction of integers. Negative thirteen divided by five is a rational number because it can be written as:"

$$\frac{-13}{5}$$

"which is a fraction of integers. Zero is a rational number because it can be written as:"

$$\frac{0}{1}$$

"which is a fraction of integers. But something over zero is NOT a rational number because you may not divide something by zero."

A. "Which of the following are rational numbers?"

i. $\frac{132}{331}$

ii. $1{,}231$

iii. $\frac{-32}{331}$

iv. $-1{,}231$

v. $\frac{32}{-331}$

vi. 0

vii. $\frac{0}{-931}$

viii. $\frac{-931}{0}$

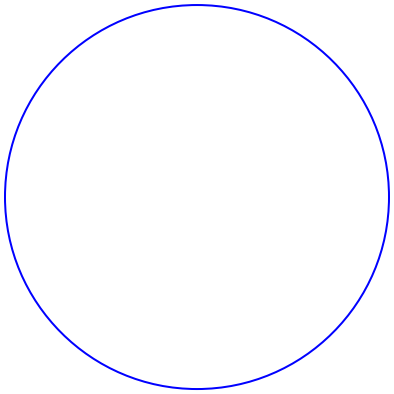
"True or false:"

B. If you divide one integer by another integer you'll always get a rational number.

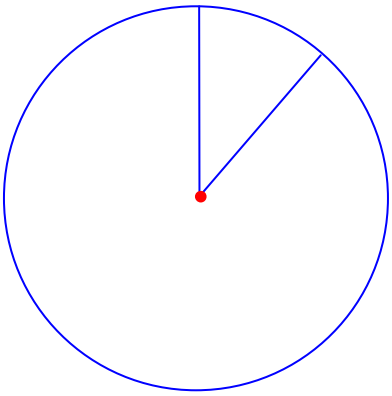
C. Every rational number can be expressed as one integer divided by another integer.

LESSON 6-153 AREA OF A CIRCLE

"This is a circle:"



"Let's cut a little pie slice into the circle:"



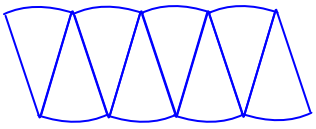
"Think of this pie slice as very narrow, like what you'd feed a baby sparrow!"

A. "Fill in the blank: It is almost a triangle, except that _____"

B. "True or false: The curved line – or arc – that is the third side of our near-triangle is part of the circumference of the circle."

C. "Imagine that we made lots of these pie cuts all over the circle. True or false: The little arcs from each near-triangle would sum up to the circumference."

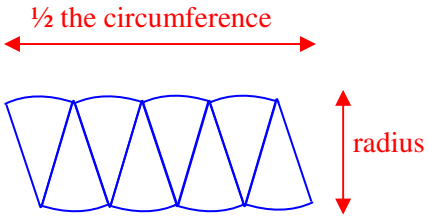
D. "Now imagine putting all these near-triangles next to each other – one up and one down – in a row like this:"



"It's a near-rectangle! Remember, each near-triangle is very thin, so thin that they are just about straight lines."

"True or false: Since the lengths of the arcs in the near-triangles add up to the circumference, the top and bottom of the near-rectangle both add up to one half the circumference."

E. "The area of a rectangle is height times width, which is the radius of the circle times one half the circumference of the circle:"



i. "True or false: The area of a circle equals one half its circumference times its radius."

ii. "True or false: The circumference of a circle is $2\pi r$, where r is the radius."

iii. "True or false: The area of a circle is πr^2, where r is the radius. Show your work, using the information from E)i and E)ii."

F. "Using the drawing compass, draw a circle on a ShillerMath Graphsheet with radius 2. Draw a square on top of the circle, with each side of the square being 4, and the centers of the square and the circle being the same point."

i. "What is the area of the square?"

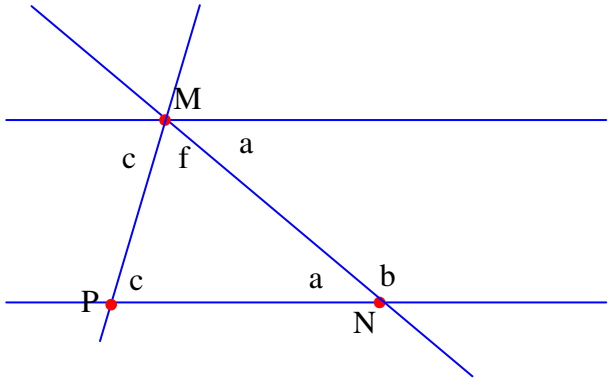
ii. "What is the area of the circle?"

iii. "Which has the larger area: The square or the circle?"

iv. "By eye, approximate the area of the circle. How far is it from the answer in F)ii?"

LESSON 6-159 DEGREES IN A TRIANGLE

A. "Now let's draw another transversal $\overleftrightarrow{MP}$ and label the new angles and points:"



"Look at point M and note the three angles *c*, *f*, and *a* that make up the straight angle."

"True or false: Angles *c*, *f*, and *a* sum to 180 degrees. Discuss your answer."

B. "Look at the triangle in the middle of the diagram. It has angles *c*, *f*, and *a*. True or false: A triangle always has 180 degrees. Discuss your answer."

C. "True or false: The degrees in angle *b* equals the sum of the degrees in angles *c* and *f*. Discuss your answer."

D. "True or false: In every right triangle, the two angles besides the right angle are complementary. Discuss your answer."

E. "True or false: In every triangle, all three angles are always supplementary. Discuss your answer."

F. "True or false: A right triangle can have an obtuse angle. Discuss your answer."