LESSON 5-2 ABSOLUTE VALUE

"Here is a number line that includes both negative and positive numbers:"

```
 |----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
 -10 -9  -8  -7  -6  -5  -4  -3  -2  -1  0   1   2   3   4   5   6   7   8   9   10
```
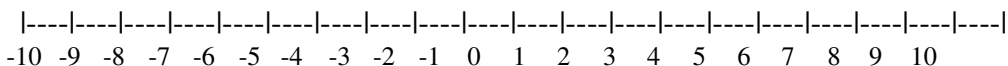
"Let's call each mark above the numbers a 'tick'."

A. "Can you show me the first tick on the left? Good!" Now point at the tick all the way to the right above the 10. "What's the label for this tick?"

B. "Let's start at zero and move to the right 5 ticks. On what number are you?"

"You may circle that number."

"Now let's start at zero and move to the left 5 ticks. On what number are you?"

"You may circle that number."

C. Try step B for several other numbers from 1 to 10 until the student is competent.

D. "What rule can you make from what you have done?"

E. "Now we will define a term: *absolute value*. The absolute value of a number is the distance of the number from zero on the number line. The absolute value of a number is always a positive number (or zero)."

F. "For example, the absolute value of 5 is 5 because that's how far we had to move, regardless of direction, on the number line to get from zero to five. The absolute value of negative 5 is 5 because that's how far we had to move, regardless of direction, on the number line to get from zero to negative five. The absolute value of 4 is 4 because that's how far we had to move, regardless of direction, on the number line to get from zero to four. The absolute value of negative 4 is 4 because that's how far we had to move, regardless of direction, on the number line to get from zero to negative four."

LESSON 5-9 LINES, SEGMENTS, RAYS

"A line goes on forever – the arrows show that the line never stops:"
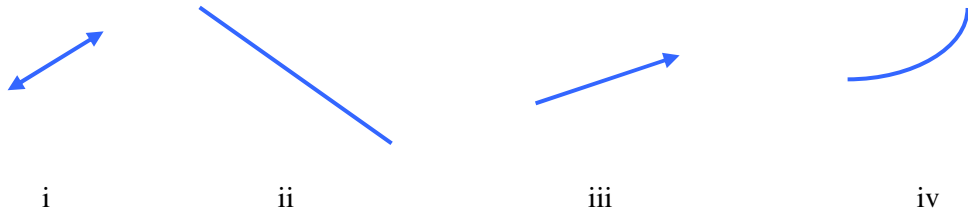
"A line segment has a beginning and an end:"

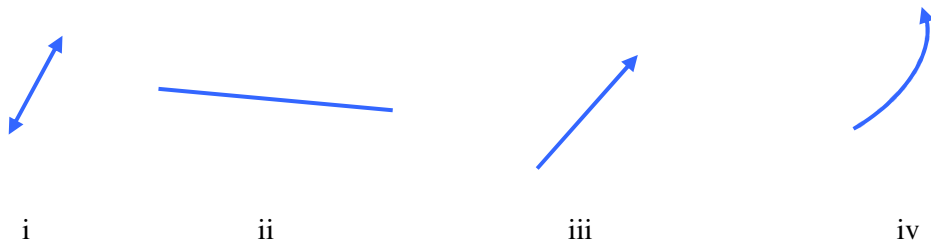"There is another type of line that has a beginning but not an end:"

"This line is called a ray. Say with me: *ray*. Rays are straight lines that start at a point and go on forever in one direction only."
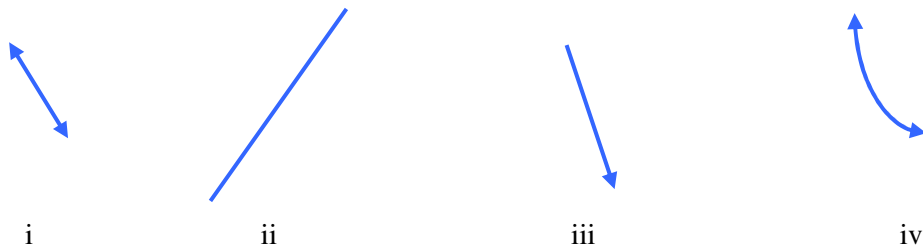
A. "Show me a line:"

| i | ii | iii | iv |

B. "Which of the following is a ray?"

| i | ii | iii | iv |

C. "Which of the following is a line segment?"

| i | ii | iii | iv |

D. "What type of line is it when you walk from one end of the room to the other?"

E. "What type of line is it when a light is shone from a flashlight into space?"

F. "What type of line does a garden hose make when it's straightened out?"

G. "What type of line has two arrows?"

H. "How many different types of straight lines are there?"

LESSON 5-36 FILL IN THE BLANKS

"True or false? If false, give a counter-example. If true, say why."

A. "An odd number times an odd number is always an even number."

B. "An odd number times an even number is always an even number."

C. "An even number times an even number is always an even number."

D. "An even number times an odd number is always an even number."

"For E, F, and G, using these numbers:"   2 3 4 5 6

"Fill in the boxes so the product is less than 10,000 and it is also:"

E. "Odd"

$$\square\ \square\ \square\ \square$$
$$\times\ \square$$

F. "Even"

$$\square\ \square\ \square\ \square$$
$$\times\ \square$$

G. "a four-digit number"
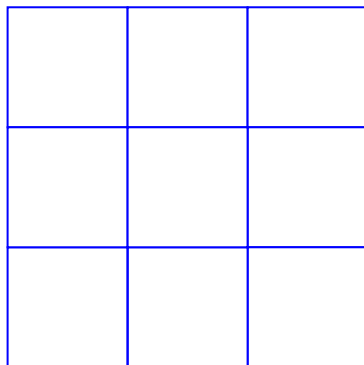
$$\square\ \square\ \square\ \square$$
$$\times\ \square$$

LESSON 5-80 STRANGE MAGIC SQUARE

"We have seen that in a magic square all the rows, columns, and diagonals add up to the same number."

"In a strange magic square, each row, column, and diagonal adds up to a *different* number."

"You may use the numbers 1 through 9 to build a strange magic square:"

LESSON 5-90 GEOMETRY: SOLIDS

A. "We have been used to working with shapes in 2 dimensions:"

"2-dimensional shapes are called plane shapes. *Plane* is spelled P-L-A-N-E, and it means flat."

"Shapes that lie on a plane – or shapes that have a face that lie on a plane - have a width and a length, but they do not have height because they only have 2 dimensions. You may call these shapes 'plane shapes'."

"Plane shapes are flat and may be drawn on a piece of paper. In fact a piece of paper can be considered to be a plane shape."
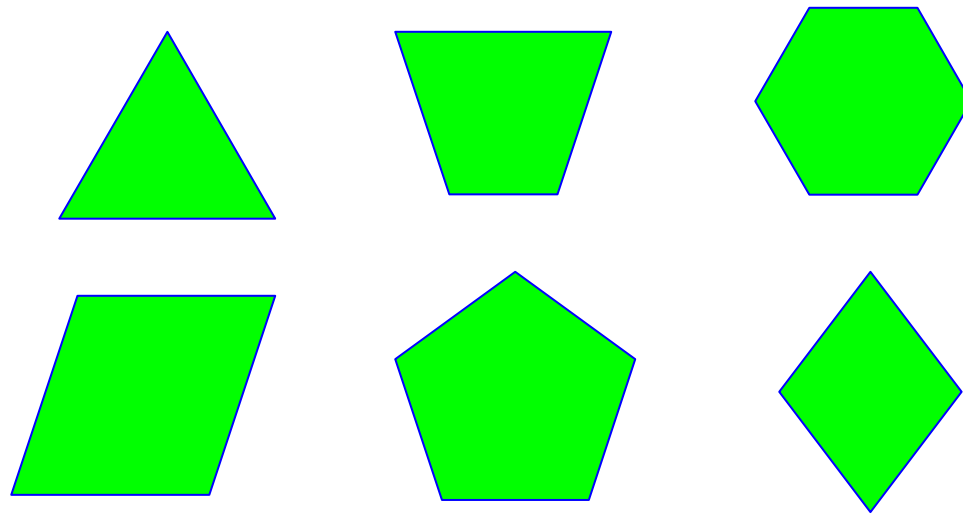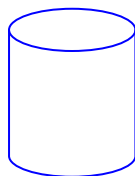
"Are all the above shapes plane shapes?"

B. "Plane shapes typically enclose an area. All the above shapes have an enclosed area, which is shaded bright green."
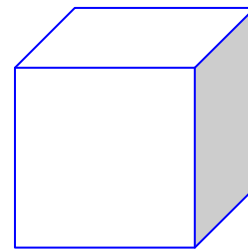
C. "Here are various solids. All solid shapes are three-dimensional; they have width, length, *and* height."
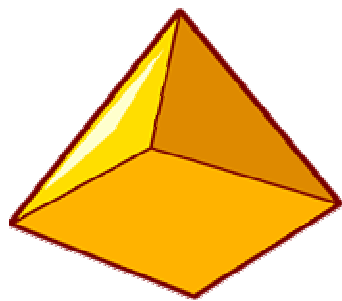
X	Y	Z

i. "Which of these solids have only plane faces?"

ii. "Which solids have only a curved surface?"

iii. "Which solids have both plane and curved faces?"

iv. "Which solids have only rectangular faces?"

"A solid with only rectangular faces is called a cuboid. Say with me: *cuboid*."

v. "Which solids have only squares for faces?"

"A solids with only square faces is called a cube. Cube."

D. "Here are some questions that show the difference between plane and solid shapes:"

i. "Can plane shapes hold water?"

ii. "Can solid shapes hold water?"

iii. "Do plane shapes have mass?"

iv. "Do solid shapes have mass?"

v. "Can you calculate an area for a plane shape?"

vi. "Can you calculate an area for a solid shape?"

LESSON 5-100 APPROPRIATE TIME MEASURES

A. "What is the appropriate time measure for each of the following:"

i. Time spent on a vacation

ii. Time spent on a plane ride

iii. Time spent to run a mile

iv. Time spent learning during the day

v. Time spent getting dressed in the morning

vi. Time spent sleeping at night

vii. How long a person typically lives

LESSON 5-114 THE PROTRACTOR AND THE RADIUS

"It might be helpful to have a tool to measure the number of degrees in an angle. This tool is called a protractor:"
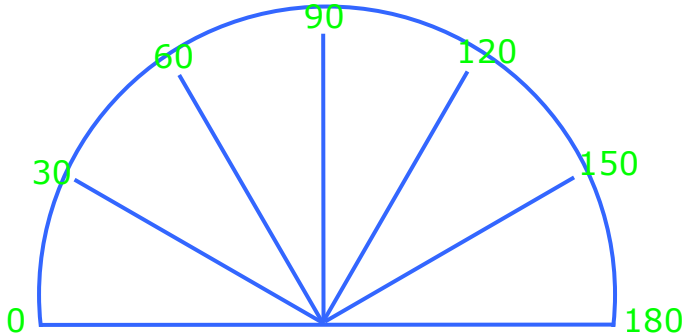
A. "What shape is the perimeter of a protractor?"

B. "Show me the center of the circle."

"Each line segment that connects the center of the circle to a point on the circle is called a radius. Say with me: *radius*."

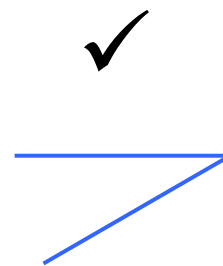C. "You may point to each radius above. How many are there?"

"The protractor has many radiuses. *Radiuses* is not really a word. The plural for radius is radii [RAID-ee-eye]. Say with me: *radii*."

D. "It's easy to use a protractor if you follow these simple steps."

1) "Move the angle so its point is on the right. You might need to turn the paper sideways or even upside down."

✘   ✔
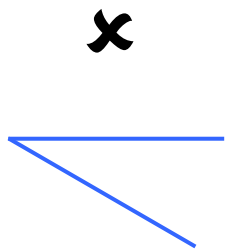
This angle's point is on the left   This angle's point is on the right

2) "Line up the bottom line of the angle with the bottom of the semi-circle on the protractor."

3) "Move the protractor left and right until the middle of the semi-circle is on the angle."

4) "Read the number of degrees."

E. "You may experiment using your protractor on the angles from the previous lesson. How many degrees does each angle have?"

F. "If an angle is exactly half the size of a right angle, how many degrees does it have?"

G. "Without using the protractor estimate the number of degrees for each of these angles:"

H. "Using the protractor you may determine the number of degrees for each of these angles:"

I. "Can you think of any rules to help you make good estimates in the future?"

LESSON 5-115 SEQUENCE USING DIVISION
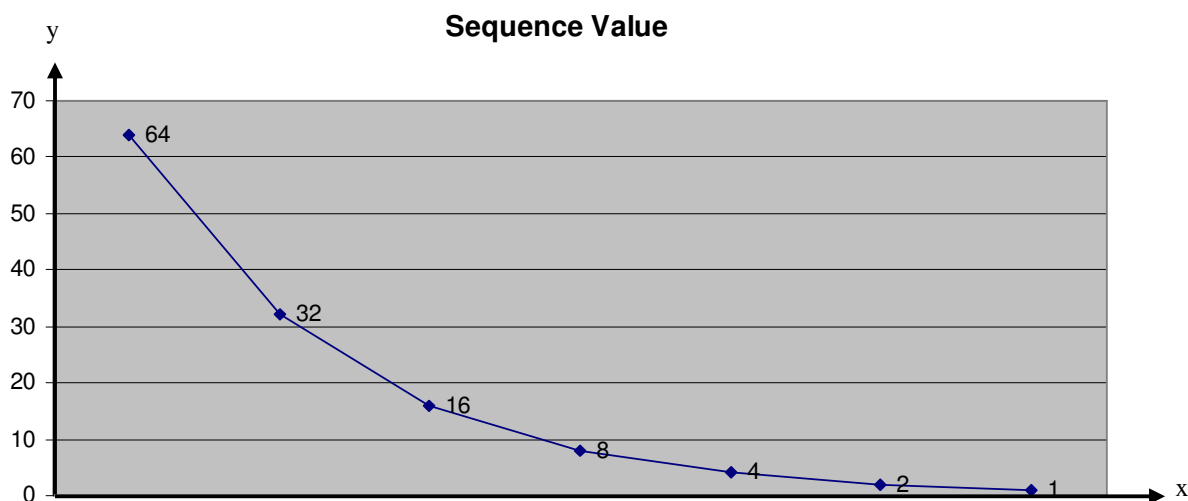
A. "This is a sequence:"

<p style="text-align:center; font-size:2em; color:blue;">64 32 16 8</p>

"Can you tell me what the rule is for this sequence?"

B. "What are the next three numbers in the sequence?"

C. "This is a graph of this sequence:"

i. "What are the values shown along the y axis?"

ii. "Does 64 equal one of those values?"

iii. "What two values is 64 between?"

iv. "Which is 64 closer to, 60 or 70?"

v. "Each sequence value, 64, 32, etc., is labeled. If the sequence values weren't labeled, would you be able to figure out what the values are from this graph?"

D. "What do you think the sequence value is after 1?"

E. "Does this sequence ever end?"

F. "Does this sequence ever reach zero?"

G. "How close does the sequence get to zero?"

LESSON 5-138 MULTIPLICATION AND EVEN/ODD

"Set E is the set of all even numbers:

$$E = \{\ 2,\ 4,\ 6,\ 8,\ ...\ \}$$

"Set O is the set of all odd numbers:"

$$O = \{\ 1,\ 3,\ 5,\ 7,\ ...\ \}$$

A. "When you take two numbers from set E and multiply them together, say 2 times 4, is the product even or odd? Will that always be true? Discuss why."

B. "When you take two numbers from set O and multiply them together, say 1 times 3, is the product even or odd? Will that always be true? Discuss why."

C. "When you multiply a number from E by a number from O, say 2 times 1, is the product even or odd? Will that always be true? Discuss why."

LESSON 5-142 SET UNIONS AND INTERSECTS

"The *union* of two more sets is a new set that contains all of the members of all of the sets."

A
4
2
1
B
3
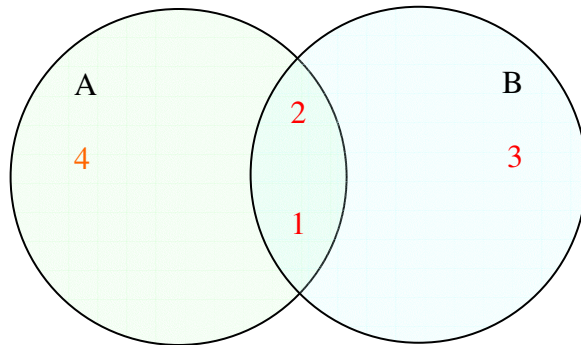
$$A = \{\ 1,\ 2,\ 4\ \}\quad B = \{\ 1,\ 2,\ 3\ \}$$

"Here the union of sets A and B are the numbers from 1 to 4, because each number appears in at least one set. The symbol for union is ∪. ∪ looks like the letter U, which stands for union. We would write this as follows:

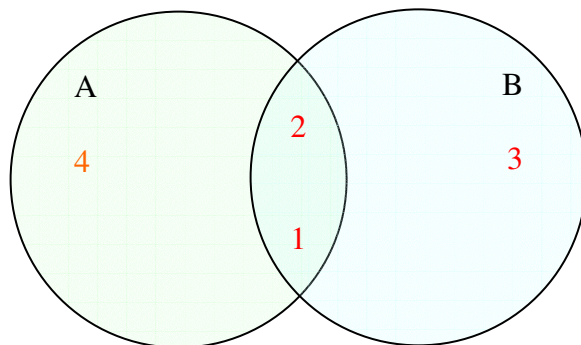$$A \cup B = \{\ 1,\ 2,\ 3,\ 4\ \}$$

"This is read: A union B contains the members 1, 2, 3, and 4. A union B really defines a new set."

"When an element could be in one set or another (or both), that element is a member of the *union* of those sets. True or false:"

A. "The union of set A and B has more numbers that set A."

B. "The union of both sets has the counting numbers from one to three."

C. "The symbol for a set union is: ∩."

"The *intersect* of two more sets is a new set that contains only those members that are in every one of the sets."

A
4
2
1
B
3

A = { 1, 2, 4 }   B = { 1, 2, 3 }

"Here the intersect of sets A and B are the numbers 1 and 2, because those are the only number that appear in both sets. We would write this as follows:

A ∩ B = { 1, 2 }

"This is read: A intersect B contains the members 1 and 2."

"A intersect B really defines a new set."

"When an element is in all sets, that element is a member of the *intersect* of those sets. True or false:"

D. "The intersect of set A and B has more numbers that set A."

E. "The intersect of both sets has the counting numbers from one to three."

F. "The symbol for a set intersect is: ∩."

G. "Let set E be the set of even integers. Let set O be the set of odd integers. The intersect of E and O has one member."

H. "Let set E be the set of even integers. Let set O be the set of odd integers. The union of E and O is the set of all integers."