HOMEWORK HELP

Shapes and Designs

Investigation 1, ACE Exercises 13–16

For Exercises 13–16, write an equation and find the measure of the angle labeled $x$, without measuring.

13.  

14.  

15.  

16.  

HINT:

1. What is the sum of the measures of the two angles?
2. Use this sum to write an equation relating the measures of the two angles.
3. Use your equation to find the measure of the angle labeled $x$. 
Shapes and Designs

Investigation 2, ACE Exercise 23

Kele claims that the angle sum of a polygon he has drawn is 1,660°. Can he be correct? Explain.

HINT:

1. Recall the relationship you found between the number of sides of a polygon and its angle sum.

2. What do the angles sums of polygons with any number of sides have in common?

3. Is there any polygon for which the angle sum is 1,660°? How do you know?
**Shapes and Designs**

**Investigation 3, ACE Exercise 25**

Li Mei builds a quadrilateral with sides that are each five inches long. To help stabilize the quadrilateral, she wants to insert a ten-inch diagonal. Will that work? Explain.

**HINT:**

1. When Li Mei inserts a diagonal into her quadrilateral, what shapes will she make?

2. Recall the pattern that you found that explains why some sets of numbers make a triangle and some do not.

3. What will be the side lengths of the triangles that Li Mei is trying to make?

4. Will it be possible for Li Mei to fit a 10-inch diagonal into her quadrilateral of 5-inch sides?
Accentuate the Negative

Investigation 1, ACE Exercises 72–75

For Exercises 72–75, order the numbers from least to greatest.

72. \(\frac{2}{5}, \frac{3}{10}, \frac{5}{9}, \frac{9}{25}\)  
73. 0.33, 2.505, 23.30, 23  
74. 1.52, 1 \(\frac{4}{7}\), 2, \(\frac{9}{6}\)  
75. 3, \(\frac{19}{6}\), 2 \(\frac{8}{9}\), 2.95

HINT:

1. Draw a number line, and place 0 in the middle of the line.
2. Place the positive numbers in the correct order to the right of 0 on the number line.
3. Place the negative numbers in the correct order to the left of 0 on the number line.
4. Read and record the numbers on the number line from left to right.
Accentuate the Negative

Investigation 2, ACE Exercise 16

Write a number sentence to represent each situation. Then find the new value of the chip board.

a. Remove 5 red chips from the original board.

b. Then add 5 black chips.

c. Then add 4 black chips and 4 red chips.

**HINT:**

1. Recall the algorithm you developed for subtracting a negative number. Remember, red chips represent negative numbers.

2. Be sure to use your new number sentence from part (a). Remember, black chips represent positive numbers.

3. What does it mean to add an equal number of red and black chips to the board?
Accentuate the Negative

Investigation 3, ACE Exercise 36

Chris and Elizabeth are making a version of the Integer Product Game in which players need three products in a row to win.

What six factors do they need for their game? Explain your reasoning.

**HINT:**

1. List all of the factors of the following numbers: 4, 6, 9, 10, 15, and 25. How do you know you have listed all the factors?
2. Cross out any duplicate factors. That is, write each factor only once.
3. Include the opposites of any factors that you will need to form the negative products.
Accentuate the Negative

Investigation 4, ACE Exercises 70–73

For Exercises 70–73, draw and label the edges and areas of a rectangle to illustrate each pair of equivalent expressions.

70. \((3 + 2) \cdot 12 = 3 \cdot 12 + 2 \cdot 12\)

71. \(9 \cdot 3 + 9 \cdot 5 = 9 \cdot (3 + 5)\)

72. \(x \cdot (5 + 9) = 5x + 9x\)

73. \(2 \cdot (x + 8) = 2x + 16\)

**HINT:**

1. Draw four rectangles. Divide each rectangle into two parts.
2. Label the edges of each rectangle with numbers from the side of each sentence without parentheses.
3. Draw a rectangle congruent to each of the first four rectangles. Do not divide each rectangle into two parts.
4. Label the edges of each of these rectangles with numbers from the side of each sentence with parentheses.
5. What is the area of each rectangle? What are the areas of the parts of each rectangle?
Stretching and Shrinking

Investigation 1, ACE Exercise 7

Suppose you copy a drawing of a polygon using the given size factor. How will the side lengths, angle measures, and perimeter of the image compare to those of the original?

a. 200%  b. 150%  c. 50%  d. 75%

HINT:

1. Draw a rectangle with length 2 units and width 3 units.
2. Find the perimeter and area of this rectangle.
3. Now use size factors of 200%, 150%, 50%, and 75% to find the new lengths and widths.
4. Compare the side lengths, perimeter, and area of the original rectangle to those of the new figure. How do these comparisons relate to the size factors used?
Stretching and Shrinking

Investigation 2, ACE Exercises 5 and 6

For Exercises 5 and 6, study the size and shape of the polygons below.

5. **Multiple Choice** Choose the pair of similar figures.
   - A. Z and Y
   - B. V and T
   - C. X and Y
   - D. Y and W

6. Find another pair of similar figures. Explain your reasoning.

**HINT:**

1. What do you know about the shapes of similar figures?
2. What is the relationship between the lengths of corresponding sides of similar figures?
3. What is the relationship between the measures of corresponding angles of similar figures?
4. Use these relationships to find two figures that are similar.
Stretching and Shrinking

Investigation 3, ACE Exercise 6

Copy polygons A–D onto grid paper. Draw line segments that divide each of the polygons into four congruent polygons that are similar to the original polygon.

**HINT:**

1. Suppose you make four congruent figures that are similar to the original figure. What part of the area of the original figure would be the area of each of the four new figures?

2. Use the relationship between the area of each new figure and the area of the original to help you determine the relationship between the side lengths of each new figure and the side lengths of the original figure.

3. Draw lines that will make the four new congruent figures with the correct side lengths.
**Stretching and Shrinking**

**Investigation 4, ACE Exercise 11**

Rectangles C and D are similar.

a. What is the value of $x$?

b. What is the scale factor from Rectangle C to Rectangle D?

c. Find the area of each rectangle. How are the areas related?

**HINT:**

1. Find the ratio of the shortest side length to the longest side length of Rectangle D.

2. Use this ratio to find an equivalent ratio of the shortest side length to the longest side length of Rectangle C.

3. Find the value of $x$.

4. What scale factor can you use to multiply the longest side of Rectangle C to find the longest side of Rectangle D?
Stretching and Shrinking

Investigation 4, ACE Exercise 44

Suppose a photographer for the school newspaper took this picture. The editors want to resize the photo to fit in a specific space on a page.

Can the original photo be changed to a similar rectangle with the given measurements (in inches)?

a. 8 by 12  
   b. 9 by 11  
   c. 6 by 9  
   d. 3 by 4.5

HINT:

1. Find the ratio of the width to the height of the original photo.
2. For parts (a)–(d), write each set of measurements as a ratio.
3. Compare each ratio that you wrote with the ratio of the original photo. Which ratios are equivalent to the ratio of the original photo?
Comparing and Scaling

Investigation 1, ACE Exercise 22

The organizers of an environmental conference order buttons for the participants. They pay $18 for 12 dozen buttons. Write and solve proportions to answer each question. Assume that price is proportional to the size of the order.

a. How much do 4 dozen buttons cost?

b. How much do 50 dozen buttons cost?

c. How many dozens of buttons can the organizers buy for $27?

d. How many dozens of buttons can the organizers buy for $63?

HINT:

1. Write a fraction to represent the cost of 12 dozen buttons.
2. Write a proportion that you can use to answer each question.
3. Use the strategy that you discovered in Problem 1.4 to solve each proportion.
Comparing and Scaling

Investigation 2, ACE Exercise 4

Each business day, news reports tell the number of stocks that gained (went up in price) and the number that declined (went down in price). For each of the following pairs of reports, determine which is better news for investors.

HINT:

1. Write ratios for the reports you are comparing.
2. Scale the ratios to find which is greater, the gain or decline.
3. Is a larger or smaller gain better for an investor?
4. Is a larger or smaller decline better for an investor?

a. Gains outnumber declines by a ratio of 5 to 3.

b. Gains outnumber declines by a ratio of 9 to 5.

c. Gains outnumber declines by a ratio of 10 to 7.

OR

Gains outnumber declines by a ratio of 7 to 5.

Gains outnumber declines by a ratio of 6 to 5.

Gains outnumber declines by a ratio of 6 to 4.
Comparing and Scaling

Investigation 3, ACE Exercise 35

Claire and Pam consider the two situations below.

- marking up the price 25% and getting a 10% commission on the markup
- marking up the price 10% and getting a 25% commission on the markup

Will these situations result in the same commission, or will one commission be greater? If one commission is greater, which one?

HINT:

1. Choose a sample buying price for an item, such as $100. Using the method described in the first situation, what would be the commission for selling this item?

2. Use the same sample buying price. Using the method described in the second situation, what would be the commission for selling this item?

3. Compare the two commissions. Are they equal, or is one greater than the other?
Moving Straight Ahead

Investigation 1, ACE Exercise 9

The equation $d = 3.5t + 50$ gives the distance $d$ in meters that a cyclist is from his home after $t$ seconds.

a. Which of the following ordered pairs represents a point on the graph of this equation? Explain your answer.
   i. (10, 85) ii. (0, 0) iii. (3, 60.5)

b. What information do the coordinates tell you about the cyclist?

**HINT:**

1. Use the equation $d = 3.5t + 50$ to determine the distance in meters that a cyclist is from home when $t = 10$ seconds.

2. Use the equation $d = 3.5t + 50$ to determine how far from home the cyclist is when $t = 0$ seconds.

3. Use the equation $d = 3.5t + 50$ to determine how far from home the cyclist is when $t = 3$ seconds.
A band decides to sell protein bars to raise money for an upcoming trip. The cost (the amount the band pays for the protein bars) and the income the band receives for the protein bars are represented on the graph.

a. How many protein bars must be sold for the cost to equal the income?

b. What is the income from selling 50 protein bars? 125 bars?

c. Suppose the income is $200. How many protein bars were sold? How much of this income is profit?

**HINT:**

1. Where on the graph can you find the point at which income and cost are the same?

2. If you know the number of bars sold, how can you use the graph to find the income received for that number of bars?

3. If you know the income, how can you use the graph to find the number of bars sold?

4. If you know the cost and the income for a certain number of bars, how can you determine the profit?
Moving Straight Ahead

Investigation 3, ACE Exercise 3

Find the solution (the value of the variable) for each equation.

a. \( y = 3(10) + 15 \)  
b. \( 24 = x + 2 \)  
c. \( 10 = 2x + 4 \)

HINT:

1. For the equation \( y = 3(10) + 15 \), tell what information you are looking for and how you can find it.

2. For the equation \( 24 = x + 2 \), tell what information you are looking for and how you can find it.

3. For the equation \( 10 = 2x + 4 \), tell what information you are looking for. Use gold coins and pouches to describe this equation.

4. Using the description you wrote for the equation \( 10 = 2x + 4 \), find the number of coins in each pouch.
Moving Straight Ahead

Investigation 4, ACE Exercises 8–12

In Exercises 8–12, the tables represent linear relationships. Give the slope and the $y$-intercept of the graph of each relationship. Then match each of the following equations with the appropriate table.

$$y = 5 - 2x \quad y = 2x \quad y = -3x - 5$$

$$y = 2x - 1 \quad y = x + 3.5$$

8.  

<table>
<thead>
<tr>
<th>$x$</th>
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<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
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</table>

9.  

<table>
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10.  

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<th>4</th>
<th>5</th>
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</thead>
<tbody>
<tr>
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<td>5</td>
<td>7</td>
<td>9</td>
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</table>

11.  

<table>
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<th>3</th>
<th>4</th>
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</thead>
<tbody>
<tr>
<td>$y$</td>
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<td>1</td>
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<td>-3</td>
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</table>

12.  

<table>
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<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td>$y$</td>
<td>-11</td>
<td>-14</td>
<td>-17</td>
<td>-20</td>
<td>-23</td>
</tr>
</tbody>
</table>

HINT:

1. In each table, do the data represent an increase (positive slope) or a decrease (negative slope)?

2. Use the data in each table to calculate the ratio of rise to run, or slope.

3. Which part of a linear equation represents the slope?

4. What is the $y$-intercept for the data in each table? Which part of a linear equation represents the $y$-intercept?
What Do You Expect?

Investigation 1, ACE Exercise 7

Dawn tosses a pawn from her chess set five times. It lands on its base four times and on its side only once.

Andre tosses the same pawn 100 times. It lands on its base 28 times and on its side 72 times. Based on their data, if you toss the pawn one more time, is it more likely to land on its base or its side? Explain.

HINT:

1. Using Dawn’s data, what percentage of the time does the pawn land on its base? On its side?

2. Using Andre’s data, what percentage of the time does the pawn land on its base? On its side?

3. Is Dawn’s or Andre’s set of data larger?

4. Is it better to base your prediction on a small set of data or a large set of data? Explain.
What Do You Expect?

Investigation 2, ACE Exercise 10

Silvia and Juanita are designing a game. A player in the game tosses two number cubes. Winning depends on whether the sum of the two numbers is odd or even. Silvia and Juanita make a tree diagram of possible outcomes.

a. List all the outcomes for the sums.

b. Design rules for a two-player game that is fair.

c. Design rules for a two-player game that is not fair.

d. How is this situation similar to tossing two coins and seeing if the coins match or don’t match?

**HINT:**

1. What does it mean for a game to be fair?
2. What outcomes or results are equally likely?
3. What does it mean for a game to not be fair?
4. What outcomes or results are not equally likely?
What Do You Expect?

Investigation 3, ACE Exercise 4

Molly designs a game for a class project. She makes the three spinners shown. She tests to see which one she likes best for her game. She spins each pointer 20 times and writes down her results, but she forgets to record which spinner gives which set of data. Match each spinner with one of the data sets. Explain your answer.

![Spinner A](image1.png) ![Spinner B](image2.png) ![Spinner C](image3.png)

First data set: 1, 2, 3, 2, 1, 1, 2, 1, 2, 2, 2, 3, 2, 1, 2, 2, 2, 3, 2, 2
Second data set: 2, 3, 1, 1, 3, 3, 3, 1, 1, 2, 3, 2, 2, 2, 1, 1, 1, 3, 3, 3
Third data set: 1, 2, 3, 3, 1, 2, 2, 2, 3, 2, 1, 2, 2, 2, 3, 2, 3, 2, 1

HINT:

1. If you spin the pointer of Spinner A 20 times, how many times would you expect the pointer to land on 1? On 2? On 3? Compare your answers to each data set.

2. If you spin the pointer of Spinner B 20 times, how many times would you expect the pointer to land on 1? On 2? On 3? Compare your answers to each data set.

3. If you spin the pointer of Spinner C 20 times, how many times would you expect the pointer to land on 1? On 2? On 3? Compare your answers to each data set.
What Do You Expect?

Investigation 3, ACE Exercise 13

In some board games, you can end up in "jail." One way to get out of jail is to roll doubles (two number cubes that match). What is the probability of getting out of jail on your turn by rolling doubles? Use your list of possible outcomes of rolling two number cubes that you created for Problem 3.3. Explain your reasoning.

HINT:

1. How many different sets of doubles are possible when rolling two number cubes?

2. How many outcomes are possible when rolling two number cubes?

3. Use your answers to Questions 1 and 2 to determine the probability of rolling any set of doubles.
What Do You Expect?

Investigation 4, ACE Exercise 18

Nishi, who has a 60% free-throw percentage, is in a two-attempt free-throw situation. This means that she will attempt the second free throw no matter what happens on the first.

a. Is Nishi most likely to score 0 points, 1 point, or 2 points? Explain.

b. Nishi plans to keep track of her score on two-attempt free-throw situations. What average number of points can she expect to score per two-attempt situation?

HINT:

1. Make a list of the possible outcomes for Nishi in a two-attempt free-throw situation.

2. Use your list of outcomes to calculate the probability of Nishi scoring 0 points, 1 point, or 2 points.

3. Use the probabilities of scoring 0, 1, or 2 points to calculate the number of times Nishi can expect to score 0, 1, or 2 points if she is in this situation 100 times.

4. Find the average of these points.
What Do You Expect?

Investigation 5, ACE Exercise 12

The largest hamster litter on record consisted of 26 babies. Suppose a hamster has 26 babies. Assume that for each baby, females and males are equally likely. What is the theoretical probability that all 26 babies will be male? Explain your reasoning.

HINT:

1. Assume that male and female hamsters are equally likely. List the different outcomes for 1 hamster.

2. List all possible outcomes for 2 hamsters and 3 hamsters.

3. Without listing outcomes, find the number of possible outcomes for a litter of 26 hamsters.

4. Find the probability that all 26 hamsters are male.
Filling and Wrapping

Investigation 1, ACE Exercise 31

Each expression below will help you to find either the volume or surface area of one of the boxes pictured. Simplify each expression. Decide whether you have found a volume or a surface area, and for which box.

a. \(2 \times (3.5 \times 5.7) + 2 \times (5.7 \times 12) + 2 \times (3.5 \times 12)\)

b. \(6 \frac{1}{4} \times 6\)

c. \(6 \times 6 \frac{1}{2}\)

d. \(2 \frac{1}{4} \times 2 \frac{2}{5} \times 5\)

HINT:

1. For boxes like A, C, or D, how many of the faces have like areas? For boxes like B, how many faces have like areas?

2. Use these answers to help you find expressions for the surface areas of the boxes.

3. When finding volume, what is the relationship among the length, width, and height of a box? If you know the area of the bottom face of a box, how can you find its volume?

4. Use these answers to help you find expressions for the volumes of the boxes.
Filling and Wrapping

**Investigation 2, ACE Exercise 24**

The figure below shows four rectangles on a grid of squares.

![Diagram of four rectangles on a grid]

a. Which pairs of rectangles are similar? Explain.

b. Suppose that a fifth rectangle has length 12 and is similar to rectangle D in the figure above. What must be the width of the fifth rectangle?

**HINT:**

1. For each pair of rectangles, find the ratios of the dimensions of the first rectangle to the corresponding dimensions of the second rectangle. Based on these ratios, how can you tell that whether the rectangles are similar?

2. Find the scale factor for rectangle D and the fifth rectangle. That is, find the number that each dimension of the rectangle D must be multiplied by to get each dimension of the fifth rectangle. How can you use the scale factor to find the width of the fifth rectangle?
Filling and Wrapping

Investigation 3, ACE Exercise 50

The Nevins want to install a circular pool with a 15-foot diameter in their rectangular patio. The patio will be surrounded by new fencing, and the patio area surrounding the pool will be covered with new tiles.

a. How many feet of fencing are needed to enclose the patio?

b. How much plastic is needed to cover the pool if there is a 1-foot overhang?

c. How many feet of plastic tubing are needed to fit around the edge of the pool?

d. How many square feet of ground will be covered with tiles?

HINT:

1. When you find the length of fencing around the patio, are you finding perimeter or area?

2. What is the radius of the pool?

3. What is the radius of the cover of the pool with the 1-foot overhang?

4. When you find the amount of plastic that will cover the pool, are you finding circumference or area?

5. When you find the amount of plastic tubing that will fit around the pool, are you finding circumference or area?
Filling and Wrapping

Investigation 4, ACE Exercise 6

A pipeline carrying oil is 5,000 kilometers long and has an inside diameter of 2 meters. (Remember: 1 km = 1,000 m.)

a. How many cubic meters of oil will it take to fill 1 kilometer of the pipeline?

b. How many cubic meters of oil will it take to fill the entire pipeline?

HINT:

1. Find the radius of the pipe.
2. Find the volume of a pipe with an inside diameter of 2 meters that is 1 kilometer (1,000 meters) long.
3. If a pipe is 5,000 kilometers long, how long is the pipe in meters?
4. Use the length of the pipe in meters and the radius of the pipe to find the number of cubic meters of oil it will take to fill the entire pipeline.
Samples and Populations

Investigation 1, ACE Exercise 8

The following question was asked in a survey:

What is your favorite amusement-park ride?

- Roller Coaster  - Log Ride  - Ferris Wheel  - Bumper Cars

The tablet below shows the results from an Internet survey and from surveys of 7th-grade students at East Jr. High and West Jr. High.

<table>
<thead>
<tr>
<th>Favorite Ride</th>
<th>Votes From the Internet</th>
<th>Votes From East Jr. High</th>
<th>Votes From West Jr. High</th>
</tr>
</thead>
<tbody>
<tr>
<td>Roller Coaster</td>
<td>92</td>
<td>42</td>
<td>36</td>
</tr>
<tr>
<td>Log Ride</td>
<td>26</td>
<td>31</td>
<td>14</td>
</tr>
<tr>
<td>Ferris Wheel</td>
<td>22</td>
<td>3</td>
<td>6</td>
</tr>
<tr>
<td>Bumper Cars</td>
<td>20</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Total Votes</td>
<td>160</td>
<td>80</td>
<td>60</td>
</tr>
</tbody>
</table>

a. Make bar graphs for each of the three data sets: the Internet survey data, the data from East Jr. High, and the data from West Jr. High. Use percents to show relative frequencies.

b. Write three or more statements comparing the data sets.

HINT:

1. Write a ratio to compare the number of students in the survey who chose the roller coaster to the total number of students surveyed.

2. Write a ratio for each ride comparing the number of students who chose that ride to the total number of students surveyed.

3. Write the ratios as percents.

4. Use the percents to write comparison statements. Use the phrases greater than, less than, or approximately equal to in your statements.
Samples and Populations

Investigation 2, ACE Exercise 14

Use the table from Problem 2.3 shown below.

<table>
<thead>
<tr>
<th>Student</th>
<th>Sleep Last Night (h)</th>
<th>Movies Last Week (no. of)</th>
<th>Student</th>
<th>Sleep Last Night (h)</th>
<th>Movies Last Week (no. of)</th>
<th>Student</th>
<th>Sleep Last Night (h)</th>
<th>Movies Last Week (no. of)</th>
</tr>
</thead>
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Samples and Populations

Investigation 2, ACE Exercise 14 (continued)

a. Suppose you select the first 30 students for a sample. A second student selects the next 30 students for a different sample, and so on. Will these samples be representative? Explain.

b. You select students 1, 5, 9, 13, 17, 21, 25, . . . for your sample. A second student chooses students 2, 6, 10, 14, 18, 22, 26, . . . for his sample. A third student chooses students 3, 7, 11, 15, 19, 23, 27, . . . for her sample, and so on. Will this result in representative samples? Explain.

HINT:

1. What does it mean to have a representative sample?

2. Select the first 30 students from the table in Problem 2.3. Make a line plot showing the distribution of the movie data from this sample.

3. Describe the variability in the number of movies watched by the students in your sample. How does the variability of your data compare to your results from Problem 3.2, Question B, part (3)?

4. Make a line plot showing the distributions of the hours of sleep for the students in your sample. How does the variability of your data compare to your results from Problem 3.2, Question C, part (3).

5. Select the next 30 students for a new sample. How does the variability of this data compare to that of Problem 3.2?
Samples and Populations

Investigation 3, ACE Exercise 18

Sometimes graphs can be misleading. The graphs below all display the same data about the percent of paper and paperboard recovered from 2001 to 2012.

a. Which graph do you think gives the clearest picture of the data pattern? Explain your reasoning.

b. Why are the other graphs misleading?
Samples and Populations

Investigation 3, ACE Exercise 18 (continued)

**HINT:**

1. Look at the intervals on both sets of axes for each graph.

2. Suppose you use an interval of 5% rather than 10% for the $y$-axis. What would be the effect on the graph of data?

3. Suppose you use an interval of 2.5% rather than 5% for the $y$-axis. What would be the effect on the graph of data?

4. How would these different intervals affect the appearances of several graphs of the same data? Explain.