

# Data and Probability

Histograms  
Frequency  
Circle Graphs  
Stem-and-Leaf Plots

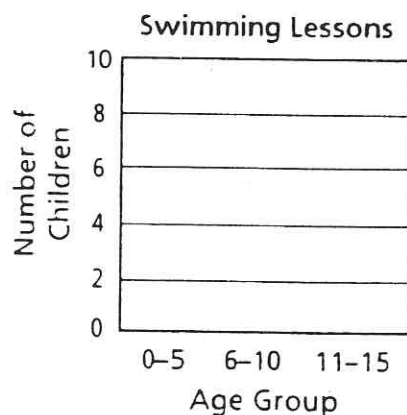
Box-and-Whisker Plots  
Quartiles  
Scatterplots  
Line of Best Fit

Examples 1–12: Read each question. Choose the best answer or write the answer to the question in the space you are given.

## Histograms

- 1 Complete the histogram for the data in this table.

Age Group	Number of Children
0–5	6
6–10	4
11–15	10



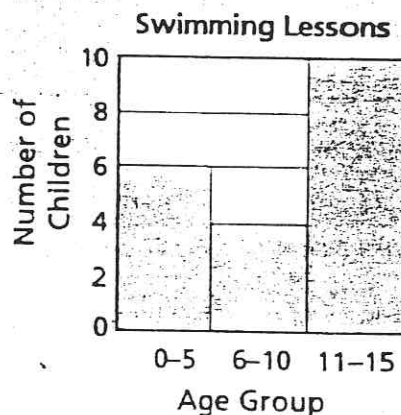
## Remember

A histogram is a special kind of bar graph. It shows data grouped into equal intervals. There are no spaces between the bars because the intervals cover all possible values of the data.

## Step-By-Step

For **example 1**, remember that there are no spaces between the bars on a histogram.

- 1 Write the age groups on the horizontal scale. (This has been done for you.)
- 2 Choose a scale for the vertical axis. For example, you can number by 2s from 0 to 10. (This has been done for you.)
- 3 Draw the bars on the graph.



## Tip

When making a bar, first draw the outline to the proper mark, then fill in the bar.

## Frequency

Here are test scores for a group of 50 students.

80	60	100	85	50	80	75	60	70	85
70	100	70	80	80	85	85	95	85	95
95	80	95	70	70	100	60	95	60	80
85	95	50	85	80	70	80	70	80	95
75	60	80	95	75	80	85	95	100	80

The **frequency** of a score is the number of times that score appears in the set of data. Review the table below. Then use the table for examples 2–4.

Test Score	Frequency	Relative Frequency %	Cumulative Frequency
50	2	4%	2
60	5	10%	7
70	7	14%	14
75	3	6%	
80	12	24%	
85	8	16%	
95	9	18%	
100	4	8%	
	Sum: 50	Sum: 100%	

- 2 How many students got a score of 75?
 

(A) 3
(C) 7

(B) 6
(D) 17
- 3 What percent of the students got a score of 75?
 

(A) 3
(C) 17

(B) 6
(D) 75
- 4 How many students got a score of 75 or lower?
 

(A) 3
(C) 17

(B) 6
(D) 75

### Step-By-Step

- 1 For **example 2**, you are to find the number of times the score 75 appears in the data set. You could count the number. But with a frequency table, you can look up the answer in the frequency column.
- 2 For **example 3**, you could figure the relative frequency by finding the percent. Look in the Relative Frequency column for the score of 75 to find the answer quicker.
- 3 **Cumulative frequency** is the number of scores that fall at or below another score. Complete the cumulative frequency column before solving **example 4**. Notice that each number is a sum of its frequency and all the frequencies before.



## Stem-and-Leaf Plots

- 7 Gabriella recorded her scores on math tests for the first 16 weeks of school. Are more of her test scores 90 or above or below 90? Complete the stem-and-leaf plot below to find out.

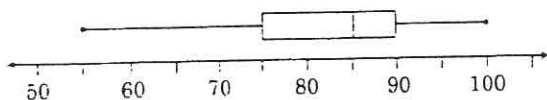
85, 90, 88, 95, 95, 87, ~~78~~, 92,  
98, ~~84~~, ~~84~~, 95, 98, 95, 87, 95

Stem	Leaves
7	8
8	4 4

Answer: \_\_\_\_\_

## Box-and-Whisker Plots

- 8 John recorded the final score of the Basketville basketball team for each game. At the end of the season, he used a box-and-whisker plot to summarize the scores. The team played 16 games this season. In how many games did they score at least 85 points?



- (A) 2  
(B) 3  
(C) 8  
(D) It's impossible to tell.

## Step-By-Step

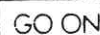
**Example 7** asks you to make a stem-and-leaf plot. The stem is the tens digits of the numbers in the data set. The leaves are the ones digits.

- 1 Record the tens in numerical order in the stem column.
- 2 Record in numerical order, a leaf, or ones digit, for each number in the data set. Notice that the number 84 appears twice in the data set. As shown, two 4s should be recorded in the leaves column.
- 3 Complete the chart. Cross out each number as you record it in the stem-and-leaf chart.
- 4 When you complete the chart, you can easily count the numbers above and below 90 to answer the question.

## Step-By-Step

The graph shown in **example 8** is called a box-and-whisker plot. This type of graph displays the range of a data set and breaks the data into four equal-sized groups.

- 1 Analyze the box-and-whisker plot. Notice that the scores fall between 55 and 100. Each point breaks the data into fourths. For example, one-fourth of the scores fall between 55 and 75. How many scores were between 55 and 85? Remember, there were 16 games played.
- 2 How many scores were between 85 and 100?

GO ON 

## Quartiles

- 9 Hannah asked her classmates how many siblings they had. She wants to display the data on a box-and-whisker plot. Find the median, upper quartile, lower quartile, and interquartile range of the data set shown below. Draw a box-and-whisker plot to display the data.

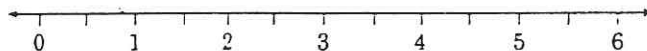
0, 4, 3, 2, 3, 1, 0, 1, 2, 1, 2,  
3, 6, 1, 0, 5, 1, 0, 3, 2, 2, 4

median: \_\_\_\_\_

upper quartile: \_\_\_\_\_

lower quartile: \_\_\_\_\_

interquartile range: \_\_\_\_\_



### Remember

The **median** is the middle number of a data set. If there's an even number of numbers in the data set, the median is the average of the two middle numbers.

The **upper quartile** is the median of the upper half of the data.

The **lower quartile** is the median of the lower half of the data.

## Step-By-Step

Follow these steps to create a box-and-whisker plot for the data in **example 9**.

- 1 Order the data from least to greatest.

0, 0, 0, 0, 1, 1, 1, 1, 1, 2, 2,  
2, 2, 2, 3, 3, 3, 3, 4, 4, 5, 6

- 2 Find the median. This set of data has an even number of values, so find the average of the two middle numbers.

- 3 Find the upper quartile—the median of the upper half of the data.

2, 2, 2, 3, 3, 3, 3, 4, 4, 5, 6

- 4 Find the lower quartile—the median of the lower half of the data.

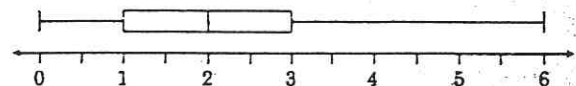
0, 0, 0, 0, 1, 1, 1, 1, 2, 2

- 5 Find the interquartile range. Subtract the lower quartile from the upper quartile.

— =

- 6 To draw the box-and-whisker plot, mark lines above the minimum, maximum, median, lower quartile, and upper quartile.

- 7 Using the upper and lower quartile lines as sides, draw a box. Then draw "whiskers" from the minimum to the lower quartile and from the maximum to the upper quartile.





Read each question and choose the best answer. Then write the letter for the answer you have chosen in the blank at the right of each question.

3 Which shows the division of fractions as the inverse of multiplication?

3 \_\_\_\_\_

A  $\frac{2}{3} \div \frac{1}{4} = \frac{2}{3} \times \frac{1}{4}$

B  $\frac{2}{3} \div \frac{1}{4} = \frac{2}{3} \times \frac{4}{1}$

C  $\frac{2}{3} \div \frac{1}{4} = \frac{3}{2} \times \frac{1}{4}$

D  $\frac{2}{3} \div \frac{1}{4} = \frac{3}{2} \times \frac{4}{1}$

4 Which step should Angelina take to evaluate  $\frac{5}{8} \div \frac{3}{8}$ ?

4 \_\_\_\_\_

A Use the reciprocal of  $\frac{5}{8}$  and multiply  $\frac{8}{5} \times \frac{3}{8}$ .

B Use multiplication instead of division and multiply  $\frac{5}{8} \times \frac{3}{8}$ .

C Use the reciprocal of both fractions and multiply  $\frac{8}{5} \times \frac{8}{3}$ .

D Use the reciprocal of  $\frac{3}{8}$  and multiply  $\frac{5}{8} \times \frac{8}{3}$ .

5 Which shows the correct use of multiplication as the inverse of the division of two fractions?

5 \_\_\_\_\_

A  $\frac{2}{5} \div \frac{2}{5} = \frac{2}{5} \times \frac{3}{2} = \frac{6}{10}$  or  $\frac{3}{5}$

B  $\frac{2}{5} \div \frac{2}{5} = \frac{2}{5} \times \frac{2}{5} = \frac{4}{15}$

C  $\frac{2}{5} \div \frac{2}{5} = \frac{5}{2} \times \frac{2}{5} = \frac{10}{6}$  or  $1\frac{2}{3}$

D  $\frac{2}{5} \div \frac{2}{5} = \frac{5}{2} \times \frac{3}{2} = \frac{15}{4}$  or  $3\frac{3}{4}$

3 Jorge needs to divide  $\frac{5}{6}$  yard of cord into  $\frac{1}{3}$  yard pieces. Which statement represents the situation?

3 \_\_\_\_\_

A  $\frac{5}{6} \div 3$

B  $\frac{1}{3} \div \frac{5}{6}$

C  $\frac{5}{6} \div \frac{1}{3}$

D  $\frac{6}{5} \div 3$

4 Mikaela is hiking a trail that is  $5\frac{1}{3}$  miles long. She hikes  $\frac{2}{3}$  mile each hour. Which statement represents the number of hours it will take Mikaela to hike the trail?

4 \_\_\_\_\_

A  $5\frac{1}{3} \div \frac{2}{3} = \square$

B  $\frac{2}{3} \div 5\frac{1}{3} = \square$

C  $5\frac{1}{3} \div \square = \frac{2}{3}$

D  $\frac{2}{3} \div \square = 5\frac{1}{3}$

5 Mr. Charles is distributing string to 24 students in his math class so they can measure the circumference of objects. Each student receives a piece of string that is  $\frac{2}{3}$  yard long. Which of the following can be used to determine the total length of string he distributed?

5 \_\_\_\_\_

A  $\frac{2}{3} \div \square = 24$

B  $\square \div \frac{2}{3} = 24$

C  $\frac{2}{3} \div 24 = \square$

D  $\square \div 24 = \frac{2}{3}$

- 1 Annalise bought 2 sweaters that together cost \$45.00 at a store in Saginaw. The sales tax in Michigan is 6%. How much sales tax did Annalise pay for the 2 sweaters?

A \$2.70                      B \$3.24  
C \$5.40                      D \$6.00

1 \_\_\_\_\_

- 2 The Johnson family spent \$86.00 on dinner. Mr. Johnson left a 15% tip for the waiter. How much tip did he leave?

A \$13.60                      B \$12.90  
C \$5.16                      D \$1.29

2 \_\_\_\_\_

- 3 A sporting goods store has skis on sale. Daniel has a coupon for 30% off the sales price. If Daniel uses his coupon, how much less than the sale price will he pay for the skis?

A \$60.80  
B \$69.80  
C \$70.80  
D \$78.00

Buy Now!  
All Skis Same Price  
\$236

3 \_\_\_\_\_

- 1 The table shows the number of people who attended an arts fair each day in Kalamazoo. How many more people attended on Saturday than on Thursday and Friday combined?

A 276  
B 286  
C 334  
D 1,276

Art Fair Attendance	
Day	Number
Thursday	17,563
Friday	21,629
Saturday	39,468

1 \_\_\_\_\_

- 2 Sault Ste. Marie had  $18\frac{2}{3}$  inches of snow in 3 days. How many inches of snow did Sault Ste. Marie average per day?

A  $6\frac{1}{3}$  in.                      B  $6\frac{2}{9}$  in.  
C  $18\frac{2}{3}$  in.                      D 56 in.

2 \_\_\_\_\_

- 3 What is the sum of  $13.9 \div 41.67$ ?

A 54.57  
B 54.66  
C 54.76  
D 55.57

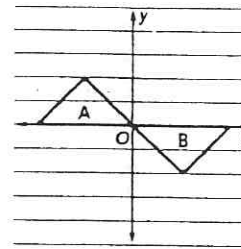
3 \_\_\_\_\_

- 4 What is the product of  $0.25 \times 1.24$ ?

A 0.31  
B 3.1  
C 31  
D 310

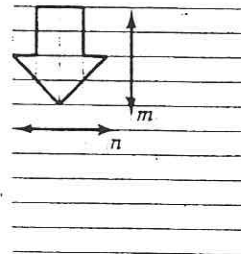
4 \_\_\_\_\_

- 1 Which describes the transformation from figure A to figure B?
- A  $90^\circ$  counterclockwise rotation
  - B  $180^\circ$  clockwise rotation
  - C reflection over the  $x$ -axis
  - D translation



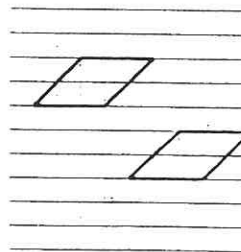
1 \_\_\_\_\_

- 2 Martin is using the grid to create a design in which two arrows point towards each other. Which transformation should Martin use to create the design?
- A translation 5 units down
  - B reflection across line  $m$
  - C reflection across line  $n$
  - D translation 5 units right



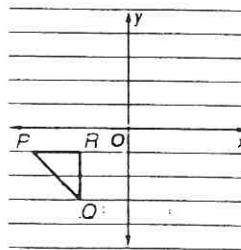
2 \_\_\_\_\_

- 3 Which describes the transformation from the unshaded parallelogram to the shaded parallelogram?
- A translation
  - B reflection
  - C  $90^\circ$  clockwise rotation
  - D  $180^\circ$  counterclockwise rotation



3 \_\_\_\_\_

- 4 Suppose  $\triangle PQR$  is translated 2 units right and 3 units up. What will be the coordinates of point  $P'$ ?
- A  $(2, -2)$
  - B  $(0, 2)$
  - C  $(-1, -1)$
  - D  $(-2, 2)$



4 \_\_\_\_\_

- 1 It took Madison  $4\frac{1}{2}$  hours to drive 260 miles from Grand Haven to the Mackinac Bridge. What was Madison's average rate of speed in miles per hour? Round to the nearest whole number.
- A 47 mph
  - B 52 mph
  - C 58 mph
  - D 65 mph

1 \_\_\_\_\_

- 2 The table shows the cost of rentals at a shop in Harbor Springs. If Mrs. Roberts rents a stroller for 4 hours, how much will it cost?
- A \$9.00
  - B \$10.00
  - C \$20.50
  - D \$22.00

Rent by the Hour	
Bicycles	\$5.50
Strollers	\$2.25

2 \_\_\_\_\_

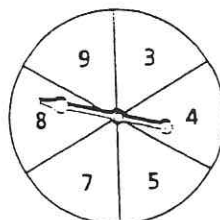
1 There are 9 yellow marbles and 6 blue marbles in a bag. What is the probability that Sofia picks a blue marble at random?

- A 0                      B 40%  
C  $66\frac{2}{3}\%$                 D 1

1 \_\_\_\_\_

2 Esteban spun the arrow on the spinner. What is the probability that the arrow lands on an even number?

- A  $\frac{2}{3}$                       B  $\frac{1}{2}$   
C  $\frac{1}{3}$                       D  $\frac{1}{6}$



2 \_\_\_\_\_

3 The table shows the number of students who wrote reports on Michigan historical figures. If Mr. Hanson selects one paper to read in class, what is the probability he selects a paper on Chief Okemos?

- A 0.2                      B 0.25  
C 0.3                      D 0.4

History Reports	
Topic	Number
Chief Okemos	6
Father Marquette	8
Henry Ford	9
Sojourner Truth	7

3 \_\_\_\_\_

4 The Detroit Lions gained a total of  $x$  yards in 2 plays. If  $x = 2$ , how many yards did the Lions gain?

- A 1 yd                      B 2 yd  
C 4 yd                      D  $x$  yd

4 \_\_\_\_\_

5 A ferry that crosses Lake Michigan 4 times per day carries  $p$  cars per trip. If  $p = 28$  on the first trip of the day, how many cars are on the ferry?

- A 4 cars                      B 7 cars  
C 28 cars                      D  $p$  cars

5 \_\_\_\_\_

6 Katie burned  $b$  calories on a 40-minute walk around the park. What does the variable  $b$  stand for?

- A the number of calories burned per minute  
B the number of calories burned per mile  
C the number of minutes it takes to burn a calorie  
D the number of calories burned during the walk

6 \_\_\_\_\_



## 7<sup>th</sup> grade summer extra credit package

Completing this assignment will earn you extra credit points and give you practice in solving MEAP like problems. Here are three test taking strategies that you can start practicing:

### **Elimination Strategy**

1. Read the problem slowly -- carefully.
2. Underline important words to help process the answer.
3. Look for a pattern in the four answer choices.

Crazy answer – not related

Off the wall – irrelevant answer

Close answer – similar to the answer

Correct answer

### **Make a model**

1. Read the problem slowly – carefully.
2. Underline important words to help process the answer.
3. Draw or make a model of the problem.
4. Label all parts of the diagram that relate to the problem.
5. Once you have a drawing the problem is much easier to solve.
6. Pick the correct answer.

### **Look for a pattern**

1. Read the problem slowly – carefully.
2. Underline important words to help process the answer.
3. Make a chart and look for a pattern in the problem.
4. Cross out the three choices that can be identified as incorrect.
5. Pick the correct choice.

**SHOW ALL YOUR WORK OR NO CREDIT**

**DUE SEPTEMBER 8, 2008**

**NAME \_\_\_\_\_ MATH TEACHER \_\_\_\_\_**

**PLEASE READ STEP BY STEP EXAMPLE**

# Mathematics Chart

## LENGTH

### Metric

1 kilometer = 1,000 meters  
1 meter = 100 centimeters  
1 centimeter = 10 millimeters

### Customary

1 mile = 1,760 yards  
1 mile = 5,280 feet  
1 yard = 3 feet  
1 foot = 12 inches

## CAPACITY AND VOLUME

### Metric

1 liter = 1,000 milliliters

### Customary

1 gallon = 4 quarts  
1 gallon = 128 ounces  
1 quart = 2 pints  
1 pint = 2 cups  
1 cup = 8 ounces

## MASS AND WEIGHT

### Metric

1 metric ton = 1,000 kilograms  
1 kilogram = 1,000 grams  
1 gram = 1,000 milligrams

### Customary

1 ton = 2,000 pounds  
1 pound = 16 ounces

### Perimeter

square

$$P = 4s$$

rectangle

$$P = 2l + 2w \quad \text{or} \quad P = 2(l + w)$$

### Area

square

$$A = s^2$$

rectangle

$$A = lw \quad \text{or} \quad A = bh$$

triangle

$$A = \frac{1}{2}bh \quad \text{or} \quad A = \frac{bh}{2}$$

$b$  = the length of the base of rectangle or triangle.

### Surface Area

cube

$$SA = 6s^2$$

rectangular prism

$$SA = 2lw + 2lh + 2wh$$

### Volume

cube

$$V = s^3$$

rectangular prism

$$V = lwh$$

### Slope

slope formula

$$\frac{\text{rise}}{\text{run}} = \frac{y_2 - y_1}{x_2 - x_1}$$

slope-intercept

when  $y = mx + b$ ,  
 $m$  = slope and  $b$  =  $y$ -intercept

NO WORK, NO CREDIT

## PLEASE READ STEP BY STEP EXAMPLE

### Rate of Work

- 5 A person-hour is equivalent to one person doing 1 hour of work. If a job requires 20 person-hours, it could be accomplished by 20 people each working 1 hour, or 5 people each working 4 hours, or any combination with a product of 20. Suppose it takes 1,500 person-hours to complete a job. How many hours will it take 50 workers to do the job?

- Ⓐ 3 hours                      Ⓒ 25 hours  
Ⓑ 15 hours                    Ⓓ 30 hours

### Converting Speeds

- 6 Karen's stride is 18 inches. During her 15-minute walk to school, she counted 1,128 strides. What is Karen's walking speed in feet per minute?

- Ⓐ 112.8 ft per min  
Ⓑ 1,353.6 ft per min  
Ⓒ 1,692 ft per min  
Ⓓ 6,768 ft per min



### Distance Measurement Facts

1 mi = 5,280 ft	1 km = 1,000 m
1 yd = 3 ft	1 m = 100 cm
1 ft = 12 in.	1 cm = 10 mm

### Step-By-Step

For example 5, divide to find the number of hours each of 50 workers needs to work to complete the job.

$$1,500 \text{ person-hours} \div 50 = \quad \text{hrs}$$

### Step-By-Step

To solve example 6, start by finding the distance in inches.

- 1 Multiply to find the total distance in inches Karen walked.

$$\text{strides} \times \text{in./stride} = \text{total inches}$$

$$1,128 \times 18 = \quad \text{in.}$$

- 2 Divide by 12 to convert inches to feet.

$$\text{inches} \div \text{inches/foot} = \text{total feet}$$

$$20,304 \div 12 = \quad \text{ft}$$

- 3 You know that Karen walked 1,692 feet in 15 minutes. Write a ratio and divide to find the unit rate.

$$\frac{1,692 \text{ ft}}{15 \text{ min}} = \frac{?}{1 \text{ min}}$$

$$1,692 \div 15 = \quad \text{ft per min}$$

NO WORK, NO CREDIT



## Solving Proportions

- 7 What is the missing term in this proportion?

$$\frac{10}{15} = \frac{n}{9}$$

- (A) 20                      (C) 6  
(B) 22.5                    (D) 5



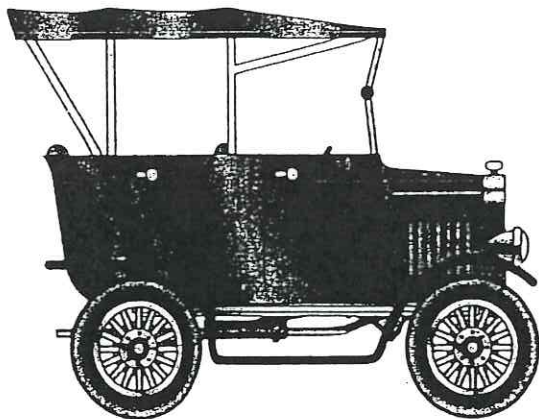
### Remember

When reading a proportion such as the one above, it may help to convert it into a sentence.

10 is to 15 as  $n$  is to 9.

## Scale Drawings

- 8 Georgia drew a scale drawing of a Model T car. She used a scale of 1 cm = 2 ft. What is the actual length of the Model T?



Key: 1 cm = 2 ft

## Step-By-Step

There are several ways to solve **example 7**. One is shown below.

- 1 Use cross-multiplication to change the proportion to an equation

$$15 \cdot n = 10 \cdot 9 \text{ or } 15n = 90$$

- 2 To solve, divide both sides by 15. Complete the last step.

$$15n \div 15 = 90 \div 15$$

$$n =$$

## Step-By-Step

You will need a centimeter ruler to solve **example 8**.

- 1 Measure the length of the car to the nearest centimeter. Use centimeters because the scale is given in centimeters.

$$\text{length} = \quad \text{cm}$$

- 2 Write a proportion.

$$\frac{\text{scale length}}{\text{actual length}} = \frac{1 \text{ cm}}{2 \text{ ft}} = \frac{7 \text{ cm}}{?}$$

- 3 Solve the proposition using cross products.

$$\frac{1}{2} = \frac{7}{x}$$

$$1x = 2 \times 7$$

$$x =$$

Answer: \_\_\_\_\_

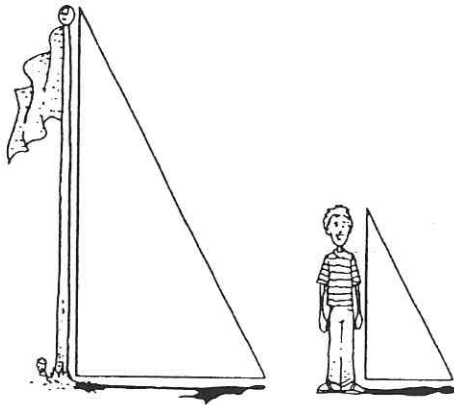
NO WORK, NO CREDIT

GO ON 

## Constructed-Response Practice

Some tests include constructed-response questions in which you must show your work and explain your solution. The example below will give you practice responding to such questions.

- 9 A 6-foot person casts a shadow 4 feet long. The shadow of a flagpole is 8 feet long. How tall is the flagpole?



### Writing Proportions

When writing a proportion such as the one in example 9, common elements need to be kept together.

Show all your work. Explain how you got your answer.

---

---

---

---

---

### Step-By-Step

**Example 9** involves using similar triangles and a proportion. Start by labeling the diagram at the left to show the three given terms of the proportion.

- 1 Write the proportion.

$$\frac{\text{6-ft person}}{\text{4-ft shadow}} = \frac{n}{\text{8-ft shadow}}$$

- 2 Cross-multiply.

$$4n = 6 \cdot 8$$

- 3 Solve the equation by completing the last step.

$$4n = 48$$

$$4n \div 4 = 48 \div 4$$

$$n =$$

- 4 Explain your steps using complete sentences.

The ratio of the person to his shadow is the same as the ratio of the flagpole to its shadow. Two similar triangles show this relationship. I used the triangle to write a proportion and then solved it for the missing term.

**NO WORK, NO CREDIT**