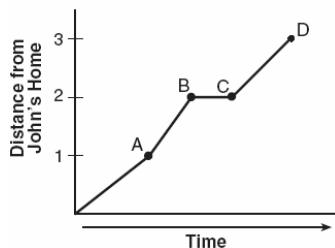


## Lesson 5-1: Relating Graphs to Events

### Part 1: Interpreting, Sketching, and Analyzing Graphs

1. 010412a, P.I. 8.A.3

John left his home and walked 3 blocks to his school, as shown in the accompanying graph.

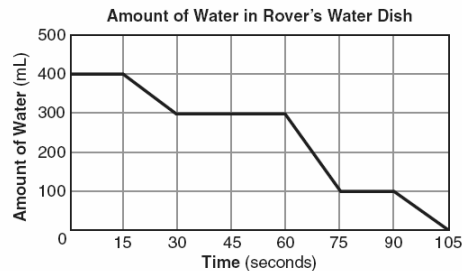


What is one possible interpretation of the section of the graph from point *B* to point *C*?

- [A] John arrived at school and stayed throughout the day.
- [B] John reached the top of a hill and began walking on level ground.
- [C] John returned home to get his mathematics homework.
- [D] John waited before crossing a busy street.

2. 080410a, P.I. 8.A.3

The accompanying graph shows the amount of water left in Rover's water dish over a period of time.

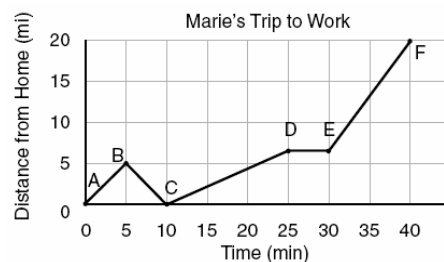


How long did Rover wait from the end of his first drink to the start of his second drink of water?

- [A] 10 sec
- [B] 30 sec
- [C] 75 sec
- [D] 60 sec

3. 010121a, P.I. 8.A.3

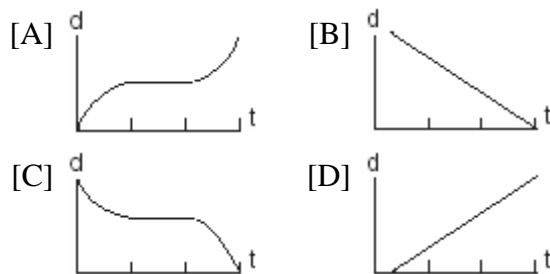
The accompanying graph shows Marie's distance from home (*A*) to work (*F*) at various times during her drive.



- a* Marie left her briefcase at home and had to return to get it. State which point represents when she turned back around to go home and explain how you arrived at that conclusion.
- b* Marie also had to wait at the railroad tracks for a train to pass. How long did she wait?

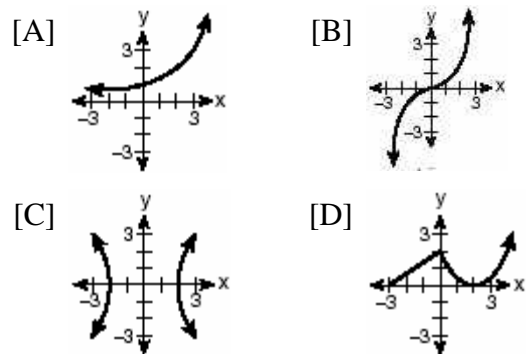
4. 060114b, P.I. 8.A.3

A bug travels up a tree, from the ground, over a 30-second interval. It travels fast at first and then slows down. It stops for 10 seconds, then proceeds slowly, speeding up as it goes. Which sketch best illustrates the bug's distance ( $d$ ) from the ground over the 30-second interval ( $t$ )?



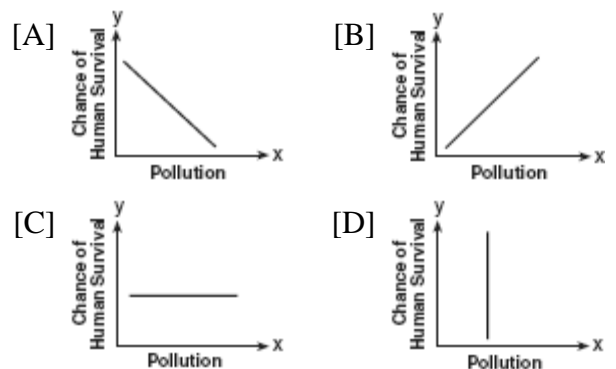
6. 010511b, P.I. A.G.3

Which graph is *not* a function?



7. 080301b, P.I. A.G.3

Which graph does not represent a function of  $x$ ?

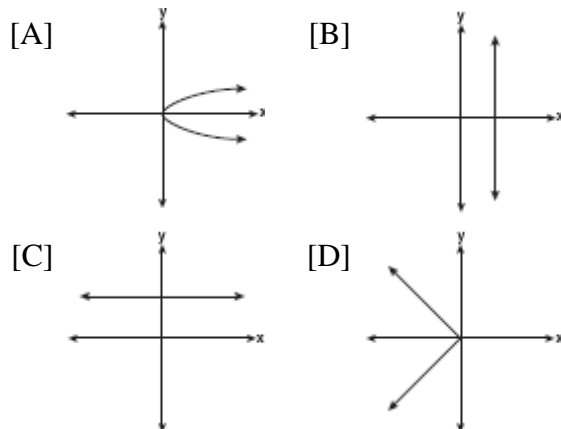


## Lesson 5-2: Relations and Functions

### Part 1: Identifying Relations and Functions

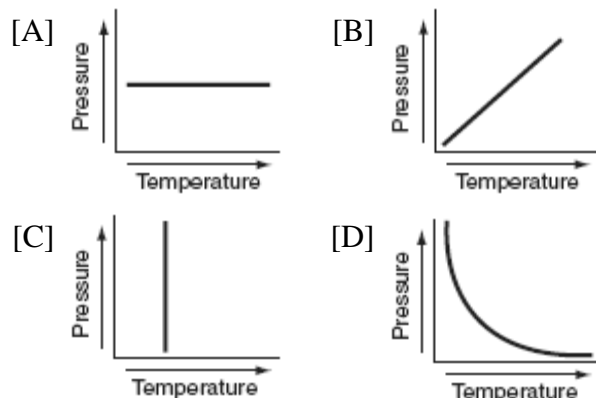
5. fall0730ia, P.I. A.G.3

Which graph represents a function?



8. 060601b, P.I. A.G.3

Each graph below represents a possible relationship between temperature and pressure. Which graph does *not* represent a function?



9. 080403b, P.I. A.G.3

Which set of ordered pairs is *not* a function?

- [A]  $\{(1,2), (3,4), (4,5), (5,6)\}$   
 [B]  $\{(4,1), (5,1), (6,1), (7,1)\}$   
 [C]  $\{(3,1), (2,1), (1,2), (3,2)\}$   
 [D]  $\{(0,0), (1,1), (2,2), (3,3)\}$

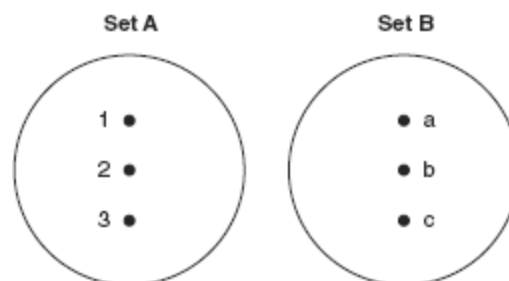
10. 060715b, P.I. A.G.3

Which set of ordered pairs does *not* represent a function?

- [A]  $\{(3,-2), (3,-4), (4,-1), (4,-3)\}$   
 [B]  $\{(3,-2), (4,-3), (5,-4), (6,-5)\}$   
 [C]  $\{(3,-2), (-2,3), (4,-1), (-1,4)\}$   
 [D]  $\{(3,-2), (5,-2), (4,-2), (-1,-2)\}$

11. 010622b, P.I. A2.A.37

On the accompanying diagram, draw a mapping of a relation from set  $A$  to set  $B$  that is *not* a function. Explain why the relationship you drew is *not* a function.



## Part 2: Evaluating Functions

12. 060406b, P.I. A2.A.41

If  $f(x) = 4x^0 + (4x)^{-1}$ , what is the value of  $f(4)$ ?

- [A] 0 [B]  $4\frac{1}{16}$  [C] -12 [D]  $1\frac{1}{16}$

13. 080701b, P.I. A2.A.41

If  $f(x) = (x^{-x} - x^0 + 2^x)$ , then  $f(3)$  is equal to

- [A] -22 [B] -21  
 [C]  $8\frac{1}{27}$  [D]  $7\frac{1}{27}$

## Lesson 5-5: Direct Variation

### Part 1: Writing the Equation of a Direct Variation

14. Which equation represents the direct variation relationship of the equation  $\frac{x}{y} = \frac{1}{2}$ ?
- [A]  $y = 3x$                       [B]  $x = 2y$
- [C]  $y = x + \frac{1}{2}$                       [D]  $y = 2x$

### Part 2: Proportions and Equations of Direct Variations

15. Which table does *not* show an example of direct variation?

[A]

$x$	$y$
1	4
2	8
3	12
4	16

[B]

$x$	$y$
2	24
4	12
6	8
8	6

[C]

$x$	$y$
-4	-20
-3	-15
-2	-10
-1	-5

[D]

$x$	$y$
1	$\frac{1}{2}$
2	1
3	$\frac{3}{2}$
4	2

16. Julio's wages vary directly as the number of hours that he works. If his wages for 5 hours are \$29.75, how much will he earn for 30 hours?

## Lesson 5-6: Inverse Variation

### Part 1: Solving Inverse Variations

17. 010221b  
Explain how a person can determine if a set of data represents inverse variation and give an example using a table of values.
18. 010503b  
If  $R$  varies inversely as  $S$ , when  $S$  is doubled,  $R$  is multiplied by
- [A] 4                      [B]  $\frac{1}{2}$                       [C] 2                      [D]  $\frac{1}{4}$
19. 060508b  
In a given rectangle, the length varies inversely as the width. If the length is doubled, the width will
- [A] remain the same  
[B] be divided by 2                      [C] be multiplied by 2  
[D] increase by 2
20. 080402b, P.I. A2.A.5  
The speed of a laundry truck varies inversely with the time it takes to reach its destination. If the truck takes 3 hours to reach its destination traveling at a constant speed of 50 miles per hour, how long will it take to reach the same location when it travels at a constant speed of 60 miles per hour?
- [A]  $2\frac{2}{3}$  hours                      [B] 2 hours  
[C]  $2\frac{1}{3}$  hours                      [D]  $2\frac{1}{2}$  hours

21. 010624b, P.I. A2.A.5  
The time it takes to travel to a location varies inversely to the speed traveled. It takes 4 hours driving at an average speed of 55 miles per hour to reach a location. To the *nearest tenth of an hour*, how long will it take to reach the same location driving at an average speed of 50 miles per hour?
22. 060323b, P.I. A2.A.5  
When air is pumped into an automobile tire, the pressure is inversely proportional to the volume. If the pressure is 35 pounds when the volume is 120 cubic inches, what is the pressure, in pounds, when the volume is 140 cubic inches?
23. 080523b, P.I. A2.A.5  
Boyle's Law states that the pressure of compressed gas is inversely proportional to its volume. The pressure of a certain sample of a gas is 16 kilopascals when its volume is 1,800 liters. What is the pressure, in kilopascals, when its volume is 900 liters?
24. 060618b, P.I. A2.A.5  
According to Boyle's Law, the pressure,  $p$ , of a compressed gas is inversely proportional to the volume,  $v$ . If a pressure of 20 pounds per square inch exists when the volume of the gas is 500 cubic inches, what is the pressure when the gas is compressed to 400 cubic inches?  
[A] 16 lb / in<sup>2</sup>                      [B] 25 lb / in<sup>2</sup>  
[C] 40 lb / in<sup>2</sup>                      [D] 50 lb / in<sup>2</sup>
25. 010823b, P.I. A2.A.5  
The amount of money each member of a band earns playing at a graduation party varies inversely as the number of members in the band. If the band has five members, each member earns \$70. Write an equation that models the relationship between the number of members in a band,  $n$ , and the amount each member earns,  $d$ . Use the equation to calculate the amount each member earns if there are four members in the band.
26. 080123b, P.I. A2.A.5  
The price per person to rent a limousine for a prom varies inversely as the number of passengers. If five people rent the limousine, the cost is \$70 each. How many people are renting the limousine when the cost *per couple* is \$87.50?
27. 080207b, P.I. A2.A.5  
To balance a seesaw, the distance, in feet, a person is from the fulcrum is inversely proportional to the person's weight, in pounds. Bill, who weighs 150 pounds, is sitting 4 feet away from the fulcrum. If Dan weighs 120 pounds, how far from the fulcrum should he sit to balance the seesaw?  
[A] 3 ft    [B] 4.5 ft    [C] 5 ft    [D] 3.5 ft
28. 010423b, P.I. A2.A.5  
A pulley that has a diameter of 8 inches is belted to a pulley that has a diameter of 12 inches. The 8-inch-diameter pulley is running at 1,548 revolutions per minute. If the speeds of the pulleys vary inversely to their diameters, how many revolutions per minute does the larger pulley make?

## Activity Lab P. 304: Histograms

29. 060401a, P.I. A.S.9

The test scores for 10 students in Ms. Sampson's homeroom were 61, 67, 81, 83, 87, 88, 89, 90, 98, and 100. Which frequency table is accurate for this set of data?

Interval	Frequency
61–70	2
71–80	2
81–90	8
91–100	10

Interval	Frequency
61–70	2
71–80	0
81–90	6
91–100	2

Interval	Frequency
61–70	2
71–80	0
81–90	8
91–100	10

Interval	Frequency
61–70	2
71–80	2
81–90	7
91–100	10

30. 080437a, P.I. A.S.5

The following set of data represents the scores on a mathematics quiz:

58, 79, 81, 99, 68, 92, 76, 84, 53, 57, 81, 91,  
77, 50, 65, 57, 51, 72, 84, 89

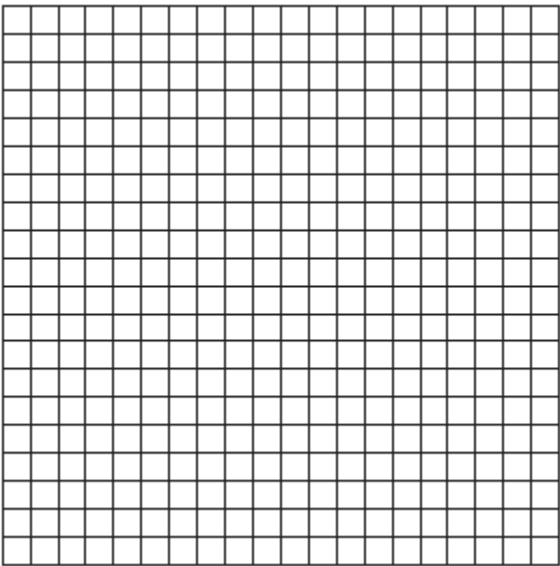
Complete the frequency table below and, on the accompanying grid, draw and label a frequency histogram of these scores.

### Mathematics Quiz Scores

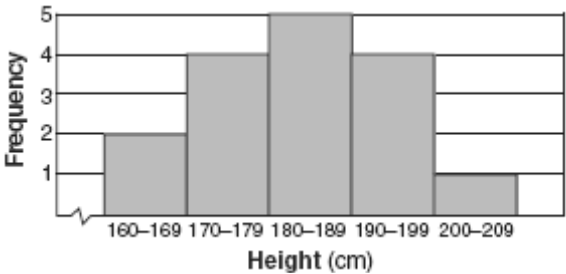
Interval	Tally	Frequency
50–59		
60–69		
70–79		
80–89		
90–99		

31. 060033a, P.I. A.S.5
- The scores on a mathematics test were 70, 55, 61, 80, 85, 72, 65, 40, 74, 68, and 84. Complete the accompanying table, and use the table to construct a frequency histogram for these scores.

Score	Tally	Frequency
40–49		
50–59		
60–69		
70–79		
80–89		

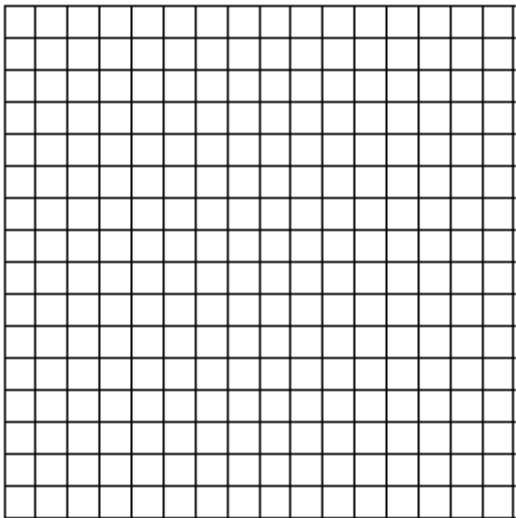


32. 010504a, P.I. A.S.9
- The accompanying histogram shows the heights of the students in Kyra's health class.



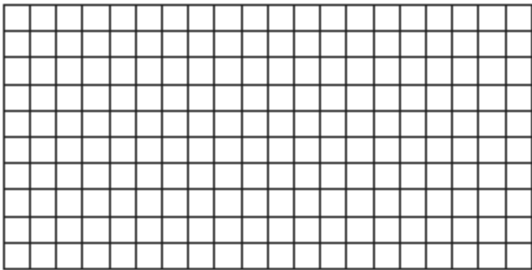
- What is the total number of students in the class?
- [A] 16      [B] 15      [C] 209      [D] 5

33. 010132a, P.I. A.S.5
- On a science quiz, 20 students received the following scores: 100, 95, 95, 90, 85, 85, 85, 80, 80, 80, 80, 75, 75, 75, 70, 70, 65, 65, 60, 55. Construct a statistical graph, such as a histogram or a stem-and-leaf plot, to display this data. *[Be sure to title the graph and label all axes or parts used.]*



34. 010334a, P.I. A.S.5
- Sarah's mathematics grades for one marking period were 85, 72, 97, 81, 77, 93, 100, 75, 86, 70, 96, and 80.
- a Complete the tally sheet and frequency table below, and construct and label a frequency histogram for Sarah's grades using the accompanying grid.

Interval (grades)	Tally	Frequency
61–70		
71–80		
81–90		
91–100		

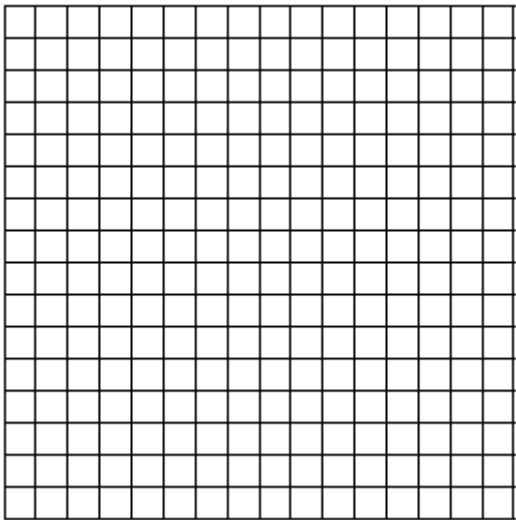


- b Which interval contains the 75th percentile (upper quartile)?

35. 010032a, P.I. A.S.5
- In the time trials for the 400-meter run at the state sectionals, the 15 runners recorded the times shown in the table below.

400-Meter Run	
Time (sec)	Frequency
50.0–50.9	
51.0–51.9	II
52.0–52.9	
53.0–53.9	III
54.0–54.9	IIII

- a Using the data from the frequency column, draw a frequency histogram on the grid provided below.

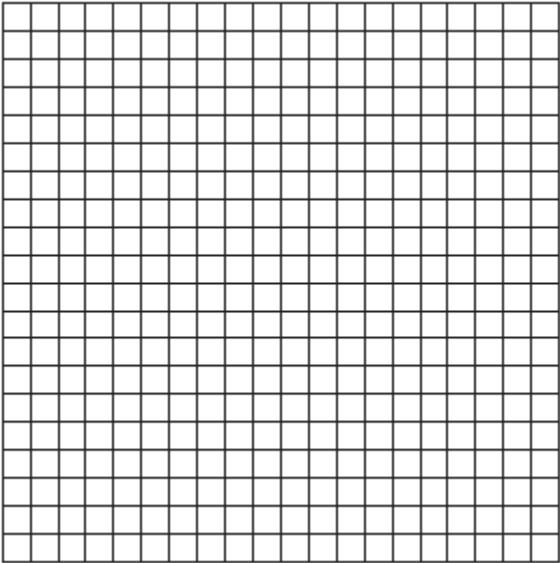


- b What percent of the runners completed the time trial between 52.0 and 53.9 seconds?



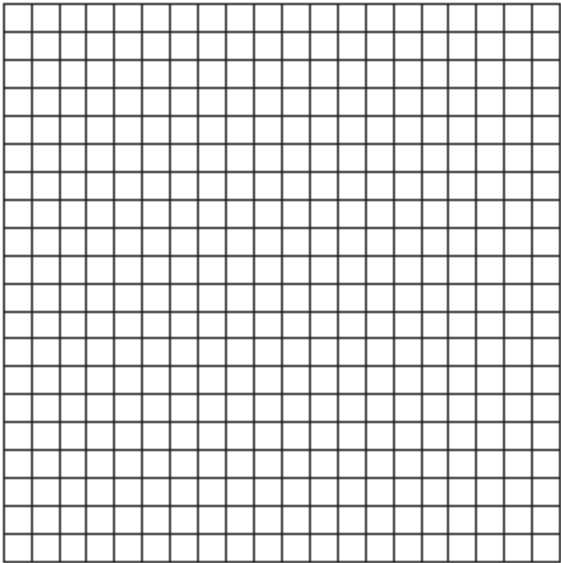
36. 080134a, P.I. A.S.5
- The following data consists of the weights, in pounds, of 30 adults:  
195, 206, 100, 98, 150, 210, 195, 106, 195, 168, 180, 212, 104, 195, 100, 216, 195, 209, 112, 99, 206, 116, 195, 100, 142, 100, 135, 98, 160, 155  
Using the data, complete the accompanying cumulative frequency table and construct a cumulative frequency histogram on the grid below.

Interval	Frequency	Cumulative Frequency
51–100		
101–150		
151–200		
201–250		



37. 010739a, P.I. A.S.5
- The accompanying table shows the weights, in pounds, for the students in an algebra class. Using the data, complete the cumulative frequency table and construct a cumulative frequency histogram on the grid below.

Interval	Frequency	Cumulative Frequency
91–100	6	
101–110	3	
111–120	0	
121–130	3	
131–140	0	
141–150	2	
151–160	2	



[1] D

[2] B

a [1] B, and an appropriate explanation is given.

b [1] 5 minutes

a and b

[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously

[3] incorrect procedure.

[4] A

[5] C

[6] C

[7] D

[8] C

[9] C

[10] A

[2] A mapping is drawn that maps at least one element of set A to more than one element of set B, and an appropriate explanation of the difference between functions and relations is written.

[1] An appropriate mapping is drawn, but no explanation is written.

or [1] An incorrect mapping is drawn, but an appropriate explanation is written.

[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct

response that was obtained by an obviously

[11] incorrect procedure.

[12] B

[13] D

[14] D

[15] B

[2] \$178.50, and appropriate work is shown, such as solving a proportion, using a table, or trial and error with at least three trials and appropriate checks.

[1] Appropriate work is shown, but one computational error is made.

or [1] An appropriate proportion is set up, but no solution or an incorrect solution is found.

or [1] An incorrect proportion is set up, but an appropriate solution is found.

or [1] \$178.50, but no work is shown or fewer than three trials with appropriate checks are shown.

[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously

[16] incorrect procedure.

[2] An explanation is given that indicates that a set of data can represent inverse variation if the product of two variables is constant, and a correct table of values is shown.

[1] The rule for direct rather than inverse variation is stated, but an appropriate equation and table of values are shown.

or [1] An example of inverse variation is shown, but no explanation of why it is an inverse variation is given.

or [1] An explanation is given that indicates that a set of data can represent inverse variation, but no table of values is shown.

[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously

[17] incorrect procedure.

[18] B

[19] B

[20] D

- [2] 4.4, and appropriate work is shown.  
[1] Appropriate work is shown, but one computational error is made.  
or [1] Appropriate work is shown, but one conceptual error is made.  
or [1] Only the constant of variation, 220, is found.  
or [1] 4.4, but no work is shown.  
[0] Direct variation is used.  
or [0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.
- [21] \_\_\_\_\_
- [2] 30, and appropriate work is shown.  
[1] Appropriate work is shown, but one computational error is made.  
or [1] 30, but no work is shown.  
[0] Direct variation is used to find a solution.  
or [0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.
- [22] \_\_\_\_\_
- [2] 32, and appropriate work is shown.  
[1] Appropriate work is shown, but one computational error is made.  
or [1] Only the constant of variation, 28,800, is found.  
or [1] 32, but no work is shown.  
[0] Direct variation is used.  
or [0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.
- [23] \_\_\_\_\_
- [24] B \_\_\_\_\_

- [2]  $nd = 350$  or an equivalent equation and \$87.50, and appropriate work is shown, such as the equation  $350 = 4d$ .  
[1] Appropriate work is shown, but one computational error is made.  
or [1] Appropriate work is shown, but one conceptual error is made,  
or [1] A correct equation is written, but no further correct work is shown.  
or [1] \$87.50, but no work is shown.  
[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.
- [25] \_\_\_\_\_
- [2] 8, and appropriate work is shown, such as  $5(70) = 43.75x$ .  
[1] 4, and \$87.50 is used instead of \$43.75 per person.  
or [1] Appropriate work is shown, but one computational error is made.  
or [1] 8, but no work is shown.  
[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.
- [26] \_\_\_\_\_
- [27] C \_\_\_\_\_
- [2] 1,032, and appropriate work is shown.  
[1] Appropriate work is shown, but one computational error is made.  
or [1] Appropriate work is shown, but one conceptual error is made.  
or [1] 1,032, but no work is shown.  
[0] Direct variation is used instead of inverse variation.  
or [0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.
- [28] \_\_\_\_\_
- [29] B \_\_\_\_\_

[3] The frequency table is completed correctly, showing frequencies of 6, 2, 4, 5, and 3, and a frequency histogram is drawn and labeled correctly.

[2] The frequency table is completed correctly, but one graphing error is made, such as not labeling the axes, having nonequal intervals, or starting the  $x$ -axis at 50.

or [2] The frequency table is completed incorrectly, but an appropriate frequency histogram is drawn.

or [2] The frequency histogram is drawn and labeled correctly, but the frequency table is not completed.

[1] The frequency table is completed correctly, but two or more graphing errors are made.

or [1] The frequency table is completed correctly, but no frequency histogram is drawn or a bar graph is drawn.

[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously

[30] incorrect procedure.

[4] A correct table and histogram with appropriate labels and scales are shown, such as

the table below.

SCORE	TALLY	FREQUENCY
40-49	/	1
50-59	/	1
60-69	///	3
70-79	///	3
80-89	///	3

[3] An incorrect table is shown, but the histogram is appropriate, based on this table.

or [3] A correct table is shown, but one error is made on the histogram, such as using incorrect labels or no labels.

or [3] An incomplete table is shown, but the histogram is correct.

[2] An incomplete table is shown, and the histogram is partially correct.

or [2] A correct table is shown, and a correct bar graph is made.

[1] A correct table is shown.

[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously

[31] incorrect procedure.

[32] A

[4] The student draws a histogram, a stem-and-leaf plot, or any other acceptable statistical graph, with proper labels and a title.

[3] The student makes one or two minor errors, such as a lack of label, title, or connected dots.

[2] The student makes several minor errors or one major error, such as not accounting for all 20 scores.

[1] The student draws just the beginning of a graph.

[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously

[33] incorrect procedure.

*a* [3] The frequency table is completed correctly, and a histogram is drawn with a correct scale and is labeled correctly.  
[2] One or two errors are made in the frequency table, but an appropriate histogram is drawn.  
or [2] The frequency table is completed correctly, but one error is made in drawing the histogram.  
[1] A correct histogram is drawn, but the frequency table is not completed.  
*b* [1] The interval 91-100 is identified as containing the 75th percentile.  
or [1] The appropriate interval is identified, based on an incorrect frequency table in part *a*.

*a* and *b*

[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.  
[34]

*a* [2] An appropriate histogram is drawn with both axes labeled with a correct numerical scale.  
[1] A correct bar graph is drawn.  
or [1] The parts of the histogram are not labeled.  
or [1] Equal interval scales are not shown.  
or [1] One error on frequency calculation is made.  
[0] Two or more mistakes on frequency calculation are made.  
*b* [2] 60% and an appropriate explanation is given.  
[1] An appropriate method to find percent is shown, but a mistake is made in reading the chart, such as  $\frac{6}{15} = 40\%$  or  $\frac{9}{15}$  is shown but not given as a percent answer.  
or [1] 60% and no explanation is given.  
*a* and *b*

[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.  
[35]

[4] Correct cumulative frequencies of 7, 14, 24, and 30 and a fully labeled correct histogram are shown.

[3] Incorrect cumulative frequencies are shown, but the histogram is appropriate for the data.

or [3] Correct cumulative frequencies are shown, but a partially incorrect histogram is shown, such as the axes not being labeled, having nonequal intervals, or the x-axis starting at 50.

[2] Only a frequency histogram is completed correctly.

or [2] Only a correct cumulative frequency table and a correct bar graph are shown.

[1] An appropriate bar graph is shown, but it is based on frequencies, not the cumulative frequency.

or [1] Only a correct cumulative frequency table is shown.

[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.  
[36]

[4] The table is completed correctly, and an appropriate cumulative frequency histogram is drawn and labeled.

[3] The table is completed correctly, but one error is made in drawing the cumulative frequency histogram or one or more labeling errors are made.

or [3] The table is not completed correctly, but an appropriate cumulative frequency histogram is drawn, based on the table.

[2] One error is made in completing the table, and one graphing error is made in drawing the cumulative frequency histogram.

or [2] The table is completed correctly, but one conceptual error is made, such as drawing a frequency histogram or a cumulative frequency bar graph.

[1] The table is completed correctly, but no histogram is drawn.

[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.  
[37]