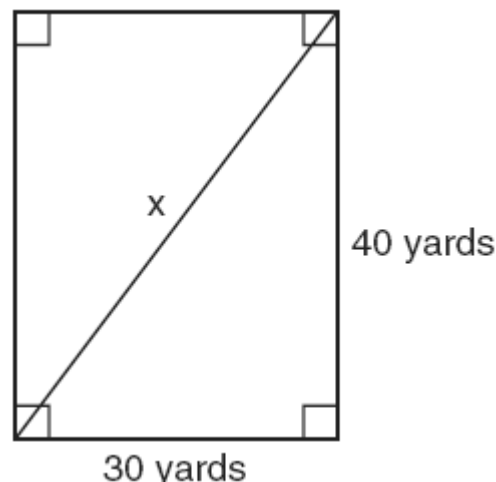


CHAPTER 9-1

PYTHAGORAS

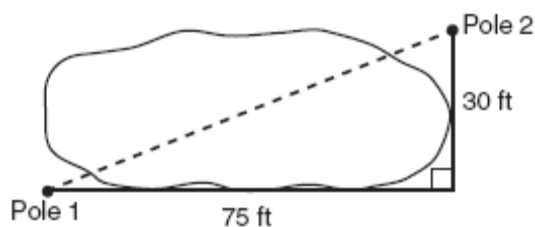
1. 060009a, P.I. G.G.48
The set of integers $\{3,4,5\}$ is a Pythagorean triple. Another such set is
[A] $\{8,15,17\}$ [B] $\{6,8,12\}$
[C] $\{6,7,8\}$ [D] $\{6,12,13\}$
2. 010827a, P.I. G.G.48
Which set of numbers could be the lengths of the sides of a right triangle?
[A] $\{10,24,26\}$ [B] $\{4,7,8\}$
[C] $\{12,16,30\}$ [D] $\{3,4,6\}$
3. 010615a, P.I. G.G.48
A builder is building a rectangular deck with dimensions of 16 feet by 30 feet. To ensure that the sides form 90° angles, what should each diagonal measure?
[A] 30 ft [B] 46 ft [C] 34 ft [D] 16 ft
4. 010202a, P.I. A.A.45
If the length of the legs of a right triangle are 5 and 7, what is the length of the hypotenuse?
[A] $2\sqrt{3}$ [B] $2\sqrt{6}$
[C] $\sqrt{2}$ [D] $\sqrt{74}$
5. 060710a, P.I. A.A.45
If the length of a rectangular television screen is 20 inches and its height is 15 inches, what is the length of its diagonal, in inches?
[A] 13.2 [B] 5 [C] 25 [D] 35

6. fall0711ia, P.I. A.A.45
Tanya runs diagonally across a rectangular field that has a length of 40 yards and a width of 30 yards, as shown in the diagram below.



What is the length of the diagonal, in yards, that Tanya runs?

- [A] 50 [B] 70 [C] 60 [D] 80
7. 010736a, P.I. G.G.48
The perimeter of a square is 56. Express the length of a diagonal of the square in simplest radical form.
 8. 010508a, P.I. A.A.45
The NuFone Communications Company must run a telephone line between two poles at opposite ends of a lake, as shown in the accompanying diagram. The length and width of the lake are 75 feet and 30 feet, respectively.

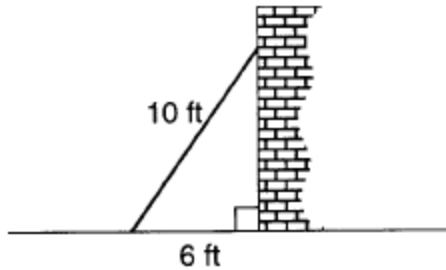


What is the distance between the two poles, to the nearest foot?

- [A] 69 [B] 105 [C] 81 [D] 45

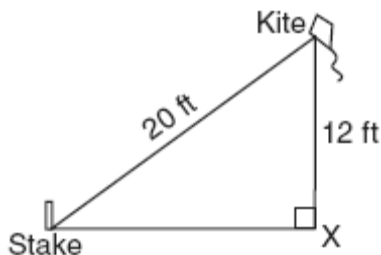
9. 010023a, P.I. A.A.45

A wall is supported by a brace 10 feet long, as shown in the diagram below. If one end of the brace is placed 6 feet from the base of the wall, how many feet up the wall does the brace reach?



10. 080531a, P.I. A.A.45

The accompanying diagram shows a kite that has been secured to a stake in the ground with a 20-foot string. The kite is located 12 feet from the ground, directly over point X . What is the distance, in feet, between the stake and point X ?



11. 080122a, P.I. A.A.45

How many feet from the base of a house must a 39-foot ladder be placed so that the top of the ladder will reach a point on the house 36 feet from the ground?

12. 060115a, P.I. A.A.45

A woman has a ladder that is 13 feet long. If she sets the base of the ladder on level ground 5 feet from the side of a house, how many feet above the ground will the top of the ladder be when it rests against the house?

[A] 8 [B] 9 [C] 12 [D] 11

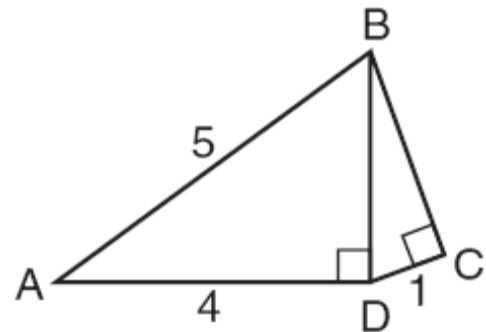
13. 080707a, P.I. A.A.45

A cable 20 feet long connects the top of a flagpole to a point on the ground that is 16 feet from the base of the pole. How tall is the flagpole?

[A] 12 ft [B] 26 ft [C] 8 ft [D] 10 ft

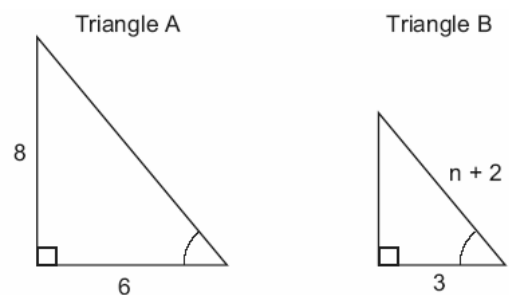
14. 080633a, P.I. A.A.45

In the accompanying diagram of right triangles ABD and DBC , $AB = 5$, $AD = 4$, and $CD = 1$. Find the length of \overline{BC} , to the nearest tenth.



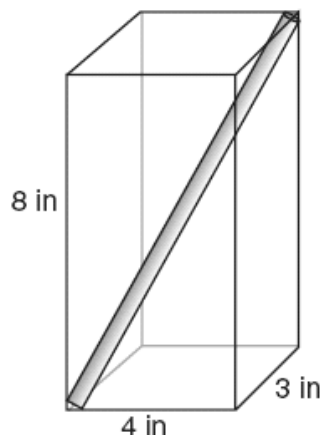
15. 060230a, P.I. G.G.48

In the accompanying diagram, triangle A is similar to triangle B . Find the value of n .



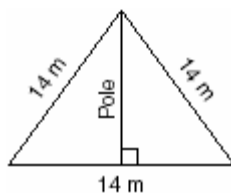
16. 060334a, G.G.48

A straw is placed into a rectangular box that is 3 inches by 4 inches by 8 inches, as shown in the accompanying diagram. If the straw fits exactly into the box diagonally from the bottom left front corner to the top right back corner, how long is the straw, to the *nearest tenth of an inch*?



17. 080504b, P.I. G.G.48

The accompanying diagram shows two cables of equal length supporting a pole. Both cables are 14 meters long, and they are anchored to points in the ground that are 14 meters apart.

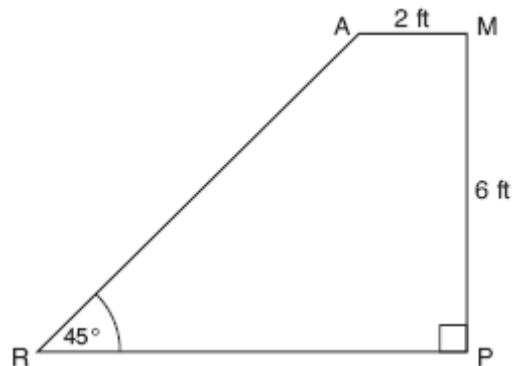


What is the exact height of the pole, in meters?

- [A] $7\sqrt{3}$ [B] 14 [C] 7 [D] $7\sqrt{2}$

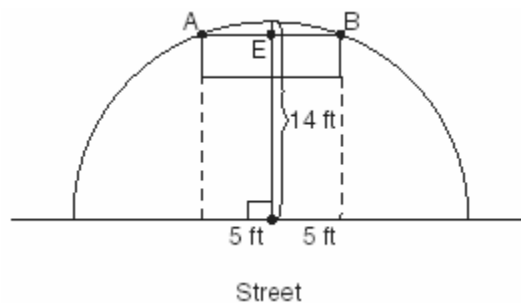
18. 080726b, P.I. G.G.48

The accompanying diagram shows ramp \overline{RA} leading to level platform \overline{AM} , forming an angle of 45° with level ground. If platform \overline{AM} measures 2 feet and is 6 feet above the ground, explain why the exact length of ramp \overline{RA} is $6\sqrt{2}$ feet.



19. 080124b P.I. G.G.48

The accompanying diagram shows a semicircular arch over a street that has a radius of 14 feet. A banner is attached to the arch at points A and B, such that $AE = EB = 5$ feet. How many feet above the ground are these points of attachment for the banner?



CHAPTER 9-2

DISTANCE

20. 010524a, P.I. G.G.67

The coordinates of point R are $(-3,2)$ and the coordinates of point T are $(4,1)$. What is the length of \overline{RT} ?

[A] $2\sqrt{2}$ [B] $\sqrt{10}$

[C] $4\sqrt{3}$ [D] $5\sqrt{2}$

21. 080726a, P.I. G.G.67

What is the length of the line segment that joins the points whose coordinates are $(4,7)$ and $(-3,5)$?

[A] $\sqrt{193}$ [B] $\sqrt{53}$

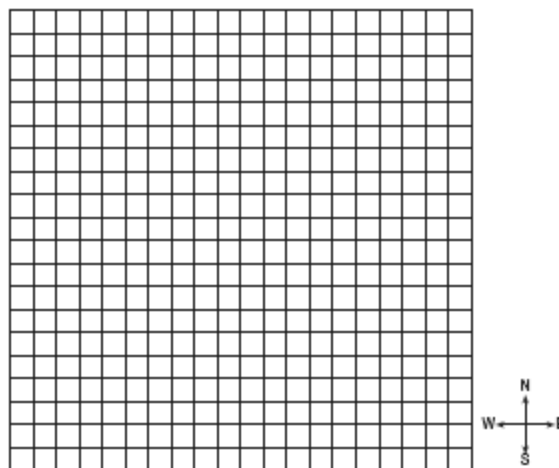
[C] $\sqrt{5}$ [D] $3\sqrt{6}$

22. 080030a

Katrina hikes 5 miles north, 7 miles east, and then 3 miles north again. To the *nearest tenth of a mile*, how far, in a straight line, is Katrina from her starting point?

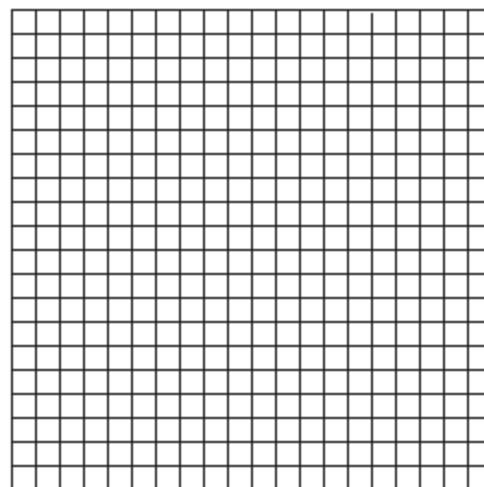
23. 060330a

To get from his high school to his home, Jamal travels 5.0 miles east and then 4.0 miles north. When Sheila goes to her home from the same high school, she travels 8.0 miles east and 2.0 miles south. What is the measure of the shortest distance, to the *nearest tenth of a mile*, between Jamal's home and Sheila's home? [The use of the accompanying grid is optional.]



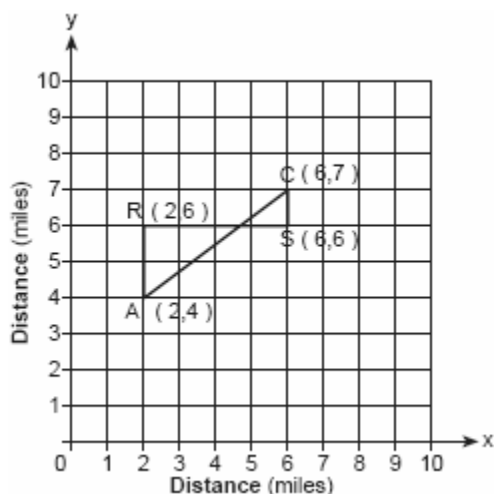
24. 060633a

Two hikers started at the same location. One traveled 2 miles east and then 1 mile north. The other traveled 1 mile west and then 3 miles south. At the end of their hikes, how many miles apart are the two hikers? [The use of the accompanying grid is optional.]



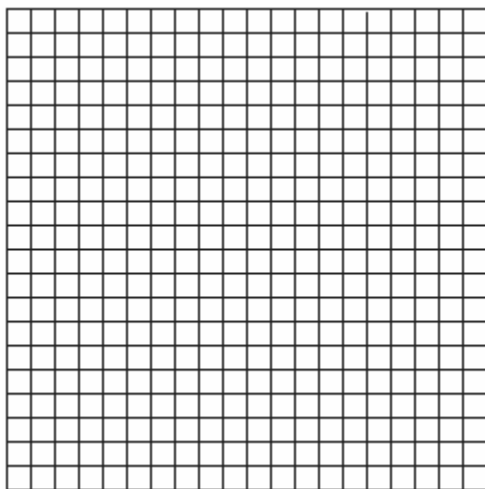
25. 010226a, P.I. G.G.67

Jerry and Jean Jogger start at the same time from point A shown on the accompanying set of axes. Jerry jogs at a rate of 5 miles per hour traveling from point A to point R to point S and then to point C. Jean jogs directly from point A to point C on \overline{AC} at the rate of 3 miles per hour. Which jogger reaches point C first? Explain or show your reasoning.



26. 080235a, P.I. G.G.68

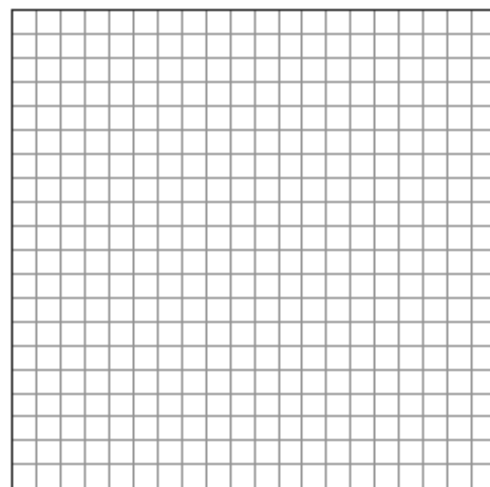
Determine the distance between point A(-1,-3) and point B(5,5). Write an equation of the perpendicular bisector of \overline{AB} . [The use of the accompanying grid is optional.]



MIDPOINT

27. 060434a

The coordinates of the midpoint of \overline{AB} are (2,4), and the coordinates of point B are (3,7). What are the coordinates of point A? [The use of the accompanying grid is optional.]



28. 080217a

M is the midpoint of \overline{AB} . If the coordinates of A are (-1,5) and the coordinates of M are (3,3), what are the coordinates of B?

- [A] (2,8) [B] (7,1)
[C] (-5,7) [D] (1,4)

29. 010718a

The midpoint of \overline{AB} is (-1,5) and the coordinates of point A are (-3,2). What are the coordinates of point B?

- [A] (-5,8) [B] (1,10)
[C] (0,7) [D] (1,8)

30. 080515a

A line segment on the coordinate plane has endpoints (2,4) and (4,y). The midpoint of the segment is point (3,7). What is the value of y?

- [A] 11 [B] 10 [C] -2 [D] 5

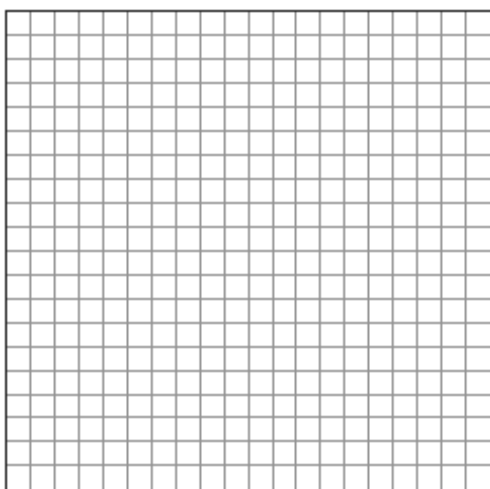
31. 080624a, P.I. G.G.66

The coordinates of A are $(-9, 2)$ and the coordinates of G are $(3, 14)$. What are the coordinates of the midpoint of \overline{AG} ?

- [A] $(-21, -10)$ [B] $(-6, 6)$
[C] $(-3, 8)$ [D] $(-6, 16)$

32. 010021a

The midpoint M of line segment AB has coordinates $(-3, 4)$. If point A is the origin, $(0, 0)$, what are the coordinates of point B ?
[The use of the accompanying grid is optional.]



CHAPTER 9-3

BASIC TRIGONOMETRIC RATIOS

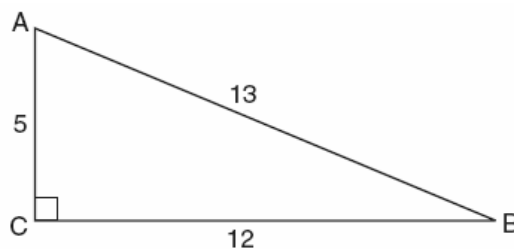
33. fall0721a, P.I. A.A.42

In triangle MCT , the measure of $\angle T = 90^\circ$, $MC = 85$ cm, $CT = 84$ cm, and $TM = 13$ cm. Which ratio represents the sine of $\angle C$?

- [A] $\frac{84}{85}$ [B] $\frac{13}{85}$ [C] $\frac{84}{13}$ [D] $\frac{13}{84}$

34. 080414a, P.I. A.A.42

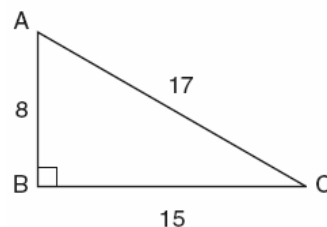
Which ratio represents $\cos A$ in the accompanying diagram of $\triangle ABC$?



- [A] $\frac{5}{13}$ [B] $\frac{13}{5}$ [C] $\frac{12}{13}$ [D] $\frac{12}{5}$

35. 010316a, P.I. A.A.42

In the accompanying diagram of right triangle ABC , $AB = 8$, $BC = 15$, $AC = 17$, and $m\angle ABC = 90$.



What is $\tan \angle C$?

- [A] $\frac{15}{17}$ [B] $\frac{8}{15}$ [C] $\frac{8}{17}$ [D] $\frac{17}{15}$

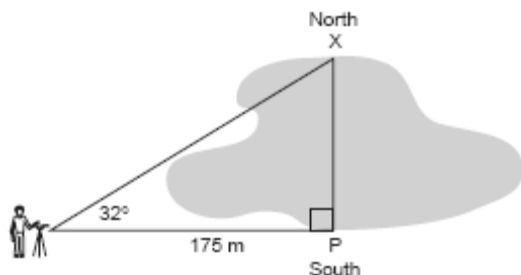
36. 060419a, P.I. A.A.44

The angle of elevation from a point 25 feet from the base of a tree on level ground to the top of the tree is 30° . Which equation can be used to find the height of the tree?

- [A] $\tan 30^\circ = \frac{x}{25}$ [B] $\sin 30^\circ = \frac{x}{25}$
[C] $30^2 + 25^2 = x^2$ [D] $\cos 30^\circ = \frac{x}{25}$

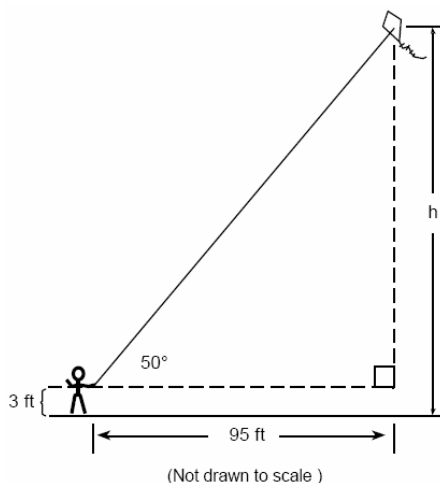
37. 060030a, P.I. A.A.44

A surveyor needs to determine the distance across the pond shown in the accompanying diagram. She determines that the distance from her position to point P on the south shore of the pond is 175 meters and the angle from her position to point X on the north shore is 32° . Determine the distance, PX , across the pond, rounded to the *nearest meter*.



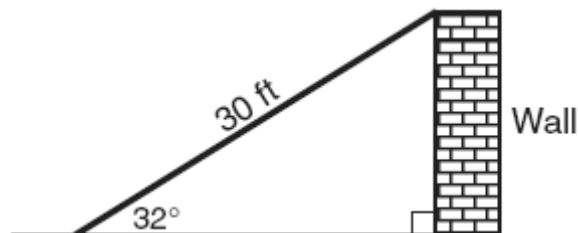
38. 069934a, P.I. A.A.44

Joe is holding his kite string 3 feet above the ground, as shown in the accompanying diagram. The distance between his hand and a point directly under the kite is 95 feet. If the angle of elevation to the kite is 50° , find the height, h , of his kite, to the *nearest foot*.



39. 080724a, P.I. A.A.44

The accompanying diagram shows a ramp 30 feet long leaning against a wall at a construction site.

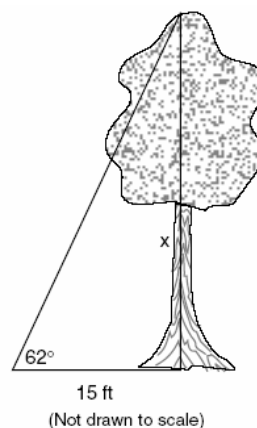


If the ramp forms an angle of 32° with the ground, how high above the ground, to the *nearest tenth*, is the top of the ramp?

- [A] 18.7 ft [B] 15.9 ft
[C] 56.6 ft [D] 25.4 ft

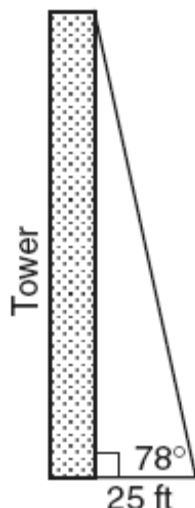
40. 010135a, P.I. A.A.44

Find, to the *nearest tenth of a foot*, the height of the tree represented in the accompanying diagram.



41. 010735a, P.I. A.A.44

From a point on level ground 25 feet from the base of a tower, the angle of elevation to the top of the tower is 78° , as shown in the accompanying diagram. Find the height of the tower, to the *nearest tenth of a foot*.



42. 010531a, P.I. A.A.44

In the accompanying diagram, a ladder leaning against a building makes an angle of 58° with level ground. If the distance from the foot of the ladder to the building is 6 feet, find, to the *nearest foot*, how far up the building the ladder will reach.



43. 080536a, P.I. A.A.44

A tree casts a shadow that is 20 feet long. The angle of elevation from the end of the shadow to the top of the tree is 66° . Determine the height of the tree, to the *nearest foot*.

44. 010235a, P.I. A.A.44

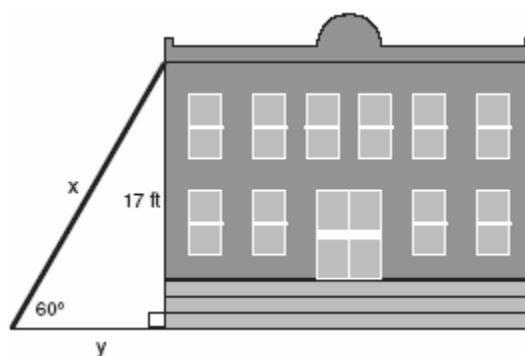
Draw and label a diagram of the path of an airplane climbing at an angle of 11° with the ground. Find, to the *nearest foot*, the ground distance the airplane has traveled when it has attained an altitude of 400 feet.

45. 080033a, P.I. A.A.44

A 10-foot ladder is to be placed against the side of a building. The base of the ladder must be placed at an angle of 72° with the level ground for a secure footing. Find, to the *nearest inch*, how far the base of the ladder should be from the side of the building and how far up the side of the building the ladder will reach.

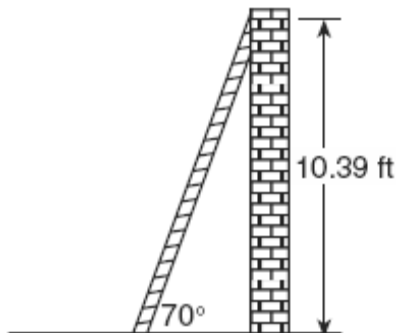
46. 080231a, P.I. A.A.44

In the accompanying diagram, x represents the length of a ladder that is leaning against a wall of a building, and y represents the distance from the foot of the ladder to the base of the wall. The ladder makes a 60° angle with the ground and reaches a point on the wall 17 feet above the ground. Find the number of feet in x and y .



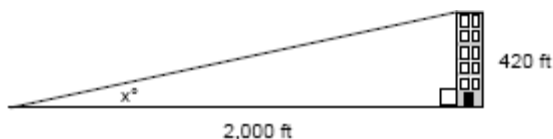
47. 010638a, P.I. A.A.44

As shown in the accompanying diagram, a ladder is leaning against a vertical wall, making an angle of 70° with the ground and reaching a height of 10.39 feet on the wall. Find, to the *nearest foot*, the length of the ladder. Find, to the *nearest foot*, the distance from the base of the ladder to the wall.



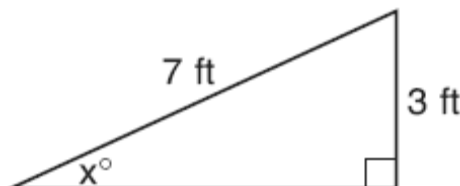
48. 089927a, P.I. A.A.43

A person standing on level ground is 2,000 feet away from the foot of a 420-foot-tall building, as shown in the accompanying diagram. To the *nearest degree*, what is the value of x ?



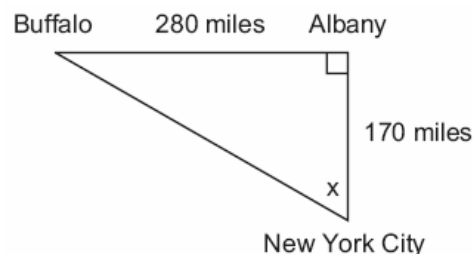
49. 060735a, P.I. A.A.43

Ron and Francine are building a ramp for performing skateboard stunts, as shown in the accompanying diagram. The ramp is 7 feet long and 3 feet high. What is the measure of the angle, x , that the ramp makes with the ground, to the *nearest tenth of a degree*?



50. 060231a, P.I. A.A.43, G.G.48

As seen in the accompanying diagram, a person can travel from New York City to Buffalo by going north 170 miles to Albany and then west 280 miles to Buffalo.

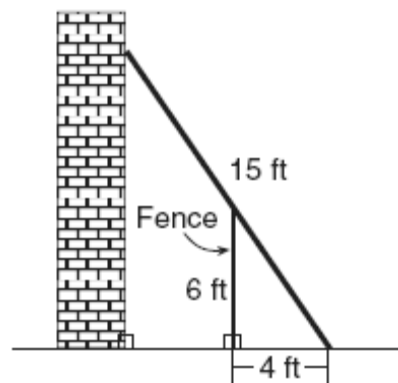


a If an engineer wants to design a highway to connect New York City directly to Buffalo, at what angle, x , would she need to build the highway? Find the angle to the *nearest degree*.

b To the *nearest mile*, how many miles would be saved by traveling directly from New York City to Buffalo rather than by traveling first to Albany and then to Buffalo?

51. 010438a, P.I. A.A.43

In the accompanying diagram, the base of a 15-foot ladder rests on the ground 4 feet from a 6-foot fence.

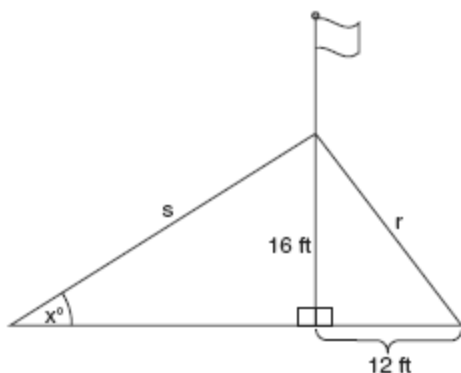


a If the ladder touches the top of the fence and the side of a building, what angle, to the *nearest degree*, does the ladder make with the ground?

b Using the angle found in part *a*, determine how far the top of the ladder reaches up the side of the building, to the *nearest foot*.

52. 060539a, P.I. A.A.43

The accompanying diagram shows a flagpole that stands on level ground. Two cables, r and s , are attached to the pole at a point 16 feet above the ground. The combined length of the two cables is 50 feet. If cable r is attached to the ground 12 feet from the base of the pole, what is the measure of the angle, x , to the *nearest degree*, that cable s makes with the ground?



53. 080133a, P.I. A.A.44

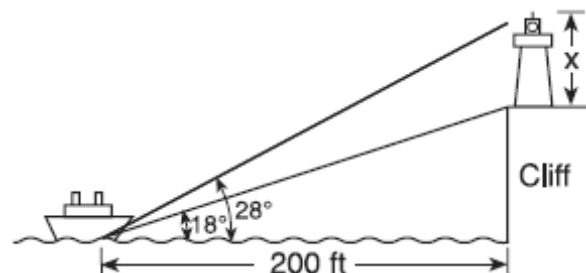
A ship on the ocean surface detects a sunken ship on the ocean floor at an angle of depression of 50° . The distance between the ship on the surface and the sunken ship on the ocean floor is 200 meters. If the ocean floor is level in this area, how far above the ocean floor, to the *nearest meter*, is the ship on the surface?

54. 060639a, P.I. A.A.44

A person measures the angle of depression from the top of a wall to a point on the ground. The point is located on level ground 62 feet from the base of the wall and the angle of depression is 52° . How high is the wall, to the *nearest tenth of a foot*?

55. 010838a, P.I. A.A.44

A lighthouse is built on the edge of a cliff near the ocean, as shown in the accompanying diagram. From a boat located 200 feet from the base of the cliff, the angle of elevation to the top of the cliff is 18° and the angle of elevation to the top of the lighthouse is 28° . What is the height of the lighthouse, x , to the *nearest tenth of a foot*?



56. 080108b, P.I. A.A.44

At Mogul's Ski Resort, the beginner's slope is inclined at an angle of 12.3° , while the advanced slope is inclined at an angle of 26.4° . If Rudy skis 1,000 meters down the advanced slope while Valerie skis the same distance on the beginner's slope, how much longer was the horizontal distance that Valerie covered?

- [A] 895.7 m [B] 977.0 m
[C] 81.3 m [D] 231.6 m

CHAPTER 9-4

SIMPLIFYING RADICALS

57. 089902a, P.I. A.N.2

The expression $\sqrt{50}$ can be simplified to

- [A] $2\sqrt{25}$ [B] $25\sqrt{2}$
[C] $5\sqrt{2}$ [D] $5\sqrt{10}$

58. 010530a, P.I. A.N.2

When $\sqrt{72}$ is expressed in simplest $a\sqrt{b}$ form, what is the value of a ?

- [A] 2 [B] 8 [C] 6 [D] 3

59. fall0731ia, P.I. A.N.2

Express $5\sqrt{72}$ in simplest radical form.

60. 080125a, P.I. A2.A.13

Simplify: $\sqrt{50r^2s^4}$

61. 010422a, P.I. A2.A.13

If $a > 0$, then $\sqrt{9a^2 + 16a^2}$ equals

[A] $5\sqrt{a}$ [B] $5a$ [C] $\sqrt{7a}$ [D] $7a$

67. 080614a, P.I. A.N.3

What is the sum of $\sqrt{50}$ and $\sqrt{32}$?

[A] $20\sqrt{20}$ [B] $\sqrt{82}$

[C] $9\sqrt{2}$ [D] $\sqrt{2}$

68. 080712a, P.I. A.N.3

What is the sum of $\sqrt{50}$ and $\sqrt{8}$?

[A] $7\sqrt{2}$ [B] $29\sqrt{2}$

[C] $9\sqrt{2}$ [D] $\sqrt{58}$

69. 080524a, P.I. A.N.3

What is the sum of $5\sqrt{7}$ and $3\sqrt{28}$?

[A] $9\sqrt{7}$ [B] $60\sqrt{7}$

[C] $8\sqrt{35}$ [D] $11\sqrt{7}$

70. 010826a, P.I. A.N.3

The expression $\sqrt{28} - \sqrt{7}$ is equivalent to

[A] 4 [B] $\sqrt{7}$ [C] $3\sqrt{7}$ [D] 2

71. 080016a, P.I. A.N.3

The expression $2\sqrt{50} - \sqrt{2}$ is equivalent to

[A] $9\sqrt{2}$ [B] 10

[C] $2\sqrt{48}$ [D] $49\sqrt{2}$

72. 060627a, P.I. A.N.3

Expressed in simplest radical form, the product of $\sqrt{6} \cdot \sqrt{15}$ is

[A] $3\sqrt{10}$ [B] $\sqrt{90}$

[C] $9\sqrt{10}$ [D] $3\sqrt{15}$

73. 010103a, P.I. A2.A.13

If $x > 0$, the expression $(\sqrt{x})(\sqrt{2x})$ is equivalent to

[A] $2x$ [B] $x^2\sqrt{2}$

[C] $x\sqrt{2}$ [D] $\sqrt{2x}$

CHAPTER 9-5

OPERATIONS WITH RADICALS

62. 060316a, P.I. A.N.3

The sum of $\sqrt{18}$ and $\sqrt{72}$ is

[A] $9\sqrt{2}$ [B] $\sqrt{90}$

[C] $3\sqrt{10}$ [D] $6\sqrt{3}$

63. 010311a, P.I. A.N.3

The sum of $\sqrt{75}$ and $\sqrt{3}$ is

[A] 18 [B] $\sqrt{78}$ [C] 15 [D] $6\sqrt{3}$

64. 069920a, P.I. A.N.3

The expression $\sqrt{27} + \sqrt{12}$ is equivalent to

[A] $13\sqrt{3}$ [B] $5\sqrt{3}$

[C] $5\sqrt{6}$ [D] $\sqrt{39}$

65. 060512a, P.I. A.N.3

The expression $\sqrt{50} + \sqrt{32}$ is equivalent to

[A] 18 [B] $9\sqrt{2}$ [C] $\sqrt{82}$ [D] 6

66. 060724a, P.I. A.N.3

The expression $\sqrt{28} + \sqrt{63}$ is equivalent to

[A] $13\sqrt{7}$ [B] $6\sqrt{7}$

[C] $\sqrt{91}$ [D] $5\sqrt{7}$

74. 010622a, P.I. A.N.3

The expression $\frac{6\sqrt{20}}{3\sqrt{5}}$ is equivalent to

- [A] $3\sqrt{15}$ [B] 8 [C] $2\sqrt{15}$ [D] 4

75. 060218a, P.I. A.N.3

The expression $\sqrt{90} \cdot \sqrt{40} - \sqrt{8} \cdot \sqrt{18}$ simplifies to

- [A] 48 [B] 22.9 [C] 3,456 [D] 864

76. 080724b, P.I. A.N.3

Classical mathematics uses the term "Golden Ratio" for the ratio $(1 + \sqrt{5}):2$. The Golden Ratio was used by many famous artists to determine the dimensions of their paintings. If the ratio of the length to the width of a painting is $(1 + \sqrt{5}):2$, find the length, in feet, of a painting that has a width of 14 feet. Express your answer in simplest radical form.

81. 010305b, P.I. A2.A.22

What is the solution set of the equation $\sqrt{9x+10} = x$

- [A] $\{-1\}$ [B] $\{10\}$
[C] $\{10, -1\}$ [D] $\{9\}$

82. 060214b, P.I. A2.A.22

What is the solution set of the equation $x = 2\sqrt{2x-3}$?

- [A] $\{2,6\}$ [B] $\{6\}$ [C] $\{2\}$ [D] $\{ \}$

83. 060528b, P.I. A2.A.22

Solve for all values of q that satisfy the equation $\sqrt{3q+7} = q+3$.

84. 010427b, P.I. A2.A.22

Solve algebraically: $\sqrt{x+5} + 1 = x$

85. 060629b, P.I. A2.A.22

Solve algebraically for x : $\sqrt{3x+1} + 1 = x$

86. 010323b, P.I. A2.A.22

A wrecking ball suspended from a chain is a type of pendulum. The relationship between the rate of speed of the ball, R , the mass of the ball, m , the length of the chain, L , and the force, F , is $R = 2\pi\sqrt{\frac{mL}{F}}$. Determine the force, F , to the *nearest hundredth*, when $L = 12$, $m = 50$, and $R = 0.6$.

87. 080528b, P.I. A2.A.22

The lateral surface area of a right circular cone, s , is represented by the equation $s = \pi r\sqrt{r^2 + h^2}$, where r is the radius of the circular base and h is the height of the cone. If the lateral surface area of a large funnel is 236.64 square centimeters and its radius is 4.75 centimeters, find its height, to the *nearest hundredth of a centimeter*.

CHAPTER 9-6

SOLVING RADICALS

77. 010607b, P.I. A2.A.22

If $\sqrt{2x-1} + 2 = 5$, then x is equal to

- [A] 2 [B] 4 [C] 5 [D] 1

78. 080602b, P.I. A2.A.22

What is the solution of the equation $\sqrt{2x-3} - 3 = 6$?

- [A] 6 [B] 42 [C] 3 [D] 39

79. 010802b, P.I. A2.A.22

What is the value of x in the equation $\sqrt{3+x} - 5 = -2$?

- [A] 6 [B] 12 [C] 46 [D] 3

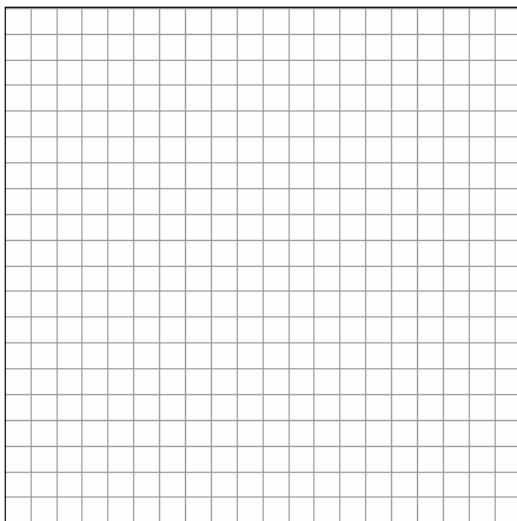
80. 080104b, P.I. A2.A.22

The solution set of the equation $\sqrt{x+6} = x$ is

- [A] $\{-2\}$ [B] $\{-2,3\}$ [C] $\{3\}$ [D] $\{ \}$

88. 010532b, P.I. A2.A.22

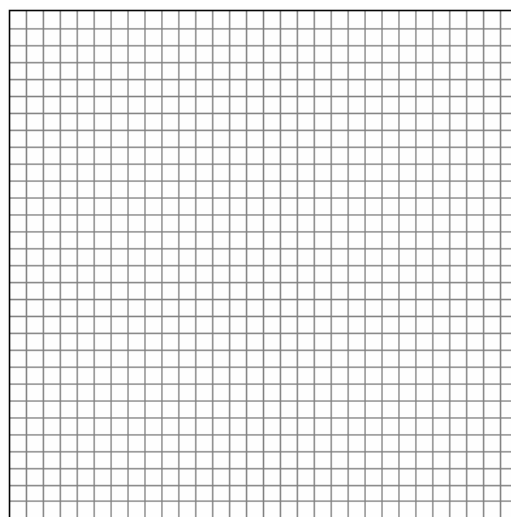
The equation $V = 20\sqrt{C + 273}$ relates speed of sound, V , in meters per second, to air temperature, C , in degrees Celsius. What is the temperature, in degrees Celsius, when the speed of sound is 320 meters per second? [The use of the accompanying grid is optional.]



89. 010532b, P.I. A2.A.22

The number of people, y , involved in recycling in a community is modeled by the function $y = 90\sqrt{3x} + 400$, where x is the number of months the recycling plant has been open.

Construct a table of values, sketch the function on the grid, and find the number of people involved in recycling exactly 3 months after the plant opened. After how many months will 940 people be involved in recycling?



SYSTEMS

90. 060205b, P.I. A2.A.22

The path of a rocket is represented by the equation $y = \sqrt{25 - x^2}$. The path of a missile designed to intersect the path of the rocket is represented by the equation $x = \frac{3}{2}\sqrt{y}$. The value of x at the point of intersection is 3. What is the corresponding value of y ?

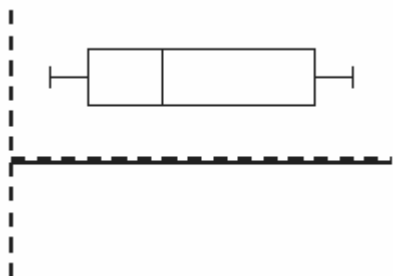
[A] -4 [B] -2 [C] 4 [D] 2

MATH TOOLBOX P. 450

BOX-AND-WHISKER PLOTS

91. 060220a

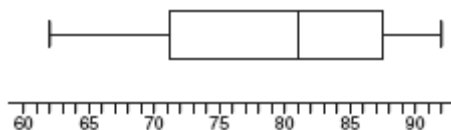
The accompanying diagram is an example of which type of graph?



- [A] box-and-whisker plot [B] bar graph
[C] stem-and-leaf plot [D] histogram

92. 010301a, P.I. A.S.6

The accompanying diagram shows a box-and-whisker plot of student test scores on last year's Mathematics A midterm examination.

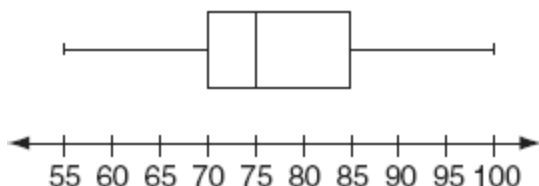


What is the median score?

- [A] 92 [B] 71 [C] 62 [D] 81

93. 060610a, P.I. A.S.6

The accompanying box-and-whisker plot represents the scores earned on a science test.



What is the median score?

- [A] 85 [B] 70 [C] 75 [D] 77

94. fall0709ia, P.I. A.S.5

The data set 5, 6, 7, 8, 9, 9, 9, 10, 12, 14, 17, 17, 18, 19, 19 represents the number of hours spent on the Internet in a week by students in a mathematics class. Which box-and-whisker plot represents the data?

- [A]
- [B]
- [C]
- [D]

[1] A

[2] A

[3] C

[4] D

[5] C

[6] A

[3] $14\sqrt{2}$, and appropriate work is shown, such as using the Pythagorean theorem or drawing a correctly labeled diagram that shows the isosceles right triangle.

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

or [2] Appropriate work is shown, but the answer is expressed as a decimal or the radical is not simplified.

[1] Appropriate work is shown, but two or more computational errors are made.

or [1] Appropriate work is shown, but one computational error is made, and the answer is not expressed as a radical in simplest form.

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

or [1] 14, the side of the square is found correctly, but no further correct work is shown.

or [1] $14\sqrt{2}$, 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

[7] incorrect procedure.

[8] C

[2] 8 and the use of trigonometry, the Pythagorean theorem, or Pythagorean triple is shown.

[1] The Pythagorean theorem or trigonometry is used, but a computational mistake is made or substitution is incorrect, such as

$$6^2 = 10^2 + x^2.$$

[1] 8 and 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

[9] incorrect procedure.

[2] 16, and appropriate work is shown, such as the Pythagorean theorem, the Pythagorean triple, or trigonometry.

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

or [1] Appropriate work is shown, but one conceptual error is made, such as using an incorrect trigonometric function.

or [1] 16, 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

[10] incorrect procedure.

[2] 15, and appropriate work is shown, such as using the Pythagorean theorem, Pythagorean triples, or trigonometric functions.

[1] The data are substituted incorrectly, but an appropriate answer is found and is rounded correctly.

or [1] Appropriate work is shown, but one or more computational errors are made.

or [1] 15, 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

[11] incorrect procedure.

[12] C

[13] A

[2] 2.8, and appropriate work is shown, such as $3^2 = 1^2 + (BC)^2$.

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

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

or [1] The length of \overline{BD} is found to be 3, but no further correct work is shown.

or [1] 2.8, 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

[14] incorrect procedure.

[3] 3, and appropriate work is shown, such as using a 3:4:5 right triangle, correct proportions, or the Pythagorean theorem with a proportion.

[2] Appropriate work is shown, and the value of the side is determined to be 5, but $n = 3$ is not found.

[1] A correct proportion is set up, but no answer or an incorrect answer is found.

or [1] 3, 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

[15] incorrect procedure.

[4] 9.4, and appropriate work is shown, such as the use of the Pythagorean theorem.

[3] Appropriate work is shown, but one computational or rounding error is made.

[2] Appropriate work is shown, but more than one computational or rounding error is made.

or [2] Appropriate work is shown, but one conceptual error is made.

or [2] An incorrect diagonal of the base is found, but an appropriate solution is found.

or [2] Only the diagonal of the base is found correctly, but appropriate work is shown, such as $3^2 + 4^2 = d^2$ or use of 3–4–5 right triangles.

[1] Appropriate work is shown, but one conceptual error and one computational or rounding error are made.

or [1] The Pythagorean theorem is used to find the length of the straw, but the appropriate legs are not used.

or [1] 9.4, 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

[16] incorrect procedure.

[17] A

[2] An appropriate explanation is written, such as defining special isosceles right triangles, or appropriate work is shown, such as using legs of six and finding the hypotenuse.

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

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

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

[18] incorrect procedure.

[2] $\sqrt{171}$ or 13 or 13.1 or 13.08 or an equivalent answer, and appropriate work is shown, such as the use of the equation of a circle ($x^2 + y^2 = r^2$) or the Pythagorean theorem.

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

or [1] Incorrect analysis is shown, such as $x = 5$ and $y = 14$, but the work is concluded appropriately.

or [1] A correct answer is found, 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

[19] incorrect procedure.

[20] D

[21] B

[3] 10.6 and the Pythagorean theorem, $C^2 = 8^2 + 7^2$, or any other appropriate method is shown.

[2] Appropriate work is shown, but the answer is left as $\sqrt{113}$ or is rounded incorrectly.

or [2] Appropriate work is shown, but one computational error is made.

[1] Appropriate work is shown, but multiple errors are made.

or [1] The only correct work shown is a correctly drawn diagram with three distances labeled.

or [1] 10.6 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

[22] incorrect procedure.

[3] 6.7, and appropriate work is shown, such as using the distance formula.

[2] Appropriate work is shown, but one computational or rounding or graphing error is made or the answer is left in radical form.

[1] Appropriate work is shown, but more than one computational or rounding or graphing error is made.

or [1] Only an appropriate diagram or graph is shown.

or [1] The horizontal distance is determined to be 3, and the vertical distance is determined to be 6, but the shortest distance is not found.

or [1] 6.7, 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

[23] incorrect procedure.

[2] 5, and appropriate work is shown, such as the distance formula, the Pythagorean theorem, or a Pythagorean triple.

[1] Appropriate work is shown, but one computational or graphing 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] 5, 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

[24] incorrect procedure.

[3] Jerry, and appropriate work is shown, such as the following explanation: Jerry traveled 7 miles at a rate of 5 miles per hour and his time was $1\frac{2}{5}$ hours; Jean traveled 5 miles at a rate of 3 miles per hour for a time of $1\frac{2}{3}$ hours.

[2] The time for each jogger is calculated appropriately, but an error is made in determining one of the distances, but an appropriate answer is found.

or [2] The time for each jogger is calculated correctly, but the question of which person reached C first is not answered.

or [2] Both distances are calculated correctly, but an error is made in determining times, but an appropriate answer is found.

[1] Only the distances are calculated correctly. No answer to the question is found or an answer is found based on distance only.

or [1] The time for only one jogger is calculated correctly, and the question of which person reached C first is not answered.

or [1] The time for both joggers is calculated appropriately, but multiple computational errors are made.

or [1] Jerry and $1\frac{2}{5}$ hours and $1\frac{2}{3}$ hours, but no work is shown.

[0] Jerry, but no work is shown.

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

[25] obviously incorrect procedure.

[4] 10 and $y - 1 = -\frac{3}{4}(x - 2)$ or an equivalent

equation, and appropriate work is shown.

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

[2] Appropriate work is shown, but more than one computational error is made.

or [2] Appropriate work is shown, but one conceptual error is made in determining the distance or the equation of the line.

or [2] The length, the midpoint, and the slope of \overline{AB} are found correctly, but no equation or an incorrect equation is given for the perpendicular bisector.

or [2] Only a correct equation of the perpendicular bisector is found.

[1] The correct distance is found, but no attempt is made to find the equation of the perpendicular bisector.

or [1] The midpoint and slope of \overline{AB} are found correctly, but no further correct work is shown.

or [1] The slope of \overline{AB} and the slope of the perpendicular bisector are calculated correctly.

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

[26]

[2] (1,1), and appropriate work is shown, such as a correct graph of \overline{AB} and an appropriate explanation of how point A is found or the use of the midpoint formula.

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

or [1] Appropriate work is shown, but one conceptual error is made, such as finding the midpoint of the given coordinates.

or [1] The midpoint and points A and B are graphed correctly, but the coordinates of point A are not stated or are stated incorrectly.

or [1] (1,1), 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

[27] incorrect procedure.

[28] B

[29] D

[30] B

[31] C

[2] (-6,8) or -6,8 or $x = -6$ and $y = 8$ and an appropriate explanation is given, such as graphing the line or doubling the coordinates.

[1] One correct coordinate and one incorrect coordinate are found.

or [1] An appropriate method is shown, such as algebraic or graphing, but computational mistakes are made.

or [1] (-6,8) or -6,8 or $x = -6$ and $y = 8$ and no explanation is given.

or [1] Substitutions are correct for the midpoint formula, but computational mistakes are made.

or [1] The student properly locates point B on the graph but does not state its coordinates.

or [1] Point A and point M are reversed, resulting in B(3,-4), and an explanation is given.

[0] Only the midpoint of \overline{AM} $(-\frac{3}{2}, 2)$ is found.

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

[32] incorrect procedure.

[33] B

[34] A

[35] B

[36] A

[3] 109 meters and appropriate work is shown by using an appropriate trigonometric ratio,

such as $\tan 32^\circ = \frac{y}{175}$.

[2] 109 meters but one rounding error is made.

or [2] The student uses an appropriate trigonometric function with an inverted ratio,

such as $\tan 32^\circ = \frac{175}{y}$, but completes the

calculation appropriately, such as showing 280 meters.

[1] The student uses an incorrect trigonometric ratio but completes the calculation appropriately.

or [1] The student uses an inverted tangent ratio and makes one computational or rounding error.

or [1] The student uses the correct trigonometric ratio but solves it incorrectly or does not solve it at all.

or [1] 109 meters but no work or explanation is shown.

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

[37] incorrect procedure.

[4] 116 and an appropriate method is shown.

[3] An appropriate method is shown, but the answer is left in an inappropriate form, such as 116.2.

or [3] An appropriate method is shown, but 3 feet is not added, and the answer is left 113.

or [3] Tangent function is used, but computational mistakes are made, but 3 feet is added to the incorrect value and the answer is found correctly.

[2] An incorrect trigonometric function is used, 3 feet is added, and the answer is rounded correctly.

or [2] Tangent function is used, but computational mistakes are made, and 3 feet is not added to an incorrect answer.

[1] 116 and no work is shown.

or [1] An incorrect trigonometric function is used, and 3 feet is added to the incorrect answer, but the answer is rounded incorrectly.

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

[38] incorrect procedure.

[39] B

[4] 28.2, and an appropriate equation is shown, such as $\tan 62 = \frac{x}{15}$.

[3] Appropriate work is shown, but the answer is rounded incorrectly.

or [3] The student uses the correct tangent function and rounds the answer, but makes one computational error.

[2] The student uses the correct tangent function, but makes several errors.

or [2] An incorrect trigonometric function is used, but appropriate work is shown.

[1] The tangent function is indicated, but the ratio is set up incorrectly.

or [1] 28.2, 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

[40] incorrect procedure.

[2] 117.6, and appropriate work is shown,

such as $\tan 78^\circ = \frac{x}{25}$.

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

or [1] Appropriate work is shown, but one conceptual error is made, such as using an incorrect trigonometric function, but an appropriate solution is found.

or [1] A correct trigonometric equation is written, but no further correct work is shown.

or [1] 117.6, 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

[41] incorrect procedure.

[2] 10, and appropriate work is shown.

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

or [1] Appropriate work is shown, but one conceptual error is made, such as using an incorrect trigonometric function.

or [1] Appropriate work is shown, but the length of the ladder is found.

or [1] 10, 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

[42] incorrect procedure.

[3] 45, and appropriate work is shown, such as $\tan 66^\circ = \frac{x}{20}$.

[2] A correct trigonometric ratio is used, and values are substituted correctly, but one computational or rounding error is made, or the calculator is left in radian mode.

[1] Appropriate work is shown, but two or more computational or rounding errors are made.

or [1] Appropriate work is shown, but one conceptual error is made, such as using an incorrect trigonometric ratio.

or [1] An incorrect diagram is drawn, but an appropriate solution is found.

or [1] A correctly labeled diagram is drawn, but no further correct work is shown.

or [1] A correct trigonometric ratio is written, but no further correct work is shown.

or [1] 45, 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

[43] incorrect procedure.

[4] 2,058, and appropriate work is shown, such as the accompanying diagram and equation.



[3] Appropriate work is shown, including a correct diagram and the use of the tangent function, but one computational error is made. or [3] Appropriate work is shown, including a correct diagram and the use of the tangent function, but the answer is not rounded or is rounded incorrectly.

[2] A correct diagram is drawn, but an incorrect trigonometric function is selected, but it is solved and rounded appropriately.

or [2] A correct diagram is drawn and the tangent function is selected, but no further work is shown.

or [2] An incorrect diagram is drawn, but the appropriate trigonometric function, based on the drawing, is selected, solved, and rounded appropriately.

[1] An incorrect diagram is drawn and an incorrect trigonometric function is selected, but it is solved and rounded appropriately.

or [1] Only a correct diagram is drawn.

or [1] 2,058, 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

[44] incorrect procedure.

[4] 114" (9 feet 6 inches) and 37" (3 feet 1 inch) and appropriate work is shown, such as

$$\sin 72^\circ = \frac{x}{10} \text{ and } \cos 72^\circ = \frac{y}{10} \text{ or use of the}$$

Pythagorean theorem.

[3] An incorrect diagram is drawn, but appropriate work and an appropriate solution for that diagram are shown.

or [3] Appropriate work is shown, but the answers are rounded to the nearest foot and then converted to inches, arriving at 120" and 36".

or [3] The setup is correct, but the answers are not converted to the nearest inch.

[2] One correct dimension is shown, such as 114" (9 feet 6 inches) or 37" (3 feet 1 inch).

or [2] Only one error involving interchanging sine and cosine is made.

or [2] An incorrect diagram is drawn, and the solution is appropriate for the diagram but is not rounded to the nearest inch.

[1] The student switches sine and cosine and does not round to the nearest inch.

or [1] The student uses the correct trigonometric function to compute one side correctly but does not convert it to the nearest inch.

or [1] 114" (9 feet 6 inches) and 37" (3 feet 1 inch) 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

[45] incorrect procedure.

[4] $x = 19.62990915$ and $y = 9.814954576$ or equivalent answers, and appropriate work is

shown, such as $\sin 60^\circ = \frac{17}{x}$ and

$$\tan 60^\circ = \frac{17}{y} \text{ or the Pythagorean theorem.}$$

[3] Appropriate work is shown, but one computational or rounding error is made.

or [3] Appropriate work is shown, and the correct answers are found, but not identified.

[2] Appropriate work is shown, but one conceptual error is made, such as

$$\sin 60^\circ = \frac{x}{17}.$$

or [2] Appropriate work is shown, but more than one computational or rounding error is made.

[1] Appropriate work is shown, but two conceptual errors are made, such as

$$\sin 60^\circ = \frac{x}{17} \text{ and } \tan 60^\circ = \frac{y}{17}.$$

or [1] $x = 19.62990915$ and $y = 9.814954576$ or equivalent answers, 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

[46] incorrect procedure.

- [4] Length of ladder = 11 and distance from the base of the ladder to the wall = 4, and appropriate work is shown, such as using sine and then tangent or the Pythagorean theorem.
- [3] Appropriate work is shown, but one computational or rounding error is made.
- or [3] Appropriate work is shown, but the correct answers are not labeled or are labeled incorrectly.
- [2] Appropriate work is shown, but two or more computational or rounding errors are made.
- or [2] Appropriate work is shown, but one conceptual error is made, such as using one incorrect trigonometric ratio.
- or [2] Appropriate work is shown, but only the length of the ladder or the distance from the base of the ladder to the wall is found.
- or [2] Two correct trigonometric equations are written, but no further correct work is shown.
- [1] Appropriate work is shown, but one conceptual error and one computational or rounding error are made.
- or [1] Only one correct trigonometric equation is written, and no further correct work is shown.
- or [1] Length of ladder = 11 and distance from the base of the ladder to the wall = 4, but no work is shown.
- [0] Length of ladder = 11 or distance from the base of the ladder to the wall = 4, but no work is shown.
- or [0] 11 and 4, but no work is shown, and the solutions are not labeled.
- or [0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.
-
- [47]

- [3] 12 and the equation $\tan x = \frac{420}{2000} = .21$ is shown.
- or [3] 12 and the Pythagorean theorem and an appropriate trigonometric function are correctly used.
- [2] Tan function is correctly used, but the answer is not rounded, such as 11.859.
- or [2] The setup is correct, but one computational mistake is made, and an appropriate angle is found.
- or [2] The answer is incorrectly expressed, such as $\tan x = 12$.
- [1] The tan function is set up correctly, but the angle is not computed.
- or [1] 12 and no work is shown.
- or [1] 12 and $\sin x = \frac{420}{2000}$ is used.
- or [1] 78 and $\cos x = \frac{420}{2000}$ is used.
- [0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.
-
- [48]
- [2] 25.4, and appropriate work is shown, such as solving the equation $\sin x = \frac{3}{7}$.
- [1] Appropriate work is shown, but one computational or rounding error is made.
- or [1] Appropriate work is shown, but one conceptual error is made, such as using an incorrect trigonometric function.
- or [1] A correct trigonometric equation is written, but no further correct work is shown.
- or [1] 25.4, 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.
-
- [49]

a [2] 59, and the equation $\tan x = \frac{280}{170}$ is shown, or the Pythagorean theorem is used first to find the hypotenuse, and either sine or cosine is used correctly to find x .

[1] Appropriate work is shown, but one computational or rounding error is made.
or [1] 59, but no work is shown.

b [2] 122, if the Pythagorean theorem is used or if a trigonometric function of the angle is used before it was rounded to 59° .

or [2] 120, if $\cos 59 = \frac{170}{hyp}$ is used.

or [2] 123, if $\sin 59 = \frac{170}{hyp}$ is used.

[1] Appropriate work is shown, but one computational or rounding error is made.
or [1] 122 or 120 or 123, but no work is shown.

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.

[50]

a [2] 56, and appropriate work is shown, such as $\tan A = \frac{6}{4}$ or finding the hypotenuse and

then using sine or cosine or using proportional sides of similar triangles.

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

or [1] The length of the hypotenuse is found correctly, but no further correct work is shown.

or [1] 56, but no work is shown.

b [2] 12, and appropriate work is shown, such as $\sin 56 = \frac{h}{15}$.

or [2] An appropriate answer is found based on an incorrect angle found in part a.

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

or [1] 12, but no work is shown.

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.

[51]

[4] 32, and appropriate work is shown, such as $12^2 + 16^2 = r^2$, $50 - r = s$, and $\sin x = \frac{16}{30}$.

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

or [3] Appropriate work is shown to find $r = 20$ and $s = 30$ and the trigonometric equation $\sin x = \frac{16}{30}$ is written, but it is not solved or is

solved incorrectly.

[2] Appropriate work is shown, but two or more computational errors are made.

or [2] Appropriate work is shown, but one conceptual error is made, such as using an incorrect trigonometric function to find the angle.

or [2] The lengths of r and s are found correctly, but no further correct work is shown.

or [2] Incorrect lengths are found for r and s , but the sine function is used correctly to find an appropriate angle.

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

or [1] The length of r is found correctly, but no further correct work is shown.

or [1] 32, 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

[52] incorrect procedure.

[4] 153, and appropriate work is shown, such as $\sin 50^\circ = \frac{x}{200}$.

[3] An appropriate analysis is shown, but one computational or rounding error is made.

[2] An incorrect trigonometric function is

used, such as $\cos 50^\circ = \frac{x}{200}$, but it is carried

to an appropriate final answer and is rounded correctly.

[1] An incorrect trigonometric function is used and solved appropriately, but it is rounded incorrectly.

or [1] Only an appropriate diagram is shown.

or [1] 153, but no work is shown.

[0] Use of the Pythagorean theorem, such as $200^2 = 50^2 + x^2$, is shown.

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

[53] obviously incorrect procedure.

[4] 79.4, and appropriate work is shown, such as $\tan 52 = \frac{x}{62}$.

[3] Appropriate work is shown, but one computational or rounding error is made.
or [3] An incorrectly labeled diagram is drawn, but the appropriate trigonometric function is used, and an appropriate answer is found.

[2] Appropriate work is shown, but two or more computational or rounding errors are made.

or [2] Appropriate work is shown, but one conceptual error is made, such as using an incorrect trigonometric function or ratio.

[1] Appropriate work is shown, but one conceptual error and one computational or rounding error are made.

or [1] A correctly labeled diagram is drawn, but no further correct work is shown.

or [1] A correct equation is written, but no further correct work is shown.

or [1] An incorrectly labeled diagram is drawn, but an appropriate equation is written, but no further correct work is shown.

or [1] 79.4, 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

[54] incorrect procedure.

[4] 41.4, and appropriate work is shown, such as $200 \tan 28^\circ - 200 \tan 18^\circ$.

[3] Appropriate work is shown, but one computational or rounding error is made.
or [3] Appropriate work is shown to find the correct height of the cliff and the correct combined height of the lighthouse and the cliff, but they are not subtracted.

[2] Appropriate work is shown, but two or more computational or rounding errors are made.

[2] Appropriate work is shown, but one conceptual error is made, such as using an incorrect trigonometric function.

or [2] Appropriate work is shown to find the correct height of the cliff or the correct combined height of the lighthouse and the cliff, but no further correct work is shown.

[1] Appropriate work is shown, but one conceptual error and one computational or rounding error are made.

or [1] A correct equation is written to find the height of the lighthouse, but no further correct work is shown.

or [1] 41.4, but no work is shown.

[0] The correct height of the cliff or the correct combined height of the lighthouse and cliff is found, but no work is shown.

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

[55] obviously incorrect procedure.

[56] C

[57] C

[58] C

- [2] $30\sqrt{2}$, 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] Appropriate work is shown, but the answer is not in simplest radical form.
 or [1] $30\sqrt{2}$, 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.
- [59] _____
- [2] $5rs^2\sqrt{2}$, and appropriate work is shown.
 [1] A partially correct answer is found, such as $5r\sqrt{2s^4}$ or $5s^2\sqrt{2r^2}$, and appropriate work is shown.
 or [1] $7.07rs^2$, but appropriate work is shown.
 or [1] $5rs^2\sqrt{2}$, 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.
- [60] _____
- [61] B _____
- [62] A _____
- [63] D _____
- [64] B _____
- [65] B _____
- [66] D _____
- [67] C _____
- [68] A _____
- [69] D _____
- [70] B _____
- [71] A _____
- [72] A _____
- [73] C _____

- [74] D _____
- [75] A _____
- [2] $7 + 7\sqrt{5}$ and $7(1 + \sqrt{5})$, appropriate work is shown.
 [1] Appropriate work is shown, but one computational error is made, or the answer is not expressed in simplest radical form.
 or [1] Appropriate work is shown, but one conceptual error is made.
 or [1] $7 + 7\sqrt{5}$ or $7(1 + \sqrt{5})$, 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.
- [76] _____
- [77] C _____
- [78] B _____
- [79] A _____
- [80] C _____
- [81] B _____
- [82] A _____
- [4] -2 and -1 , and appropriate work is shown.
 [3] Appropriate work is shown, but one computational error is made.
 or [3] Appropriate work is shown, but only one value of q is found.
 [2] Appropriate work is shown, but two or more computational errors are made.
 or [2] Appropriate work is shown, but one conceptual error is made, such as squaring only the left side of the equation.
 [1] Appropriate work is shown, but one conceptual error and one computational error are made.
 or [1] -2 and -1 , but no work is shown.
 [0] -2 or -1 , but no work is shown.
 or [0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.
- [83] _____

- [4] 4, and appropriate work is shown.
[3] Appropriate work is shown, but one computational error is made.
or [3] Appropriate work is shown, but $x = -1$ is not rejected.
[2] Appropriate work is shown, but two or more computational errors are made.
or [2] Appropriate work is shown, but one conceptual error is made.
or [2] The correct quadratic equation is written in standard form, but no further correct work is shown.
or [2] A quadratic equation of equal difficulty is solved appropriately.
[1] Both sides of the equation are squared correctly, but no further correct work is shown.
or [1] 4, 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.
-

- [4] 5, and appropriate algebraic work is shown.
[3] Appropriate work is shown, but one computational error is made.
or [3] 5 and 0, and appropriate work is shown, but the zero is not rejected.
[2] Appropriate work is shown, but two or more computational errors are made.
or [2] Appropriate work is shown, but one conceptual error is made, such as squaring $x - 1$ incorrectly.
or [2] 5, but a method other than an algebraic solution is used, such as graphing or trial and error with at least three trials and appropriate checks.
or [2] A correct quadratic equation is written in standard form, such as $0 = x^2 - 5x$, but no further correct work is shown.
or [2] An incorrect quadratic equation of equal difficulty is solved appropriately.
[1] Appropriate work is shown, but one conceptual error and one computational error are made.
or [1] An incorrect equation of a lesser degree of difficulty is solved appropriately.
or [1] 5, but no work is shown.
[0] 5 and 0, and no work is shown.
or [0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.
-
- [85] [2] 65,797.36, and appropriate work is shown.
[1] Appropriate work is shown, but one computational or rounding error is made.
or [1] An incorrect derivation of the equation is solved appropriately.
or [1] 65,797.36, 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.
-
- [86]

[4] 15.13, and appropriate work is shown, such as solving the equation

$$236.64 = \pi(4.75)\sqrt{(4.75)^2 + h^2}.$$

[3] Appropriate work is shown, but one computational or rounding error is made.

[2] Appropriate work is shown, but two or more computational or rounding errors are made.

or [2] Appropriate work is shown, but one conceptual error is made.

[1] Appropriate work is shown, but one conceptual error and one computational or rounding error are made.

or [1] Correct substitution of values is made into the equation, but no further correct work is shown.

or [1] 15.13, 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

[87] incorrect procedure.

[2] -17, and appropriate work is shown.

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

or [1] -17, 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

[88] incorrect procedure.

[4] A correct table of values is provided, a correct graph is drawn, and 670; 12, and appropriate work is shown, such as extending the graph or solving algebraically.

[3] Appropriate work is shown, but one computational or graphing error is made.

or [3] A correct table of values is provided, a correct graph is drawn, and 670, but no further correct work is shown.

[2] Appropriate work is shown, but two or more computational or graphing errors are made.

or [2] Appropriate work is shown, but one conceptual error is made.

or [2] 670 and 12, but an algebraic solution is provided.

or [2] 670 and 12, but either the graph is not drawn or the table of values is not provided.

[1] Appropriate work is shown, but one conceptual error and one computational or graphing error are made.

or [1] A correct graph is drawn, but no further correct work is shown.

or [1] A correct table of values is provided, but no further correct work is shown.

or [1] 670 and 12, but no work is shown and no graph is drawn.

[0] 670 or 12, but no work is shown and no graph is drawn.

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

[89] obviously incorrect procedure.

[90] C

[91] A

[92] D

[93] C

[94] C