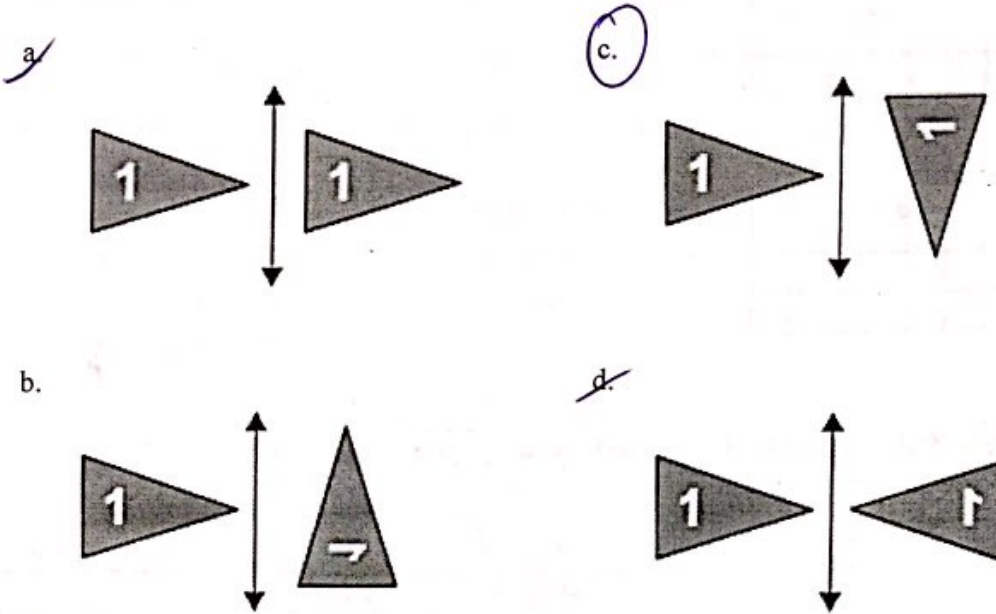


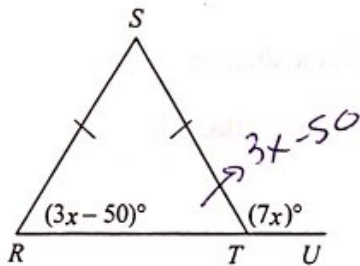
Multiple Choice

Identify the choice that best completes the statement or answers the question.

- C 1. Which figure shows the flag on the left after it has been flipped across the line and then rotated 90° counterclockwise?



- A 2. Find the value of x . The diagram is not to scale.



$$3x - 50 + 7x = 180$$

$$10x = 230$$

$$x = 23$$

- a. $x = 23$ b. $x = 40$ c. $x = 13$ d. none of these

- B 3. What is the vertex form of $y = x^2 + 16x + 14$?

- a. $y = (x + 8)^2 + 14$ ~~c.~~ $y = (x - 8)^2 + 14$
b. $y = (x + 8)^2 - 50$ ~~d.~~ $y = (x - 8)^2 - 50$

$$y = a(x - h)^2 + k$$

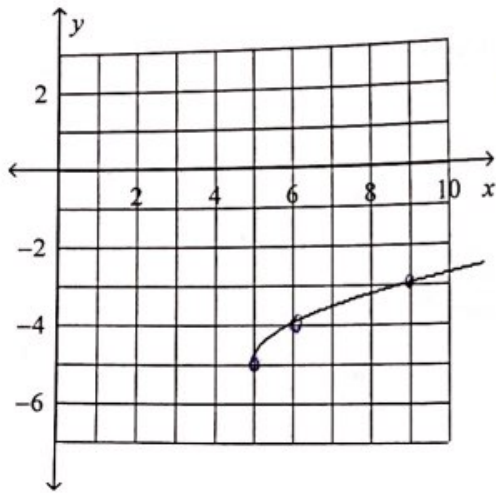
$$-14 = x^2 + 16x + 64$$

$$y = (x + 8)^2 - 50$$

$$\frac{-b}{2a} = \frac{-16}{2} = -8$$

B

4. Which function matches the graph?



RS
DS

~~a.~~ $y = \sqrt{x+5} + 5$

~~c.~~ $y = \sqrt{x+5} - 5$

b. $y = \sqrt{x-5} - 5$

d. $y = \sqrt{x-5} + 5$

D

5. Three transformations will be performed on triangle ABC. Which set of transformations will always produce a congruent triangle?

a. dilation, rotation, translation

c. rotation, reflection, dilation

b. reflection, dilation, translation

d. rotation, translation, reflection

B

6. When $f(x) = x^2 - 4x + 7$ is written in the form $f(x) = (x - 2)^2 + 3$, which properties of the graph are revealed?

a. Axis of symmetry, maximum

c. zeros, maximum

b. Axis of symmetry, minimum

d. zeros, minimum

↕
↕
Min

7. A biologist took a count of the number of migrating waterfowl at a particular lake, and recounted the lake's population of waterfowl on each of the next six weeks.

| | | | | | | | |
|------------|-----|-----|-----|-----|-----|-------|-------|
| Week | 0 | 1 | 2 | 3 | 4 | 5 | 6 |
| Population | 585 | 582 | 629 | 726 | 873 | 1,070 | 1,317 |

- a. Find a quadratic function that models the data as a function of x , the number of weeks.
 b. Use the model to estimate the number of waterfowl at the lake on week 8.

- a. $P(x) = 25x^2 - 28x + 585$; 1,614 waterfowl
 b. $P(x) = 30x^2 + 28x + 535$; 2,679 waterfowl
 c. $P(x) = 25x^2 - 28x + 585$; 1,961 waterfowl
 d. $P(x) = 30x^2 + 28x + 535$; 2,201 waterfowl

8. The table shows the results of a survey of college students. Find the probability that a student's first class of the day is a humanities class, given the student is male. Round to the nearest thousandth.

First Class of the Day for College Students

| | Male | Female |
|------------|------|--------|
| Humanities | 70 | 80 |
| Science | 50 | 80 |
| Other | 60 | 70 |

$$\frac{70}{180} = .389$$

- a. 0.171 b. 0.467 c. 0.269 d. 0.389

9. Simplify: $(16x^{-6}y^2)^{-\frac{1}{2}}$

a. $\frac{x^3}{4y}$

~~$\frac{x^3}{4y}$~~

$\frac{x^3}{4y}$

c. $\frac{4x^3}{y}$

b. $\frac{x^3}{4y}$

d. $\frac{4x^3}{y}$

10. What number must be added to $x^2 - 3x$ to complete the square?

a. 3

$(\frac{3}{2})^2 = 9/4$

c. $\frac{9}{2}$

b. $\frac{3}{2}$

d. $\frac{9}{4}$

D 11. What are the roots of the equation $3x^2 - x + 2 = 0$?

a. $1, \frac{-2}{3}$

c. $\frac{1 \pm 5i}{6}$

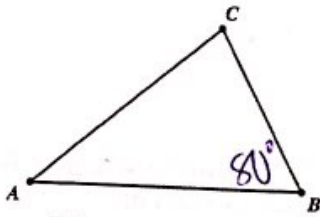
b. 3, -2

d. $\frac{1 \pm i\sqrt{23}}{6}$

$$x = \frac{1 \pm \sqrt{1^2 - 4(3)(2)}}{2(3)}$$

$$= \frac{1 \pm i\sqrt{23}}{6}$$

B 12. In the accompanying diagram of $\triangle ABC$, $m\angle B = 80^\circ$. What is the value of $\frac{1}{2}(m\angle A + m\angle C)$?



a. 40°

b. 50°

c. 100°

d. 140°

$$A + C = 180^\circ$$

C 13. An urn contains five red marbles, four green marbles, and three blue marbles. If one marble is drawn at random, what is the probability that it is either a green marble or a blue marble?

a. $\frac{5}{12}$

b. $\frac{3}{12}$

$$\frac{4}{12} + \frac{3}{12} = \frac{7}{12}$$

c. $\frac{7}{12}$

d. $\frac{4}{12}$

A 14. In the figure, $m\angle CNA = m\angle WAN$ and $CN = WA$. What congruence statement proves $\triangle CAN \cong \triangle WNA$?



a. SAS

b. SSS

c. ASA

d. SSA

$$\sqrt{9(x-4)} - 4$$

$$3\sqrt{x-4} - 4$$

D 15. Rewrite $y = \sqrt{9x - 36} - 4$ to make it easy to graph using a translation. Describe the graph.

a. $y = 3\sqrt{x-4} - 4$.

It is the graph of $y = 3\sqrt{x}$ translated 4 units left and 4 units down.

b. $y = \sqrt{x-4} - 4$. It is the graph of $y = \sqrt{x}$ translated 4 units left and 4 units down.

c. $y = \sqrt{x+4} - 4$.

It is the graph of $y = \sqrt{x}$ translated 4 units right and 4 units down.

(d) $y = 3\sqrt{x-4} - 4$.

It is the graph of $y = 3\sqrt{x}$ translated 4 units right and 4 units down.

B 16. Given the quadratic function, $f(x) = 2x^2 + 3x - 2$, what are the zeros?

a. $-\frac{1}{2}, 2$

c. $\frac{1}{2}, 2$

(b) $\frac{1}{2}, -2$

d. $-\frac{1}{2}, -2$

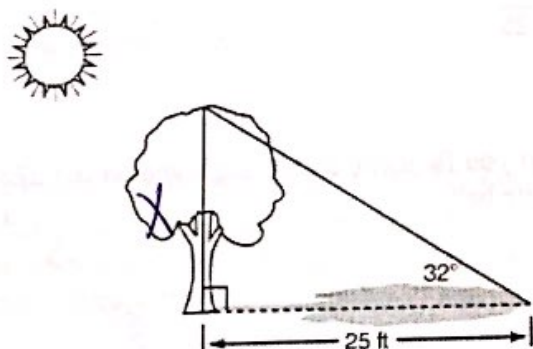
$$\frac{-4}{3} - 1$$

$$(x + \frac{4}{2})(x - \frac{1}{2})$$

$$(x + 2)(2x - 1)$$

$$x = -2, \frac{1}{2}$$

B 17. A tree casts a 25-foot shadow on a sunny day, as shown in the diagram below.



$$\tan 32 = \frac{x}{25}$$

$$25 \tan 32 = x$$

$$15.62 = x$$

If the angle of elevation from the tip of the shadow to the top of the tree is 32° , what is the height of the tree to the nearest tenth of a foot?

a. 13.2 feet

c. 21.2 feet

(b) 15.6 feet

d. 40.0 feet

B 18. Suppose that y varies inversely with x , and $x = 7$ when $y = 11$. Write the function that models the inverse variation.

a. $y = 1.57x$

c. $y = \frac{4}{x}$

(b) $y = \frac{77}{x}$

d. $y = \frac{18}{x}$

$$y = \frac{k}{x}$$

$$11 = \frac{k}{7}$$

$$77 = k$$

C

19. When Carmen and Eric tried to solve the following system of equations, Carmen said there were two real solutions and Eric said there was one real solution. Who is correct and why?

$$y = x^2 + 7x + 10$$

$$y = 5x + 9$$

$$5x + 9 = x^2 + 7x + 10$$

$$0 = x^2 + 2x + 1$$

$$x = \frac{-2 \pm \sqrt{4 - 4(1)(1)}}{2}$$

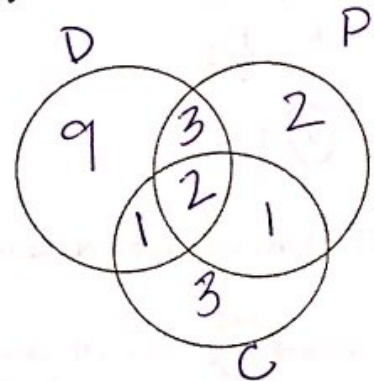
- a. Carmen, two real solutions at (-1, 4) and (1, 14)
- b. Eric, one real solution at (-1, 14)
- c. Eric, one real solution at (-1, 4)
- d. Neither, no real solutions

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

D

20. Twenty-five people watched a movie showing at the Empire Theaters. Of them, fifteen ordered a drink, eight ordered popcorn, and seven ordered candy. Two people ordered all three items, one ordered only a drink and candy, three ordered a drink and popcorn but not candy, and one ordered only popcorn and candy. Find the probability that a moviegoer chose *not* to eat popcorn or candy and only ordered a drink.

Use the Venn diagram to help organize your information.



a. $\frac{2}{5}$

c. $\frac{6}{25}$

b. $\frac{3}{5}$

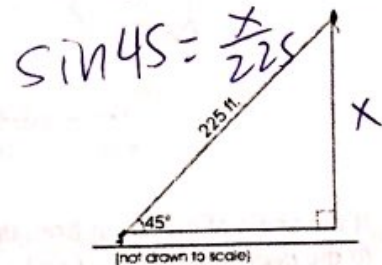
d. $\frac{9}{25}$

C

21. It is believed that the best angle to fly a kite is 45° . If you fly a kite at this angle and let out 225 feet of string, approximately how high above the ground will the kite be?

- a. 250 feet
- b. 200 feet

- c. 150 feet
- d. 100 feet



D

22. The accompanying graph shows the relationship between a person's weight and the distance that the person must sit from the center of a seesaw to make it balanced.

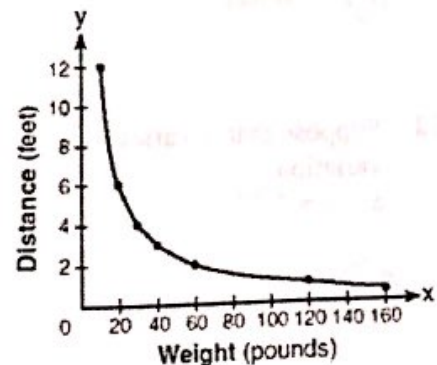
Which equation best represents this graph?

a. $y = 12x^2$

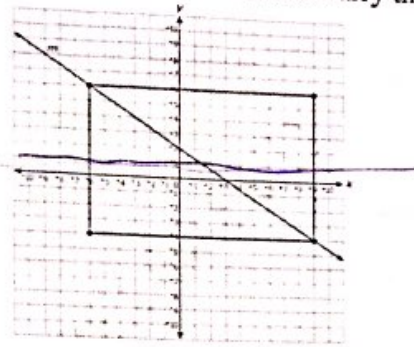
c. $y = \log x$

b. $y = -120x$

d. $y = \frac{120}{x}$



- B 23. Which transformation will carry the rectangle shown below onto itself?



- a. A reflection over line m
- b. A reflection over the line $y = 1$
- c. A rotation 90° counterclockwise about the origin
- d. A rotation 270° counterclockwise about the origin

- D 24. Which expression below is equivalent to: $(-7x - 5x^4 + 5) - (-7x^4 - 5 - 9x)$

- a. $2x^4 + 2x + 8$
- b. $-14x^4 + 10x + 10$
- c. $-14x^4 - 10x + 10$
- d. $2x^4 + 2x + 10$
- Handwritten work:* $+7x^4 + 5 + 9x$
 $2x^4 + 2x + 10$

- B 25. The height of a swimmer's dive off a 10-foot platform into a diving pool is modeled by the equation $y = 2x^2 - 12x + 10$, where x represents the number of seconds since the swimmer left the diving board and y represents the number of feet above or below the water's surface. What is the farthest depth below the water's surface that the swimmer will reach?

- a. 6 feet
- b. 8 feet
- c. 10 feet
- d. 12 feet

- A 26. Which expression is equivalent to $(2x + 3)^2 - 5$?

- a. $4x^2 + 12x + 4$
- b. $2x^2 + 12x + 9$
- c. $4x^2 + 6x + 4$
- d. $4x^2 + 12x - 5$
- Handwritten work:*
 $= (2x+3)(2x+3) - 5$
 $= 4x^2 + 12x + 9 - 5$
 $= 4x^2 + 12x + 4$

$$3x^2 - 7x + 3 = 0$$

C 27. Solve the quadratic equation for x: $3x^2 + 3 = 7x$

a. $x = \frac{7 \pm \sqrt{85}}{6}$

c. $x = \frac{7 \pm \sqrt{13}}{6}$

$$x = \frac{7 \pm \sqrt{49 - 4(3)(3)}}{6}$$

b. $x = \frac{-7 \pm \sqrt{85}}{6}$

d. $x = \frac{-7 \pm \sqrt{13}}{6}$

$$x = \frac{7 \pm \sqrt{13}}{6}$$

A 28. A drama club is planning a bus trip to New York City to see a Broadway play. The cost per person for the bus rental varies inversely as the number of people going on the trip. It will cost \$30 per person if 44 people go on the trip. How much will it cost per person if 60 people go on the trip? Round your answer to the nearest cent, if necessary.

a. \$22.00

b. \$40.91

c. \$1,320.00

d. \$21.29

$$30 = \frac{k}{44}$$

$$1320 = k$$

$$y = \frac{1320}{60}$$

$$y = 22$$

D 29. Find all real solutions of $\sqrt{2x+1} + x = 7$

a. 4, 12

b. 12

c. 8, -6

$$\sqrt{2x+1} = (7-x)^2$$

$$2x+1 = 49 - 14x + x^2$$

$$0 = x^2 - 16x + 48$$

e. No real solution.

$$\begin{array}{r} -12 \ 48 \\ \times \quad 4 \\ \hline 48 \\ -120 \\ \hline 48 \\ -48 \\ \hline 0 \end{array}$$

12, 4

A 30. Which of the following transformations always preserves the dimensions of a figure:

- I. translation
- II. rotation
- III. reflection
- ~~IV. dilation~~

a. I, II, and III

c. I, III, and IV

b. I, II, and IV

d. II, III, and IV

D 31. You are asked to explain what $\sqrt[5]{72}$ means. Which of the following explanations is true?

a. $\sqrt[5]{72}$ means to find $\frac{1}{5}$ of 72

c. $\sqrt[5]{72}$ means to multiply $(72)(72)(72)(72)(72)$

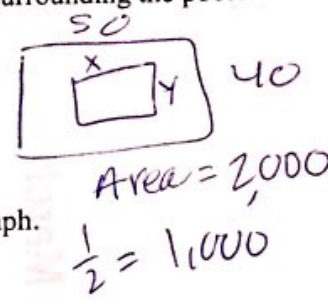
b. $\sqrt[5]{72}$ means to divide 72 by 5

d. $\sqrt[5]{72}$ means the number that multiplies itself five times to equal 72

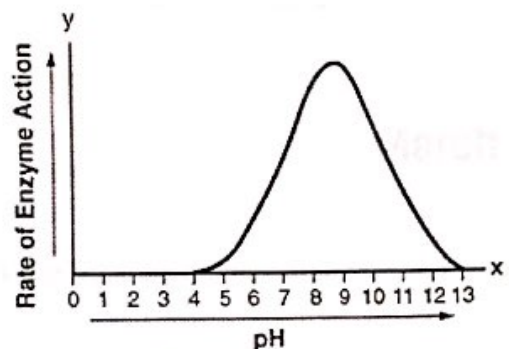
OMIT

32. Charlene wants to center a pool in her back yard. The yard currently measures 50 m by 40 m. She wants to use $\frac{1}{2}$ of the yard. Which equation best represents how to find the width of the yard surrounding the pool?

- a. $4x^2 - 180x + 1000 = 0$
- b. $2x^2 - 90x + 1000 = 0$
- c. $4x^2 - 180x + 2000 = 0$
- d. $4x^2 + 180x + 1000 = 0$



33. The effect of pH on the action of a certain enzyme is shown on the accompanying graph.



What is the domain of this function?

- a. $4 \leq x \leq 13$
- b. $4 \leq y \leq 13$
- c. $x \geq 0$
- d. $y \geq 0$

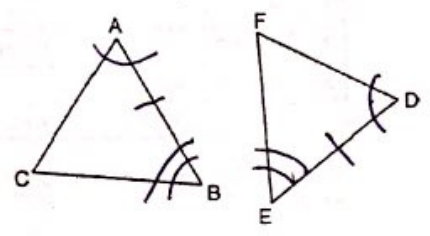
34. The graph of $y = ax^2$ is shifted up 3 units and right 5 units. Which equation represents the resulting graph?

- a. $y = a(x-5)^2 + 3$
- b. $y = a(x+5)^2 + 3$
- c. $y = a(x-3)^2 + 5$
- d. $y = a(x+3)^2 + 5$

35. In the diagram of $\triangle ABC$ and $\triangle DEF$ below, $\overline{AB} \cong \overline{DE}$, $\angle A \cong \angle D$, and $\angle B \cong \angle E$.

Which method can be used to prove $\triangle ABC \cong \triangle DEF$?

- a. SSS
- b. SAS
- c. ASA
- d. AAS



B 36. Ruby is making a calendar.

Which shows a translation of the word "March" over the line?



slide

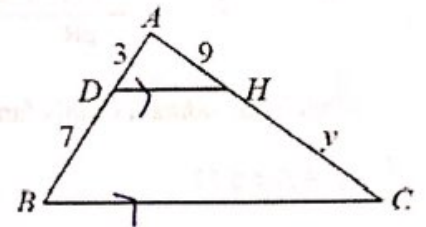


C 37. In the diagram to the right, $\overline{BC} \parallel \overline{DH}$.

What is the value of y ?

- a. 13
- b. 19

- c. 21
- d. 30

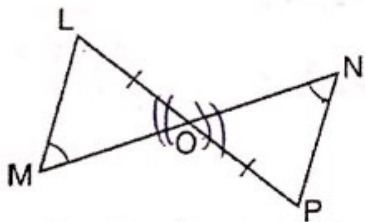


$\frac{3}{7} = \frac{a}{y}$ $3y = 63$
 $y = 21$

C 38.

Given: $\angle M \cong \angle N$, $\overline{LO} \cong \overline{PO}$

Prove: $\triangle MOL \cong \triangle NOP$



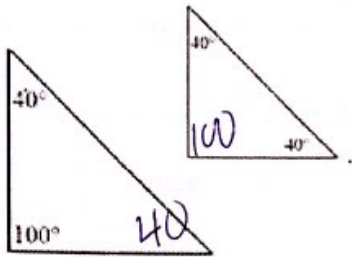
| Statements | Reasons |
|--|----------|
| 1) $\angle M \cong \angle N$ | 1) Given |
| 2) $\overline{LO} \cong \overline{PO}$ | 2) Given |
| 3) $\angle MOL \cong \angle NOP$ | 3) |
| 4) $\triangle MOL \cong \triangle NOP$ | 4) AAS |

Which of these reasons would be appropriate for statement 3?

- a. Reflexive property
- b. Definition of Midpoint

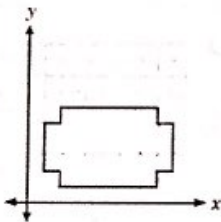
- c. Vertical angles are congruent
- d. Corresponding parts of congruent triangles are congruent.

39. Determine if the following triangles are similar. If so, by what criterion?



- a. AA~
- b. SSS~
- c. SAS~
- d. Not similar

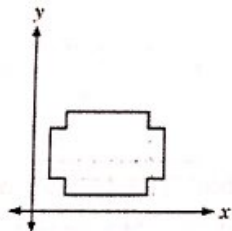
40. A company logo contains the shape represented by the figure below.



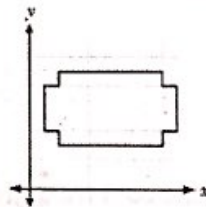
~~aaaaaa~~

Which shape is congruent to the figure above?

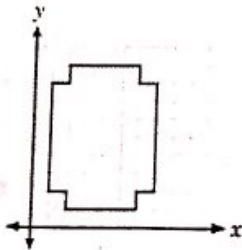
a.



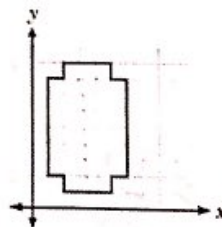
~~c.~~



~~b.~~



d.



D 41. Matty's piano book includes 15 songs in the key of C, 10 in the key of G, and 5 in the key of F. The songs from all three keys appear in random order. Over the past month, Matty has randomly opened his piano book to a song in the key of C 80 times, the key of G 30 times, and the key of F 10 times. What are the theoretical and experimental probabilities that the next song Matty randomly picks will be in the key of G?

- a. Theoretical probability = $\frac{1}{4}$; and experimental probability = $\frac{1}{3}$
- b. Theoretical probability = $\frac{1}{2}$; and experimental probability = $\frac{1}{3}$
- c. Theoretical probability = $\frac{1}{3}$; and experimental probability = $\frac{1}{2}$
- d. Theoretical probability = $\frac{1}{3}$; and experimental probability = $\frac{1}{4}$

$\frac{30}{120} = \frac{1}{4}$
exp

B 42. Describe how the graph of $g(x) = \frac{3}{x-4} + 5$ is a translation of $g(x) = \frac{3}{x}$.

- a. It is a translation of $g(x) = \frac{3}{x}$, 4 units right and 5 units down.
- b. It is a translation of $g(x) = \frac{3}{x}$, 4 units right and 5 units up.
- c. It is a translation of $g(x) = \frac{3}{x}$, 4 units left and 5 units up.
- d. It is a translation of $g(x) = \frac{3}{x}$, 4 units left and 5 units down.

R4,
↑5

B 43. Gary has 10 coins in his pocket.

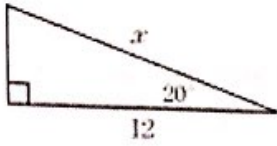
- 2 quarters
- 5 dimes
- 3 nickels

Without looking, Gary pulls one coin from his pocket and puts it on the table. Then, he pulls one more coin from his pocket. What is the probability that the first coin is a dime and the second coin is a nickel?

- a. $\frac{1}{8}$
- b. $\frac{1}{6}$
- c. $\frac{1}{5}$
- d. $\frac{1}{2}$

$\frac{5}{10} \cdot \frac{3}{9} = \frac{15}{90} = \frac{3}{18} = \frac{1}{6}$

- V/A
C 44. Which equation can be used to find the value of x in the right triangle shown?



Handwritten notes:
 $\cos 20^\circ = \frac{x}{12}$
 $\cos 70^\circ = \frac{12}{x}$

- ~~a.~~ $\cos 20^\circ = \frac{x}{12}$ c. $\cos 20^\circ = \frac{12}{x}$
~~b.~~ $\sin 20^\circ = \frac{12}{x}$ d. $\cos 70^\circ = \frac{x}{12}$

- B 45. The table shows the results of a survey of students in two math classes. Find $P(\text{more than 1 hour of TV} \mid \text{6th period class})$. Round to the nearest thousandth.

Did You Watch More Than One Hour of TV Last Night?

| | Yes | No |
|------------------|-----|----|
| 3rd period class | 11 | 6 |
| 6th period class | 13 | 10 |

Handwritten calculation:
 $\frac{13}{23} = 0.565$

- a. 0.647 b. 0.565 c. 0.435 d. 0.765

- C 46. The expression $\frac{3^{\frac{1}{3}}}{3^{\frac{2}{3}}}$ is equivalent to

Handwritten calculation:
 $3^{1/3} \cdot 3^{-2/3} = 3^{1/3 - 2/3} = 3^{-1/3} = \frac{1}{3^{1/3}} = \frac{1}{\sqrt[3]{3}}$

- a. 1 c. 3
b. $\sqrt{3}$ d. $\frac{1}{\sqrt[3]{3}}$

- A 47. When is $f(x) = x^2 - x - 12$ increasing?

- a. $x > \frac{1}{2}$ c. $x > -3$
b. $x < \frac{1}{2}$ d. $x < 4$

Handwritten note:
 $M(\frac{1}{2}, -12.25)$

A 48. Which of the following is an example of independent events?

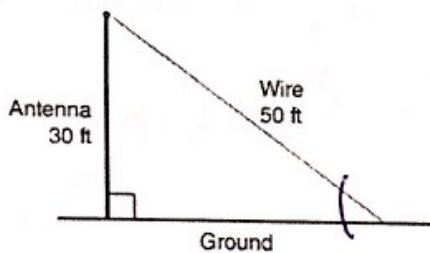
- a. flipping a fair coin and rolling a six-sided cube ✓
- b. selecting the order in which one picture will be taken of each of four friends by drawing their names out of a hat
- c. selecting the order in which each member of a history class will present a speech to the rest of the class
- d. selecting two different flavored pieces of candy one piece at a time, from a bag containing four different flavors of candy.

Short Answer

49. John draws a single card from a deck of 52 cards. What is the probability that the card is a king or a club?

$$\frac{4}{52} + \frac{13}{52} - \frac{1}{52} = \frac{16}{52} = \frac{4}{13}$$

50. A communications company is building a 30-foot antenna to carry cell phone transmissions. As shown in the diagram below, a 50-foot wire from the top of the antenna to the ground is used to stabilize the antenna.



$$\sin x = \frac{30}{50}$$

$$x = 36.869^\circ$$

Find, to the *nearest degree*, the measure of the angle that the wire makes with the ground.

$$37^\circ$$

51. a. Rewrite the equation in vertex form: $y = x^2 + 10x + 16$

$$+25 - 16 = x^2 + 10x + 25$$

$$9 = (x+5)^2$$

$$y = (x+5)^2 - 9$$

b. State the vertex of the equation above.

$$(-5, -9)$$

52. Write a function rule using function notation that will transform a geometric figure by rotating the figure 90° counterclockwise.

$$(-y, x)$$

53.

The two-way table gives some information about how 100 children travelled to school one day.

(a) Complete the two-way table.

| | Walk | Car | Other | Total |
|-------|------|-----|-------|-------|
| Boy | 15 | 25 | 14 | 54 |
| Girl | 22 | 8 | 16 | 46 |
| Total | 37 | 33 | 30 | 100 |

(b) One of the children is picked at random. Find the probability that this child walked to school that day.

$$\frac{37}{100} \text{ or } 37\%$$

(c) One of the girls is picked at random. Find the probability that this girl did not walk to school that day.

$$\frac{24}{46} = \frac{6}{25}$$

54. The student council is planning a dance for their high school. They did some research and found that the relationship between the ticket price and the income that they will receive from the dance can be modeled by the function $f(x) = -2x^2 + 12x - 4$, where x is the ticket price and $f(x)$ is the amount of profit in thousands. They also calculated their expenses and found that their expenses can be modeled by the function $g(x) = 2x + 4$, where $g(x)$ is their expenses in thousands. What ticket price(s) could the student council charge for the dance if they wanted to break-even (the expenses are equal to the income)?

$$2x + 4 = -2x^2 + 12x - 4$$

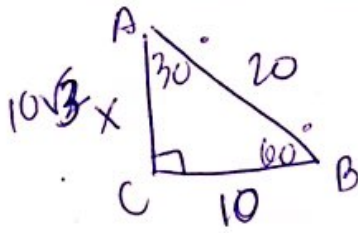
\$1 each or \$4 each to break even.

(1, 6)
(4, 12)

55. A committee consists of four women and three men. The committee will randomly select two people to attend a conference in Hawaii. Find the probability that both people selected are women.

$$\frac{4}{7} \cdot \frac{3}{6} = \frac{12}{42} = \frac{6}{21} = \frac{2}{7}$$

56. In right $\triangle ABC$, where \overline{AB} is the hypotenuse, $\overline{AB} = 20$ and $m\angle A = 30^\circ$. Find \overline{AC} .



$$\overline{AC} = 10\sqrt{3}$$

57. Solve the following systems of equations:

$$y = x^2 + 3x + 4$$

$$y - x = 7$$

$$y = x + 7$$

$$\begin{array}{r} 3 \\ \times \\ -1 \\ \hline 2 \end{array}$$

$$x + 7 = x^2 + 3x + 4$$

$$0 = x^2 + 2x - 3$$

$$0 = (x + 3)(x - 1)$$

$$x = -3, 1$$

$$(1, 8)$$

$$(-3, 4)$$

$$\begin{array}{l} y = -3 + 7 \\ \boxed{y = 4} \end{array}$$

$$\begin{array}{l} y = 1 + 7 \\ \boxed{y = 8} \end{array}$$

58. Rebecca was called to the whiteboard to solve the equation $x = \sqrt{25 - 3x^2}$. Her work is shown below.

$$1) x = \sqrt{25 - 3x^2}$$

$$2) x^2 = 25 - 3x^2$$

$$3) 4x^2 = 25$$

$$4) x^2 = \frac{25}{4}$$

$$5) x = \pm \frac{5}{4}$$

Is Rebecca's solution correct? Explain where she made her mistakes, if any, and find the correct solution.

Step 5 is wrong

$$\sqrt{x^2} = \sqrt{\frac{25}{4}}$$

$$x = \pm \frac{5}{2}$$