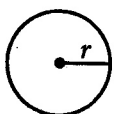# Math: Reference Sheet
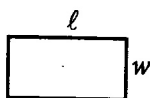
You'll have access to the following common formulas at any time as you take the digital SAT.

$A = \pi r^2$
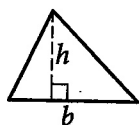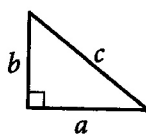
$C = 2\pi r$

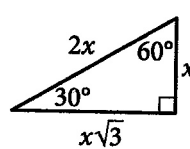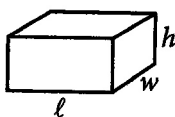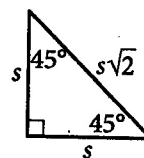$A = \ell w$

$A = \dfrac{1}{2}bh$
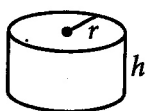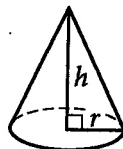
$c^2 = a^2 + b^2$

Special Right Triangles

$V = \ell wh$
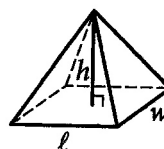
$V = \pi r^2 h$

$V = \dfrac{4}{3}\pi r^3$

$V = \dfrac{1}{3}\pi r^2 h$

$V = \dfrac{1}{3}\ell wh$

Unacceptable and Acceptable Answers

The directions themselves are clear on what can and can't be entered into an SPR answer field, but let's go over what disqualifies the "unacceptable" answers (as well as a few other examples) to clarify what makes them impermissible and to help you avoid making these (and similar) entry mistakes.

Table 1. Math Section: Examples of Unacceptable and Acceptable SPR Answers.

Intended answer	Unacceptable answer(s)	Reason	Acceptable answer(s)
3.5	31/2 3 1/2	Mixed numbers should be entered as improper fractions or as decimal equivalents.	7/2 (improper fraction that fits the space) 3.5 (decimal equivalent)
$\frac{2}{3}$	0.66 .66 0.67 .67	Decimals that don't fit the provided space should be truncated or rounded at the fourth digit.	2/3 (fraction that fits the space) .6666 (decimal truncated at the fourth digit) .6667 (decimal rounded at the fourth digit) 0.666 (decimal truncated at the fourth digit, includes leading zero) 0.667 (decimal rounded at the fourth digit, includes leading zero)
$-\frac{1}{3}$	−0.33	Decimals that don't fit the provided space should be truncated or rounded at the fourth digit.	−1/3 (fraction that fits the space) −.3333 (decimal rounded or truncated at the fourth digit) −0.333 (decimal rounded or truncated at the fourth digit, includes leading zero)
$2.53	$2.53	Answers may not include symbols such as a dollar sign.	2.53
68,132	68,132	Answers may not include symbols such as a comma.	68132
45%	45%	Answers may not include symbols such as a percent sign.	0.45

CHAPTER 22

Math: Questions— Algebra Drills

1

$$3a + 4b = 25$$

A shipping company charged a customer \$25 to ship some small boxes and some large boxes. The given equation represents the relationship between a, the number of small boxes, and b, the number of large boxes, the customer had shipped. If the customer had 3 small boxes shipped, how many large boxes were shipped?

A) 3

B) 4

C) 5

D) 6

2

$$ax = 5$$

In the given equation, a is a constant. For which of the following values of a will the equation have no solution?

A) 0

B) 1

C) 5

D) 10

3

Tom scored 85, 78, and 98 on his first three exams in history class. Solving which inequality gives all the possible scores, G, that Tom could get on his fourth exam that will result in a mean score on all four exams of at least 90?

A) $90 - (85 + 78 + 98) \leq 4G$

B) $4G + 85 + 78 + 98 \geq 360$

C) $\dfrac{(G + 85 + 78 + 98)}{4} \geq 90$

D) $\dfrac{(85 + 78 + 98)}{4} \geq 90 - 4G$

4

If $3(3x + 5) = 2x - 8$, what is the value of x?

A) $-\frac{23}{7}$

B) $-\frac{15}{7}$

C) $-\frac{13}{7}$

D) $\frac{7}{11}$

5

On Monday, Jao walked a total of 11,400 steps. On Tuesday, Jao has a goal to walk at least 1,500 more steps than he did on Monday. What is the least number of steps Jao could walk on Tuesday to meet his goal?

6

$$x - 3y = 7$$

$$3y = 9$$

If (x, y) is the solution to the given system of equations, what is the value of x?

A) -2

B) 10

C) 16

D) 34

7

$$P = 1.20x + 5.00$$

The given equation gives the total monthly price P, in dollars, for using an online gaming service. The total monthly price for the online service consists of a flat monthly fee and a charge for each game played during a month. Of the following, which is the best interpretation of the value of x in this context?

A) The number of games played during a month

B) The charge, in dollars, for playing x games

C) The flat monthly fee, in dollars, for the gaming service

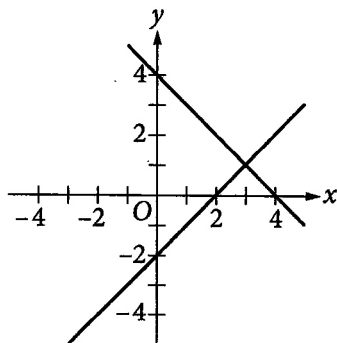D) The number of months the gaming service was used
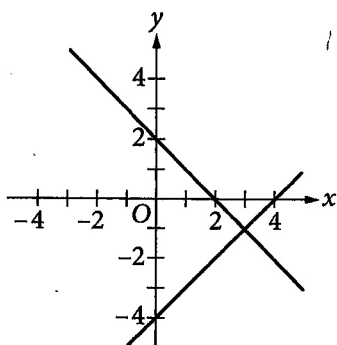
8

$$x + y = 4$$
$$x - y = 2$$

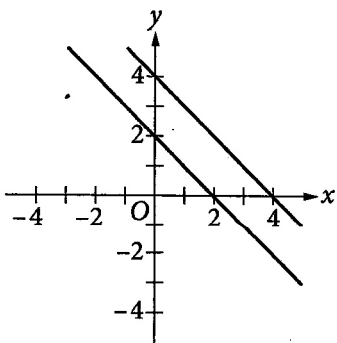Which of the following is the graph in the *xy*-plane of the given system of equations?
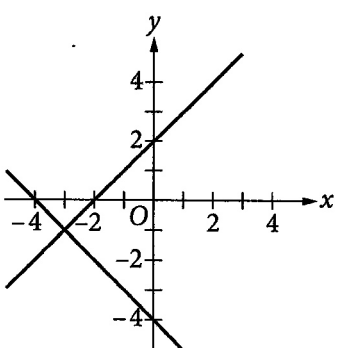
A)

B)

C)

D)

9

Nayya burns 5 kilocalories per minute running on a treadmill and 10 kilocalories per minute pedaling on a stationary bike. Which of the following equations represents the total number of kilocalories, T, Nayya has burned after running on the treadmill for 50 minutes and pedaling on the stationary bike for m minutes?

A) $T = 15m + 50$

B) $T = 50m + 50$

C) $T = 5m + 500$

D) $T = 10m + 250$

10

$$f(x) = \frac{(x+7)}{4}$$

For the function f defined as shown, what is the value of $f(9) - f(1)$?

A) 1

B) 2

C) $\frac{1}{4}$

D) $\frac{9}{4}$

11

In the xy-plane, line l contains the points (2, 6) and (8, 10). Which of the following is an equation of line l?

A) $y = \frac{2}{3}x + \frac{14}{3}$

B) $y = \frac{3}{2}x - 2$

C) $y = 2x + 6$

D) $y = 8x + 10$

12

During a month, Morgan ran r miles at 5 miles per hour and biked b miles at 10 miles per hour. She ran and biked a total of 200 miles that month, and she biked for twice as many hours as she ran. What is the total number of miles that Morgan biked during the month?

A) 80

B) 100

C) 120

D) 160

13

The equation $c = \frac{5}{4}x + 406$ gives the total cost c, in dollars, to produce a quantity of x units. If the quantity of units produced increases by 39 units, what is the corresponding increase in the total cost, in dollars?

14

$$kx - 3y = 4$$
$$4x - 5y = 7$$

In the given system of equations, k is a constant and x and y are variables. For what value of k will the system of equations have no solution?

A) $\frac{12}{5}$

B) $\frac{16}{7}$

C) $-\frac{16}{7}$

D) $-\frac{12}{5}$

15

x	y
−10	66
−5	45
5	3
10	−18

The table shows four values of x and their corresponding values of y. There is a linear relationship between x and y. If an equation representing this relationship is written in the form $Ax + 5y = C$, where A and C are constants, what is the value of C?

16
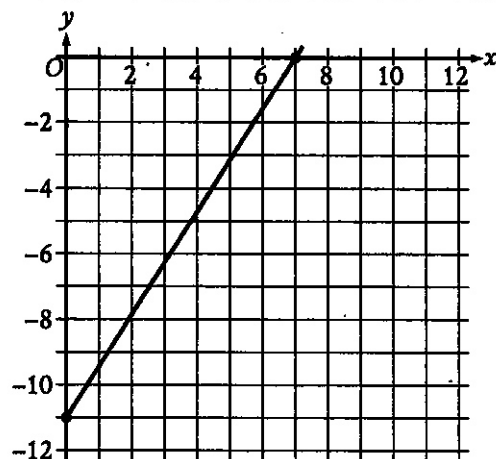
The point $(3, d)$ lies on the line shown. What is the value of d?

CHAPTER 24
Math: Questions— Advanced Math Drills

1

Which of the following expressions is equivalent to $2(ab - 3) + 2$?

A) $2ab - 1$

B) $2ab - 4$

C) $2ab - 5$

D) $2ab - 8$

2

$$f(x) = (x + 0.25x)(50 - x)$$

The function f is defined as shown. What is the value of $f(20)$?

A) 250

B) 500

C) 750

D) 2,000

3

$$x^2 + 6x + 9 = 36$$

What is the positive solution to the given equation?
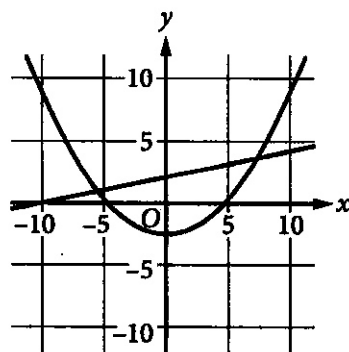
4

The function f is defined by $f(x) = \frac{22}{x+1}$. What is the value of $f(22)$?

5

A system of equations consists of a quadratic equation and a linear equation. The equations in this system are graphed in the *xy*-plane shown. How many solutions does this system have?

A) 0

B) 1

C) 2

D) 3

6

$$S = 4\pi r^2$$

The formula shown gives the surface area, S, of a sphere in terms of the length of its radius, r. Which of the following gives the radius of the sphere in terms of its surface area?

A) $r = \sqrt{\dfrac{S}{4\pi}}$

B) $r = \sqrt{\dfrac{4\pi}{S}}$

C) $r = \dfrac{\sqrt{S}}{4\pi}$

D) $r = \dfrac{\sqrt{4\pi}}{S}$

7

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

Which of the following is equivalent to the given expression for $x \neq -1$ and $x \neq 1$?

A) $\dfrac{1}{6(x - 1)}$

B) $\dfrac{x}{6(x^2 - 1)}$

C) $\dfrac{1}{x - 1}$

D) $\dfrac{x}{x^2 - 1}$

Number of board games
(thousands)
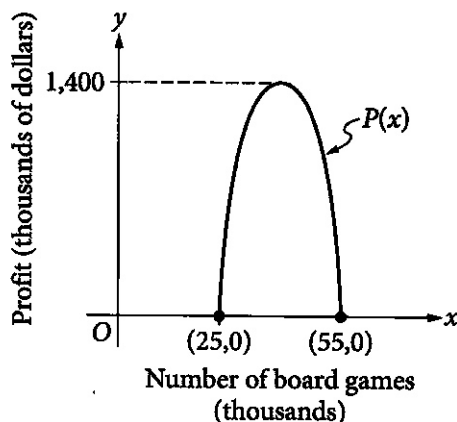
A company produces board games and sells them online and in stores. The quadratic function P models the company's monthly profits $P(x)$, in thousands of dollars, when x board games, in thousands, are produced and sold. The graph of $y = P(x)$, where $25 \le x \le 55$, is shown in the xy-plane. How many board games must the company produce and sell in order to earn the maximum profit estimated by the model?

A) 20,000

B) 40,000

C) 60,000

D) 1,400,000

9

$$y - x = 30$$

$$y = x^2 - 28x$$

The graphs of the equations in the given system intersect at the point (x, y) in the xy-plane. What is a possible value of y?

10

In the equation $9x^2 + 108x + \frac{c}{4} = 0$, c is a constant. If the equation has exactly one real solution, what is the value of c?

A) 0

B) 324

C) 1,296

D) 11,664

11

Kao measured the temperature of a cup of hot chocolate placed in a room with a constant temperature of 70 degrees Fahrenheit (°F). The temperature of the hot chocolate was 185°F at 6:00 p.m. when it started cooling. The temperature of the hot chocolate was 156°F at 6:05 p.m. and 135°F at 6:10 p.m. The hot chocolate's temperature continued to decrease. Of the following functions, which best models the temperature $T(m)$, in degrees Fahrenheit, of Kao's hot chocolate m minutes after it started cooling?

A) $T(m) = 185(1.25)^m$

B) $T(m) = 185(0.85)^m$

C) $T(m) = (185 - 70)(0.75)^{\frac{m}{5}}$

D) $T(m) = 70 + 115(0.75)^{\frac{m}{5}}$

12

$$\sqrt{5(x - k)} = x - k$$

In the given equation, k is a positive constant. The greatest solution to the equation is 12. What is the value of k?

13

$$g(x) = (5 - 2x)(14 + 2x)$$

The function g is defined by the given equation. For what value of x does $g(x)$ reach its maximum?

14

A rectangular volleyball court has an area of 162 square meters. If the length of the court is twice the width, what is the width of the court, in meters?

A) 9

B) 18

C) 27

D) 54

15

$$x^2 = 6x + y$$

$$y = -6x + 36$$

A solution to the given system of equations is (x, y). Which of the following is a possible value of xy?

A) 0

B) 6

C) 12

D) 36

16

The function f is defined by $f(x) = ax^2 + bx + c$, where a, b, and c are constants and $1 < a < 4$. The graph of $y = f(x)$ in the xy-plane passes through points $(11, 0)$ and $(-2, 0)$. If a is an integer, what could be the value of $a + b$?

Math: Questions— Problem-Solving and Data Analysis Drills

Makayla is planning an event in a 5,400-square-foot room. If there should be at least 8 square feet per person, what is the maximum number of people that could attend this event?

A) 588

B) 675

C) 15,274

D) 43,200

Water flows from a pipe at a rate of 6.0 gallons per minute. How many gallons of water will flow from the pipe in 8.4 minutes?

The bar graph shows the results from a survey in which a group of students was asked during which month they prefer to have the class picnic.

Class Picnic Survey
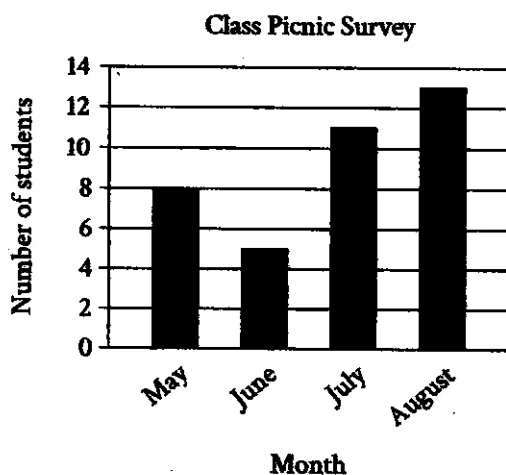
Based on the graph, how many students did not respond "May"?

4

A fish hatchery has three tanks for holding fish before they are introduced into the wild. Ten fish weighing less than 5 ounces are placed in tank A. Eleven fish weighing at least 5 ounces but no more than 13 ounces are placed in tank B. Twelve fish weighing more than 13 ounces are placed in tank C. Which of the following could be the median of the weights, in ounces, of these 33 fish?

A) 4.5

B) 8

C) 13.5

D) 15

5

A data set of 27 different numbers has a mean of 33 and a median of 33. A new data set is created by adding 7 to each number in the original data set that is greater than the median and subtracting 7 from each number in the original data set that is less than the median. Which of the following measures does NOT have the same value in both the original and new data sets?

A) Median

B) Mean

C) Sum of the numbers

D) Standard deviation

6
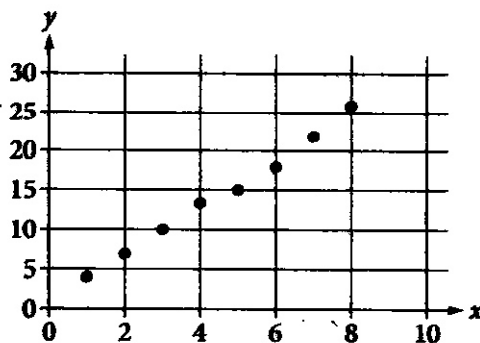
Which of the following could be the equation for a line of best fit for the data shown in the scatterplot above?

A) $y = 0.8 + 3x$

B) $y = 3 + 0.8x$

C) $y = 3 - 0.8x$

D) $y = 0.8 - 3x$

A sample of 40 fourth-grade students was selected at random from a certain school. The 40 students completed a survey about the morning announcements, and 32 thought the announcements were helpful. Which of the following is the largest population to which the results of the survey can be applied?

A) The 40 students who were surveyed

B) All fourth-grade students at the school

C) All students at the school

D) All fourth-grade students in the county in which the school is located

In which of the following tables is the relationship between the values of x and their corresponding y-values nonlinear?

A)

x	1	2	3	4
y	8	11	14	17

B)

x	1	2	3	4
y	4	8	12	· 16

C)

x	1	2	3	4
y	8	13	18	23

D)

x	1	2	3	4
y	6	12	24	48

A bag containing 10,000 beads of assorted colors is purchased from a craft store. To estimate the percent of red beads in the bag, a sample of beads is selected at random. The percent of red beads in the bag was estimated to be 15%, with an associated margin of error of 2%. If r is the actual number of red beads in the bag, which of the following is most plausible?

A) $r > 1,700$

B) $1,300 < r < 1,700$

C) $200 < r < 1,500$

D) $r < 1,300$

10

The table summarizes the distribution of people in a certain city by age group.

Age group	Percent
Less than 18 years old	27%
18–40 years old	22%
41–65 years old	26%
Greater than 65 years old	25%

If a person in this city is selected at random, what is the probability of selecting a person who is greater than 65 years old, given that the person is at least 18 years old? (Express your answer as a decimal or fraction, not as a percent.)

11
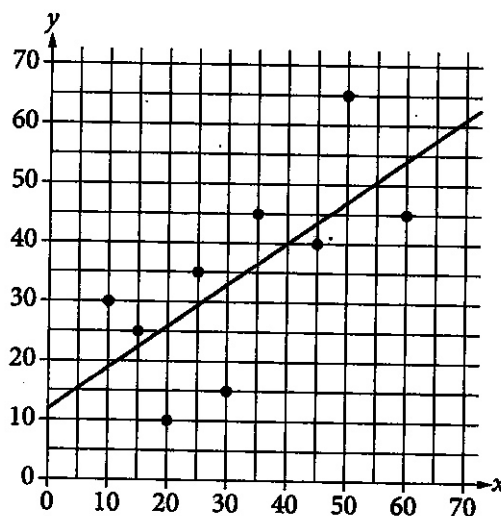
The scatterplot in the *xy*-plane above shows nine points (*x*, *y*) and a line of best fit. Of the following, which best estimates the amount by which the line underestimates the value of *y* when *x* = 50?

A) 8

B) 10

C) 13

D) 18

12

Sample	Percent in favor	Margin of error
A	52%	4.2%
B	48%	1.6%

The results of two random samples of votes for a proposition are shown. The samples were selected from the same population, and the margins of error were calculated using the same method. Which of the following is the most appropriate reason that the margin of error for sample A is greater than the margin of error for sample B?

A) Sample A had a smaller number of votes that could not be recorded.

B) Sample A had a higher percent of favorable responses.

C) Sample A had a larger sample size.

D) Sample A had a smaller sample size.

13

The number of crane flies in a wildlife sanctuary is 30% less than the number of ladybugs in the sanctuary. The number of honeybees in the sanctuary is 85% greater than the number of crane flies in the sanctuary. The number of honeybees in the sanctuary is how many times the number of ladybugs in the sanctuary?

14

The positive number a is 210% of the number b, and a is 30% of the number c. If c is p% of b, what is the value of p?

Math: Questions— Geometry and Trigonometry Drills
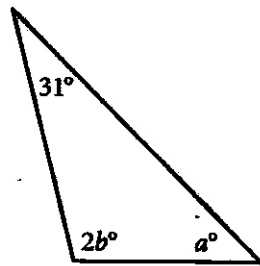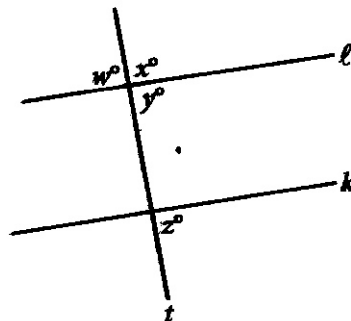

In the triangle shown, $a = 45$. What is the value of b?

A) 52

B) 59

C) 76

D) 104

A cube has a surface area of 54 square meters. What is the volume, in cubic meters, of the cube?

A) 18

B) 27

C) 36

D) 81

In the xy-plane, a circle with radius 5 has center $(-8, 6)$. Which of the following is an equation of the circle?

A) $(x - 8)^2 + (y + 6)^2 = 25$

B) $(x + 8)^2 + (y - 6)^2 = 25$

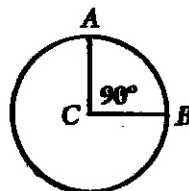C) $(x - 8)^2 + (y + 6)^2 = 5$

D) $(x + 8)^2 + (y - 6)^2 = 5$

Note: Figure not drawn to scale.

In the figure shown, line t intersects lines ℓ and k. Which of the following statements, if true, would imply that lines ℓ and k are parallel?

A) $w = y$

B) $w = z$

C) $x = z$

D) $x + y = 180$

In a right triangle, the tangent of one of the two acute angles is $\frac{\sqrt{3}}{3}$. What is the tangent of the other acute angle?

A) $-\frac{\sqrt{3}}{3}$

B) $-\frac{3}{\sqrt{3}}$

C) $\frac{\sqrt{3}}{3}$

D) $\frac{3}{\sqrt{3}}$

Point C is the center of the circle shown. What is the measure of angle ACB, in radians?

A) 2π

B) π

C) $\frac{\pi}{2}$

D) $\frac{\pi}{4}$

The length of one side of square M is 5 times the length of one side of square N. The area of square N is 361 square centimeters. What is the area, in square centimeters, of square M?

Triangle *KLM* is similar to triangle *QRS*, where angle *K* corresponds to angle *Q* and where angles *L* and *R* are right angles. If $\sin K = \frac{105}{233}$ and $\sin M = \frac{208}{233}$, what is the value of $\tan S$?
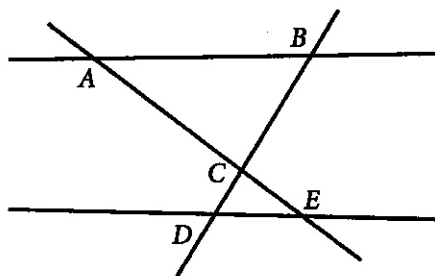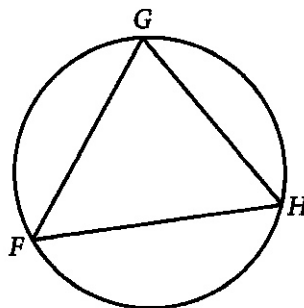

Note: Figure not drawn to scale.

In the figure shown, $\triangle ABC$ is similar to $\triangle EDC$, with $\angle BAC$ corresponding to $\angle CED$ and $\angle ABC$ corresponding to $\angle CDE$. Which of the following must be true?

A) $\overline{AE} \parallel \overline{BD}$

B) $\overline{AE} \perp \overline{BD}$

C) $\overline{AB} \parallel \overline{DE}$
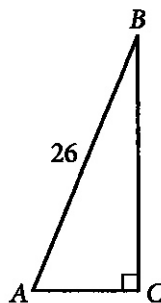
D) $\overline{AB} \perp \overline{DE}$

10

Note: Figure not drawn to scale.

Triangle *FGH* is inscribed in the circle shown. If arc *FG* is congruent to arc *GH* and the measure of ∠*G* is 30°, what is the measure of ∠*H*?

A) 30°

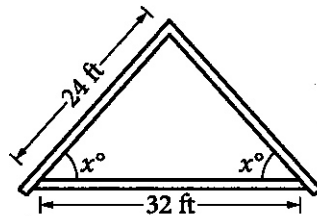B) 60°

C) 75°

D) 120°

11

Triangle *ABC* shown is a right triangle, and $\sin B = \frac{5}{13}$. What is the length of side $\overline{BC}$?

12

An architect drew the sketch shown while designing a house roof. The dimensions shown are for the interior of the triangle.

Note: Figure not drawn to scale.

What is the value of cos *x*?

13

Line ℓ is parallel to line m. Points A and B lie on line ℓ, and points P and Q lie on line m. If $\angle ABP$ and $\angle QAB$ each have measure $21°$ and $\angle AQB$ has measure $76°$, what is the measure, in degrees, of $\angle PAQ$?

14

The semicircle shown has a radius of r inches, and chord $\overline{CD}$ is parallel to the diameter $\overline{AB}$. If the length of $\overline{CD}$ is $\frac{2}{3}$ of the length of $\overline{AB}$, what is the distance between the chord and the diameter in terms of r?

A) $\frac{1}{3}\pi r$

B) $\frac{2}{3}\pi r$

C) $\frac{\sqrt{2}}{2} r$

D) $\frac{\sqrt{5}}{3} r$