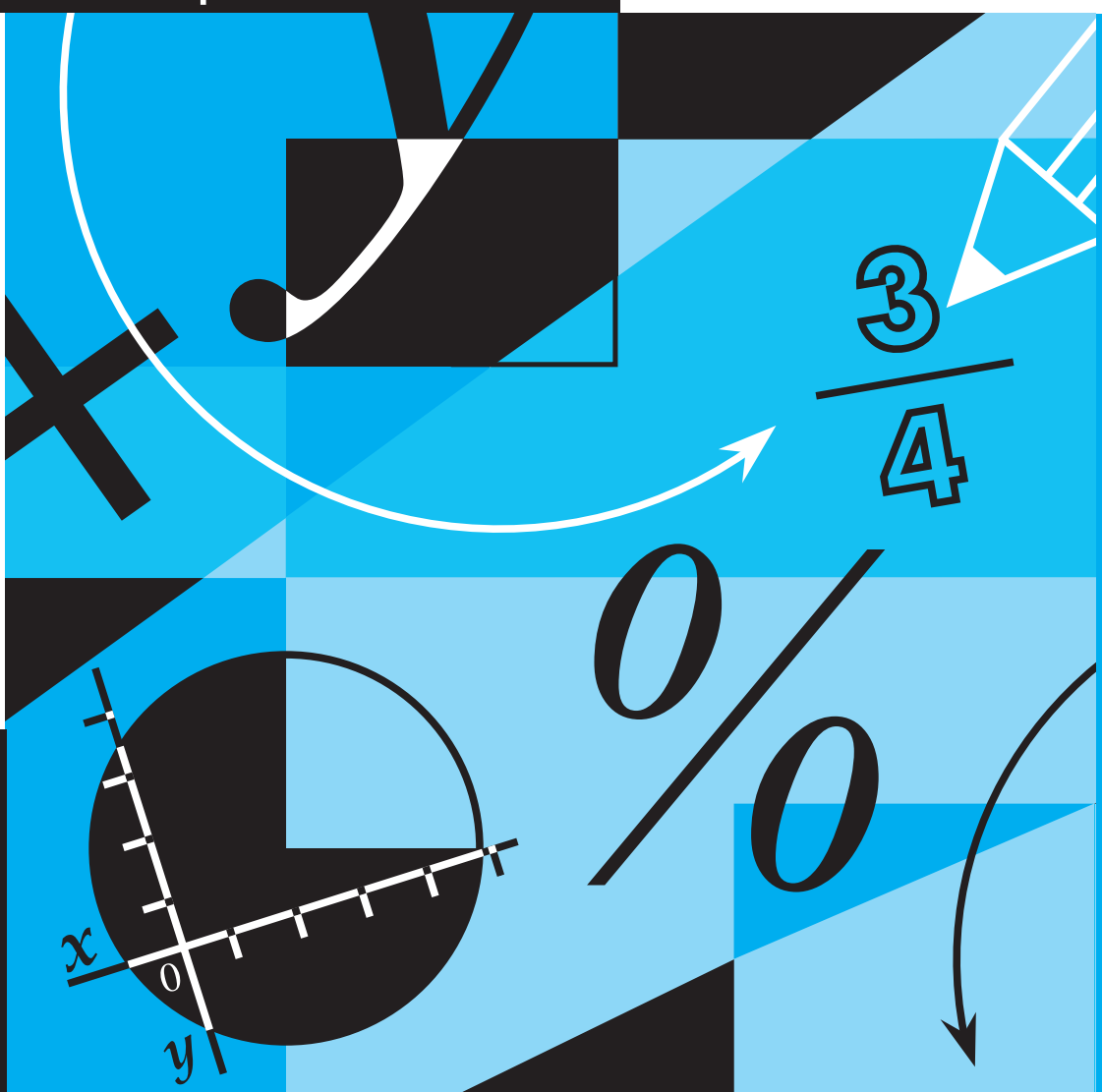
FCAT

Florida Comprehensive Assessment Test

Student Name

_____



MATHEMATICS

Sunshine State Standards

Test Book

Released August 2005

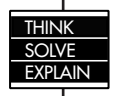
Last used: March 2004

GRADE

10

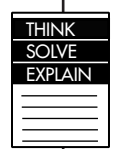
FC10000389

FCAT Question Symbols



This symbol appears next to questions that require short written answers. Use about 5 minutes to answer these questions.

A complete and correct answer to each of these questions is worth 2 points.
A partially correct answer is worth 1 point.



This symbol appears next to questions that require longer written answers. Use about 10–15 minutes to answer these questions.

A complete and correct answer to each of these questions is worth 4 points.
A partially complete answer is worth 1, 2, or 3 points.

This symbol appears next to questions that require you to fill in your answer on a grid. Answers may be gridded using several correct formats. You MUST fill in the bubbles accurately to receive credit for your answer.

Directions for Completing the Response Grid

1. Work the problem and find an answer.
2. Write your answer in the answer boxes at the top of the grid.
   - Print your answer with the first digit in the left answer box, or with the last digit in the right answer box.
   - Print only one digit or symbol in each answer box. Do NOT leave a blank answer box in the middle of an answer.
3. Fill in a bubble under each box in which you wrote your answer.
   - Fill in one and ONLY one bubble for each answer box. Do NOT fill in a bubble under an unused answer box.
   - Fill in each bubble by making a solid black mark that completely fills the circle.
   - You MUST fill in the bubbles accurately to receive credit for your answer.

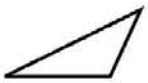
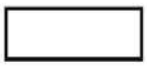
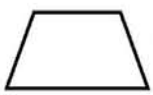
This page is as it appeared for the Spring 2004 test administration. It has since been modified for all subsequent administrations.

Grades 9-10 FCAT Mathematics SSS Reference Sheet

Fold and Tear Carefully Along Dotted Line.

This FCAT Mathematics Reference Sheet is for use only on the SSS FCAT Mathematics Test.

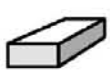
Area

 Triangle	$A = \frac{1}{2}bh$
 Rectangle	$A = lw$
 Trapezoid	$A = \frac{1}{2}h(b_1 + b_2)$
 Parallelogram	$A = bh$
 Circle	$A = \pi r^2$

KEY	
b = base	d = diameter
h = height	r = radius
l = length	A = area
w = width	C = circumference
ℓ = slant height	V = volume
$S.A.$ = surface area	
Use 3.14 or $\frac{22}{7}$ for π.	

Circumference

$C = \pi d = 2\pi r$

	Volume	Total Surface Area
 Right Circular Cone	$V = \frac{1}{3}\pi r^2 h$	$S.A. = \frac{1}{2}(2\pi r)\ell + \pi r^2 = \pi r\ell + \pi r^2$
 Square Pyramid	$V = \frac{1}{3}lwh$	$S.A. = 4(\frac{1}{2}l\ell) + l^2 = 2l\ell + l^2$
 Sphere	$V = \frac{4}{3}\pi r^3$	$S.A. = 4\pi r^2$
 Right Circular Cylinder	$V = \pi r^2 h$	$S.A. = 2\pi rh + 2\pi r^2$
 Rectangular Solid	$V = lwh$	$S.A. = 2(lw) + 2(hw) + 2(lh)$

In the following formulas, n represents the number of sides.

In a polygon, the sum of the measures of the interior angles is equal to $180(n-2)$.

In a regular polygon, the measure of an interior angle is equal to $\frac{180(n-2)}{n}$.

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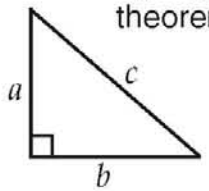
Grades 9-10 FCAT Mathematics SSS Reference Sheet

Pythagorean theorem: $c^2 = a^2 + b^2$



Distance between two points $P_1(x_1, y_1)$ and $P_2(x_2, y_2)$:

$$\sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$

Midpoint between two points $P_1(x_1, y_1)$ and $P_2(x_2, y_2)$:

$$\left(\frac{x_2 + x_1}{2}, \frac{y_2 + y_1}{2}\right)$$

$y = mx + b$

Slope-intercept form of an equation of a line, where m = slope and b = the y-intercept.

$d = rt$

Distance, rate, time formula, where d = distance, r = rate, t = time.

$I = prt$

Simple interest formula, where p = principal, r = rate, t = time.

Conversions

1 yard = 3 feet = 36 inches
1 mile = 1,760 yards = 5,280 feet
1 acre = 43,560 square feet
1 hour = 60 minutes
1 minute = 60 seconds

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

1 liter = 1000 milliliters = 1000 cubic centimeters
1 meter = 100 centimeters = 1000 millimeters
1 kilometer = 1000 meters
1 gram = 1000 milligrams
1 kilogram = 1000 grams

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

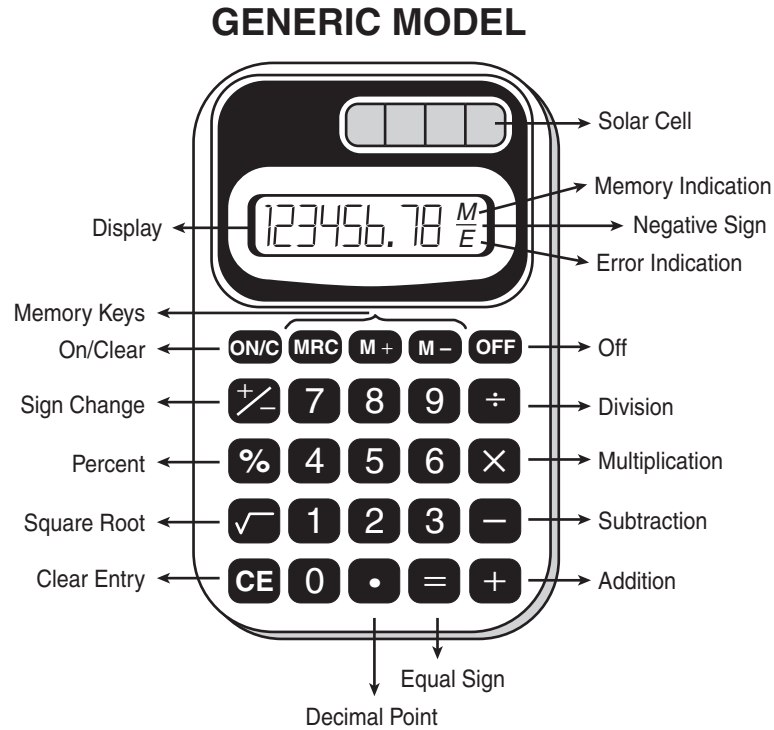
Metric numbers with four digits are presented without a comma (e.g., 9960 kilometers). For metric numbers greater than four digits, a space is used instead of a comma (e.g., 12 500 liters).

Fold and Tear Carefully Along Dotted Line.

This FCAT Mathematics Reference Sheet is for use only on the SSS FCAT Mathematics Test.

This page is as it appeared for the Spring 2004 test administration. It has since been modified for all subsequent administrations.

This is a picture of a generic calculator and its parts.



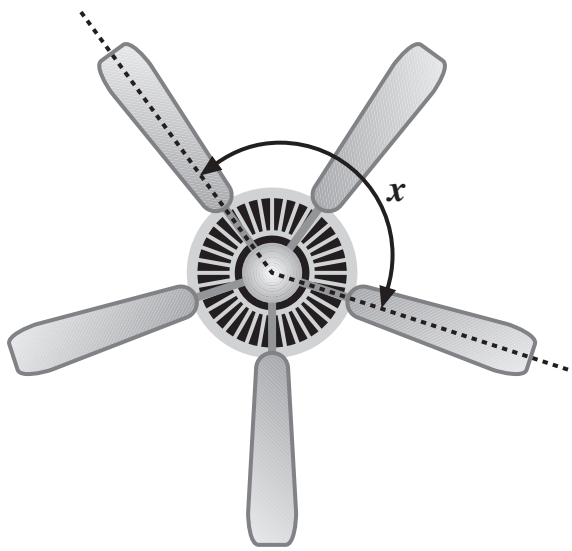
HELPFUL HINTS FOR TAKING THE FCAT MATHEMATICS SSS TEST

1. Read the problem very carefully. Then decide whether or not you need the calculator to help you solve the problem.
2. When starting a new problem, always clear your calculator by pressing the clear key.
3. If you see an **E** in the display, clear the error before you begin.
4. If you see an **M** in the display, clear the memory and the calculator before you begin.
5. If the number in the display is not one of the answer choices, check your work. Remember that when computing with certain types of fractions, you may have to round the number in the display.
6. Remember, your calculator will NOT automatically perform the algebraic order of operations.
7. Calculators might display an incorrect answer if you press the keys too quickly. When working with calculators, use careful and deliberate keystrokes, and always remember to check your answer to make sure that it is reasonable.
8. The negative sign may appear either to the left or to the right of the number.

Use the space in the Test Book to do your work. Then mark your Test Book for the answer you have chosen. If you change your answer, be sure to erase completely.

The correct answer for each multiple-choice question is circled. To the left of each answer choice is the percentage of students who chose that answer.

1 A ceiling fan with five equally-spaced blades is shown below.



What is the degree measure of angle x?

4% **A.** 36°
15% **B.** 72°
17% **C.** 108°
64% **D.** 144°

Benchmark	Content Focus	Content Difficulty
MA.B.1.4.2	angle measures	Moderate

2 Tanisha and some friends from her bicycle club went on a training ride from West Palm Beach to Miami. They planned to ride 45 miles from West Palm Beach to Fort Lauderdale, another 10 miles to Hollywood, and finally 15 miles to Miami. Tanisha's bicycle got a flat tire north of Miami, and she was unable to complete the training ride. Her odometer showed she had traveled 60 miles. Approximately what percent of the training ride did Tanisha complete?

4% **F.** 14%

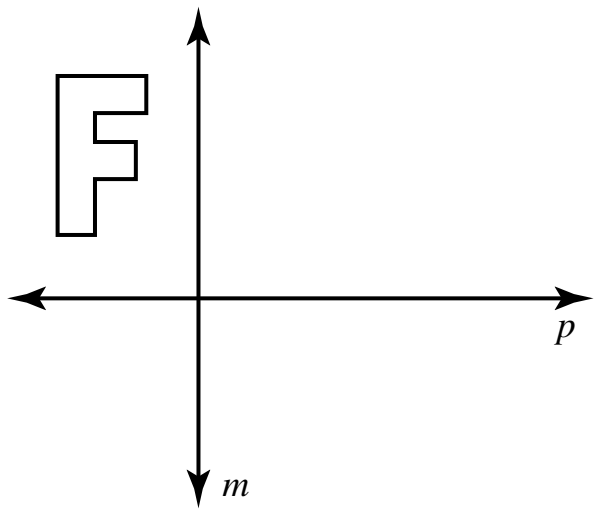
12% **G.** 75%

80% **H.** 86%

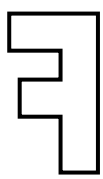
4% **I.** 116%

Benchmark	Content Focus	Content Difficulty
MA.A.3.4.3	solving real world problems involving percents	Moderate

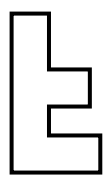
3 In the figure, the letter "F" is to be first reflected over the vertical line m and then again reflected over the horizontal line p.



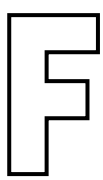
Which of these figures would be the correct orientation of the letter "F" after the two transformations described?



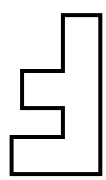
11% **A.**



7% **C.**



5% **B.**

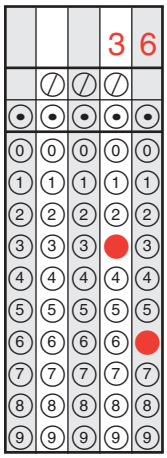


76% **D.**

Benchmark	Content Focus	Content Difficulty
MA.C.3.4.1	transformations	Moderate

4 Krista has decided to enter a local marathon. As part of her training, she is going to increase the number of miles she runs every week by 3 miles. If Krista runs 12 miles in the first week, how many miles will she run during the ninth week?

Example of a Correct Gridded Response:



Acceptable Gridded Response(s)
36

Benchmark	Content Focus	Content Difficulty
MA.D.1.4.1	functions	Moderate

Percentage of Students Answering Correctly
68

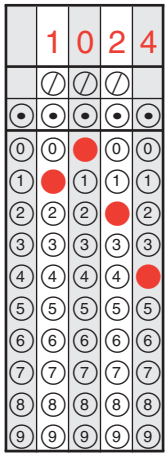
5 The table below contains a modification of *Pascal's triangle,* in which each number is the sum of the two adjacent numbers in the previous row.

MODIFIED PASCAL'S TRIANGLE

Row	Numbers in a Row	Sum of the Numbers in the Row
1	2	2
2	2 2	4
3	2 4 2	8
4	2 6 6 2	16
5	2 8 12 8 2	32
6		

In the table, the sum of the numbers in each row is shown. According to the table, what is the sum of the numbers in the **tenth** row of the modified *Pascal's triangle*?

Example of a Correct Gridded Response:



Acceptable Gridded Response(s)
1024

Benchmark	Content Focus	Content Difficulty
MA.D.1.4.1	number sequences	Moderate

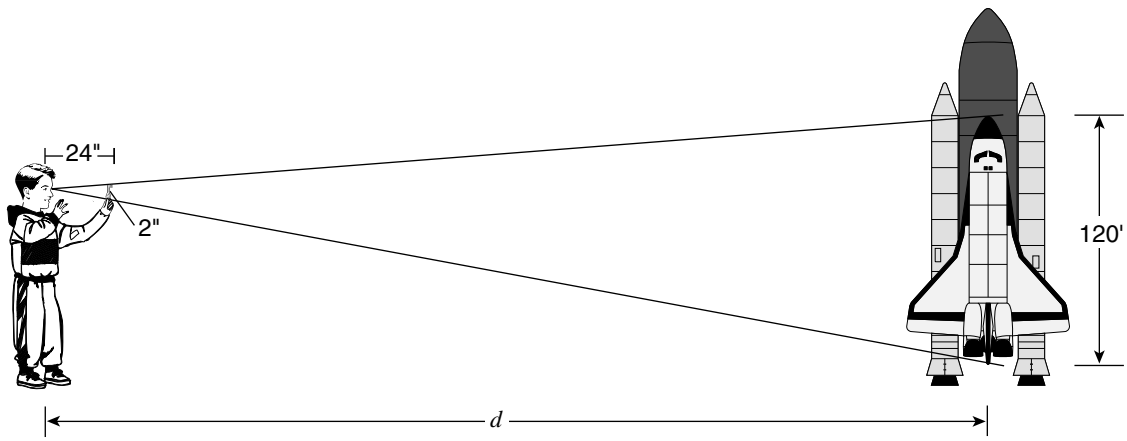
Percentage of Students Answering Correctly
68

6 A rectangular piece of window screen has a width of 1.75 feet. The packaging label says the screen is 42 square feet. What is the length of the screen?

76% **F.** 24.0 feet
6% **G.** 43.75 feet
17% **H.** 73.5 feet
1% **I.** 101.0 feet

Benchmark	Content Focus	Content Difficulty
MA.B.2.4.1	indirect measurement	Low

7 Raul was taking a tour of the Kennedy Space Center. He could see a space shuttle being prepared for launch a distance, *d*, away. He held one of his keys out at arm's length and noticed that, at this distance, the shuttle appeared to be about the same size as his key.



(Not to Scale)

Raul knows that the shuttle is really about 120 feet in length and that his key is about 2 inches long. He is holding the key 24 inches away from his eyes. Using this information, which is closest to the distance, *d*, between Raul and the space shuttle?

15% **A.** 240 feet

54% **B.** 1440 feet

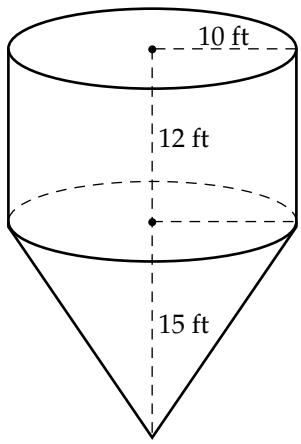
20% **C.** 2880 feet

10% **D.** 5760 feet

Benchmark	Content Focus	Content Difficulty
MA.C.2.4.1	similarity	Moderate

8 THINK SOLVE EXPLAIN

The drawing below shows an empty sand hopper at a construction site. The upper part is in the shape of a right circular cylinder with a height of 12 feet (ft) and radius of 10 feet. The lower part is in the shape of a right circular cone with a height of 15 feet.



Determine the volume of sand, in cubic feet, that will completely fill the sand hopper. Show all work necessary to justify your answer.

Work or explanation equivalent to the following:

Using 3.14 and $\frac{1}{3}$

Volume of Right Circular Cylinder $= \pi r^2 h$
$= 3.14\ (10)^2\ 12$
$= 3.14\ (1200)$
$= 3768$

Volume of Right Circular Cone $= \frac{1}{3}\ \pi\ r^2\ h$
$= \frac{1}{3}\ (3.14)(10)^2\ 15$
$= 3.14\ (500)$
$= 1570$

Add the two volumes.
Volume of Sand Hopper $= 3768 + 1570$
$= 5338$

OR

Using $\frac{22}{7}$ and $\frac{1}{3}$

Volume of Right Circular Cylinder $= \pi r^2 h$
$= \left(\frac{22}{7}\right)(10)^2\ 12$
$= \frac{22}{7}\ (1200)$
$= 3771.4285$

Volume of Right Circular Cone $= \frac{1}{3}\ \pi\ r^2\ h$
$= \frac{1}{3}\left(\frac{22}{7}\right)(10)^2\ 15$
$= \frac{22}{7}\ (500)$
$= 1571.4285$

Add the two volumes.
Volume of Sand Hopper $= 3771.4285 + 1571.4285$
$= 5342.857$

OR other equivalent

Volume of sand an answer in the range of 5322-5343 (cu. ft.) or 1700 π (cu. ft.)

Benchmark	Content Focus	Content Difficulty
MA.B.1.4.1	volume	Moderate

Percentage of Students Receiving				
Score Point 0	Score Point 1	Score Point 2	Score Point 3	Score Point 4
31	31	39		

9 At the close of the stock market on Monday, the value of a certain stock was $12.00 per share. By the close on Tuesday, the value of the stock went up 50% per share. At close on Wednesday, the value of the stock was down 5% per share from Tuesday's closing value.

THINK
SOLVE
EXPLAIN

Complete Parts A, B, and C.

Part A Determine the value of the stock at closing on Tuesday and Wednesday. Show all work necessary to justify your answer.

Explanation or work equivalent to the following:

$12 + (12 \times .5) = 18$

$18 - (18 \times .05) = 17.10$

$18 - .9 = 17.10$

Value on Tuesday $18.00 ***Value on Wednesday*** $17.10

Part B Determine the total percent change in the value of the stock from Monday to Wednesday. Show all work necessary to justify your answer.

Work Space

Explanation or work equivalent to the following:

$17.10 - 12.00 = 5.10$

$5.10 \div 12.00 = .425$

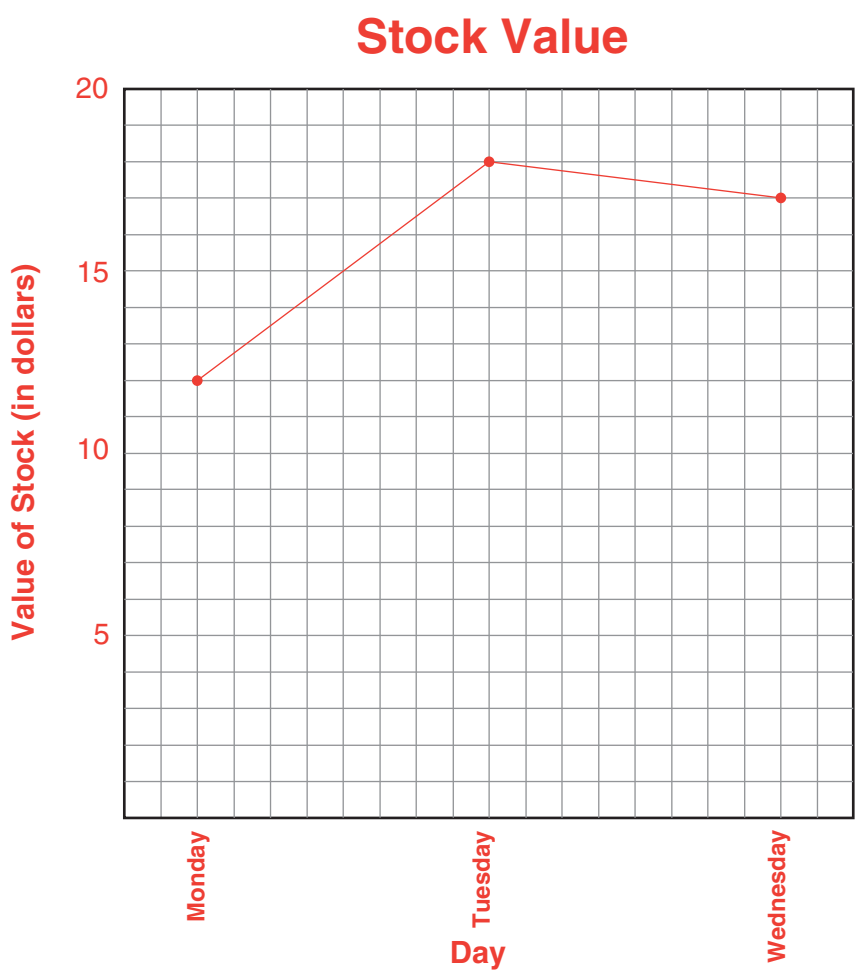
$0.425 \times 100 = 42.5$

Total percent change 42.5% increase

Part C Make a line graph that shows the trend in the value of the stock at the close of the stock market on Monday, Tuesday, and Wednesday.

Be sure to include:

- a title for the graph
- labels for the axes
- appropriate and consistent scales
- accurately graphed data



Benchmark	Content Focus	Content Difficulty
MA.E.1.4.1	line graph	Moderate

Percentage of Students Receiving				
Score Point 0	Score Point 1	Score Point 2	Score Point 3	Score Point 4
15	21	48	8	9

10 Each ship that passes through the Panama Canal requires about 52 million gallons of water to move the ship through the canal from the Atlantic Ocean to the Pacific Ocean.

If 36 ships passed through the canal, moving from the Atlantic Ocean to the Pacific Ocean, which is closest to the number of gallons of water that was required?

29% **F.** 1.9×10^8 gallons

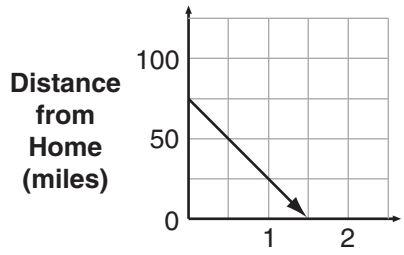
51% **G.** 1.9×10^9 gallons

14% **H.** 8.8×10^8 gallons

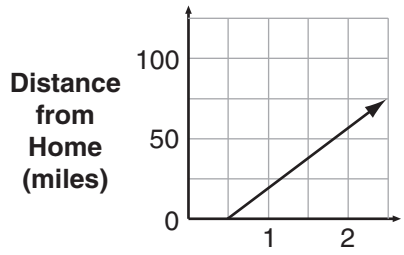
6% **I.** 8.8×10^9 gallons

Benchmark	Content Focus	Content Difficulty
MA.A.3.4.3	solving real world problems involving scientific notation	Low

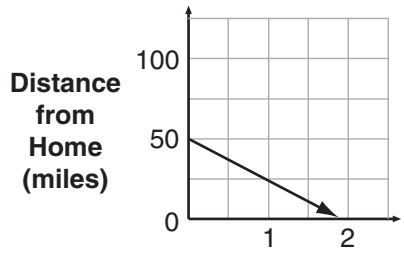
11 It took Myron 90 minutes, at an average rate of 50 miles per hour, to drive home from a business trip. Which of these graphs best represents Myron's drive home?



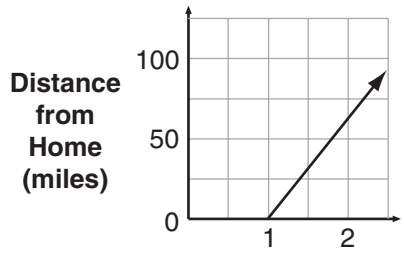
55% **A.**



8% **C.**



26% **B.**



11% **D.**

Benchmark	Content Focus	Content Difficulty
MA.E.3.4.1	interpretation of data	Moderate

12 Louella runs a messenger service and must keep track of the gas mileage of each car. When she filled the gas tank of one car, she used a calculator to find the gas mileage. The calculator display read "23.355178."

Which of these numbers most closely represents the gas mileage in miles per gallon?

18% **F.** 2.335×10^2

6% **G.** $\frac{24}{3}$

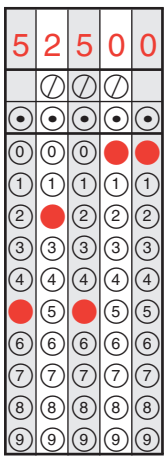
53% **H.** $23\frac{1}{3}$

23% **I.** $\frac{2335}{1000}$

Benchmark	Content Focus	Content Difficulty
MA.A.1.4.4	equivalent forms of numbers	Low

13 The sun travels along the Milky Way's spiral arm at a rate of 250 kilometers per second. How far, in kilometers, will the sun travel in $3\frac{1}{2}$ minutes?

Example of a Correct Gridded Response:

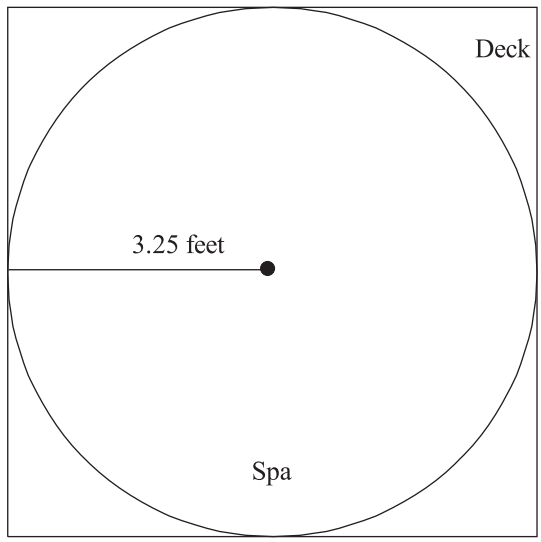


Acceptable Gridded Response(s)
52500

Benchmark	Content Focus	Content Difficulty
MA.B.2.4.2	rated measure	Moderate

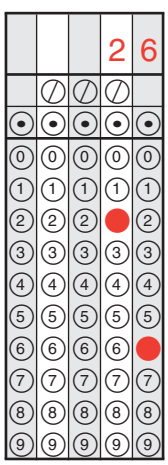
Percentage of Students Answering Correctly
60

14 Roderick works for JB Spas. He is installing a circular spa that will be enclosed by a square deck. The figure below illustrates the spa and the deck as seen from above.



The radius of the spa is 3.25 feet. What will be the perimeter, in feet, of the deck?

Example of a Correct Gridded Response:

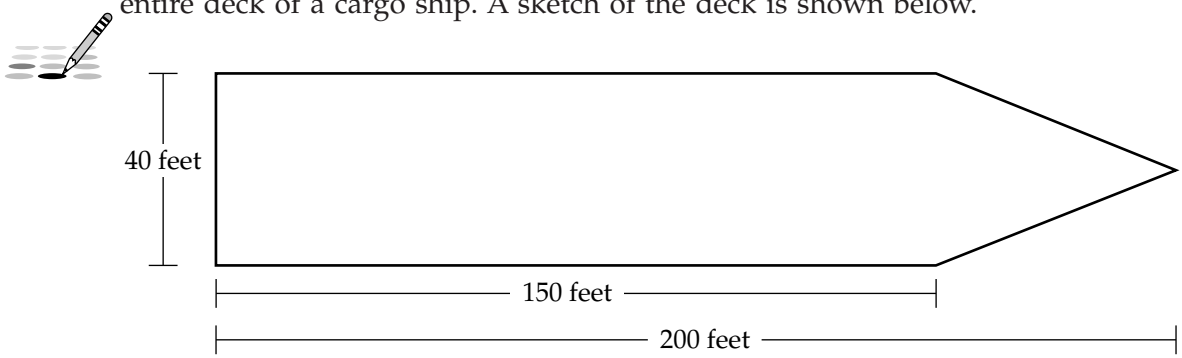


Acceptable Gridded Response(s)
26

Benchmark	Content Focus	Content Difficulty
MA.C.1.4.1	regular polygons	Moderate

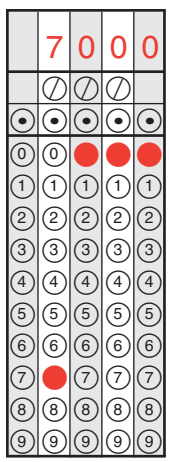
Percentage of Students Answering Correctly
49

15 Jackie wants to determine the number of gallons of paint needed to paint the entire deck of a cargo ship. A sketch of the deck is shown below.



How many square feet will be painted?

Example of a Correct Gridded Response:



Acceptable Gridded Response(s)
7000

Benchmark	Content Focus	Content Difficulty
MA.B.1.4.1	area	Moderate

Percentage of Students Answering Correctly
42

16 The Regal High Debate Club qualified for the state meet. How many possible two-member debate teams can be formed from a pool of six students in the Regal High Debate Club?

4% **A.** 720
8% **B.** 360
37% **C.** 30
50% **D.** 15

Benchmark	Content Focus	Content Difficulty
MA.E.2.4.1	combinations	Moderate

17 The four members of an a cappella singing group, two men and two women, always stand in a row when they sing. If they line up in random order, what is the probability that a woman will be at each end of the row?

60% **F.** $\frac{1}{2}$

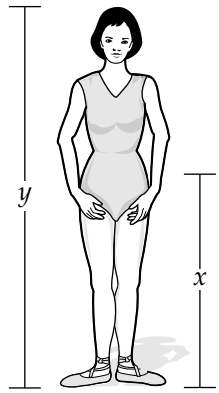
27% **G.** $\frac{1}{6}$

9% **H.** $\frac{1}{12}$

3% **I.** $\frac{1}{24}$

Benchmark	Content Focus	Content Difficulty
MA.E.2.4.1	single event probability	High

18 Artists have traditionally studied human proportions to draw human figures realistically. When drawing a female figure like the one in this picture, the realistic ratio of the distance from the hip to the toe *(x)* to the height of the woman *(y)* is 0.613. An artist is creating a 9-inch-high drawing of a woman. What should be the approximate distance in inches from the hip to the toe?



9% **A.** 0.07 inch

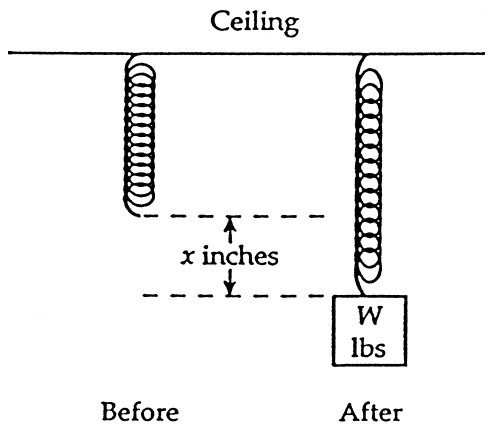
19% **B.** 3.5 inches

59% **C.** 5.5 inches

13% **D.** 14.7 inches

Benchmark	Content Focus	Content Difficulty
MA.B.2.4.1	indirect measurement	Moderate

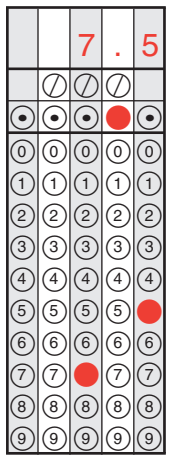
19 When an object that weighs W pounds is hung from a spring, the spring stretches x inches, as shown in the picture below.



Use the equation below to determine how many inches the spring will stretch if an object weighing 5 pounds is attached to the end of the spring.

$$W = \frac{2}{3}x$$

Example of a Correct Gridded Response:

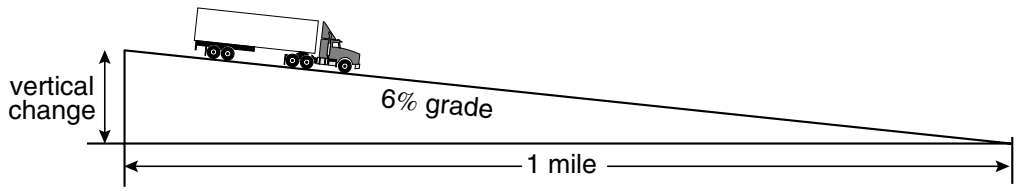


Acceptable Gridded Response(s)
7.5

Benchmark	Content Focus	Content Difficulty
MA.D.2.3.2	equations	Low

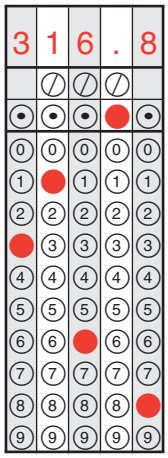
Percentage of Students Answering Correctly
41

20 On some mountain highways, trucks are advised to use low gear on roads that have a 6% grade. A 6% grade means the road changes vertically 6 feet for every 100 feet of horizontal distance.



With a 6% grade, what is the vertical change, **in feet**, if the horizontal distance traveled is 1 mile?

Example of a Correct Gridded Response:

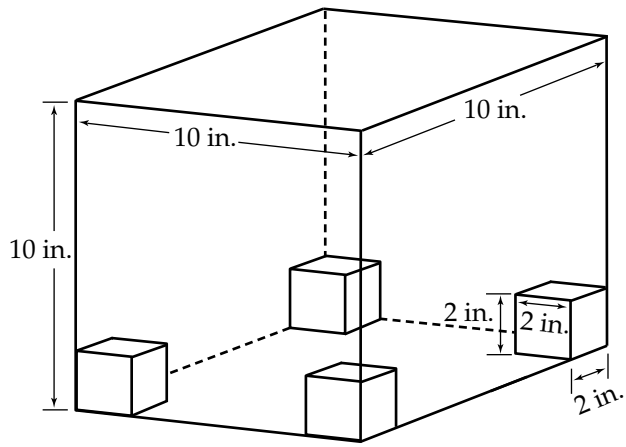


Acceptable Gridded Response(s)
316.8

Benchmark	Content Focus	Content Difficulty
MA.C.2.4.1	similarity	Moderate

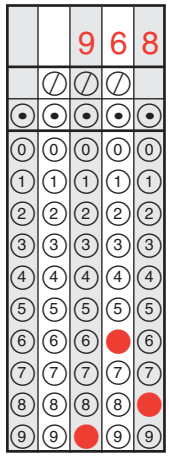
Percentage of Students Answering Correctly
38

21 A shipping carton for computer parts is in the shape of a cube that measures 10 inches on each edge. In each of its bottom corners, the carton has 1 foam cube. Each foam cube measures 2 inches on an edge, as shown in the diagram below.



What is the volume, in cubic inches, of the empty space in the shipping carton when the 4 foam cubes are inside the box?

Example of a Correct Gridded Response:

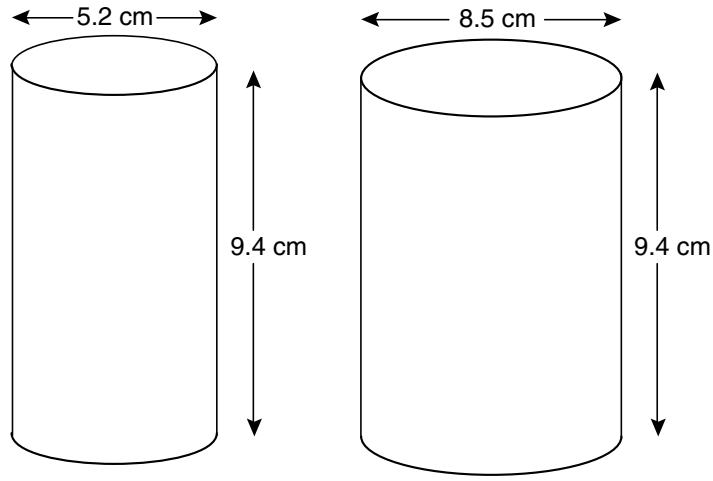


Acceptable Gridded Response(s)
968

Benchmark	Content Focus	Content Difficulty
MA.B.1.4.1	volume	Moderate

Percentage of Students Answering Correctly
42

22 An orange juice company sells a can of frozen orange juice that measures 9.4 centimeters in height and 5.2 centimeters in diameter.



The company wants to sell a larger can of juice. The height of the can is kept at 9.4 cm, but the diameter is increased to 8.5 cm. About how many times more juice will the new can hold?

18% **F.** 1.6 times as much

9% **G.** 1.7 times as much

37% **H.** 2.7 times as much

35% **I.** 3.3 times as much

Benchmark	Content Focus	Content Difficulty
MA.D.1.4.2	changing measurement parameters	Moderate

23 Frank plans to set up a fruit juice stand at the state fair. He will purchase 500 cans of juice for $135, and he will charge $2 for each can he sells. In addition to the cost of the juice, Frank will need to pay $20 to set up the stand. Which of the following expressions could Frank use to find out how much money he could make, after expenses, for selling j cans of juice?

23% **A.** $500j - 135 - 20$

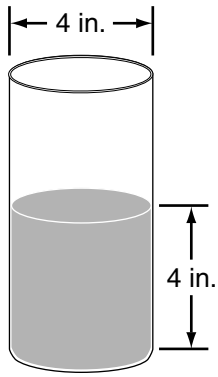
8% **B.** $135j - 500 - 20$

9% **C.** $2j - 500 - 20$

60% **D.** $2j - 135 - 20$

Benchmark	Content Focus	Content Difficulty
MA.D.1.4.1	functions	Moderate

24 A scientist studying global warming conducted an experiment in her lab. She poured 4 inches of water into a cylinder as shown below.



According to her study, the volume of water in the cylinder should rise by 0.1% when she raises the water temperature by 10 degrees. Which of these is closest to the volume of water in the cylinder **after** the temperature is raised 10 degrees?

46% **F.** 50.29 cubic inches
33% **G.** 55.26 cubic inches
13% **H.** 200.96 cubic inches
7% **I.** 201.16 cubic inches

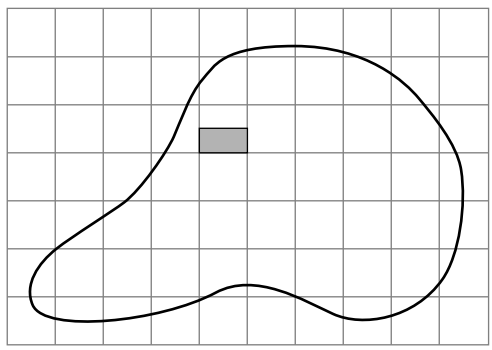
Benchmark	Content Focus	Content Difficulty
MA.D.1.4.2	changing measurement parameters	High

25 For the following problem, you will be required to use ESTIMATION strategies.

THINK
SOLVE
EXPLAIN

Luisa, a ranger at a desert preserve, is estimating the number of snakes in the preserve. She counted 25 snakes in a 0.5-square kilometer area as represented by the shaded area on the grid below. The total area of the preserve is also outlined on the grid.

DESERT PRESERVE MAP



= 1 km^2

If Luisa assumes the snakes are evenly distributed throughout the preserve, how many snakes should she ESTIMATE are in the entire preserve?

Show your work or explain in words how to make an estimate.

Work or explanation must be consistent with the student's estimate and be similar to the following:

22 squares (full) × 50 snakes per square = 1,100 snakes
12.5 squares (from partials) × 50 snakes per square = 625 snakes
1,100 + 625 = 1,725 snakes

OR

I counted 22 full squares and another $12\frac{1}{2}$ squares by adding parts of squares together, for a total of $34\frac{1}{2}$ squares. Then I multiplied that times 50, the number of snakes per km^2, and that is the total number of snakes in the preserve.

Estimate *Estimate in the range of:* 1,400 − 1,800 (Based on 28 − 36 squares)

Benchmark	Content Focus	Content Difficulty
MA.A.4.4.1	area estimations	Moderate

Percentage of Students Receiving				
Score Point 0	Score Point 1	Score Point 2	Score Point 3	Score Point 4
42	26	32		

26 Becky's 16th birthday is on September 4th. On the last day of February, she calculates how many more days there will be until her birthday by making the table below.

NUMBER OF DAYS UNTIL 16TH BIRTHDAY

Month	Number of Days
March	31
April	30
May	31
June	30
July	31
August	31
September	3

Which of the following expressions could Becky use to calculate the number of days there will be until her 16th birthday?

5% **A.** $3 \times 31 + 3 \times 30 + 3$

5% **B.** $3 \times 31 + 4 \times 30 + 3$

84% **C.** $4 \times 31 + 2 \times 30 + 3$

6% **D.** $4 \times 31 + 3 \times 30 + 3$

Benchmark	Content Focus	Content Difficulty
MA.A.3.4.2	operational shortcuts	Low

27 A geneticist studying twins read that fraternal twins occur in 1 out of every 80 births. In a sample of 560 mothers-to-be, how many would be expected to give birth to fraternal twins?

11% **F.** $\frac{1}{7}$

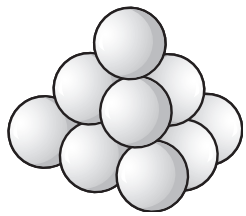
5% **G.** $\frac{1}{70}$

80% **H.** 7

4% **I.** 70

Benchmark	Content Focus	Content Difficulty
MA.E.2.4.1	single event probability	Low

28 The pirates who plundered ships in the Caribbean Sea used cannons in their attacks. Cannonballs were stacked on the deck in a square pyramid like the one shown below. The top layer had 1 ball, the second layer had 4 balls, and the third layer had 9 balls.



If the pyramid were 5 layers high, how many cannonballs would be in the **fifth** layer?

84% **A.** 25
10% **B.** 39
4% **C.** 44
2% **D.** 55

Benchmark	Content Focus	Content Difficulty
MA.D.1.4.1	graphic pattern	Moderate

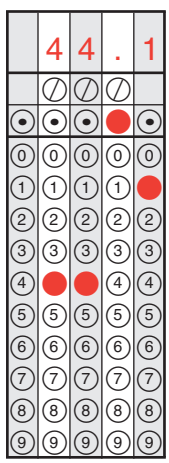
29 At the surface of the ocean, a scuba diver's pressure gauge reads zero pounds per square inch (psi). At 33 feet below the surface of the ocean, the pressure is 14.7 psi. At 66 feet below the surface, the pressure is 29.4 psi. The table below shows the relationship between depth and pressure.

PRESSURE AT GIVEN DEPTHS

Depth (in feet)	Pressure (in psi)
0	0
33	14.7
66	29.4
99	

If the pressure increases at a constant rate, what will be the pressure in psi at 99 feet?

Example of a Correct Gridded Response:



Acceptable Gridded Response(s)
44.1

Benchmark	Content Focus	Content Difficulty
MA.D.1.4.1	functions	Moderate

Percentage of Students Answering Correctly
66

30 A fishing boat captain organized his fishing records in the table below.

APRIL FISHING RECORDS

Type of Fish	Cost per Pound	Pounds Sold	Total Dollars Earned
Snapper	\$5.50	s	\$8,250.00
Grouper	\$4.75	g	
Total		2,600	\$13,475.00

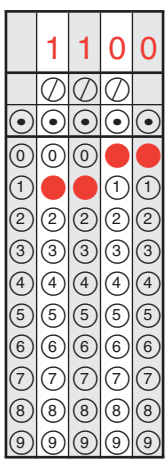
The following equations represent the information in the table, where s is the number of pounds of snapper and g is the number of pounds of grouper.

$$s + g = 2{,}600$$

$$5.50s + 4.75g = 13{,}475$$

The captain used these equations to determine that \$8,250.00 was received from the sale of the snapper. How many pounds of grouper, g, were sold in April?

Example of a Correct Gridded Response:



Acceptable Gridded Response(s)
1100

Benchmark	Content Focus	Content Difficulty
MA.D.2.4.2	systems of equations/inequalities	Moderate

Percentage of Students Answering Correctly
63

31

THINK
SOLVE
EXPLAIN

The drama club plans to sell cans of orange soda and lemon-lime soda at its annual theater event. The club has enough money to buy a total of 288 cans of soda and has decided to buy twice as many cans of lemon-lime soda as orange soda.

Determine the number of cans of each flavor of soda the drama club will buy for the event. Show your work.

Work equivalent to the following:

x = orange cans
2x = lemon-lime cans
288 = total cans of soda

96 cans of orange soda

$x + 2x = 288$
$3x = 288$
$x = \frac{288}{3}$
$x = 96$

2x = lemon-lime cans
2(96) = lemon-lime cans
192 cans of lemon-lime soda

OR *equivalent work or explanation*

Number of cans of orange soda 96

Number of cans of lemon-lime soda 192

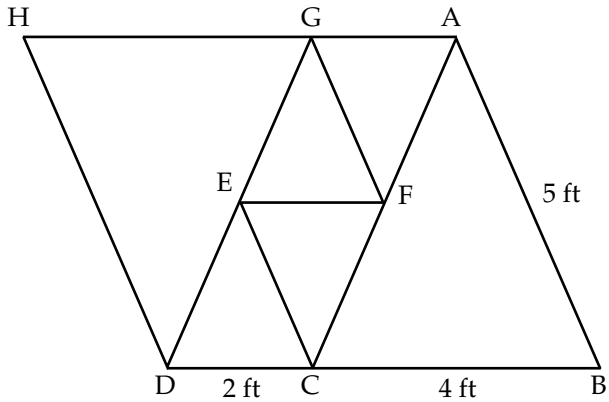
Benchmark	Content Focus	Content Difficulty
MA.D.2.4.2	systems of equations/inequalities	Moderate

Percentage of Students Receiving				
Score Point 0	Score Point 1	Score Point 2	Score Point 3	Score Point 4
43	18	39		

32

THINK
SOLVE
EXPLAIN

An architect is using **isosceles triangles** in the design of a bridge. In the diagram below, all line segments represent the steel beams needed to build this section of the bridge. Line segment $\overline{HA}$ is parallel to line segment $\overline{DB}$. ΔDEC is similar to ΔCAB and congruent to ΔAFG.



Part A Write and solve a proportion to determine the length, in feet, of $\overline{EC}$. Show your work.

Work equivalent to the following:

$\frac{EC}{5} = \frac{2}{4}$

$EC = 5\left(\frac{2}{4}\right)$

$EC = \frac{10}{4}$

$EC = 2.5$

Proportion $\frac{EC}{5} = \frac{2}{4}$ **OR** *other valid proportion for determining the length of* $\overline{EC}$.

Length, in feet, of $\overline{EC}$ 2.5 (feet)

Part B In the diagram, all the smaller triangles are congruent, and all the larger triangles are congruent. Determine the total length, in feet, of all the steel beams needed to build the section of the bridge shown. Show all of the work needed to determine the total length of the beams.

Work equivalent to the following:

Total length in feet = 6(2.5) + 2(5) + 3(2) + 2(4)

Total length in feet = 15 + 10 + 6 + 8

Total length in feet = 39

Total length in feet 39 (feet)

Benchmark	Content Focus	Content Difficulty
MA.C.2.4.1	similarity	Moderate

Percentage of Students Receiving				
Score Point 0	Score Point 1	Score Point 2	Score Point 3	Score Point 4
32	18	24	9	17

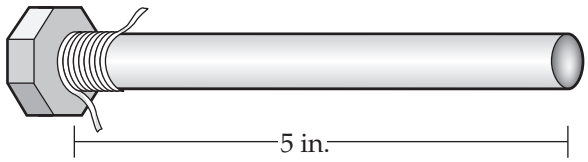
33 On December 17, 1903, Wilbur and Orville Wright flew their first powered airplane near Kitty Hawk, North Carolina. They flew the plane a distance of 852 feet in 59 seconds.

If the Wrights' plane had continued at the same rate of speed, about how many **minutes** would it have taken them to fly 1 mile?

77% **F.** 6 minutes
8% **G.** 9 minutes
10% **H.** 14 minutes
5% **I.** 90 minutes

Benchmark	Content Focus	Content Difficulty
MA.B.1.4.2	rate/distance/time	Moderate

34 Jenny is making an electromagnet by wrapping wire around an iron bolt, as shown in the picture below.



(not to scale)

The wire is 0.1 inch in diameter so each wrap is 0.1 inch wide. If Jenny makes one wrap every 3 seconds, how many **seconds** will it take to wrap the 5-inch bolt?

17% **A.** 16.7 seconds

13% **B.** 30.0 seconds

66% **C.** 150.0 seconds

5% **D.** 166.7 seconds

Benchmark	Content Focus	Content Difficulty
MA.B.1.4.2	rate/distance/time	High

35 The table lists 4 stars and their approximate distances from Earth.

APPROXIMATE DISTANCE FROM EARTH

Star	Distance (in km)
Star Q	4.2×10^{15}
Star R	3.9×10^{15}
Star S	1.2×10^{16}
Star T	9.0×10^{14}

Which star is the greatest distance from Earth?

7% **F.** Star Q
2% **G.** Star R
69% **H.** Star S
22% **I.** Star T

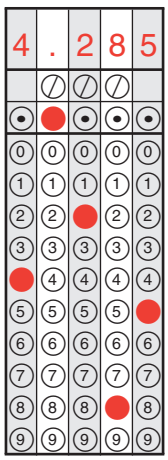
Benchmark	Content Focus	Content Difficulty
MA.A.1.4.2	order of numbers	Moderate

36 Arturo was evaluating some formulas as part of a science experiment.

What is the value of the following expression?

$$(^{-}2.1)^2 + (^{-}0.5)^3$$

Example of a Correct Gridded Response:



Acceptable Gridded Response(s)
4.285

Benchmark	Content Focus	Content Difficulty
MA.A.3.4.1	raising to powers	Moderate

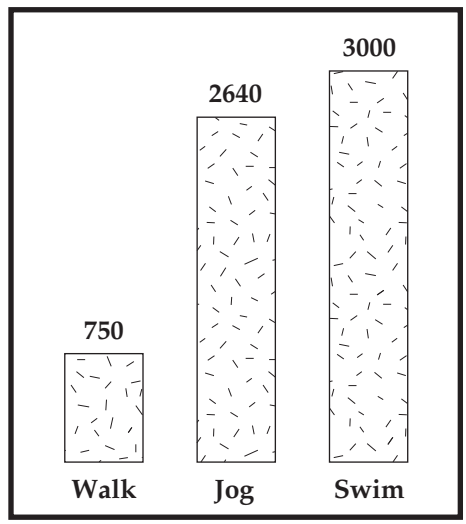
Percentage of Students Answering Correctly
57

37 A nutritionist has a female client who has been inactive, but plans to begin swimming one hour each day. This change in her level of activity will result in her daily energy requirement increasing by the same amount she expends swimming. According to the information below, what will be the woman's new daily energy requirement in kilojoules (kJ) after she begins swimming one hour each day?

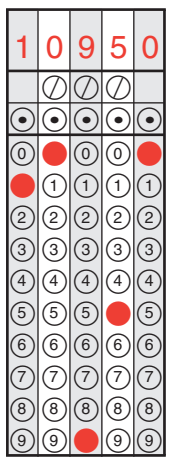
AVERAGE DAILY ENERGY REQUIREMENT

Subject	kJ/day
Infant, 9–12 months	4200
Child, 8 years	8770
Boy, 15 years	12 560
Girl, 15 years	9560
Woman (inactive)	7950
Man (inactive)	10 460

ENERGY EXPENDED DURING CERTAIN ACTIVITIES (in kJ per hour)



Example of a Correct Gridded Response:



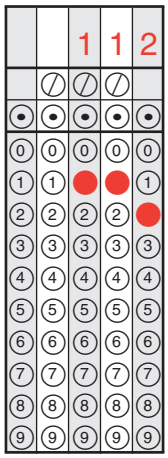
Acceptable Gridded Response(s)
10950

Benchmark	Content Focus	Content Difficulty
MA.E.3.4.1	interpretation of data	Moderate

Percentage of Students Answering Correctly
55

38 A bicycle store owner sells all merchandise at 25% above original cost. A customer bought a bicycle for $140.00. How many dollars did the store owner originally pay for the bicycle?

Example of a Correct Gridded Response:



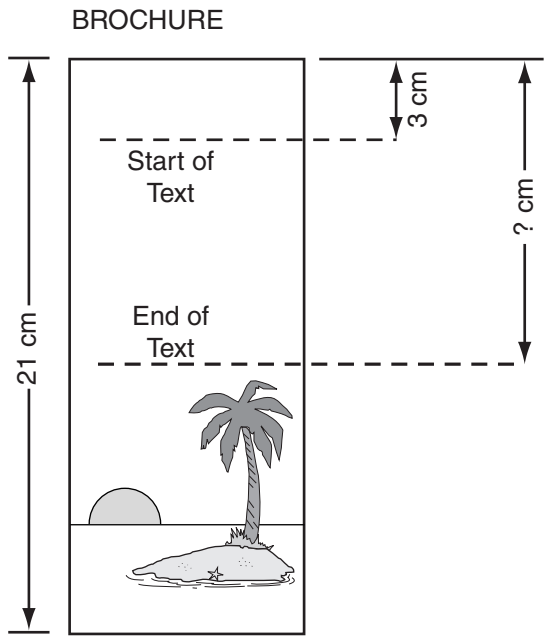
Acceptable Gridded Response(s)
112

Benchmark	Content Focus	Content Difficulty
MA.A.3.4.3	solving real-world problems involving fractions/decimals	Moderate

Percentage of Students Answering Correctly
12

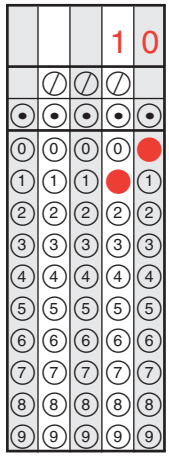
39 A graphic artist is creating a brochure according to the following specifications.

- The length of the brochure is 21 centimeters.
- The text must start 3 centimeters from the top of the brochure.
- The total amount of space the text occupies must not exceed one-third of the total length of the brochure.



What is the maximum distance in centimeters (cm) between the top of the brochure and the end of the text?

Example of a Correct Gridded Response:

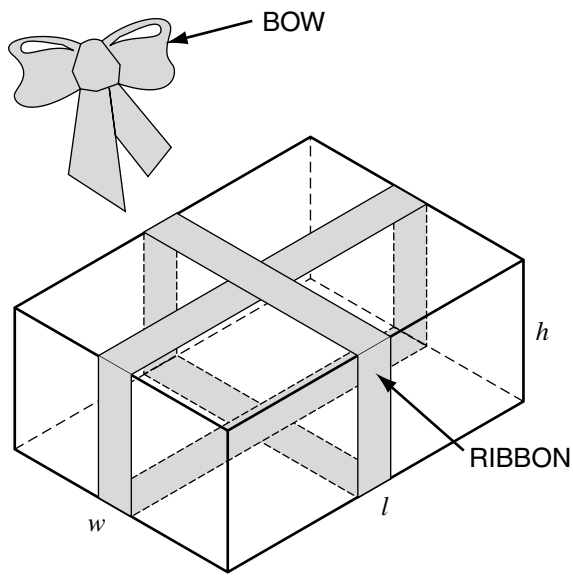


Acceptable Gridded Response(s)
10

Benchmark	Content Focus	Content Difficulty
MA.A.3.4.3	solving real world problems involving measurement	Moderate

Percentage of Students Answering Correctly
25

40 Sonya needs to buy ribbon to wrap around the rectangular-shaped present shown.



She also needs 25 inches of ribbon to make a bow. Which expression represents the minimum amount of ribbon Sonya needs to buy?

7% **A.** $l + w + h + 25$

27% **B.** $l \times w \times h + 25$

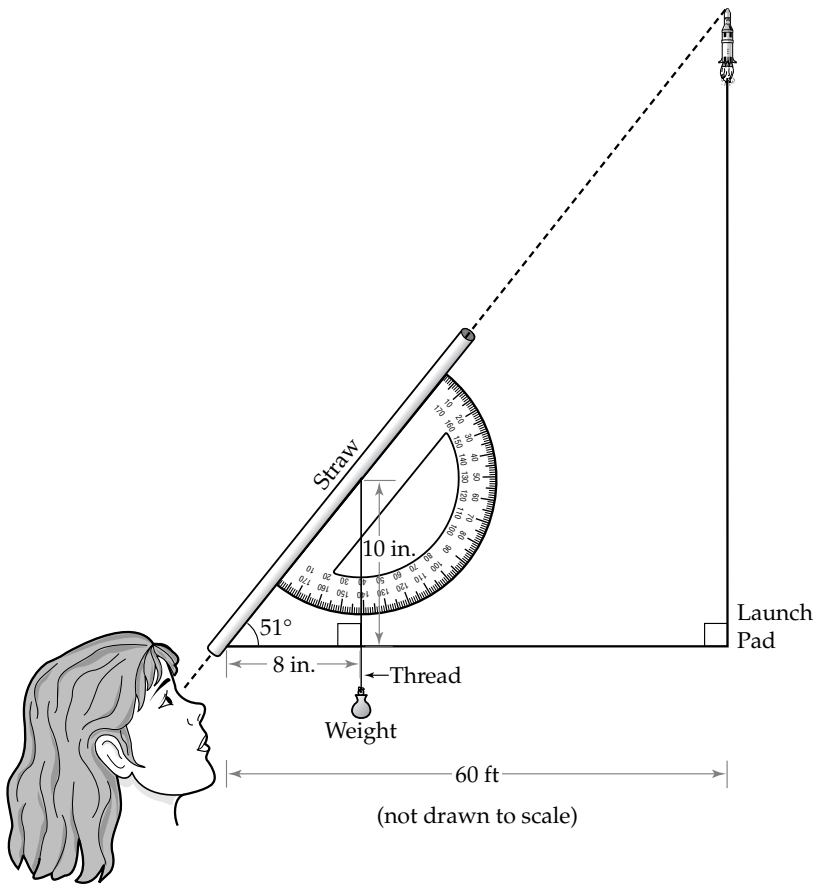
21% **C.** $2l + 2w + 2h + 25$

45% **D.** $2l + 2w + 4h + 25$

Benchmark	Content Focus	Content Difficulty
MA.D.2.4.2	expressions	High

41 Rita designs and tests model rockets. She made a device that allows her to measure the angle of the rocket's elevation at the peak of its path.

During one test, she used the device at a point 60 feet from the launch pad. When the rocket reached the peak of its path, the measurements on Rita's device were as shown in the diagram below.



Based on Rita's measurements, what was the approximate height, in feet, that the rocket reached at the peak of its path?

10% **F.** 48 feet

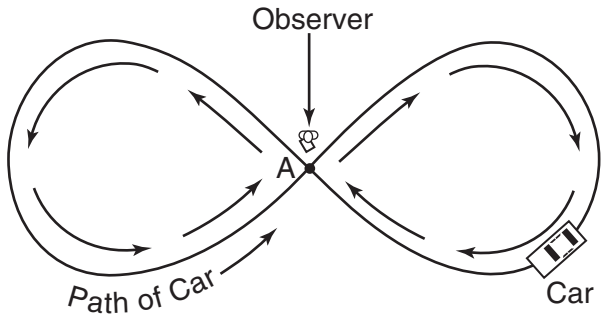
55% **G.** 75 feet

25% **H.** 96 feet

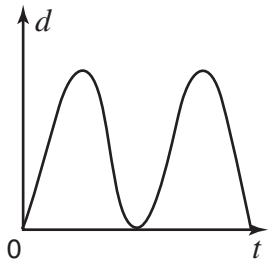
11% **I.** 128 feet

Benchmark	Content Focus	Content Difficulty
MA.C.3.4.1	similarity	Moderate

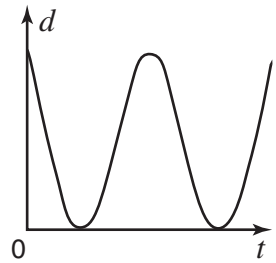
42 An observer stood at the intersection of a figure-eight racetrack. The diagram shows the observer and a single car as it started at point *A* next to the observer and traveled once around the track and returned to point *A*.



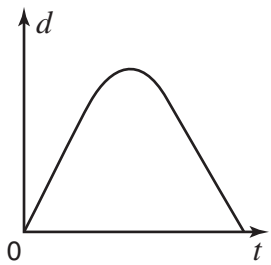
Which graph best shows *d*, the distance of the car from the observer as it traveled *t* seconds around the track?



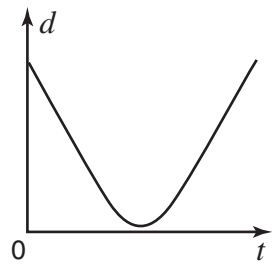
60% **A.**



20% **C.**



13% **B.**

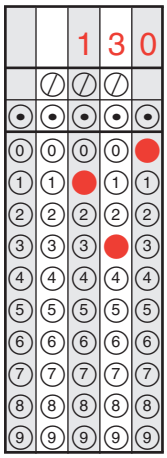


8% **D.**

Benchmark	Content Focus	Content Difficulty
MA.E.1.4.1	line graph	High

43 Ed bowled six games at Jordan's Bowlerama. For the first 5 games that Ed bowled, his mean score was 120. He bowled a score of 180 for his 6th game. What was his **mean** bowling score for all 6 games?

Example of a Correct Gridded Response:

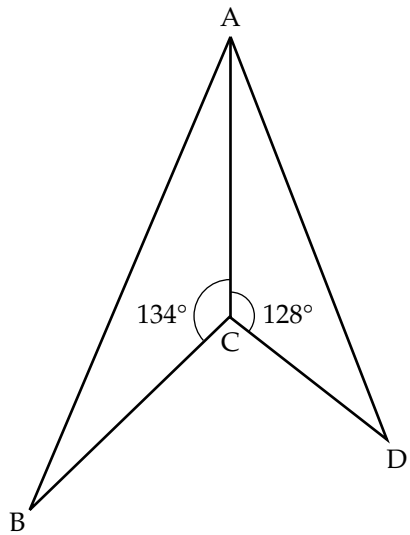


Acceptable Gridded Response(s)
130

Benchmark	Content Focus	Content Difficulty
MA.E.1.4.2	mean	Moderate

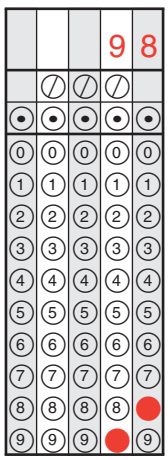
Percentage of Students Answering Correctly
33

44 The diagram below shows a design found on a mask from Nigeria. In the diagram, ∠ACB measures 134°, and ∠ACD measures 128°.



What is the measure, in degrees, of ∠BCD?

Example of a Correct Gridded Response:



Acceptable Gridded Response(s)
98

Benchmark	Content Focus	Content Difficulty
MA.C.1.4.1	measurement of angles	Moderate

Percentage of Students Answering Correctly
58

45 THINK SOLVE EXPLAIN

The course of the monorail at an amusement park must be changed to make room for a new parking lot. Engineers have decided that only the main supporting column located at point C on the grid below should be relocated. They have also decided that the rebuilt course should be in the shape of a parallelogram.

Part A Plot the new location of the supporting column and write its coordinates. Label the new location C′.

MONORAIL COURSE

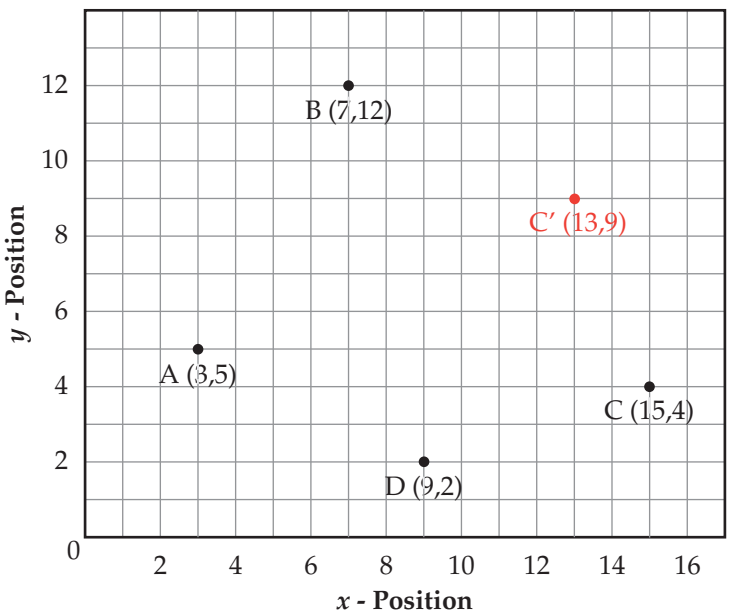
Using the slope formula:

Slope $\overline{AD} = \frac{2-5}{9-3} = \frac{-3}{6}$

Slope $\overline{BC'} = \frac{9-12}{13-7} = \frac{-3}{6}$

Slope $\overline{AB} = \frac{12-5}{7-3} = \frac{7}{4}$

Slope $\overline{DC'} = \frac{9-2}{13-9} = \frac{7}{4}$



Using the distance formula:

AD = $\sqrt{(9-3)^2 + (2-5)^2}$
AD = $\sqrt{36+9}$
AD = $\sqrt{45}$

BC′ = $\sqrt{(13-7)^2 + (9-12)^2}$
BC′ = $\sqrt{36+9}$
BC′ = $\sqrt{45}$

AB = $\sqrt{(7-3)^2 + (12-5)^2}$
AB = $\sqrt{16+49}$
AB = $\sqrt{65}$

DC′ = $\sqrt{(13-9)^2 + (9-2)^2}$
DC′ = $\sqrt{16+49}$
DC′ = $\sqrt{65}$

Part B Use the definition or properties of a parallelogram to verify that the new monorail course is a parallelogram. You must use the slopes of the sides, the lengths of the sides, or both, to help verify your answer.

$\overline{AD} \cong \overline{BC'}$ because the length of each side is $\sqrt{45}$ or $3\sqrt{5}$.

$\overline{AB} \cong \overline{DC'}$ because the length of each side is $\sqrt{65}$.

$\overline{AD} \parallel \overline{BC'}$ because the slope of each side is $\frac{-3}{6}$ or $\frac{-1}{2}$.

$\overline{AD} \parallel \overline{DC'}$ because the slope of each side is $\frac{7}{4}$.

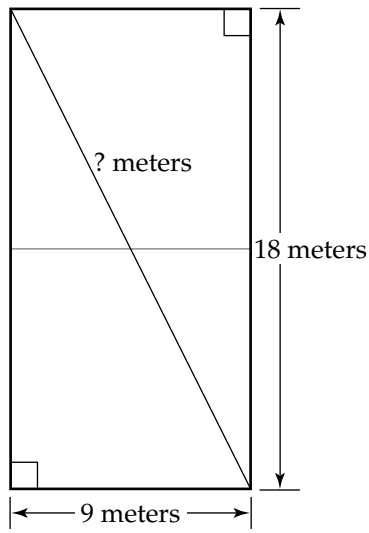
Therefore, ABC′D is a parallelogram because both pairs of opposite sides are parallel and congruent to each other.

OR *similar explanations for (1, 15) and (1, −5)*

Benchmark	Content Focus	Content Difficulty
MA.C.3.4.2	parallelism	High

Percentage of Students Receiving				
Score Point 0	Score Point 1	Score Point 2	Score Point 3	Score Point 4
58	33	9		

46 The dimensions and shape of a volleyball court are shown in this picture. What is the approximate distance of a serve that is hit diagonally from one corner of the court to the other?



22% **F.** 27.0 meters

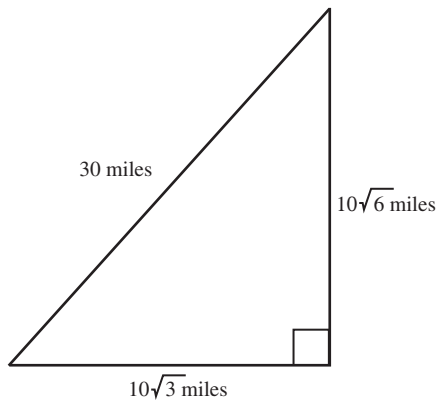
66% **G.** 20.1 meters

9% **H.** 15.6 meters

3% **I.** 12.7 meters

Benchmark	Content Focus	Content Difficulty
MA.C.3.4.1	Pythagorean theorem	Moderate

47 The dimensions of a right triangle are shown below.



The ratio of the base of the triangle to its height is $\frac{10\sqrt{3}}{10\sqrt{6}}$.

Which of the following is equivalent to $\frac{10\sqrt{3}}{10\sqrt{6}}$?

38% **A.** $\frac{1}{2}$

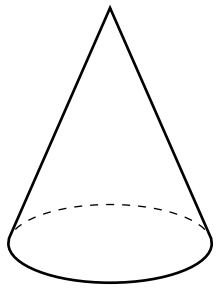
36% **B.** $\frac{\sqrt{2}}{2}$

18% **C.** $\sqrt{2}$

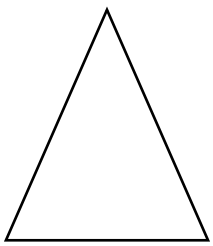
8% **D.** $\frac{2}{\sqrt{2}}$

Benchmark	Content Focus	Content Difficulty
MA.A.1.4.4	equivalent forms of numbers	Low

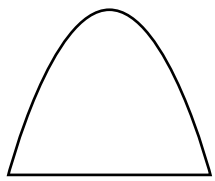
48 The figure below is a right circular cone.



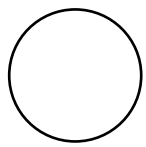
Which of the following is NOT a planar cross-section from the right circular cone?



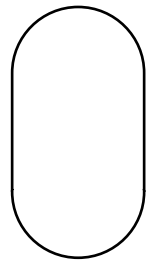
10% **F.**



21% **G.**



6% **H.**



64% **I.**

Benchmark	Content Focus	Content Difficulty
MA.C.2.4.2	identifying planar cross sections	Moderate

49 A salesperson's total salary includes a base pay of $500 per month plus 8.5% of the monthly sales. If x = sales per month and y = total salary, which of the following shows how to determine the total salary for any month?

4% **A.** $500 - y = 0.085x$

87% **B.** $y = 500 + 0.085x$

6% **C.** $y = -500 - 0.085x$

2% **D.** $-0.085x + y = -500$

Benchmark	Content Focus	Content Difficulty
MA.D.1.4.1	functions	Low

50 Every year in the Chinese calendar is named for an animal. Each year in the table below has been designated as a "Year of the Ox."

SOME CHINESE CALENDAR YEARS OF THE OX

Year
1973
1985
1997
2009

If n represents any "Year of the Ox," which of the following expressions represents the **previous** "Year of the Ox"?

70% **F.** $n - 12$

14% **G.** $n + 12$

9% **H.** $12n$

7% **I.** $\frac{n}{12}$

Benchmark	Content Focus	Content Difficulty
MA.D.1.4.1	number sequences	Low

MATHEMATICS

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Test Book

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