

Student Name _____

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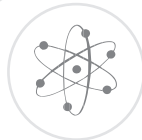
Georgia



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Tests

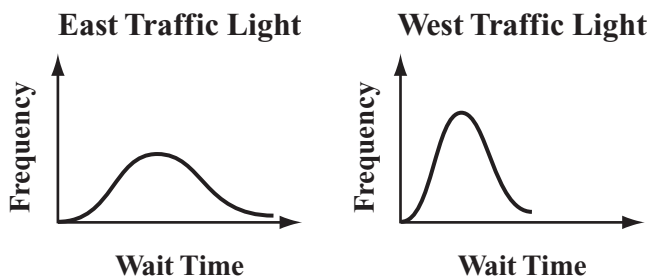
Mathematics II
Geometry/Algebra II/Statistics
Released Item Commentary



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ITEM NUMBER	STANDARD ALIGNMENT	DOK	KEY
1	2D,1,c; 2P,1,b; 2P,3,a	2	A

1 The curves in these graphs represent the distribution of wait times for two traffic lights.



Which statement best describes the range and the standard deviation of the wait times at each traffic light?

- A The east traffic light has both a greater range and a greater standard deviation.
- B The west traffic light has both a greater range and a greater standard deviation.
- C The east traffic light has a greater range, and the west traffic light has a greater standard deviation.
- D The west traffic light has a greater range, and the east traffic light has a greater standard deviation.

GM2073012_1

COMMENTARY:

This item requires students to demonstrate the conceptual understanding of range and standard deviation when given graphs showing the frequency of data. Students need to have had experiences comparing graphs with similar and disparate characteristics in order to feel comfortable answering this item. The graphs that students use need to include frequency graphs in order to interpret the meaning of the horizontal and vertical axis appropriately. Students who have only dealt with range and standard deviation as algorithmic applications of formulas are unlikely to be able to make the conclusions necessary to answer this question correctly. Answer A is correct. Answers B, C, and D are incorrect because neither the relative width along the wait time axis (range of the data), nor the spread of the clustering of the frequencies (standard deviation of the data) on the graph of the West Traffic Light is greater than either for the East Traffic Light.

ITEM NUMBER	STANDARD ALIGNMENT	DOK	KEY
2	2D,1,c; 2P,1,b; 2P,4,c	3	A

2 At Eastview Pizza, orders for delivered pizza are free if the pizza is delivered more than 45 minutes after it is ordered. It always takes 15 minutes to prepare a pizza at this restaurant. This table shows statistics on the delivery times for two drivers.

Pizza Delivery Driver Statistics

Driver	Mean Delivery Time	Standard Deviation
Ben	12 minutes	10 minutes
Jim	15 minutes	6 minutes

Which conclusion can be made from the data?

- A Orders for delivered pizzas are free more often when Ben is the driver.
- B Orders for delivered pizzas are free more often when Jim is the driver.
- C Orders for delivered pizzas are never free when either Ben or Jim is the driver.
- D Orders for delivered pizzas are free equally often when either Ben or Jim is the driver.

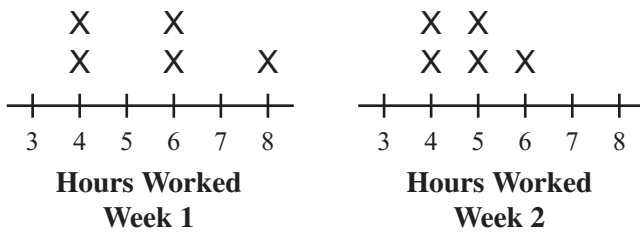
GM2073015_1

COMMENTARY:

This item requires students to demonstrate an understanding of mean and standard deviation within a real world context. The student must analyze each driver individually; then compare this analysis to choose the correct answer. Using Ben's given mean and standard deviation, and recognizing that there is no penalty for being early, for one standard deviation above the mean his deliveries occur within 22 minutes plus the 15 to cook the pizza or 37 minutes of ordering so, no free pizza; but, for two standard deviations above the mean his deliveries range up to 32 minutes plus 15 to cook or 47 minutes, so some free pizza. For Jim, one standard deviation above the mean has his deliveries occurring within 21 minutes plus 15 to cook or 36 minutes of ordering and for two standard deviations above the mean his deliveries range up to 27 minutes plus 15 to cook or 42 minutes, so still no free pizza. Thus making answer A correct because Ben causes the occurrence of free pizza more often than Jim does. Answers B, C, and D are incorrect because the comparisons are not accurate.

ITEM NUMBER	STANDARD ALIGNMENT	DOK	KEY
3	2D,1,c; 2P,1,b; 2P,3,a	2	A

3 These line plots show the number of hours Theodore worked each day for the past two weeks.



Which conclusion can be made from the line plots?

- A Both the mean and the standard deviation for Week 1 are greater than for Week 2.
- B Both the mean and the standard deviation for Week 2 are greater than for Week 1.
- C The mean for Week 1 is greater, but the standard deviation for Week 2 is greater.
- D The mean for Week 2 is greater, but the standard deviation for Week 1 is greater.

[GM2073019_1](#)

COMMENTARY:

In this item, students are given a line plot of the number of hours worked during two weeks. Students are asked to make a conclusion based on the information given in the line plots. After reading the choices, they should realize that the comparison of the mean and standard deviation is being done. Again, students are asked to draw conclusions based on a graphic display, not to actually calculate the mean and standard deviation. By looking at the graphs, students should see that the average for week one is going to be close to 6 while the mean for week two is going to be close to 5 and the standard deviation for week one will be greater because the data points are more widely dispersed than in week two. Thus, the answer is A. Answers B, C, and D are incorrect because the comparisons are inappropriately made.

ITEM NUMBER	STANDARD ALIGNMENT	DOK	KEY
4	2D,2,d; 2P,4,c	2	C

4 An English teacher determined that there is a positive linear relationship between students' scores on an essay test and the length of time students take to complete the test. Based on this information, which conclusion is valid?

- A The student with the highest score on the essay test took the longest to complete the test.
- B A student who takes more time to complete the essay test will have a higher score than a student who takes less time to complete the test.
- C Students with lower scores on the essay test tend to have taken shorter times to complete the test.
- D Students with higher scores on the essay test tend to have taken shorter times to complete the test.

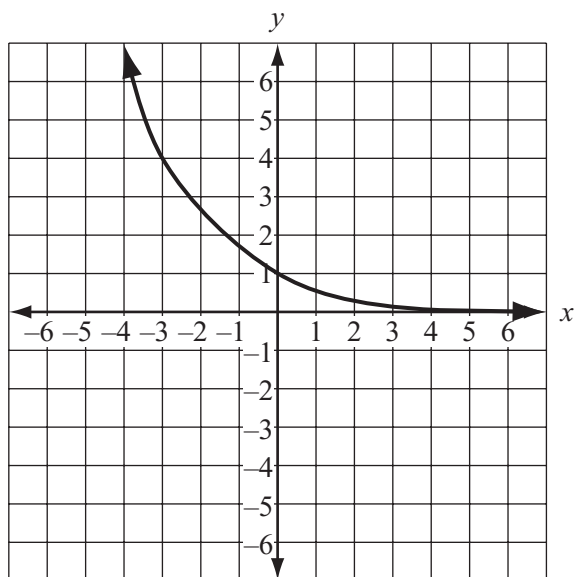
[GM2074125_3](#)

COMMENTARY:

In this item, students are given that a positive linear relationship exists between two quantities and asked to choose a valid conclusion. The wording of each choice is the most important part of which answer is correct. The fact that there is a positive linear relationship does not guarantee any results, but in fact gives the tendency of the data. Answer A is incorrect because it states that the highest range value must be matched with the largest domain value. Answer B is incorrect because it makes a certain prediction with the use of the phrase “will have,” not something that can be known for sure. Answer C is correct because of the usage of the word “tend” to appropriately describe data behavior. Answer D is incorrect because, while the word “tend” is used, it does not appropriately describe the data behavior.

ITEM NUMBER	STANDARD ALIGNMENT	DOK	KEY
5	2A,5,a; 2P,4,a	2	D

5 The function $f(x)$ is graphed on this coordinate grid.



What are the domain and the range of the function $f^{-1}(x)$?

- A Both the domain and the range are the set of all real numbers.
- B Both the domain and the range are the set of all positive real numbers.
- C The domain is the set of all real numbers and the range is the set of all positive real numbers.
- D The domain is the set of all positive real numbers and the range is the set of all real numbers.

GM2075058_4

COMMENTARY:

In this item, students are given the graph of a function and asked to make a determination about the domain and range of the inverse. In order to answer this question correctly, students must first understand what the domain and range of the function is, then must know the relationship of the domain and range of the function to the domain and range of the inverse. This item addresses a conceptual understanding of this relationship but requires no algebraic manipulation. If students have been drilled on the algebraic skill of find the inverse only, they will not understand how to determine the correct answer to this type of question. Concepts and skills must be addressed as two connected facets of this problem situation. Answer A is incorrect because it uses the domain of the function for both the domain and range of the inverse. Answer B is incorrect because it uses the range of the function as the domain and range of the inverse. Answer C is incorrect because these are the domain and range of the function itself. Answer D is correct.

ITEM NUMBER	STANDARD ALIGNMENT	DOK	KEY
6	2A,3,c; 2P,5,c	2	C

6 This function models the height, $f(x)$, in feet, of an object x seconds after it is tossed into the air.

$$f(x) = -16x^2 + 48x + 64$$

Which statement describes the object 1.5 seconds after it is tossed into the air?

- A The object is on the ground.
- B The object is moving upward.
- C The object is at its highest point.
- D The object is moving downward.

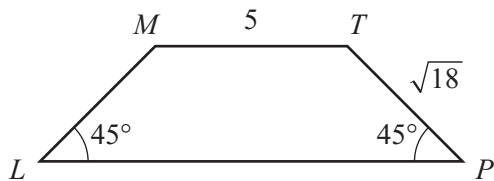
[GM2075048_3](#)

COMMENTARY:

This item asked the student to make a real world interpretation of an ordered pair that satisfies the given function. Students should first recognize that the function is a quadratic and therefore function behavior should be examined relative to the vertex. Using the fact that the x -coordinate of the vertex is found using $-b/2a$, students find that the x -coordinate is in fact -1.5 , the time that the object behavior is being asked about. Because this is the x -coordinate of the vertex, and the negative coefficient of the squared term means the parabola opens downward, the statement that best describes the object is that it is at its highest point, answer C. Answers A, B, and D are incorrect because they are not mathematically accurate.

ITEM NUMBER	STANDARD ALIGNMENT	DOK	KEY
7	2G,1,b; 2P,4,a	2	B

7 Quadrilateral $LMTP$ is an isosceles trapezoid.



What is the length of \overline{LP} ?

- A 10
- B 11
- C $5 + 2\sqrt{18}$
- D $5 + 6\sqrt{2}$

[GM2076066_2](#)

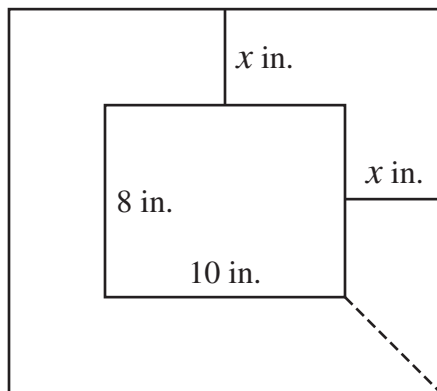
COMMENTARY:

In this item, students must recognize the need for an auxiliary line, drop the perpendicular from either vertex M or T , use the 45-45-90 triangle relationship to find the length of the legs of the right triangle, then add that (for each end of the trapezoid) to 5 to find the entire length of side LP . The length of the leg in the right triangle is found by dividing by square root of 2, giving 3. The entire length of LP is $3 + 5 + 3$ equaling 11. The correct answer is B. Answer A is incorrect because it is just side MT doubled. Answer C is incorrect because it uses the length of the hypotenuse as the length of each leg. Answer D is incorrect because it is the same numerical value as answer C, just in simplified form.

ITEM NUMBER	STANDARD ALIGNMENT	DOK	KEY
8	2A,3,c; 2P,5,c	3	B

Use this information to answer question 8.

A picture has a length of 10 inches and a width of 8 inches. Marcus will build a frame for the picture. The frame will be x inches wide as shown in this diagram.



GM20710

8 Marcus increases the dimensions of the picture by a scale factor of k . He then builds a new frame with the same width x . Which expression represents the increase in the area, in square inches, of the new frame?

- A $36kx$
- B $36x(k - 1)$
- C $80k^2x$
- D $80x^2(4k^2 - 1)$

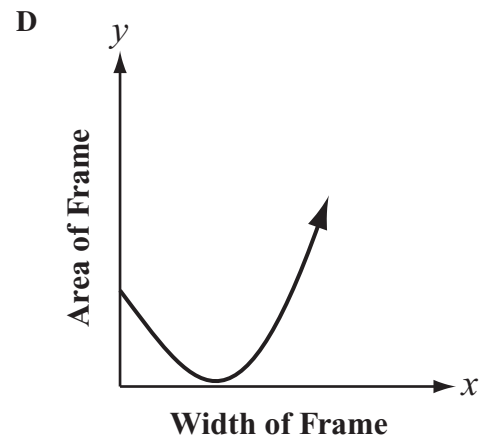
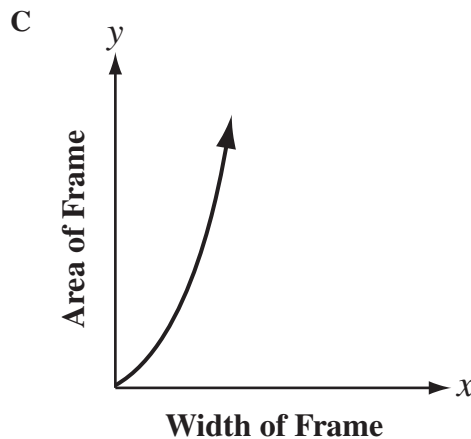
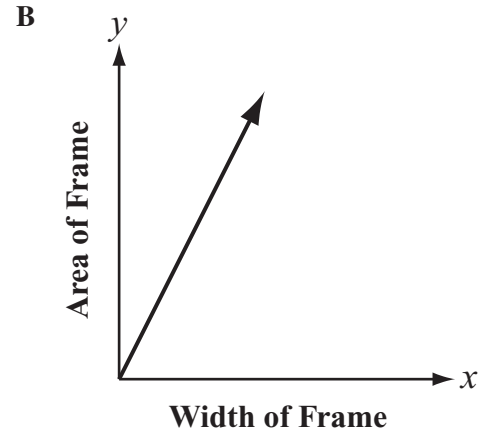
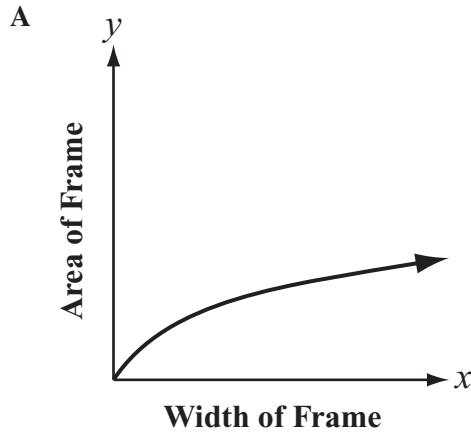
GM2073105.0710_2

COMMENTARY:

This item was one of the cluster items, so while we have released only one question aligned with the given information, there were several that went with the stem of this item. Since the given dimensions of 8 and 10 are increased by a scale factor of k , the new dimensions become $8k$ and $10k$ for the interior measurements and $8k + 2x$ and $10k + 2x$ for the exterior measurements. That means that the area of the frame is the outside area $(8k + 2x)(10k + 2x)$ minus the inside area $(8k)(10k)$ which gives $(80k^2 + 36kx + 4x^2) - (80k^2) = 36kx + 4x^2$. However, the question has not been answered yet, it asks for the INCREASE in the area of the frame, so the student must find the area of the original frame $(36x + 4x^2)$ and subtract it from the new area. Giving $(36kx + 4x^2) - (36x + 4x^2) = 36kx - 36x$ or $36x(k - 1)$, answer B. Answer A is incorrect because the student only subtracted the $4x^2$. Answer C is incorrect because the student used the inside dimensions times the width of the frame. Answer D is incorrect because the student used new outside minus original outside, but found the new outside by multiplying $(8k)(2x)(10k)(2x)$ and found the old outside by multiplying $(8x)(10x)$.

ITEM NUMBER	STANDARD ALIGNMENT	DOK	KEY
9	2A,3,c; 2P,5,c	2	C

9 Which graph could model the relationship between the area, y , in square inches, of the frame alone and the width of the frame, x , in inches?



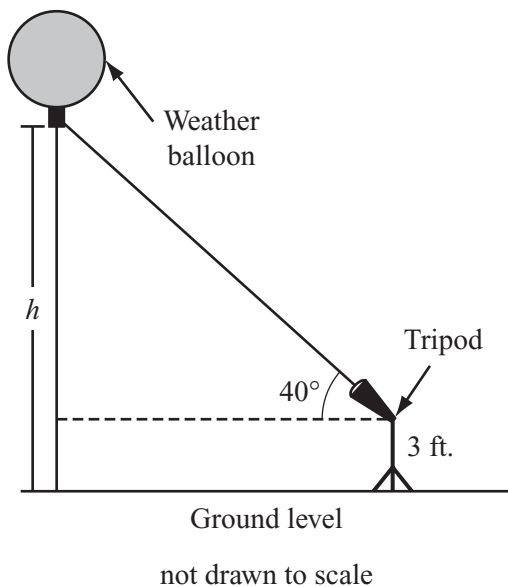
GM2073101.0710_3

COMMENTARY:

This item was a second cluster item from the same stem as number 8. Be sure to look back to 8 for the given information. In this item, students are asked to identify the graph that models a given relationship. Y represents the area of the frame alone and x represents the width of the frame. Using the outside minus inside, we know that $(8 + 2x)(10 + 2x) - 80$ will produce a quadratic function which has a parabola as its graph. Answer A is incorrect because it is a square root function. Answer B is incorrect because it is linear. Answer C is correct because it is a parabola with $(0,0)$ on the graph. Answer D is incorrect because while it is a parabola, it contains a positive intercept, indicating that the student forgot to subtract the constant 80 from the outside area to accommodate the frame only.

ITEM NUMBER	STANDARD ALIGNMENT	DOK	KEY
10	2G,2,c; 2P,4,c	2	B

- 10** Bianca uses an angle-measuring device on a 3-foot tripod to find the height, h , of a weather balloon above ground level, as shown in this diagram.



The balloon is at a 40° angle of elevation. A radio signal from the balloon tells Bianca that the distance between the tripod and the balloon is 25,000 feet.

Which expression represents the height, h , of the balloon above ground level?

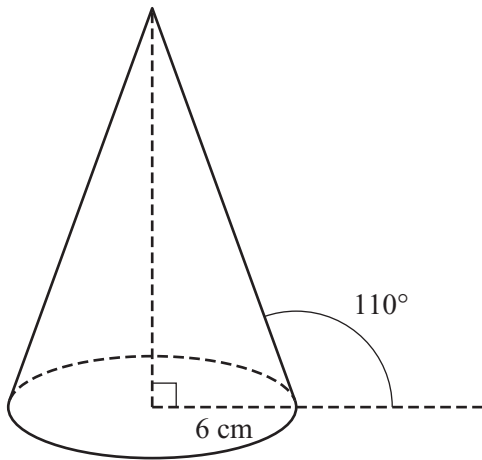
- A $25,000 \cdot \sin 40^\circ - 3$
- B $25,000 \cdot \sin 40^\circ + 3$
- C $\frac{25,000}{\sin 40^\circ} - 3$
- D $\frac{25,000}{\sin 40^\circ} + 3$

COMMENTARY:

In this item, the student is asked to use right triangle trigonometric relationships to set up an expression that will give the height of a balloon above ground level. Notice that the student DID NOT need a calculator that gave trigonometric values to answer this question, but simply needed an understanding of the trigonometric relationships needed to write the appropriate expression. Answer A is incorrect because while the trigonometric relationship is set up appropriately, the initial height off the ground is subtracted. Answer B is correct because the trigonometric relationship is set up appropriately and the initial height off the ground is added. Answer C is incorrect because the trigonometric relationship is set up as the reciprocal of the actual relationship and the initial height is subtracted. Answer D is incorrect because the trigonometric relationship is set up as the reciprocal of the actual relationship.

ITEM NUMBER	STANDARD ALIGNMENT	DOK	KEY
11	2G,2,c; 2P,1,b	1	C

11 Use this diagram of a cone to answer the question.



The base of the cone has a radius of 6 cm. Which expression represents the slant height, in centimeters, of the cone?

- A $6 \cos 70^\circ$
- B $6 \cos 110^\circ$
- C $\frac{6}{\cos 70^\circ}$
- D $\frac{6}{\cos 110^\circ}$

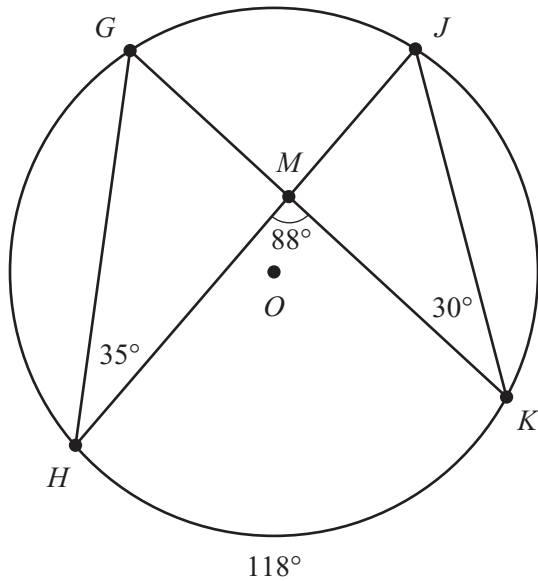
GM2076087_3

COMMENTARY:

This item simply asks students to use a right triangle trigonometric relationship to write an expression for the length of the hypotenuse. Again notice that the student DID NOT need a calculator that gave trigonometric values to answer this question, but rather needed an understanding of the trigonometric relationships within a right triangle between the sides and the angles. Since the exterior angle is given as 110 degrees, the interior angle is 70 (180 – 110) degrees. Relative to the 70 degree angle, the 6 is the adjacent and the slant height is the hypotenuse. The appropriate trigonometric ratio is cosine. Answer A is incorrect because the reciprocal of the actual trigonometric ratio is used. Answer B is incorrect because the reciprocal and the wrong angle measure is used. Answer C is correct. Answer D uses the correct trigonometric relationship, but the wrong angle.

ITEM NUMBER	STANDARD ALIGNMENT	DOK	KEY
12	2G,3,d; 2P,4,a	2	C

12 Use this diagram to answer the question.



What is wrong with the information given in the diagram?

- A \overline{HJ} should pass through the center of the circle.
- B The length of \overline{GH} should be equal to the length of \overline{JK} .
- C The measure of $\angle GHM$ should be equal to the measure of $\angle JKM$.
- D The measure of $\angle HMK$ should be equal to half the measure of \widehat{HK} .

GM2076109_3

COMMENTARY:

In this item, students are asked, not to find an answer, but to find what is incorrect about the diagram. By asking the question this way, students must use multiple relationships between angles formed by intersecting chords, inscribed angles, and the arcs that correspond to these angles. Answer A is incorrect because if HJ passed through the center, the angle given as 88 degrees would be 118 degrees, making the arc GJ also 118 degrees, but neither the inscribed angle at H nor K would be correct, so the given fact in A would not be the ONLY wrong information given. Answer B is incorrect because if the chords are equal, then their corresponding arcs are equal and we are back to a totally incorrect drawing that we saw in answer A. Answer C is correct because no matter what the other measures given are, these two angles MUST have the same measure because they intercept the same arc and are therefore both one-half of the same arc. Answer C does not change measures that would make other parts of the figure incorrect also, for it does not specify what the measure should be, but simply that it must be the same. Answer D uses an inscribed angle relationship when the angle is not inscribed but formed by two intersecting chords.

ITEM NUMBER	STANDARD ALIGNMENT	DOK	KEY
13	2G,4,b; 2P,4,c	2	B

13 The ratio of the surface area of Pluto to the surface area of Mercury is approximately 1 to 4. Assuming the planets are roughly spherical, what is the ratio of the volume of Pluto to the volume of Mercury?

- A 1 to 4
- B 1 to 8
- C 1 to 16
- D 1 to 64

[GM2076123_2](#)

COMMENTARY:

This item requires students to understand the relationship between the ratios of lengths, areas, and volumes of similar spheres. Answer A is incorrect because it uses the same ratio for volume as is given for area. Answer B is correct because the ratio given for area has been square rooted then cubed to find the ratio of the volume. Answer C is incorrect because the ratio given for area is squared to find the ratio of the volume. Answer D is incorrect because the ratio given for area is cubed to find the ratio of the volume.

ITEM NUMBER	STANDARD ALIGNMENT	DOK	KEY
14	2G,4,b; 2P,4,a	2	A

14 The radius of a blue marble is $\frac{3}{4}$ the radius of a red marble. The volume of the red marble is 32π cubic centimeters. Assuming both marbles are spherical, what is the volume, in cubic centimeters, of the blue marble?

A $\frac{27}{2}\pi$

B $\frac{32}{3}\pi$

C 18π

D 24π

GM2076127_1

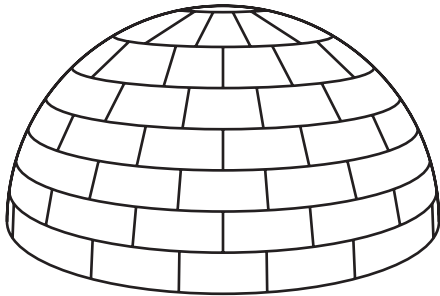
COMMENTARY:

In this item, the student is given the ratio of the length of the radius of two marbles and asked to use this ratio to find the actual volume of the second sphere. The student must first cube the ratio given, then use that cubed ratio to create and solve an appropriate proportion. Answer A is correct. Answer B is incorrect because the student took the volume of the red marble and divided by a factor of the blue marble, the numerator of the ratio given. Answer C is incorrect because the student used the square of the given ratio to set up and solve the proportion, not the cube of the given ratio. Answer D is incorrect because the student used the given ratio to set up and solve the proportion, not the cube of the given ratio.

ITEM NUMBER	STANDARD ALIGNMENT	DOK	KEY
15	2G,4,b; 2P,4,b	1	D

Use this information to answer question 15.

An igloo is a shelter constructed from blocks of ice in the shape of a hemisphere. This igloo has an entrance below ground level.



The outside diameter of the igloo is 12 feet. The thickness of each block of ice that was used to construct the igloo is 1.5 feet.

GM20708

15 What happens to the outside radius of the igloo if the outside surface area of the igloo is multiplied by $\frac{1}{4}$?

- A The outside radius is multiplied by $\frac{1}{64}$.
- B The outside radius is multiplied by $\frac{1}{16}$.
- C The outside radius is multiplied by $\frac{1}{4}$.
- D The outside radius is multiplied by $\frac{1}{2}$.

GM2072083.0708_4

COMMENTARY:

This item also was part of a cluster item, so the stem was used for multiple questions. Only one question is given here. While the given situation uses one-half the surface area of a sphere for the ice in the igloo, a hemisphere, the question again asked students to apply the relationship between the ratio of the radius, surface area, and volume. Answer A is incorrect because it simply cubes the given ratio. Answer B is incorrect because it squares the given ratio. Answer C is incorrect because it keeps the given ratio. Answer D is correct because the given ratio is the surface area and the square root of this ratio gives the ratio of the radius.