SAMPLE OGT MATH PROBLEMS: Data Analysis, Geometry, Measurement

These problems are taken from "Preparing for the Math OGT", a book that will be published by Barron's Publications in 2004. Teachers may duplicate these problems to use in their classroom but these problems are not to be used in any other preparation book that will be sold. Any comments are welcome and may be directed to the me at: aust_tr@access-k12.org. Enjoy…

The problems are coded. The first letter stands for the Standard:
D – Data Analysis and Probability
A – Algebra and Patterns
M – Measurement
G – Geometry
N – Numbers and Operations
The second letter stands for the letter of the grade 8 – 10 benchmark.
ER stands for Extended Response / Short Answer.
The number is the number for my reference.

DATA ANALYSIS PROBLEMS

DA22. In a poll of 1280 students at Canton McKinley High School, students were asked to name their favorite classic TV show. The results are illustrated below.
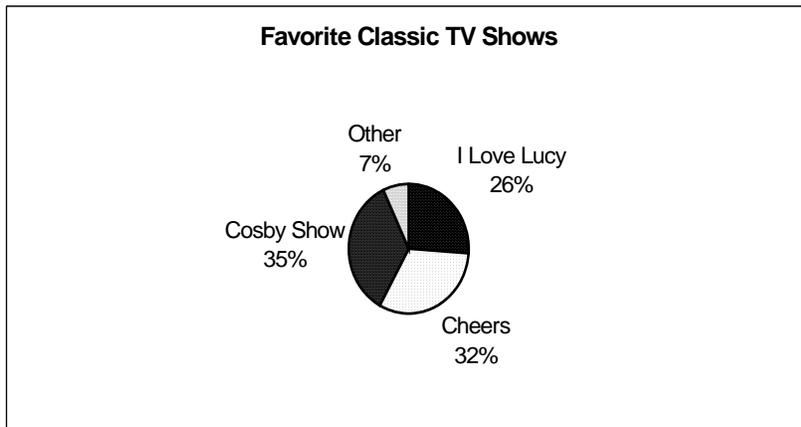
If one-fourth of the students who voted for "The Cosby Show" were seniors, how many seniors voted for "The Cosby Show?"

A) 112   B) 138   C) 320   D) 448

DA31. This graph shows the pulse rate for a 16-year-old student during different activities.

Pulse Rate of a 16 year-old
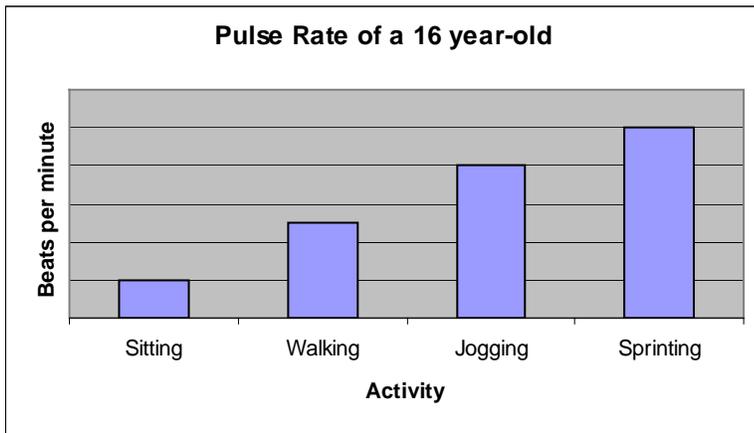
If the student's pulse rate is 50 beats per minute when sitting and 82 beats per minute when sprinting, what is the student's pulse rate in beats per minute when jogging?

A) 68   B) 70   C) 72   D) 74

DA39. Maggie pays $15 per month for her cell phone. She gets the first 200 minutes in the month free. After that it costs 8 cents per minute. Below is a table of the first 4 months of Maggie's cell phone usage.

Month	Number of minutes
January	290
February	330
March	350
April	240

What is the mean cost per month for Maggie's cell phone?

A) $21.20   B) $22.20   C) $23.20   D) $24.20

DC47. Griselda wanted to find the typical cost of a 14-inch pizza in Steubenville. She called 8 pizza places and obtained the following prices:

$7.35 $7.00 $6.75 $6.50 $6.10 $6.00 $6.00 $5.50

Based on the data she collected, Griselda decided that the typical cost for a 14-inch pizza is $6.30. What measure of central tendency did she use?

A) Mean   B) Median   C) Mode   D) Range

DC51. A data set contains 7 single-digit numbers and 2 double-digit numbers.
Which statement **must** be true?

A) The mode is a single-digit number.
B) The mean is a single-digit number.
C) The range is a single-digit number.
D) The median is a single-digit number.

DD57. Shanna's quiz scores in Miss D'Eramo's geography class are:
98, 94, 90, 88, 88, 82, 42.
42 is the outlier. If that score is dropped from the other scores, which of the following is
closest to the increase in mean of the remaining scores?

A) 6   B) 7   C) 9   D) 11

DE77. This graph compares how much a person smokes and the death rate by cancer for
males and females.

Cancer Deaths by Smoking Habit and Gender
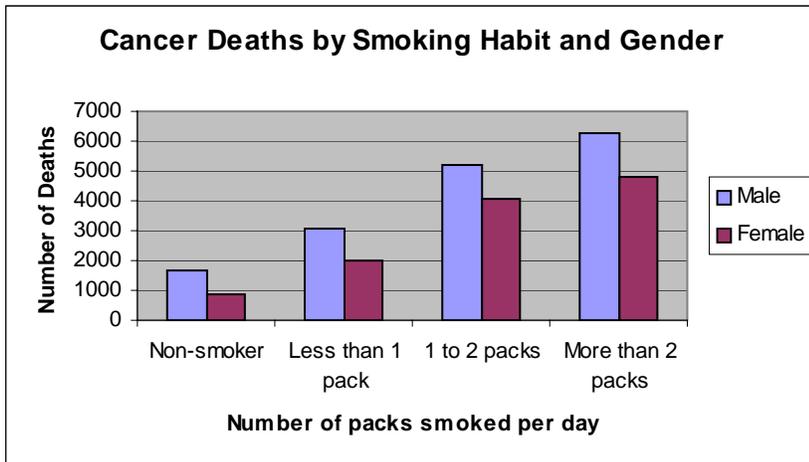
Based on this graph, which of the following is true?
A) Gender does not appear to have an impact on death by cancer.
B) The more a person smokes, the more likely he/she is to die from cancer.
C) The number of females that die from cancer is about the same as the number of men.
D) Non-smokers do not die from cancer.

DF81. During an activity in math class, Todd's distance away from a wall was recorded by his friend, Kenny, over a 28-second period with a CBR.

Todd's Distance from a wall over time
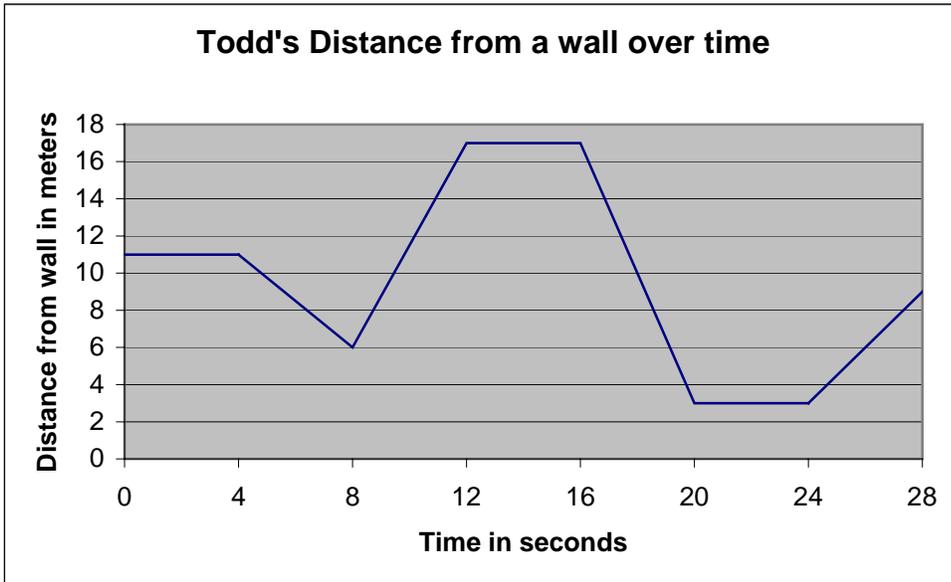
Based on this graph, which of the following is false?

A) Todd was 11 meters away from the wall when Kenny began recording.
B) Todd walked toward the wall between the 8th and 12th seconds.
C) Todd stopped walking a total of 12 seconds during the 28-second period.
D) Todd walked the fastest between the 16th and 20th seconds.

DH91. License plates in Portage County will be of the form & # # # & &, where & is a letter and # is a digit from 0 to 9 inclusive. The first letter must be either W, X, Y, or Z, and the last letter must be A or B. If repetition of digits and letters is possible, how many different license plates are possible in Portage County?

A) 52,000   B) 104,00   C) 208,000   D) 17,576,000

DJ113. BJ has a bag of marbles. 9 are black, 8 are red, 7 are white, and 5 are green. Without looking BJ draws two marbles. He replaces the first marble before drawing the second marble. Which of the following expressions can be used to compute the probability that he first picks a black marble and then a green one?

A) $\dfrac{9}{29} \times \dfrac{5}{28}$ B) $\dfrac{9}{29} + \dfrac{5}{28}$ C) $\dfrac{9}{29} \times \dfrac{5}{29}$ D) $\dfrac{9}{29} + \dfrac{5}{29}$

DK138. Kristin works at Videos R Us. She randomly chose 50 videos from a shipment of 1000 videos and found that 3 of them were defective. Based on this information, what is the probability that a video selected from the shipment will not be defective?

A) 0.05 B) 0.94 C) 0.95 D) 0.997


Extended Response / Short Answer

DCER03. The yearly earnings for workers at a local business are shown in the table.

JOB	YEARLY EARNINGS
Owner	$100,000
Sales Manager	$60,000
Production Manager	$50,000
Bookkeeper	$35,000
	$30,000
Production Staff	$27,000
	$25,000
	$24,000
	$22,000
	$22,000
	$20,000
Office Staff	$22,000
	$18,000
	$12,000
Sales Staff	$40,000
	$38,000
TOTAL	**$545,000**

Compute the mode, median, and mean of the yearly earnings.

Tell which measure of central tendency most accurately reflects the yearly earnings of this company's workers and give an explanation to support your choice.

DAER22. Interpret this box-and-whisker plot for the number of hours worked per week:
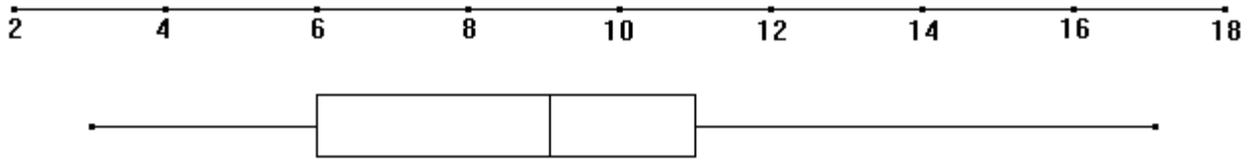
a) What is the smallest number of hours worked in a week?
b) What is the largest number of hours worked in a week?
c) What number has approximately 50% of the data below it?
d) What number has approximately 25% of the data above it?
e) Between what two numbers is approximately the middle 50% of the data?
f) What is the lower quartile value?
g) What is the median value?

Show your work and/or provide an explanation to support your answer.

GEOMETRY STANDARD PROBLEMS

GA04. A regular hexagon is divided into three congruent figures. Which of the following best describes the shape of each figure:

A. triangle

B. parallelogram

C. trapezoid

D. rhombus
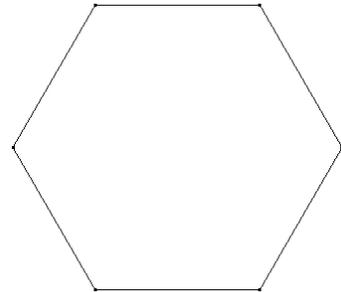
GB08.
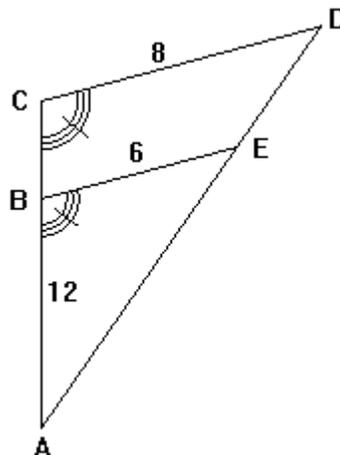It is known that $\angle ABE \cong \angle C.$
AB = 12
BE = 6
CD = 8

What is the length of segment BC?

A. 2   B. 4

C. 6   D. 16
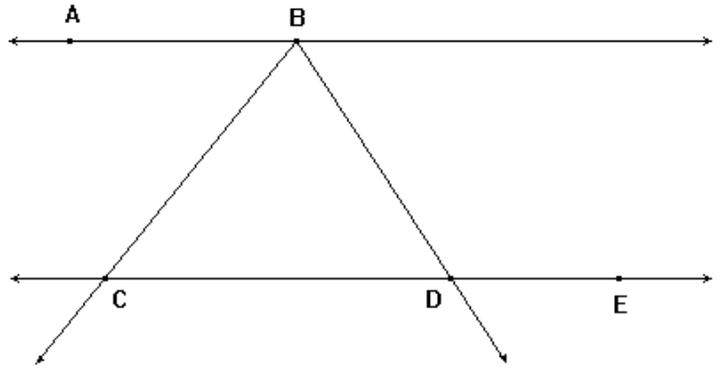
GC08.
Line AB is parallel to line CD.
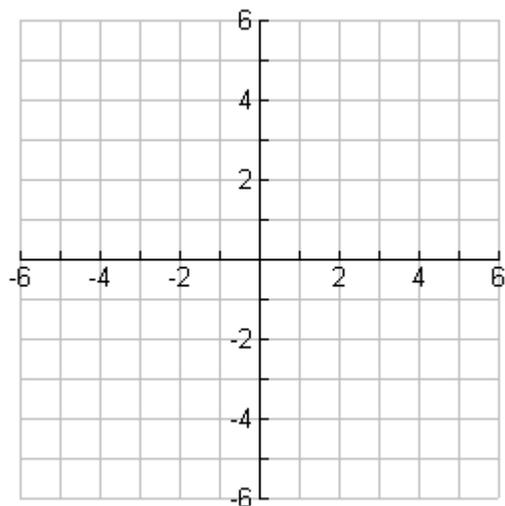
$m\angle ABC = 50°$

$m\angle BDE = 110°$

What is the measure of
angle CBD?

A. 60°   B. 70°   C. 80°   D. 110°

GD06. Line $a \perp$ line b. Line a contains $(-2, 3)$ and $(4, -1)$.
Which pair of points could line b contain?

A. $(4, 6)$ $(2, 3)$ B. $(3, 2)$ $(0, 0)$

C. $(2, 3)$ $(5, 1)$ D. $(-2, 7)$ $(0, 4)$

GD13. Two of the vertices of a right isosceles
triangle have coordinates: $(3, 2)$ and $(3, -2)$.
What could be the coordinates of the third
vertex?

A. $(-1, 2)$

B. $(5, -2)$

C. $(3, 6)$

D. $(0, -2)$

GE05. Zach drew a diagonal of a regular octagon. Which two geometric figures could NOT be the result of this action?

A. a triangle and a hexagon

B. two congruent pentagons

C. an isosceles trapezoid and a hexagon

D. an isosceles triangle and a heptagon

GF05. A point has coordinates $(-2, 5)$. Sarah reflected the point over the y-axis, and then reflected it over the x-axis.
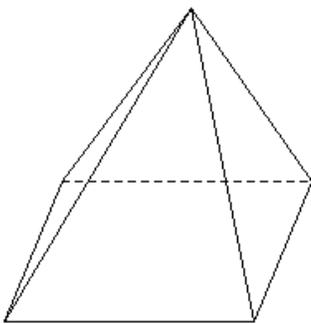
What are the coordinates of this point after both reflections?

A. $(2, 5)$
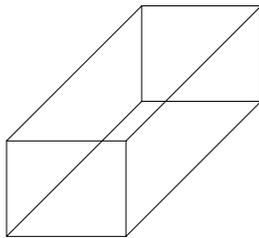
B. $(2, -5)$

C. $(-2, -5)$

D. $(5, -2)$
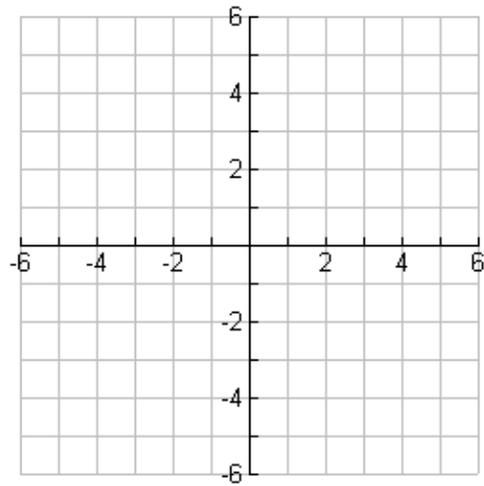
GH02. For which of the following three-dimensional figures is the number of vertices plus the number of edges equal to 13?
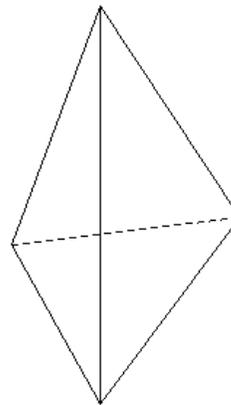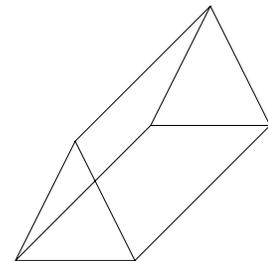
A.

B.

C.

D.

GI07. To find the approximate height of a tree, Elizabeth stepped off a distance of 30 feet from the base of the tree. From that point to the top of the tree is an angle whose measure is 75 degrees.
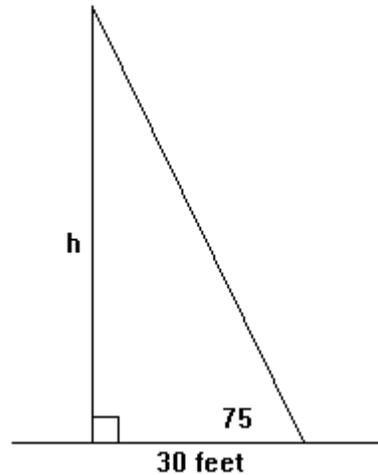
Which of the following equations can be used to find the closest approximation to the height of the tree?

A. $\sin 75° = \dfrac{h}{30}$

B. $\cos 75° = \dfrac{30}{h}$

C. $\tan 75° = \dfrac{30}{h}$

D. $\tan 75° = \dfrac{h}{30}$

h

75

30 feet

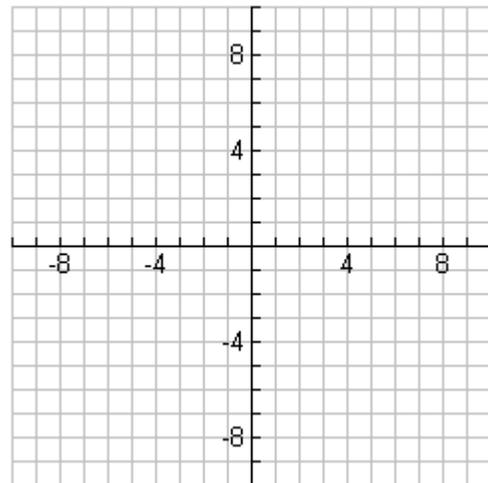## Extended Response / Short Answer

GER.DA/D03. The coordinates of the 4 vertices of a quadrilateral are given in order.
$I : (-2, -5)$ $J : (0, -8)$ $K : (6, -4)$ $L : (4, -1)$

In your answer document, plot each point and draw quadrilateral IJKL.

Find the slope of each side of IJKL. Decide if the quadrilateral is a rectangle.

Show your work or provide an explanation to support your answer.

GER.F/E16. Given: $\triangle PQR$ with vertices:
$P:(4, 2)$ $Q:(6, 5)$ $R:(7, 1)$

a) Draw and label $\triangle PQR$
b) Draw and label $\triangle P'Q'R'$ by reflecting
$\triangle PQR$ about the line $x = 2$.
c) Draw and label $\triangle A"B"C"$ by reflecting
$\triangle P'Q'R'$ about the x-axis.
d) Would you get the same result if you would
reflect $\triangle PQR$ about the x-axis first and then
reflect that triangle about the line x = 2?
Explain your reasoning.
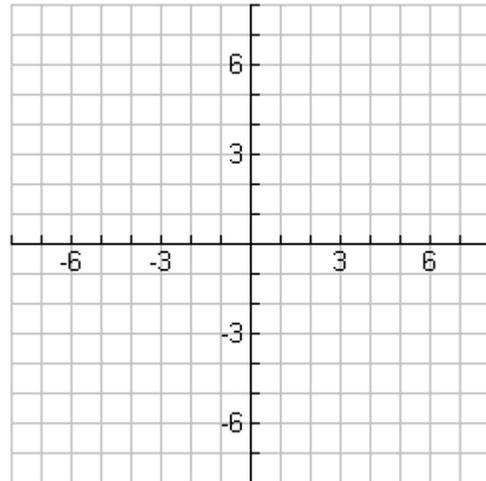
MEASUREMENT PROBLEMS

MA01. Rick has a rectangular "baby pool" that is 12 feet by 18 feet. If water costs $0.021 per cubic foot, how much will it cost Rick to fill the pool to a depth of 33 inches?

A) $12.47   B) $13.61   C) $124.74   D) $149.69

MA14. The diameter of a size 3 soccer ball is 6 inches. The diameter of a size 4 soccer ball is 7 inches. The volume of the size 4 soccer ball is what percent greater than the volume of the size 3 soccer ball?

A) 10%   B) 17%   C) 36%   D) 59%

MB06. A rectangular sandbox has dimensions 12 feet long, 15 feet wide, and 4 feet deep. What is the volume of the sand in the sand box when it is two-thirds full?

A) 240 cu ft   B) 480 cu ft   C) 720 cu ft   D) 1080 cu ft

MB23. A liter of paint will cover 125 sq m. The top and sides of a cylindrical tank need to be painted. If the dimensions of the tank are 10 m high with a radius of 7 m, how many liters of paint will be needed?

A) 3 L   B) 5 L   C) 8 L   D) 12 L

MC04. Juan made a box without a lid by notching out equal-sized squares from the four corners of a poster board and folded up the sides. The poster board measures 18 inches by 12 inches. The length of the side of the notch is inches. What is the volume of the box that Juan made?

A) 540 cu in   B) 288 cu in   C) 270 cu in   D) 144 cu in

MC16. Woodside Elementary School and Lynn Kirk Elementary School each have rectangular-shaped playgrounds. The area of Lynn Kirk's playground is 1728 sq ft. The dimensions of the Woodside Elementary playground are each half of the dimensions of the Lynn Kirk playground.
What is the area of the Woodside Elementary playground?

A) 108 sq ft   B) 432 sq ft   C) 576 sq ft   D) 864 sq ft

MC42. Doug is buying new carpet for his family room. The floor measures 16 feet by 21 feet. What is the minimum number of square yards of carpeting that he needs to buy that will cover the floor in the family room?

A) 38 sq yd   B) 42 sq yd   C) 56 sq yd   D) 112 sq yd

MD12. Katie is going to London and was told that one GBP (Great Britain Pound) is equivalent to 1.68 US dollars. Approximately how many GBP's are equivalent to 50 US dollars?

A) 28 GBP   B) 30 GBP   C) 34 GBP   D) 84 GBP

MD15. On a 50-mile stretch of the Ohio Turnpike, the speed limit was raised from 55 mph to 65 mph. Approximately how much time is saved by driving that 50-mile stretch at 65 mph rather than at 55 mph?

A) 4 min   B) 8 min   C) 12 min   D) 20 min

MD21. A catering service charges $14.25 per person for the first 50 people, $14 per person for the next 10 people, $13.75 per person for the next 10 people, and so on. How much will the catering service charge for a group of 114 people?

A) $1425.00   B) $1510.50   C) $1565.00   D) $1624.50

MD29. A flagpole casts a shadow that is 16 feet 10 inches long. Amy is 5 feet 4 inches tall and her shadow is 3 feet long. Which of the following would be the closest to the height of the flagpole?

A) 29 feet 6 inches   B) 30 feet   C) 30 feet 6 inches   D) 31 feet

MD35. TP Tools manufactures 500 sandblast cabinets per week. The plant manager wants to increase cabinet production by 4 cabinets each week until the weekly production is doubled. Approximately how long will it take for this to happen?

A) $2\frac{1}{2}$ years   B) 2 years   C) $1\frac{1}{2}$ years   D) 1 year

ME07. The entire contents of this cylindrical can are poured into a cube and it fills the cube.

8 inches

6 inches
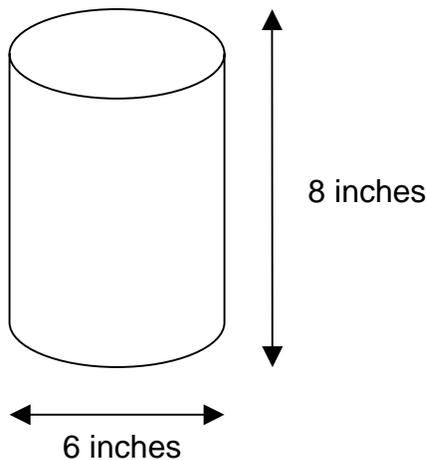
Approximately what is the length of each edge of the cube?

A) 15.04 in   B) 9.67 in   C) 6.84 in   D) 6.09 in

ME18. In Art class, Lyndsy took a piece of modeling clay that was in the shape of a rectangular prism and reformed the clay so that it was a sphere. If the dimensions of the prism were 2 inches by 3 inches by 2 inches, then approximately what is the radius of the shere?

A) 1.25 in   B) 1.42 in   C) 1.69 in   D) 2.08 in

Extended Response / Short Answer

MCER01. Paint is sold in a cylindrical can that has a diameter of 3 inches and a height of 5 inches.
Find the dimensions of two different cylindrical containers that have a volume that is 4 times the volume of the given container.

Show your work or provide an explanation to support your answer.

MEER01. Lucy drew a triangle with lengths of 5 cm, 6 cm, and 7 cm. She wants to draw a similar triangle but with a perimeter of 63 cm.

Calculate the length of each side of the larger triangle.

Show your work or provide an explanation to support your answer.

MFER01. Tocco's Pizza Parlor sells a 14-inch circular pizza for $7.50. They also sell a 14-inch square pizza. What should Tocco charge for the 14-inch square pizza so that you get approximately the same amount of pizza per dollar?

Show your work or provide an explanation to support your answer.