O.G.T. MATHEMATICS: *QUICK STUDY GUIDE*

Point Values:
Multiple Choice = 1pt
Short Answer = 2 pt
Extended Response = 4 pts

Be sure to support answers for free response.

Skip questions that you're stuck on, come back at the end – LEAVE NOTHING BLANK!!!!

BEFORE THE TEST:

Get a good night sleep (8 hours is key!)

Eat Breakfast (not candy bars and soda)

Take your TIME!!!

DURING THE TEST:

Draw a picture if there's not one there.

Read the question before attempting to answer.

Try to answer before looking at the multiple choices – look to see if your answer is there.

Your FIRST answer is usually correct – DON'T CHANGE IT!

Does your answer make sense?

Test Taking Strategies:

Eliminate answer choices that look right but are planted to fool you.

Back solve by plugging the answer choices into the question being asked.

Plug and Chug: try plugging in a number instead of a letter if you're stumped by a problem.

Calculator Box:

Scientific Notation is "inverse decimal point"

Use "10 ^" for $10^{\#}$

% is "2^{nd} ("

a b/c is the "fraction button"… (hit "=", it reduces the fraction)

Square Root is "2^{nd} x^2"

Graphing:

$y = x^2$ graphs a U-shape
if a is positive, it's a smile
if a is negative, it 's a frown

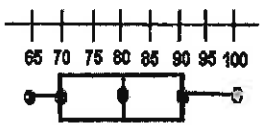
$y = |x|$ graphs a V-shape

$y = mx + b$ graphs a line
m = slope (rise over run)
b = y-int

Plotting points: "y's up" wise up

(3, -6) from origin, go right 3, down 6

Box and Whiskers Graph:



The 5 dots from left to right:
Lower bound, 1^{st} quartile, median, 3^{rd} quartile, upper bound

Median – middle number
Mode – the number seen "MOST"
Mean – the average (add and divide by how many)

PEMDAS
Parenthesis
Exponents
Multiply and Divide (from left to right)
Add and Subtract (from left to right)

When solving for x – use "reverse PEMDAS"

VUXHOY:

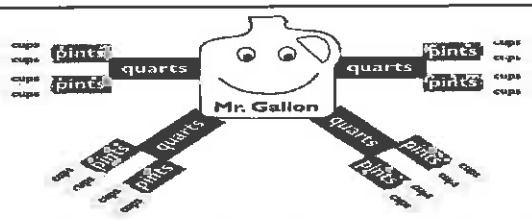
Vertical lines have an Undefined slope
x = #
Horizontal lines have a **0** slope
y = #

LAST MINUTE NOTES:

Probability is the measure of how likely an event is

$$P(A) = \frac{\text{The Number Of Ways Event A Can Occur}}{\text{The Total Number Of Possible Outcomes}}$$

An **outcome** is the result of a single trial of an experiment



"Go Help Quincy Pick Cherries" = Gallon, Half gallon, Quart, Pint, Cup

I = prt (simple interest = principal x rate x time)

D = rt (distance = rate x time)

Tax makes things cost MORE
Discount makes things cost LESS

Parallel Lines have the *same slope*.
Perpendicular Lines have slopes that are *negative reciprocals* (like ½ and -2)

Midpoint: (average of the x's, average of the y's)

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

Surface area of a retangular prism = area of the base + area of the top + area of each side

Difference between prism:  and pyramid: *Prism has 2 bases while a pyramid has 1 base*

Cylinder:  Cone:  Sphere: 

Area = how many squares fit ON the shape

Area is in unit^2

Volume = How many blocks fit IN the object

Volume is in unit^3

Perimeter = How far around an object

Perimeter is in units

A proportion is an equation with a ratio on each side – to solve, cross multiply and divide.

Example: $\frac{x}{6} = \frac{1}{2}$

$2x = 6$

$x = 3$

King Henry Died Drinking Chocolate Milk

Kilo
Hecto
Deca
<meter liter gram>
Deci
Centi
Milli

Make sure that your units match before you start doing calculations

The number sets:

Natural numbers	The counting numbers	$1, 2, 3, 4, 5, \ldots$
Whole numbers	The set of natural numbers and 0	$0, 1, 2, 3, 4, \ldots$
Integers	The set of whole numbers and their opposites	$\ldots, -2, -1, 0, 1, 2, \ldots$
Rational numbers	The set of numbers that can be written as a ratio of integers	$-\frac{3}{4}, 5, -2, 0.5, 0$
Irrational numbers	The set of numbers that cannot be written as a ratio of integers	$\pi, \sqrt{10}, 8 + \sqrt{2}$

MATH O.G.T. TERMS

Acute	An angle whose measure is greater than 0° and less than 90°.
Central angle	An angle whose vertex is the center of a circle and is in the same plane as the circle.
Coefficient	The numeric factor in a *term*; e.g., the number 3 in the term $3x2y$ is the coefficient or in the term $a3b$, 1 is the coefficient.
Equiangular	In a given shape, all angles have the same measure.
Equilateral	In a given shape, all sides have the same length.
Intercepts	The value of y on the *coordinate plane* where $x = 0$, called the *y*-intercept. The value of *x* on the *coordinate plane* where $y = 0$, called the *x*-intercept.
Inverse operations	An operation that will undo another operation; e.g., addition and subtraction.
Irrational numbers	Numbers that cannot be written as a ratio of two integers. The decimal form of the number never terminates and never repeats.
Isosceles triangle	A triangle with at least two congruent sides.
Line of best fit	A line drawn in the midst of the points on a scatter plot in an attempt to estimate the mathematical relationship between the *variables* used to generate the plot.
Major arc	On a circle, an arc that is larger than a semicircle and its measure is greater than 180°.
Measures of center	Numbers that provide information about cluster and average of a collection of data.
Mean	The sum of a set of numbers divided by the number of elements in the set.
b. Mode	The number or object that appears most frequently in a set of numbers or objects.
c. Median	The middle number or item in a set of numbers or objects arranged from least to greatest, or the *mean* of the two middle numbers when the set has two middle numbers.
Minor arc	An arc that is less than a semicircle or 180°.

Obtuse	An angle measure greater than 90° and less than 180°.
Odds of an event	The ratio of favorable outcomes to unfavorable outcomes.
Parallel lines	Lines in the same plane that do not cross, the distance between the lines is constant.
Perpendicular lines	Lines that intersect at one point forming 90°.
Polygon	A closed figure formed from line segments that meet only at their endpoints.
Probability	The chance of an event occurring. The probability of an event is equal to the number of favorable outcomes divided by the number of possible outcomes.
Rational numbers	Any number that can be written in the form a/b , where a and b are integers and $b \neq 0$.
Right	Relating to 90°; e.g., a right angle measures 90°, a right triangle has only one right angle.
Roots of equations	A value that will satisfy the equation which has been formed by putting an expression, containing one *variable*, equal to zero.
Scalene triangle	A triangle that has no congruent sides.
Transformation	An operation that creates an image from an original figure, or preimage.
a. Reflection	A *transformation* that results in a mirror image of the original shape.
b. Rotation	A rotation is a *transformation* about a fixed point such that every point in the object turns through the same angle relative to that fixed point.
c. Translation	A *transformation* in which an image is formed by moving every point on a figure the same distance in the same direction.
d. Dilation	A *transformation* that preserves the shape of a figure, but allows the size to change.
Zeros of a function	The solutions of a *function* or the x-intercepts.

Ohio | Department of Education

Student Name _____

OHIO GRADUATION TESTS

Mathematics

Spring 2009

This test was originally administered to students in March 2009. This publicly released material is appropriate for use by Ohio teachers in instructional settings. This test is aligned with Ohio's Academic Content Standards.

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MATHEMATICS TEST

Directions: For multiple-choice questions, solve each problem, choose the correct answer, and then mark the corresponding circle in the Answer Document. If you change an answer, be sure to erase the first mark completely. You may use the page labeled "Optional Grid Paper" in the Answer Document to solve multiple-choice problems.

Short-answer questions are worth two points. Extended-response questions are worth four points. Point values are printed near each question in your Test Booklet. The amount of gridded space provided for your answer is the same for all two- and four-point questions.

Make sure the number of the question in this Test Booklet corresponds to the number on the Answer Document. Be sure to answer the question completely and show all your work in the Answer Document.

1. A mother is keeping a record of how her new baby's weight changes as the baby grows. The mother's record is shown in the table below.

Age	Weight (pounds)
Birth	7
1 month	9
2 months	11
3 months	13
4 months	14
5 months	15.5
6 months	16
7 months	17
8 months	17.5
9 months	18
10 months	18.5

What type of graph should she use to show how the baby's weight changed over time?

A. line graph

B. histogram

C. circle graph

D. box-and-whisker plot

2. Jill charges a base rate of $25 per lawn plus $18 for each hour she mows the lawn. Which equation gives the amount of money, m, Jill earns from mowing a lawn for h hours?

   A. $m = 25h + 18$

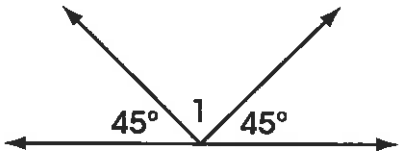
   B. $m = 18h + 25$

   C. $m = \frac{h - 18}{25}$

   D. $m = \frac{h - 25}{18}$

3. In which figure is the measure of $\angle 1$ equal to 45°?

A.



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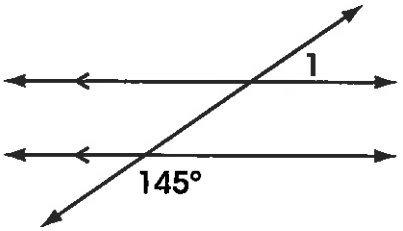
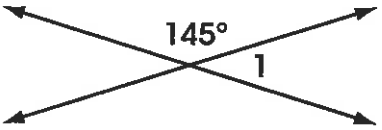
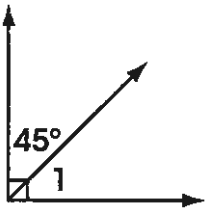


C.



D.



4. Leroy has a number cube with sides labeled 1 through 6. He tosses the number cube 4 times. Each toss results in a 5.

   What is the likelihood that the next toss will result in a 5?

   A. $\frac{1}{1}$

   B. $\frac{1}{4}$

   C. $\frac{1}{5}$

   D. $\frac{1}{6}$

5. For lunch Fanya drank a can of cola that had a diameter of 2 inches and a height of 5 inches. After school, she drank a can of juice that measures twice the diameter and twice the height of the can of cola.

   In your **Answer Document**, find the volume of each can. Show work or provide an explanation to support your answers.

   Determine how many times larger the volume of the juice can is than the volume of the cola can.

For question 5, respond completely in your **Answer Document**. (2 points)

6. A virus measures 0.000022 mm in length.

   Which value expresses the length of the virus in scientific notation?

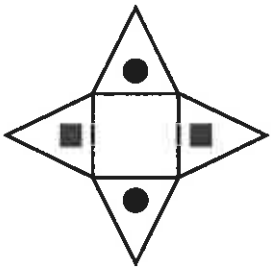
   A. 2.2×10^{-4} mm

   B. 2.2×10^{-5} mm

   C. 2.2×10^{-6} mm

   D. 2.2×10^{-7} mm

7. This net is folded to produce a three-dimensional object.



   Which object will this net produce?

   A. 

   B. 

   C. 

   D. 

8. At the beginning of the day, the owner of a restaurant opens a new case of take-out boxes. One case holds 500 take-out boxes. He uses an average of 35 take-out boxes each day.

   Based on his average usage, which expression represents the number of take-out boxes that remain d days after the new case of boxes is opened?

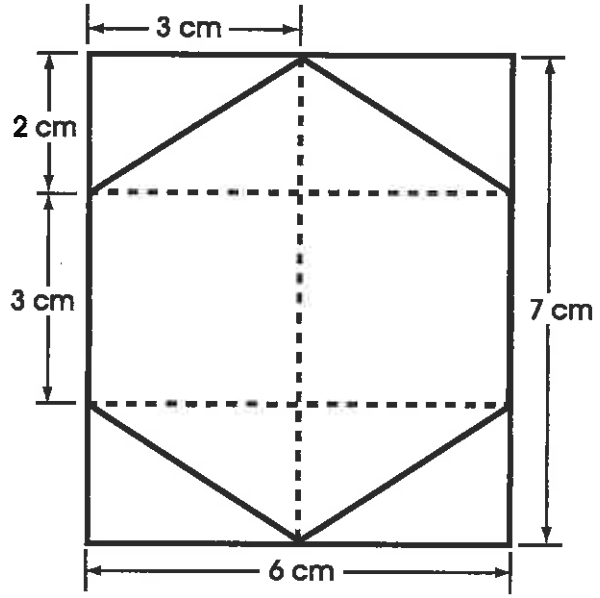
   A. $500 - 35d$

   B. $500 + 35d$

   C. $500d - 35$

   D. $500d + 35$

9. The diagram shows a hexagon drawn inside a rectangle.



What is the area of the hexagon?

A. 21 cm^2

B. 24 cm^2

C. 30 cm^2

D. 54 cm^2

On the March 2009 Ohio Graduation Mathematics Test, questions 10–15 are field test questions that are not released.

16. Tonya and her friends earned extra money by mowing lawns around their neighborhood. Tonya created a table to show their earnings.

Name	Earnings
Tonya	$34
Betty	$34
Jose	$34
Mario	$25
Eliza	$22
George	$22
Sue	$17
Pedro	$ 8

Pedro noticed that Tonya made a mistake. His earnings were $24, not $8.

How does this change affect the mean of the group's earnings?

A. The mean remains the same.

B. The mean increases by $2.00.

C. The mean increases by $3.00.

D. The mean decreases by $9.00.

17. A pattern of shaded and unshaded squares is shown below.

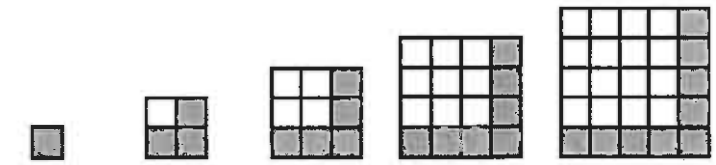


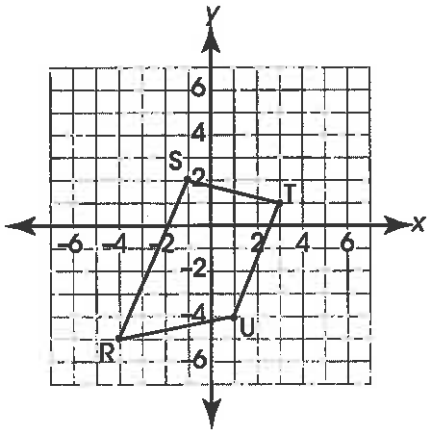
Figure 1 Figure 2 Figure 3 Figure 4 Figure 5

In your **Answer Document**, find a formula for or describe in words the number of shaded squares in the n^{th} figure.

Find the number of shaded squares in the 50th figure. Show your work or explain your answer.

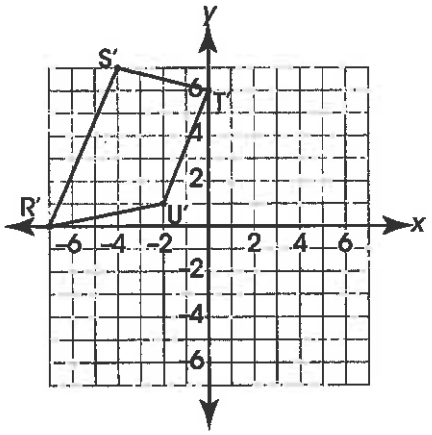
For question 17, respond completely in your **Answer Document**. (2 points)

18. Trapezoid RSTU is shown on the grid.

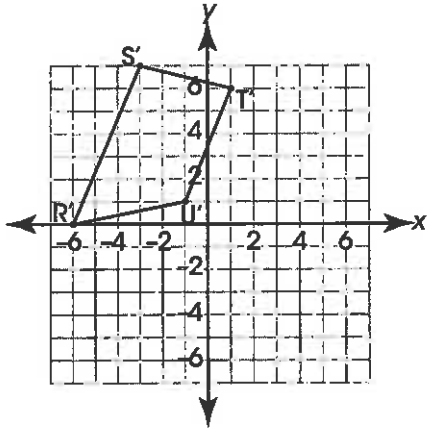


Which graph shows the image of trapezoid RSTU after it is translated 5 units up and 3 units to the left?

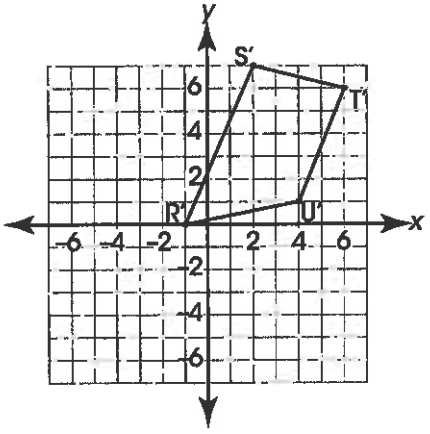
A.



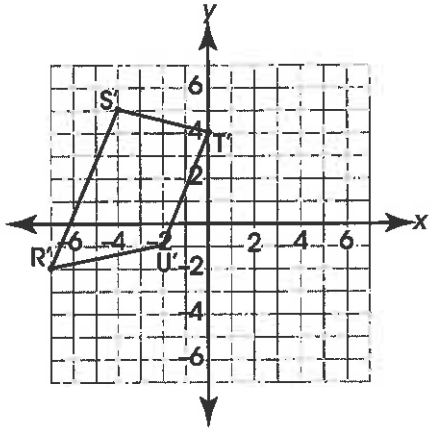
B.



C.



D.



19. Four numbers are shown.

$\frac{31}{4}$, $7\frac{5}{8}$, $\sqrt{50}$, 7.82

Which shows these numbers ordered from least to greatest?

A. $7\frac{5}{8}$, $\frac{31}{4}$, 7.82, $\sqrt{50}$

B. $\sqrt{50}$, 7.82, $\frac{31}{4}$, $7\frac{5}{8}$

C. $\sqrt{50}$, $7\frac{5}{8}$, $\frac{31}{4}$, 7.82

D. $\frac{31}{4}$, $\sqrt{50}$, $7\frac{5}{8}$, 7.82

20. Zack is packing for a trip to Scotland. He read that the average temperature in the summer is 18°C during the day and 7°C during the night.

($F = \frac{9}{5}C + 32$)

What is the difference between the high and low temperatures in degrees Fahrenheit?

A. 19.8°F

B. 43.0°F

C. 51.8°F

D. 77.4°F

21. A grocery store has a triangular pyramid of soup cans on display. Steven counts the number of cans in each of the top five layers. Each successive layer continues following the same pattern.

Layer	Number of Cans
1	1
2	3
3	6
4	10
5	15

The display has 10 layers. How many cans are in the 10th layer?

A. 25

B. 30

C. 45

D. 55

22. Local residents have requested a traffic light at the intersection of Polk Road and Vine Street. They claim that the intersection has become unsafe for their children due to the high volume of drivers using these roads as shortcuts during rush hour from 4 p.m. to 6 p.m.

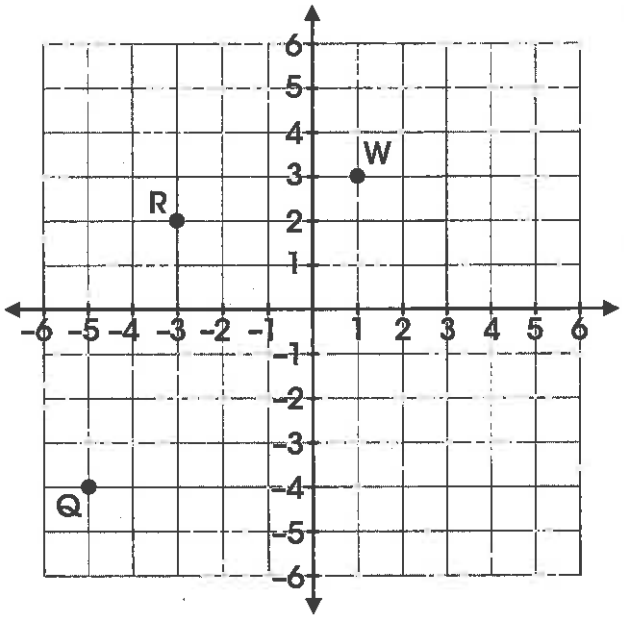
    In response, the street department installed a device that would count cars going through the intersection. The device counted the total number of cars each day for a two-week period. The department used the results to determine the average number of cars passing through the intersection each day. They decided the number was normal for an intersection with no light, and refused the residents' request.

    In your **Answer Document**, explain how the residents can claim that the method the department used to collect the data does **not** provide valid information for evaluating their request.

    Explain how the department's method can be altered to provide more valid data.

For question 22, respond completely in your **Answer Document**. (2 points)

23. Points *Q*, *R*, and *W* are plotted on the coordinate grid.



Where should point *Z* be plotted so that parallelogram QRWZ is formed?

A. (–2, –6)

B. (–1, –3)

C. (3, –2)

D. (2, –1)

24. A manufacturer wants to make a rectangular storage box with volume 0.75 cubic meters, length 1.5 meters, and width 0.4 meters.

What is the height of this box?

A. 0.15 m

B. 0.45 m

C. 0.80 m

D. 1.25 m

25. Kim is selling sandwiches for a school fundraiser. She made the chart below to help her with pricing.

Number of sandwiches x	Cost $f(x)$
3	\$ 3.45
5	\$ 5.75
8	\$ 9.20
12	\$13.80

Which function represents the cost of the sandwiches?

A. $f(x) = 1.15x$

B. $f(x) = 3.45x$

C. $f(x) = 1.15x + 3.45$

D. $f(x) = x^2 + 1.15x - 9$

26. A banquet center offers a choice of 3 salads, 5 main courses and 4 desserts.

    How many different meals can be created by selecting one salad, one main course and one dessert?

    A. 12

    B. 20

    C. 35

    D. 60

27. Joel has a 50-meter roll of copper wire that weighs 7.5 kilograms. Approximately how many meters of wire will be in a new shipment that weighs 502.5 kilograms?

    A. 75 m

    B. 610 m

    C. 3,350 m

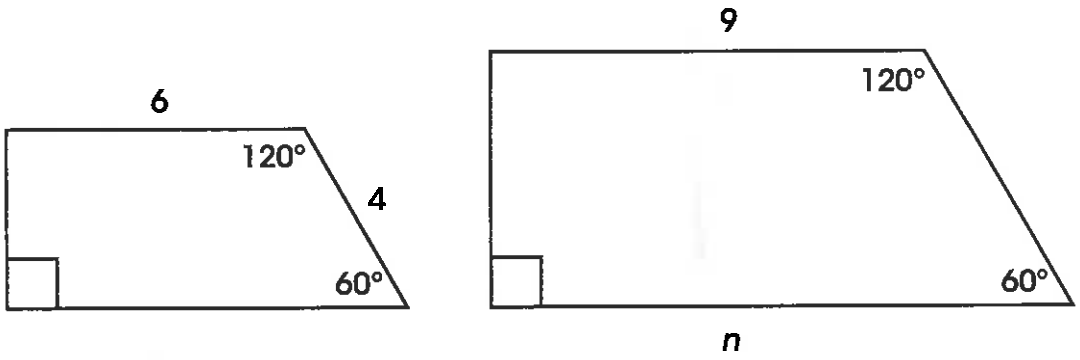
    D. 3,770 m

28. Frank makes and sells small picture frames. His revenue from sales can be represented as $R = \$13.60x$ for x frames sold. The cost of making the frames can be represented as $C = \$5.80x + \$120$ for x frames made.

    In your **Answer Document**, determine the minimum number of frames Frank must make and sell in order for his revenue to be greater than his costs. Show your work or provide an explanation for your answer.

    For question 28, respond completely in your **Answer Document**. (2 points)

29. Similar trapezoids are shown.



What is the value of n?

A. 10

B. 12

C. 15

D. 19

30. The value of x is even, and the value of y is odd. Which expression will produce an even number?

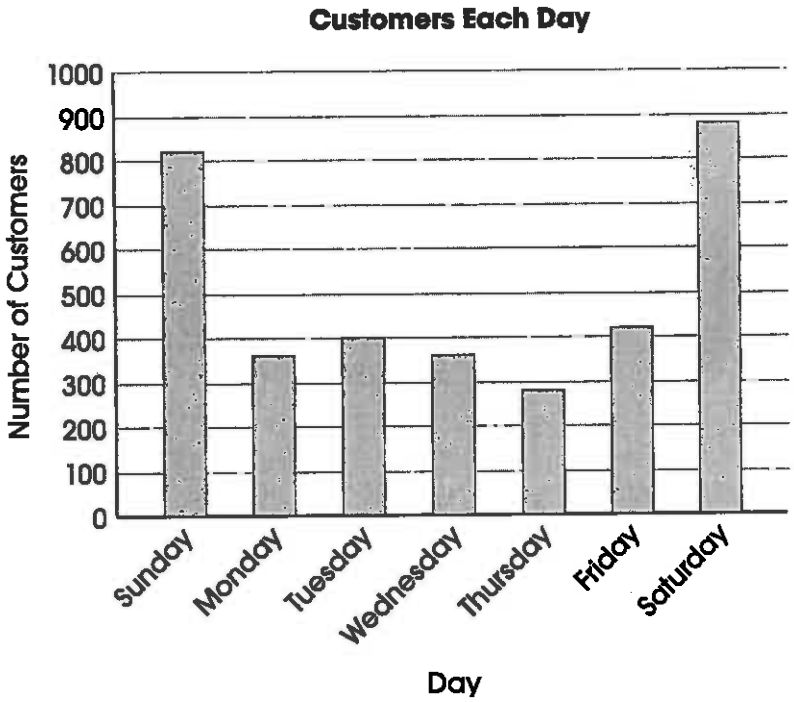
A. $x + 2y$

B. $2x + y$

C. $x^2 + y^2$

D. $(x + y)^2$

31. The bar graph shows the number of customers in Rio's restaurant each day last week.



What is the approximate mean number of customers per day in Rio's restaurant last week?

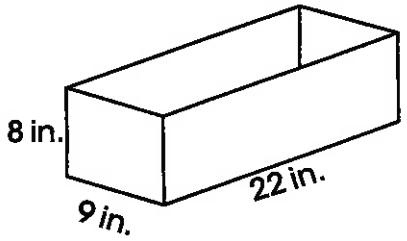
A. 360

B. 400

C. 440

D. 500

32. Mitchell is planting tulip bulbs in a rectangular planter with the dimensions shown.



Mitchell plans to fill $\frac{3}{4}$ of the planter with soil.

How much soil will Mitchell need?

A. 1,188 cubic inches

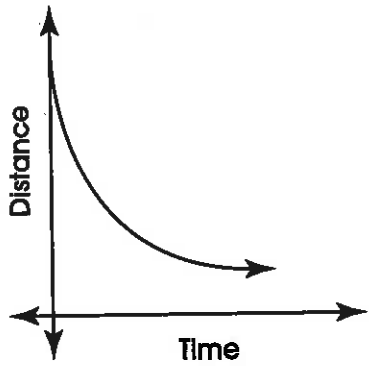
B. 1,584 cubic inches

C. 2,107 cubic inches

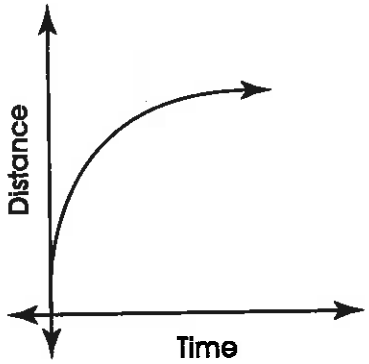
D. 11,880 cubic inches

33. When a car travels at a constant rate, distance varies directly with time. Which graph could represent the distance as a function of time?

A.



B.



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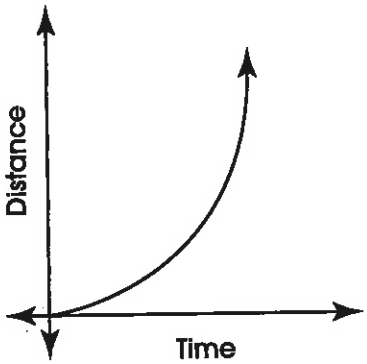
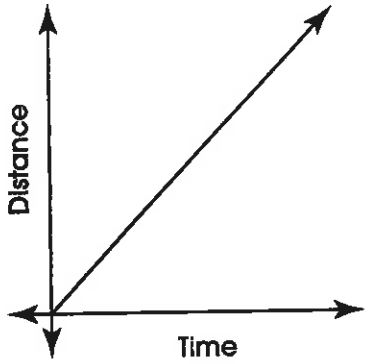


D.



34. The employees of a company will vote on two options for pay increases. The first option states that each employee will receive a $500 raise; the second option states that each employee will receive a 2% raise.

The table shows the annual salaries of the employees of the company.

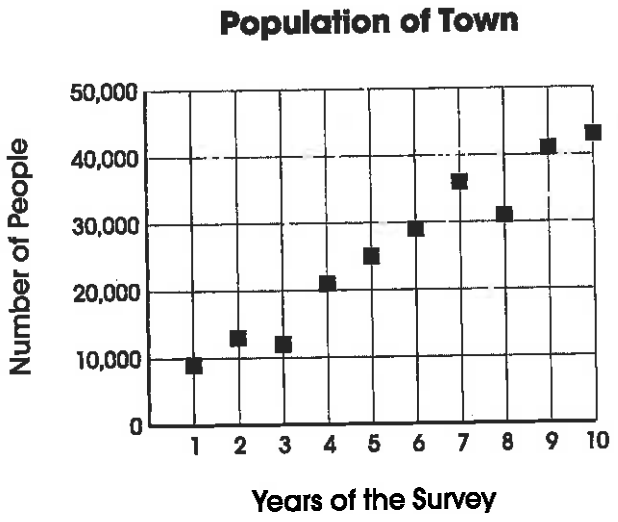
Annual Salaries of Employees

Annual Salary	Number of Employees Receiving the Salary
$18,500	6
$20,300	10
$24,100	18
$31,000	21
$42,000	5
$58,000	3
$71,000	1

In your **Answer Document**, determine which option is likely to receive the most votes. Support your response by comparing the effects of each option on the given salaries.

For question 34, respond completely in your **Answer Document**. (4 points)

35. A town census was conducted every year for the past 10 years. The scatterplot below shows the results of the census.



If the linear trend continues, which prediction is supported by the data?

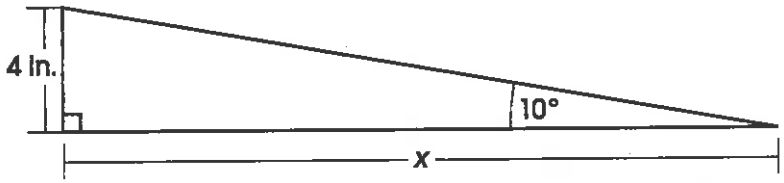
A. The population will stay the same for the next 5 years.

B. The population will reach 120,000 within the next 10 years.

C. The population will decline steadily over the next 10 years.

D. The population will exceed 50,000 people within the next 5 years.

36. A ramp is being built next to a 4-inch-high sidewalk, as shown in the diagram below.



Which trigonometric relationship could be used to find the value of x?

A. $\cos 10° = \frac{4}{x}$

B. $\cos 10° = \frac{x}{4}$

C. $\tan 10° = \frac{4}{x}$

D. $\tan 10° = \frac{x}{4}$

37. The number of hamburgers sold at a local restaurant varies inversely with the price that is charged. The number, n, of hamburgers sold at a price, p, in dollars can be found using the formula $n = \frac{687.5}{p}$. Approximately how many hamburgers did the restaurant sell if the price of the hamburgers was $3?

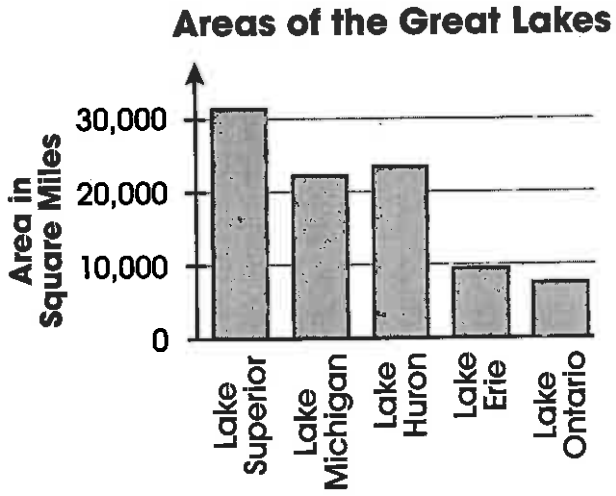
A. 278

B. 229

C. 225

D. 215

38. The areas in square miles of the Great Lakes are shown in the bar graph.



Based on this graph, which set of numbers is the closest to the total area of the five Great Lakes?

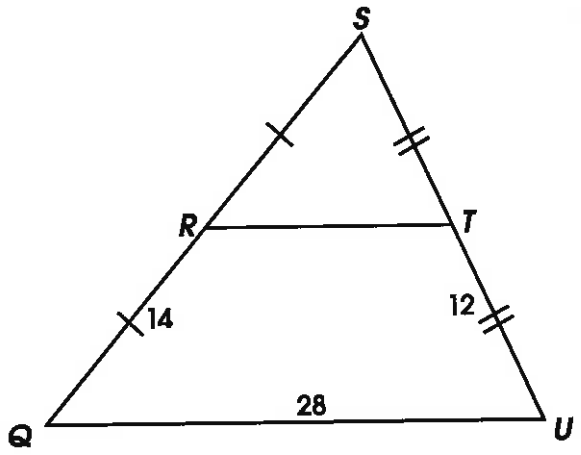
A. between 70,000 and 80,000 square miles

B. between 80,000 and 90,000 square miles

C. between 90,000 and 100,000 square miles

D. between 100,000 and 110,000 square miles

39. Points *R* and *T* are the midpoints of the sides of triangle *QSU*, as shown in the diagram below.



What is the perimeter of ΔRST?

A. 26

B. 40

C. 54

D. 80

40. The vertices of a kite are located at the points P (-2, -1), Q (-1, -2), R (-2, -5), and S (-3, -2). The image of the kite is reflected over the *x*-axis, and then the reflected image is translated 3 units to the right and 2 units up.

In your **Answer Document**, provide the coordinates for the vertices of the final image of the kite. Provide a graph, calculations or reasoning to explain how you determined the coordinates.

For question 40, respond completely in your **Answer Document**. (2 points)

41. What is the value of the expression $n^2 - \frac{w^2}{q}$ if $n = \frac{1}{3}$, $w = -6$ and $q = \frac{2}{3}$?

A. $-53\frac{8}{9}$

B. $-23\frac{8}{9}$

C. $24\frac{1}{9}$

D. $54\frac{1}{9}$

42. Population data for Ohio is provided in the table below.

1998 Ohio Population Data

	Male	Female	Total
White/Nonhispanic	4,459,172	4,950,779	9,409,951
Hispanic	76,660	79,554	156,214
Black	606,772	682,989	1,289,761
All other	72,969	78,608	151,577
Total Population	**5,215,573**	**5,791,930**	**11,007,503**

Based on the data, what is the probability, rounded to the nearest ten thousandth, that a male selected at random in Ohio in 1998 would have been Hispanic?

A. 0.4910

B. 0.0170

C. 0.0147

D. 0.0070

43. A company is comparing two different postage plans for next year. The company can purchase a postage plan where the total cost, c_1, is \$45,000 plus \$3,000 per mailing, where n is the number of mailings. The cost, c_2, of the other plan is \$0.35 for each piece, p, mailed. Which of the following is a set of equations modeling the costs of the two plans?

A. $c_1 = 45000n + 3000$
$c_2 = 0.035p$

B. $c_1 = 45000 + 3000n$
$c_2 = 0.35 + p$

C. $c_1 = 45000n + 3000$
$c_2 = 0.35 + p$

D. $c_1 = 45000 + 3000n$
$c_2 = 0.35p$

44. The Johnsons were going to a family wedding and drove a total of 1,244 miles to reach their cousin's house. They spent 9 hours driving the first day at an average speed of 60 miles per hour. They reached their cousin's house on the second day after driving 11 hours.

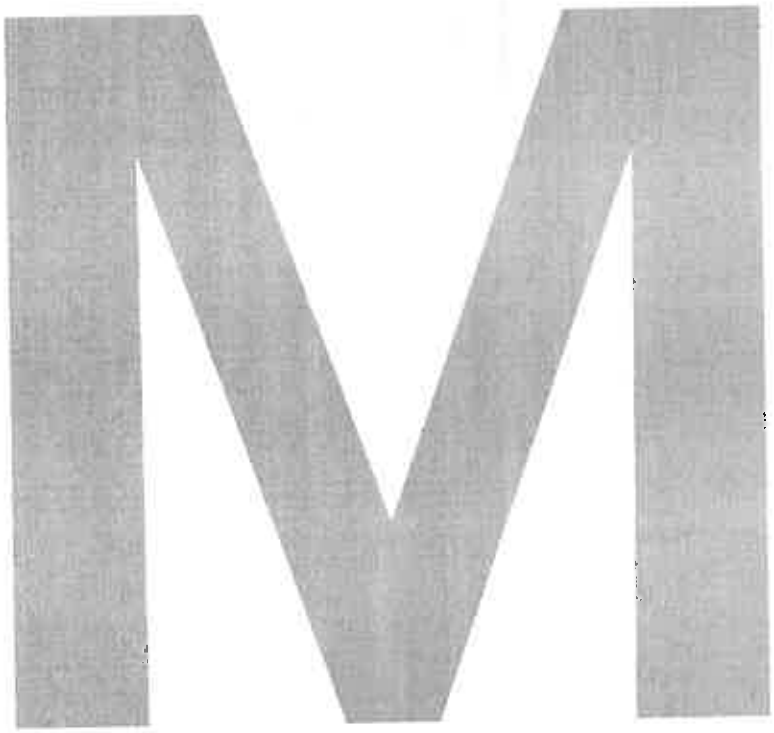
What was their average speed on the second day?

A. 60 miles per hour

B. 62 miles per hour

C. 64 miles per hour

D. 78 miles per hour



Spring 2009 Ohio Graduation Tests (OGT)

Mathematics Answer Key

Question Number	Type	Content Standard	Content Standard Benchmark	Answer Key
1	Multiple Choice	Data Analysis and Probability	B	A
2	Multiple Choice	Patterns, Functions and Algebra	F	B
3	Multiple Choice	Geometry and Spatial Sense	C	D
4	Multiple Choice	Data Analysis and Probability	K	D
5	Short Answer	Measurement	B	S
6	Multiple Choice	Number Sense	A	B
7	Multiple Choice	Geometry and Spatial Sense	E	A
8	Multiple Choice	Patterns, Functions and Algebra	D	A
9	Multiple Choice	Measurement	C	C
10	Multiple Choice	Not Released		
11	Short Answer	Not Released		
12	Multiple Choice	Not Released		
13	Multiple Choice	Not Released		
14	Multiple Choice	Not Released		
15	Multiple Choice	Not Released		
16	Multiple Choice	Data Analysis and Probability	D	B
17	Short Answer	Patterns, Functions and Algebra	A	S
18	Multiple Choice	Geometry and Spatial Sense	F	A
19	Multiple Choice	Number Sense	E	C
20	Multiple Choice	Measurement	D	A
21	Multiple Choice	Patterns, Functions and Algebra	A	D
22	Short Answer	Data Analysis and Probability	E	S
23	Multiple Choice	Geometry and Spatial Sense	D	B
24	Multiple Choice	Measurement	E	D
25	Multiple Choice	Patterns, Functions and Algebra	C	A
26	Multiple Choice	Data Analysis and Probability	H	D
27	Multiple Choice	Number Sense	G	C
28	Short Answer	Patterns, Functions and Algebra	F	S
29	Multiple Choice	Geometry and Spatial Sense	B	B
30	Multiple Choice	Number Sense	C	A
31	Multiple Choice	Data Analysis and Probability	A	D
32	Multiple Choice	Measurement	B	A
33	Multiple Choice	Patterns, Functions and Algebra	E	D
34	Extended Response	Number Sense	G	E
35	Multiple Choice	Data Analysis and Probability	F	D
36	Multiple Choice	Geometry and Spatial Sense	I	C
37	Multiple Choice	Patterns, Functions and Algebra	I	B
38	Multiple Choice	Data Analysis and Probability	A	C
39	Multiple Choice	Measurement	C	B
40	Short Answer	Geometry and Spatial Sense	F	S
41	Multiple Choice	Number Sense	I	A
42	Multiple Choice	Data Analysis and Probability	J	C
43	Multiple Choice	Patterns, Functions and Algebra	D	D
44	Multiple Choice	Measurement	F	C

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44	Multiple Choice	Measurement	F	C