GRADE 10
MATHEMATICS

Administered October 2009
Multiple Choice
Identify the choice that best completes the statement or answers the question.

1 The sides of squares can be used to form triangles. The areas of the squares that form right triangles have a special relationship.

Using the dimensions of the squares shown below, determine which set of squares will form a right triangle.
2 Jake studies the parabola shown below.

![Graph of a parabola with vertex at (-2, 0) and x-axis as the axis of symmetry.]

Which is an accurate conclusion that Jake could make about this parabola?

- **F** The vertex is at (–2, 0).
- **G** The minimum value is at (0, –4).
- **H** The maximum value is at (2, 0).
- **J** The axis of symmetry is the x-axis.

3 Simplify the expression $3(x + 1) – 2(3x + 7)$.

- **A** $–3x – 11$
- **B** $–3x – 10$
- **C** $–3x – 8$
- **D** $–3x + 17$
4. The drawing shows a view of a building.

Which drawing best represents the top view of this building?

F

G

H

J

5. The world’s fastest flying insect is the dragonfly. It can fly 36 miles per hour. If a dragonfly flew in a straight path at this rate, what distance would it fly in 15 minutes?

A 2 mi
B 9 mi
C 25 mi
D 540 mi

6. Which equation best represents the area, $A$, of the rectangle below?

F $A = 2x + 2(x + c)$
G $A = x^2 + (x + c)^2$
H $A = x(x + c)$
J $A = 2x(x + c)$

7. Use the Pythagorean Theorem to find the figure that is a right triangle.

A

B

C

D
8. What is $m$, the slope of the line that contains the points $(2, 0), (0, 3),$ and $(4, -3)$?

\[ F \quad m = \frac{3}{2} \]
\[ G \quad m = \frac{2}{3} \]
\[ H \quad m = -\frac{2}{3} \]
\[ J \quad m = -\frac{3}{2} \]

9. Mitch wants to use 40 feet of fencing to enclose a flower garden. Which of these shapes would use all the fencing and enclose the largest area?

A. A rectangle with a length of 8 feet and a width of 12 feet
B. An isosceles right triangle with a side length of about 12 feet
C. A circle with a radius of about 5.6 feet
D. A square with a side length of 10 feet

10. Greta and her friends are having lunch at Joe’s Diner. The total cost of their lunch, including tax, is $54.63. Greta and her friends have $65.00 altogether and want to leave a tip equal to 15% of the total bill. Is $65.00 enough to cover the cost of their lunch and the 15% tip for the server?

\[ F \quad \text{No, they need}$0.56 more.\]
\[ G \quad \text{No, they need}$3.29 more.\]
\[ H \quad \text{Yes, and they have}$2.18 left over.\]
\[ J \quad \text{Yes, they have the exact amount.}\]
11 Which equation best describes the relationship between \( x \) and \( y \) in this table?

<table>
<thead>
<tr>
<th>( x )</th>
<th>( y )</th>
</tr>
</thead>
<tbody>
<tr>
<td>-4</td>
<td>-11</td>
</tr>
<tr>
<td>-1</td>
<td>-2</td>
</tr>
<tr>
<td>2</td>
<td>7</td>
</tr>
<tr>
<td>5</td>
<td>16</td>
</tr>
</tbody>
</table>

A \( y = \frac{1}{3}x + 1 \)
B \( y = \frac{1}{3}x - 1 \)
C \( y = 3x - 1 \)
D \( y = 3x + 1 \)

12 Which of the following describes the line containing the points (0, 4) and (3, -2)?

F \( y = -2x + 4 \)
G \( y = \frac{1}{2}x + 6 \)
H \( y = 2x + 4 \)
J \( y = -\frac{1}{2}x + 6 \)

13 A blueprint of a house plan uses a scale in which \( \frac{1}{4} \) inch equals 1 foot. If the length of one side of the house is 65 feet, how many inches will the length be on the blueprint?

A 4 in.
B 16\( \frac{1}{4} \) in.
C 65\( \frac{1}{4} \) in.
D 260 in.

14 Vicki works as a salesclerk in a clothing store. She earns $10 per hour plus a commission of 6\% of her total sales. Which equation represents \( e \), her total earnings when she works \( h \) hours and sells a total of \( d \) dollars in merchandise?

F \( e = 10h + 0.06d \)
G \( e = 10h + 0.6d \)
H \( e = 6h + 10d \)
J \( e = 0.06h + 10d \)
Triangle $RST$ is translated so that $R$ is mapped to $R'$.

Which set of ordered pairs best identifies points $S'$ and $T'$?

A $S'(8, 3), T'(3, 8)$
B $S'(4, 3), T'(9, 8)$
C $S'(10, -1), T'(12, -9)$
D $S'(10, 3), T'(5, 4)$
The graph shows the path of a golf ball.

What is the range of this function?

F $0 < y < 100$
G $0 \leq y \leq 100$
H $0 \leq x \leq 5$
J $0 < x < 5$

17 The scale of two similar quadrilaterals is 1:2. The perimeter of the smaller quadrilateral is 80 centimeters. What is the perimeter of the larger quadrilateral?

A 40 cm
B 80 cm
C 160 cm
D 320 cm

18 Jerry and Dan are recycling newspaper for a school project. Together they made 21 stacks of newspaper. Each stack is 4 feet tall. Dan can load a stack in 15 minutes, and Jerry can load a stack in 10 minutes. What information is NOT needed to find whether they can load all the newspaper in 2 hours if they work together?

F The time it takes to load the newspaper
G The rate at which each boy loads the newspaper
H The height of each stack of newspaper
J The number of stacks of newspaper
19. At Northwest Electronics audiotapes cost $5.00 per package, and videotapes cost $10.00 per package. Which inequality best describes the number of packages of audiotapes, \(a\), and the number of packages of videotapes, \(v\), that can be purchased for $45.00 or less?

A. \(5a + 10v < 45\)
B. \(10a + 5v \leq 45\)
C. \(5a + 10v \leq 45\)
D. \(10a + 5v < 45\)

20. The sales record for a recent hit CD at Tony’s Music Store is shown on the graph below.

Which statement best describes the sales of this CD?

F. Sales rapidly increased, reached a peak, and then gradually decreased.
G. Sales gradually increased, reached a peak, and then leveled off.
H. Sales rapidly increased, reached a peak, and then rapidly decreased.
J. Sales remained constant throughout the time period.

21. The drawing shows part of the plan for a new underground lawn-sprinkler system.

Which is closest to the length of the section of plastic pipe from point \(A\) to point \(C\)?

A. 4.7 ft
B. 5.7 ft
C. 6.7 ft
D. 7.7 ft
22 Jared has a white cube and a red cube. The surfaces of each cube are numbered with a unique number from 1 to 6. If Jared tosses the cubes, what is the probability he will get a 4 on the white cube and an odd number on the red cube?

F \( \frac{1}{12} \)

G \( \frac{1}{3} \)

H \( \frac{1}{2} \)

J \( \frac{2}{3} \)

23 A certain parallelogram has the dimensions shown.

Which set of dimensions would produce a similar figure?

A  17.6 cm, 88 cm
B  70.4 cm, 176 cm
C  105.6 cm, 132 cm
D  140.8 cm, 220 cm
24. Identify the location of point \( P \) under translation \((x + 3, y - 2)\).

\[
\begin{array}{|c|c|c|c|}
\hline
& & & \\
& & & \\
& & & \\
& & & \\
& & & \\
& & & \\
& & & \\
& & & \\
\end{array}
\]

\( F \) (3, –2)  
\( G \) (2, 3)  
\( H \) (–1, 0)  
\( J \) (2, 0)

25. A function is described by the equation \( f(x) = x^2 + 5 \). The replacement set for the independent variable is \( \{1, 5, 7, 12\} \). Which of the following is contained in the corresponding set for the dependent variable?

\( A \) 0  
\( B \) 6  
\( C \) 7  
\( D \) 15

26. The length of a rectangle is equal to triple the width. Which system of equations can be used to find the dimensions of the rectangle if the perimeter is 85 centimeters?

\( F \) \[
\begin{align*}
l &= w + 3 \\
2(l + w) &= 85
\end{align*}
\]

\( G \) \[
\begin{align*}
l &= 3w \\
2l + 6w &= 85
\end{align*}
\]

\( H \) \[
\begin{align*}
l &= 3w \\
2(l + w) &= 85
\end{align*}
\]

\( J \) \[
\begin{align*}
l &= w + 3 \\
2l + 6w &= 85
\end{align*}
\]
27 Bob surveyed 10 people about the average number of hours per week they spent in the library last year and the number of books they read last year. The results of the survey are shown in the table.

<table>
<thead>
<tr>
<th>Person</th>
<th>Hours Spent in Library per Week</th>
<th>Number of Books Read Last Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>B</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>C</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>D</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>E</td>
<td>2</td>
<td>5</td>
</tr>
<tr>
<td>F</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>G</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>H</td>
<td>3</td>
<td>6</td>
</tr>
<tr>
<td>I</td>
<td>5</td>
<td>8</td>
</tr>
<tr>
<td>J</td>
<td>2</td>
<td>2</td>
</tr>
</tbody>
</table>

Which graphic display on the next page would be most helpful to determine whether there is a correlation between the number of hours spent in the library and the number of books read?

A

B

C

D
28 A regular hexagon is drawn in a circle as a design on a window. Opposite vertices are connected by line segments.

What is the measure of angle $Y$ in degrees?

F 30
G 60
H 120
J 360

29 Marcos had 15 coins in nickels and quarters. He had 3 more quarters than nickels. He wrote a system of equations to represent this situation, letting $x$ represent the number of nickels and $y$ represent the number of quarters. Then he solved the system by graphing. What is the solution?

A (6, 9)
B (5, 10)
C (9, 6)
D (10, 5)
30 Which best describes the effect on the graph of \( f(x) = 4x + 8 \) if the \( y \)-intercept is changed to \(-3\)?

- F The slope decreases.
- G The new line passes through the origin.
- H The \( x \)-intercept increases.
- J The \( y \)-intercept increases.
31 For which point is \( x < -\frac{15}{2} \) and \( y < -\frac{3}{2} \)?

A) M  
B) N  
C) P  
D) Q

32 What is the \( y \)-intercept of the function \( f(x) = 3(x - 2) \)?

F) 3  
G) 1  
H) -2  
J) -6
33 The graph below shows triangle $XYZ$ and similar triangle $X'Y'Z'$.

Which statement is true when transforming triangle $XYZ$ to triangle $X'Y'Z'$?

A All the corresponding angles will increase by a multiple of 3.
B All the corresponding angles will increase by a scale factor of $\frac{1}{3}$.
C All the corresponding sides are proportional, with a scale factor of 3.
D All the corresponding sides are proportional, with a scale factor of $\frac{1}{3}$.

34 Given the set of data {20, 15, 10, 20, 15, 10, 20, 20, 50}, which statement best interprets the data?

F Only the mean is 20.
G The range of the set of data is 20.
H The mean, median, and mode are all 20.
J The mode and median are not the same.
35 The polynomial $x^2 + x - 6$ is modeled below using algebraic tiles.

What are the solutions to the equation $x^2 + x = 6$?

A $x = -3$ and $x = -2$
B $x = -3$ and $x = 2$
C $x = 3$ and $x = -2$
D $x = 3$ and $x = 2$
36 Which mapping best represents the function \( y = 2x^2 + 1 \) when the replacement set for \( x \) is \{-1, 0, 3\}?

\[ x \]
\[ -1 \]
\[ 0 \]
\[ 3 \]

\[ y \]
\[ 1 \]
\[ 5 \]
\[ 37 \]

F

37 After a ball is dropped, the rebound height of each bounce decreases. The equation \( y = 5(0.8)^x \) shows the relationship between \( x \), the number of bounces, and \( y \), the height of the bounce, for a certain ball. What is the approximate height of the fifth bounce of this ball to the nearest tenth of a unit?

A 20.0 units
B 4.0 units
C 1.6 units
D 1.3 units

38 The edges of a large cube are 4 times longer than the edges of a small cube. How many times greater is the volume of the large cube?

F 4 times
G 12 times
H 16 times
J 64 times

39 In the equation \( y = 2x^2 - 5x - 18 \), which is a value of \( x \) when \( y = 0 \)?

A \(-18\)
B \(1\frac{1}{2}\)
C 2
D \(4\frac{1}{2}\)

40 What are the roots of the quadratic equation \( x^2 - 3x + 2 = 0 \)?

F \(-2\) and \(-1\)
G \(-2\) and 1
H 2 and \(-1\)
J 2 and 1

41 What is the value of \( y \) if \((3, y)\) is a solution to the equation \( 5x - 3y = 18 \)?

A 3
B 1
C \(-1\)
D 11
A pattern exists among the digits in the ones place when 2 is raised to different powers, as shown in the table below. For example, in \(2^4 = 16\) the number in the ones place is 6.

<table>
<thead>
<tr>
<th>Power of 2</th>
<th>Number in Ones Place</th>
</tr>
</thead>
<tbody>
<tr>
<td>(2^1)</td>
<td>2</td>
</tr>
<tr>
<td>(2^2)</td>
<td>4</td>
</tr>
<tr>
<td>(2^3)</td>
<td>8</td>
</tr>
<tr>
<td>(2^4)</td>
<td>6</td>
</tr>
<tr>
<td>(2^5)</td>
<td>2</td>
</tr>
<tr>
<td>(2^6)</td>
<td>4</td>
</tr>
<tr>
<td>(2^7)</td>
<td>8</td>
</tr>
</tbody>
</table>

Which digit is in the ones place in \(2^{38}\)?

F 2
G 4
H 6
J 8
The net of a cube is shown below. Use the ruler on the Mathematics Chart to measure the dimensions of the cube to the nearest quarter inch.

Which best represents the volume of this cube to the nearest cubic inch?

A 2 in.³  
B 9 in.³  
C 12 in.³  
D 18 in³
44 Identify the drawing that shows Figure 1 under dilation to produce Figure 2, using center of dilation (0, 0) and a scale factor of $\frac{1}{2}$.

45 Ginny made a cylindrical clay vase for her art project. If the vase has a volume of 339 cubic inches and a diameter of 6 inches, which is closest to the height of the vase?

A 36 in.
B 18 in.
C 12 in.
D 3 in.
46 The graph of the function \( y = x^2 \) is given below.

![Graph of \( y = x^2 \)](image)

How will the graph be affected if the coefficient of \( x^2 \) is decreased to \( \frac{1}{4} \)?

F  The parabola will be wider.
G  The parabola will be narrower.
H  The parabola will be translated up.
J  The parabola will be translated down.

47 Manuel has 5 more CDs than Pedro has. Bob has twice as many CDs as Manuel has. Altogether the boys have 63 CDs. Which equation can be used to find how many CDs each person has?

A  \( 5x + 2x + x = 63 \)
B  \( x + (x + 5) + 2x = 63 \)
C  \( x + (x + 5) + 2(x + 5) = 63 \)
D  \( x + 2(5x) + 5x = 63 \)

48 Which graph best represents a solution to this system of equations?

\[
\begin{align*}
2x - 3y &= 0 \\
x + 2y &= -7
\end{align*}
\]
The student election committee at Chesterfield High School recorded the number of votes that each of 4 presidential candidates received in the student council election. A total of 240 students voted. Charlene received 12.5% of the votes, Jimmy received 33.3%, Stephen received 16.7%, and Lupe received 37.5%. Which bar graph best represents the number of votes each presidential candidate received in the student council election?
50 The area of a rectangle is $144a^8b^4$ square units. If the width of the rectangle is $8a^2b^2$ units, what is the length in units?

- F $18a^6b^2$ units
- G $136a^6b^2$ units
- H $152a^{10}b^6$ units
- J $1152a^{10}b^6$ units

51 Which of the following is best represented by the data in the graph below?

- A Comparing the length of a side of a square to the square’s area
- B Comparing the length of the radius of a circle to the circle’s circumference
- C Comparing the length of a side of a cube to the cube’s volume
- D Comparing the length of the diameter of a circle to the circle’s area

52 Which linear function best describes the graph shown below?

- F $y = -3x + \frac{1}{2}$
- G $y = \frac{1}{2}x + 3$
- H $y = -3x - \frac{1}{2}$
- J $y = \frac{1}{2}x - 3$

53 Rinaldo’s school sold all of the tickets to a band concert. The tickets cost $8 each. The auditorium where the concert was held had 39 rows, with 56 seats in each row. Which of the following is a correct method for Rinaldo to calculate the total amount of ticket sales?

- A Rinaldo can multiply 56 by $8$ and then add 39.
- B Rinaldo can add 39 and 56 and then multiply by $8$.
- C Rinaldo can multiply 39 and 56 and then multiply by $8$.
- D Rinaldo can add 56 and $8$ and then multiply by 39.
54 The net of a cylinder is shown below. Use the ruler on the Mathematics Chart to measure the dimensions of the cylinder to the nearest tenth of a centimeter.

Find the total surface area of this cylinder to the nearest square centimeter.

F  6 cm$^2$
G  14 cm$^2$
H  19 cm$^2$
J  33 cm$^2$

55 What is the perimeter to the nearest centimeter of the regular octagon drawn below?

A  41 cm
B  36 cm
C  27 cm
D  18 cm

56 Mr. Salinas, a real estate agent, received a 5% commission on the selling price of a house. If his commission was $6,975, what was the selling price of the house?

F  $7,342
G  $34,875
H  $139,500
J  $662,625