Algebra I Accelerated

Summer Work

Show all your thinking (work) this included thinking for multiple choice problems.
Section A  Multiple-Choice Questions

1. Which is the solution of the equation $5x - 2 = 7x - 8$?
   - A) $x = 10$
   - B) $x = 5$
   - C) $x = 3$
   - D) $x = 2$

2. Which is the solution of the equation $\frac{2}{5}(10x - 15) - 6 = 0$?
   - A) 3
   - B) 5
   - C) 6
   - D) 4

3. Which values satisfy the inequality $10 - 3x < -2$?
   Choose all that apply.
   - A) $\frac{5}{8}$
   - B) 4
   - C) 5
   - D) 4.5
   - E) $4\frac{1}{8}$
   - F) 2
4. The sum of two consecutive even numbers is 94. What is the greater number?
   A. 44
   B. 46
   C. 48
   D. 50

5. Which statement about the equation $3(6x + 2) = 18x + 10$ is true?
   A. $x = -3$ is the only solution of the equation.
   B. The equation has many solutions.
   C. The equation has no solution.
   D. The equation has one solution only.

6. Consider the inequality $3(2 - 5x) > x - 10$.
   Which statements can satisfy the inequality?
   Choose all that apply.
   A. $x = 0.3$
   B. $x = -2$
   C. $x = 1$
   D. $x < 1$
   E. $x < 2$
   F. $x > 0.3$
7. A straight line is shown.

What is the slope of the line?

A) \( \frac{2}{3} \)
B) \( -\frac{2}{3} \)
C) \( \frac{3}{2} \)
D) \( -\frac{3}{2} \)

8. A line has an equation \( 2x + y + 3 = 0 \). Which statement about the line is true?

A) The slope of the line is 2, and the y-intercept is 3.
B) The slope of the line is 3, and the y-intercept is 2.
C) The slope of the line is –3, and the y-intercept is –2.
D) The slope of the line is –2, and the y-intercept is –3.
9. Which equations can represent the line shown?

Choose all that apply.

A. $y = -6x + 3$
B. $y = 3x - 6$
C. $3x + y = 6$
D. $-3x + y + 6 = 0$
E. $3x - y = 6$

10. Which equations represent lines that are parallel to $2x + 4y = 3$?

Choose all that apply.

A. $x + 2y = 3$
B. $3x - 6y = 6$
C. $5x + 10y = 6$
D. $2x + y = 5$
E. $7x + 14y = 9$
F. $9x - 18y = 6$
Section B  Short Answer Questions

11  Solve the equation $\frac{1}{3}x - \frac{1}{4} = \frac{1}{6}$

Write your answer in the space below.

12  A bagel and a cup of coffee cost $5. The bagel costs $1.60 less than the cup of coffee. How much does the cup of coffee cost?

Write your answer in the answer grid.

$[\ldots]$
13. Solve the equation $2(1 - x) - 4(5 + x) = 3x$.

Write your answer in the answer grid.

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14. If $x = \frac{2}{3}$ is the solution to the equation $\left(\frac{a}{3} - \frac{a}{4}\right)x = 1 + x$, what is the value of $a$?

Explain how you found the answer in the space below.
15 Solve the inequality $4x - 3 \geq 9$, and graph the solution set on a number line.

Show your answer and drawing in the space below.

16 The yearly assessment for science is the average score of 5 tests. Lola scored 57, 66, and 70 for her first 3 tests. What is the minimum average score Lola must get for the last 2 tests for her to get at least 70 for her yearly assessment?

Write your answer and your work or explanation in the space below.
17 Points (–6, 15) and (2, –1) lie on a straight line. What is the slope of the line?

Write your answer in the answer grid.

18 A vertical line is shown.

- Find the equation of the horizontal line that intersects the line at (4, 2).
- Find the equations of two vertical lines that are 3 units away from the given line.

Write your answers in the space below.
19. A line has a y-intercept of 7 and is parallel to $10x - 2y + 6 = 0$.

Write the equation of the line in slope-intercept form in the space below.

20. Diana wants to make a triangle using a copper wire of length 40 centimeters. The three sides of the triangle are $x$ centimeters, $(x - 3)$ centimeters, and $(x - 3)$ centimeters long respectively. Suppose the longest side of the triangle is an integer greater than 1, what could the maximum length of the longest side of the triangle be?

Explain how you found the answer in the space below.
Section C  Constructed Response (21: 3 points; 22: 3 points; 23: 4 points)

Jenna and Sean each save a portion of their allowance every day. The table shows the amounts.

<table>
<thead>
<tr>
<th>Jenna</th>
<th>Sean</th>
</tr>
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<tbody>
<tr>
<td>Initial amount of savings: $50</td>
<td>Initial amount of savings: $42</td>
</tr>
<tr>
<td>Daily savings: $0.60</td>
<td>Daily savings: $0.90</td>
</tr>
</tbody>
</table>

After how many days will Sean's savings be $10 more than Jenna's savings?

Write your answer and your work or explanation in the space below.
This question has three parts.

Melrose High School is putting on a variety show to raise money. It costs $900 to rent a hall for use. They plan to sell each admission ticket for $18. The amount raised, x dollars, after deducting the cost of renting the hall, is given by the equation $y = 18x - 900$, where x is the number of tickets sold.

**Part A**

A line representing the equation $y = 18x - 900$ is shown below.

Use the graph to find the minimum number of tickets that the school needs to sell in order to break even.

Explain your answer in the space below.
Part B
The school decides to sell each admission ticket for $20 instead. Will the line representing this situation have a steeper slope than the line shown in Part A?

Explain your answer in the space below.

Part C
On the same coordinate grid, draw the line mentioned in Part B. Use the graphs to deduce how much more money the school can raise by selling each admission ticket for $20, if 150 tickets are sold.

Explain your answer in the space below.
This question has two parts.

**Part A**
Carla says that the equation $3(5x + 4) = 15x + 12$ has no solution, because $3(5x + 4)$ can be written as $15x + 12$.
Do you agree?

Explain your answer in the space below.
Part B
Carson says that the solution of the equation $3(5x + 4) = 57$ is $\frac{23}{5}$. The steps below show how he worked out the answer.

$3(5x + 4) = 57$
$15x + 12 = 57$
$15x = 12 + 57$
$15x = 69$
$x = \frac{69}{15}$

$= \frac{23}{5}$

• Identify the mistake Carson made in his work.
• Solve $3(5x + 4) = 57$ for $x$.

Show your work and answer in the space below.
Section A  Multiple-Choice Questions

1. Which equations represent functions where \( x \) is the input and \( y \) is the output? Choose all that apply.

   - A) \( y = 0 \)
   - B) \( x = 7 \)
   - C) \( y = 2x + 8 \)
   - D) \( x - y = 10 \)
   - E) \( y = \sqrt{x} \)
   - F) \( x^2 + y^2 = 9 \)

2. The graph shows \( y \) as a function of \( x \).

   For which intervals is the function decreasing?

   Choose all that apply.

   - A) \( -8 < x < -4 \)
   - B) \( -4 < x < -2 \)
   - C) \( -2 < x < 0 \)
   - D) \( 0 < x < 4 \)
   - E) \( 4 < x < 6 \)
3 Town A is 100 miles away from Town B. At 10 A.M., on a day, a truck from Town A travels toward Town B at an average speed of 50 miles per hour. One hour later, a car from Town B travels toward Town A at an average speed of 60 miles per hour. Which function represents the distance between the two vehicles, \(d\) miles, after the truck has traveled for \(t\) hours?

\[\text{A} \quad d = 160 - 110t\]
\[\text{B} \quad d = 110t - 60\]
\[\text{C} \quad d = 160 - 10t\]
\[\text{D} \quad d = 100 - 10t\]

4 The graph shows the relationship between the weight of the grapes and the cost of the grapes.

![Graph showing the relationship between weight (pounds) and cost ($) with points at (0, 0), (1, 3), (2, 6), (3, 9), and (4, 12).]

Which statement about the graph is not true?

\[\text{A} \quad \text{The graph represents a linear function because it is a straight line.}\]
\[\text{B} \quad \text{The slope of the line is 3, which represents the rate of the change of the function.}\]
\[\text{C} \quad \text{The initial value of } y \text{ occurs at (1, 3). It tells us that 1 pound of grapes costs $3.}\]
\[\text{D} \quad \text{The rate of change of the function represents the cost of grapes for every additional 1 pound of grapes.}\]
5 Which expression is equivalent to \((-3b)^4\)?
   A \(-12b^4\)
   B \(256b^4\)
   C \(81b^4\)
   D \(-3b^4\)

6 Which expression is equivalent to \((4 \cdot 3^3) \cdot (6 \cdot 3^2)\)?

   Choose all that apply.
   A \(6 \cdot 4 \cdot 3^6\)
   B \(6^3 \cdot 3^2\)
   C \(2^3 \cdot 3^6\)
   D \(24 \cdot 3^6\)
   E \(6^6\)
   F \(5,832\)

7 Which expression is equivalent to \(100^0 \cdot \left(\frac{1}{3}\right)^{-2}\)?
   A \(0\)
   B \(\frac{1}{9}\)
   C \(9\)
   D \(\frac{100}{9}\)

8 A square park has an area of 57,600 square meters. What is the length, in meters, of each side of the park?
   A \(24\)
   B \(240\)
   C \(76\)
   D \(288\)
9. Which expression is equivalent to $8.1 \times 10^{-3} + 4.6 \times 10^{-4}$?

Choose all that apply.

A. 0.00856
B. 0.0127
C. $1.27 \times 10^{-2}$
D. $8.56 \times 10^{-4}$
E. $8.56 \times 10^{-3}$
F. $8.56 \times 10^{-2}$

10. The thickness of a piece of gold foil is 0.1 micrometer. Which statements below show a smaller measurement when compared to the piece of gold foil?

Choose all that apply.

A. The size of an oxygen atom is $6 \times 10^{-11}$ meter.
B. The thickness of a strand of hair is $20 \times 10^{-5}$ meter.
C. The wavelength of orange light is 620 nanometers.
D. The typical length of a carbon-carbon single bond is 154 picometers.
E. The radius of a human egg is 0.05 millimeter.
F. The size of an animal cell is $1 \times 10^{-5}$ meter.
Section B  Short Answer Questions

A mapping diagram is shown.

<table>
<thead>
<tr>
<th>x</th>
<th>Relation</th>
<th>y</th>
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</thead>
<tbody>
<tr>
<td>-2</td>
<td></td>
<td>4</td>
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<tr>
<td>0</td>
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<td>0</td>
</tr>
<tr>
<td>3</td>
<td></td>
<td>-6</td>
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<tr>
<td>4</td>
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<td>-8</td>
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- Explain why x is a function of y.
- Write an equation to represent the function.

Show your explanation and answer in the space below.
The graph shows the number of pages of a book read by Evelyn in a number of days.

- Find the rate of change and the initial value of y from the graph.
- Interpret the rate of change and the initial value of y in this situation.

Write your answers in the space below.
13 A taxi company charges $5 for the first mile plus a fixed rate for each additional 1 mile of distance traveled. A 5-mile ride costs $9.
   - Construct a function to model the relationship between the cost in dollars of a taxi ride, \( c \), and the number of miles traveled, \( d \).
   - Find the distance traveled for $20.

Write your answers in the space below.

14 At a Farmers’ Market, milk is sold at $3 per one gallon (4 quarts), $1.80 per half gallon, and $1 per one quart. Is the cost of milk a linear function of the number of quarts?

Explain your answer in the space below.
This question has two parts.

An airplane at 20,000 feet above the ground descends at a rate of 2,000 feet per minute. A fighter jet at 30,000 feet above the ground descends at a rate of 125 feet per second.

**Part A**
Find two equations that represent the height, $h$ feet, of each aircraft above the ground at time $t$ minutes.

Write your answers in the space below.

**Part B**
To land safely, an aircraft must reduce its rate of descent at a minimal height. The minimal height for an airplane is 1,000 feet, while the minimal height for a fighter jet is 3,750 feet.

- Which aircraft will reach its minimal height first?
- What is the difference in time?

Explain your answers in the space below.
16. Simplify \( \frac{\left( \frac{2}{5} \right)^3 \left( \frac{2}{5} \right)^4}{\left( \frac{2}{5} \right)^{2+3}} \).

Write your answer in the space below.
17 Evaluate \(\left(\frac{4^3 + 8}{2^{18}}\right)^3\).

Write your answer in the answer grid.

18 Evaluate \(2^{2^2}\).

Write your answer in the answer grid.
A carbon atom has a radius of 0.07 nanometer. A gold atom has a diameter of $3.32 \cdot 10^{-10}$ meter. A hydrogen atom has a radius of 53 picometers. What is the smallest difference in radius length between these atoms?

Explain how you found the answer in the space below.
Evaluate \((1.25 \cdot 10^2) \cdot (4 \cdot 10^{-4})\).

Write your answer in the answer grid.
Section C  Constructed Response

(21): 3 points; (22): 3 points; (23): 4 points

(21) This question has two parts.

Part A
A light year is the distance that light travels in one year. If light travels at a speed of
$3 \times 10^8$ meters per second, how many trillion kilometers are there in one light year?
Suppose a year has 365 days. Round your answer to 2 significant digits.

Write your answer and your work or explanation in the space below.

Part B
If $x$ and $y$ are positive numbers such that $x^2y^2 = 4$, what is the value of \( \frac{(xy)^2}{x^2y^3} \)? Leave your answer in positive indices.

Write your answer and your work or explanation in the space below.
This question has three parts.

A bus rental company has two plans for its customers.

Plan X

<table>
<thead>
<tr>
<th>Number of passengers (n)</th>
<th>10</th>
<th>20</th>
<th>30</th>
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<tbody>
<tr>
<td>Total charge (c dollars)</td>
<td>250</td>
<td>500</td>
<td>750</td>
</tr>
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Plan Y
An admission fee of $200 plus $12 per passenger.

Part A
Find an equation to represent each function.

Part B
Compare the rate of change and the initial value of the two functions in this situation.

Write your answers in the space below.
Part C
Suppose there are 15 passengers. Which plan is a better deal?

Explain your answer in the space below.

This question has three parts.

James packs 40 dictionaries in a cube-shaped cardboard box with no extra space. Each dictionary occupies 1,852.2 cubic centimeters of space. Assume the thickness of the box is negligible.

Part A
What is the length of each side of the box?

Write your answer and your work or explanation in the space below.
Part B
The box can hold 343 cube-shaped candles with no extra space. What is the length in centimeters of each side of the candle?

Write your answer in the answer grid.

Part C
If the box holds a largest possible spherical ball, what percent is the volume of the ball smaller than the volume of the box? Use the formula below to help you.

Volume of a sphere, \( V = \frac{4}{3} \pi r^3 \), where \( r \) is the radius of the sphere

Round your answer to 3 significant digits.

Write your answer and your work or explanation in the space below.