2007

Green River

Regional Educational Cooperative

Grade 9

Mathematics

Multiple Choice

Measured Progress

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Multiple Choice Item 1

Standard: MA-HS-1.1.1: Number Sense — Students will compare real numbers using order relations (less than, greater than, equal to) and represent problems using real numbers.

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Answer Key: A

Portion of Standard Being Addressed
This item requires the student to identify the inequality that represents a real-world problem.

1. Use the problem below to answer the question.

> Duane spent an evening playing video games and drinking sodas. Each video game cost 25¢ to play, and sodas cost 70¢ each. Duane had $7 to spend, and he spent money only on video games and sodas. If he drank 3 sodas and played as many video games as he could with his money, how many video games did he play?

Which inequality would be most helpful in solving the problem?

A. $0.25x + 2.10 \leq 7$

B. $x + 2.10 \leq 7$

C. $0.70x + 0.75 \leq 7$

D. $3x + 0.25 \leq 7$

Multiple Choice Item 2

Standard: MA-HS-1.1.2: Number Sense — Students will demonstrate the relationships between different subsets of the real number system.

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Answer Key: B

Portion of Standard Being Addressed
This item requires the student to demonstrate the relationships between different subsets of the real number system.

2. Which statement about number sets is true?
   A. All square roots are rational numbers.
   B. All whole numbers are rational numbers.
   C. All integers are irrational numbers.
   D. All repeating decimals are irrational numbers.

Multiple Choice Item 3

Standard: MA-HS-1.1.3: Number Sense — Students will use scientific notation to express very large or very small quantities.

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Answer Key: D

Portion of Standard Being Addressed
This item requires the student to use scientific notation to express very small numbers.

3. A unit of measure called the grain is used to measure the weight of very small items. One grain is 0.002285 ounce. Which expression shows the number of ounces in a grain in scientific notation?

   A. 2.285×10^{2}
   B. 2.285×10^{-2}
   C. 2.285×10^{3}
   D. 2.285×10^{-3}

Multiple Choice Item 4

Standard: MA-HS-1.3.1: Number Operations — Students will solve real-world and mathematical problems to specified accuracy levels by simplifying expressions with real numbers involving addition, subtraction, multiplication, division, absolute value, integer exponents, roots (square, cube) and factorials.

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Answer Key: B

Portion of Standard Being Addressed
This item requires the student to solve real-world problems to specified accuracy levels by simplifying expressions with real numbers involving addition, subtraction, multiplication and division.

4. Ace Manufacturing, Inc., makes bicycle parts. The cost of designing and creating tools for a certain new part is $4200. In addition, the manufacturing cost is $4.50 per part. If the company sells the part for $10, how many parts must it sell in order to start making a profit?

   A. 934
   B. 764
   C. 421
   D. 290

Multiple Choice Item 5

Standard: MA-HS-1.3.2: Number Operations — Students will:

- describe and extend arithmetic and geometric sequences;
- determine a specific term of a sequence given an explicit formula;
- determine an explicit rule for the nth term of an arithmetic sequence and
- apply sequences to solve real-world problems.

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Answer Key: D

Portion of Standard Being Addressed
This item requires the student to determine an explicit rule for the *n*th term in an arithmetic sequence.

5. Use the table below to answer the question.

	A	B	C	D	E
1	2.5	5	10	20	x
2	20	10	5	2.5	y

This table shows part of a computer spreadsheet. The value of each number in row 2 depends on the value of the number above it in row 1. This relationship is the same in each column. Which equation shows the correct relationship between x and y?

A. $y = \frac{x}{2}$

B. $y = 2x$

C. $y = 50x$

D. $y = \frac{50}{x}$

Multiple Choice Item 6

Standard: MA-HS-1.4.1: Ratios and Proportional Reasoning — Students will apply ratios, percents and proportional reasoning to solve real-world problems (e.g., those involving slope and rate, percent of increase and decrease) and will explain how slope determines a rate of change in linear functions representing real-world problems.

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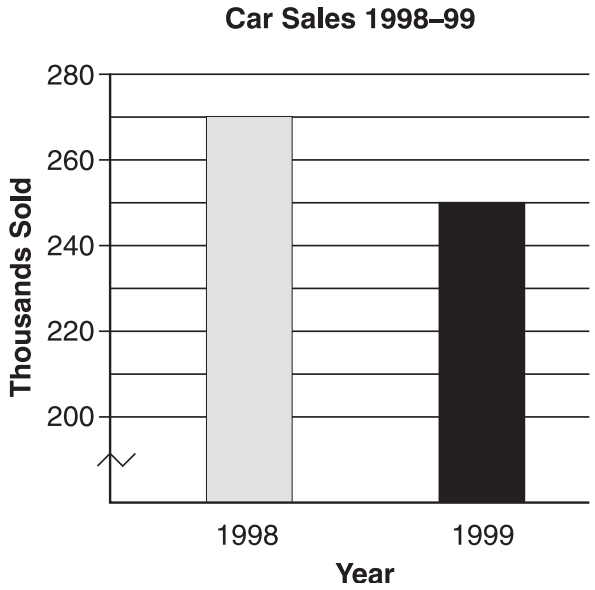
Answer Key: A

Portion of Standard Being Addressed
This item requires the student to find the percent of decrease in a real-world problem.

6. Use the bar graph below to answer the question.



This bar graph shows the 1998 and 1999 sales for a car model. By what **percent** did the sales decrease from 1998 to 1999?

A. 7%
B. 8%
C. 16%
D. 20%

Multiple Choice Item 7

Standard: MA-HS-1.4.1: Ratios and Proportional Reasoning — Students will apply ratios, percents and proportional reasoning to solve real-world problems (e.g., those involving slope and rate, percent of increase and decrease) and will explain how slope determines a rate of change in linear functions representing real-world problems.

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Answer Key: A

Portion of Standard Being Addressed
This item requires the student to apply ratios to solve real-world problems.

7. Three business partners, Mr. Gray, Ms. Peterson, and Mr. Wu, share profits in the ratio of 2:3:5, respectively. Which of the following is the best estimate of Ms. Peterson's share of a profit of $24,925?

   A. $ 7,500
   B. $ 8,300
   C. $10,300
   D. $12,500

Multiple Choice Item 8

Standard: MA-HS-1.5.1: Properties of Numbers and Operations — Students will identify real number properties (commutative properties of addition and multiplication, associative properties of addition and multiplication, distributive property of multiplication over addition and subtraction, identity properties of addition and multiplication and inverse properties of addition and multiplication) when used to justify a given step in simplifying an expression or solving an equation.

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Answer Key: B

Portion of Standard Being Addressed
This item requires the student to identify real number properties.

8. Which equation represents the additive inverse?

   A. $3 + 0 = 3$

   B. $-3 + 3 = 0$

   C. $3 \times 1 = 3$

   D. $3 \times \frac{1}{3} = 1$

Multiple Choice Item 9

Standard: MA-HS-2.1.2: Measuring Physical Attributes — Students will describe how a change in one or more dimensions of a geometric figure affects the perimeter, area and volume of the figure.

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Answer Key: D

Portion of Standard Being Addressed
This item requires the student to describe how a change in one or more dimensions of a geometric figure affects the area of the figure.

9. A shop sells small posters that have an area of 15 square feet. The shop also sells large posters that have lengths and widths 2 times as big as those of the small posters. What is the area of the large posters?

   A. 17 square feet
   B. 30 square feet
   C. 45 square feet
   D. 60 square feet

Multiple Choice Item 10

Standard: MA-HS-2.1.3: Measuring Physical Attributes — Students will apply definitions and properties of right triangle relationships (right triangle trigonometry and the Pythagorean theorem) to determine length and angle measures to solve real-world and mathematical problems.

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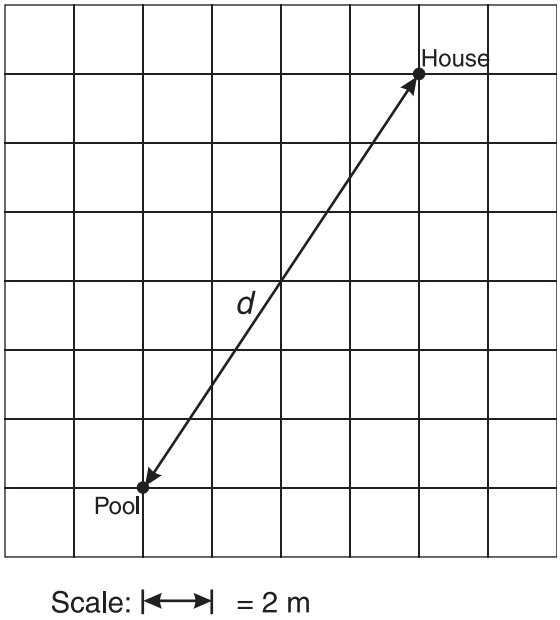
Answer Key: B

Portion of Standard Being Addressed
This item requires the student to apply properties of right triangle relationships to determine length to solve real-world problems.

10. Use the scale drawing below to answer the question.



About how far is it from the house to the pool?

A. 6.3 m
B. 14.4 m
C. 52.0 m
D. 104.0 m

Multiple Choice Item 11

Standard: MA-HS-4.1.1: Data Representations — Students will analyze and make inferences from a set of data with no more than two variables, and will analyze problems for the use and misuse of data representations.

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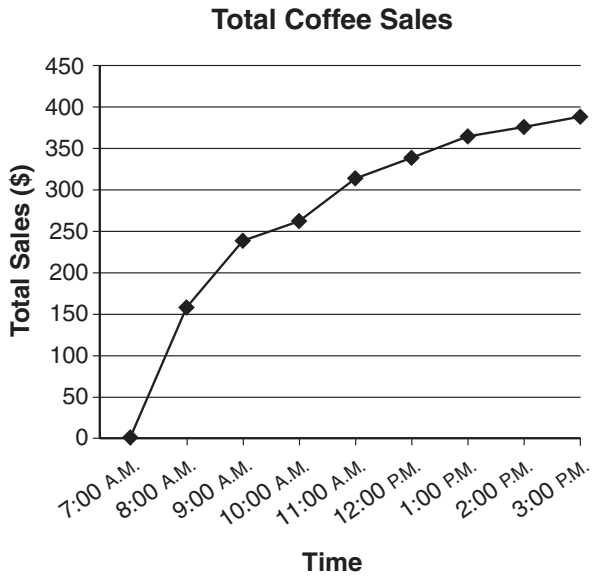
Answer Key: C

Portion of Standard Being Addressed
This item requires the student to make inferences from a set of data with no more than two variables.

11. The manager of Buzzy's Coffee Shop used the graph below to show the pattern of coffee sales on an average day. Each point on the graph represents the total sales up to that time in the day.



Which statement is the most reasonable conclusion that can be made based on the graph?

A. Most people do not go to work until 9:00 A.M.
B. Most people do not like to drink coffee after 11:00 A.M.
C. The coffee shop sells the most coffee between 7:00 and 8:00 A.M.
D. The coffee shop should close after 1:00 P.M.

Multiple Choice Item 12

Standard: MA-HS-4.1.2: Data Representations — Students will construct data displays for data with no more than two variables.

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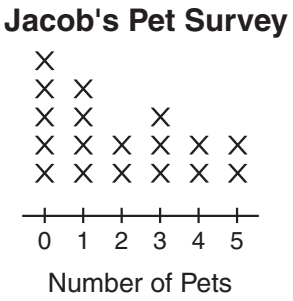
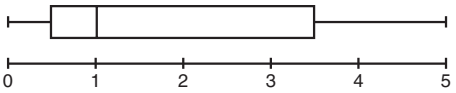
Answer Key: C

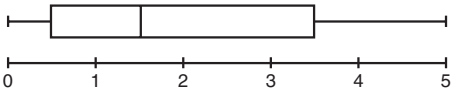
Portion of Standard Being Addressed
This item requires the student to construct data displays for data with no more than two variables.

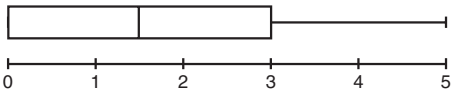
12. Jacob surveyed his classmates about the number of pets their families have. He displayed his data in a line plot, as shown below.

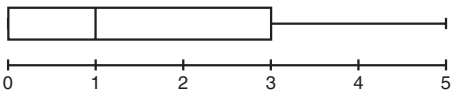


Which box-and-whisker plot correctly represents these data?

A.


B.


C.


D.


Multiple Choice Item 13

Standard: MA-HS-4.1.3: Data Representations — Students will represent real-world data using matrices and will use matrix addition, subtraction, multiplication (with matrices no larger than 2x2) and scalar multiplication to solve real-world problems.

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Answer Key: C

Portion of Standard Being Addressed
This item requires the student to use subtraction with matrices no larger than 2x2 to solve real-world problems.

13. The prices for popcorn and soft drinks at two local movie theaters are shown in the matrices below.

Theater A

$$\begin{array}{r} \\ \textbf{Small} \\ \textbf{Medium} \\ \textbf{Large} \end{array} \begin{array}{c} \begin{array}{cc} \textbf{Popcorn} & \textbf{Soft Drink} \end{array} \\ \begin{bmatrix} \$2.50 & \$2.00 \\ \$3.50 & \$3.00 \\ \$4.50 & \$4.00 \end{bmatrix} \end{array}$$

Theater B

$$\begin{array}{r} \\ \textbf{Small} \\ \textbf{Medium} \\ \textbf{Large} \end{array} \begin{array}{c} \begin{array}{cc} \textbf{Popcorn} & \textbf{Soft Drink} \end{array} \\ \begin{bmatrix} \$1.50 & \$1.00 \\ \$2.00 & \$1.50 \\ \$2.50 & \$2.00 \end{bmatrix} \end{array}$$

How much **more** will a customer pay for a medium soda and a medium popcorn at Theater A than at Theater B?

A. $1.50
B. $2.00
C. $3.00
D. $4.00

Multiple Choice Item 14

Standard: MA-HS-4.2.1: Characteristics of Data Sets — Students will describe and compare data distributions and make inferences from the data based on the shapes of graphs, measures of center (mean, median, mode) and measures of spread (range, standard deviation).

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Answer Key: C

Portion of Standard Being Addressed
This item requires the student to describe and compare data distributions based on measures of center.

14. While calculating the mean of a set of five integers, Liam mistakenly entered a 3 on his calculator instead of a 13. The incorrect mean he calculated was 9. What is the **correct** mean?

    A. 19
    B. 14
    C. 11
    D. 10

Multiple Choice Item 15

Standard: MA-HS-4.2.3: Characteristics of Data Sets — Students will:

- identify an appropriate curve of best fit (linear, quadratic, exponential) for a set of two-variable data;
- determine a line of best fit equation for a set of linear two-variable data and
- apply a line of best fit to make predictions within and beyond a given set of two-variable data.

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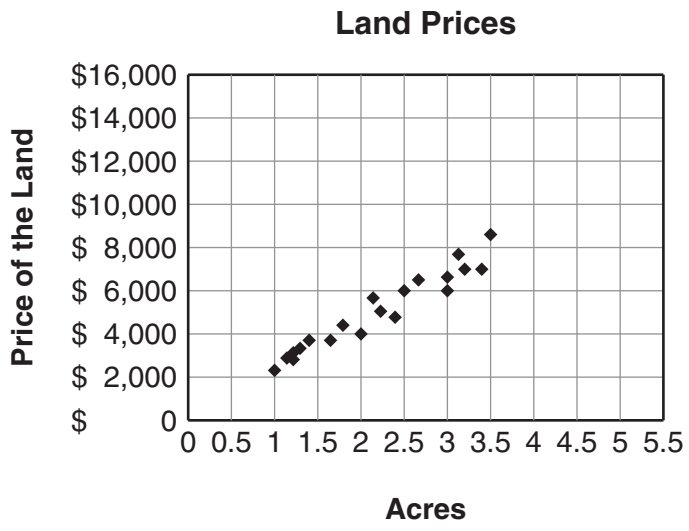
Answer Key: B

Portion of Standard Being Addressed
This item requires the student to apply a line of best fit to make predictions within and beyond a given set of two-variable data.

15. Mrs. Lee researched the prices of land for sale in her area. She found the graph shown below.



Mrs. Lee wants to sell 5.2 acres of land. Based on the information in the graph, at about what price should she sell her land?

A. $ 8,000
B. $11,000
C. $15,000
D. $16,000

Multiple Choice Item 16

Standard: MA-HS-4.3.1: Experiments and Samples — Students will recognize potential for bias resulting from the misuse of sampling methods (e.g., non-random sampling, polling only a specific group of people, using limited or extremely small sample sizes) and explain why these samples can lead to inaccurate inferences.

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Answer Key: A

Portion of Standard Being Addressed
This item requires the student to recognize potential for bias resulting from the misuses of sampling methods.

16. A member of the city council wants to find out the public opinion in her city about a proposed new sports arena. Which sampling method would be **least** biased?
    A. giving the survey to every 25th person listed on the city census
    B. giving the survey to 20 people suggested by each city council member
    C. giving the survey to every 5th person who buys tickets at the old sports arena
    D. giving the survey to every 10th person who comes into town hall

Multiple Choice Item 17

Standard: MA-HS-4.4.1: Probability — Students will:

- determine theoretical and experimental (from given data) probabilities;
- make predictions and draw inferences from probabilities;
- compare theoretical and experimental probabilities and
- determine probabilities involving replacement and non-replacement.

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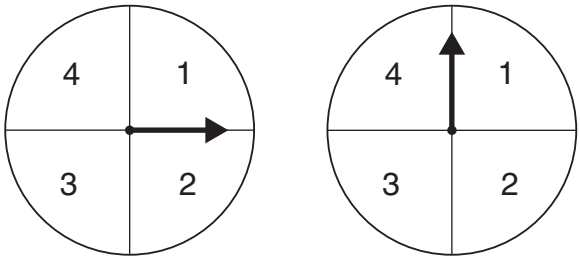
Answer Key: D

Portion of Standard Being Addressed
This item requires the student to determine theoretical probabilities.

17. Use the spinners shown below to answer the question.



If Claire spins each of these spinners once and then adds the two numbers, what is the probability that the sum will be 4?

A. $\frac{2}{16}$

B. $\frac{1}{7}$

C. $\frac{2}{10}$

D. $\frac{3}{16}$

Multiple Choice Item 18

Standard: MA-HS-4.4.1: Probability — Students will:

- determine theoretical and experimental (from given data) probabilities;
- make predictions and draw inferences from probabilities;
- compare theoretical and experimental probabilities and
- determine probabilities involving replacement and non-replacement.

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Answer Key: C

Portion of Standard Being Addressed
This item requires the student to make predictions from probabilities.

18. From a shipment of 500 batteries, a sample of 25 was selected at random and tested. If 2 batteries in the sample were found to be dead, how many dead batteries would be expected in the entire shipment?

    A. 20
    B. 30
    C. 40
    D. 50

Multiple Choice Item 19

Standard: MA-HS-4.4.2: Probability — Students will recognize and identify the differences between combinations and permutations and use them to count discrete quantities.

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Answer Key: B

Portion of Standard Being Addressed
This item requires the student to identify the differences between combinations and permutations and use them to count discrete quantities.

19. Members of the eighth-grade class are selecting two colors for decorations. They have 8 different colors to choose from. How many different 2-color choices are possible?

    A. 16
    B. 28
    C. 56
    D. 64

Multiple Choice Item 20

Standard: MA-HS-5.1.1: Patterns, Relations and Functions — Students will identify multiple representations (tables, graphs, equations) of functions (linear, quadratic, absolute value, exponential) in real-world or mathematical problems.

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Answer Key: D

Portion of Standard Being Addressed
This item requires the student to identify multiple representations of functions in real-world problems.

20. The value over time of a certain $20,000 car is modeled by the equation $y = 20{,}000(0.75^x)$, where x is the age of the car in years.

    Which graph best represents the value over time of the car?

A.

C.

B.

D.

Multiple Choice Item 21

Standard: MA-HS-5.1.1: Patterns, Relations and Functions — Students will identify multiple representations (tables, graphs, equations) of functions (linear, quadratic, absolute value, exponential) in real-world or mathematical problems.

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Answer Key: B

Portion of Standard Being Addressed
This item requires the student to identify a linear function.

21. Which table represents a function?

A.

Input (x)	Output (y)
1	5
2	6
3	8
3	9

B.

Input (x)	Output (y)
1	2
2	2
3	2
4	2

C.

Input (x)	Output (y)
1	6
1	9
3	12
4	9

D.

Input (x)	Output (y)
2	4
2	0
2	5
2	9

Multiple Choice Item 22

Standard: MA-HS-5.1.3: Patterns, Relations and Functions — Students will demonstrate how equations and graphs are models of the relationship between two real-world quantities (e.g., the relationship between degrees Celsius and degrees Fahrenheit).

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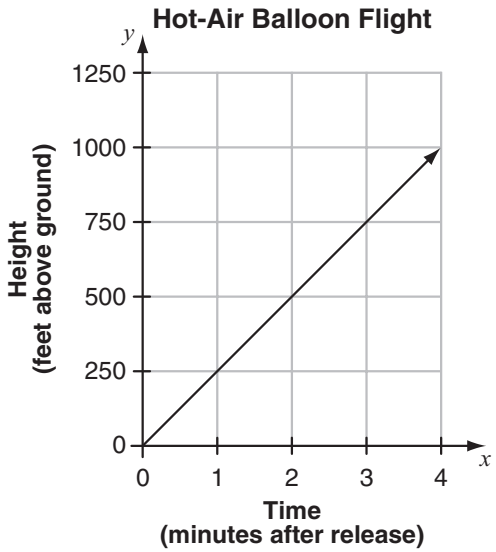
Answer Key: B

Portion of Standard Being Addressed
This item requires the student to demonstrate how equations and graphs are models of the relationship between two real-world quantities.

22. The graph below shows the relationship between the number of minutes after a hot-air balloon is released and the balloon's height above the ground.



Which equation represents the balloon's height (y), in feet above the ground, x minutes after being released?

A. $y = x$
B. $y = 250x$
C. $y = 500x$
D. $y = 750x$

Multiple Choice Item 23

Standard: MA-HS-5.1.5: Patterns, Relations and Functions — Students will:

- determine if a relation is a function;
- determine the domain and range of a function (linear and quadratic);
- determine the slope and intercepts of a linear function;
- determine the maximum, minimum, and intercepts (roots/zeros) of a quadratic function and
- evaluate a function written in function notation for a specified rational number.

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Answer Key: B

Portion of Standard Being Addressed
This item requires the student to determine the intercepts of a linear function.

23. Look at this equation.

$$\mathbf{150}\boldsymbol{x} + \boldsymbol{y} = \mathbf{750}$$

What is the ***x*-intercept** of the graph of this equation?

A. 1
B. 5
C. 150
D. 750

Multiple Choice Item 24

Standard: MA-HS-5.1.5: Patterns, Relations and Functions — Students will:

- determine if a relation is a function;
- determine the domain and range of a function (linear and quadratic);
- determine the slope and intercepts of a linear function;
- determine the maximum, minimum, and intercepts (roots/zeros) of a quadratic function and
- evaluate a function written in function notation for a specified rational number.

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Answer Key: A

Portion of Standard Being Addressed
This item requires the student to determine the solution set of an equation.

24. Look at this equation.

$$3x - y = -5$$

What is the **solution set** of this equation if the domain is {1, 2}?

A. {(1, 8), (2, 11)}
B. {(1, –2), (2, 1)}
C. {(1, –2), (2, –1)}
D. {(1, –8), (2, –11)}

Multiple Choice Item 25

Standard: MA-HS-5.1.5: Patterns, Relations and Functions — Students will:

- determine if a relation is a function;
- determine the domain and range of a function (linear and quadratic);
- determine the slope and intercepts of a linear function;
- determine the maximum, minimum, and intercepts (roots/zeros) of a quadratic function and
- evaluate a function written in function notation for a specified rational number.

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Answer Key: B

Portion of Standard Being Addressed
This item requires the student to determine if a relation is a function.

25. Which set of ordered pairs represents a function?

A. {(1, 1), (1, 2), (1, 3), (1, 4)}
B. {(4, 4), (5, 5), (6, 6), (7, 7)}
C. {(1, 1), (1, –1), (2, 1), (2, –1)}
D. {(4, 2), (2, –2), (9, 3), (9, –3)}

Multiple Choice Item 26

Standard: MA-HS-5.2.1: Variables, Expressions and Operations — Students will apply order of operations, real number properties (identity, inverse, commutative, associative, distributive, closure) and rules of exponents (integer) to simplify algebraic expressions.

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Answer Key: D

Portion of Standard Being Addressed
This item requires the student to apply real number properties to simplify algebraic expressions.

26. Malcolm wrote the expression below.

$$\mathbf{5x - 2x^2 - 5 + 2x}$$

Which of the following is equivalent to Malcolm's expression?

A. $x - x^2$
B. $5x - 5$
C. $-2x^2 + 2x$
D. $-2x^2 + 7x - 5$

Multiple Choice Item 27

Standard: MA-HS-5.2.3: Variables, Expressions and Operations — Students will:

- add, subtract and multiply polynomial expressions;
- factor polynomial expressions using the greatest common monomial factor and
- factor quadratic polynomials of the form ax2 + bx + c, when a = 1 and b and c are integers.

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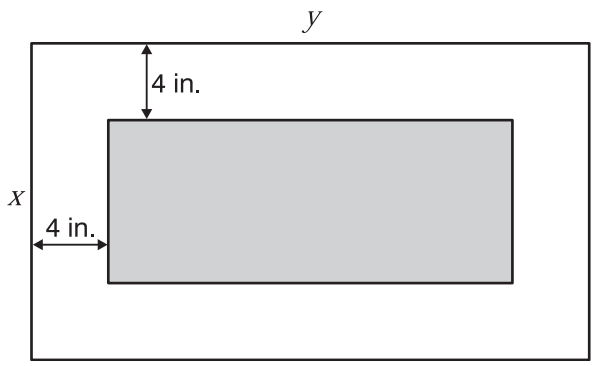
Answer Key: D

Portion of Standard Being Addressed
This item requires the student to add, subtract, and multiply polynomial expressions.

27. Use the diagram below to answer the question.



The outside edge of a picture frame is x in. long and y in. wide. If the distance from the outside edge to the inside edge of the frame is 4 in., which expression describes the shaded **area**?

A. $xy - 64$

B. $2x + 2y - 32$

C. $x^2 - 8xy + 16y^2$

D. $xy - 8x - 8y + 64$

Multiple Choice Item 28

Standard: MA-HS-5.2.3: Variables, Expressions and Operations — Students will:

- add, subtract and multiply polynomial expressions;
- factor polynomial expressions using the greatest common monomial factor and
- factor quadratic polynomials of the form ax2 + bx + c, when a = 1 and b and c are integers.

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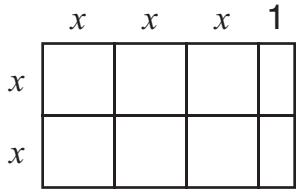
Answer Key: D

Portion of Standard Being Addressed
This item requires the student to multiply a monomial by a binomial.

28. This rectangle is made up of the tiles shown.



Which expression represents the area of this rectangle?

A. $8x^2$

B. $6x + 2$

C. $10x + 2$

D. $6x^2 + 2x$

Multiple Choice Item 29

Standard: MA-HS-5.2.3: Variables, Expressions and Operations — Students will:

- add, subtract and multiply polynomial expressions;
- factor polynomial expressions using the greatest common monomial factor and
- factor quadratic polynomials of the form ax2 + bx + c, when a = 1 and b and c are integers.

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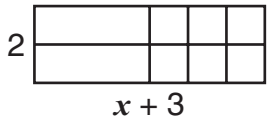
Answer Key: D

Portion of Standard Being Addressed
This item requires the student to multiply a monomial by a binomial.

29. The rectangle below has a width of 2 and a length of $x+3$.



What is the area of the rectangle?

A. $5x$
B. $2x+3$
C. $2x+5$
D. $2x+6$

Multiple Choice Item 30

Standard: MA-HS-5.2.5: Variables, Expressions and Operations — Students will add, subtract, multiply and divide simple rational expressions with monomial first-degree denominators and integer numerators (e.g., $\frac{3}{5x} + \frac{4}{3y}; \frac{9}{2a} - \frac{-7}{4b}; \frac{3}{-5x} \times \frac{-4}{7y}; \frac{5}{2c} \div \frac{9}{-11d}$), and will express the results in simplified form.

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Answer Key: D

Portion of Standard Being Addressed
This item requires the student to divide simple rational expressions with monomial first-degree denominators and express the results in simplified form.

30. Bernice wrote the expression below.

$$\frac{6 - 15w}{9w}$$

Which of the following is equivalent to Bernice's expression?

A. $-\frac{9w}{9w}$

B. $\frac{w}{3w}$

C. $\frac{2 - 5w}{3}$

D. $\frac{2 - 5w}{3w}$

Multiple Choice Item 31

Standard: MA-HS-5.3.1 Equations and Inequalities — Students will model, solve and graph first degree, single variable equations and inequalities, including absolute value, based in real-world and mathematical problems and graph the solutions on a number line.

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Answer Key: A

Portion of Standard Being Addressed
This item requires the student to solve first degree, single variable inequalities based on mathematical problems.

31. What is the solution to the inequality below?

$$6x + 3 \leq 21$$

A. $x \leq 3$
B. $x \geq 3$
C. $x \leq 4$
D. $x \geq 4$

Multiple Choice Item 32

Standard: MA-HS-5.3.3: Equations and Inequalities — Students will model, solve and graph first degree, two-variable equations and inequalities in real-world and mathematical problems.

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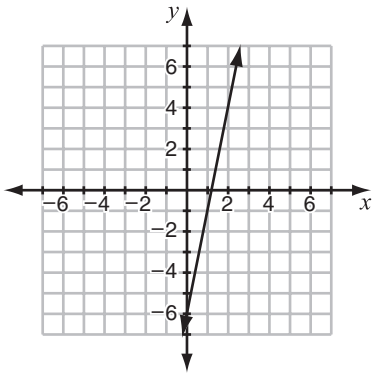
Answer Key: A

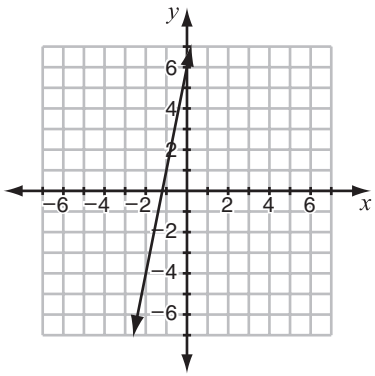
Portion of Standard Being Addressed
This item requires the student to graph first degree, two variable equations in mathematical problems.

32. Which graph represents the equation $5x - y = 6$?

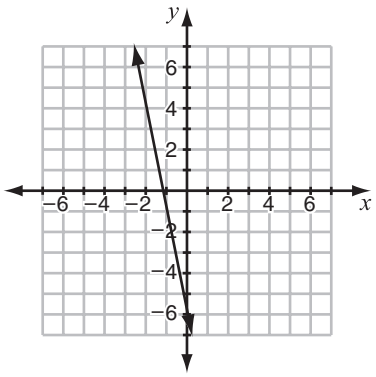
A.



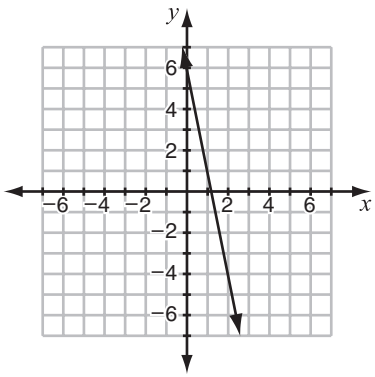
C.



B.



D.



Multiple Choice Item 33

Standard: MA-HS-5.3.3: Equations and Inequalities — Students will model, solve and graph first degree, two-variable equations and inequalities in real-world and mathematical problems.

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Answer Key: A

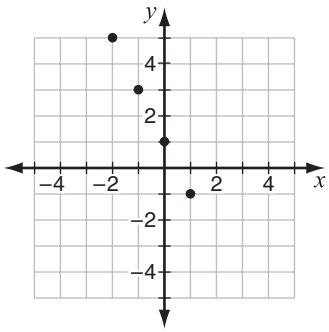
Portion of Standard Being Addressed
This item requires the student to identify the graph of an equation.

33. Look at this equation.

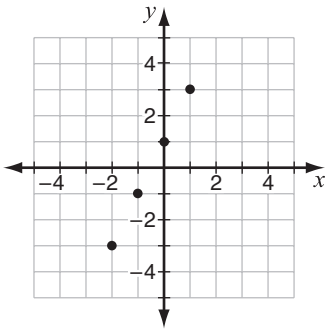
$$y = 1 - 2x$$

Which graph shows the solutions of this equation if the domain is $\{-2, -1, 0, 1\}$?

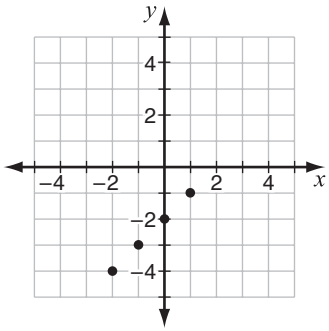
A.



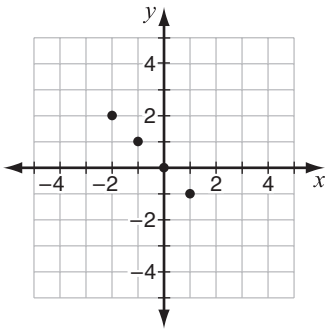
C.



B.



D.



Multiple Choice Item 34

Standard: MA-HS-5.3.4: Equations and Inequalities — Students will model, solve and graph systems of two linear equations in real-world and mathematical problems.

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Answer Key: B

Portion of Standard Being Addressed
This item requires the student to solve a system of two linear equations in a real-world problem.

34. The total fee that each of two storage companies charges to rent a locker for m months is modeled by the equations below.

Storage Company	Locker Rental Fee
Secure Storage	$f = 15m + 35$
U Fill Storage	$f = 25m + 5$

Carlos rented a locker from Secure Storage. At the same time, Lisa rented a locker from U Fill Storage. After how many months will they have spent the same amount of money on the lockers?

A. 1
B. 3
C. 4
D. 6

Multiple Choice Item 35

Standard: MA-HS-5.3.4: Equations and Inequalities — Students will model, solve and graph systems of two linear equations in real-world and mathematical problems.

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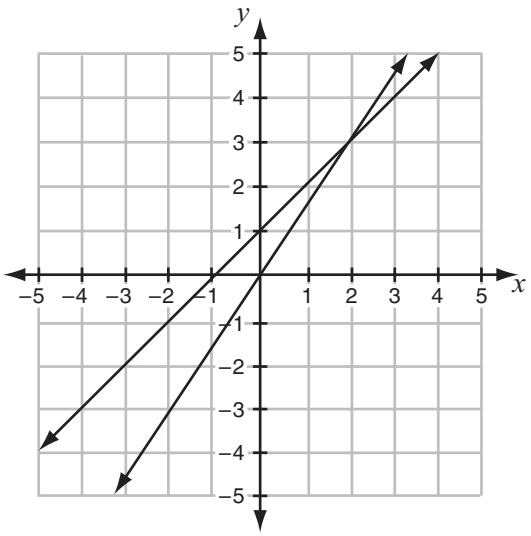
Answer Key: A

Portion of Standard Being Addressed
This item requires the student to identify the system of equations that represent the graphs of two lines.

35. Charlie used the graph below to solve a system of equations.



Which system of equations is represented by this graph?

A. $\begin{cases} x - y = -1 \\ -3x + 2y = 0 \end{cases}$

B. $\begin{cases} x - y = 1 \\ -2x + 3y = 0 \end{cases}$

C. $\begin{cases} x + y = 1 \\ 3x + 2y = 0 \end{cases}$

D. $\begin{cases} -x + y = -1 \\ 2x + 3y = 0 \end{cases}$

Multiple Choice Item 36

Standard: MA-HS-5.3.6: Equations and Inequalities — Students will model, solve and graph quadratic equations in real-world and mathematical problems.

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Answer Key: C

Portion of Standard Being Addressed
This item requires the student to find the solution to a non-linear function.

36. Latisha threw a ball in the air. The equation below shows the relationship between the height (h) in feet of the ball above the ground and the number (t) of seconds the ball was up in the air.

$$h = -t^2 + 4t$$

Which ordered pair, (t, h), is a solution to this equation?

A. (1, 5)
B. (2, 12)
C. (3, 3)
D. (4, 24)

Multiple Choice Item 37

Standard: MA-HS-5.3.6: Equations and Inequalities — Students will model, solve and graph quadratic equations in real-world and mathematical problems.

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Answer Key: B

Portion of Standard Being Addressed
This item requires the student to solve quadratic equations in real-world problems.

37. The formula $d = 16t^2$ can be used to find the distance in feet, d, that an object falls in t seconds. To the nearest second, how long will it take an object to fall 350 feet?

    A. 2 seconds
    B. 5 seconds
    C. 11 seconds
    D. 18 seconds