MCAS Review

Topic #1: Algebra and Functions

Session 1 Questions: No Calculator

Multiple Choice Questions:

1 Which of the following is equivalent to the expression below?

$$x^6 \cdot x^2$$

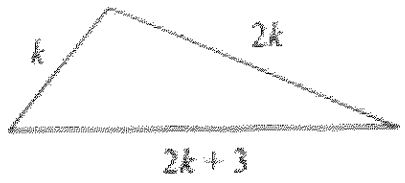
A. x^3

B. x^4

C. x^8

D. x^{12}

3 The dimensions of a triangle, in units, are represented by expressions, as shown in the diagram below.



Which of the following expressions represents the perimeter, in units, of the triangle?

A. $4k^3 + 3$

B. $5k^3 + 3$

C. $4k + 3$

D. $5k + 3$

4 What is the smallest value of x that makes the inequality below true?

$$0.5x - 18 \geq -14$$

A. 2

B. 8

C. 16

D. 64

6 What are the solutions of the equation below?

$$(x - 2)(x + 9) = 0$$

A. $x = -2;\ x = -9$

B. $x = -2;\ x = 9$

C. $x = 2;\ x = -9$

D. $x = 2;\ x = 9$

7 Which of the following is **not** a solutio of the equation below?

$$3x(x - 1)(x - 2) = 0$$

A. $x = 0$

B. $x = 1$

C. $x = 2$

D. $x = 3$

14 What is the value of x in the solution of the system of equations below?

$$3x - 2y = 6$$
$$x + 2y = 10$$

A. 2

B. 4

C. 10

D. 16

1 The first five terms in a geometric sequence are shown below.

4, 12, 36, 108, 324, . . .

What is the next term in the sequence?

A. 432
B. 648
C. 972
D. 1296

2 Which of the following is equivalent to the expression below?

$$x^2 + 7x - 60$$

A. $(x + 12)(x - 5)$
B. $(x + 10)(x - 6)$
C. $(x + 15)(x - 4)$
D. $(x + 20)(x - 3)$

14 Which of the following is equivalent to the expression below?

$$(x + 3)(x + 4)$$

A. $x^2 + 7$
B. $x^2 + 12$
C. $x^2 + 3x + 7$
D. $x^2 + 7x + 12$

10 A linear equation is shown below.

$$y = \frac{2}{5}x + 2$$

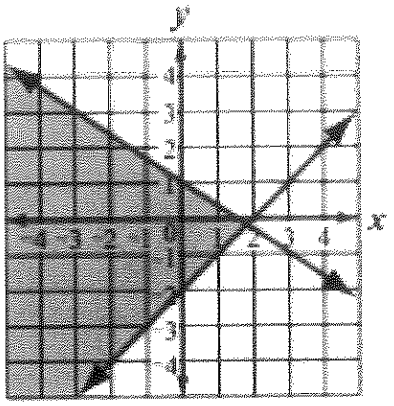
What is the value of x when $y = 2\frac{2}{3}$?

A. $3\frac{3}{4}$
B. $3\frac{1}{15}$
C. $1\frac{2}{3}$
D. $1\frac{1}{9}$

4 Which of the following graphs represents the solution of the system of inequalities below?

$$y \geq x - 2$$
$$y \leq -\frac{2}{3}x + 1$$

A.



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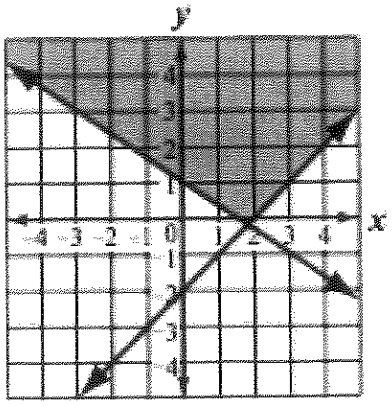

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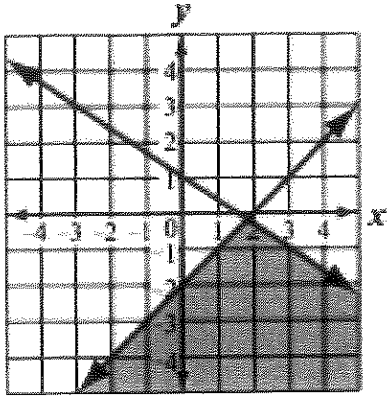

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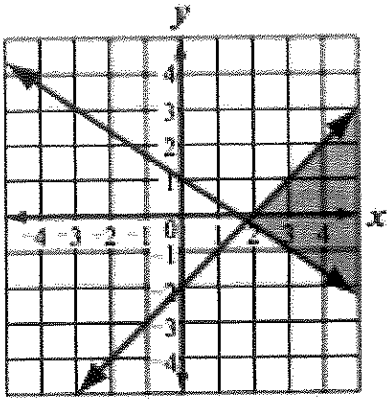


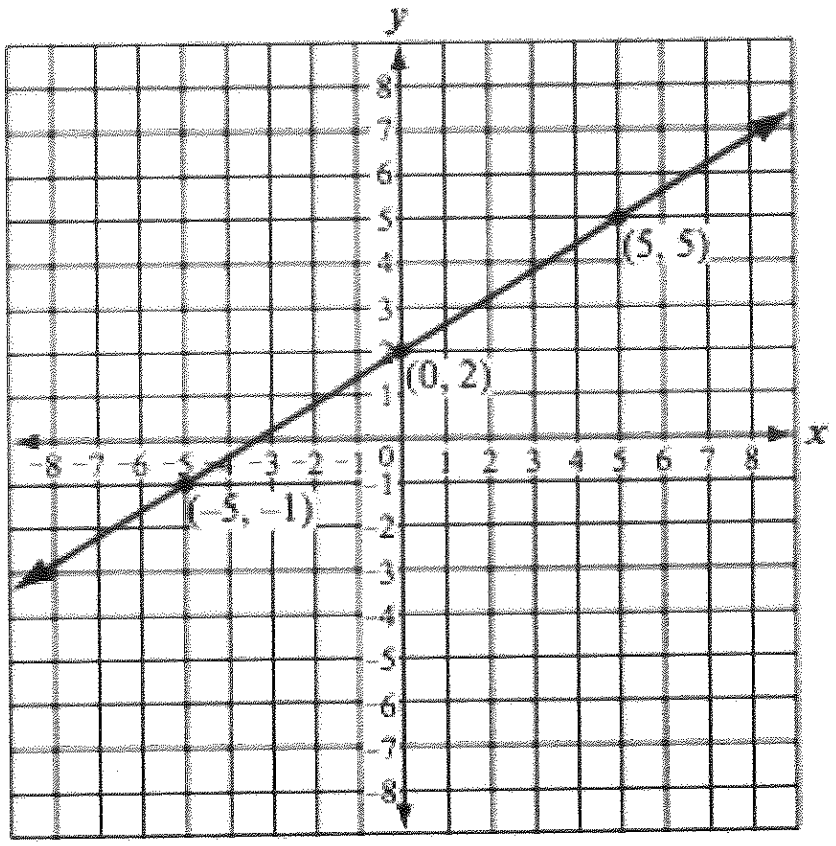
Short Answer Questions:

15 One solution of the quadratic equation below is $x = -2$.

$$x^2 + 3x + 2 = 0$$

What is the other solution of the quadratic equation?

19 What is the slope of the line graphed below?



Open Response Questions:

Write your answer to question 21 in the space provided in your Student Answer Booklet.

21 A company packages barbeque sauce in two different-sized bottles, small and large. Although the label on each small bottle states that the bottle contains 18 ounces of sauce, the company allows a tolerance of plus or minus 0.25 ounce for the amount of sauce in each small bottle. In manufacturing, tolerance is the amount of error that is allowed in packaging a product.

a. What is the maximum amount of sauce, in ounces, the company allows in each small bottle? Show or explain how you got your answer.

In the absolute-value inequality below, x represents the amount of sauce, in ounces, the company allows in each small bottle.

$$|x - 18| \leq 0.25$$

b. Solve the absolute-value inequality. Show or explain how you got your answer.

The company also makes a large bottle of barbeque sauce.

- The label on the large bottle states that each bottle contains 24 ounces of sauce.
- The minimum amount of sauce allowed in each large bottle is 23.55 ounces.
- The maximum amount of sauce allowed in each large bottle is 24.45 ounces.

c. What is the tolerance, in ounces, the company allows for the large bottle? Show or explain how you got your answer.

d. Write an absolute-value inequality that represents y, the amount of sauce, in ounces, the company allows in the large bottle.

21 The first five figures in a pattern are shown below.

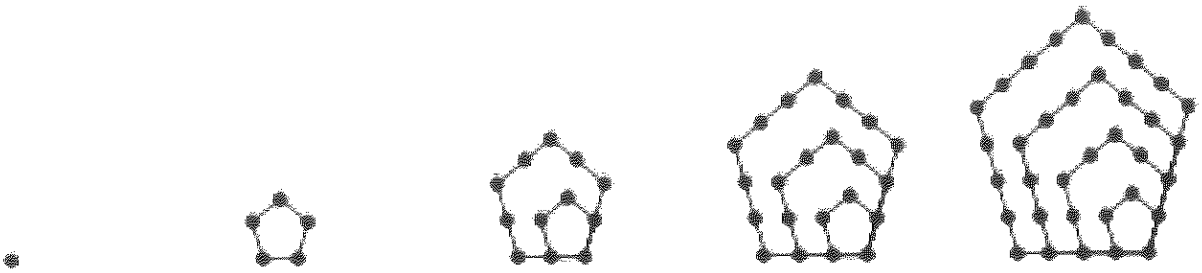


Figure 1 **Figure 2** **Figure 3** **Figure 4** **Figure 5**

The pattern continues.

a. What is the number of pentagons in Figure 6? Show or explain how you got your answer.

b. Write an expression that represents the number of pentagons in Figure *n*.

Figure 1 is one dot. Figure 2 is composed of five dots connected by line segments.

c. What is the number of dots in **Figure 6**? Show or explain how you got your answer.

d. Explain how the number of dots in Figure 8 and the number of dots in Figure 9 can be used to determine the number of dots in Figure 10.

Session 2 Questions: Calculator OK!

Multiple Choice Questions:

23 Which of the following is equivalent to the expression below?

$$(6x - 4y + 9) + (-3x - 2y)$$

A. $3x - 2y + 9$

B. $3x - 6y + 9$

C. $9x - 2y + 9$

D. $9x - 6y + 9$

29 Brooke rides her bicycle each day. On Monday, she rode the length of Maple Street in 0.4 hour at a constant speed of 15 miles per hour.

What is Brooke's constant speed if she rides the length of Maple Street on Tuesday in 0.3 hour?

A. 21 miles per hour

B. 20 miles per hour

C. 11 miles per hour

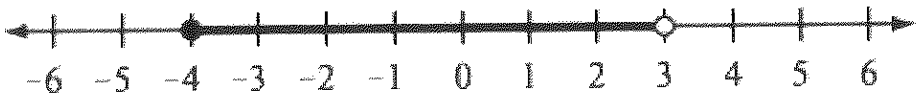
D. 6 miles per hour

25 An inequality is shown below.

$$-2 < 2x + 6 \leq 12$$

Which of the following graphs represents the solution to the inequality?

A.



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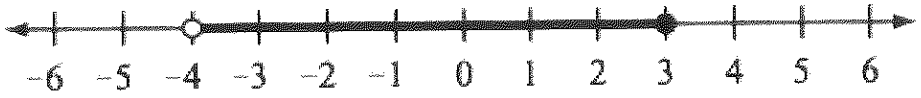

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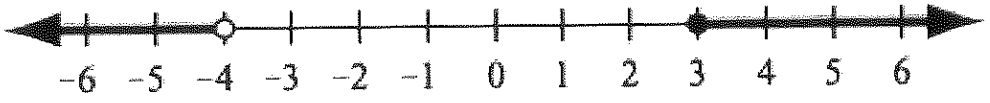
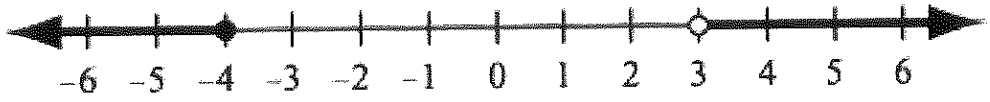


D.



33 The first five terms of a geometric sequence are shown below.

$$\frac{25}{2}, \quad \frac{125}{4}, \quad \frac{625}{8}, \quad \frac{3125}{16}, \quad \frac{15625}{32}, \ldots$$

What is the common ratio of the sequence?

A. $\frac{5}{2}$

B. $\frac{2}{5}$

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

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

35 Which of the following is equivalent to the expression below for all positive values of x?

$$\frac{x^2 + x - 6}{x^2 + 5x + 6}$$

A. -1

B. $-\frac{6}{11}$

C. $\frac{x - 2}{x + 2}$

D. $\frac{(x + 3)(x - 2)}{(x + 6)(x - 1)}$

37 The distance traveled by a student walking at a constant rate varies directly with the amount of time the student walks. The student walked $1\frac{2}{3}$ miles in $\frac{2}{3}$ hour.

Which of the following represents the relationship between d, the distance in miles walked by the student, and t, the amount of time in hours the student walked?

A. $d = \frac{5}{2}t$

B. $d = \frac{7}{3}t$

C. $d = \frac{10}{9}t$

D. $d = \frac{2}{5}t$

22 Hooke's law states that the force needed to stretch a spring varies directly with the length the spring is stretched.

A force of 20 newtons will stretch a spring 5 centimeters. What is the total number of centimeters that a force of 60 newtons will stretch the same spring?

A. 15

B. 20

C. 100

D. 240

34 The first four terms of a quadratic sequence are shown below.

6, 9, 14, 21, . . .

What is the difference between the 5th term and the 6th term of the quadratic sequence?

A. 3

B. 7

C. 11

D. 13

29 The first term in a sequence is 24. Each term in the sequence after the first term is equal to half the previous term, plus 4.

Which of the following statements best describes the terms in the sequence as it progresses?

A. The terms get closer to 8.

B. The terms get closer to 12.

C. The terms increase at a constant rate.

D. The terms decrease at a constant rate.

37 A student is knitting sweaters to give as gifts. The time it takes the student to knit each sweater is 10% less than the time it took the student to knit each previous sweater. It took the student 14 hours to knit the first sweater.

Which of the following is closest to the time it will take the student to knit the **third** sweater?

A. 10.2 hours

B. 11.3 hours

C. 12.6 hours

D. 16.9 hours

28 Two families buy refreshments at a concession stand.

- Each drink costs d dollars.
- Each snack costs s dollars.
- The Blake family buys 3 drinks and 2 snacks for $12.
- The Reese family buys 2 drinks and 4 snacks for $16.

What is the cost of one **drink** at the concession stand?

A. $2

B. $3

C. $4

D. $5

34 What is the slope of the line represented by the equation below?

$$4x + 5y = 10$$

A. $\frac{4}{5}$

B. $-\frac{4}{5}$

C. 4

D. -4

30 Brandon plans to rent a truck. The cost to rent the truck is $30 for the first four hours plus $10 for each additional hour. He can spend no more than $60.

What is the maximum number of hours for which Brandon can rent the truck?

A. 3

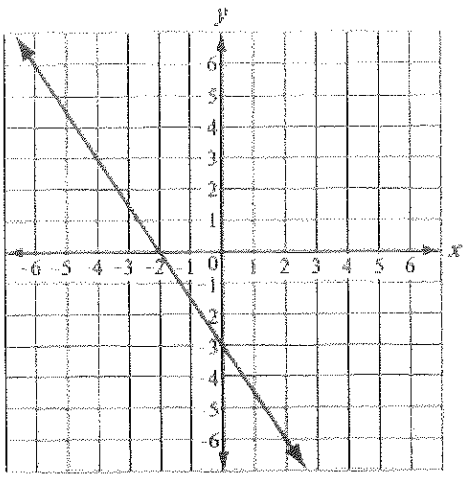
B. 4

C. 6

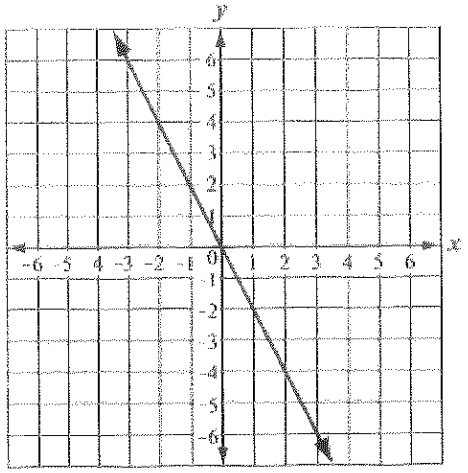
D. 7

26 Which of the following graphs represents a line that has an x-intercept of -2?

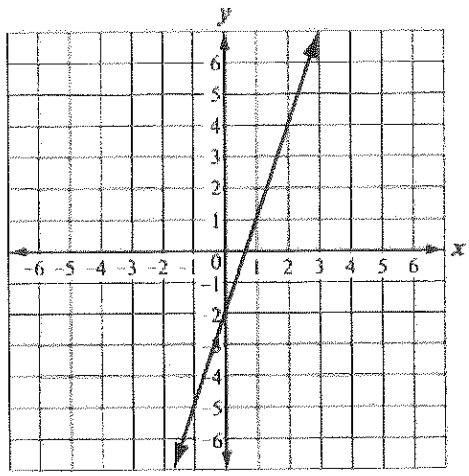
A.



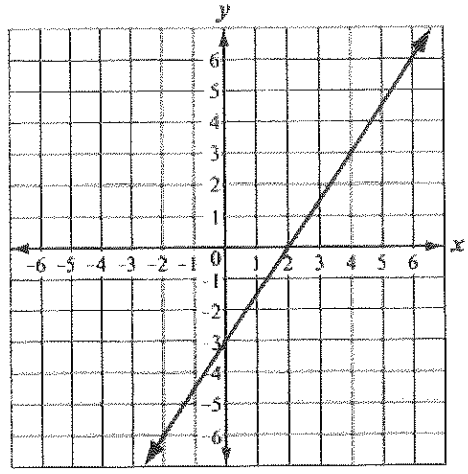
C.



B.



D.



39 A computer software package is sold to small-business clients. The total cost of the software package is $500 for the first 10 computers on which the software is installed, plus $20 for installation on each additional computer.

Which statement best describes the function that models the relationship between the number of computers on which the software is installed and the cost of the software?

A. It is a constant linear function for 10 or fewer computers and an exponential function for more than 10 computers.

B. It is an increasing linear function for 10 or fewer computers and an exponential function for more than 10 computers.

C. It is a constant linear function for 10 or fewer computers and an increasing linear function for more than 10 computers.

D. It is an increasing linear function for 10 or fewer computers and a constant linear function for more than 10 computers.

Open Response Questions:

31 Katya wants to earn $1500 this summer by doing yard work. She plans on working 125 hours over the summer.

a. Based on her plan, what is the rate, in dollars per hour, that Katya must charge customers for doing yard work to earn $1500 over the summer? Show or explain how you got your answer.

Katya also wants to enroll in a summer class at a local college. As a result, she will have to work 50 hours less than the total number of hours she had originally planned.

b. What is the rate, in dollars per hour, that Katya must charge customers for doing yard work to still earn $1500? Show or explain how you got your answer.

c. Write an equation that represents the relationship between x, the number of hours Katya will have to work, and y, the rate she must charge customers to earn $1500.

d. Explain how a change in x, the number of hours Katya will have to work, affects y, the rate she will have to charge customers to earn $1500, in your equation from part (c).

36 A chef is making 20 pounds of fruit salad to sell in his shop. The chef will use only grapes and blueberries in the fruit salad.

Let x and y be defined as follows:

- x = the number of pounds of grapes the chef will use
- y = the number of pounds of blueberries the chef will use

a. Write an equation in terms of x and y that can be used to represent the total number of pounds of fruit salad the chef will make.

Grapes cost $2.50 per pound, and blueberries cost $4.00 per pound. The chef spent a total of $59.00 for grapes and blueberries for the fruit salad.

b. Write an equation in terms of x and y that can be used to represent the total cost, in dollars, of the fruit salad.

c. Use your answers from parts (a) and (b) to determine the number of pounds of grapes **and** the number of pounds of blueberries the chef will use to make the fruit salad. Show or explain how you got your answer.

41 The expression below can be used to calculate the balance in a savings account for which an initial deposit of P dollars has been compounded each year for t years at interest rate r.

$$P(1 + r)^t$$

Elaine opened a savings account with a deposit of $1000. The interest on her account is compounded each year at a rate of 2%. Elaine will not make any additional deposits to or withdrawals from her account.

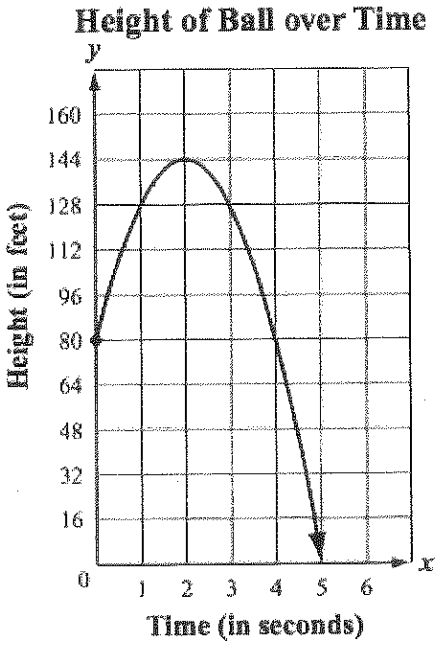
a. What will be the balance in Elaine's account at the end of 1 year? Show or explain how you got your answer.

b. What will be the balance in Elaine's account at the end of 3 years? Show or explain how you got your answer.

Pavel opened a savings account with a deposit of $800. The interest on his account is compounded each year at a rate of 2.5%. Pavel will not make any additional deposits to or withdrawals from his account.

c. Whose account, Elaine's or Pavel's, will have earned more **interest** at the end of 3 years? Show or explain how you got your answer.

42 The graph below represents y, the height in feet of a ball, x seconds after the ball was thrown upward from a bridge that crosses a river.



a. What is the y-intercept of the graph? Show or explain how you got your answer.

b. What does the y-intercept represent in the context of this situation?

c. After how many seconds did the ball reach its maximum height? Show or explain how you got your answer.

d. What is the maximum height, in feet, the ball reached? Show or explain how you got your answer.

e. After how many seconds did the ball reach the surface of the river? Show or explain how you got your answer.