

Kansas City Area Teachers of Mathematics
2015 KCATM Math Competition

ALGEBRAIC REASONING
GRADE 5

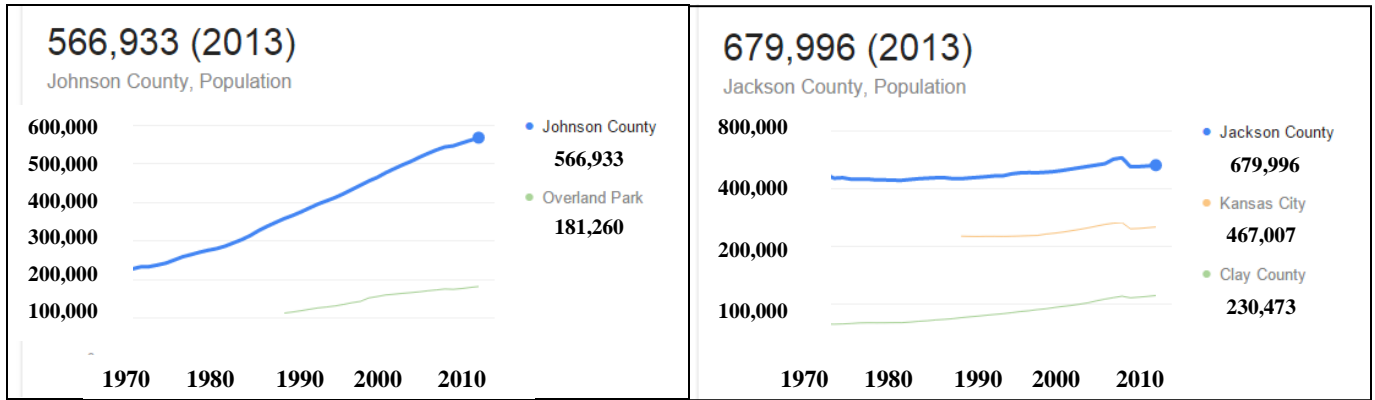
INSTRUCTIONS

- **Do not open this booklet** until instructed to do so.
- Time limit: **15 minutes**
- You **may use calculators** on this test.
- Use the π **key** on your calculator **or 3.14** as the approximation for pi.
- Mark your answer on the answer sheet by **FILLING in the oval**.
- You **may not use rulers, protractors, or other measurement devices** on this test.

Student Name _____ Student Number _____

School _____

Use the US Census Bureau population information for 2013 for problems 101-104.



101. To the nearest percent, **what percent** is the city of Kansas City (2013) of the total Jackson County, MO population (2013)?

- A. 68%
- B. 69%
- C. 70%
- D. 71%
- E. None of the above

102. To the nearest percent, **what percent** is Overland Park’s 2013 population of the total Johnson County, KS population (2013)?

- A. 31%
- B. 32%
- C. 33%
- D. 34%
- E. None of the above

103. If the population in Overland Park was 112,498 in 1990, **what is the percent increase** to its 2013 population (to the nearest percent)?

- A. 61%
- B. 38%
- C. 53%
- D. 41%
- E. None of the above

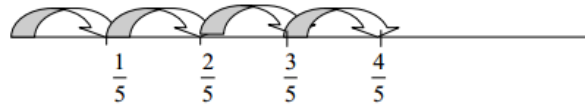
104. Looking at the trends in the data from the chart, **which statement is correct?**

- A. Johnson County, KS population > Jackson County, MO population
- B. Kansas City, MO population is over 2 ½ times greater than Overland, Park, KS
- C. Jackson County, MO decreased in population from 1990 to 2013.
- D. Overland Park, KS grew at a faster rate than the Johnson County, KS population
- E. None of the above

105. You are explaining negative numbers several different ways to a new student in your class. Which of the following statements would you **NOT** use in your description?

- A. You borrowed \$10 from your mom, you are now \$ -10 in debt.
- B. You have \$200 in the bank, but the game system you want costs \$350. You are \$-150, so you cannot buy the game system yet.
- C. The temperature fell from 5° F to -5° F, so the temperature change is -10 degrees lower.
- D. A submarine goes 800 feet below sea level, so it is -800 feet.
- E. All of the above are ways to explain negative numbers.

106. Which statement below is **NOT** correct based on the number line below?



- A. $4 \times (1/5) = 4/5$ B. $4/5 \div 1/5 = 4$ C. $1/5 + 1/5 + 1/5 + 1/5 = 4/5$
 D. $1/5 + 4/5 = 1$ E. None of the above

107. **Calculate:** $(-4)^2 + 2(3 - 13)$

- A. -4 B. -36 C. -23 D. 9 E. None of the above

108. Use the order of operations to **evaluate this expression:**

$$(7 - 2) \times 4^2 \div 2 - 3 + 1$$

- A. 18 B. 98 C. 48 D. 38 E. None of the above

109. Which operation **should be done first** in the order of operations?

- A. Addition B. Multiplication C. Parenthesis
 D. Exponents E. None of the above

110. What is $1/4 + 1/5 + 1/6$?

	<p>A. 3/15</p> <p>B. 37/60</p> <p>C. 1/2</p> <p>D. 2/3</p> <p>E. None of the above</p>
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111. Which inequality statement **is correct**?

- A. $0.45 < 0.46$ B. $1,200 > 1,200.5$ C. $0.002 < 0.002$
 D. $0.061 > 0.061$ E. None of the above

112. **Solve:** $5(n + 3) = 35$

- A. $n = 3$ B. $n = 4$ C. $n = -1$ D. $n = 7$ E. None of the above

113. **Solve:** $2n + 11 = 4n - 8$

- A. $n = 19$ B. $n = 18$ C. 9.5 D. 10.5 E. None of the above

114. Which property is **NOT** used to solve this problem?

$$4(n - 2) = 64 + n$$

$$4n - 8 = 64 + n$$



$$3n - 8 = 64$$

$$3n = 72$$

$$n = 24$$

- A. Addition property of equality B. Division property of equality
 C. Distributive property D. Subtraction property of equality
 E. All properties above are used.

115. Based on the pattern below, what is the **value of 10^{-1}** ?

Multiplication Expression	Words and/or Pictures	Exponential Notation	Standard Notation
$10 \times 10 \times 10$	 ten cubed	10^3	1,000
10		10^1	10
$10 \times 10 \times 10 \times 10$	ten to the fourth power	10^4	10,000
$10 \times 10 \times 10 \times 10 \times 10$	ten to the fifth power	10^5	100,000

- A. 0.1 B. 0 C. 0.01 D. 1 E. None of the above

116. Evaluate: $2 \times 2 - 2 \times 2 + 2 \div 2 - 2 + 2$

- A. 2 B. 1 C. 0 D. -2 E. None of the above

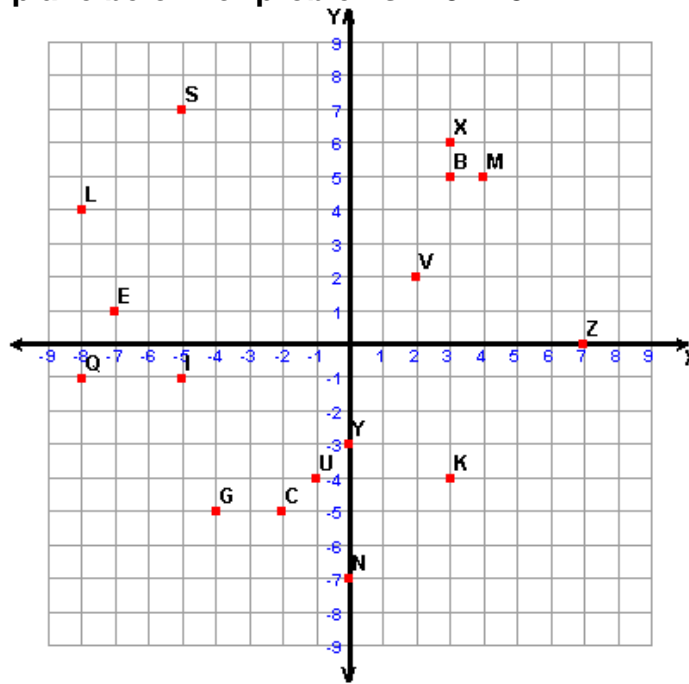
117. Evaluate: $16 + 8 \div \frac{1}{2} \times 4$

- A. 80 B. 28 C. 192 D. 20 E. None of the above

118. Evaluate: $2 - \left(\frac{2}{5} + \frac{1}{3}\right)$

- A. $\frac{5}{8}$ B. $1\frac{4}{15}$ C. $\frac{11}{15}$ D. $1\frac{4}{5}$ E. None of the above

Use the coordinate plane below for problems 119-123.



119. What are the **coordinates** of pt. S?

- A. (7, -5) B. (5, -7) C. (-5, 7) D. (5,7) E. None of the above

120. What is the **slope** of the line UK?

- A. Undefined B. zero C. positive D. negative E. None of the above

121. Create a rectangle with 3 of the vertices being B, M, and K. What is its **area**?

- A. 1 sq. unit B. 8 sq. units C. 16 sq. units D. 9 sq. units E. None of the above

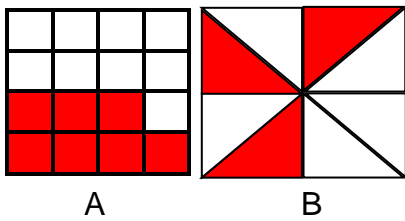
122. What is the **slope** of the line that goes through points C, U, and Y?

- A. Undefined B. 1 C. -1 D. 1 E. None of the above

123. Which quadrant is **point K** in on the coordinate plane?

- A. I B. II C. III D. IV E. None of the above

124. The shaded parts of shape A represent fraction A, and the shaded parts of shape B represent fraction B. **Evaluate: A - B**

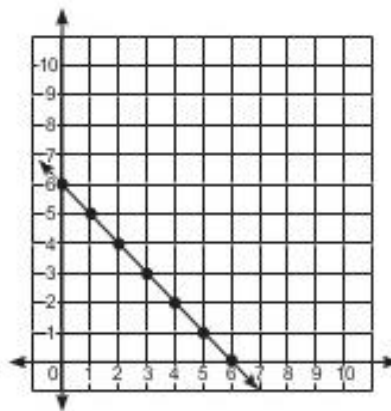
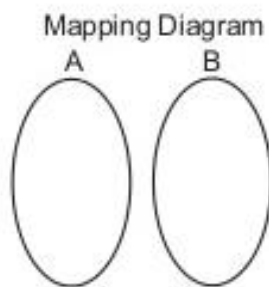


- A. $\frac{13}{16}$ B. $\frac{1}{4}$ C. $\frac{1}{16}$ D. $\frac{1}{8}$ E. None of the above

Use the following graph for problems 125-127.

Table

x	y
0	
1	
2	
3	
4	
5	
6	



125. Identify the correct **mapping diagram** for the graph above.

- A. B. C. D. E. None of the above

126. What is the **y** value when $x = 5$ in the table?

- A. 0 B. 1 C. 2 D. 5 E. None of the above

127. What is the rule for the **graph**?

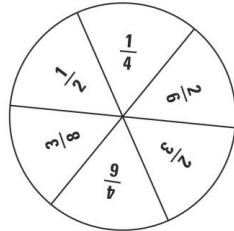
- A. $x + y = 6$ B. $x + y = 7$ C. $x - y = 0$
 D. $y - x = 6$ E. None of the above

128. Three siblings are each 2 years apart. The oldest is 6 years less than the sum of the other two. **How old are the siblings?**

- A. 10, 12, 14
- B. 14, 16, 18
- C. 8, 10, 12
- D. 6, 8, 10
- E. None of the above

129. Which fraction has the **highest probability** of a spinner landing on it?

Hint: Reduce fractions on the spinner before answering this question.



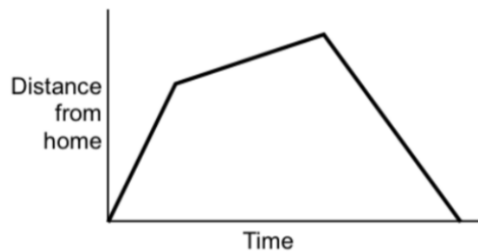
- A. 1/2
- B. 1/4
- C. 1/3
- D. 2/3
- E. None of the above

130. You bought 3 gifts for \$24 each and 5 of another gift and spent \$162. Which of the following equations would help you find the cost of each of the 5 gifts?

- A. $\$162 - \$24 = 5x$
- B. $\$162 = 5x + 3(\$24)$
- C. $\$162 - 5x = \24
- D. $\$162 - 3(\$24) = x$
- E. None of the above

131. What story can be used to describe the function graph below?

<https://easingthehurrysndrome.wordpress.com/2014/08/18/graphing-stories/>



- A. Tom took his dog for a walk to the park. He set off slowly and then increased his pace. At the park, Tom turned around and walked slowly back home.
- B. Tom rode his bike east from his home up a steep hill. After a while the slope eased off. At the top he raced down the other side.
- C. Tom went for a jog. At the end of his road he bumped into a friend and his pace slowed. When Tom left his friend he walked slowly back home.
- D. Tom went for a drive in his new car. He headed away from home fast, but then was slowed up by traffic. He then headed back home quickly.
- E. None of the above

132. “Half the difference of a number and four” is which expression?

- A. $\frac{1}{2}(x - 4)$
- B. $2 \cdot (x - 4)$
- C. $0.5(x + 4)$
- D. $\frac{1}{2}(x) - 4$
- E. None of the above

133. What is the remainder when you divide 1525 by 15?

- A. 6
- B. 0.6
- C. 10
- D. 12
- E. None of the above

134. The mean (average) of 4 tests is 86%. What was the fourth test if the first three were: 89%, 91%, 82%?

- A. 82% B. 83% C. 85% D. 86% E. None of the above

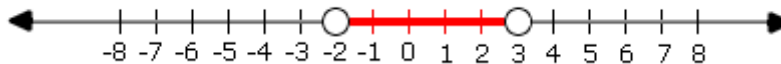
135. You were given \$100 for your birthday. You want to save 10% and spend 25% on clothes. Which algebraic statement does **NOT** determine how much you have left?

- A. $\$100 - 0.35(100)$ B. $\$100 - 0.15(100)$ C. $\$100 - 0.10(100) - 0.25(100)$
 D. $0.65(\$100)$ E. None of the above

136. The number of monkeys to tigers in a zoo is 5:2. If there are 12 tigers, **how many monkeys** are at the zoo?

- A. 60 B. 45 C. 30 D. 7 E. None of the above

137. Which inequality is graphed below?



- A. $-2 > N > 3$ B. $-2 < N < 3$ C. $-2 \leq N \leq 3$ D. $-2 \geq N \geq 3$
 E. None of the above

138. **Solve** the inequality: $3(y + 2) - 4y > 11$

- A. $y < -5$ B. $y > 5$ C. $y < 3$ D. $y > 3$ E. None of the above

139. What would the **INPUT** be in this function machine when the function is $f(x) = x^2 - 2$ and the output is 23?

	<p>Input is:</p> <p>A. 25 B. 12.5 C. 7.5 D. 5 E. None of the above</p>
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140. In the table of values, determine the missing value (x) for the input of 12?

Input	3	5	8	12	17
Output	-8	0	12	x	48

- A. 28 B. 26 C. 25 D. 24 E. None of the above

Shade the correct answer!

Example: A ● C D E

Name _____

School _____

- 101. A B C D E
- 102. A B C D E
- 103. A B C D E
- 104. A B C D E
- 105. A B C D E
- 106. A B C D E
- 107. A B C D E
- 108. A B C D E
- 109. A B C D E
- 110. A B C D E
- 111. A B C D E
- 112. A B C D E
- 113. A B C D E
- 114. A B C D E
- 115. A B C D E
- 116. A B C D E
- 117. A B C D E
- 118. A B C D E
- 119. A B C D E
- 120. A B C D E

- 121. A B C D E
- 122. A B C D E
- 123. A B C D E
- 124. A B C D E
- 125. A B C D E
- 126. A B C D E
- 127. A B C D E
- 128. A B C D E
- 129. A B C D E
- 130. A B C D E
- 131. A B C D E
- 132. A B C D E
- 133. A B C D E
- 134. A B C D E
- 135. A B C D E
- 136. A B C D E
- 137. A B C D E
- 138. A B C D E
- 139. A B C D E
- 140. A B C D E

Shade the correct answer!

Example: A ● C D E

Name _____

School _____

ANSWER KEY – 3.15.15 JH

- | | | | | | | | | | | | |
|------|---|---|---|---|---|------|---|---|---|---|---|
| 101. | A | ● | C | D | E | 121. | A | B | C | ● | E |
| 102. | A | ● | C | D | E | 122. | A | ● | C | D | E |
| 103. | ● | B | C | D | E | 123. | A | B | C | ● | E |
| 104. | A | ● | C | D | E | 124. | A | B | ● | D | E |
| 105. | A | B | C | D | ● | 125. | A | B | ● | D | E |
| 106. | A | B | C | ● | E | 126. | A | ● | C | D | E |
| 107. | ● | B | C | D | E | 127. | ● | B | C | D | E |
| 108. | A | B | C | ● | E | 128. | A | B | ● | D | E |
| 109. | A | B | ● | D | E | 129. | A | B | C | ● | E |
| 110. | A | ● | C | D | E | 130. | A | ● | C | D | E |
| 111. | ● | B | C | D | E | 131. | A | B | C | ● | E |
| 112. | A | ● | C | D | E | 132. | ● | B | C | D | E |
| 113. | A | B | ● | D | E | 133. | A | B | ● | D | E |
| 114. | A | B | C | D | ● | 134. | ● | B | C | D | E |
| 115. | ● | B | C | D | E | 135. | A | ● | C | D | E |
| 116. | A | ● | C | D | E | 136. | A | B | ● | D | E |
| 117. | ● | B | C | D | E | 137. | A | ● | C | D | E |
| 118. | A | ● | C | D | E | 138. | ● | B | C | D | E |
| 119. | A | B | ● | D | E | 139. | A | B | C | ● | E |
| 120. | A | ● | C | D | E | 140. | ● | B | C | D | E |