Kansas City Area Teachers of Mathematics
2014 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 _____

101. When you evaluate the expression: 5 {3 [2 - 6 (350 + 150) - 698]}, **what do you do first?**

A. Multiply: 5 x 3 B. Subtract: 2 - 6 C. Add: 350 + 150
D. Multiply: 6 x 350 E. None of the above

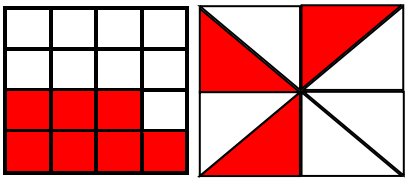
102. Evaluate: 16 + 24 ÷ 6 + 4

A. 4 B. 32 C. 41 D. 24 E. None of the above

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

A. $1\frac{5}{6}$ B. $1\frac{2}{3}$ C. $2\frac{5}{6}$ D. $2\frac{1}{3}$ E. None of the above

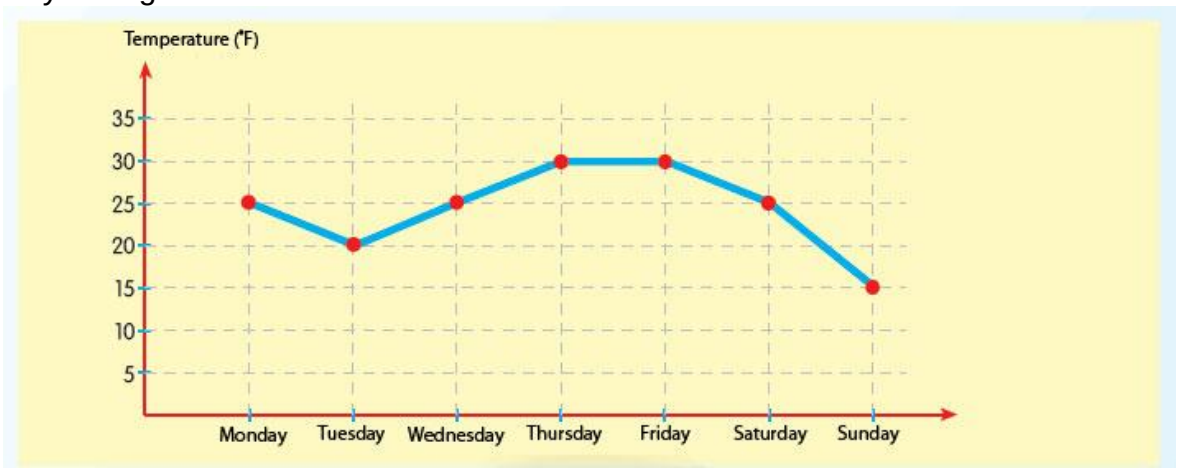
104. The shaded parts of shape A represent fraction A, and the shaded parts of shape B represent fraction B. **Evaluate: A + B**



A B

A. $\frac{13}{16}$ B. $1\frac{2}{3}$ C. $\frac{4}{16}$ D. $\frac{5}{6}$ E. None of the above

105. The graph below is the graph of the temperature collected at noon time in Kansas City during a winter week. Which conclusion is **NOT** true?



A. The coldest day is Sunday.
B. Saturday is colder than Thursday, but warmer than Tuesday.
C. Tuesday is warmer than Sunday, but colder than Monday.
D. Friday is colder than Thursday, but warmer than Saturday.
E. All statements are true.

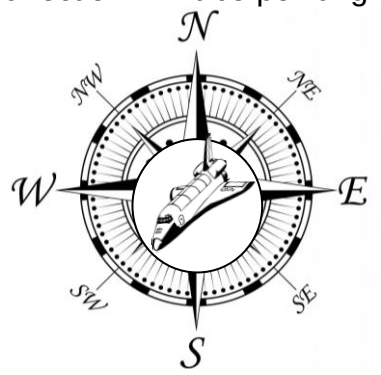
106. Five years ago Maggie (M) was 4 years old, and Connie (C) is 3 years older than Maggie. Which equation shows a correct algebraic relationship between the ages of Connie and Maggie today?

A. M = 2 x C B. M = 5 + C C. C - 3 = M
D. C ÷ 2 = M E. None of the above

107. Number of Girls (G) in a classroom is 8 less than the number of Boys (B). Half of the girls in this classroom have brown eyes (BE). Which equation shows a correct algebraic relationship between the number of boys and number of girls who have brown eyes?

A. BE = 2 x G – B B. BE = (B - 8) ÷ 2 C. B – 8 = 2 x G - BE
D. BE x 2 = G + 8 E. None of the above

108. As you come into the Kansas City Science Museum, you notice a space shuttle model on a platform that turns around. The shuttle always points south at 10 A.M.; west at 10:15 A.M.; north at 10:30 A.M.; east at 10:45 A.M.; and south again at 11 A.M. Which direction will it be pointing at 7:30 P.M.?



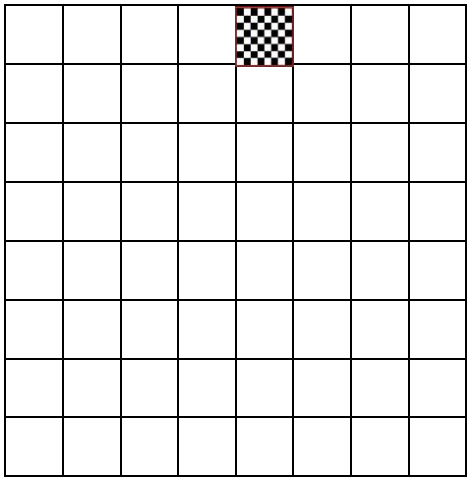
A. North
B. East
C. West
D. South
E. North-East

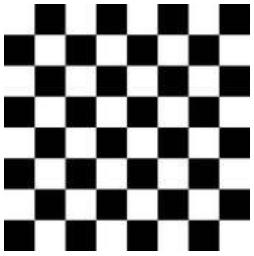
109. If **t = 6,** what is the value of the expression: $t^2 - t$?

A. 6 B. 12 C. 15 D. 30 E. 45

110. John loves playing chess, and he would like to remodel the kitchen floor which is a perfect square. He wants to replace the tiles with a **chess-board size perfect square tiles**. **How many small white and black squares** will be in his kitchen at the end?

Kitchen Floor

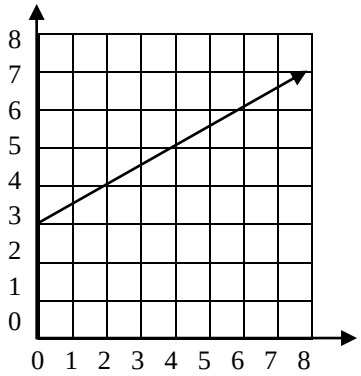




Sample Chess board

	White	**Black**
A.	4096	2048
B.	2048	4096
C.	2048	2048
D.	4096	4096
E.	None of the above	

111. What are the missing values on input/output table?



Input (x)	Output (y)
0	3
2	**y**
4	5
x	6

A. x = 5 ; y = 4
B. x = 4 ; y = 4
C. x = 6 ; y = 4
D. x = 6 ; y = 6
E. None of the above

Use this magic number trick for problems 112-114. Please follow the steps:

1. *Write down any positive 7 digit whole number:* _ _ _ _ _ _ _
2. *Take the first 3 digits and multiply it by 80.*
3. *Add 1 to the result.*
4. *Multiply it by 250.*
5. *Add last four digits.*
6. *Add last four digits again.*
7. *Subtract 250.*
8. *Divide by 2.*

112. What is the answer for every number?

A. 1111111 B. 2222222 C. 3333333
D. The same number written at the beginning E. None of the above

113. If you try the number “2352241”, which expression shows the order of operations of the magic number trick?

A. [(235*80+1)*250 + (2241+2241– 250)] ÷ 2
B. [(2241*80*250+1) + (2 * 2241– 250)] ÷ 2
C. [(2241*80+1) ÷ 250 + (2241+2241+250)] ÷ 2
D. [(235*80+1) ÷ 250 + (2241+2241+250)] ÷ 2
E. None of the above

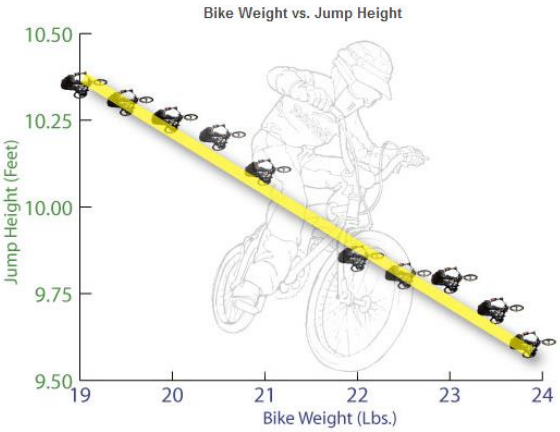
114. When “x” represents the first three digits and “y” represents last four digits which algebraic expression shows the correct order for the magic number trick?

A. xy = [(y * 80 * 250 + 1) + (2 * y – 250)] ÷ 2
B. xy = [(y * 80 + 1) ÷ 250 + (y + y + 250)] ÷ 2
C. xy = [(x * 80 + 1) ÷ 250 + (y + y + 250)] ÷ 2
D. xy = [(x * 80 + 1) * 250 + (y + y – 250)] ÷ 2
E. None of the above

115. Jake wants to save enough money to buy a snowboard. His dad will pay him $6 for each time he rakes leaves (r) during the fall and $9 for each time he shovels (s) the driveway during the winter. If Manuel earned $72 from these jobs, which of the following would be a way in which he earned the $72?

A. r = 2, s = 9 B. r = 3, s = 6 C. r = 4, s = 5
D. r = 6, s = 3 E. None of the above

116. Which statement is **NOT** a conclusion that can be made from the graph below?



A. As a bike gets heavier, the jump height increases.

B. As a bike gets heavier, the jump height decreases.

C. A bike that weighs 21 pounds can jump about 10 feet.

D. Bikes that range in weight from 19 to 24 pounds can jump from 9 ½ to 10 ½ feet.

E. None of the above

http://illuminations.nctm.org/Lesson.aspx?id=1189

117. "Twice the sum of a number and five" is which expression?

A. 2 · (x) + 5 B. 2 · (x + 5) C. x · (2 + 5)
D. 5 · (x + 2) E. None of the above

118. "Three less than the three-fourths of a number" is which expression?

A. 3 – (¾)x B. (¾) x + 3 C. (¾) x – 3
D. 3x – (¾) E. None of the above

119. In the table of values, determine the missing value (x) for the input of 15?

Input	3	7	11	15	19
Output	-14	-10	-6	x	2

A. -2 B. -4 C. -6 D. -8 E. None of the above

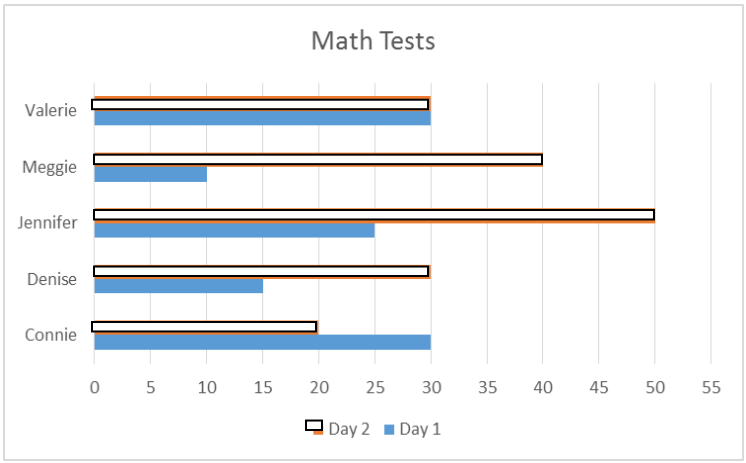
120. Find the value for the expression: $[(32 – 23)^2 \div 3]$

A. 81 B. 243 C. 27 D. 3 E. None of the above

121. Distribute: **8 (5x + 4) =**

A. 32x + 40 B. 40x + 32 C. 20x + 8 D. 40x – 20 E. None of the above

Use the graph for questions 122-123. The graph shows the number of questions that five students answered correctly in two mathematics tests in Day 1 and Day 2.



122. Who answered an equal number of questions correctly on both tests?

A. Maggie B. Connie C. Jennifer D. Valerie E. None of the above

123. Who answered twice as much questions correctly on Day 2 when compared to Day 1?

A. Maggie & Connie B. Connie & Valerie C. Jennifer & Denise
D. Valerie & Connie E. None of the above

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124. Which statement shows the **associative property of addition**?

A. (5 + 9) + 4 = (9 + 5) + 4 B. (5 + 9) + 4 = 5 + (9 + 4)
C. (5 + 9) x 4 = 5 x (9 + 4) D. 5 + (9 + 4) = 5 x (4 + 9)
E. None of the above

125. Which statement shows the **commutative property of multiplication**?

A. (3 + 5) x 8 = 8 x (3 + 5) B. (3 x 5) x 8 = (5 x 3) x 8
C. 3 x (5 x 8) = (3 x 5) x 8) D. (3 x 5) x 8 = 3 x (5 x 8)
E. None of the above

126. Which expressions does **NOT** show a way to divide a number, n, by 2?

A. n/2 B. (½)n C. 0.5(n) D. n ÷ 2 E. None of the above

127. Given the equation: $(\square + 5)^{\square} = 1$, which value should be in the square?

A. 0 B. 1 C. 2 D. 3 E. 4

128. If $0.03 \times 10^x = 3000$, what power would "x" have to be to produce an answer of 3000?

A. 2 B. 4 C. 5 D. 3 E. None of the above

129. Dividing by the 10 is the same as:

A. Multiplying by 0.01 B. Multiplying by 0.1 C. Multiplying by 10
D. Dividing by 0.01 E. None of the above

130. Which decimal expression is the smallest?

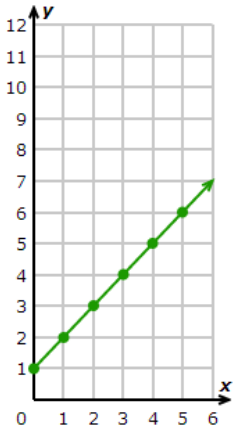
A. 0.1234 x 1000 B. 1.234 x 1000 C. 0.01234 x 1000
D. 12.34 x 10 E. None of the above

131. Which expression is equivalent to "the difference of a number squared and five"?

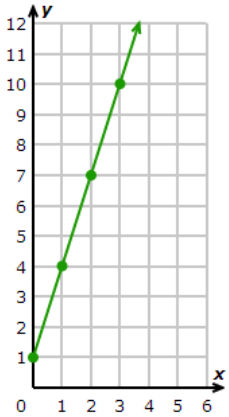
A. $5^2 - x$ B. $x^3 - 5$ C. $x^2 - 5$ D. $5 - x^2$ E. None of the above

132. Select **the correct graph** that shows the graph of the function $y = 3x + 1$?

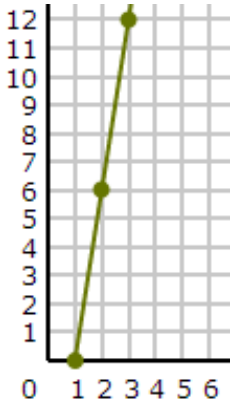
A.



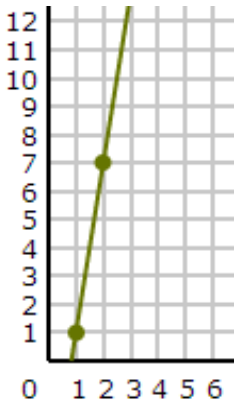
B.



C.



D.



E. None of the above

133. Let a and b be digits from 0-9. Find **a** and **b** in the addition problem.

If
$$\begin{array}{r} \mathbf{a}\ 2\ 3 \\ +\ 4\ 5\ \mathbf{b} \\ \hline 6\ 8\ 1 \end{array}$$

	a	**b**
A.	2	-2
B.	8	2
C.	3	4
D.	2	8

E. None of the above

134. The problem (21282 + 328) x 4 is the same as thinking:
A. The answer is found by multiplying 21282 by four and adding 328
B. The answer is one-third as large as the sum of the two given numbers.
C. The answer is four times as large as the sum of the two given numbers.
D. The answer is found by adding the 2 given numbers, then dividing by four.
E. None of the above

135. If x is even and y is odd, which of the following must be even?
A. $x + y$ B. xy C. x/y D. x– y E. None of the above

136. Which point is on the graph of the equation $4x + 6y = 40$?

A. (-1,0) B. (0,2) C. (4,1) D. (4,4) E. None of the above

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137. The table of values shows the height of a bamboo tree for the first 4 weeks after it was planted. Which expression would give you **its height at week 5** if the pattern would continue?

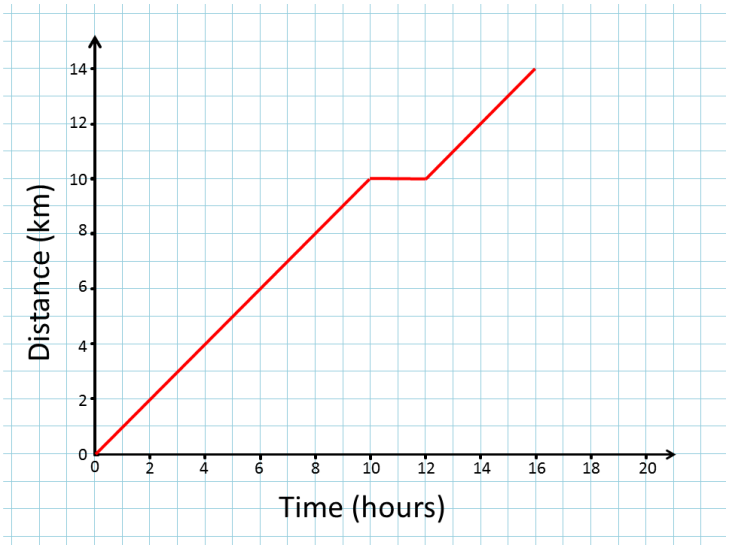
Time	Height
Planted	10 inches
Week 1	25 inches
Week 2	55 inches
Week 3	115 inches
Week 4	235 inches

A. (2 x 235) + 5 B. (115 x 6) - 10 C. (110 x 4) + 7
D. (3 x 220) + 10 E. None of the above

138. Which expression could be used to figure the final cost of a book at a bookstore if a 15% discount is applied to the original cost of the book?
Let C = Original cost of the book

A. 0.15C + C B. C/10 + ½(C/10) + C C. 1.15 C
D. C - C x 0.15 E. None of the above

Use the Distance -Time Graph below for the questions 139-140.



http://www.transum.org/Software/SW/Distance-Time/Graphs.asp

139. Which of the following statements is true.

A. In 10 minutes, the distance will be 10 km.
B. In 4 hours, the distance will be 6 km.
C. in 8 hours, the distance will be 8 km.
D. In 16 minutes, the distance will be 14 km.
E. None of the above

140. Explain the horizontal line in the middle of the graph.

A. The driver stopped to visit for 2 hours and then continued driving.
B. The driver stopped to take a 1 hour break, then continued driving.
C. The driver was in an accident that took 3 hours to settle, then continued driving.
D. The driver slowed down during a construction zone, but continued to drive.
E. None of the above.

Shade the correct answer!
Example: A ● C D E

Name_____

School _____

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

Shade the correct answer!
Example: A ● C D E

Name_____

School _____

ANSWER KEY

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