

Kansas City Area Teachers of Mathematics
2013 KCATM Math Competition

ALGEBRA REASONING AND FUNCTIONS
GRADE 6

INSTRUCTIONS

- **Do not open this booklet** until instructed to do so.
- Time limit: **20 minutes**
- You **may use calculators** on this test.
 - 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.
- Choice **E** is a correct answer. It is “None of the above.”

Student Name _____ Student Number _____

School _____

151. If you purchase a case of water with 24 bottles for \$4.29, what is the unit cost per bottle to the nearest tenth of a cent?

- A. 10.5 cents per bottle
- B. 17.9 cents per bottle
- C. 10.3 cents per bottle
- D. 4.53 cents per bottle
- E. None of the above

152. Which proportion shows the procedure to solve this application problem: If you use 12 ounces of chocolate chips for 48 cookies, how many ounces of chocolate chips would you use for 60 cookies?

- A. $\frac{12}{60} = \frac{x}{48}$
- B. $\frac{12}{x} = \frac{60}{48}$
- C. $\frac{48}{60} = \frac{x}{12}$
- D. $\frac{x}{60} = \frac{12}{48}$
- E. None of the above

153. Which statement shows one way to find the answer: If your mom drives 45 miles per hour for 3 minutes, how far does she drive?

- A. $\frac{45 \text{ miles}}{1 \text{ hour}} \cdot \frac{3 \text{ min}}{1 \text{ trip}}$
- B. $\frac{45 \text{ miles}}{1 \text{ hour}} \cdot \frac{1 \text{ hour}}{3 \text{ min}}$
- C. $\frac{45 \text{ miles}}{1 \text{ hour}} \cdot \frac{60 \text{ min}}{1 \text{ hour}}$
- D. $\frac{45 \text{ miles}}{1 \text{ hour}} \cdot \frac{1 \text{ hour}}{60 \text{ min}} \cdot \frac{3 \text{ min}}{1}$
- E. None of the above

154. Solve the proportion: $\frac{2x - 5}{6} = \frac{15}{3}$

- A. $x = 17.5$
- B. $x = 15 \frac{5}{6}$
- C. $x = 30$
- D. $\frac{5}{3}$
- E. None of the above

155. Simplify the expression: $5x - 7 - 8x + 2x + 11$

- A. $15x + 18$
- B. $-1x + 4$
- C. $42x - 4$
- D. $11x - 18$
- E. None of the above

156. Use the distributive property to expand the expression: $4(3x^2 - 2x + 5)$

- A. $7x^2 - 6x + 9$
- B. $7x^2 - 8x + 20$
- C. $2x^2 - 8x + 20$
- D. $12x^2 + 8x + 20$
- E. None of the above

Use the coordinate grid for problems 157-159.

157. Which variable is the **independent variable** on the coordinate graph?

- A. x
- B. y
- C. (0,0)
- D. m
- E. None of the above

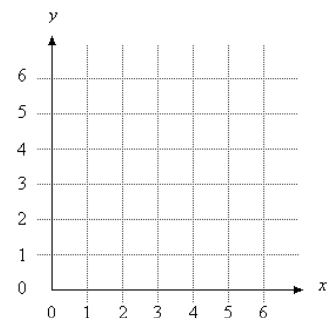
158. How far away from the x axis is the point (2, 6)?

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

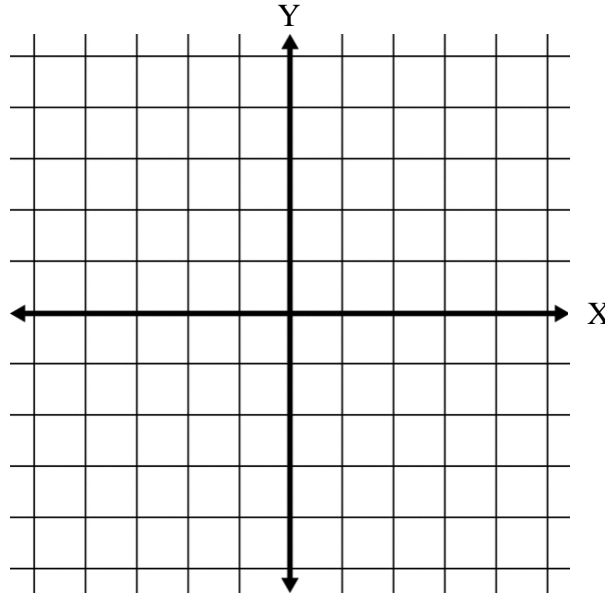
159. Which equation is the horizontal line through (2, 6)?

- A. $x = 2$
- B. $y = 2$
- C. $x = 6$
- D. $y = 6$
- E. None of the above

Coordinate Grid




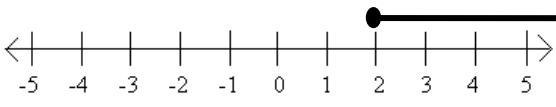


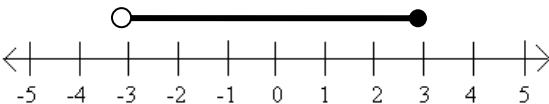
Use the graph for problems 160-163.



160. Which axis is the vertical axes?
 A. X B. Y
161. The point $(-1/2, -3)$ is located in which quadrant?
 A. I B. II C. III D. IV
162. What is the y-intercept of the linear graph: $y = 2x + 1$?
 A. 3 B. 2 C. 1 D. 0 E. None of the above
163. If the point $(-4, 3)$ is reflected over the y axis, what are the coordinates of the new point?
 A. $(-4, 3)$ B. $(4, 3)$ C. $(-4, -3)$ D. $(4, -3)$ E. None of the above

164. Which graph shows the inequality: $x \geq -2$?

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

165. Write an inequality for the graph: 

- A. $-3 < x < 3$ B. $-3 \leq x \leq 3$ C. $-3 \leq x < 3$ D. $-3 < x \leq 3$ E. None of the above

166. Simplify the expression: $(8x - 1) + 2(x - 3) - x$
 A. $8x + 2$ B. $7x + 2$ C. $10x - 2$ D. $9x - 7$ E. None of the above

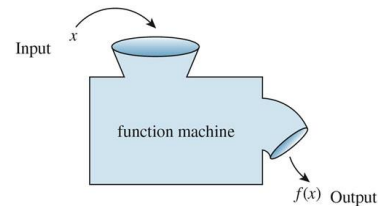
167. Evaluate the expression when $a = 5$ and $b = 2$: $a^2 - 4a + b - 3(a + b)$
 A. -21 B. -14 C. -18 D. -20 E. None of the above

168. Which of the following data sets **IS** a function?

A.		B.		C.		D.		E.
x	f(x)	x	f(x)	x	f(x)	x	f(x)	None of the above
1	12	-5	14	3	1	2	-8	
0	10	-5	7	6	3	0	-4	
1	8	15	10	9	5	1	3	
2	9	20	15	12	3	2	12	

169. Find the values of the **range** in the function: $f(x) = 2x - 1$ when $x \in \{-1, 0, 1, \text{ and } 2\}$?

- A. $\{-3, -1, 1, 3\}$ B. $\{1, -1, 4\}$
 C. $\{-1, 0, 1, 2\}$ D. $\{-5, -3, -1, 1\}$
 E. None of the above



170. If the function equation in the function machine is: $f(x) = x^2 + x - 4$, what is one possible **INPUT** when the output is 2?

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

171. Identify the **rule**.

x	COST
4	\$10.50
5	\$13.00
6	\$15.50
7	\$18.00

- A. Cost = $\$2x$ B. Cost = $\$2.50x$
 C. Cost = $\$3x$ D. Cost = $\$3.50x$
 E. None of the above

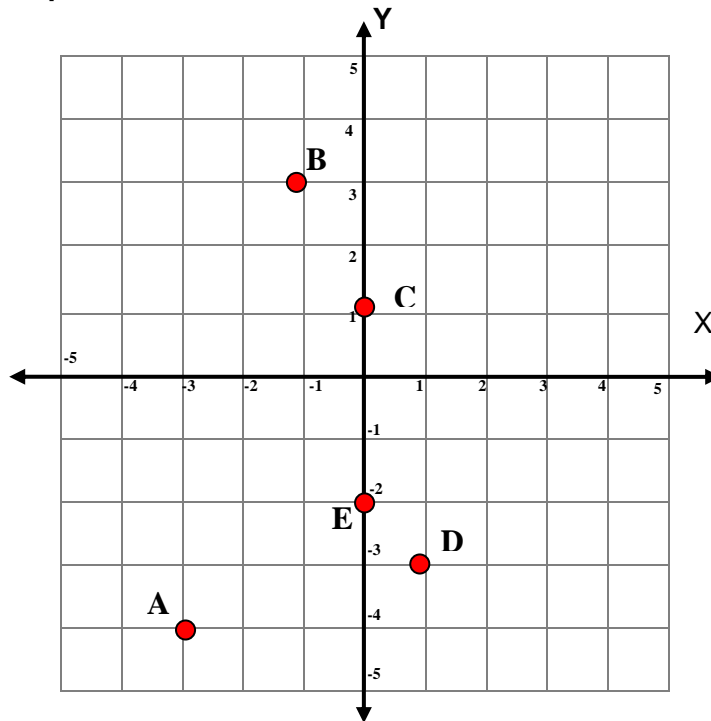
172. Which expression is: “**three times the sum of a number and seven**” ?

- A. $3n + 7$ B. $3 + 7n$ C. $3(n + 7)$ D. $3 \times n \times 7$ E. None of the above

173. Which expression is: “**eight less than a number**” ?

- A. $8/n$ B. $n - 8$ C. $8n$ D. $8 - n$ E. None of the above

Use the graph for problems 174.-177.



174. What are the **coordinates** of point E?
 A. (-2,0) B. (0, -2) C. (0,1) D. (0,-1) E. None of the above
175. What is the **slope** of \overrightarrow{CE} ?
 A. 0 B. -3 C. undefined D. -1 E. None of the above
176. Which line has the steepest slope?
 A. \overrightarrow{AE} B. \overrightarrow{BC} C. \overrightarrow{ED} D. \overrightarrow{AB} E. None of the above
177. What is the **equation** of \overrightarrow{ED} ?
 A. $y = x - 2$ B. $y = -x - 2$ C. $y = \frac{2}{3}x - 2$ D. $y = -2x - 2$ E. None of the above

178. Evaluate the expression: $5(n + 3) - 7n$ when $n = \frac{1}{2}$
 A. 14 B. 0.5 C. 9 D. 4 E. None of the above
179. Evaluate the expression: $\frac{7x}{y}$ when x is 8 and y is 2.5
 A. 28.1 B. 140 C. 22.4 D. 14 E. None of the above
180. Find x: $2^x = 32$.
 A. 3 B. 8 C. 5 D. 16 E. None of the above

181. The price of a US postage stamp went from \$0.45 to \$0.46 on January 27, 2013. If you purchased Forever stamps before that date, they can still be used. Cameron had 100 letters to put in the mail. He had some Forever stamps he could use, and then he had to purchase the newer stamps at \$0.46 each. **Which equation shows how he could calculate the total cost, C, when x represents the number of \$0.45 stamps he has?**
- A. $C = (\$0.455)x$
 B. $C = \$0.45x + \$0.46x$
 C. $C = \$0.45x + \$0.46(100 - x)$
 D. $C = \$0.45(100 - x) + \$0.46x$
 E. None of the above
182. Half a number plus fourteen is equal to five more than twice a number. **What is the number?**
- A. 4 B. 6 C. 8 D. 10 E. None of the above
183. Simplify $(x)(5x^3)(4x^5)$
- A. $9x^8$ B. $20x^7$ C. $20x^9$ D. $9x^{16}$ E. None of the above
184. Simplify by making all exponents positive: $(3x^{-1}y^0)^2$
- A. $9x^{-2}$ B. $6x^{-2}y^0$ C. $\frac{9}{x^3y}$ D. $\frac{9}{x^2}$ E. None of the above
185. Solve for x: $-5(4 - 3^2) + x = -10$
- A. 0 B. -35 C. -25 D. 10 E. None of the above
186. Multiply: $(2x - 3)(x - 6)$
- A. $x^2 + 11x + 18$ B. $2x^2 - 18$
 C. $2x^2 - 12x + 9$ D. $2x^2 - 15x - 18$ E. None of the above
187. Multiply: $(x - 1)(2x^2 + 7x + 5)$
- A. $2x^3 + 5x^2 - 2x + 5$ B. $2x^3 + 5x^2 - 2x - 5$
 C. $2x^2 + 8x + 4$ D. $2x^3 - 5x^2 + 2x - 5$ E. None of the above
188. Factor: $3x^2 + 14x - 5$
- A. $(x + 5)(3x - 1)$ B. $(3x + 5)(x + 1)$
 C. $(3x + 1)(x - 5)$ D. $(x - 1)(3x + 5)$ E. None of the above
189. Solve for the value of x: $(2x + 1)(x - 4) = 0$
- A. -1/2, 4 B. -1/2, -4 C. 1/2, -4 D. 1/2, 4 E. None of the above
190. Solve: $-5(x + 11) - 4 = 2(9x + 8) - 6$
- A. 2 B. 3 C. -2 D. -3 E. None of the above

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

Name _____

School _____

151. A B C D E

152. A B C D E

153. A B C D E

154. A B C D E

155. A B C D E

156. A B C D E

157. A B C D E

158. A B C D E

159. A B C D E

160. A B C D E

161. A B C D E

162. A B C D E

163. A B C D E

164. A B C D E

165. A B C D E

166. A B C D E

167. A B C D E

168. A B C D E

169. A B C D E

170. A B C D E

171. A B C D E

172. A B C D E

173. A B C D E

174. A B C D E

175. A B C D E

176. A B C D E

177. A B C D E

178. A B C D E

179. A B C D E

180. A B C D E

181. A B C D E

182. A B C D E

183. A B C D E

184. A B C D E

185. A B C D E

186. A B C D E

187. A B C D E

188. A B C D E

189. A B C D E

190. A B C D E

Shade the correct answer!

Example: A C D E

Name _____

School _____

ANSWER KEY

151. A C D E

152. A B C E

153. A B C E

154. B C D E

155. A C D E

156. A B C D E

157. B C D E

158. A B D E

159. A B C E

160. A C D E

161. A B D E

162. A B D E

163. A C D E

164. B C D E

165. A B C E

166. A B C E

167. A C D E

168. A B D E

169. B C D E

170. A B C E

171. A B C D E

172. A B D E

173. A C D E

174. A C D E

175. A B D E

176. A B C E

177. A C D E

178. B C D E

179. A B D E

180. A B D E

181. A B D E

182. A C D E

183. A B D E

184. A B C E

185. A C D E

186. A B C D E

187. A C D E

188. B C D E

189. B C D E

190. A B C E