## Kansas City Area Teachers of Mathematics 2016 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.
- Some multiple-choice questions do not have a correct answer provided as options A, B, C, or D. On those questions, the response is "E. not given."

$$
\text { e.g. } 3+4=
$$

A. 4
B. 5
C. 6
D. 8
E. not given
$\qquad$ Student Number $\qquad$
School $\qquad$
151. Find an equivalent expression for $5(x-4)+3 x-15$.
A. $8 x+5$
B. $20 x-19$
C. $8 x-35$
D. $-17 x-95$
E. None of the above
152. Write the expression: Four less than twice a number
A. $4-2+n$
B. $4-2 \mathrm{n}$
C. $2 \mathrm{n}+4$
D. $2 n-4$
E. None of the above
153. Solve for $\mathbf{x}$. $\frac{4}{3}=\frac{x}{18}$
A. 6
B. 24
C. 27
D. 72
E. None of the above
154. Solve for $\mathrm{x} . ~ 5 \mathbf{x}-10=\mathbf{2 3}$
A. 6.6
B. 2.6
C. 165
D. 28
E. None of the above
155. Which method NOT correct when finding tip of $15 \%$ of $\$ 20$ ?
A. $\frac{x}{20}=\frac{15}{100}$
B. $0.15 \times 20$
C. $20 \times 0.15$
D. $20 \div 0.15$
E. None of the above

Use the following graph for problems \#156-158.

156. What is the x-intercept?
A. $(1,0)$
B. $(2,0)$
C. $(0,-2)$
D. $(0,-4)$
E. None of the above
157. What is the slope of the line?
A. -2
B. 2
C. 4
D. -4
E. None of the above
158. What is the equation of the line in slope-intercept form?
A. $y=2 x-2$
B. $y=-2 x+1$
C. $y=4 x-2$
D. $y=-2$
E. None of the above
159. Solve for $x: \frac{3}{5} x=9$
A. 12
B. 15
C. 9
D. 30
E. None of the above
160. Find the radius ( $r$ ) using the formula for the circumference of a circle: $C=2 \pi r$ when the circumference is $16 \pi$. $16 \pi=2 \pi r$
A. 16
B. 4
C. 8
D. 2
E. None of the above
161. Identify an equivalent expression for $3 x y-5 x y+7 x+12 x-7$
A. $2 x y^{2}+19 x-7$
B. $-2 x y+19 x+7$
C. $-2 x y+19 x-7$
D. $2 x y+19 x-7$
E. None of the above
162. Solve for $x: \frac{2 x+4}{8}=5$
A. $x=16$
B. $x=18$
C. $x=20$
D. 24
E. None of the above
163. Your parent's boss wanted to purchase Royals World Series Champion t-shirt for the employees. They cost $\$ 18$ each. The boss spent $\$ 774$ before tax. Which equation does NOT represent a correct way to solve for the number of $t$-shirts the boss purchased?
A. $18 \times n=774$
B. $18 \mathrm{n}=774$
C. $n=774 \div 18$
D. $\mathrm{n}=774-18$
E. None of the above
164. Which inequality represents "Thirteen is less than four times a number"?
A. $13>4 n$
B. $13 \geq 4 n$
C. $13 \leq 4 n$
D. $13=4 n$
E. None of the above
165. Which equation below could represented "The quotient of ten and 3 more than twice a number is seven"?
A. $\frac{10}{n+3}=7$
B. $\frac{10}{3 n+2}=7$
C. $\frac{2 n+3}{10}=7$
D. $\frac{10}{2 n+3}=7$
E. None of the above
166. You are going to the mall and have no more than $\$ 20$ to spend. You find an item for $\$ 8$. Which inequality represents how much more you can spend?
A. $x+8>20$
B. $x+8<20$
C. $x+8 \leq 20$
D. $x+8 \geq 20$
E. None of the above
167. One benefit of working for a company is getting a discount on your merchandise. You get a $20 \%$ employee discount. You went shopping and found a shirt for $\$ 23$, a pair of shoes for $\$ 35$, a pair of jeans for $\$ 45$. What is the discount and the sale price after you get your discount?
A. \$18.60; \$74.40
B. $\$ 20.60 ; \$ 82.40$
C. $\$ 0.20 ; \$ 102.80$
D. $\$ 20 ; \$ 83$
E. None of the above
168. Find the value of: $\frac{9 \times 10^{6}}{3 \times 10^{4}}$
A. 3
B. 30
C. 300
D. 3000
E. None of the above

Use the following coordinate grid and table for problems \#169-171.

169. Why is there no graph in the third and fourth quadrants?
A. This is a quadratic graph and all $y$-values would be positive.
B. This is an absolute value graph and all $y$-values would be positive.
C. This is a linear graph and all $y$-values would be positive.
D. This is an exponential graph and all $y$-values would be positive.
E. None of the above
170. When the output is 10 , what could the $x$ input value(s) be?
A. 10
B. -10
C. 10 and -10
D. 0
E. None of the above
171. Using the function equation: $f(x)=|x|$ in the above table, if $x=1 / 2$, what would the function value be?
A. $1 / 2$
B. $-1 / 2$
C. $3 / 4$
D. 1
E. None of the above
172. In order, which properties are demonstrated?

$$
\begin{aligned}
-(6 x-7) & =8 \\
-6 x+7 & =8 \\
-6 x & =1 \\
x & =-1 / 6
\end{aligned}
$$

A. Distributive Property, Subtraction Property of Equality, Addition Property of Equality
B. Division Property of Equality, Distributive Property, Subtraction Property of Equality
C. Division Property of Equality, Distributive Property, Division Property of Equality
D. Distributive Property, Subtraction Property of Equality, Division Property of Equality
E. None of the above
173. Evaluate: $8 \times 2-7 \times 2+2^{3}$
A. 7
B. 14
C. 8
D. 10
E. None of the above
174. Factor completely: $x^{2}+8 x+15$
A. $(x+5)(x+3)$
B. $(x-5)(x+3)$
C. $(x-5)(x-3)$
D. $(x+5)(x-3)$
E. None of the above
175. What is the expression for the area of a square with sides lengths of $5 x$ ?
A. $10 x$
B. $20 x$
C. $25 x$
D. $25 x^{2}$
$E$. None of the above
176. What is the greatest common factor (GCF) of 72 and 48 ?
A. 3
B. 6
C. 9
D. 12
E. None of the above
177. Simplify the expression to an equivalent form of the fraction: $\frac{15 x^{5} y}{3 x y}$
A. $5 x y^{2}$
B. $5 x^{4} y$
C. $5 x^{2} y$
D. $5 x y$
E. None of the above
178. Between which two whole numbers does $\sqrt{40}$ fall?
A. 3 and 4
B. 4 and 5
C. 5 and 6
D. 6 and 7
E. None of the above
179. Expand using the distributive property: $(2 x-1)(x+3) \quad$ (do not simplify)
A. $2 x^{2}+5 x-1 x+2$
B. $3 x+5 x-1 x+2$
C. $2 x^{2}+6 x-1 x-3$
D. $3 x^{2}-17 x+28$
E. None of the above
180. Solve for the value(s) of $x:(2 x-1)(x+3)=0$
A. $\{1 / 2,-3\}$
B. $\{-1 / 2,-3\}$
C. $\{2,-3\}$
D. $\{-2,3\}$
E. None of the above

Use the function graph below for problems \#181-184.

Position vs Time

181. Which segment has the steepest rate of change?
A. $\overline{B C}$
B. $\overline{D E}$
C. $\overline{F G}$
D. $\overline{G H}$
E. None of the above
182. Which scenario could this graph be showing?
A. The position of an airplane over time
B. A person going swimming by a boat in a lake
C. A car driving in Kansas City.
D. A ball being tossed to a dog.
E. None of the above
183. What is the slope of $\overline{B C}$ ?
A. -1
B. 1
C. 5
D. -5
E. None of the above
184. What is happening during $1-2$ seconds, $4-5$ seconds, and $6-8$ seconds?
A. The object was moving very slowly.
B. The position of the object was steadily moving over time.
C. The object's position did not change.
D. The object was rolling on the ground.
E. None of the above
185. $f(x)=3 x-5$ and $g(x)=2 x+7$. What is $f(x)+g(x)$ ?
A. $5 x^{2}+2$
B. $x+2$
C. $x-12$
D. $5 x+2$
E. None of the above
186. Which graph shows the solution to the inequality? $-2 x+5 \leq 3-x$
A.

B.

C.

D.

E. None of the above
187. Which statement is correct about the values of $(-4)^{2}$ and $-4^{2}$ ?
A. There is no difference.
B. $(-4)^{2}$ is 16 and $-4^{2}$ is -16
C. Both are -8
D. $(-4)^{2}$ is $(-4)(-4)$ which is 16 , and $-4^{2}$ is a -8 .
E. None of the above
188. What is the linear equation in slope-intercept form for a line going through $(2,6)$ and $(0,4)$ ?
A. $y=x+4$
B. $y=2 x+4$
C. $y=-x+4$
D. $y=-2 x+4$
E. None of the above
189. What value(s) of $x$ would work in the equation $(x-2)^{2}=16$ ?
A. 6
B. -6
C. 4
D. -4
E. None of the above
190. Write the equation that represents the pattern in the table below and then find the value when $x=5$ ?

| $\mathbf{x}$ | $\mathbf{y}$ |
| :---: | :---: |
| 0 | 0 |
| 1 | 1 |
| 2 | 8 |
| 3 | 27 |
|  |  |
| 5 |  |

A. $y=x ; y=5$
B. $y=2 x ; y=10$
C. $y=x^{2} ; y=25$
D. $y=x^{3} ; y=125$
E. None of the above

Shade the correct answer!
Example: A C D E
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

Name $\qquad$
School $\qquad$
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 $\qquad$
School $\qquad$

ANSWER KEY


