Kansas City Area Teachers of Mathematics
2017 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. None of the above."

          Example: 3 + 4 =

   A. 4   B. 5   C. 6   D. 8   E. None of the above

Student Name _____ Student Number _____

School _____

151. There are five swings on the playground. During recess 75 students come out to play. What is the ratio of students to swings?

    A. 20%   B. 5:75   C. 1:15   D. 15:1   E. None of the above

152. Half of a number plus six is 47. What is the number?

    A. 82   B. 29.5   C. 20.5   D. 23.5   E. None of the above

153. Solve for x. $\dfrac{4}{x} = \dfrac{x}{16}$

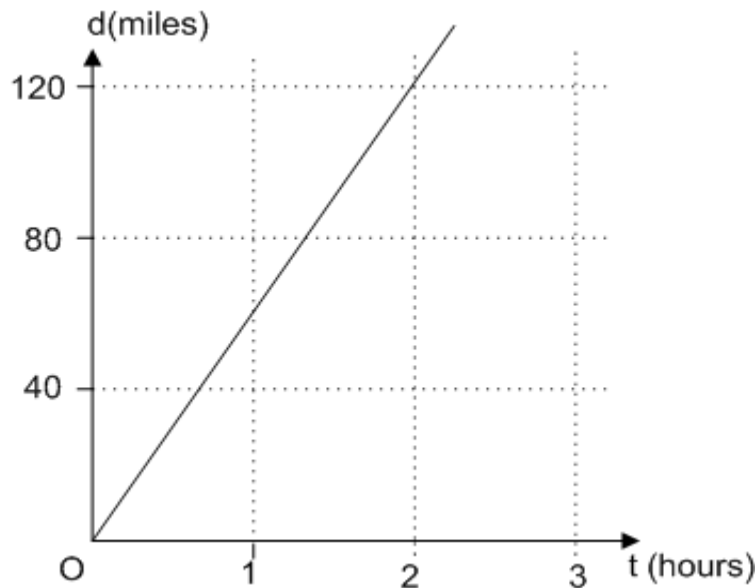   A. 9   B. 16   C. 6 and -6   D. 4 and -4   E. None of the above

154. Solve for x. 3x – 11 = 13

    A. 5   B. 4   C. 8   D. 7   E. None of the above

155. A food store has 3 crates of squash weighing 2.2kg each. At the end of the day, the total weight of squash was 3.5 kg. What weight of squash was sold that day?

    A. 0.7kg   B. 3.1 kg   C. 0.9 kg   D. 1.4 kg   E. None of the above

Use the graph for #156 & 157. A vehicle travels **at constant speed** as shown below:

156. How far would the car go in 5 hours if the pattern continued?

    A. 250 mi.   B. 275 mi.   C. 300 mi.   D. 350 mi.   E. None of the above

157. What is the rate of speed in miles per hour?

    A. 40 mph   B. 60 mph   C. 70 mph   D. 90 mph   E. None of the above

158. How many hours are in a minute?

A. 60   B. 360   C. 1/60   D. 60/1   E. None of the above

159. How many seconds are there in a week?

A. 3,600   B. 86,400   C. 604,800   D. 1,209,600   E. None of the above

160. Solve for x: 15x = 9

A. $\dfrac{3}{5}$ B. $1\dfrac{2}{3}$ C. $\dfrac{5}{9}$ D. 135   E. None of the above

161. Isolate the radius (r) in the formula for the circumference of a circle: $C = 2\pi r$

A. $r = \dfrac{C}{2}$ B. $r = \dfrac{C}{2}\pi$ C. $r = \dfrac{C}{2\pi}$ D. $r = \dfrac{2C}{\pi}$ E. None of the above

162. Identify an equivalent expression for $8x - 7x^2 + 5x + x - 3 + 9x^2 - 14$.

A. $2x^2 + 3x - 17$ B. $-2x^2 + 6x + 17$ C. $2x^2 + 14x + 11$

D. $2x^2 + 14x - 17$ E. None of the above

163. Solve for **x:** $\dfrac{2x-5}{12} = \dfrac{7}{3}$

A. x = 11.5   B. x = 16.5   C. x = 15   D. 4   E. None of the above

164. Each piece of candy costs 52 cents. The price of "n" pieces of candy is $9.36.
       Which equation represents how to set the problem up to solve for n?

A. 0.52 x n = 936   B. 0.52 x n = 9.36   C. n = 936/0.52

D. 9.36/52 = n   E. None of the above

165. Which equation below could represent "Thirteen is seventeen less than four times a number"?

A. 13 = 17 − 4n   B. 13 − 17 = 4n   C. 13 = 4n − 17

D. 17 = 4n - 13   E. not given

166. Which equation below could represent "The quotient of fifty and five more than a number
       is ten"?

A. $\dfrac{50}{n+5} = 10$ B. $\dfrac{10}{n+5} = 50$ C. $\dfrac{n+5}{50} = 10$

D. $\dfrac{n+5}{10} = 50$ E. None of the above

167. Kelsey had $197 in his savings account before he deposited all of his weekly salary for 3 weeks. His current savings balance is $878. If Kelsey deposits all of the weekly earnings, how much money did Kelsey earn each week?

   A. $219.50   B. $293.67   C. $287   D. $227   E. None of the above

168. One benefit of working for a company is getting a discount on your merchandise. **If you get a 15% employee discount and then another 10% discount off the sale price**, how much would a purchase of a pair of jeans that retail at $70 cost an employee?

   A. $53.55   B. $52.50   C. $45.00   D. $66.50   E. None of the above

169. Find the value of: $\dfrac{2.1 \times 10^6}{7 \times 10^3}$

   A. 3   B. 30   C. 300   D. 3000   E. None of the above

Use the following coordinate grid for problems #170-172.
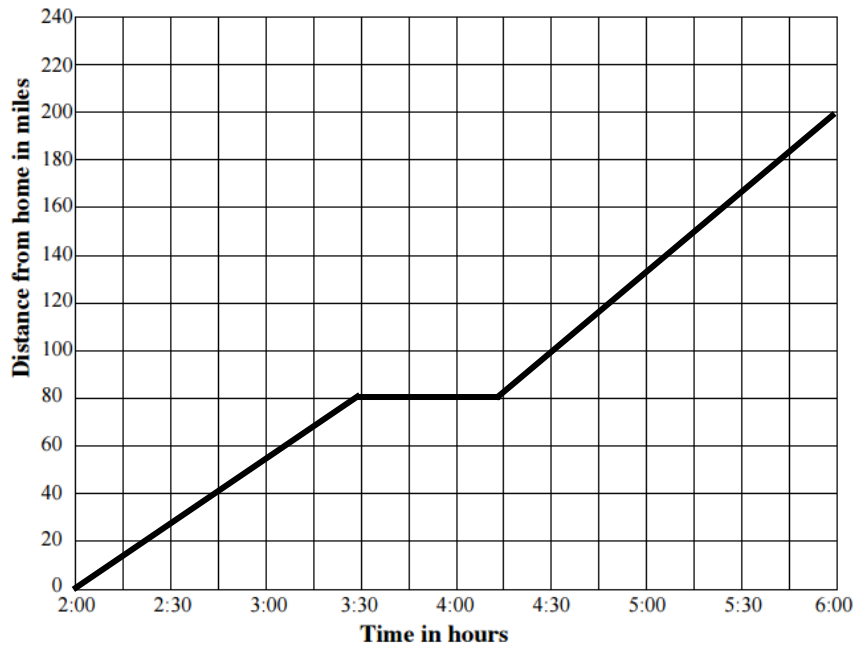
170. What was the rate in miles per hour (to the nearest tenth) from 2:00 to 3:30?

   A. 58.5 mph   B. 60.0 mph   C. 53.3 mph   D. 40.0 mph   E. None of the above

171. Which scenario could have happened from 3:30-4:15?

   A. Driving break   B. Stopped to visit grandma   C. Napped at a rest stop
   D. Took a hike   E. All of the above

172. What was the rate in miles per hour (to the nearest tenth) from 4:15-6:00?

   A. 68.6 mph   B. 60 mph   C. 58.5 mph   D. 69.2 mph   E. None of the above

173. Logan is organizing a trip to the Plaza for his parents' anniversary party for 75 people.
The following two options are being explored:
- Using all small taxi cabs. Each costs $40 for the trip and holds 4 people. *Need: _____ taxis*
- Using all large taxi cabs. Each costs $63 for the trip and holds 7 people. *Need: _____ taxis*

| to | **What is the difference in cost for Logan in planning for the 75 people taking taxis the Plaza?** |

   A. $67   B. $73   C. $75   D. $65   E. None of the above

174. In order, which properties are demonstrated?   -2(5x – 7) = 8
$$-10x + 14 = 8$$
$$-10x = -6$$
$$x = 3/5$$

   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

175. Evaluate: $(2^3 – 2^2)$ x 5 - 3^3

   A. -7   B. 1   C. -10   D. -17   E. None of the above

176. Factor completely: $4x^2 – 8x + 12$

   A. $2(2x^2 – 4x + 6)$ B. $4(x^2 – 2x + 3)$ C. $2(x – 3)(x – 1)$
   D. $4x(x^2 – 2x + 3)$ E. not given

177. What is the **perimeter of a square** with sides lengths of 3x – 1 ?

   A. 12x - 4   B. 12 x + 4   C. $9x^2$ - 1   D. $9x^2 – 6x + 1$ E. None of the above

178. What is the greatest common factor (GCF) of $9x^2y$ and $18x^3y$?

   A. 3xy   B. 9xy   C. $9x^2y$ D. $18x^2y$ E. None of the above

179. What is the least common multiple (LCM) of $24n^3$ and $36n^2$?

   A. $3n^2$ B. $12n^2$ C. $72n^2$ D. $72n^3$ E. None of the above

180. Choose an equivalent form of the fraction: $\dfrac{8m^2n}{2mn}$

   A. $4m^2$ B. 6m   C. 4m   D. 4mn   E. None of the above

181. Which of the following is the **same value** as $\sqrt{2}$?

    A. $2^{1/2}$ B. 2^0 C. $\dfrac{1}{\sqrt{2}}$ D. $\sqrt{4}$ E. None of the above

182. Multiply: $(3x - 4)(x + 7)$

    A. $3x^2 - 28$ B. $3x^2 - 25x - 28$ C. $3x^2 + 17x - 28$
    D. $3x^2 - 17x + 28$ E. None of the above

183. Factor: $16n^2 - 25$

    A. $(4n - 5)^2$ B. $(4n - 5)(4n + 5)$ C. $(8n - 5)(8n + 5)$
    D. $(2n - 5)(8n + 5)$ E. None of the above

184. Choose an equivalent form of $\dfrac{x^2 - x - 6}{(x-3)}$.

    A. $(x + 2)$ B. $(x - 2)$ C. $(x - 3)$ D. $(x + 3)$ E. None of the above

185. The following equations are for the problem below.
 $3b + 4c = \$12.95$
             $4b + 2c = \$14.60$

Sal buys 3 bags of potato chips and 4 candy bars and spends $12.95
Jose buys 4 bags of potato chips and 2 candy bars and spends $14.60 from the same store.
What is the cost of each item?

    A. Potato chips cost $3.15 and candy bars cost $0.50.
    B. Potato chips cost $3.25 and candy bars cost $0.80.
    C. Potato chips cost $3.50 and candy bars cost $0.75.
    D. Potato chips cost $3.65 and candy bars cost $0.70.
    E. None of the above

186. Which graph shows the **solution** to the inequality? **$-2x + 7 \leq 3$**
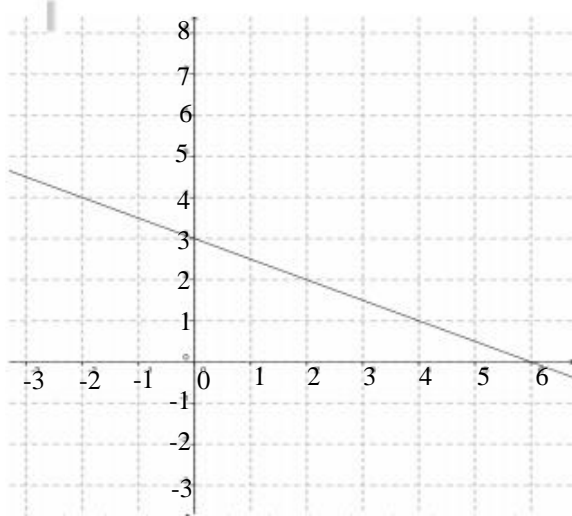
A.

B.

C.

D.
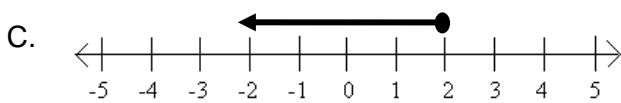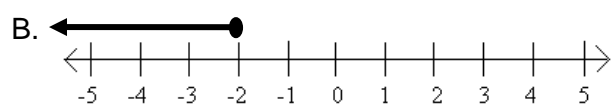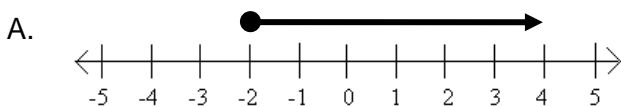
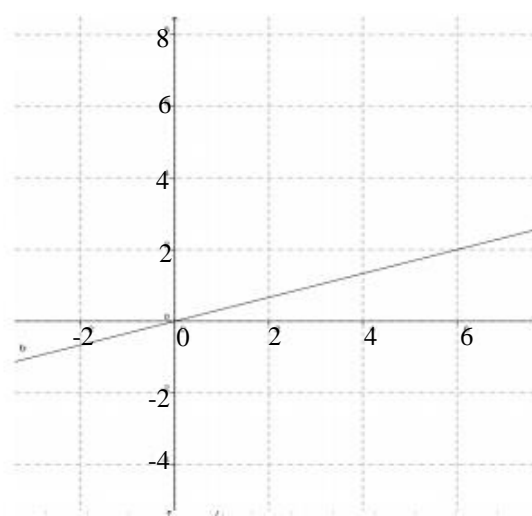E. None of the above

187. Evaluate: $\dfrac{6!}{(6 - 2)!\,2!}$

    A. 15   B. 12   C. 3/4   D. 7.5   E. None of the above

Use the graphs for problems #188-190.

Graph A: f(x)	Graph B: g(x)

188. Which equation represents the line in Graph A, the f(x) function?

A. f(x) =   1/2 x + 3   B. f(x) = - 1/6 x + 3   C. f(x) = - 1/2 x + 3

D. f(x) = - 3/4 x + 3   E. None of the above

189. Which equation represents the line in Graph B, the g(x) function?

A. g(x) = - 1/3 x   B. g(x) = 1/3 x   C. g(x) = 6x

D. g(x) = - 1/6 x   E. None of the above

190. What is the value of **f(g(6))?**

A. 0   B. 6   C. 4   D. 2   E. None of the above