Kansas City Area Teachers of Mathematics
2012 KCATM Math Competition

ALGEBRA
GRADE 6

INSTRUCTIONS

- **Do not open this booklet** until instructed to do so.

- Time limit: **20 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 Scantron sheet by **FILLING in the oval**.

- You **may not use rulers, protractors, or other measurement devices** on this test.

Student Name _____ Student Number _____

School _____

1. Solve for x: $\dfrac{2}{3} = \dfrac{x}{18}$

   A.   x = 9   B. x = 17   C. x = 12   D. 8   E. None of the above

2. Solve the proportion: $\dfrac{x-3}{5} = \dfrac{14}{2}$

   A.   x = 27   B. x = 38   C. x = 51   D. 43   E. None of the above

3. Simplify the expression: 3x – 5 + 4x – 2x + 7
   A. 5x + 2   B. 14x + 2   C. $9x^2 - 2$ D. 5x – 12   E. None of the above

4. 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

5. Simplify the expression: 4a – 2b – (a + b) – 3a
   A. –a – 3b   B. – 2a – b   C. – 2a – 3b   D. a – 2b   E. None of the above

6. Simplify the expression: $(2n^2 + 5n - 6) + (n^2 + 3n - 4)$
   A. $n^2 + 8n - 2$ B. $3n^2 + 2n - 2$ C. $2n^2 + 8n - 10$
   D. $3n^2 + 8n - 10$ E. None of the above

7. Given the following magic square, select the correct algebraic solution.
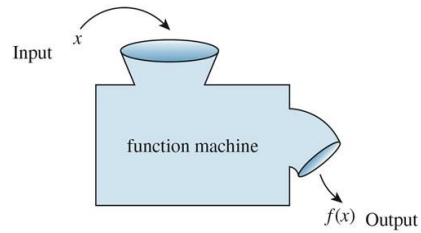
4	11	6
9	7	5
8	3	10

A.			B.			C.			D.		
-n+3	n+4	n +1	n - 3	2n-3	n - 1	n - 3	n+4	n - 1	n - 3	n - 4	n - 1
n+2	**n**	n - 1	n+2	**n**	n + 3	n+2	**n**	n - 2	n+2	**n**	2n-9
n+3	n - 3	n+2	n+1	n /2	2n-4	n+1	n - 4	n+3	n+1	n+4	n+3

   E. None of the above
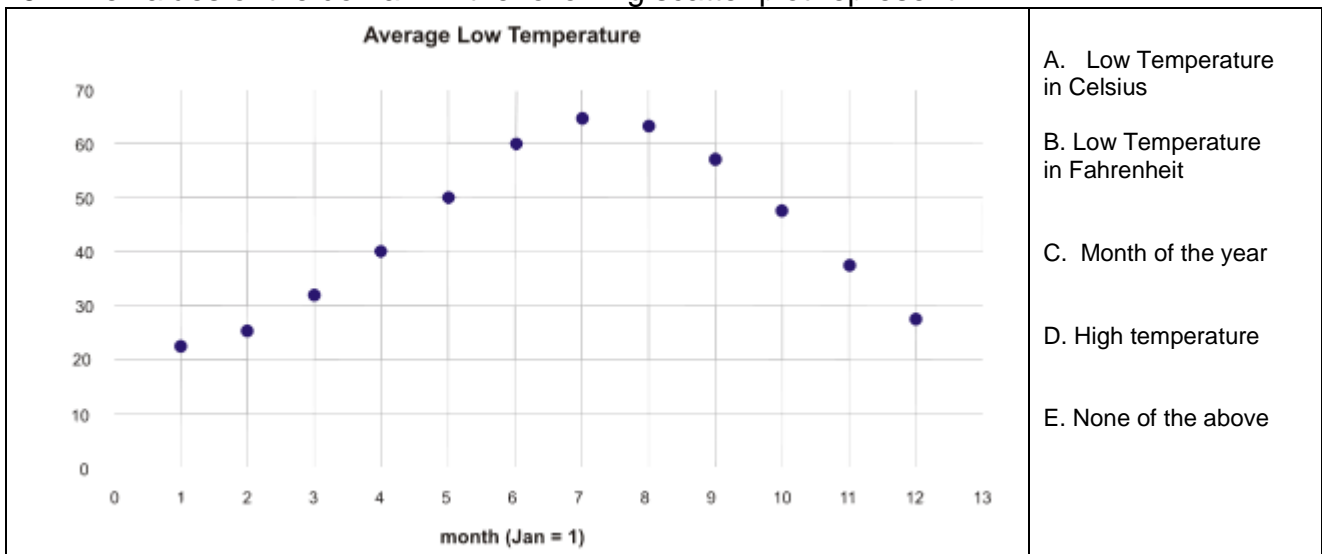
Use this definition of a mathematical function for problems 9-12:
Function: A relation where every element of the domain (x values, input) is paired with exactly one range value (y value, output).

Input x

function machine

$f(x)$ Output

8. Which of the following data sets is **NOT** a function?

A.		B.		C.		D.		E.
x	**y**	**x**	**y**	**x**	**y**	**x**	**y**	None of the above
-1	6	2	14	5	11	2	-8	
2	5	1	7	6	13	1	-4	
3	8	15	10	7	15	2	3	
4	7	23	15	8	23	3	12	

9. The values of the domain in the following scatter plot represent:

Average Low Temperature

month (Jan = 1)

A. Low Temperature in Celsius

B. Low Temperature in Fahrenheit

C. Month of the year

D. High temperature

E. None of the above

10. What is the range of the function: (2,3), (4,-5), (-2,8) and (1,7)
   A. {-2, 2, 4}   B. {-5, 3, 7, 8}   C. {-2, 1, 2, 4}   D. {3, 5, 7, 8}   E. None of the above

11. Identify the rule of the function:

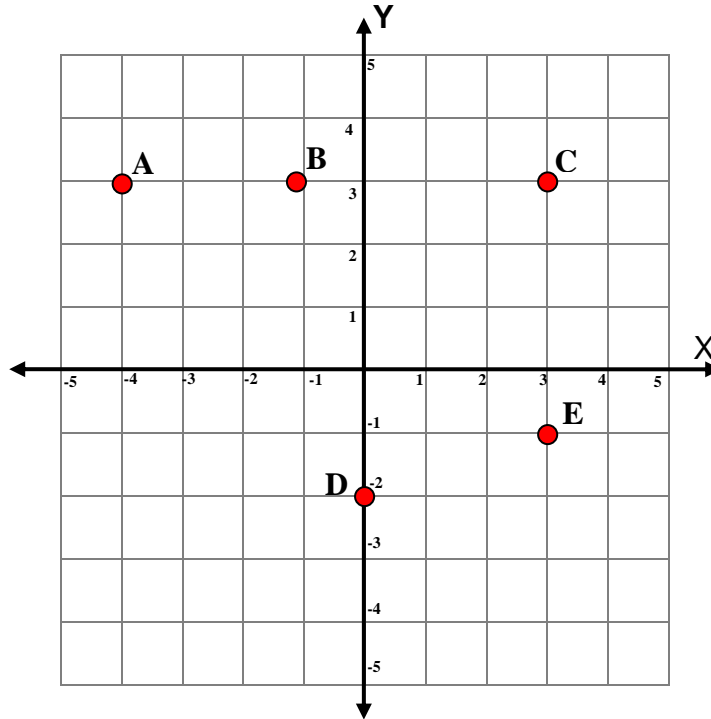| x	f(x)
-2	-10
-1	-5
2	10
3	15

A. $f(x) = 2x$
B. $f(x) = 3x$
C. $f(x) = 5x$
D. $f(x) = x + 8$
E. None of the above

12. The function machine's rule is: $f(x) = x^2$, find the function value when the input is -3.
   A. 9   B. -9   C. -1   D. -6   E. None of the above

Use the graph with lines *m, n,* and *p* for problems 13.-20.

13. What are the coordinates of point D?
    A. (-2,0)   B. (0, -2)   C. (0,2)   D. (0,-2)   E. None of the above

14. Which line is horizontal?
    A. $\overleftrightarrow{AB}$ B. $\overleftrightarrow{CE}$ C. $\overleftrightarrow{BD}$ D. $\overleftrightarrow{CD}$ E. None of the above

15. Which line has the steepest negative slope?
    A. $\overleftrightarrow{DE}$ B. $\overleftrightarrow{AD}$ C. $\overleftrightarrow{DB}$ D. $\overleftrightarrow{AC}$ E. None of the above

16. What is the slope of $\overleftrightarrow{CE}$?
    A. 4   B. 1   C. 0   D. undefined   E. None of the above

17. What is the slope of $\overleftrightarrow{DE}$?
    A. 3/1   B. 1/3   C. -3/1   D. -1/3   E. None of the above

18. What is the equation of $\overleftrightarrow{AB}$?
    A. y = -3   B. y = 3   C. x = 3   D. y = 0x + 4   E. None of the above

19. What is the equation of $\overleftrightarrow{CD}$?
    A. $y = \frac{5}{3}x - 2$ B. $y = \frac{3}{5}x - 2$ C. $y = -2x + \frac{5}{3}$ D. $y = 2x - 2$ E. None of the above

20. Which quadrant is point D in?
    A. I   B. II   C. III   D. IV   E. None of the above

21. Two consecutive odd integers have a sum of 120. What is the **largest number**?
    A. 49   B. 77   C. 61   D. 59   E. None of the above

22. The price of a US postage stamp rose $0.01 from $0.44 to $0.45 on January 22, 2012.
    What was the percent of change?

    A. 1%   B. 2.2%   C. 98%   D. 2.3%   E. None of the above

23. Twice a number plus fourteen is equal to the six less than the same number.
    What is the number?
    A. -20   B. 8   C. 28   D. -12   E. None of the above

24. Which equation shows how to determine the sale price (S) of an item that normally
    costs "C" and is now 20% off?
    A. S = 20%(C)   B. S = 80%(C)   C. S = C – 10%(C)
    D. S = C/(20%)   E. None of the above

25. Your History test scores are: 67%, 86%, and 93%. To earn a B for the class, you
    must have a mean score of exactly 80%. Which score below is the lowest test score
    that will earn you an 80% in your social studies class to get a B?

    A. 71%   B. 78%   C. 80%   D. 74%   E. None of the above

26. The result of taking a half of a half of a half is 4. What was the original number?
    A. 8   B. 16   C. 32   D. 64   E. None of the above

27. $5^4 =$
    A. 20   B. $1/5^4$ C. 125   D. 625   E. None of the above

28. Simplify $(2x)(3x^2)(x^4)$
    A. $6x^6$ B. $7x^7$ C. $6x^7$ D. $6x^8$ E. None of the above

29. Rewrite using positive exponents: 5^{-2}
    A. $-(5^2)$ B. $1/5^2$ C. $1/2^5$ D. 2^5 E. None of the above

30. Simplify: $(3x^2y)^2$
    A. $5x^4y$ B. $6x^4y^2$ C. $9x^4y^2$ D. $6x^2y$ E. None of the above

31. Solve for x: $2(4 – 3^2) + x = -10$
    A. 0   B. -10   C. -20   D. 20   E. None of the above

32. Solve for x: $10 = 7^2 + x – (–3)$
    A. -36   B. -42   C. 0   D. -7   E. None of the above
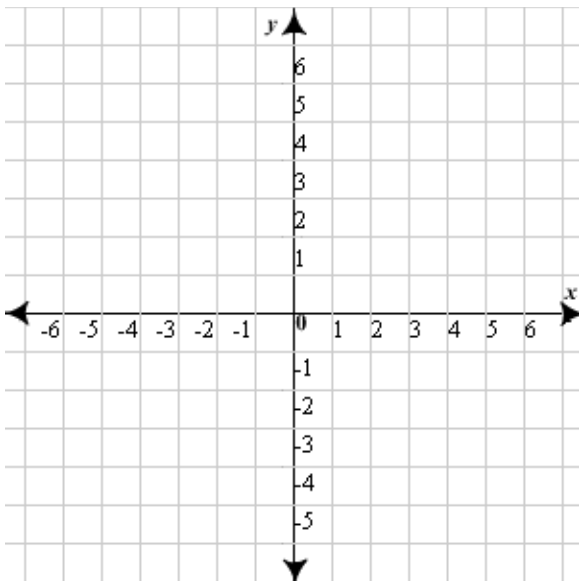
33. Multiply: $(x - 4)(x + 4)$
    A. 0   B. $x^2 - 16$ C. 2x   D. $x^2 - 8x - 16$ E. None of the above

34. Multiply: $(3x - 1)(2x - 5)$
    A. $6x^2 - 10x - 6$ B. $5x^2 - 13x + 6$ C. $6x^2 - 17x + 5$
    D. $x^2 + 5x - 6$ E. None of the above

35. Factor: $x^2 + 5x + 6$
    A. $(x + 6)(x + 1)$ B. $(x + 2)(x + 3)$ C. $(x - 6)(x + 1)$
    D. $(x - 2)(x - 3)$ E. None of the above

36. Solve for the value of x: $(x - 5)(x + 3) = 0$
    A. -5, 3   B. 5   C. -3   D. -3, 5   E. None of the above

37. Solve the system by graphing: $y = 3x - 5$ and $y = \frac{1}{2} x$

A.   (3, 4)

B.   (-1, -8)

C.   (2, -1)

D.   (2,1)

E.   None of the above

38. Solve the system: $3x + 4y = 12$
    $x - 2y = 4$

    A.   (6,-1)   B. (4,0)   C. (0,3)   D. (1, -2)   E. None of the above

39. Solve the inequality: $4x - 2 < 18$
    A. x < 5   B. x > 5   C. x < 4   D. x > 4   E. None of the above

40. Solve the inequality: $-5x + 11 \le 16$
    A. $x \ge -27/5$ B. $x \le -1$ C. $x \ge -27/5$ D. $x \ge -1$ E. None of the above

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

Name_____

School _____

1.	A B C D E		21.	A B C D E
2.	A B C D E		22.	A B C D E
3.	A B C D E		23.	A B C D E
4.	A B C D E		24.	A B C D E
5.	A B C D E		25.	A B C D E
6.	A B C D E		26.	A B C D E
7.	A B C D E		27.	A B C D E
8.	A B C D E		28.	A B C D E
9.	A B C D E		29.	A B C D E
10.	A B C D E		30.	A B C D E
11.	A B C D E		31.	A B C D E
12.	A B C D E		32.	A B C D E
13.	A B C D E		33.	A B C D E
14.	A B C D E		34.	A B C D E
15.	A B C D E		35.	A B C D E
16.	A B C D E		36.	A B C D E
17.	A B C D E		37.	A B C D E
18.	A B C D E		38.	A B C D E
19.	A B C D E		39.	A B C D E
20.	A B C D E		40.	A B C D E

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

Name_____

School _____

ANSWER KEY

1.	A	B	●	D	E
2.	A	●	C	D	E
3.	●	B	C	D	E
4.	A	B	C	●	E
5.	A	B	C	D	●
6.	A	B	C	●	E
7.	A	B	●	D	E
8.	A	B	C	●	E
9.	A	B	●	D	E
10.	A	●	C	D	E
11.	A	B	●	D	E
12.	●	B	C	D	E
13.	A	B	C	●	E
14.	●	B	C	D	E
15.	A	B	●	D	E
16.	A	B	C	●	E
17.	A	●	C	D	E
18.	A	●	C	D	E
19.	●	B	C	D	E
20.	A	B	C	D	●

21.	A	B	●	D	E
22.	A	B	C	●	E
23.	●	B	C	D	E
24.	A	●	C	D	E
25.	A	B	C	●	E
26.	A	B	●	D	E
27.	A	B	C	●	E
28.	A	B	●	D	E
29.	A	●	C	D	E
30.	A	B	●	D	E
31.	●	B	C	D	E
32.	A	●	C	D	E
33.	A	●	C	D	E
34.	A	B	●	D	E
35.	A	●	C	D	E
36.	A	B	C	●	E
37.	A	B	C	●	E
38.	A	●	C	D	E
39.	●	B	C	D	E
40.	A	B	C	●	E