Kansas City Area Teachers of Mathematics
2011 KCATM Math Competition

ALGEBRA
GRADES 7-8

INSTRUCTIONS

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

- Time limit: **20 minutes**

- You **may NOT use calculators**.

- 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.

- Letter **"E" is "None of the above"** , which is a correct answer for some of the problems.

- With circles, **exact answers** will be given in terms of π .

1. The ½ of ½ of ½ ?
    A. 1/8   B. 1/6   C. 1/2   D. 1/16   E. None of the above

2. Simplify the expression: $(3x^3 - 5x^2 + 7) + (x^2 - x + 6)$
    A. $3x^3 - 4x^2 + 13$ B. $3x^3 - 5x^2 + 13$
    C. $3x^3 - 4x^2 - x + 13$ D. $3x^3 - 6x^2 + x + 13$ E. None of the above

3. Simplify the expression: $\dfrac{2x - 10}{2}$

    A. x - 10   B. x + 10   C. x + 5   D. x - 5   E. None of the above

4. What is the product of $(3x)^2$ and $2x$?
    A. $6x^3$ B. $6x^2$ C. $9x^3$ D. $18x^3$ E. None of the above

Solve each equation #5 - #12.

5. $2x + 5 = 4x$
    A.   2.5   B. -2   C. -2.5   D. 2   E. None of the above

6. $4x^2 = 100$
    A.   5/2   B. 5   C. 5 and -5   D. 2 and -2   E. None of the above

7. $2x^3 - 1 = 15$
    A.   2.5   B. -2   C. -2.5   D. 2   E. None of the above

8. $4(x - 3) = 10x + 12$
    A.   4   B. -4   C. 6   D. -6   E. None of the above

9. $\dfrac{3}{7} = \dfrac{x}{21}$
    A. 4.5   B. 3.5   C. 5.5   D. 6.5   E. None of the above

10. $(2x - 3)(x + 5) = 0$
     A.   -4   B. 3/2 and -5   C. 2/3 and -5   D. 3/2 and 5   E. None of the above

11. $-(x + 4) = 7x - 12$
     A. 4/3   B. 2/7   C. -2   D. 2   E. None of the above

12. $2^x = 14$
     A.   7   B. 2.39   C. 3.81   D. 4.11   E. None of the above

13. Simplify $2\sqrt{18}$

    A. $6\sqrt{2}$ B. $6\sqrt{2}$ C. $6\sqrt{3}$ D. $9\sqrt{2}$ E. None of the above

14. What is the diameter of a circle when the area is 78.54 sq. ft.?

    A. 10 ft.   B. 5 ft.   C. 39 ft.   D. 79 ft.   E. None of the above

15. Three consecutive integers have a sum of 174. What is the largest integer?

    A. 61   B. 57   C. 49   D. 59   E. None of the above

16. The ratio of three numbers whose sum is 300 is 3:4:8. What are the numbers?

    A. 20, 80, 160   B. 20, 80, 180

    C. 30, 40, 230   D. 50, 80, 170   E. None of the above

17. Evaluate: $(2^3)(3^2) + (5x)^0$

    A. 54x   B. 270x   C. 71   D. 77   E. None of the above

18. If $f(x) = 3x^2 - x + 4$, evaluate the function for $f(-4)$

    A. 40   B. 48   C. 56   D. 32   E. None of the above

19. If $g(x) = 2x$ and $f(x) = (x + 1)$, find the value of the composite function: $g(f(x))$.

    A. 2x + 2   B. 3x + 1   C. $2x^2 + 2x$ D. x − 1   E. None of the above

20. Evaluate: $\left(\dfrac{2}{3}\right)^{-2}$

    A. 4/9   B. -4/9   C. -9/4   D. 9/4   E. None of the above

21. What is the value of $(9)^{3/2}$?

    A. 13.5   B. 12   C. 27   D. 1/6   E. None of the above

22. Write the logarithmic equation as an exponential equation: $\log_4 2 = \frac{1}{2}$

    A. (4)(1/2) = 2   B. $4^{1/2} = 2$

    C. 2/ ½ = 4   D. 2/4 = ½   E. None of the above

23. What is the point of intersection of the system of linear equations:

$$3x + 2y = 14$$
$$x - 2y = 10$$

    A. (0, 7)   B. (2, -4)   C. (6, -2)   D. (4, 1)   E. None of the above

24. What is the slope of a line through the points (-3, 5) and (-2, -7)

    A. 4/3   B. -12/5   C. 7/4   D. 12   E. None of the above

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

26. Simplify the polynomial expression: $(3x^3 - 4x^2 + 5x - 2) - (x^3 + 2x - 7)$
    A. $2x^3 - 4x^2 + 3x - 9$ B. $2x^3 - 6x^2 - 2x - 2$
    C. $3x^3 - 4x^2 + 7x - 9$ D. $2x^3 - 4x^2 + 3x + 5$ E. None of the above

27. Multiply: $(3x - 4)(2x + 7)$
    A. $5x^2 + 2x + 3$ B. $6x^2 + 13x - 28$ C. $6x + 3$ D. $6x^2 + 2x - 28$ E. None of the above

28. Multiply: $(2x - 3)(2x + 3)$
    A. $4x^2 - 9$ B. $4x$ C. $4x^2 - 6x - 9$ D. $4x^2 + 6x - 9$ E. None of the above

29. Solve for all values of x in the absolute value equation: $\frac{1}{2} |x - 4| + 2 = 8$
    A. 12   B. -8, 16   C. -1, 9   D. 5, 4   E. None of the above

---

**30. Use the graph that shows stress vs. eating difficulties for problems #29.**
   Which statement is TRUE about the graph:
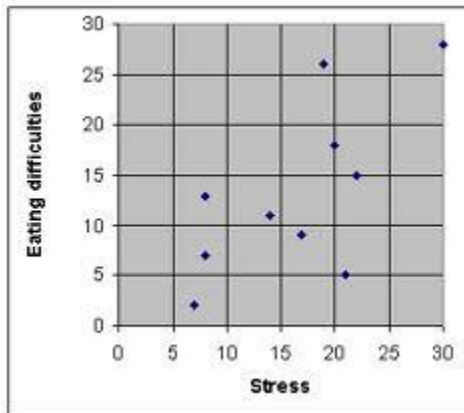
A. There is a strong linear correlation between stress and eating difficulties.
B. The point on the graph is (30, 28) represents high stress, high eating difficulty.
C. The point (0,0) represents that when there is zero stress, no one has difficulty eating.
D. Eating difficulties are caused by stress.
E. None of the above

---

31. Which line(s) of best fit model a strong negative correlation in the graph below?
    A. A only   B. B only   C. C only   D. B and C   E. None of the above
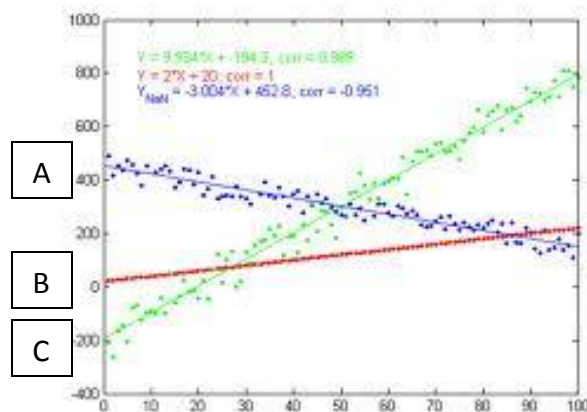
Use the graph below of time vs. distance of a ball projected vertically for problems #32-#33.
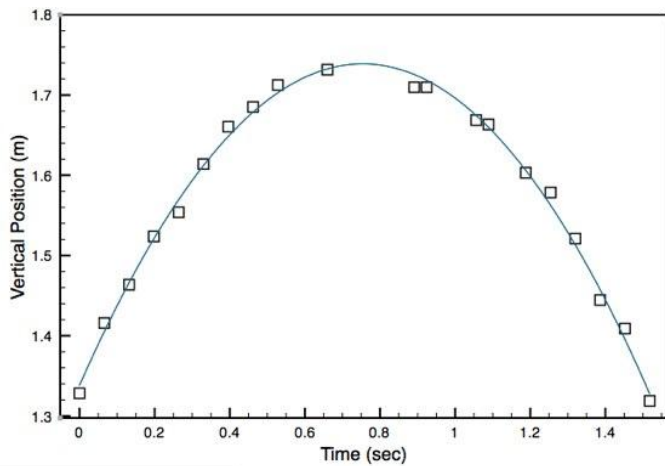
$y(t) = -0.704t^2 + 1.063t + 1.338$

32. What is the height of the ball at 0.5 seconds?
    A. 1.7 m   B. 1.6 m
    C. 1.5 m   D. 1.4 m
    E. None of the above

33. The model that fits this graph is:
    A. Linear   B. Quadratic
    C. Cubic   D. Exponential
    E. None of the above

34. I.M. Hungry eats out quite regularly. Find the cost of the two meals he ate if the following characteristics is true: The sum of the 2 meals was $23, and the difference was $9.
    A. $15 and $8   B. $14 and $9   C. $16 and $7   D. $13 and $10   E. None of the above

35. What is the rate in feet per second if the rate in miles per hour is 25mph?
    A. 35.8 ft/sec.   B. 38.5 ft./sec.   C. 34.6 ft./sec.   D. 36.7 ft./sec.   E. None of the above

36. Which equation shows a line parallel to the line: y = 3x − 6 ?
    A. y = 3x − 6   B. y = -1/3 x + 5   C. y = 3x − 1   D. y = 1/3 x + 2   E. None of the above

37. What is the slope of this equation: 2x − 7y = 21 ?
    A. 21/2   B. -3   C. 7   D. 2/7   E. None of the above

38. Which equation shows a line that is parallel to the y-axis?
    A. y = 0   B. x = 3   C. y = ½ x + 6   D. y = -4/3 x − 1   E. None of the above

39. What is the area of the following rectangle: length is 5 less than three times the width ?

    x   [   ]

    A. A = 8x − 10   B. A = 10 − 8x   C. A = 16x²
    D. A = 5x + 6x²   E. None of the above

40. You read 23 pages per hour. If you plan on reading 2 books with 560 pages and 250 pages, how long will it take you to read them over spring break? Round your answer to the nearest hour.
    A. 35 hours   B. 32 hours   C. 28 hours   D. 38 hours   E. None of the above