

Kansas City Area Teachers of Mathematics 2012 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 .

Student Name _____ Student Number _____

School _____

1. Solve: $-5 = 5(x + 2)$
A. 3 B. -3 C. $-7/5$ D. $-3/10$ E. None of the above
2. Solve: $\frac{5}{3} = \frac{n}{18}$
A. 20 B. 27 C. 30 D. 6 E. None of the above
3. Solve: $|x| = 11$
A. 11 B. -11 C. 22 D. -11 and 11 E. None of the above
4. Simplify the expression: $\frac{6x + 27}{-3}$
A. $x - 9$ B. $-2x - 9$ C. $-2x + 9$ D. $2x - 9$ E. None of the above
5. Simplify the expression: $7 - 3x + 2 - 11x - 12$
A. $14x - 10$ B. $-17x$ C. $8x - 7$ D. $-14x - 3$ E. None of the above
6. Simplify the radical: $2\sqrt{45}$
A. $18\sqrt{5}$ B. $\sqrt{90}$ C. $10\sqrt{3}$ D. $6\sqrt{5}$ E. None of the above
7. Simplify the expression: $(3x)^2(2x)^3$
A. $36x^6$ B. $36x^5$ C. $72x^5$ D. $72x^6$ E. None of the above
8. Use the distance formula: $d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$ to find the distance between the points $(-5, 1)$ and $(3, 4)$ on a coordinate graph. Round the answer to the nearest thousandth.
A. 8.544 B. 8.485 C. 8.300 D. 8.500 E. None of the above
9. Find the midpoint between the points $(3, 4)$ and $(-5, 1)$.
A. $(-2, 5)$ B. $(4, 2.5)$ C. $(-1, 2.5)$ D. $(-4, 1.5)$ E. None of the above
10. Find $f(3)$ when $f(x) = 2x^2 - 4x + 7$
A. 4 B. 1 C. 7 D. 13 E. None of the above

11. Solve for all values: $(x + 3)(x - 8) = 0$
 A. 3 B. -3, 8 C. 8 D. 3, -8 E. None of the above

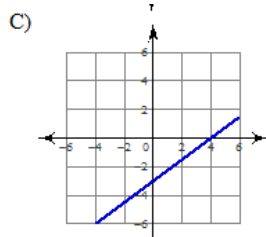
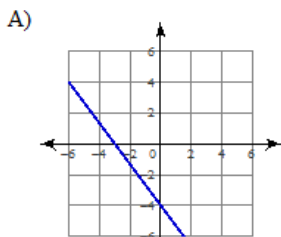
12. Simplify the expression using scientific notation: $\frac{3 \times 10^6}{5 \times 10^1}$
 A. 1.2×10^5 B. 6×10^4 C. 6×10^5 D. 3×10^7 E. None of the above

13. Factor completely: $16x - 24$
 A. $4(4x - 6)$ B. $2(8x - 12)$ C. $8(2x - 3)$ D. $4(4x + 6)$ E. None of the above

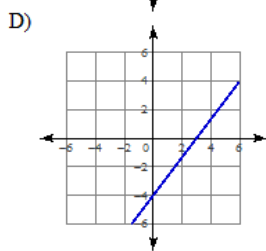
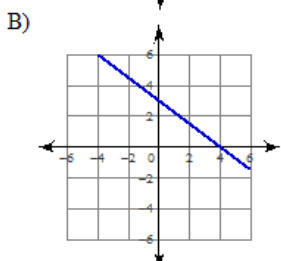
14. Factor **completely**: $2x^2 - 10x + 12$
 A. $(2x - 4)(x - 3)$ B. $2(x^2 - 5x + 6)$ C. $(2x - 6)(x - 2)$
 D. $2(x - 3)(x - 2)$ E. None of the above

15. Simplify: $-7(a - 8) + 9a$
 A. $-16a - 8$ B. $2a + 56$ C. $2a - 8$ D. $2a + 63$ E. None of the above

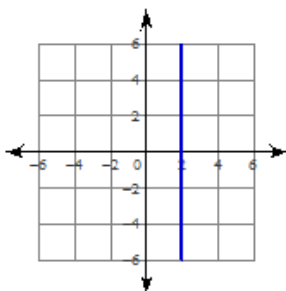
16. Which graph has y-intercept -4 and x-intercept -3?



E. None of the above



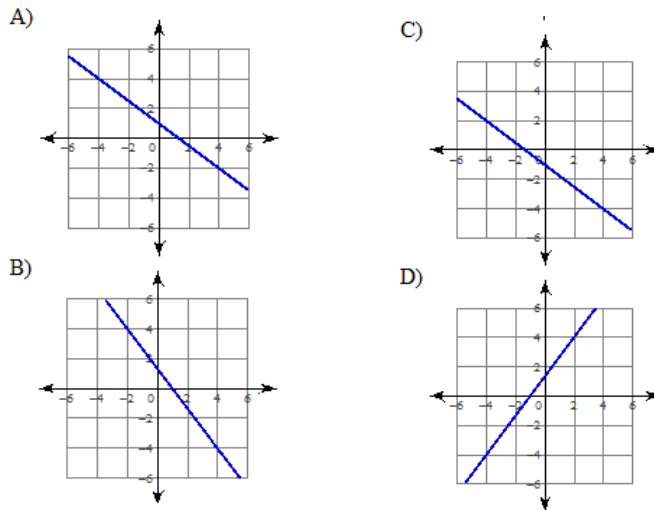
17. Given the graph, write the equation of the line.



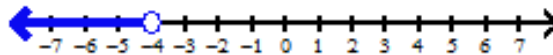
- A. $y = x + 2$
 B. $y = 2$
 C. $y = x$
 D. $x = 2$
 E. None of the above

18. Write the equation in slope-intercept form: $6x - 2y = 12$
 A. $y = 3x + 6$ B. $y = 3x - 6$ C. $y = -3x - 2$ D. $y = -3x - 6$ E. None of the above

19. Which graph shows the linear equation: $3x + 4y = 4$?



20. Which inequality is graphed:



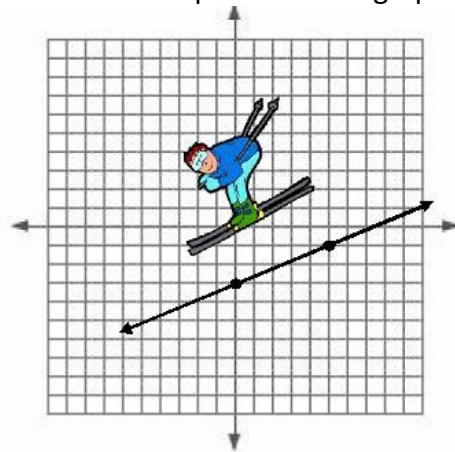
- A. $n < -4$ B. $n \leq -4$ C. $n > -4$ D. $n \geq -4$ E. None of the above

21. What is the solution to the inequality: $1 - b + 5 \leq 10$



- E. None of the above

22. What is the slope of the line graphed below:



- A. $m = -5/2$
 B. $m = -2/5$
 C. $m = 5/2$
 D. $m = 2/5$
 E. None of the above

23. What is the slope between $(-5, 7)$ and $(13, 4)$?

- A. $3/8$ B. $-1/6$ C. $8/11$ D. $11/8$ E. None of the above

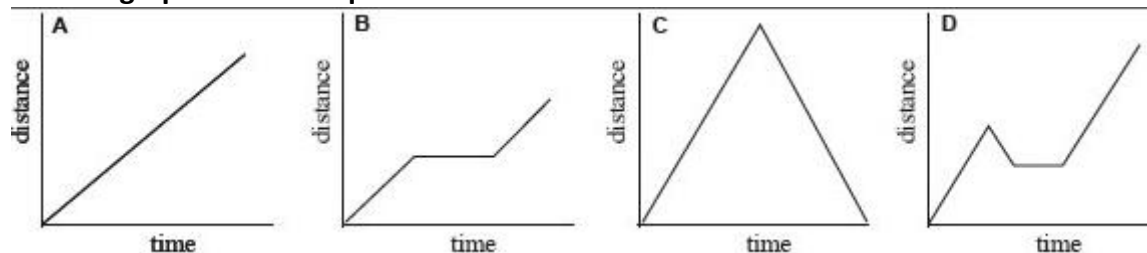
Use the graph below for questions #24-#26. Note that after an initial charge of \$5, you are charged by the minute when making an overseas call.

Cell Phone Cost Per Minute for Overseas Calls



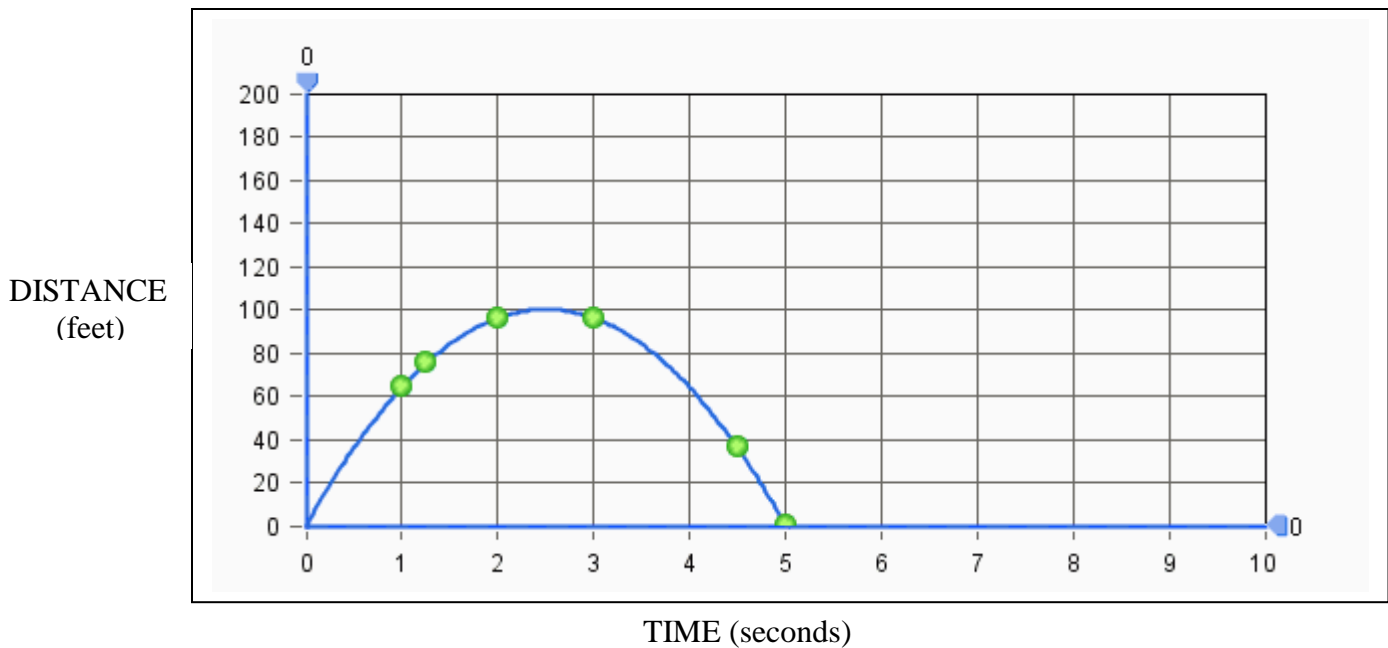
24. What is the cost per minute for an overseas call for Company S?
- A. \$1 per minute B. \$0.40 per minute C. \$0.25 per minute
D. \$15 per minute E. None of the above
25. What is the equation that represents the cost for an overseas call for Company T?
- A. $C = 0.75m + 5$ B. $C = 15m + 5$ C. $C = 15x$
D. $C = 5x + 15$ E. None of the above
26. The **intersection** of the two company graphs can be interpreted as:
- A. Company S is a less expensive company for your cell phone plan for overseas calls.
B. Company T is a less expensive company for your cell phone plan for overseas calls.
C. Company S and Company T are equal in their cell phone plans for overseas calls.
D. Company S is cheaper until 20 minutes of calls, then Company T becomes the cheaper plan.
E. None of the above

Use the graph below for questions 27-28.



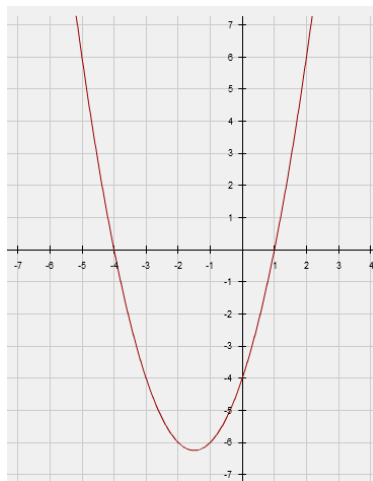
27. Which graph(s) show a constant rate of change over time?
- A. A only B. A and B only C. B and C only
D. B and D only E. None of the above
28. Which graph would best fit the following scenario?
You left home driving at a constant rate, turned on a street that went back toward home, stopped at a stop sign, then continued your drive away from home at a constant rate.
- A. B. C. D. E. None of the above

29. Which equation models the following distance over time graph for an object thrown up in the air.



- A. $d = -16t^2 + 80$ B. $d = t^2 + 100t + 0$ C. $d = -16t^2 + 100t + 60$
 D. $d = -16t^2 + 80t$ E. None of the above

30. Which equation produces the following graph with the given zeros of the quadratic function?



- A. $f(x) = x^2 - 3x + 4$
 B. $f(x) = x^2 + 3x - 4$
 C. $f(x) = x^2 + x - 4$
 D. $f(x) = x^2 - 4x - 4$
 E. None of the above

31. Divide: $(m^2 + 5m - 18) \div (m + 8)$

- A. $(m - 3) + \frac{6}{m + 8}$ B. $(m + 3) + \frac{6}{m + 8}$ C. $(m + 2) + \frac{2}{m + 8}$ D. $(m - 2) + \frac{2}{m + 8}$
 E. None of the above

32. Solve the system: $3x - 2y = -16$
 $4x + 3y = -10$
- A. (-2, 4) B. (4, -2) C. (-4, 2) D. (2, -4) E. None of the above
33. Luis traveled to his cabin on the lake and back. It took two hours less time to get there than it did to get back. The average speed on the trip there was 69 miles/hr. The average speed on the way back was 46 miles/hr. because of an accident on the highway. How many hours did the trip there take?
- A. 1 hr. B. 2 hrs. C. 3 hrs. D. 4 hrs. E. None of the above
34. Two kg of walnuts cost \$10/kg were combined with 4 kg of peanuts which cost \$7 per kg. Find the cost per kg of the mixed nuts.
- A. \$7.50 B. \$8.00 C. \$8.50 D. \$9.00 E. None of the above
35. The sum of the digits of a certain two-digit number is 14. When you reverse its digits you decrease the number by 18. Find the number.
- A. 18 B. 68 C. 59 D. 86 E. None of the above
36. Aryana is selling ticket a community theater musical. On the first day of the ticket sales she sold 4 student tickets and 1 adult ticket for a total of \$45. She sold \$132 in tickets on the second day by selling 10 student tickets and 4 adult tickets. What is the price for adult and student tickets?
- A. Student ticket: \$6, adult ticket: \$15 B. student ticket: \$8, adult ticket: \$13
C. Student ticket: \$6, adult ticket: \$21 D. student ticket: \$5, adult ticket: \$21
37. Evaluate the logarithm: $\log_2 64 = x$
- A. 4 B. 5 C. 8 D. 32 E. None of the above
38. Use the quadratic formula to solve for all solutions of: $3x^2 + x - 3 = 0$
- Quadratic formula: $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$
- A. -0.893, 0.56 B. 2.54, -3.54 C. -1.18, 0.847 D. 1.695, -2.361
E. None of the above
39. Compound interest is computed by the formula: $A = P(1 + r/n)^{nt}$ where A = Accrued amount, P = Principal, r = Annual rate of interest, n = number of times per year interest is paid, and t = time in years. How much money would be accrued if \$1000 receives 4% interest **compounded monthly** for **2 years**? Round your answer to the nearest dollar.
- A. \$1083 B. \$996,620 C. \$1091 D. \$2000 E. None of the above
40. Factor: $x^3 - 8$
- A. $(x - 2)(x^2 + 4)$ B. $(x - 2)(x^2 + 2x + 4)$ C. $(x - 2)(x^2 - 2x + 4)$ D. $(x - 2)(x^2 - 2x - 4)$
E. None of the above

Shade the correct answer!

Example: A B ● D E

Name _____

School _____

1. A B C D E

2. A B C D E

3. A B C D E

4. A B C D E

5. A B C D E

6. A B C D E

7. A B C D E

8. A B C D E

9. A B C D E

10. A B C D E

11. A B C D E

12. A B C D E

13. A B C D E

14. A B C D E

15. A B C D E

16. A B C D E

17. A B C D E

18. A B C D E

19. A B C D E

20. A B C D E

21. A B C D E

22. A B C D E

23. A B C D E

24. A B C D E

25. A B C D E

26. A B C D E

27. A B C D E

28. A B C D E

29. A B C D E

30. A B C D E

31. A B C D E

32. A B C D E

33. A B C D E

34. A B C D E

35. A B C D E

36. A B C D E

37. A B C D E

38. A B C D E

39. A B C D E

40. A B C D E

Shade the correct answer!Example: A C D E

Name _____

School _____

1. A C D E2. A B D E3. A B C E4. A C D E5. A B C E6. A B C E7. A B D E8. B C D E9. A B D E10. A B C E11. A C D E12. A C D E13. A B D E14. A B C E15. A C D E16. B C D E17. A B C E18. A C D E19. B C D E20. B C D E21. A B C E22. A B C E23. A B C D 24. A B D E25. B C D E26. A B D E27. B C D E28. A B C E29. A B C E30. A C D E31. B C D E32. A B D E33. A B C E34. A C D E35. A B C E36. A B C D 37. A C D E38. A B D E39. B C D E40. A C D E