

MATHEMATICS COMPETENCY TEST

SAMPLE TEST

2005

- A scientific, non-graphing calculator is allowed for this test.
- The following formulas may be used on this test:

Area of a triangle: $A = \frac{1}{2}bh$

Area of a rectangle: $A = LW$

Perimeter of a rectangle: $P = 2L + 2W$

Area of a circle: $A = \pi r^2$

Circumference of a circle: $C = 2\pi r$

Distance traveled: $D = RT$

Pythagorean theorem: $a^2 + b^2 = c^2$

a and b are legs of a right triangle; c is the hypotenuse

Quadratic formula: $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

Slope of a line through the points (x_1, y_1) and (x_2, y_2) : $m = \frac{y_2 - y_1}{x_2 - x_1}$

Standard form of a line: $ax + by = c$

Slope-intercept form of a line: $y = mx + b$

Point-slope form of a line: $y - y_1 = m(x - x_1)$

- Answers may be found on the last page of this test.

8. Simplify and write your answer without negative exponents:

Use exponent rules

$$\left(\frac{-3x^2}{y}\right)^{-2} = ?$$

- a. $\frac{6y}{x^4}$ b. $\frac{9x^0}{y^2}$ c. $\frac{6x^4}{y^2}$ d. $\frac{y^2}{9x^4}$ e. none of these

9. Subtract: $(5x^2 - 2xy + 3y^2) - (-4x^2 + xy - 3y^2) =$

Operations on polynomials

- a. $9x^2 - xy$ b. $9x^2 - xy + 6y^2$ c. $9x^2 - 3xy$
d. $9x^2 - 3xy + 6y^2$ e. none of these

10. Multiply: $(3x + 5)(x - 4) =$

Operations on polynomials

- a. $3x^2 - 20$ b. $3x^2 + 7x - 20$ c. $3x^2 - 7x - 20$
d. $3x^2 - 7x + 20$ e. none of these

11. Expand: $(2x - 5)^2 =$

Operations on polynomials

- a. $4x - 10$ b. $4x^2 - 25$ c. $4x^2 - 10x + 25$
d. $4x^2 + 25$ e. $4x^2 - 20x + 25$

12. Multiply $3x^2y(4xy - 2y^3 - 5x^4y^2)$

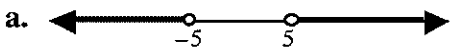

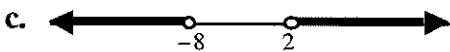
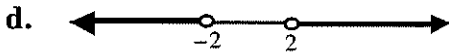
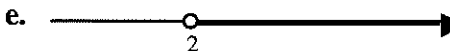
Operations on polynomials

- a. $12x^3y^2 - 2y^3 - 5x^4y^2$ b. $7x^3y^2 - x^2y^4 - 2x^6y^3$
c. $12x^3y^2 - 6x^2y^4 - 15x^6y^3$ d. $12x^2y - 6x^2y^3 - 15x^6y^2$
e. none of these

13. Divide: $\frac{15m^3n^4 + 3mn^2 - 12mn}{3mn^2} =$

Operations on polynomials

- a. $12m^3n^2 - 9n$ b. $5m^2n^2 + 1mn - 4mn^2$ c. $5m^3n^2 - 4n$
d. $5m^2n^2 + 1 - \frac{4}{n}$ e. none of these

14. The greatest common factor of the polynomial $12a^2b^2 + 18ab^3 - 24a^3b^2$ is: Determine the GCF of a polynomial; factor monomial from a polynomial
 a. $12ab$ b. $6a^2b^2$ c. $24a^3b^3$ d. $6ab$ e. none of these
15. One factor of $6x^2 - 11x - 10$ is: Factor trinomial
 a. $3x + 10$ b. $3x - 2$ c. $6x + 5$ d. $2x - 5$ e. can't be factored
16. When the formula: $Ax + By = C$ is solved for B, the result is: Evaluate a formula or solve for given variable
 a. $\frac{C - Ax}{y}$ b. $\frac{C - By}{Ax}$ c. $\frac{C - y}{Ax}$ d. $\frac{C}{Ax + y}$ e. none of these
17. Solve for x: $-\frac{3}{4}x + 2 = \frac{x}{6}$ Solve a linear equation involving fractional or integer coefficients
 a. $-\frac{12}{7}$ b. $\frac{2}{11}$ c. $-\frac{2}{7}$ d. $\frac{24}{11}$ e. none of these
18. The solution for the inequality $-6 \leq 10 - 2x < 14$ is: Solve a compound inequality involving fractional or integer coefficients
 a. $x \geq -2$ b. $-8 \leq x < 2$ c. $-2 < x \leq 8$
 d. $-2 < x \leq 12$ e. none of these
19. The number line solution for the inequality $|x + 3| > 5$ is: Solve or interpret absolute value inequality; read answer on number line
- a.  b. 
- c.  d. 
- e. 
20. When the system of equations $\begin{cases} 2x + y = 6 \\ 3x - 2y = 16 \end{cases}$ is solved, the value of x is: Solve a 2x2 system of linear equations
 a. 4 b. 2 c. -2 d. 3 e. -3

21. The solutions of the equation $x^2 = 6x + 16$ would add up to: Solve a quadratic equation
 a. 8 b. 6 c. -4 d. 4 e. 0
22. The solution set for the quadratic equation $x^2 - 6x + 10 = 0$ would consist of: Solve a quadratic equation
 a. two real numbers b. one real number
 c. two imaginary numbers d. one imaginary number e. none of these
23. In a triangle, the sum of the angles is 180° . If one angle is 25° greater than the smallest angle, and the other angle is 5° less than twice the smallest angle, find the measure of the smallest angle. Application problem using linear or quadratic equations
 a. 40° b. 35° c. 52° d. 29° e. not enough information is given
- 24a. A salesperson earns a weekly base salary of \$210. She also earns a 6% commission on her total dollar amount of sales for the week. What is the dollar amount of sales in a week where she made total earnings of \$450? Application problem using linear or quadratic equations involving percent
 a. \$5,670 b. \$2,370 c. \$4,000 d. \$11,000
 e. none of these

OR

- 24b. Kerri can buy a season pass to the high school girls soccer games for \$20. Without the pass, each game costs \$2.25. How many games would Kerri have to attend to make the season pass a better deal? Application problem using linear or quadratic equations involving comparisons
 a. 6 b. 7 c. 8 d. 9 e. 10
25. The length of a rectangle is 8 meters more than twice its width. If the rectangle has a perimeter of 94 meters, what is the length of the rectangle? Application problem involving circumference, perimeter, or area, using linear or quadratic equations
 a. 13 meters b. 27 meters c. 42 meters
 d. 34 meters e. none of these
26. Simplify completely: $\frac{4x^2 - 9}{2x^2 + x - 3} = ?$ Rational expressions
 a. $\frac{x-3}{x+1}$ b. $\frac{5}{x}$ c. $\frac{2x-3}{x-1}$ d. $\frac{2x-9}{x-3}$
 e. none of these

27. Add the fractions and simplify: $\frac{5m}{6n^3} + \frac{7}{12m^2n} = ?$

Operations with rational expressions

- a. $\frac{10m^3 + 7n^2}{12m^2n^3}$ b. $\frac{5m^3 + 7n^3}{12m^2n^4}$ c. $\frac{5m + 7}{72m^2n^4}$ d. $\frac{5m^2 + 14n}{6mn}$
 e. none of these

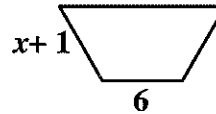
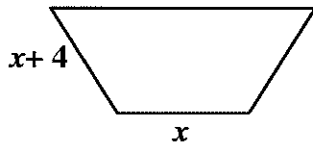
28. Divide and simplify: $\frac{x}{x+2} \div \frac{3x^2}{x^2-4} = ?$

Operations with rational expressions

- a. $\frac{3x^3}{x-2}$ b. $\frac{3}{(x+2)^2}$ c. $\frac{x-2}{3x}$ d. $\frac{3}{-8}$ e. none of these

29. For the similar figures shown, an equation that will determine the value of x is:

Application problem involving proportion

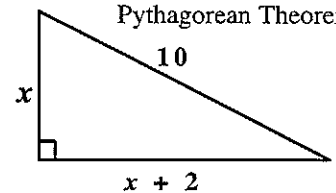


- a. $x^2 + x = 6x + 24$ b. $x^2 + 4x = 6x + 6$ c. $2x + 4 = x + 6$
 d. $x^2 + 5x + 4 = 6x$ e. none of these

30. An equation that will determine the value of x in the given right triangle is:

Application of Pythagorean Theorem

- a. $x + (x + 2) + 10 = 0$ b. $2x^2 + 4x - 96 = 0$
 c. $x^2 + 2x = 10$ d. $2x^2 - 96 = 0$
 e. none of these



31. Completely simplify the radical $\sqrt{60x^2y^5}$

Roots and radicals

- a. $30xy^{2.5}$ b. $4xy\sqrt{15xy}$ c. $20x^2y^2\sqrt{3y}$ d. $2xy^2\sqrt{15y}$
 e. none of these

32. The solution the radical equation $\sqrt{x^2 + 3} = x + 5$ is: Roots and radicals
- a. less than zero b. between 0 and 10 c. greater than 10
 d. there is no solution e. none of these

- 33a. Two trains leave a station at the same time, traveling in opposite directions. The rate of the first train is 14 *mph* faster than that of the second train. If they are 730 miles apart in 5 hours, find the rate of the second train. Applications of linear equations: distance, rate, time
- a. 110 *mph* b. 80 *mph* c. 71.6 *mph*
 d. 66 *mph* e. none of these

OR

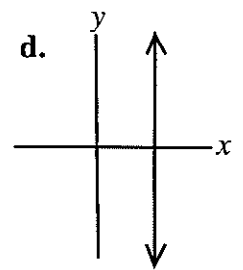
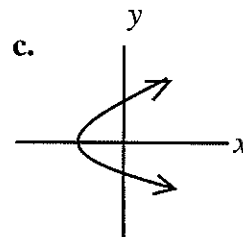
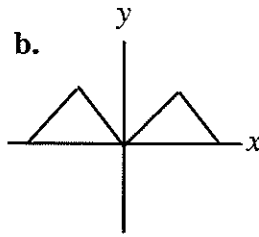
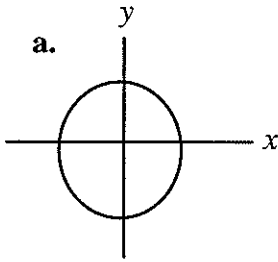
- 33b. Find an equation (or pair of equations) representing the information in the following word problem: Applications of linear equations: mixtures

A food stand sells hot dogs for \$2.00 and beef tacos for \$2.50 each. If the sales for the day total \$635, and 278 items were sold, how many hot dogs were sold?

- a. $\begin{cases} x + y = 635 \\ 2x + 2.5y = 278 \end{cases}$ b. $\begin{cases} x + y = 278 \\ 2x + 2.5y = 635 \end{cases}$ c. $2x + (278 - x) = 2.5x$
 d. $2x + 2.5(635 - x) = 278$ e. none of these
34. The slope of the line between the points (2, -1) and (4, 5) is: Evaluate slope of a line
- a. 3 b. 2 c. -3 d. -2 e. 2/3
35. For the line $3x - 2y = 12$, the x -intercept is: Find intercepts of a line
- a. (0, -6) b. (3, 0) c. (2, 0) d. (0, -2) e. none of these
36. Find the equation of a line through the point (3, 2) and parallel to the line $y = 6 - 3x$. Find equation of a line
- a. $3x + y = 9$ b. $3x + y = 11$ c. $y = 3x - 7$ d. $y = 6x - 16$
 e. none of these
37. If $f(x) = -x^2 + 4x - 3$ then $f(-5) = ?$ Understand function notation; identify function value
- a. 2 b. -8 c. 42 d. -48 e. none of these

38. Which of the following graphs shows a function $f(x)$?

Recognize graph of a function

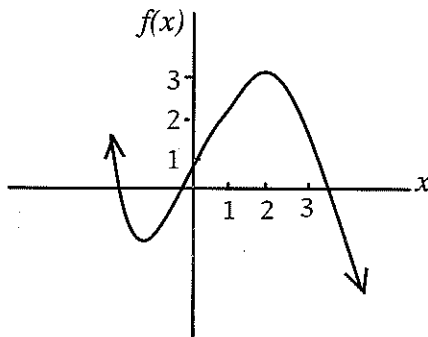


e. none of these is a function

39. In the graph of function $y = f(x)$ shown below, $f(2)$ is:

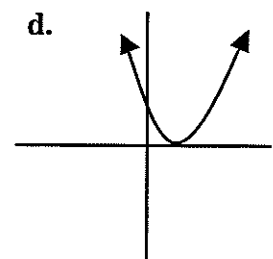
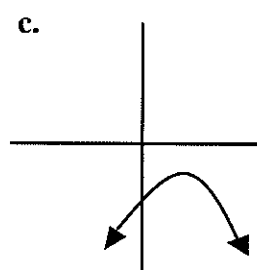
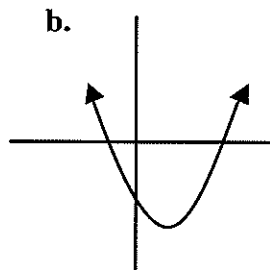
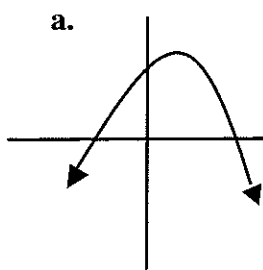
Identify function value from a graph

a. not defined b. 0 c. 1 d. 2 e. 3



40. The graph that shows a quadratic function with *two real numbers* as roots and a *negative* coefficient of the x^2 term is:

Analyze function properties for linear and quadratic functions



e. none of these

ANSWER KEY--SAMPLE TEST

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