

BASIC MATHEMATICS COMPETENCY TEST

SAMPLE TEST 2004

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

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

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

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

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

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

Simple interest: $I = Prt$
 t is in years

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

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

**MATHEMATICS COMPETENCY EXAM
SAMPLE TEST**

1. Evaluate $7 - 3(8 - 2)$

- a.** -19 **b.** -15 **c.** 30
d. 25 **e.** -11

Order of operations

2. Three-fifths of seven-sixths is:

- a.** $18/35$ **b.** $53/30$ **c.** $7/10$
d. $35/18$ **e.** none of these

Arithmetic concepts using
fractions, mixed numbers

3. A rectangle is $\frac{5}{9}$ yd. wide and $1\frac{7}{12}$ yd. long.

Find the perimeter (in yards) around the rectangle.

Application of fraction,
mixed number arithmetic

- a.** $4\frac{5}{18}$ yards **b.** $1\frac{12}{21}$ yards **c.** $2\frac{5}{36}$ yards
d. $3\frac{9}{16}$ yards **e.** none of these

4. $\frac{\frac{5}{8}}{\frac{21}{40}} =$ **a.** $\frac{21}{25}$ **b.** $\frac{21}{64}$ **c.** 21
d. $\frac{1}{21}$ **e.** $\frac{25}{21}$

Simplify complex fraction

5. The STRIP CARPET CO. specializes in carpets for hallways in hotels, motels, etc. The price for a particular style is quoted at \$14 per linear foot. How much will it cost to carpet a hallway that is 60 ft. long?

Application of whole
number arithmetic

- a.** \$3360.00 **b.** \$373.33 **c.** \$124.44
d. \$840.00 **e.** \$2520.00

6. Which represents the largest value?

- a.** $|\square 5|$ **b.** $|\square 8|$ **c.** $|0|$
d. $|\square 4 + 1|$ **e.** $|5 \square 9|$

Absolute value concept
Order relationships

7. Which of the following shows the correct order for the four numbers?

Ordering fractions and decimals

- a. $.43 > \frac{3}{7} > .39 > \frac{8}{21}$ b. $.43 > .39 > \frac{8}{21} > \frac{3}{7}$
c. $\frac{3}{7} < .43 < .39 < \frac{8}{21}$ d. $.43 > .39 > \frac{3}{7} > \frac{8}{21}$
e. none of these

8. The least common multiple of 20 and 45 is:

Number theory concepts:
Prime, factor, greatest common factor; least common multiple

- a. 5 b. 900 c. 450
d. 180 e. none of these

9. The prime factorization of 72 is:

Prime factorization

- a. $8 \square 9$ b. $12 \square 6$ c. $2 \square 2 \square 2 \square 3 \square 3$
d. $72 \square 1$ e. none of these

10. 7^5 is equal to:

Definition of exponent

- a. $7 \cdot 5$ b. $7 + 7 + 7 + 7 + 7$ c. $\frac{1}{7} + \frac{1}{7} + \frac{1}{7} + \frac{1}{7} + \frac{1}{7}$
d. $7 \cdot 7 \cdot 7 \cdot 7 \cdot 7$ e. $5 \cdot 5 \cdot 5 \cdot 5 \cdot 5 \cdot 5 \cdot 5$

11. $\square 2^4 =$

- a. -16 b. 16 c. 8 d. -8
e. none of these

Use exponent rules;
identify base, exponent,
coefficient of exponential
expression

12. 2^0 is: a. 0 b. 1 c. 2 d. undefined
e. none of these

Use exponent rules

13. $4^{\square 2} =$ a. -16 b. 16 c. $\frac{1}{16}$ d. -8
e. none of these

Use exponent rules

14. $16^{1/2} =$ a. 4 b. $\frac{1}{4}$ c. 8 d. $\frac{1}{8}$
e. none of these

Use exponent rules

15. $\sqrt[3]{x^4}$ is the same as:

- a. $x^{3/4}$ b. $x^{4/3}$ c. $\frac{4x}{3}$ d. $3x^4$ e. $\frac{x^4}{3}$

Use exponent rules

16. The Library of Congress has approximately 59,000,000 volumes. Write this number in scientific notation.

Use scientific notation

- a. 59,000,000 b. 5.9×10^6 c. 59 mil
d. 5.9×10^7 e. 5.9×10^6

17. $\frac{x^{12}}{x^3} =$ a. x^4 b. x^{15} c. x^9 d. x^6

Use exponent rules

e. none of these

18. If $x = 3$, then $4x^2 =$

Evaluate polynomial expression for positive integer values of x

- a. 64 b. 144 c. 24 d. 36
e. none of these

19. If $x = -5$, then $2x^2 + x + 1 =$

Evaluate polynomial for integer values of x

- a. 56 b. 106 c. 46 d. 96
e. none of these

20. $(3x^4)(7x^2) =$

Operations on polynomials

- a. $21x^{16}$ b. $21x^8$ c. $10x^8$ d. $10x^6$ e. $21x^6$

21. $(5x^2 + 2xy + 3y^2) + (4x^2 + xy + 3y^2) =$

Operations on polynomials

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

22. $(5x^2 + 2xy + 3y^2) - (4x^2 + xy + 3y^2) =$

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

23. $(3x + 5)(x - 4) =$ 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
24. The greatest common monomial 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
25. Simplify $\frac{-12x^3y^7}{4xy^2}$ Operations on polynomials
- a. $-3 \frac{x^3y^7}{xy^2}$ b. $-8x^2y^5$ c. $3x^3y^{7/2}$ d. $-3x^2y^5$
e. none of these
26. Multiply $3x^2y(4xy - 2y^3 - 5x^4y^2)$ Operations on polynomials
- a. $12x^2y - 6x^2y^3 - 15x^6y^2$ b. $7x^3y^2 - x^2y^4 - 2x^6y^3$
c. $12x^3y^2 - 6x^2y^4 - 15x^6y^3$ d. $12x^3y^2 - 2y^3 - 5x^4y^2$
e. none of these
27. One factor of $x^2 - 5x - 24$ is: Factor trinomial
- a. $x - 4$ b. $x - 8$ c. $x + 6$ d. $x - 3$
e. can't be factored
28. In a triangle, the sum of the angles is 180° . If the three angles are represented by x , $3x - 10$, and $2(x + 14)$, find the measure of angle x . Application problem using polynomial expressions.
- a. 27° b. 35° c. 52° d. 29°
e. not enough information is given
29. The formula to change from Fahrenheit to Celsius temperature is: $C = \frac{5}{9}(F - 32)$. If the Fahrenheit temperature is 77° , what is the equivalent Celsius temperature? (to the nearest degree) Evaluate a formula
- a. 81° b. 49° c. 25° d. 11° e. none of these

30. A number decreased by 5 is equal to -4 . Find the number.

- a. 9 b. 1 c. -1 d. -9
e. none of these

Solve a word problem using a linear equation

31. Solve for x : $\frac{17}{8}x + 2 = 4$

- a. $\frac{-48}{7}$ b. $\frac{23}{8}$ c. $\frac{16}{7}$ d. $\frac{-16}{7}$ e. 15

Solve a linear inequality involving fractional or integer coefficients

32. The solution for $-3x < 4$ is:

- a. $x < 1$ b. $x < 7$ c. $x < \frac{-4}{3}$
d. $x > \frac{-3}{4}$ e. $x > \frac{-4}{3}$

Solve a linear inequality involving fractional or integer coefficients

33. Write in symbols, using n for the unknown number:

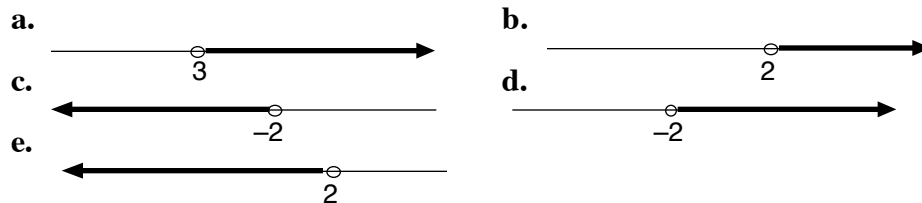
“Five more than twice a number is less than one.”

- a. $5 > 2n < 1$ b. $2n + 5 < 1$ c. $(2n)(5) - 1$
d. $5 + 2n - 1$ e. none of these

Use algebraic notation for a linear inequality

34. The number line solution for the inequality $2x + 5 > 1$ is:

Solve or interpret a linear inequality involving fractional or integer coefficients; read answer on number line



35. $A = kB$ where $k > 0$. If B increases, A will:

- a. increase b. decrease c. stay the same
d. can't tell without knowing the values of A and B

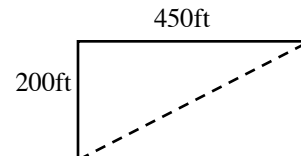
Direct and inverse variation; ratio

36. The scale on a map is 2 inches to 25 miles. How far apart are two towns that are $3\frac{1}{2}$ inches apart on the map?

Application problem involving proportion

- a. $87\frac{1}{2}$ mi. b. $43\frac{3}{4}$ mi. c. $137\frac{1}{2}$ mi.
d. 50 miles e. none of these

37. In a city with a population of 12,000, a recent market survey revealed that 8 of every 200 people will purchase a new brand of soap. What percent of the population will purchase this new soap?
a. 25% **b.** 8% **c.** 4% **d.** 7.5% **e.** $13\frac{1}{3}\%$ Application problem involving per cent
38. If $\frac{3}{t} = \frac{4}{5}$ then $t = ?$
a. $\frac{12}{5}$ **b.** $\frac{14}{5}$ **c.** $\frac{15}{4}$ **d.** $\frac{11}{5}$ **e.** $\frac{15}{4}$ Solve a proportion
39. If you can invest \$7500 in a Certificate of Deposit paying $5\frac{3}{4}\%$ per year simple interest, how much interest (in dollars) will you have earned after 3 years?
a. \$8793.75 **b.** \$1201.50 **c.** \$431.25
d. \$1293.75 **e.** \$7931.25 Application problem involving simple interest
40. A salesperson earns a weekly base salary of \$210. She also earns a 6% commission on her total dollar volume of sales for the week. What is the dollar volume of sales in a week where she made a total of \$450?
a. \$5,670 **b.** \$2,370 **c.** \$4,000 **d.** \$11,000
e. none of these Application problem using a linear equation
41. The danger area surrounding a "spill" of radioactive material covers a circular region. The radiation from this material is dangerous for a distance of 2.3 km. from the center. What is the total area affected by the radioactive material?
a. $10.58\pi \text{ km}^2$ **b.** $9.2\pi \text{ km}^2$ **c.** $5.29\pi \text{ km}^2$
d. $2.3\pi \text{ km}$ **e.** $4.6\pi \text{ km}$ Application problem involving circumference, perimeter, or area
42. 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?
a. 13 meters **b.** 27 meters **c.** 42 meters
d. 34 meters **e.** none of these Application problem involving circumference, perimeter, or area, using linear equations or 2x2 systems of equations
43. A parking lot is in the shape of a rectangle with a width of 200 feet and length of 450 feet. How far would you walk from one corner of the parking lot diagonally across to the opposite corner? (to the nearest foot)
a. 500 ft. **b.** 492 ft. **c.** 650 ft. **d.** 403 ft.
e. none of these Application of the Pythagorean Theorem



44. 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

45. The solution set for the equation $x^2 - 9x = 0$ is
 a. {3} b. {9} c. {3, -3} d. {0, 9} e. {9, -9}

Solve a quadratic equation

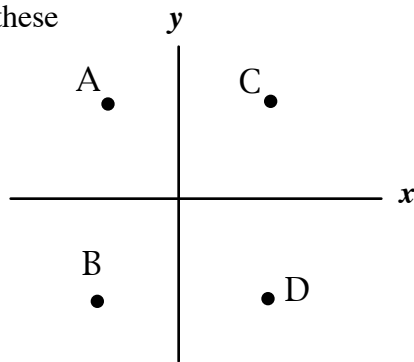
46. The solution set for the equation $x^2 = 6x + 16$ is
 a. {8} b. {8, -2} c. {2, -6} d. {0, 4} e. {4, -4}

Solve a quadratic equation

47. The point $(-3, 4)$ could be located at point

Locate a point on rectangular coordinate system

- a. A b. B c. C d. D
 e. none of these



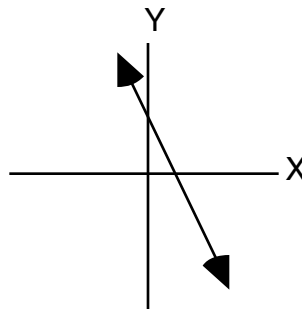
48. The slope of the line between the points $(2, -1)$ and $(4, 5)$ is:
 a. -2 b. 2 c. -3 d. 3 e. 2/3

Evaluate slope of a line

49. The slope of the line in the accompanying graph is:

Identify, interpret slope of a line

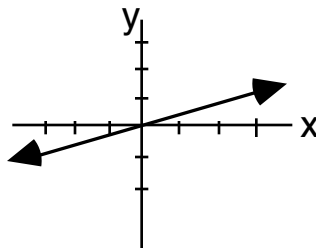
- a. positive b. negative c. undefined d. zero
 e. not enough information is given



50. Which is closest to the slope of the line shown below?

- a. 3 b. -3 c. 1/3 d. 0 e. -1/3

Identify slope, y-intercept, x-intercept from a graph of a line



51. Expressed in slope-intercept form, the equation of the line $3x - y = 10$ is:

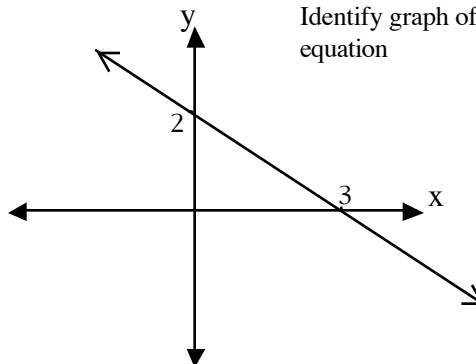
- a. $y = 3x + 10$ b. $y = 3x - 10$ c. $3x - y = 10$
 d. $y = \frac{10}{3}x$ e. none of these

Express a linear equation in slope-intercept form

52. The line shown is the graph of the equation:

- a. $y = 3x + 2$
 b. $y = \frac{2}{3}x + 2$
 c. $y = 2x + 3$
 d. $y = \frac{3}{2}x + 3$
 e. $y = \frac{2}{3}x + 2$

Identify graph of a linear equation



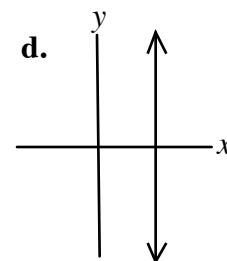
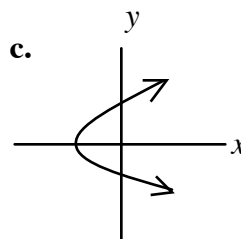
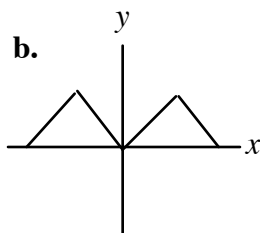
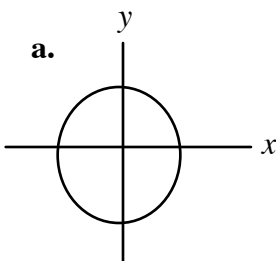
53. If $f(x) = 4x - x^2$ then $f(-1) = ?$

- a. 5 b. -5 c. 3 d. -3
 e. none of these

Understand function notation; identify function value

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

Recognize graph of a function

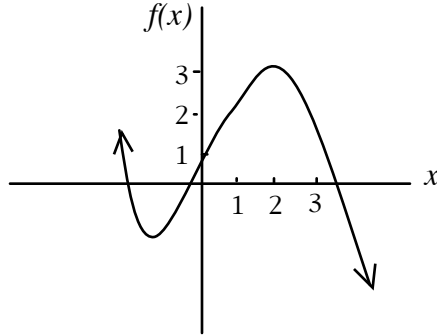


- e. none of these

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

Identify function value from a graph

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



56. The graph of the function $y = -x^2 + 3x + 4$ is

Analyze a function

- a. a parabola that opens upward b. a parabola that opens downward
 c. a line with positive slope d. a line with negative slope
 e. none of these

57. The function $y = -x^2 + 3x + 4$ has a y-intercept at the point

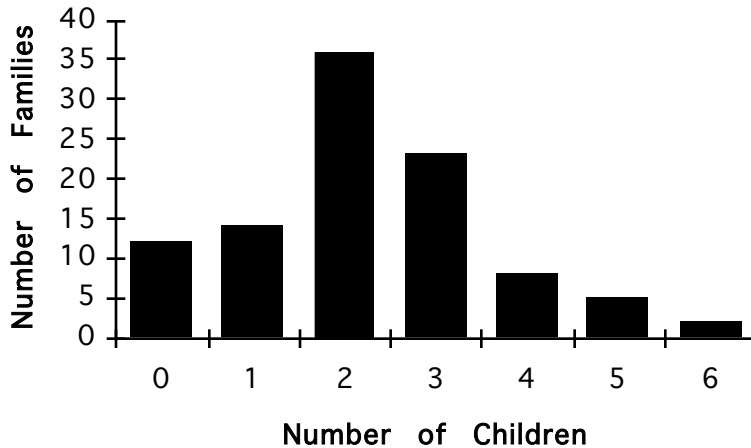
Analyze a function

- a. (0, 3) b. (0, -1) c. (0, -4) d. (0, 1) e. (0, 4)

58. The accompanying bar graph gives data on one hundred families surveyed as to the number of children in the family. Which of the following is true according to the bar graph?

Interpret charts, bar graphs, circle graphs, line graphs, picture graphs

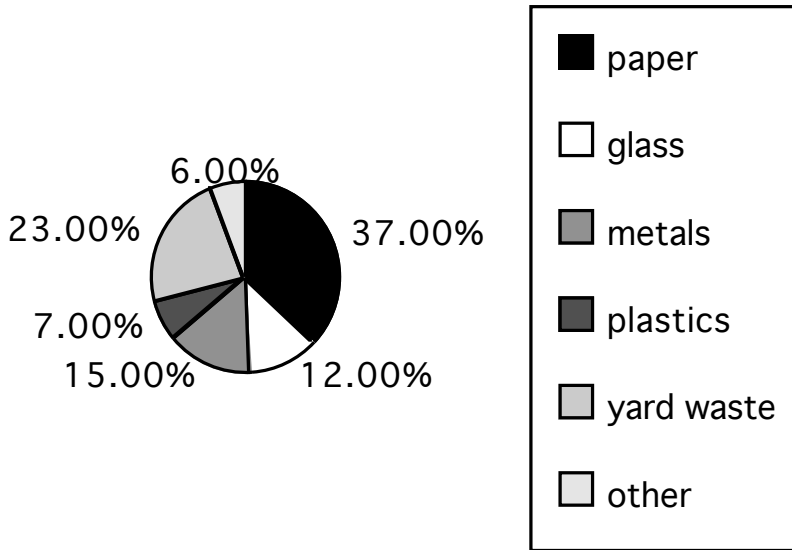
- a. More families had 1 child than had 3 children.
 b. About 15 families had 4 children.
 c. Over half of the total number of families had 2 children.
 d. About one-fourth of the total number of families had 3 children.
 e. The graph does not give sufficient information to make any of these conclusions.



59. The accompanying circle graph shows percentages of recycled materials at Smallville Recycling Center. If the total tonnage of recycled material was 4000 tons, how many tons of paper were recycled?

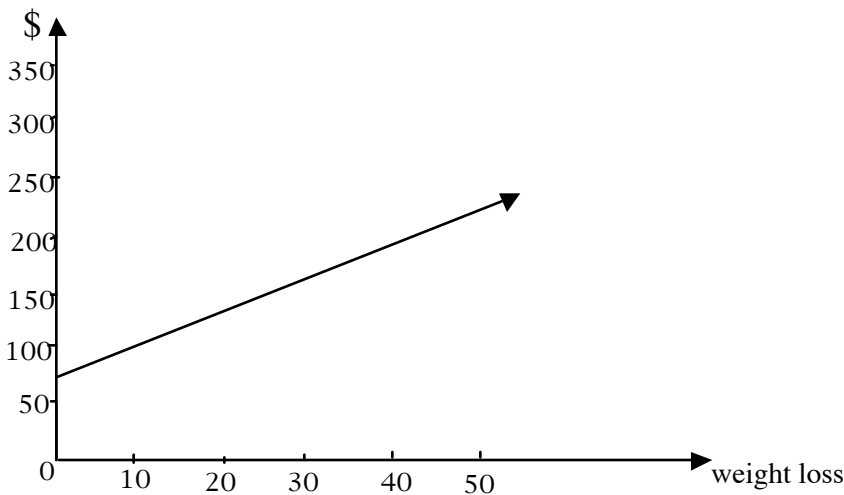
- a. 37 tons b. 1480 tons c. 3700 tons
 d. 63 tons e. none of these

Interpret charts, bar graphs, circle graphs, line graphs, picture graphs



60. Stacy Best owns a weight loss clinic. She charges her clients a one-time membership fee. She also charges per pound of weight lost. Therefore, the successful she is at helping clients lose weight, the more income she will receive. The following graph shows a client's cost for losing weight.

Interpret charts, bar graphs, circle graphs, line graphs, picture graphs



A client who was charged \$150 lost about how many pounds?

- a. 0 pounds b. 25 pounds c. 40 pounds d. 10 pounds e. 75 pounds

ANSWER KEY--SAMPLE TEST

- | | | |
|-------|-------|-------|
| 1. E | 21. A | 41. C |
| 2. C | 22. D | 42. D |
| 3. A | 23. C | 43. B |
| 4. E | 24. E | 44. A |
| 5. D | 25. D | 45. D |
| 6. B | 26. C | 46. B |
| 7. A | 27. B | 47. A |
| 8. D | 28. A | 48. D |
| 9. C | 29. C | 49. B |
| 10. D | 30. B | 50. C |
| 11. A | 31. D | 51. B |
| 12. B | 32. E | 52. E |
| 13. C | 33. B | 53. B |
| 14. A | 34. D | 54. B |
| 15. B | 35. A | 55. D |
| 16. D | 36. B | 56. B |
| 17. C | 37. C | 57. E |
| 18. D | 38. C | 58. D |
| 19. A | 39. D | 59. B |
| 20. E | 40. C | 60. B |