# MATH PLACEMENT REVIEW GUIDE

This guide is intended as a focus for your review before taking the placement test. The questions presented here may not be on the placement test.

Although a basic skills calculator is provided for your use during the test, you are encouraged to practice doing basic arithmetic problems without a calculator.

This review is for levels of math from arithmetic through intermediate algebra. Choose the problems appropriate to your level of skill.

In order that we may reuse these materials, **please do not write directly on the review guide.**

## Part 1:  Arithmetic Review Guide

Arithmetic covers the following topics:  operations with whole numbers, fractions, decimals, ratios and proportions, and percents.

Directions:  All fractions and ratios must be reduced completely.  Write your answers on the answer sheet.

### Operations with Fractions

1.  Reduce the fraction to lowest terms:  $\dfrac{28}{42}$

    a. $\dfrac{14}{21}$      b. $\dfrac{4}{6}$      c. $\dfrac{2}{3}$      d. $\dfrac{7}{10}$

2.  Find the product:  $\dfrac{7}{16} \times \dfrac{24}{35}$

    a. $\dfrac{3}{10}$      b. $\dfrac{31}{51}$      c. $\dfrac{595}{384}$      d. $\dfrac{384}{595}$

3.  Divide:  $\dfrac{4}{7} \div \dfrac{3}{4}$

    a. $\dfrac{3}{7}$      b. $\dfrac{16}{21}$      c. $\dfrac{7}{3}$      d. $\dfrac{21}{16}$

4.  Multiply:  $\left(3\dfrac{1}{4}\right)\left(6\dfrac{2}{3}\right)$

    a. $18\dfrac{1}{6}$      b. $13\dfrac{3}{4}$      c. $18\dfrac{1}{4}$      d. $21\dfrac{2}{3}$

5.  Subtract:  $\dfrac{11}{15} - \dfrac{1}{2}$

    a. $\dfrac{10}{13}$      b. $\dfrac{7}{30}$      c. $\dfrac{7}{15}$      d. $\dfrac{10}{17}$

6. Find the sum: $3\dfrac{3}{5} + 2\dfrac{2}{3}$

    a. $5\dfrac{5}{8}$         b. $5\dfrac{5}{15}$         c. $6\dfrac{4}{15}$         d. $6\dfrac{6}{15}$

## *Operations with Decimals*

7. Add:  $4.23 + 3.7 + 2.006$

    a. 24.66         b. 9.36         c. 9.936         d. 9.306

8. Write $\dfrac{17}{10}$ as a decimal number.

    a. .17         b. 1.7         c. 17

9. Round 1928.956 to the tenths place.

    a. 1928.9         b. 1929.0         c. 1928.95         d. 1928.96

10. If one square yard of carpet costs $15.45, how much will 45.5 square yards cost?

    a. $702.98         b. $2.95         c. $7029.75         d. $70.30

11. If Angie's gross pay for 21.5 hours was $141.04, what was her pay per hour?

    a. $15.24/hr         b. $6.72/hr         c. $6.56/hr         d. $7.29/hr

## *Operations with Ratios and Proportions*

12. Two inches on a map equals 10 miles.  Write the ratio of map inches to miles.

    a. 5         b. $\dfrac{1}{5}$         c. 20         d. $\dfrac{1}{2}$

13. Find the missing part of the proportion: $\dfrac{12}{x} = \dfrac{3}{7}$

    a. 36         b. 24         c. 21         d. 28

14. If it takes Tom 48 minutes to walk 3 miles, how many minutes will it take him to walk 5 miles?

    a. 16 min.         b. 144 min.         c. 15 min.         d. 80 min.

### Operations with Percentages

15. Change the percent to a fraction: 145%

    a. $\dfrac{29}{20}$      b. $\dfrac{29}{2}$      c. $\dfrac{29}{50}$      d. $\dfrac{29}{5}$

16. Change the decimal number to a percent: .129

    a. 1.29%      b. 12.9%      c. 129%      d. .129%

17. The 1980 Census Report listed the population of Pullman as 17,316.  The 1990 Census Report listed the population as 18,373.  Find the percent change in the population.  Round the percent to the nearest tenth.

    a. 4.9%      b. 5.75%      c. 6.1%      d. 6.7%

18. Frost's Refrigeration decided to increase their basic service call charge by 8%.  What will be the new charge for a service call if they had been charging $42.50?

    a. $44.80      b. $45.00      c. $45.20      d. $45.90

## Part II:  Introduction to Elementary Algebra Review Guide

Introduction to Elementary Algebra covers the following topics:  introduction to variables, operations with signed numbers, solutions to linear equations and inequalities, operations with positive integer exponents, evaluation and manipulations of formulas, and solving basic word problems.

### Operations with Signed Numbers

19. Simplify:  $(5-2)-(2-5)$

    a. 3      b. 0      c. 6      d. −6

20. Simplify:  $-11-(-3)+(-1)-9$

    a. −18      b. −22      c. −24      d. −16

21. Simplify:  $\dfrac{9+21}{3}-\dfrac{12(4)}{2}$

    a. −14      b. −16      c. $-\dfrac{18}{5}$      d. −1

*Variables*

22. Translate to an algebraic expression:  Twice the sum of   3x and y

    a.  $2(3x) + y$         b.  $6x + 2y$         c.  $3x + 2y$         d.  $2 + 3x + y$

23. Evaluate:  $(x - 3y)(2x + y)$  when $x = -2$ and $y = -1$

    a.  25            b.  −25          c.  −3           d.  −5

24. Simplify:  $6x - 7b - 10x + 11b$

    a.  $-x + b$        b.  $-4x + 4b$       c.  $4x - 4b$        d. $-4x - 4b$

25. Simplify:  $3(x + 1) - 4(x - 1)$

    a.  $-x - 7$         b.  $-x - 1$         c.  $-x + 7$         d.  $-x + 1$

26. Multiply:  $\left(\dfrac{4a}{9b}\right)\left(-\dfrac{3b}{16a}\right)$

    a.  $\dfrac{ab}{12\,ab}$        b.  $\dfrac{1}{12}$        c.  −12        d.  $-\dfrac{1}{12}$

27. Simplify:  $2\big[9x - 2(3x - 2)\big]$

    a.  $6x - 2$         b.  $6x - 4$         c.  $6x + 4$         d.  $6x + 8$

*Solutions to Linear Equations and Inequalities*

28. Solve:  $-2x + 21 = -11$

    a.  −5           b.  −16          c.  16           d.  5

29. Solve:  $\dfrac{2x}{3} = \dfrac{4}{5}$

    a.  $\dfrac{6}{5}$        b.  $\dfrac{8}{15}$        c.  $\dfrac{12}{5}$        d.  $\dfrac{20}{15}$

30. Solve:  $2x + 6 > 3x + 32$

    a.  $x > -26$        b.  $x > -38$       c.  $x < -26$        d.  $x < 26$

31. Solve: $6(x - 5) - 3x = -9$

    a. $-13$              b. 7              c. 13              d. $-7$

## *Operations with Positive Integer Exponents*

32. Simplify: $2^2 - (-2)^3$

    a. $-2$              b. 12              c. 10              d. 14

33. Simplify: $(2 + 3)^2 - (2 + 3^2)$

    a. 14              b. 0              c. 2              d. 32

## *Solving Basic Word Problems*

34. A board is 28 feet long and is cut into three pieces. The second piece is twice as long as the first piece and the third is three feet longer than the second. What is the length of each piece?

    a. 5, 10, 13        b. 4, 8, 16        c. 6, 12, 10        d. 8, 16, 4

35. The perimeter of a rectangle is 66 feet and the width is 7 feet. What is the length in feet?

    a. 26              b. 52              c. 40              d. 20

36. The area of a triangle is 24 square feet. If the base is 12 feet, what is the height of the triangle?

    a. 4              b. 2              c. 8              d. 6

37. Seven less than four times a number is 35. What is the number?

    a. 7              b. $\dfrac{21}{2}$              c. $-7$              d. $-\dfrac{21}{2}$

## *Manipulation of Formulas*

38. Solve: $v = k + gt$    for    t

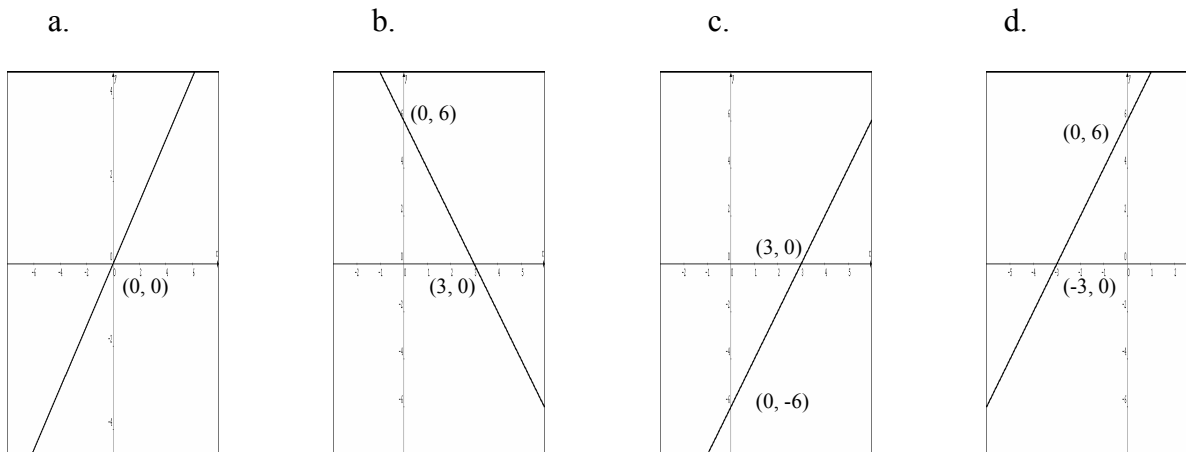    a. $t = v + \dfrac{k}{g}$        b. $t = v - \dfrac{k}{g}$        c. $t = \dfrac{v + k}{g}$        d. $t = \dfrac{v - k}{g}$

# Part III: Elementary Algebra

Elementary Algebra covers the following topics: linear and quadratic equations, inequalities, exponents, polynomials, graphing, and systems of equations in two variables.

## *Graphing of Linear Equations*

39. Graph $2x - y = 6$. Indicate x- and y-intercepts (if any).

    a.                      b.                      c.                      d.

(0, 0)

(0, 6)
(3, 0)

(3, 0)
(0, -6)

(0, 6)
(-3, 0)

## *Polynomials*

40. Subtract the following polynomials: $(x^5 - 3x^2 + 2x - 1) - 2(x^3 - 3x^2 - 2x + 1)$

    a. $x^5 + 2x^3 + 9x^2 - 6x + 3$            b. $x^5 - 2x^3 - 9x^2 - 2x + 1$
    c. $x^5 - 2x^3 + 3x^2 + 6x - 3$            d. $x^5 + 2x^3 - 3x^2 - 6x + 3$

41. Subtract $(2x + 1)$ from the sum of $(3x - 7)$ and $(5x + 2)$

    a. $6x - 6$          b. $-6x + 6$          c. $4x + 10$          d. $4x - 10$

42. Multiply: $(x + 3)(5x - 1)$

    a. $5x^2 + 14x - 3$     b. $5x^2 + 15x - 3$     c. $5x^2 - x - 3$     d. $5x^2 + 16x - 3$

43. If $x = -3$ and $y = 1$, evaluate: $x^2 + 2xy + 7$

    a. 10            b. $-5$            c. 11            d. $-8$

44. Factor completely: $9x^2 - 25$

    a. $(9x - 5)(9x + 5)$   b. $(3x - 5)(3x - 5)$   c. $(3x - 5)(3x + 5)$   d. $(3x - 5)^2$

45. Factor completely: $x^2 - 5x - 14$

    a. $(x + 7)(x - 2)$     b. $(x - 7)(x - 2)$     c. $(x - 14)(x + 1)$     d. $(x - 7)(x + 2)$

46. Factor completely: $6x^2 + 19x + 10$

    a. $(6x + 5)(x + 2)$     b. $(3x + 2)(2x + 5)$    c. $(6x + 1)(x + 10)$     d. cannot factor

47. Multiply and simplify: $\dfrac{x^2 - 2x - 3}{2x - 6} \cdot \dfrac{10}{x^2 - 1}$

    a. $\dfrac{5}{x-1}$      b. $5$      c. $\dfrac{10(x^2 - 2x - 3)}{(2x - 6)(x^2 - 1)}$      d. $\dfrac{x - 3}{x + 1}$

48. Add and simplify (if possible): $\dfrac{10}{x^2 + x - 6} + \dfrac{3x}{x^2 - 4x + 4}$

    a. $\dfrac{10 + 3x}{2x^2 - 3x - 2}$               b. $\dfrac{3x^2 + 19x - 20}{(x + 3)(x - 2)^2}$

    c. $\dfrac{13x}{2x^2 - 3x - 10}$             d. $\dfrac{10 + 3x}{(x^2 + x - 6)(x^2 - 4x + 4)}$

49. Use long division and divide: $(2x^2 - 5x + 1)) (x - 3)$

    a. $2x + 1 + \dfrac{4}{x - 3}$      b. $2x + \dfrac{x + 1}{x - 3}$      c. $2x - 11 + \dfrac{34}{x - 3}$      d. none of the above

## *Inequalities*

50. Solve: $2x - 1 < 5x - 13$

    a. $\{x \mid x < 4\}$       b. $\{x \mid x < -4\}$       c. $\{x \mid x > -4\}$       d. $\{x \mid x > 4\}$

## *Exponents*

51. Simplify: $(3x^{-2} y)^3 (2xy)$

    a. $18x^7y^4$       b. $\dfrac{54y^4}{x^5}$       c. $18x^2y^5$       d. $\dfrac{54y^4}{x^7}$

52. Simplify: $\dfrac{-8a^5 b^{-3}}{ab^2}$

   a. $\dfrac{a^4}{8b^5}$        b. $\dfrac{-8a^6}{b}$        c. $\dfrac{1}{8a^4 b}$        d. $\dfrac{-8a^4}{b^5}$

## *Quadratic Equations*

53. Solve: $x^2 - 4x = 12$

   a. $x = 12$ or $x = 16$        b. $x = 6$ or $x = -2$        c. $x^2 = 4x + 12$        d. $x = 0$

## *Linear Equations*

54. Find the slope and the y-intercept of the line: $x + 3y = 9$

   a. slope = 1; y-intercept = 9        b. slope = -3; y-intercept = 9

   c. slope = -1; y-intercept = 3        d. slope $= -\dfrac{1}{3}$; y-intercept = 3

55. Find the slope-intercept equation of the line passing through the points (1, -3) and (3, 5)

   a. $y = 4x - 7$        b. $y = x - 4$        c. $y = 4x + 13$        d. $y = \dfrac{1}{4}x - 7$

56. Solve for $P$:   $P = A - Prt$

   a. $P = A - Prt$        b. $P = \dfrac{A}{rt}$        c. $P = \dfrac{A}{1 + rt}$        d. $P = \dfrac{A}{2rt}$

## *Systems of Equations in Two Variables*

57. Solve the following linear system:   $3x + 2y = 9$ and $4x + 5y = 5$

   a. $x = 0,\ y = 1$        b. $x = -5,\ y = 3$        c. $x = 3,\ y = 0$        d. $x = 5,\ y = -3$

58. Michael has a number of dimes and quarters totaling $12.05. The number of quarters is five more than twice the number of dimes. How many coins of dimes does he have?
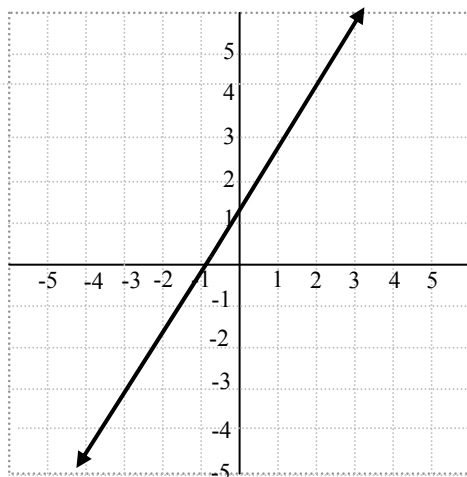
   a. 20 dimes        b. 18 dimes        c. 100 dimes        d. 5 dimes

Intermediate Algebra covers the following topics: algebraic operations and concepts, solving equations and inequalities, algebraic fractions, exponents, roots and radicals, graphing of linear and quadratic functions and equations, and introduction to logarithms.

59. Find the slope of the line pictured below.



60. Below is the graph of a function showing $y = f(x)$. Use it to answer the following questions.
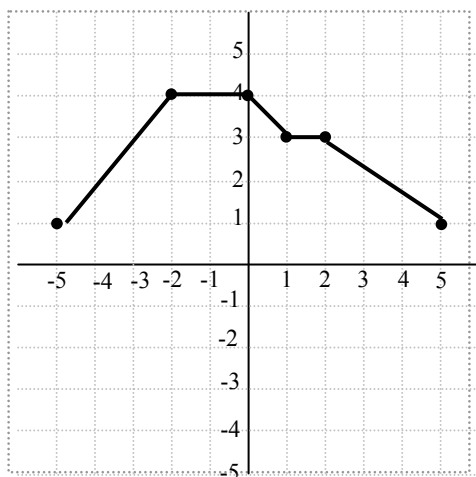


    a. What is $f(-4)$?

    b. What is $x$ if $f(x) = 1$?

61. Find the equation in slope-intercept form of the straight line containing the point $(1,-3)$ and having the slope $-\frac{5}{2}$.

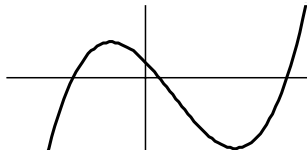62. Let $f(x) = 2x + 3$. Find and simplify $f(t - 1)$.

63. Factor the following polynomial or determine that the polynomial is prime: $2a^2 - 16a + 32$

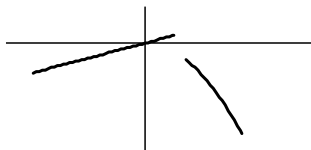64. Which of the following are graphs of functions?
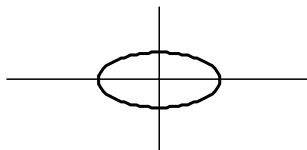
a.
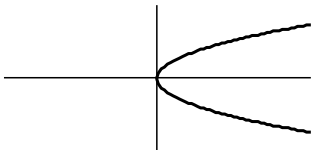


b.



c.



d.



65. Solve the given inequality and graph the solution set on a number line: $2x - 3 \geq 9 + 3x$

66. Solve the given inequality and write the solution set in interval notation: $|2x + 5| > 10$

67. Write using rational exponents (in lowest terms): $\sqrt[4]{5x^3 y^2}$

68. Simplify. Assume that $b$ represents a non-negative number. $-3\sqrt{b^5} + b\sqrt{b^3} + \sqrt{b^2}$

69. Rationalize the denominator: $\dfrac{\sqrt{2}}{\sqrt{2} + \sqrt{5}}$

70. Simplify. Do **not** assume that $x$ represents a non-negative number. $\sqrt[4]{32x^6}$

71. Solve for $a$: $\sqrt{7a - 10} = 1 + \sqrt{5a - 9}$

72. A bookcase is 1 foot taller than it is wide. A diagonal brace, 1 foot longer than the height of the bookcase, is needed for support. What is the length of the brace?

73. Simplify. Express your answer in the form $a + bi$. $(2 + i)(3 - 2i) - (i + 1)$
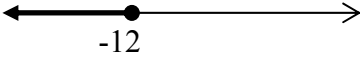
74. Solve for $x$: $x^2 + 6x = 1 + x^2$

75. Let $f(x) = -x^2 + 6x - 8$. Find the vertex and $x-$ and $y-$intercepts of the graph of $f$.

76. Solve for $t$: $t - 3\sqrt{t} + 2 = 0$

77. A ball is tossed in the air. Its distance in feet above ground $t$ seconds later is given by the formula $d(t) = 6 + 96t - 16t^2$. What is the ball's maximum height?

78. Let $g(x) = \left(\dfrac{1}{2}\right)^x$. Find $g(-3)$.

# Math Placement Review Guide Answer Key

|  Part I  |  | Part II |  | Part III |  | Part IV |
|------|---|------|---|------|---|------|

| Part I | Part II | Part III | Part IV |
|--------|---------|----------|---------|
| 1.   c | 19.   c | 39.   c | 59.   $\dfrac{3}{2}$ |
| 2.   a | 20.   a | 40.   c | 60.   a) 2   b) 5 or –5 |
| 3.   b | 21.   a | 41.   a | 61.   $y = -\frac{5}{2}x - \frac{1}{2}$ |
| 4.   d | 22.   b | 42.   a | 62.   $2t + 1$ |
| 5.   b | 23.   d | 43.   a | 63.   $2(a-4)^2$ |
| 6.   c | 24.   b | 44.   c | 64.   b. and c. |
| 7.   c | 25.   c | 45.   d |  |
| 8.   b | 26.   d | 46.   b | 65. |
| 9.   b | 27.   d | 47.   a |  |
| 10.   a | 28.   c | 48.   b |  |
| 11.   c | 29.   a | 49.   a |  |
| 12.   b | 30.   c | 50.   d | 66.   $\left(-\infty, -\frac{15}{2}\right) \cup \left(\frac{5}{2}, \infty\right)$ |
| 13.   d | 31.   b | 51.   b | 67.   $5^{1/4} x^{3/4} y^{1/2}$ |
| 14.   d | 32.   b | 52.   d | 68.   $-2b^2\sqrt{b} + b$ |
| 15.   a | 33.   a | 53.   b | 69.   $\dfrac{2 - \sqrt{10}}{-3}$ |
| 16.   b | 34.   a | 54.   d |  |
| 17.   c | 35.   a | 55.   a | 70.   $2|x|\sqrt[4]{2x^2}$ |
| 18.   d | 36.   a | 56.   c | 71.   $a = 5$ or 2 |
|  | 37.   b | 57.   d | 72.   5 feet |
|  | 38.   d | 58.   b | 73.   $7 - 2i$ |

65.

-12

74.   $x = \frac{1}{6}$

75.   Vertex: (3, 1)
     x- intercepts: (2, 0) and (4, 0)
     y-intercept: (0, -8)

76.   $t = 4$ or 1

77.   150 feet

78.   g(-3) = 8