

Department of Mathematical Sciences
Montclair State University

MATH 051/061 – Basic Skills Math II: Elementary Algebra

Topics And Sample Questions for the Final Exam

I. Introduction to Real Numbers and Algebraic Expressions

1. Tom drove at a speed of 45 mph for t hours. How far did tom travel?
2. Convert to decimal notation: $\frac{5}{8}$
3. Which of the following is the largest: $\frac{2}{3}, \frac{3}{5}, \frac{3}{4}, \frac{7}{9}$
4. $\left|2 - \frac{8}{5}\right| =$
5. $-\frac{3}{8} + \frac{5}{12} =$
6. $0.24 + 3.1 + (-0.35) + (-6.8) + 4.8 =$
7. Alice has \$350 in a checking account. she writes a check for \$175, makes a deposit of \$85, and then write a check for \$37. What is the balance in her account?
8. Simplify: $3 - 5.73 - (-2.73)$
10. Simplify: $-\frac{7}{2} \left(-\frac{5}{2}\right) \left(\frac{4}{7}\right)$
9. Simplify: $256 \div 64 \div 2^3 + 100$
11. Evaluate $3x^2$ when $x = -4$.
12. After diving 105 m below the sea level, a driver rises at a rate of 7 meter per minute for 11 minutes. Where is the diver in relation to the surface?
13. Divide: $\frac{5}{9} \div \left(-\frac{4}{3}\right)$
16. Collect like terms: $2y + \frac{2}{3}y + 2x - \frac{1}{3}y$
14. $-16 \div 3.2 =$
17. Simplify: $-1000 \div (-100) \div 10$
15. $-3(x - 2y + 4z) =$
18. Simplify: $\frac{2^3 - 3^2 - 7 \cdot 5}{32 \div 16 \times (-4)}$

II. Solving Equations and Equalities

19. Solve for x : $x + \frac{3}{8} = \frac{5}{4}$
20. Solve for x : $8.4 = 5.7 + x$
21. Solve for x : $\frac{2}{3}x = 10.6$
22. Solve for y : $4(2y - 3) = 28$
23. Solve for y : $6(2y - 1) - 12 = 7 + 12(y - 1)$
24. Solve for x : $1.2x > x + 1.6$
25. Solve for x : $3 - 2x > x + 12$
26. Solve for x : $2(x - 3) \leq x - 4$
27. The perimeter P of a rectangle is $P = 2l + 2w$ where l is the length and w is the width of the rectangle. Express the width in terms of the perimeter and the length.
28. Solve $Ax + By + Cz = D$ for y .
29. What percent of 150 is 39?
30. Tina left a 16% tip for a meal that cost \$25. What is the total amount she paid for the meal including the tip?
31. Leon left a 15% tip for a meal. The total cost she paid for the meal including the tip was \$46. What was the total cost of the meal before the tip was added?
32. Your quiz scores are 73, 78, 86, and 91. What score on the fifth quiz will allow you to get an average quiz grade of at least 84?

III. Graphs of Linear Equations

33. Graph $x + y = 5$ and indicate the x - intercept.
34. Graph $x + 2y = -6$ and indicate the y - intercept.

IV. Polynomials: Operations

35. Simplify: $\frac{5^{-9}}{5^{-2}}$
36. Simplify: $\frac{a^6 a^7}{a^9}$
37. Express using positive exponents: $\left(\frac{a^2 b}{c d^3}\right)^{-3}$
38. Convert to decimal notation: 64.08×10^{-5}
39. Multiply and write the scientific notation for the result: $(2.5 \times 10^{-3})(40 \times 10^2)$

40. Simplify: $\left(\frac{5}{8}x^3 - \frac{1}{3}x + \frac{1}{2}\right) - \left(-\frac{1}{8}x^3 + \frac{1}{3}x - \frac{1}{2}\right)$

41. Find a polynomial for the volume of the right rectangular solid of length x , width $2x$ and height 5.

42. A box with a rectangular bottom is to be made from a 10 in. by 6 in. cardboard. Squares with side x are cut out of the corners and the sides are folded up. Find the polynomial for the volume of the box.

43. A box with a rectangular bottom is to be made from a 10 in. by 6 in. cardboard. Squares with side x are cut out of the corners and the sides are folded up. Find the polynomial for the outside surface area of the box.

44. $(3x^2 - 2x)^2 =$

45. $(2x + \frac{1}{2})^2 =$

47. Divide: $(p^4 - 81) \div (p^2 - 9)$

46. $(p + 2)(p^2 - 2p + 4) =$

48. Divide: $(x^3 - x^2 + x - 1) \div (x - 1)$

V. Polynomials: Factoring

49. Factor: $2x^3 + 12x^2 - 5x - 30$

53. Factor: $2x^3 - x^2 + 6x - 3$

50. Factor: $6x^{10} - 30x^9 - 84x^8$

54. Factor: $t^3 + 8t^2 - t - 8$

51. Factor: $12x^2 - 17xy + 6y^2$

55. Solve by factoring: $3y^2 - 7y = 20$

52. Factor: $25a^2 - 4b^2$

56. Solve by factoring: $3x^2 + 8x = 9 + 2x$

57. The length of one leg of a right triangle is 6 ft. The length of the hypotenuse is 2 ft longer than the other leg. What is the length of the hypotenuse?

58. The length of one leg of a right triangle is 8 ft. The length of the hypotenuse is 2 ft longer than the other leg. What is the length of the other leg?

VI. Rational Expressions and Equations

59. Simplify: $\frac{3a^2 - 9a - 12}{6a^2 + 30a + 24}$

60. Multiply and simplify: $\frac{m^2 - 10m + 25}{m^2 - 25} \cdot \frac{m^2 + 4m - 5}{m^2 - 7m + 10}$

61. Divide and simplify: $\frac{x+y}{x-y} \div \frac{x^2+y}{x^2-y^2}$

62. Divide and simplify: $\frac{x^2+x-20}{x^2-7x+12} \div \frac{x^2+10x+25}{x^2-6x+9}$

63. Find the LCM (in a factored form) of these polynomials: $x^5 - 4x^3, x^3 + 4x^2 + 4x$

64. Find the LCM (in a factored form) of these polynomials: $x^5 + 2x^4 + x^3, 2x^3 - 2x, 5x - 5$

65. Add and simplify: $\frac{a^2}{a-b} + \frac{b^2}{b-a}$

68. Subtract and simplify: $\frac{4t}{t^2-1} - \frac{2}{t+1}$

66. Add and simplify: $\frac{2}{x^2+x-6} + \frac{3}{x^2-9}$

69. Solve for x : $\frac{x+1}{3} - \frac{x-1}{2} = 1$

67. Subtract and simplify: $\frac{8x}{16-x^2} - \frac{5}{x-4}$

70. Solve for x : $\frac{x-2}{x-3} = \frac{x-1}{x+1}$

71. Find the perimeter of the rectangle with length $\frac{3}{x+4}$ and $\frac{2}{x-5}$.

72. A passenger car travels 30 km/h faster than a delivery truck. When the car goes 400 km, the truck goes 250 km. Find the car's speed and the truck's speed.

73. Ann has walked 128 km in 13 days. At that rate, how far would she walk in 52 days?

74. Simplify: $\frac{\frac{x^2}{2}}{\frac{xy}{3}}$

76. Simplify: $\frac{x-3+\frac{2}{x}}{x-4+\frac{3}{x}}$

75. Simplify: $\frac{\frac{x^2+y}{2y}}{\frac{y}{5}}$

77. Simplify: $\frac{\frac{x}{5y^3} + \frac{3}{10y}}{\frac{3}{10y} + \frac{x}{5y^3}}$

VII. Slope and Equation of a Line

78. Ignore this one.

79. Ignore this one.

80. What is the graph of $4x - 3y = 12$?

81. What is the graph of $x + 2y = 6$?

VIII. Systems of Equations

82. What is the solution of the system $x + y = 1$ and $2x - 3y = 7$

83. What is the solution of the system $2x + 3y = 4$ and $3x - 2y = -7$

84. What is the solution of the system $x - \frac{3}{2}y = 13$ and $\frac{3}{2}x - y = 17$

85. What is the solution of the system $0.06x + 0.05y = 0.07$ and $0.4x - 0.3y = 1.1$

86. The perimeter of a rectangular rose garden is 400 m. The length is 10 m more than the width. Find the width.

87. The perimeter of a rectangular playground yard is 600 ft. The length is 100 ft more than the width. Find the length.

88. Find two numbers whose sum is 63 and whose difference is 5.

89. A movie theater charges \$9 for adults and \$6 for students and seniors. At a screening, a total of \$2,910 was collected from 355 admissions. How many adult admissions were there?

IX. Radicals

90. Simplify: $\sqrt{(-4)^2}$

91. Rationalize the denominator: $\sqrt{\frac{3}{2000}}$

X. Miscellaneous Problems from Various Topics

92. $-20 \div (-5) + 36 \div (-4)$

97. If $x = -4$, then $\frac{x^2 - x}{x} =$

93. $(-5)^3 \div 5^2 =$

98. $(7a + 3b) - (a - 4b) =$

94. If $4y - 5 = 2$, then $y =$

99. If $x = -4$ and $y = 3$, then $\frac{xy - 2}{2 - x} =$

95. If $12t - 6 = 14t + 3$, then $t =$

100. If $y(y - 4) = -4$, then $y =$

96. If $4 + \frac{2}{x} = 1$, then $x =$

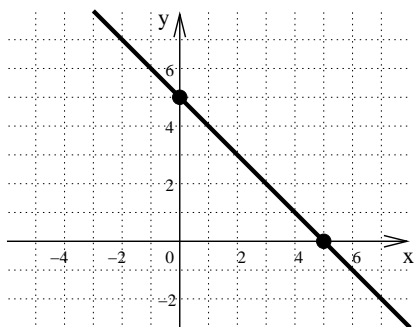
101. $(a + b)^2 =$

102. $(x - 3)(2x + 1) =$
103. $(2x + 3)(x^2 - 1) =$
104. $7\sqrt{5} - 4\sqrt{5} + 5\sqrt{5} =$
105. $(-2y)^4 =$
106. $(3x - 2y)^2 =$
107. $\frac{x}{3} + \frac{y}{5} =$
108. Jane has a nickels, b dimes and c quarters. Determine the amount of money she has in pennies.
109. The population of a city was 18,600. It dropped 420 each year for 6 years. What was the population of the city after 6 years?
110. Solve for x : $-5x + 3(x + 8) = 16$.
111. 15 is what percent of 80?
112. Add and simplify: $\frac{d^2}{d - c} + \frac{c^2}{c - d}$
113. Rationalize the denominator of $\frac{4}{2 + \sqrt{3}}$
114. A right triangle has the shortest edge 5 and the hypotenuse 9. How long is the third edge?
115. $(4m - 2) - (-2m + 1) =$
116. $\frac{1}{x + y} + \frac{1}{y - x} =$
117. Simplify: $|-27 - 3(4)| - |-36| + |-12|$
118. $64 \div (-16) \times 4$
119. After a 40% reduction, a bread maker is on sale for \$90. What was the original price?
120. Solve $1.5x - 3.6 \leq 1.3x + .4$.
121. Rewrite $2x + 5y + 3 = 0$ into $y = mx + b$ (slope-intercept) form.
122. $5^2 + (-5)^2 =$
123. Evaluate $(x - y)(x^2 - xy)$ when $x = -1$ and $y = 2$.

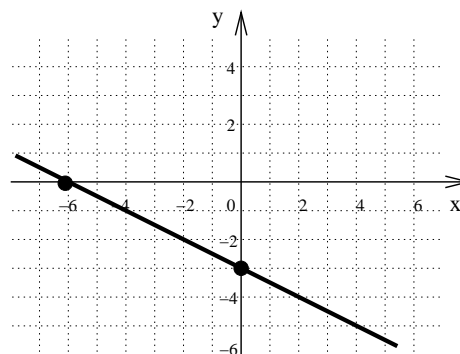
Answers

- | | | | |
|-------------------------|---|---|-------------------------------|
| 1. $45t$ miles | 26. $x \leq 2$ | 51. $(3x - 2y)(4x - 3y)$ | 74. $\frac{3x}{2y}$ |
| 2. 0.625 | 27. $\frac{P - 2l}{2}$ | 52. $(5a + 2b)(5a - 2b)$ | 75. $\frac{5(x^2 + y)}{2y^2}$ |
| 3. $\frac{7}{9}$ | 28. $\frac{D - Ax - Cz}{B}$ | 53. $(x^2 + 3)(2x - 1)$ | 76. $\frac{x - 2}{x - 3}$ |
| 4. $\frac{2}{5}$ | 29. 26% | 54. $(t + 1)(t - 1)(t + 8)$ | 77. 1 |
| 5. $\frac{1}{24}$ | 30. \$29 | 55. $y = 4, -\frac{5}{3}$ | 78. omitted |
| 6. 0.99 | 31. \$40 | 56. $x = 1, -3$ | 79. omitted |
| 7. 223 | 32. 92 | 57. 10 ft | 80. See below |
| 8. 0 | 33. See below | 58. 15 ft | 81. See below |
| 9. 100.5 | 34. See below | 59. $\frac{a - 4}{2(a + 4)}$ | 82. $(2, -1)$ |
| 10. 5 | 35. $\frac{1}{5^7}$ | 60. $\frac{m - 1}{m - 2}$ | 83. $(-1, 2)$ |
| 11. 48 | 36. a^4 | 61. $\frac{(x + y)^2}{x^2 + y}$ | 84. $(10, -2)$ |
| 12. 28 m below | 37. $\frac{c^3 d^9}{a^6 b^3}$ | 62. $\frac{x - 3}{x + 5}$ | 85. $(2, -1)$ |
| 13. $-\frac{5}{12}$ | 38. 0.0006408 | 63. $x^3(x + 2)^2(x - 2)$ | 86. 95m |
| 14. -5 | 39. $10 = 1 \times 10^1$ | 64. $10x^3(x + 1)^2(x - 1)$ | 87. 200 ft |
| 15. $-3x + 6y - 12z$ | 40. $\frac{3}{4}x^3 - \frac{2}{3}x + 1$ | 65. $a + b$ | 88. 34, 29 |
| 16. $2x + \frac{7}{3}y$ | 41. $10x^2$ | 66. $\frac{5x - 12}{(x + 2)(x - 3)(x + 3)}$ | 89. ad 260, stu/sen 95 |
| 17. 1 | 42. $4x^3 - 32x^2 + 60x$ | 67. $\frac{13x + 20}{(4 - x)(4 + x)}$ | 90. 4 |
| 18. $\frac{9}{2}$ | 43. $60 - 4x^2$ | 68. $\frac{2}{t - 1}$ | 91. $\frac{\sqrt{15}}{100}$ |
| 19. $\frac{7}{8}$ | 44. $9x^4 - 12x^3 + 4x^2$ | 69. $x = -1$ | 92. -5 |
| 20. 2.7 | 45. $4x^2 + 2x + \frac{1}{4}$ | 70. $x = \frac{5}{3}$ | 93. -5 |
| 21. 15.9 | 46. $p^3 + 8$ | 71. $\frac{2(5x - 7)}{(x + 4)(x - 5)}$ | 94. $\frac{7}{4}$ |
| 22. 5 | 47. $p^2 + 9$ | 72. t 50km/h, c 80km/h | 95. $-\frac{9}{2}$ |
| 23. No solution | 48. $x^2 + 1$ | 73. 512 km | 96. $-\frac{2}{3}$ |
| 24. $x > 8$ | 49. $(2x^2 - 5)(x + 6)$ | 74. 512 km | 97. -5 |
| 25. $x < -3$ | 50. $6x^8(x + 2)(x - 7)$ | 75. 512 km | 98. $6a + 7b$ |

99. $-\frac{7}{3}$ 106. $9x^2 - 12xy + 4y^2$ 112. $d + c$ 118. -16
 100. 2 107. $\frac{5x + 3y}{15}$ 113. $4(2 - \sqrt{3})$ 119. $\$150$
 101. $a^2 + 2ab + b^2$ 108. $5a + 10b + 25c$ 114. $2\sqrt{14}$ 120. $x \leq 20$
 102. $2x^2 - 5x - 3$ 109. $16,080$ 115. $6m - 3$ 121. $y = -\frac{2}{5}x - \frac{3}{5}$
 103. $2x^3 + 3x^2 - 2x - 3$ 110. $x = 4$ 116. $\frac{2y}{y^2 - x^2}$ 122. 50
 104. $8\sqrt{5}$ 111. 18.75% 117. 15 123. -9
 105. $16y^4$



x-intercept: (5,0)



y-intercept: (0,-3)

Figure 1: Answer for No.33 and 34

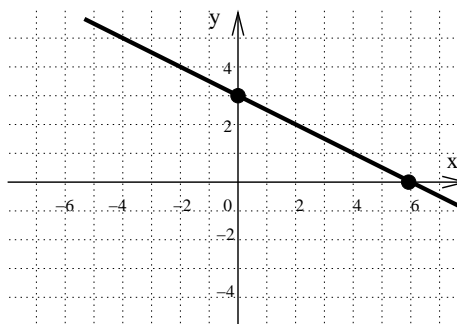
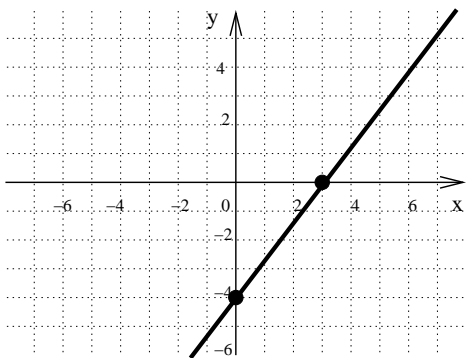


Figure 2: Answer for No.80 and 81