

Dear students,

To prepare you for next year's Honors Advanced Algebra 2 class, the Math Department requires that you complete a summer review assignment. This review will refresh your skills and prepare you for our Honors Algebra 1 course.

Solve each problem, **showing all your work**. You are expected to spend a minimum of 4 hours on this assignment, but it may require as many as 6 hours if you are not familiar with the material. ALL problems need to be done with all work shown, neat, and stapled. You may print out the summer review and complete the problems on binder paper. The completed assignment is due on the first day of class. We will quickly review the assignment on that day, so bring any questions you may have to the first class. We will be having an assessment on this material in the second class, so I would encourage you to review your work the day before classes start to have it fresh in your mind if you completed the assignment early in the summer. All problems in this review should be material that you have already mastered. If anything does not look familiar, please make sure you get the proper help during the summer.

Please note that you have signed up for an Honors math course. You are expected to come into this course with the skills necessary to be successful in this course. Fluency in the following is expected:

- Solving and Graphing Linear Equations
- Solving and Graphing Linear Inequalities
- Solving Systems of Equations
- Properties of Exponents
- Simplifying Radical Expressions
- Operations with Polynomials
- Factoring Trinomials

A great resource for any concepts you may be struggling with is Khan Academy, along with several YouTube channels. If you have any questions, you may reach out to the Math Department Chair, Mrs. Caitlin Brand, at: cbrand@moreaucatholic.org

See you in August!

Section 1: Linear Equations & Graphs (45 min)

Topic 1A: Solving Linear Equations

Solve for the variable.

1. $3x + 7 = 22$

2. $5x - 4 = 2x + 11$

3. $2(x + 3) - 5 = 3(x - 1)$

4. $\frac{x}{4} + 6 = 10$

5. $-2x + 8 = 4x - 4$

6. $\frac{3x-2}{5} = \frac{x+4}{2}$

7. $2(3x - 1) - 4(x - 2) = 5x - 8$

8. $\frac{2x-1}{3} - \frac{x-2}{4} = 2$

9. $3(2x - 5) + 2(x + 1) = 4(x - 2) + 1$

10. $\frac{5x}{2} - 3 = \frac{x}{3} + 4$

Topic 1B: Forms of Linear Equations

11. Write in **slope-intercept form**:

a. $3x + 2y = 12$

b. $2x - 5y = 10$

12. Write in **point-slope form** of the line

a. passing through $(2, 5)$ with a slope of $m = -3$

b. passing through $(0, -4)$ with a slope of $m = \frac{1}{2}$

13. Write in **standard form** with integer coefficients

a. $y = \frac{2}{3}x - 4$

14. Find the **slope** and **y-intercept** of $4x - 2y = 8$

15. Write the equation of the line in **slope-intercept form** passing through

a. $(1, 3)$ and $(4, 9)$

b. $(-2, 5)$ and $(3, -5)$

16. Given the slope of a line is $m = \frac{3}{4}$, find the slope that is

a. **parallel** to m

b. **Perpendicular** to m

17. Find the equation of the line in **slope-intercept form** that is

a. **parallel** to $y = 3x - 2$ passing through $(1, 5)$

b. **perpendicular** to $y = 2x - 1$ passing through $(2, 3)$

Topic 1C: Graphing of Linear Equations & Finding Intercepts

Graph each equation. Label the intercepts and find the points of intersection where applicable.

18. $y = 2x - 3$

19. $x + y = 5$

20. $y = -\frac{1}{2}x + 4$

21. **Find the intersection point** of $y = 2x - 3$ and $x + y = 5$

22. **Find the intersection point** of $y = -\frac{1}{2}x + 4$ and $3x - y = 6$

Section 2: Linear Inequalities (30 min)

Topic 2A: Solving Linear Inequalities

Solve and graph on a number line.

23. $2x - 5 > 7$

24. $-3x + 4 \leq 10$

25. $-2 < x + 3 < 8$ (compound inequality)

26. $4x - 1 \geq 3x + 5$

27. $\frac{3x-2}{4} < \frac{x+5}{2}$

28. $2|x - 3| > 10$

29. $-1 \leq 2x + 3 < 9$ (compound inequality)

30. $\frac{2(x-1)}{3} - \frac{x+2}{2} \leq 1$

31. $|2x - 5| \leq 3$

32. $-4 < \frac{x-2}{2} < 3$ (compound inequality)

Topic 2B: Graphing Linear Inequalities in Two-Variables

Graph each inequality and shade the solution area.

33. $y > 2x - 1$

34. $3x + 2y \leq 6$

35. $y \leq -x + 3$

36. $2x - y > 4$

37. $x + 2y < 8$

Section 3: Systems of Equations: Substitution and Elimination (40 min)

Topic 3A: Solving Systems of Equations in Two Variables

Solve each system. State the solution as an ordered pair. Identify if the system is consistent/inconsistent, or dependent/independent.

38.

$$y = 2x + 1$$

$$y = -x + 4$$

39.

$$2x + y = 7$$

$$x - y = 2$$

40.

$$3x + 2y = 12$$

$$2x - 2y = -4$$

41.

$$x = 3y - 5$$

$$2x + y = 10$$

42.

$$4x + 3y = 11$$

$$2x - y = 5$$

43.

$$2x + 4y = 8$$

$$x + 2y = 4$$

44.

$$3x - 2y = 7$$

$$-6x + 4y = 5$$

45.

$$\frac{x}{2} + \frac{y}{3} = 4$$

$$\frac{x}{4} - \frac{y}{6} = 1$$

46.

$$2x + 3y = 11$$

$$5x - y = 8$$

47.

$$\frac{3x-2y}{4} = 1$$

$$2x + y = 9$$

48. A store sells notebooks for \$3 and pens for \$2. A customer spends \$20 on 8 items. Write and solve a systems to find how many of each item was purchased.

Topic 3B: Graphing Systems of Inequalities

Graph the solution region of the system of linear inequalities. Give two possible solutions to the system.

49.

$$y \leq x + 2$$

$$y > -2x + 1$$

50.

$$x + y \leq 6$$

$$x \geq 1, y \geq 0$$

Section 4: Exponents & Radicals (45 min)

Topic 4A: Properties of Exponents

Simplify each expression. Assume all variables are positive. Write all solutions with positive exponents.

51. $x^3 \cdot x^5$

52. $\frac{a^8}{a^3}$

53. $(b^2)^4$

54. $(2xy)^3$

55. $\left(\frac{x}{y}\right)^2$

56. x^0

57. x^{-2}

58. $\frac{m^4 n^{-2}}{m^{-1} n^3}$

59. $\left(\frac{2m^3}{n^2}\right)^2 \cdot \frac{n^4}{m^{-2}}$

60. $\frac{a^{-2} b^3}{c} \cdot \frac{(abc)^2}{a^{-1} b^{-1}}$

61. $\frac{x^2 y^{-1}}{x^{-1} y^2}$

62. $(2x^3)^{-2} \div \frac{4x^{-1}}{(x^2)^{-3}}$

63. $\left(\frac{a^{-2}}{b^3}\right)^{-1} \div \frac{b^{-2}}{a}$

64. $\frac{m^3 n^{-2}}{m^{-1} n^{-2}}$

Topic 4B: Simplifying Radical Expressions

Simplify completely. Rationalize denominators where necessary.

65. $\sqrt{36}$

66. $\sqrt{50}$

67. $\sqrt{18x^2}$

68. $\sqrt{12} + 2\sqrt{27} - \sqrt{75}$

69. $\sqrt{8} \cdot \sqrt{2}$

70. $\frac{\sqrt{20}}{\sqrt{5}}$

71. $\frac{1}{\sqrt{3}}$

72. $\frac{2}{\sqrt{8}}$

73. $\frac{3}{\sqrt{12}-2}$

74. $\frac{4}{2+\sqrt{3}}$

75. $\sqrt{32} + 2\sqrt{50} - 3\sqrt{8}$

76. $\frac{\sqrt{75}}{3}$

77. $\frac{5}{\sqrt{5}} + \frac{2}{\sqrt{20}}$

78. $\frac{6+\sqrt{5}}{\sqrt{2}-\sqrt{5}}$

Section 5: Polynomials (70 min)

Topic 5A: Simplifying Polynomials Expressions

Simplify the expression.

79. $3x^2 + 5x - 2 + 4x^2 - 3x + 7$

80. $2(3a^2 - 4a) - 3(a^2 + 2a)$

81. $(5m^3 + 2m - 1) - (3m^2 - m + 4) + (m^3 - 3m)$

82. $3(2x^2 - x + 1) - 2(x^2 + 3x - 2) + 4x$

83. $-2(x^2 + 3x) + 4(x^2 - x) - (3x^2 - 5)$

84. $(7a - 3b) + (2a + 5b) - (a - b) + (4b - 2a)$

85. $\frac{1}{2}x^2 + \frac{3}{4}x - \frac{1}{4}x - \frac{1}{3}x^2$

Topic 5B: Multiplying Polynomials

Expand and simplify.

86. $(x + 3)(x + 5)$

87. $(2a - 1)(3a + 4)$

88. $(x - 2)(x^2 + 3x - 1)$

89. $(3x + 2)^2$

90. $(x + 4)(x - 4)$

91. $(x - 4)^2$

92. $(2x - 3)(2x + 3) - (x - 1)^2$

93. $(x + 1)^3$

94. $(x + 2)(x - 1)(x + 3)$

95. $(2x - 1)(3x + 2)(x - 4)$

96. $(a + b)^2 - (a - b)^2$

97. $(x^2 + 2x - 1)(x - 1)$

Topic 5C: Factoring

Factor completely.

98. $x^2 - 8x + 15$

99. $x^2 + 7x + 12$

100. $2x^2 + 5x - 3$

101. $x^2 - 9$

102. $4x^2 - 20x + 25$

103. $x^3 - 4x$

104. $3x^2 + 12x + 12$

105. $2x^3 - 8x^2 + 6x$

106. $3x^2 - 27$

Challenge Problems

107. $x^4 - 16$

108. $x^3 + 8$

109. $x^4 - 5x^2 + 4$

110. $x^6 - 64$