Dear Students and Parents:

The purpose of this packet is to review math concepts as you look forward to studying Algebra next year. Most of the concepts in this packet have been previously covered in Pre-Algebra.

This packet will be checked for effort and completion by the end of the first week back in September. Show all your work (when possible) to earn full effort credit.

Have a wonderful summer!

Student's First Name: __________________
Last Name: ____________________________

The work in this packet was completed independently by my daughter.
Parent Signature _______________________  

Please DO NOT use a calculator in completing this packet.

REMEMBER TO WORK ON ABOUT TEN PROBLEMS EACH WEEK SO YOUR BRAIN CAN STAY MATHEMATICALLY ACTIVE ALL SUMMER LONG. THANK YOU!
FRACTIONS

ADDITION AND SUBTRACTION
Add or Subtract. Reduce to lowest terms.

1. \( \frac{1}{2} + \frac{1}{4} = \)

2. \( \frac{5}{9} + \frac{1}{6} = \)

3. \( 3\frac{1}{3} + 2\frac{3}{4} = \)

4. \( \frac{1}{3} + \frac{2}{3} = \)

5. \( \frac{2}{9} + \frac{3}{4} = \)

6. \( 2\frac{7}{9} + 3\frac{1}{6} + 4\frac{2}{3} = \)

7. \( \frac{4}{5} - \frac{1}{5} = \)

8. \( \frac{4}{5} - \frac{1}{5} = \)

9. \( \frac{4}{5} - \frac{1}{5} = \)

10. \( 6\frac{1}{4} - \frac{1}{2} = \)

11. \( 7\frac{1}{3} - 6\frac{3}{4} = \)

12. \( 3\frac{2}{3} - 8\frac{1}{2} = \)

MULTIPLICATION AND DIVISION
Multiply or Divide. Reduce to lowest terms.

13. \( \frac{2}{3} \cdot \frac{1}{7} = \)

14. \( 3\frac{1}{8} \cdot \frac{4}{5} = \)

15. \( \frac{3}{7} \cdot \frac{14}{5} = \)

16. \( \frac{1}{3} \cdot \frac{3}{5} = \)

17. \( \frac{3}{4} \cdot 16 = \)

18. \( \frac{1}{5} \cdot \frac{2}{3} \cdot \frac{11}{12} = \)

19. \( \frac{1}{2} \div \frac{1}{3} = \)

20. \( \frac{3}{7} \div \frac{9}{14} = \)

21. \( \frac{7}{12} \div \frac{14}{15} = \)

22. \( 2\frac{2}{7} \div \frac{4}{7} = \)

23. \( 4\frac{1}{3} \div \frac{5}{6} = \)

24. \( 5\frac{1}{4} \div 2\frac{1}{2} = \)
ALGEBRAIC EXPRESSIONS

Example 1
a. Write an expression for seven less than a number \( n - 7 \)
b. Write an equation for three less than six times a number is five times the same number plus 5, then solve.
\[
\begin{align*}
6x - 3 &= 5x + 5 \\
x &= 8
\end{align*}
\]

Write the expression or equation. Solve the equations.

25. Half of a number plus three times the number.

26. The product of five and a number decreased by seven equals thirteen.

27. Sixteen less than twice a number is 10.

28. Twice a number increased by the product of the number and fourteen results in forty-eight.

29. Half of a number is three times the sum of the number and five.

30. Seven plus five times a number is greater than or equal to negative nine.

COMBINING LIKE TERMS

Example 2
Simplify the following: \( 8x^2 + 16xy - 3x^2 + 3xy - 3x \)

\[
\begin{align*}
8x^2 - 3x^2 + 16xy + 3xy - 3x & \quad \text{Group like terms} \\
5x^2 - 3x + 19xy & \quad \text{Simplify}
\end{align*}
\]

Simplify.

31. \( 6x + 11y - 4x + y \)

32. \( -5m + 3q + 4m - q \)

33. \( -3p - 4t - 5t - 2p \)

34. \( 9x - 22y + 18x - 3y \)

35. \( 3x^2y - 5xy^2 + 6x^2y \)

36. \( 5x^2 + 2xy - 7x^2 + xy \)

Find the value of \( x \) for the triangle or rectangle.

37. Perimeter = 294 inches

\[
\begin{align*}
(x + 4) \text{ in} & \\
4x \text{ in} & \\
(10x - 10) \text{ in}
\end{align*}
\]

38. Perimeter = 4533 centimeters

\[
\begin{align*}
(2x - 6) \text{ cm} & \\
(x + 3) \text{ cm}
\end{align*}
\]
DISTRIBUTIVE PROPERTY

Example 3

Solve.

a. \[ 4(x + 3) = 36 \]
\[ 4x + 12 = 36 \]
\[ 4x = 24 \]
\[ x = 6 \]

b. \[ 6(x + 4) + 12 = 5(x + 3) + 7 \]
\[ 6x + 24 + 12 = 5x + 15 + 7 \]
\[ 6x + 36 = 5x + 22 \]
\[ x + 36 = 22 \]
\[ x = -14 \]

Solve.

39. \[ 2(x + 7) = 20 \]

40. \[ -10(y + 8) = 40 \]

41. \[ 7(2 - x) = 5x \]

42. \[ -4(x - 6) = 28 \]

43. \[ 27 = 3c - 3(6 - 2c) \]

44. \[ 12y - 5(2y - 7) = -3 \]

45. \[ 3x + 5 = 2x + 1 \]

46. \[ -14 + 3a = 10 - a \]

47. \[ 11q - 6 = 3q + 8q \]

48. \[ 8m + 1 = 7m - 9 \]

49. \[ -2t + 10 = -t \]

50. \[ -7x + 7 = 2x - 11 \]

SOLVING EQUATIONS WITH VARIABLES ON BOTH SIDES

Example 4

Solve the following: \[ 6x - 12 = 5x + 9 \].

\[ x - 12 = 9 \] Subtract 5x from both sides [Go after the 'little guy']

\[ x = 21 \] Add 12 to each side

Solve the equation.

45. \[ 3x + 5 = 2x + 1 \]

46. \[ -14 + 3a = 10 - a \]

47. \[ 11q - 6 = 3q + 8q \]

48. \[ 8m + 1 = 7m - 9 \]

49. \[ -2t + 10 = -t \]

50. \[ -7x + 7 = 2x - 11 \]
WRITING AND SIMPLIFYING RATIOS

Example 5

a. Train A takes 35 minutes to travel its route. Train B, traveling the same route but making more stops, takes 47 minutes. What is the ratio of the time of Train A to Train B?

b. Jennie’s height is 4 feet, 7 inches. Her younger sister’s height is 25 inches. Find the ratio of Jennie’s height to her sister’s.

Solutions

a. The ratio is \(\frac{35 \text{ minutes}}{47 \text{ minutes}} = \frac{35}{47}\) or 35 minutes:47 minutes [read as 35 minutes to 47 minutes]

b. The ratio is \(\frac{4 \text{ ft}}{25 \text{ inches}}\)

However you need to compare the same units

Convert 4 ft to inches: \(4 \text{ ft} \cdot \frac{12 \text{ inches}}{1 \text{ foot}} = 48 \text{ inches}\); Jennie’s height is \(48 + 7 = 55 \text{ inches}\)

The ratio is \(\frac{55 \text{ inches}}{25 \text{ inches}} = \frac{11}{5}\)

Write the following ratios.

51. Basmati rice needs to cook for 20 minutes, while quinoa (another grain) cooks for 25 minutes. What is the ratio of cooking times for rice to quinoa?

52. Jonathan caught 7 fish and Geogeanne caught 4. What is the ratio of fish caught of Jonathan to Geogeanne?

53. Two sunflowers' growth was measured daily. At the end of the experiment, Sunflower A had grown from 2 inches to 2 feet, 3 inches. Sunflower B had grown from 3 inches to 2 feet, 6 inches. Find the ratio of the growth in height of Sunflower A to Sunflower B.

Use the diagram at the right.

54. What is the ratio of length to width of rectangle A?

55. What is the ratio of the perimeter of rectangle A to the perimeter of rectangle B?

56. What is the ratio of the area of rectangle A to the area of rectangle B?
SOLVING PROPORTIONS

Example 6
Solve. [Remember proportions are two equivalent ratios]

a. \( \frac{x}{8} = \frac{3}{4} \)
   \( 4x = 24 \)
   \( x = 6 \)

b. \( \frac{6}{x+4} = \frac{1}{9} \)
   \( 54 = 1(x + 4) \)
   \( 54 = x + 4 \)
   \( 50 = x \)

Solve.

57. \( \frac{y}{50} = \frac{3}{100} \)

58. \( \frac{6}{45} = \frac{2x+10}{15} \)

59. \( \frac{3}{p-6} = \frac{1}{p} \)

60. \( \frac{3}{8} = \frac{3}{2d} \)

61. \( \frac{1}{18} = \frac{5}{-4(x-1)} \)

62. \( \frac{r}{3r+1} = \frac{2}{3} \)

63. \( \frac{3w+6}{28} = \frac{3}{4} \)

64. \( \frac{3}{m+4} = \frac{9}{14} \)

65. \( \frac{w}{4} = \frac{9}{w} \)

PERCENT PROBLEMS

Example 7
Remember: \( \frac{\text{part}}{100} = \frac{\text{is}}{\text{of whole}} \)

a. What number is 12% of 75?
   \( \frac{12}{100} = \frac{x}{75} \)
   \( 12 \cdot 75 = 100x \)
   \( 900 = 100x \)
   \( 9 = x \)

b. 6 is what percent of 40?
   \( \frac{12}{100} = \frac{x}{75} \)
   \( (75) \frac{12}{100} = \frac{x}{75} \)
   \( (75) \cdot 12 = x \)
   \( 9 = x \)

Answer the following questions.

66. What number is 30% of 120?
67. What distance is 15% of 340 miles?
68. 34 is what percent of 136?

69. 11 dogs is what percent of 50 dogs?
70. 200 is what percent of 50?
71. 8 weeks is what percent of a year?

72. A $150 leather jacket is going on sale for a 25% discount. How much will the jacket cost on sale?
73. Jim bought 3 CD's at a cost of $14.99 each. What will he pay including 7% sales tax?
74. Last year's phone model had a battery that lasted 14 hours. This year the battery only last for 8.68 hours. What was the percent the battery life decreased?
SOLVING LITERAL EQUATIONS

Example 8
Given the formula for the surface area of a right cylinder, solve for h.

\[ SA = 2\pi r^2 + 2\pi rh; h \]

\[ SA = \frac{2\pi r}{h} + \frac{2\pi rh}{h} \]

\[ \frac{SA}{2\pi} = r + h \]

\[ \frac{SA}{2\pi} - r = h \]

Solve the literal equation for the indicated variable. Assume variables are positive.

75. \[ V = \frac{4}{3} \pi r^3; r \]

76. \[ A = s^2; s \]

77. \[ V = \pi r^2 h \]

78. \[ A = \frac{1}{2} bh; h \]

79. \[ P = 2l + 2h; l \]

80. \[ S = 6s^2; s \]

81. \[ A = \frac{1}{2} (b_1 + b_2); b_1 \]

82. \[ V = lw; w \]

83. \[ a^2 + b^2 = c^2; b \]

PLOTTING POINTS
Plot each of the following points on the grid below. Use the letter to label the point on the graph.

\[ A(3,0) \quad B(5,5) \quad C(-1,2) \quad D(-3,-2) \quad E(0,-3) \]
DETERMINING WHETHER A POINT IS ON A LINE

Example 9
Decide whether (3,-2) is a solution of the equation \( y = 2x - 8 \)

\[ (-2) = 2(3) - 8 \quad \text{Substitute 3 for } x \text{ and } -2 \text{ for } y. \]

\[ -2 = -2 \quad \text{Simplify.} \]

The statement is true, so (3,2) is a solution of the equation \( y = 2x - 8 \)

Decide whether the given ordered pair is a solution of the equation. Your answer should say 'Yes a Solution' or 'Not a Solution'.

84. \( y = 6x + 4; (−2,8) \)  
85. \( y = \frac{3}{2}x + 10; (4,12) \)  
86. \( y = −10x − 2; (1,−12) \)

87. \( y = \frac{5}{9}x + 34 \)  
88. \( y = −\frac{1}{4}x − 18; (−4,−17) \)  
89. \( y = \frac{2}{3}x − 6; (9,0) \)

CALCULATING SLOPE

Example 10
Find the slope of a line passing through (3, -9) and (2, -1).

\[ m = \frac{y_2 - y_1}{x_2 - x_1} \quad \text{Formula for slope. Label points:} \quad (3, -9) \quad (2, -1) \]

\[ m = \frac{-1 - (-9)}{2 - 3} = \frac{-1 + 9}{-1} = -8 \quad \text{Substitute values and simplify.} \]

\[ m = \frac{8}{-1} = -8 \quad \text{Slope is } -8. \]

Find the slope of the line that contains the points.

90. \((4,1), (3,6)\)  
91. \((-8,0), (5,-2)\)  
92. \((5,6), (9,8)\)

93. \((0,-4), (7,3)\)  
94. \((-1,7), (-3,18)\)  
95. \((-6,-4), (1,10)\)
FINDING THE EQUATION OF A LINE
GIVEN SLOPE AND Y-INTERCEPT

Example 11
Find an equation of the line that passes through the point (3, 4) and has a y-intercept of 5.

\[ y = mx + b \]

Write the slope-intercept form where \( m \) is slope and \( b \) is y-intercept.

\[ 4 = m(3) + 5 \]
Substitute 5 for \( b \), 3 for \( x \), and 4 for \( y \).

\[ -1 = 3m \]
Subtract 5 from each side.

\[ -\frac{1}{3} = m \]
Divide each side by 3.

The slope is \( m = -\frac{1}{3} \). The equation of the line is \( y = -\frac{1}{3}x + 5 \).

Write the equation of the line that passes through the given point and has the given y-intercept.

96. \( (2,1); b = 5 \) 97. \( (-5,3); b = -12 \) 98. \( (-3,10); b = 8 \)

99. \( (7,0); b = 13 \) 100. \( (-3,-3); b = -2 \) 101. \( (-1,4); b = -8 \)

GIVEN TWO POINTS

Example 12
Write an equation of the line that passes through the points (4, 8) and (3, 1).

\[ m = \frac{8-1}{4-3} \]
Substitute labeled values. \( \begin{align*} (4,8) \quad \text{and} \quad (3,1) \end{align*} \)

\[ m = \frac{-7}{-1} = 7 \]
Find the slope of the line.

\[ 1 = 7(3) + b \]
Choose one of the points and substitute values into \( y = mx + b \).

\[ 1 = 21 + b \]
Multiply.

\[ b = -20 \]
Solve for \( b \).

Write an equation of the line that passes through the given points.

102. \( (6, -3), (1, 2) \) 103. \( (-7, 9), (-5, 3) \) 104. \( (5, -1), (4, -5) \)

105. \( (-2, 4), (3, -6) \) 106. \( (-3, -7), (0, 8) \) 107. \( (1, 2), (-1, -4) \)
FROM A GRAPH
Write the equation of each line.

108.  

\[ m = \quad \quad b = \quad \quad \]
Equation: ________________________

109.  

\[ m = \quad \quad b = \quad \quad \]
Equation: ________________________

GRAPHING EQUATION OF LINE
Find the slope and y-intercept of the equation, and then graph the line.

110.  \[ 2x + 3y = 6 \]

\[ \text{Slope: } \quad \quad \text{y-intercept: } \]

111.  \[ y = -\frac{1}{4}x + 2 \]

\[ \text{Slope: } \quad \quad \text{y-intercept: } \]

PARALLEL AND PERPENDICULAR LINES
Find the slope of a line that is parallel to the given line.

112.  \[ y = 4x + 2 \]

113.  \[ y = -\frac{1}{2}x + 5 \]

114.  \[ -x + 3y = 6 \]

Find the slope of a line that is perpendicular to the given line.

115.  \[ y = 4x + 2 \]

116.  \[ y = -\frac{1}{2}x + 5 \]

117.  \[ -x + 3y = 6 \]