May 2024

UPPER SCHOOL SUMMER MATH
All Rising 7th Grade
Algebra I Readiness Packet

Dear Upper School Students,

This summer, we encourage you to continue to foster a belief in the importance and enjoyment of mathematics at home. Being actively involved in mathematical activities enhances learning.

In preparation for the 2024-2025 school year, each student in middle school is required to complete a summer math review packet. Each packet focuses on the prerequisite concepts and skills necessary for student success in each math class. The topics within this packet are important foundational concepts. READ THE INSTRUCTIONS. Even if it doesn't say "Show Your Work" at the top of the page, **you are expected to show your work on all pages.** If you need extra space, you must use and attach scratch paper to the back of the packet.

Please bring your completed math packet (with scratch work attached) with you on the first day of school in August. Your math teachers will be collecting them, and the packets will be graded for timeliness and thoroughness of completion.

Have a wonderful summer!

The Middle School Mathematics Department

OPERATIONS WITH INTEGERS

NO calculator for this page. Show your work on scratch paper and staple to the packet.
For a refresher on how to do any of these problems, see the back of the page

Find the sum or difference.

1. -80 + 77

2. 77 + 160

3. -64 + (-33)

4. 104 - (-92)

5. -105 - (-122)

6. 185 - (-154)

7. -53 - (-59)

8. -6 + (-35)

9. 15 - (-26) - (-39)

10. -93 + 191 + (-179)

11. 18 + (-34) + 52

12. -50 - (-93) + (-17)

Find the product or quotient.

13. 60 ÷ 12

14. -194 ÷ (-2)

15. 88 · (-2)

16. -12 · 10

17. -10 · (-11)

18. 90 ÷ (-6)

19. 3 · (-59)

20. -7 · (-2)

21. -28 · (-22) ÷ (-88)

22. -56 · 140 ÷ (-80)

23. 108 ÷ (-12) · (-12)

24. -84 · (-17) ÷ 42

Evaluate the numerical expression. (Be sure to use the order of operations!)

25. -78 + (-2) · (-56)

26. -65 + 6 ÷ (-3) + 40

27. -94 - (84 - 10)

28. 43 + (-23) - (-57)

29. -15 - (-11) + 5 · (-4)

30. -26 - (-64) + (-93)

31. -84 ÷ 4 + (-20)

32. -56 + (-50) + (-10) · (-9)

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Operations with Integers

Adding Integers

- <u>Negative + Negative</u>: Add the absolute values of the two numbers and make the answer negative.

  ex: $-5 + (-9) \longrightarrow 5 + 9 = 14 \longrightarrow$ answer: $\boxed{-14}$

- <u>Negative + Positive (or Positive + Negative)</u>: Subtract the absolute values of the two numbers (larger minus smaller) and take the sign of the number with the greater absolute value.

  ex: $-7 + 12 \longrightarrow 12 - 7 = 5 \longrightarrow$ 12 > 7, so answer is positive $\longrightarrow$ answer: $\boxed{5}$

  ex: $6 + (-9) \longrightarrow 9 - 6 = 3 \longrightarrow$ 9 > 6, so answer is negative $\longrightarrow$ answer: $\boxed{-3}$

Subtracting Integers

- Keep the first number the same, change the subtraction sign to an addition sign, and change the sign of the second number. Then use the integer addition rules.

  ex: $-3 - 9 \longrightarrow -3 + (-9) = \boxed{-12}$

  ex: $15 - (-8) \longrightarrow 15 + 8 = \boxed{23}$

  ex: $-6 - (-4) \longrightarrow -6 + 4 = \boxed{-2}$

Multiplying & Dividing Integers

Ignore the signs and multiply or divide as usual. Then determine the sign of the answer using the following rules:

- Negative · or ÷ Negative = Positive
- Negative · or ÷ Positive (or Positive · or ÷ Negative) = Negative

  ex: $-3 \cdot (-5) \longrightarrow 3 \cdot 5 = 15 \longrightarrow$ neg · neg = pos $\longrightarrow$ answer: $\boxed{15}$

  ex: $48 \div (-6) \longrightarrow 48 \div 6 = 8 \longrightarrow$ pos ÷ neg = neg $\longrightarrow$ answer: $\boxed{-8}$

Order of Operations

Parentheses
Exponents
Multiplication & Division (left to right)
Addition & Subtraction (left to right)

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⌐⌐r a refresher on how to do any of these problems, see the back of the page

Find the sum, difference, product, or quotient.

33. $38.61 + 36.841$ 34. $1.755 - 1.23$ 35. $0.71 \cdot 9.2$ 36. $13.12 \div 0.1$

37. $3.651 - (-12.63)$ 38. $-3.9 + (-7.6)$ 39. $17.6 \cdot 4.3$ 40. $6 \cdot (-16.7)$

41. $26.474 - 14.527$ 42. $-2.1 + 3.78$ 43. $-6.15 \div (-8.2)$ 44. $-12.8 \cdot (-4.88)$

Find the sum, difference, product, or quotient.

45. $15 \frac{1}{2} + 15 \frac{1}{4}$ 46. $18 \frac{11}{20} - 17 \frac{1}{2}$ 47. $2 \frac{1}{4} \cdot 1 \frac{4}{5}$ 48. $3 \frac{1}{2} \div 1 \frac{3}{7}$

49. $3 \frac{1}{3} - 5 \frac{1}{9}$ 50. $5 \cdot (-1 \frac{2}{5})$ 51. $-4 \frac{2}{3} + (-1 \frac{3}{4})$ 52. $- \frac{5}{6} \div (-2 \frac{1}{6})$

53. $9 \div (-4 \frac{1}{2})$ 54. $-18 + 3 \frac{4}{5}$ 55. $-5 \frac{2}{3} \cdot (-2 \frac{5}{6})$ 56. $-5 \frac{3}{4} - (-3 \frac{7}{8})$

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Operations with Rational Numbers

Adding & Subtracting Rational Numbers

Determine whether you should add or subtract using integer rules. Then add or subtract.

- **Decimals:** Line up the decimal points. Then add or subtract and bring the decimal point down. Use integer rules to determine the sign of the answer.

  ex: $-9.8 + 6.24 \longrightarrow$ neg + pos: subtract $\longrightarrow$
  $$\begin{array}{r} -9.80 \\ 6.24 \\ \hline 3.56 \end{array}$$
  $\longrightarrow$ answer: $\boxed{-3.56}$

- **Fractions/Mixed Numbers:** Find a common denominator and then add or subtract. Borrow or convert an improper fraction answer, if necessary. Use integer rules to determine the sign of the answer.

  ex: $5\frac{3}{4} - \left(-3\frac{7}{8}\right) \longrightarrow 5\frac{3}{4} + 3\frac{7}{8} \longrightarrow$ pos + pos: add $\longrightarrow$
  $$\begin{array}{r} 5\frac{3}{4} = \frac{6}{8} \\ + 3\frac{7}{8} = \frac{7}{8} \\ \hline 8 \quad \frac{13}{8} \end{array}$$
  $\longrightarrow$ answer: $\boxed{9\frac{5}{8}}$

Multiplying & Dividing Rational Numbers

Determine the sign of the answer using integer rules. Then multiply or divide.

- **Multiplying Decimals:** Ignore the decimal points. Multiply the numbers. Then count the decimal places in the problem to determine the location of the decimal point in the answer.

  ex: $-9.23 \cdot (-1.1) \longrightarrow$ neg · neg = pos $\longrightarrow$
  $$\begin{array}{r} 9.23 \\ \times 1.1 \\ \hline 923 \\ 9230 \\ \hline 10153 \end{array}$$
  $\longrightarrow$ answer: $\boxed{10.153}$

- **Dividing Decimals:** Move the decimal in the divisor to the end of the number. Move the decimal in the dividend the same number of places and then bring it straight up in quotient.

  ex: $-5.2 \div 0.2 \longrightarrow$ neg ÷ pos = neg $\longrightarrow$ $02\overline{)52.}^{\,26.}$ $\longrightarrow$ answer: $\boxed{-26}$

- **Multiplying Fractions:** Convert mixed numbers to improper fractions. Then cross-simplify. Multiply the numerators and multiply the denominators. Simplify if necessary.

  ex: $-1\frac{3}{4} \cdot \frac{6}{14} \longrightarrow$ neg · pos = neg $\longrightarrow$ $\frac{\cancel{7}^{1}}{\cancel{4}_{2}} \cdot \frac{\cancel{6}^{3}}{\cancel{14}_{2}} = \frac{3}{4} \longrightarrow$ answer: $\boxed{-\frac{3}{4}}$

- **Dividing Fractions:** Convert mixed numbers to improper fractions. Then flip the second fraction to its reciprocal and multiply the two fractions. Simplify if necessary.

  ex: $-\frac{1}{2} \div \left(-\frac{3}{8}\right) \longrightarrow$ neg ÷ neg = pos $\longrightarrow$ $\frac{1}{\cancel{2}_{1}} \cdot \frac{\cancel{8}^{4}}{3} = \frac{4}{3} \longrightarrow$ answer: $\boxed{1\frac{1}{3}}$

SOLVING EQUATIONS

NO calculator for this page. Show your steps as you solve the equations. CHECK YOUR ANSWERS.
IF NECESSARY, EXPRESS YOUR FINAL ANSWERS AS IMPROPER FRACTIONS (in simplest form).
For a refresher on how to do any of these problems, see the back of the page

Solve the one-step equation.

57. $19 + j = -34$

58. $m - 26 = 13$

59. $\frac{x}{5} = -3$

60. $12f = 216$

61. $g - (-31) = -7$

62. $\frac{h}{9} = 13$

63. $b + (-3) = -9$

64. $-4w = -280$

Solve the two-step equation.

65. $5m - 3 = 27$

66. $7 + \frac{y}{2} = -3$

67. $4 + 3r = -8$

68. $\frac{1}{2}p - 4 = 7$

69. $\frac{k + 8}{3} = -2$

70. $\frac{f}{5} - (-13) = 12$

71. $-15 - \frac{g}{3} = -5$

72. $-8 + 4m = 2$

73. $-18 - \frac{3}{4}v = 3$

74. $\frac{-5 + n}{4} = -1$

75. $3.5m + 0.75 = -6.25$

76. $2y + 3 = 19$

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Solving Equations

Solving One-Step Equations

- Cancel out the number on the same side of the equation as the variable by using the inverse operation. (Addition/Subtraction; Multiplication/Division). Be sure to do the same thing to both sides of the equation!

ex: $6x = -18$ $\longrightarrow$ $\dfrac{6x}{6} = \dfrac{-18}{6}$ $\longrightarrow$ answer: $\boxed{x = -3}$

ex: $y + 23 = -9$ $\longrightarrow$ $\begin{array}{c} y + 23 = -9 \\ -23 \quad -23 \end{array}$ $\longrightarrow$ answer: $\boxed{y = -32}$

ex: $\dfrac{h}{3} = 4$ $\longrightarrow$ $3 \cdot \dfrac{h}{3} = 4 \cdot 3$ $\longrightarrow$ answer: $\boxed{h = 12}$

ex: $w - 13 = -5$ $\longrightarrow$ $\begin{array}{c} w - 13 = -5 \\ +13 \quad +13 \end{array}$ $\longrightarrow$ answer: $\boxed{w = 8}$

Solving Two-Step Equations

- Undo operations using inverse operations one at a time using the order of operations in reverse. (i.e.: undo addition/subtraction before undoing multiplication/division)

ex: $7x - 4 = -32$ $\longrightarrow$ $\begin{array}{c} 7x - 4 = -32 \\ +4 \quad +4 \end{array}$ $\longrightarrow$ $\dfrac{7x}{7} = \dfrac{-28}{7}$ $\longrightarrow$ answer: $\boxed{x = -4}$

ex: $\dfrac{j}{5} + 13 = 15$ $\longrightarrow$ $\begin{array}{c} \dfrac{j}{5} + 13 = 15 \\ -13 \quad -13 \end{array}$ $\longrightarrow$ $5 \cdot \dfrac{j}{5} = 2 \cdot 5$ $\longrightarrow$ answer: $\boxed{j = 10}$

ex: $\dfrac{b + 7}{3} = -2$ $\longrightarrow$ $3 \cdot \dfrac{b + 7}{3} = -2 \cdot 3$ $\longrightarrow$ $\begin{array}{c} b + 7 = -6 \\ -7 \quad -7 \end{array}$ $\longrightarrow$ answer: $\boxed{b = -13}$

You may use calculator for this page. You still must show your work! You may use the percent proportion and/or the percent equation to solve. ROUND YOUR FINAL ANSWERS TO THE TENTHS PLACE.
a refresher on how to do any of these problems, see the back of the page

Solve the proportion.

77. $\dfrac{h}{6} = \dfrac{20}{24}$

78. $\dfrac{5}{7} = \dfrac{c}{14}$

79. $\dfrac{6}{8} = \dfrac{21}{b}$

80. $\dfrac{30}{j} = \dfrac{26}{39}$

81. $\dfrac{5}{k} = \dfrac{15}{20}$

82. $\dfrac{32}{112} = \dfrac{a}{14}$

83. $\dfrac{16}{7} = \dfrac{18}{g}$

84. $\dfrac{w}{60} = \dfrac{15}{200}$

Solve the percent problem.

85. Find 15% of 85.

86. 6 is 75% of what number?

87. 40 is what percent of 320?

88. What is 20% of 45?

89. 70 is what percent of 350?

90. Find $33.\overline{3}$% of 81.

91. A $58 camera is on sale for 20% off. Find the sale price.

92. Find the total price of a $14.00 shirt including the 7% sales tax.

Proportions and Percent

Solving Proportions

- Set cross-products equal to each other and then solve the one-step equation for the given variable.

ex: $\dfrac{5}{b}=\dfrac{4}{10}$ $\longrightarrow$ $5 \cdot 10 = 4b$ $\longrightarrow$ $\dfrac{50}{4} = \dfrac{4b}{4}$ $\longrightarrow$ answer: $\boxed{b = 12.5}$

Solving Percent Problems with Proportions

- Set up and solve a proportion as follows: $\dfrac{\%}{100}=\dfrac{part}{whole}$

ex: 25 is what percent of 500? $\longrightarrow$ $\dfrac{x}{100}=\dfrac{25}{500}$ $\longrightarrow$ answer: $x = \boxed{5\%}$

ex: What is 15% of 88? $\longrightarrow$ $\dfrac{15}{100}=\dfrac{x}{88}$ $\longrightarrow$ answer: $x = \boxed{13.2}$

ex: 18 is 30% of what number? $\longrightarrow$ $\dfrac{30}{100}=\dfrac{18}{x}$ $\longrightarrow$ answer: $x = \boxed{60}$

Solving Percent Problems with Equations

- Translate the question to an equation and then solve. (Be sure to convert percents to decimals or fractions.)

ex: 20 is 40% of what number? $\longrightarrow$ $20 = 0.4x$ $\longrightarrow$ answer: $x = \boxed{50}$

ex: 8 is what percent of 32? $\longrightarrow$ $8 = 32x$ $\longrightarrow$ $x = 0.25$ $\longrightarrow$ answer: $\boxed{25\%}$

ex: What is 25% of 88? $\longrightarrow$ $x = 0.25 \cdot 88$ $\longrightarrow$ answer: $x = \boxed{22}$

Real-World Percent Problems

(This is just one way of many to solve real-world percent problems)

- <u>Tax</u>: Find the amount of tax using a proportion or equation. Then add the tax to the original amount to find the total cost.

- <u>Discount</u>: Find the amount of the discount using a proportion or equation. Then subtract the amount of discount from the original price to find the sale price.

Problem-Solving Strategies

Show your work on scratch paper and staple to the packet. You may use a calculator for this page and whatever strategy makes the most sense.

1. At a bake sale, brownies were sold for $0.75 each and cookies were sold for $0.50 each. There were 10 more cookies sold than brownies, and the total amount earned was $40. How many brownies and cookies were sold at the bake sale?	**2.** Mr. Robertson's flight departs at 6:15 P.M. this evening. He wants to be at the departure gate at least 30 minutes before departure. Mr. Robertson figures it will take him 20 minutes to pack, 35 minutes to drive to the airport, 10 minutes to park, and 30 minutes to get through security. What is the latest time he should start packing for his trip?

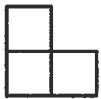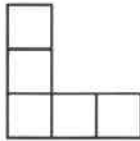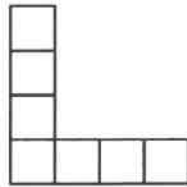**3.** Kylie uses square tiles to create the figures shown below.

Figure 1　　　**Figure 2**　　　**Figure 3**

How many tiles will she need to complete the 10th figure?

4. The area of a rectangle is 48 square centimeters. If the sides of the rectangle are whole numbers, what are the possible side lengths?

5. The table below shows the amount of money Trey earns for mowing different numbers of lawns.

Trey's Earnings	
Lawns Mowed	Earnings ($)
1	20
2	40
3	60
4	80
5	100

Trey is saving to buy a video game system that costs $275. He wants to estimate how many lawns he will need to mow to reach his goal. How many lawns will Trey need to mow to reach his goal?

6. A certain bacteria's population is cut in half every 6 hours. After 2 full days, there are 400 bacteria in the culture. How many bacteria were in the culture at the start of the first day?