

Name: \_\_\_\_\_

### Summer Math Packet

This packet is due the first day of school and will count as a test grade. In order to receive full credit on each problem, you must **show all work.** This packet is long, but you have the entire summer to complete it so make sure you use your time wisely.

Sincerely,

The Middle School Math Team

# Operations with Integers

## Adding Integers

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

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

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

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

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

## 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.

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

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

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

## Multiplying & Dividing Integers

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

- Negative  $\cdot$  or  $\div$  Negative = Positive
- Negative  $\cdot$  or  $\div$  Positive (or Positive  $\cdot$  or  $\div$  Negative) = Negative

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

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

## Order of Operations

Parentheses

Exponents

Multiplication & Division (left to right)

Addition & Subtraction (left to right)

Find the sum or difference. *NO calculator Ex entire page*

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

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Find the product or quotient.

13.  $60 \div 12$

14.  $-194 \div (-2)$

15.  $88 \cdot (-2)$

16.  $-12 \cdot 10$

17.  $-10 \cdot (-11)$

18.  $90 \div (-6)$

19.  $3 \cdot (-59)$

20.  $-7 \cdot (-2)$

21.  $-28 \div (-88) \cdot (-22)$

22.  $-56 \cdot 140 \div (-80)$

23.  $108 \div (-11) \cdot (-11)$

24.  $-84 \cdot (-17) \div 42$

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

25.  $-78 + (-2) \cdot (-56)$

26.  $-65 + 6 \div (-3) + 40$

27.  $-94 - (84 - 10)$

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

29.  $-15 - (-11) + 5 \cdot (-4)$

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

31.  $-84 \div 4 + (-20)$

32.  $-56 + (-50) + (-10) \cdot (-9)$

# 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.

$$\text{ex: } -9.8 + 6.24 \rightarrow \text{neg} + \text{pos: subtract} \rightarrow \begin{array}{r} 9.80 \\ -6.24 \\ \hline 3.56 \end{array} \rightarrow \text{answer: } (-3.56)$$

- 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.

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

## 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.

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

- 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.

$$\text{ex: } -5.2 \div 0.2 \rightarrow \text{neg} \div \text{pos} = \text{neg} \rightarrow 02 \overline{) 52} \rightarrow \text{answer: } (-26)$$

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

$$\text{ex: } -1\frac{3}{4} \cdot \frac{6}{14} \rightarrow \text{neg} \cdot \text{pos} = \text{neg} \rightarrow \frac{17}{24} \cdot \frac{63}{14} = \frac{3}{4} \rightarrow \text{answer: } (-\frac{3}{4})$$

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

$$\text{ex: } -\frac{1}{2} \div (-\frac{3}{8}) \rightarrow \text{neg} \div \text{neg} = \text{pos} \rightarrow \frac{1}{2} \cdot \frac{8}{3} = \frac{4}{3} \rightarrow \text{answer: } (1\frac{1}{3})$$

Find the sum, difference, product, or quotient. *NO Calculator for the entire page.*

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.  $-12.8 \cdot (-4.88)$

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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.  $-5 \frac{3}{4} - (-3 \frac{7}{8})$

# 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!

$$\text{ex: } 6x = -18 \rightarrow \frac{\cancel{6}x}{\cancel{6}} = \frac{-18}{6} \rightarrow \text{answer: } (x = -3)$$

$$\text{ex: } y + 23 = -9 \rightarrow \begin{array}{l} y + 23 = -9 \\ -23 \quad -23 \end{array} \rightarrow \text{answer: } (y = -32)$$

$$\text{ex: } \frac{h}{3} = 4 \rightarrow \cancel{3} \cdot \frac{h}{\cancel{3}} = 4 \cdot 3 \rightarrow \text{answer: } (h = 12)$$

$$\text{ex: } w - 13 = -5 \rightarrow \begin{array}{l} w - 13 = -5 \\ +13 \quad +13 \end{array} \rightarrow \text{answer: } (w = 8)$$

## 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)

$$\text{ex: } 7x - 4 = -32 \rightarrow \begin{array}{l} 7x - 4 = -32 \\ +4 \quad +4 \end{array} \rightarrow \frac{\cancel{7}x}{\cancel{7}} = \frac{-28}{7} \rightarrow \text{answer: } (x = -4)$$

$$\text{ex: } \frac{j}{5} + 13 = 15 \rightarrow \begin{array}{l} \frac{j}{5} + 13 = 15 \\ -13 \quad -13 \end{array} \rightarrow \cancel{5} \cdot \frac{j}{\cancel{5}} = 2 \cdot 5 \rightarrow \text{answer: } (j = 10)$$

$$\text{ex: } \frac{b+7}{3} = -2 \rightarrow \cancel{3} \cdot \frac{b+7}{\cancel{3}} = -2 \cdot 3 \rightarrow \begin{array}{l} b + 7 = -6 \\ -7 \quad -7 \end{array} \rightarrow \text{answer: } (b = -13)$$

Solve the one-step equation. Use a calculator but show work!

57.  $19 + j = -34$

58.  $m - 26 = 13$

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

60.  $12f = 216$

61.  $g - (-3) = -7$

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

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

64.  $-4w = -280$

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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.  $2y + 3 = 19$

## Proportions and Percent

### Solving Proportions

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

ex:  $\frac{5}{b} = \frac{4}{10} \rightarrow 5 \cdot 10 = 4b \rightarrow \frac{50}{4} = \frac{4b}{4} \rightarrow$  answer:  $b = 12.5$

### Solving Percent Problems with Proportions

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

ex: 25 is what percent of 500?  $\rightarrow \frac{x}{100} = \frac{25}{500} \rightarrow$  answer:  $x = 5\%$

ex: What is 15% of 88?  $\rightarrow \frac{15}{100} = \frac{x}{88} \rightarrow$  answer:  $x = 13.2$

ex: 18 is 30% of what number?  $\rightarrow \frac{30}{100} = \frac{18}{x} \rightarrow$  answer:  $x = 60$

### 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?  $\rightarrow 20 = 0.4x \rightarrow$  answer:  $x = 50$

ex: 8 is what percent of 32?  $\rightarrow 8 = 32x \rightarrow x = 0.25 \rightarrow$  answer:  $25\%$

ex: What is 25% of 88?  $\rightarrow x = 0.25 \cdot 88 \rightarrow$  answer:  $x = 22$

### Real-World Percent Problems

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

- Tax:** Find the amount of tax using a proportion or equation. Then add the tax to the original amount to find the total cost.
- Discount:** 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.



Solve the proportion.

May use your calculator, Show work

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

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

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

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

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

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

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

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

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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. $\bar{3}$ % 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.

# Geometry

## Geometry Basics

- Perimeter is the distance around a polygon
- Circumference is the distance around a circle
- Area is the space inside a figure
- Volume is the capacity of a 3-dimensional figure
- Surface Area is the sum of the areas of all the faces on a 3-dimensional figure

## 2-Dimensional Geometry Formulas

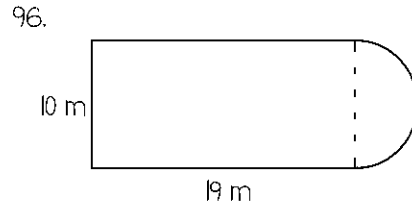
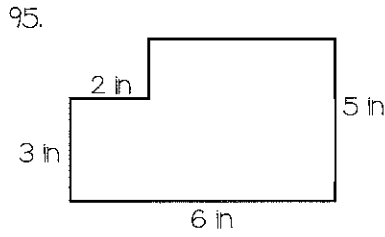
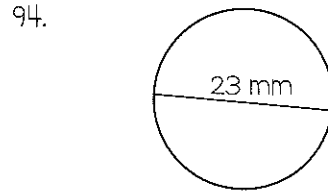
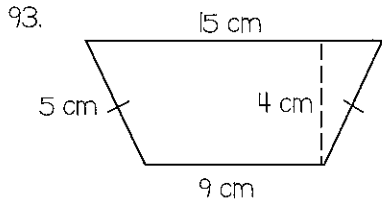
- Perimeter of Any Figure: sum of side lengths
- Circumference =  $\pi \cdot \text{diameter}$
- Area of Parallelogram = base  $\cdot$  height
- Area of Triangle =  $\frac{1}{2} \cdot \text{base} \cdot \text{height}$
- Area of Trapezoid =  $\frac{1}{2} \cdot \text{height}(\text{base}_1 + \text{base}_2)$
- Area of Circle =  $\pi \cdot \text{radius}^2$

## 3-Dimensional Geometry Formulas

- Volume of Rectangular Prism = length  $\cdot$  width  $\cdot$  height
- Volume of Cylinder =  $\pi \cdot \text{radius}^2 \cdot \text{height}$
- Surface Area of Rectangular Prism =  $2 \cdot \text{length} \cdot \text{width} + 2 \cdot \text{length} \cdot \text{height} + 2 \cdot \text{height} \cdot \text{width}$
- Surface Area of Cylinder =  $2 \cdot \pi \cdot \text{radius}^2 + 2 \cdot \pi \cdot \text{radius} \cdot \text{height}$

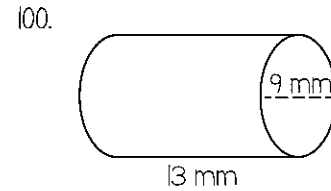
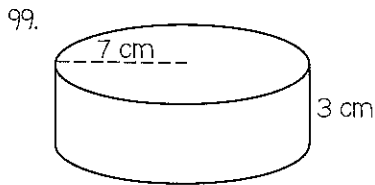
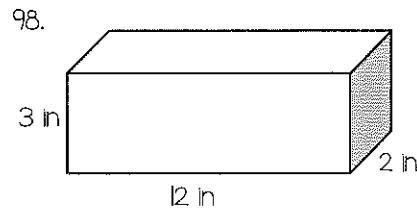
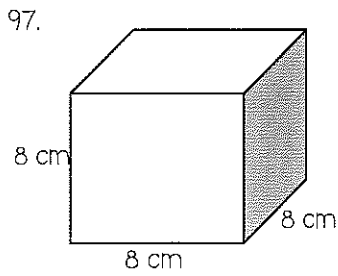
Find the perimeter (or circumference) and area. Use 3.14 for pi.

Use Calculator  
Show work  
Write formula



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Find the surface area and volume.



For the following 10 problems you may use your calculator.  
Show your work for each question.

Marco planted a tree that was 54 inches tall several years ago. The tree has grown at a rate of approximately 1.5 inches per year. Marco uses this equation to calculate the tree's height,  $h$ .

$$1.5x + 54 = h$$

What does the  $x$  represent in this equation?

- The  $x$  represents the tree's growth each year.
- The  $x$  represents the starting height of the tree.
- The  $x$  represents the height of the tree today.
- The  $x$  represents the number of years since the tree was planted.

Carla's Plumbing charges \$25 for a service call and \$28 per hour,  $h$ , for labor for any repair. The total cost,  $t$ , for a repair can be calculated using the equation below.

$$28h + 25 = t$$

Mr. Callahan paid a total of \$165 for a repair. How many hours did it take to complete his repair?

- 3 hours
- 5 hours
- 6 hours
- 7 hours

What is the value of  $x$  in the equation below?

$$40x + 120 = 720$$

- 21
- 15
- 18
- 12.5

Which value of  $n$  makes the equation below correct?

$$5n + 20 = 16$$

$n = -7\frac{1}{5}$

$n = -\frac{4}{5}$

$n = \frac{4}{5}$

$n = 7\frac{1}{5}$



Every month Jordan puts \$14 into her bank account. Her grandma puts additional money into Jordan's bank account every month. After 12 months, Jordan has \$216 in her bank account. The equation below can be used to determine  $x$ , the amount of money her grandma adds each month.

$$12(x + 14) = 216$$

How much did Jordan's grandma put into the account each month?

- \$4.00
- \$16.83
- \$17.45
- \$48.00

Kayla is purchasing 5 candles for  $x$  dollars each and 5 candle holders for \$3.50 each. Kayla paid a total of \$27.50. This equation can be used to calculate the cost per candle.

$$5(x + 3.50) = 27.50$$

Before tax, what is the cost per candle?

- \$2.00
- \$4.80
- \$6.20
- \$9.00

Olivier has \$48.25 to spend on painting classes. Each class costs \$6 plus a one-time registration fee of \$6.25. Let the variable  $n$  represent the number of classes. Which equation represents the number of classes Olivier can attend for \$48.25?

$6n + 12.25 = 48.25$

$12.25n = 48.25$

$6 + 6.25n = 48.25$

$6n + 6.25 = 48.25$

A company charges \$7 for a T-shirt and ships any order for \$15. A school principal ordered a number of T-shirts for the school store. The total cost of the order was \$1,520. Which equation can be used to find the number of shirts ordered?

$1,520 = 7x + 15$

$1,520 = x + 15(7)$

$1,520 = 15x + 7$

$1,520 = 7x + 15x$

A plumber charges a base fee of \$60, and then each hour of work costs \$15. Yesterday Joe hired the plumber to fix his sink, at a total cost of \$240. How many hours did the plumber work?

- 4 hours
- 3.75 hours
- 12 hours
- 16 hours

Daniela rented a snowboard for \$35, then took lessons that cost \$7 per hour. If her total cost to rent a snowboard and take lessons was \$73.50, how many hours of lessons did she take?

- 1.9 hours
- 10.5 hours
- 5.5 hours
- 2.1 hours

END OF ASSESSMENT

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