

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.

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. $60 \div 12$

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

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.

$$\text{ex: } -1\frac{3}{4} \cdot \frac{6}{14} \rightarrow \text{neg} \cdot \text{pos} = \text{neg} \rightarrow \frac{1\cancel{7}}{2} \cdot \frac{\cancel{6}^3}{\cancel{14}_2} = \frac{3}{4} \rightarrow \text{answer: } (-\frac{3}{4})$$

- 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.

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

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!

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

$$\text{ex: } y + 23 = -9 \rightarrow y + \cancel{23} = -9 \rightarrow \text{answer: } (y = -32)$$

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

$$\text{ex: } w - 13 = -5 \rightarrow w - \cancel{13} = -5 \rightarrow \text{answer: } (w = 8)$$

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)

$$\text{ex: } 7x - 4 = -32 \rightarrow 7x - \cancel{4} = -32 \rightarrow \frac{7x}{\cancel{7}} = \frac{-28}{\cancel{7}} \rightarrow \text{answer: } (x = -4)$$

$$\text{ex: } \frac{j}{5} + 13 = 15 \rightarrow \frac{j}{\cancel{5}} + \cancel{13} = 15 \rightarrow \cancel{5} \cdot \frac{j}{\cancel{5}} = 2 \cdot 5 \rightarrow \text{answer: } (j = 10)$$

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

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. $2y + 3 = 19$

Proportions and Percent

Solving Proportions

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

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

Solving Percent Problems with Proportions

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

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

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

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

Solving Percent Problems with Equations

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

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

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

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

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.

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. $\frac{32}{12} = \frac{a}{14}$

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

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

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. $\bar{3}$ % 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

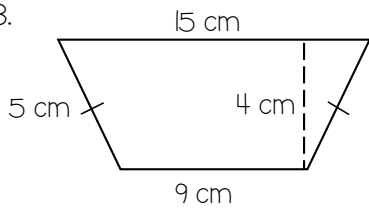
- Perimeter of Any Figure: sum of side lengths
- Circumference = $\pi \cdot \text{diameter}$
- Area of Parallelogram = $\text{base} \cdot \text{height}$
- Area of Triangle = $\frac{1}{2} \cdot \text{base} \cdot \text{height}$
- Area of Trapezoid = $\frac{1}{2} \cdot \text{height}(\text{base}_1 + \text{base}_2)$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

3-Dimensional Geometry Formulas

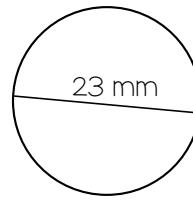
- Volume of Rectangular Prism = $\text{length} \cdot \text{width} \cdot \text{height}$
- Volume of Cylinder = $\pi \cdot \text{radius}^2 \cdot \text{height}$
- Surface Area of Rectangular Prism = $2 \cdot \text{length} \cdot \text{width} + 2 \cdot \text{length} \cdot \text{height} + 2 \cdot \text{height}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

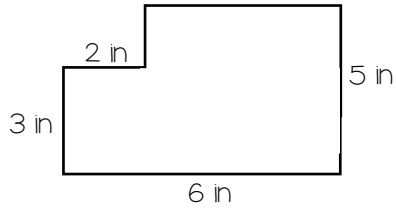
93.



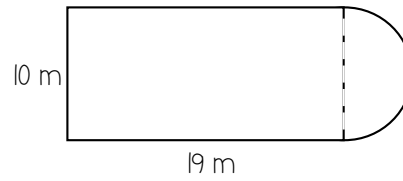
94.



95.

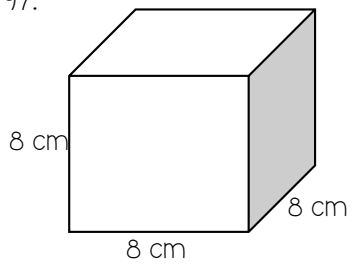


96.

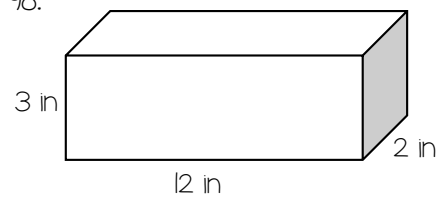


Find the surface area and volume.

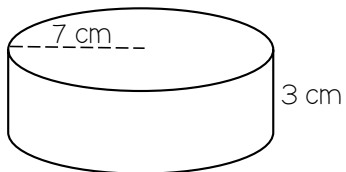
97.



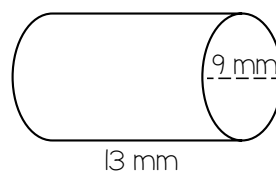
98.



99.



100.



Answer Key

- | | | | |
|--|---|---|--|
| 1. -3 | 2. 237 | 3. -97 | 4. 196 |
| 5. 17 | 6. 339 | 7. 6 | 8. -41 |
| 9. 80 | 10. -81 | 11. 36 | 12. 26 |
| 13. 5 | 14. 97 | 15. -176 | 16. -120 |
| 17. 110 | 18. -15 | 19. -177 | 20. 14 |
| 21. -7 | 22. 98 | 23. 108 | 24. 34 |
| 25. 34 | 26. -27 | 27. -168 | 28. 77 |
| 29. -24 | 30. -55 | 31. -41 | 32. -16 |
| 33. 75.451 | 34. 0.525 | 35. 6.532 | 36. 131.2 |
| 37. 16.281 | 38. -11.5 | 39. 75.68 | 40. -100.2 |
| 41. 11.947 | 42. 1.68 | 43. 0.75 | 44. 62.464 |
| 45. $30\frac{3}{4}$ | 46. $1\frac{1}{20}$ | 47. $4\frac{1}{20}$ | 48. $2\frac{9}{20}$ |
| 49. $-1\frac{7}{9}$ | 50. -7 | 51. $-6\frac{5}{12}$ | 52. $\frac{5}{13}$ |
| 53. -2 | 54. $-14\frac{1}{5}$ | 55. $16\frac{1}{18}$ | 56. $-1\frac{7}{8}$ |
| 57. $j = -53$ | 58. $m = 39$ | 59. $x = -15$ | 60. $f = 18$ |
| 61. $g = -38$ | 62. $h = 117$ | 63. $b = -6$ | 64. $w = 70$ |
| 65. $m = 6$ | 66. $y = -20$ | 67. $r = -4$ | 68. $p = 22$ |
| 69. $k = -14$ | 70. $f = -5$ | 71. $g = -30$ | 72. $m = 2\frac{1}{2}$ |
| 73. $v = -28$ | 74. $n = 1$ | 75. $m = -2$ | 76. $y = 8$ |
| 77. $h = 5$ | 78. $c = 10$ | 79. $b = 28$ | 80. $j = 45$ |
| 81. $k = 6\frac{2}{3}$ | 82. $a = 4$ | 83. $g = 7\frac{7}{8}$ | 84. $w = 4\frac{1}{2}$ |
| 85. 12.75 | 86. 8 | 87. 12.5% | 88. 9 |
| 89. 20% | 90. 27 | 91. \$46.40 | 92. \$14.98 |
| 93. $P = 34\text{ cm};$
$A = 48\text{ cm}^2$ | 94. $C = 72.22\text{ mm};$
$A = 415.265\text{ mm}^2$ | 95. $P = 22\text{ in};$
$A = 26\text{ in}^2$ | 96. $P = 63.7\text{ m};$
$A = 229.25\text{ m}^2$ |
| 97. $SA = 384\text{ cm}^2;$
$V = 512\text{ cm}^3$ | 98. $SA = 132\text{ in}^2;$
$V = 72\text{ in}^3$ | 99. $SA = 439.6\text{ cm}^2;$
$V = 461.58\text{ cm}^3$ | 100. $SA = 494.55\text{ mm}^2;$
$V = 826.605\text{ mm}^3$ |

Evaluating Algebraic Expressions

1. Substitute the given values for the variables in the expression
2. Evaluate the expression using the order of operations
 - Parentheses/Brackets (inside to outside)
 - Exponents
 - Multiplication/Division (left to right)
 - Addition/Subtraction (left to right)

ex: $9x^2 - 4(y + 3z)$
for $x = -3$, $y = 2$, $z = 5$

$$9(-3)^2 - 4(2 + 3 \cdot 5)$$

$$9(-3)^2 - 4(2 + 15)$$

$$9(-3)^2 - 4 \cdot 17$$

$$9 \cdot 9 - 4 \cdot 17$$

$$81 - 4 \cdot 17$$

$$81 - 68 = \boxed{13}$$

The Distributive Property

1. Multiply the number outside the parentheses by each term in the parentheses.
2. Keep the addition/subtraction sign between each term.

ex: $5(8x - 3)$

$$5(8x - 3)$$

$$5(8x) - 5(3)$$

$$\boxed{40x - 15}$$

Simplifying Algebraic Expressions

1. Clear any parentheses using the Distributive Property
2. Add or subtract like terms (use the sign in front of each term to determine whether to add or subtract)

ex: $2(3x - 4) - 12x + 9$

$$2(3x - 4) - 12x + 9$$

$$6x - 8 - 12x + 9$$

$$\boxed{-6x + 1}$$

Evaluate each expression for $a = 9$, $b = -3$, $c = -2$, $d = 7$. Show your work.

1. $a - cd$	2. $2b^3 + c^2$	3. $\frac{a + d - c}{b}$	4. $(a - b)^2 + d(a + c)$
5. $4c - (b - a)$	6. $\frac{a}{b} - 5a$	7. $2bc + d(12 - 5)$	8. $b + 0.5[8 - (2c + a)]$

Simplify each expression using the Distributive Property.

9. $5(2g - 8)$	10. $7(y + 3)$	11. $-3(4w - 3)$	12. $(6r + 3)2$
----------------	----------------	------------------	-----------------

Simplify each expression, showing all work.

13. $8(x + 1) - 12x$	14. $6w - 7 + 12w - 3z$	15. $9n - 8 + 3(2n - 11)$	16. $3(7x + 4y) - 2(2x + y)$
17. $(15 + 8d)(-5) - 24d + d$	18. $9(b - 1) - c + 3b + c$	19. $20f - 4(5f + 4) + 16$	20. $8(h - 4) - h - (h + 7)$

Solving One-Step Equations

1. Cancel out the number on the same side of the equal sign as the variable using inverse operations (addition/subtraction; multiplication/division)
2. Be sure to do the same thing to both sides of the equation!

ex: $-18 = 6j$

$$\frac{-18}{6} = \frac{6j}{6}$$

$$-3 = j \rightarrow \boxed{j = -3}$$

Solving Two-Step Equations

1. Undo operations one at a time with inverse operations, using the order of operations in reverse (i.e. undo addition/subtraction before multiplication/division)
2. Be sure to always do the same thing to both sides of the equation!

ex: $\frac{a}{7} - 12 = -9$

$$\frac{a}{7} - 12 = -9$$
$$+12 \quad +12$$

$$\frac{a}{7} = 3$$
$$\times 7 \quad \times 7$$

$$\boxed{a = 21}$$

Solving Multi-Step Equations

1. Clear any parentheses using the Distributive Property
2. Combine like terms on each side of the equal sign
3. Get the variable terms on the same side of the equation by adding/subtracting a variable term to/from both sides of the equation to cancel it out on one side
4. The equation is now a two-step equation, so finish solving it as described above

ex: $5(2x - 1) = 3x + 4x - 1$

$$10x - 5 = 3x + 4x - 1$$

$$10x - 5 = 7x - 1$$
$$-7x \quad -7x$$

$$3x - 5 = -1$$
$$+5 \quad +5$$

$$3x = 4$$
$$\div 3 \quad \div 3$$

$$\boxed{x = \frac{4}{3}}$$

Solve each equation, showing all work.

21. $f - 64 = -23$

22. $-7 = 2d$

23. $\frac{b}{-12} = -6$

24. $13 = m + 21$

25. $5x - 3 = -28$

26. $\frac{w + 8}{-3} = -9$

27. $-8 + \frac{h}{4} = 13$

28. $22 = 6y + 7$

29. $8x - 4 = 3x + 1$

30. $-2(5d - 8) = 20$

31. $7r + 21 = 49r$

32. $-9g - 3 = -3(3g + 2)$

33. $5(3x - 2) = 5(4x + 1)$

34. $3d - 4 + d = 8d - (-12)$

35. $f - 6 = -2f + 3(f - 2)$

36. $-2(y - 1) = 4y - (y + 2)$

Scientific Notation

Standard Form to Scientific Notation: move the decimal after the first non-zero digit and eliminate any trailing zeros. Multiply by 10 to the power equal to the number of places you moved the decimal point. If the original number was greater than 1, the exponent is positive. If the number was less than 1, the exponent is negative.

ex: 0.0000571

0.0000571

Original number < 1, so negative exponent

$$= 5.71 \times 10^{-5}$$

Scientific Notation to Standard Form: move the decimal point the number of places indicated by the exponent. If the exponent is positive, move the decimal right. If negative, move left.

ex: 3.5×10^3

Positive exponent, so move decimal right

$$3.500 = 3,500$$

Negative Exponents & Simplifying Monomials

Zero Exponent: Any number raised to the zero power equals 1

$$\text{ex: } y^0 = 1$$

Negative Exponent: Move the base to the opposite side of the fraction line and make the exponent positive

$$\text{ex: } x^{-4} = \frac{1}{x^4}$$

Monomial x Monomial: Multiply the coefficients and add the exponents of like bases

$$\text{ex: } (4x^3)(2x^5) = 8x^8$$

Monomial \div Monomial: Divide the coefficients and subtract the exponents of like bases

$$\text{ex: } \frac{a}{a^6} = a^{-5} = \frac{1}{a^5}$$

Power of a Monomial: Raise each base (including the coefficient) to that power. If a base already has an exponent, multiply the two exponents

$$\text{ex: } (-2fg^5)^3 = -8f^3g^{15}$$

Power of a Quotient: Raise each base (including the coefficient) to that power. If a base already has an exponent, multiply the two exponents

$$\text{ex: } \left(\frac{5d^3}{c}\right)^2 = \frac{25d^6}{c^2}$$

Convert each number to Scientific Notation.

37. 67,000,000,000	38. 0.0009213	39. 0.000000000004	40. 3,201,000,000,000,000
--------------------	---------------	--------------------	---------------------------

Convert each number to Standard Form.

41. 5.92×10^{-5}	42. 1.1×10^7	43. 6.733×10^{-8}	44. 3.27×10^2
---------------------------	-----------------------	----------------------------	------------------------

Simplify each expression. Write your answers using only positive exponents.

45. w^{-9}	46. $\frac{m^5}{m^2}$	47. $f^5 \cdot f^3$	48. $\left(\frac{h^2}{g}\right)^3$
49. $(a^5)^2$	50. $\frac{1}{b^{-3}}$	51. z^0	52. $4r^6 \cdot 3r \cdot 2r^2$
53. $\frac{qp^{-2}}{3q^{-3}}$	54. $\frac{8d^3}{2cd^{-2}}$	55. $(g^4h)^2 \cdot (2g^3h^{-1})^2$	56. $(6a)^0$
57. $(-3n^2k^4)^2$	58. $\left(\frac{w^5x^{-2}y}{w^2xy^4}\right)^3$	59. $\frac{6 \cdot 10^7}{2 \cdot 10^3}$	60. $(1.5 \cdot 10^{-6}) \cdot (4 \cdot 10^9)$

Slope & Rate of Change

Finding the Slope Given Two Points: Use the coordinates from the points in the slope formula:

$$\text{Slope (m)} = \frac{y_2 - y_1}{x_2 - x_1}$$

ex: $(4, -2), (-3, 8)$
 $x_1 \quad y_1 \quad x_2 \quad y_2$

$$m = \frac{8 - (-2)}{-3 - 4} = \frac{10}{-7} = -\frac{10}{7}$$

Finding the Rate of Change From a Table: Determine the amount the dependent variable (y) is changing and the amount the independent variable (x) is changing.

$$\text{Rate of Change} = \frac{\text{change in } y}{\text{change in } x}$$

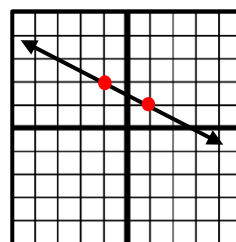
ex:

ex:

		+2	+2	+2	
x	# months	3	5	7	9
y	Cost (\$)	80	130	180	230
		+50	+50	+50	

$$m = \frac{50}{2} = 25 \text{ dollars/month}$$

Finding the Slope From a Graph: Choose 2 points on the graph. Find the vertical change (rise) and horizontal change (run) between the 2 points and write it as a fraction $\frac{\text{rise}}{\text{run}}$. (Up is positive, down is negative, right is positive, and left is negative).



rise = +1
run = -2

$$m = \frac{1}{-2} = -\frac{1}{2}$$

Graphing Linear Equations

Slope-Intercept Form: $y = mx + b$
 slope y-intercept

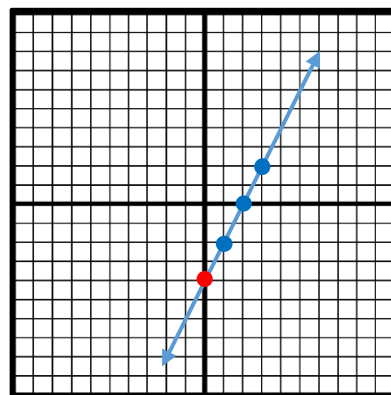
ex: $y = 2x - 4$

y-intercept: -4

slope: $2 = \frac{2}{1}$ ← rise
 ← run

How To Graph:

1. Make a point on the y-axis at the y-intercept.
2. Use the slope to determine where to make the next point. The numerator tells you the rise (how far up/down) and the denominator tells you the run (how far right/left) to make the next point.
3. Repeat to make more points and then connect the points with a line.



Find the slope of the line that passes through the points. Show your work.

61. $(-5, 3), (2, 1)$

62. $(8, 4), (11, 6)$

63. $(9, 3), (9, -1)$

64. $(-4, -2), (-6, 4)$

Find the rate of change. Show your work.

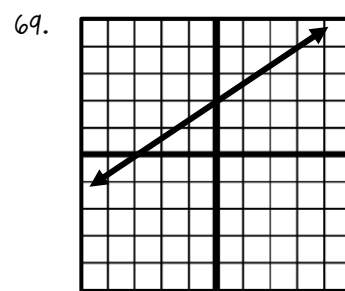
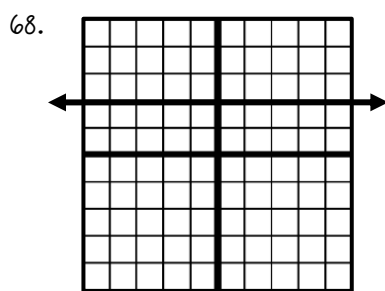
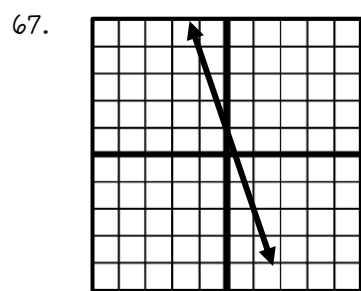
65.

Number of Hours	3	6	9	12
Distance (in miles)	135	270	405	540

66.

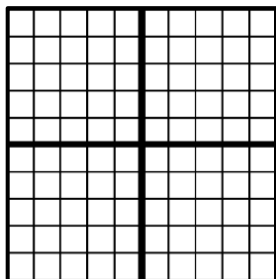
Number of Weeks	1	3	5	7
Pounds	173	169	165	161

Find the slope of the line.

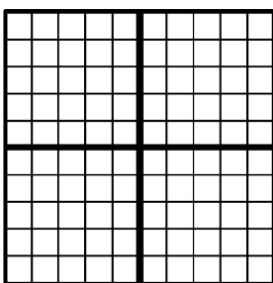


Graph the line.

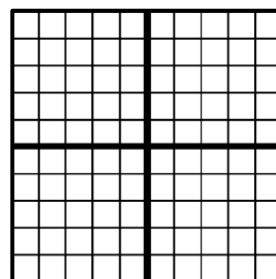
70. $y = -x - 3$



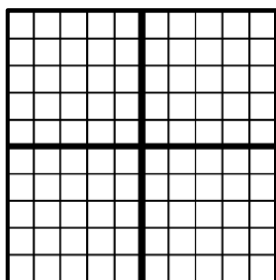
71. $y = \frac{1}{3}x + 2$



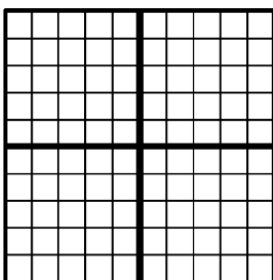
72. $y = -3x - 1$



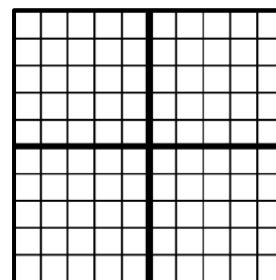
73. $y = -\frac{3}{2}x - 2$



74. $y = 2x + 1$



75. $y = \frac{1}{4}x$



Solving Proportions

1. Set the two cross-products equal to each other
2. Solve the equation for the variable

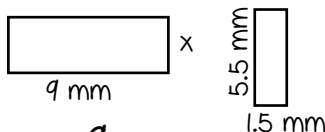
ex: $\frac{m}{4} = \frac{3}{5}$

$$\frac{5m}{5} = \frac{12}{5}$$

$$m = 2.4$$

Similar Figures

1. To find a missing side length, set up a proportion, matching up corresponding sides.
2. Solve the proportion using the steps above.

ex: 

$$\frac{x}{1.5} = \frac{9}{5.5}$$

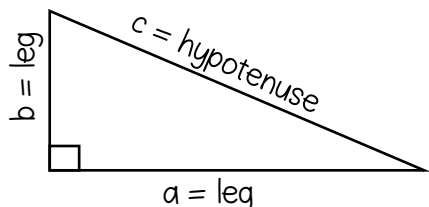
$$x = 2.45 \text{ mm}$$

The Pythagorean Theorem

*** The Pythagorean Theorem applies to right triangles only **

The sides next to the right angle (a & b) are legs

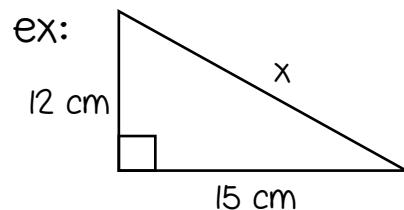
The side across from the right angle (c) is the hypotenuse



Pythagorean Theorem: $a^2 + b^2 = c^2$

To find the hypotenuse: add the squares of the legs and then find the square root of the sum

To find a leg: subtract the square of the given leg from the square of the hypotenuse and then find the square root of the difference



x is the hypotenuse

$$12^2 + 15^2 = x^2$$

$$144 + 225 = x^2$$

$$369 = x^2$$

$$x = \sqrt{369} \approx 19.2 \text{ cm}$$

ex: $a = ?$, $b = 3$, $c = 6$

a is a leg

$$a^2 + 3^2 = 6^2$$

$$a^2 + 9 = 36$$

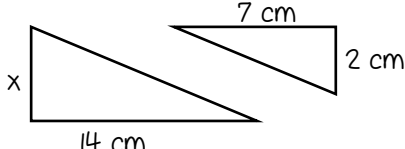
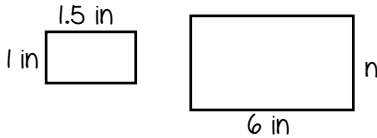
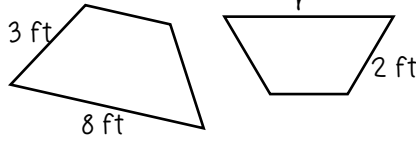
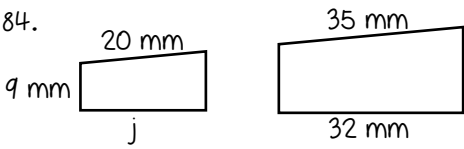
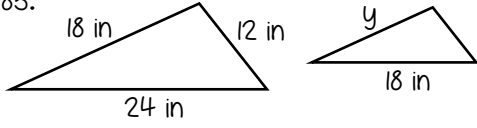
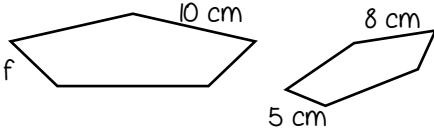
$$a^2 = 36 - 9 = 27$$

$$a = \sqrt{27} \approx 5.2$$

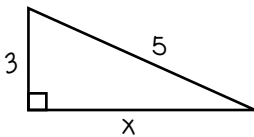
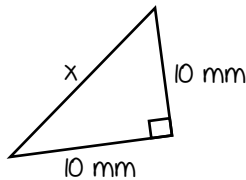
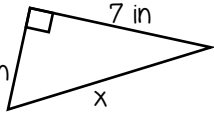
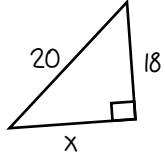
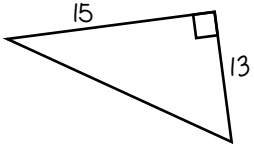
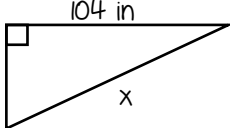
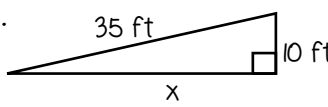
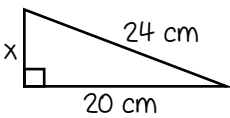
Solve each proportion, showing all work.

76. $\frac{6}{7} = \frac{4}{m}$	77. $\frac{12}{5} = \frac{k}{3}$	78. $\frac{h}{7} = \frac{8}{2}$	79. $\frac{22}{n} = \frac{9}{36}$	80. $\frac{4}{21} = \frac{3}{c}$
---------------------------------	----------------------------------	---------------------------------	-----------------------------------	----------------------------------

Assume each pair of figures is similar. Find the missing side length, showing all work.

81. 	82. 	83. 
84. 	85. 	86. 

Find the missing side length in each right triangle to the nearest tenth. Show your work!

87. $a = 6, b = 8, c = ?$	88. $a = ?, b = 9 \text{ cm}, c = 13 \text{ cm}$	89. $a = 7, b = ?, c = 14$	90. $a = 14 \text{ in}, b = 14 \text{ in}, c = ?$
91. 	92. 	93. 	94. 
95. 	96. 	97. 	98. 

Determine whether or not you can form a right triangle from the given side lengths. Explain.

99. 18, 22, 26	100. 5, 12, 13
----------------	----------------

Evaluate each expression for $a = 9$, $b = -3$, $c = -2$, $d = 7$. Show your work.

1. $a - cd$ 23	2. $2b^3 + c^2$ -50	3. $\frac{a + d - c}{b}$ -6	4. $(a - b)^2 + d(a + c)$ 193
5. $4c - (b - a)$ 4	6. $\frac{a}{b} - 5a$ -48	7. $2bc + d(12 - 5)$ 61	8. $b + 0.5[8 - (2c + a)]$ -1.5

Simplify each expression using the Distributive Property.

9. $5(2g - 8)$ $10g - 40$	10. $7(y + 3)$ $7y + 21$	11. $-3(4w - 3)$ $-12w + 9$	12. $(6r + 3)2$ $12r + 6$
--	---	--	--

Simplify each expression, showing all work.

13. $8(x + 1) - 12x$ $-4x + 8$	14. $6w - 7 + 12w - 3z$ $18w - 3z - 7$	15. $9n - 8 + 3(2n - 11)$ $15n - 41$	16. $3(7x + 4y) - 2(2x + y)$ $17x + 10y$
17. $(15 + 8d)(-5) - 24d + d$ $-63d - 75$	18. $9(b - 1) - c + 3b + c$ $12b - 9$	19. $20f - 4(5f + 4) + 16$ 0	20. $8(h - 4) - h - (h + 7)$ $6h - 39$

Solve each equation, showing all work.

21. $f - 64 = -23$

$$f = 41$$

22. $-7 = 2d$

$$d = -7/2 = -3.5$$

23. $\frac{b}{-12} = -6$

$$b = 72$$

24. $13 = m + 21$

$$m = -8$$

25. $5x - 3 = -28$

$$x = -5$$

26. $\frac{w + 8}{-3} = -9$

$$w = 19$$

27. $-8 + \frac{h}{4} = 13$

$$h = 84$$

28. $22 = 6y + 7$

$$y = 5/2 = 2.5$$

29. $8x - 4 = 3x + 1$

$$x = 1$$

30. $-2(5d - 8) = 20$

$$x = -2/5 = -0.4$$

31. $7r + 21 = 49r$

$$r = 1/2 = 0.5$$

32. $-9g - 3 = -3(3g + 2)$

no solution

33. $5(3x - 2) = 5(4x + 1)$

$$x = -3$$

34. $3d - 4 + d = 8d - (-12)$

$$d = -4$$

35. $f - 6 = -2f + 3(f - 2)$

all real numbers

36. $-2(y - 1) = 4y - (y + 2)$

$$y = 4/5 = 0.8$$

Convert each number to Scientific Notation.

37. 67,000,000,000 6.7×10^{10}	38. 0.0009213 9.213×10^{-4}	39. 0.00000000004 4×10^{-11}	40. 3,201,000,000,000,000 3.201×10^{15}
--	---	--	---

Convert each number to Standard Form.

41. 5.92×10^{-5} 0.0000592	42. 1.1×10^7 11,000,000	43. 6.733×10^{-8} 0.00000006733	44. 3.27×10^2 327
--	-------------------------------------	---	-------------------------------

Simplify each expression. Write your answers using only positive exponents.

45. w^{-9} $\frac{1}{w^9}$	46. $\frac{m^5}{m^2}$ m^3	47. $f^5 \cdot f^3$ f^8	48. $\left(\frac{h^2}{g}\right)^3$ $\frac{h^6}{g^3}$
49. $(a^5)^2$ a^{10}	50. $\frac{1}{b^{-3}}$ b^3	51. z^0 1	52. $4r^6 \cdot 3r \cdot 2r^2$ $24r^9$
53. $\frac{qp^{-2}}{3q^{-3}}$ $\frac{3q^3}{p^2}$	54. $\frac{8d^3}{2cd^{-2}}$ $\frac{4d^5}{c}$	55. $(g^4h)^2 \cdot (2g^3h^{-1})^2$ $4g^{14}$	56. $(6a)^0$ 1
57. $(-3n^2k^4)^2$ $9n^4k^8$	58. $\left(\frac{w^5x^{-2}y}{w^2xy^4}\right)^3$ $\frac{w^9}{x^9y^9}$	59. $\frac{6 \cdot 10^7}{2 \cdot 10^3}$ $3 \cdot 10^4$	60. $(1.5 \cdot 10^{-6}) \cdot (4 \cdot 10^9)$ $6 \cdot 10^3$

Find the slope of the line that passes through the points. Show your work.

61. $(-5, 3), (2, 1)$

$$m = -\frac{2}{7}$$

62. $(8, 4), (11, 6)$

$$m = \frac{2}{3}$$

63. $(9, 3), (9, -1)$

$$m = \text{undefined}$$

64. $(-4, -2), (-6, 4)$

$$m = -3$$

Find the rate of change. Show your work.

65.

Number of Hours	3	6	9	12
Distance (in miles)	135	270	405	540

45 miles per hour

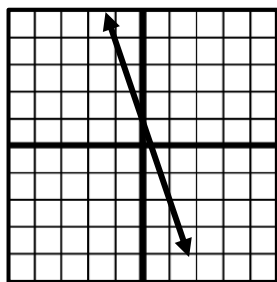
66.

Number of Weeks	1	3	5	7
Pounds	173	169	165	161

-2 pounds per week

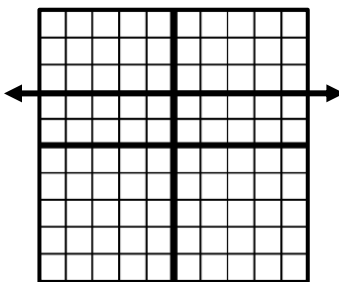
Find the slope of the line.

67.



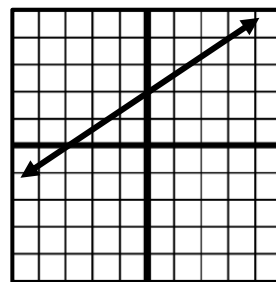
$$m = -3$$

68.



$$m = 0$$

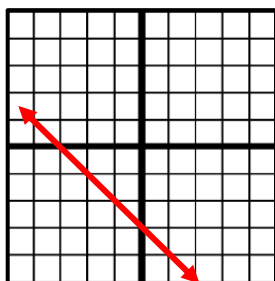
69.



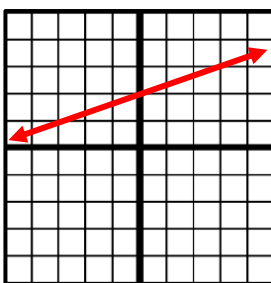
$$m = \frac{2}{3}$$

Graph the line.

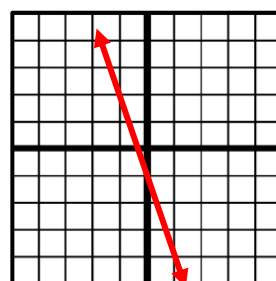
70. $y = -x - 3$



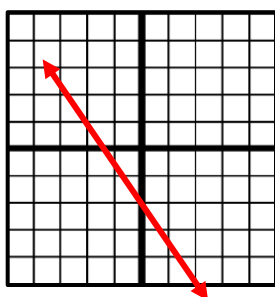
71. $y = \frac{1}{3}x + 2$



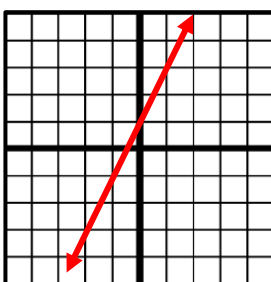
72. $y = -3x - 1$



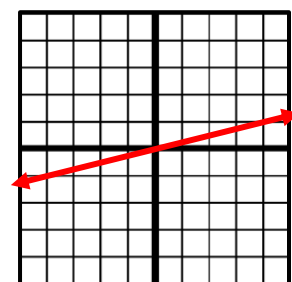
73. $y = -\frac{3}{2}x - 2$



74. $y = 2x + 1$



75. $y = \frac{1}{4}x$



Solve each proportion, showing all work.

76. $\frac{6}{7} = \frac{4}{m}$ $m = 4.\overline{6}$	77. $\frac{12}{5} = \frac{k}{3}$ $k = 7.2$	78. $\frac{h}{7} = \frac{8}{2}$ $h = 28$	79. $\frac{22}{n} = \frac{9}{36}$ $h = 88$	80. $\frac{4}{21} = \frac{3}{c}$ $h = 15.75$
---	---	---	---	---

Assume each pair of figures is similar. Find the missing side length to the nearest tenth.

81. $x = 4 \text{ cm}$	82. $x = 4 \text{ in}$	83. $x = 5.\overline{3} \text{ ft}$
84. $j \approx 18.3 \text{ mm}$	85. $y = 13.5 \text{ in}$	86. $f = 6.25 \text{ cm}$

Find the missing side length in each right triangle to the nearest tenth. Show your work!

87. $a = 6, b = 8, c = ?$ $c = 10 \text{ units}$	88. $a = ?, b = 9 \text{ cm}, c = 13 \text{ cm}$ $a \approx 9.4 \text{ cm}$	89. $a = 7, b = ?, c = 14$ $b \approx 12.1 \text{ units}$	90. $a = 14 \text{ in}, b = 14 \text{ in}, c = ?$ $c \approx 19.8 \text{ in}$
91. $x = 4 \text{ units}$	92. $x \approx 14.1 \text{ mm}$	93. $x \approx 8.6 \text{ in}$	94. $x \approx 8.7 \text{ units}$
95. $x \approx 19.8 \text{ units}$	96. $x \approx 116.3 \text{ in}$	97. $x \approx 33.5 \text{ ft}$	98. $x \approx 13.3 \text{ cm}$

Determine whether or not you can form a right triangle from the given side lengths. Explain.

99. 18, 22, 26 $\text{No; } 18^2 + 22^2 \neq 26^2$	100. 5, 12, 13 $\text{Yes; } 5^2 + 12^2 = 13^2$
---	--