SCHOOL'S OUT!

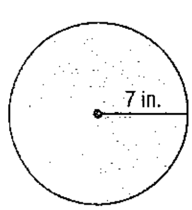
AMI Day 6: Algebra I

1. **SCHOOLS** Jefferson High School has 100 less than 5 times as many students as Taft High School. Write and evaluate an expression to find the number of students at Jefferson High School if Taft High School has 300 students.

2. **GEOGRAPHY** Guadalupe Peak in Texas has an altitude that is 671 feet more than double the altitude of Mount Sunflower in Kansas. Write and evaluate an expression for the altitude of Guadalupe Peak if Mount Sunflower has an altitude of 4039 feet.

3. **TRANSPORTATION** The Plaid Taxi Cab Company charges $1.75 per passenger plus $3.45 per mile for trips less than 10 miles. Write and evaluate an expression to find the cost for Max to take a Plaid taxi 8 miles to the airport.

4. **GEOMETRY** The area of a circle is related to the radius of the circle such that the product of the square of the radius and a number π gives the area. Write and evaluate an expression for the area of a circular pizza below. Approximate π as 3.14.



5. **BIOLOGY** Lavania is studying the growth of a population of fruit flies in her laboratory. She notices that the number of fruit flies in her experiment is five times as large after any six-day period. She observes 20 fruit flies on October 1. Write and evaluate an expression to predict the population of fruit flies Lavania will observe on October 31.

6. **CONSUMER SPENDING** During a long weekend, Devon paid a total of x dollars for a rental car so he could visit his family. He rented the car for 4 days at a rate of $36 per day. There was an additional charge of $0.20 per mile after the first 200 miles driven.

   a. Write an algebraic expression to represent the amount Devon paid for additional mileage only.

   b. Write an algebraic expression to represent the number of miles over 200 miles that Devon drove the rented car.

   c. How many miles did Devon drive overall if he paid a total of $174 for the car rental?

AMI Day 7: Algebra I

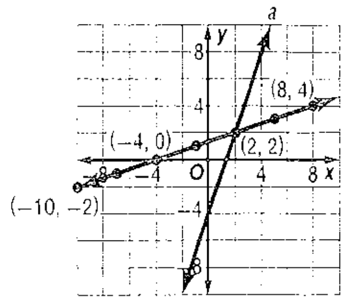
Inverse Relations An **inverse relation** is the set of ordered pairs obtained by exchanging the x-coordinates with the y-coordinates of each ordered pair. The domain of a relation becomes the range of its inverse, and the range of the relation becomes the domain of its inverse.

Example **Find and graph the inverse of the relation represented by line *a*.**

The graph of the relation passes through (–2, –10), (–1, –7), (0, –4), (1, –1), (2, 2), (3, 5), and (4, 8).

→ To find the inverse, exchange the coordinates of the ordered pairs.

The graph of the inverse passes through the points (–10, –2), (–7, –1), (–4, 0), (–1, 1), (2, 2), (5, 3), and (8, 4). Graph these points and then draw the line that passes through them.



Exercises

Find the inverse of each relation.

1. {(4, 7), (6, 2), (9, –1), (11, 3)}

2. {(–5, –9), (–4, –6), (–2, –4), (0, –3)}

3.

x	y
–8	–15
–2	–11
1	–8
5	1
11	8

4.

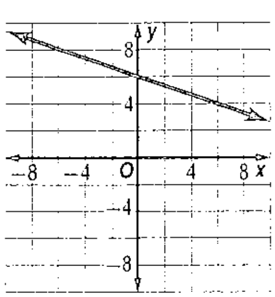
x	y
–8	3
–2	9
2	13
6	18
8	19

5.

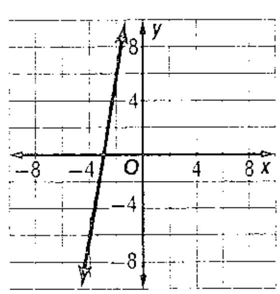
x	y
–6	14
–5	11
–4	8
–3	5
–2	2

Graph the inverse of each relation.

6.



7.



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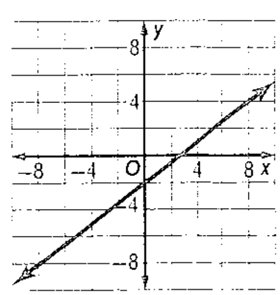


AMI Day 8: Algebra I

25% Sale

In a sale, all the prices are reduced by 25%.

1. Julie sees a jacket that cost $32 before the sale.
   How much does it cost in the sale?

   $ ________________

   Show your calculations.

In the second week of the sale, the prices are reduced by 25% of the previous week's price.
In the third week of the sale, the prices are again reduced by 25% of the previous week's price.
In the fourth week of the sale, the prices are again reduced by 25% of the previous week's price.

2. Julie thinks this will mean that the prices will be reduced to $0 after the four reductions because 4 x 25% = 100%.

   Explain why Julie is wrong.

   ____

   ____

   ____

3. If Julie is able to buy her jacket after the four reductions, how much will she have to pay?

   $ ________________

Show your calculations.

Julie buys her jacket after the four reductions.
What percentage of the original price does she save?

________________%

Show your calculations

SCHOOL'S OUT!

AMI Day 9: Algebra I

Find Slope The **slope** of a line is the ratio of change in the y-coordinates (rise) to the change in the x-coordinates (run) as you move in the positive direction.

Slope of a Line	$m = \frac{\text{rise}}{\text{run}}$ or $m = \frac{y_2 - y_1}{x_2 - x_1}$, where (x_1, y_1) and (x_2, y_2) are the coordinates of any two points on a nonvertical line

Example 1 **Find the slope of the line that passes through (−3, 5) and (4, −2).**

Let $(-3, 5) = (x_1, y_1)$ and $(4, -2) = (x_2, y_2)$.

$m = \frac{y_2 - y_1}{x_2 - x_1}$ Slope formula

$= \frac{-2 - 5}{4 - (-3)}$ $y_2 = -2, y_1 = 5, x_2 = 4, x_1 = -3$

$= \frac{-7}{7}$ Simplify.

$= -1$

Example 2 **Find the value of r so that the line through (10, r) and (3, 4) has a slope of $-\frac{2}{7}$.**

$m = \frac{y_2 - y_1}{x_2 - x_1}$ Slope formula

$-\frac{2}{7} = \frac{4 - r}{3 - 10}$ $m = -\frac{2}{7}, y_2 = 4, y_1 = r, x_2 = 3, x_1 = 10$

$-\frac{2}{7} = \frac{4 - r}{-7}$ Simplify.

$-2(-7) = 7(4 - r)$ Cross multiply.

$14 = 28 - 7r$ Distributive Property

$-14 = -7r$ Subtract 28 from each side.

$2 = r$ Divide each side by −7.

Exercises

Find the slope of the line that passes through each pair of points.

1. (4, 9), (1, 6)

2. (−4, −1), (−2, −5)

3. (−4, −1), (−4, −5)

4. (2, 1), (8, 9)

5. (14, −8), (7, −6)

6. (4, −3), (8, −3)

7. (1, −2), (6, 2)

8. (2, 5), (6, 2)

9. (4, 3.5), (−4, 3.5)

Find the value of r so the line that passes through each pair of points has the given slope.

10. (6, 8), (r, −2), $m = 1$

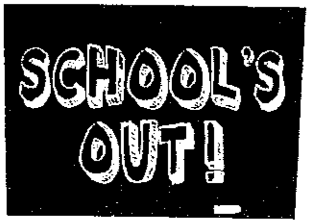
11. (−1, −3), (7, r), $m = \frac{3}{4}$

12. (2, 8), (r, −4) $m = -3$

13. (7, −5), (6, r), $m = 0$

14. (r, 4), (7, 1), $m = \frac{3}{4}$

15. (7, 5), (r, 9), $m = 6$



AMI Day 10: Algebra I

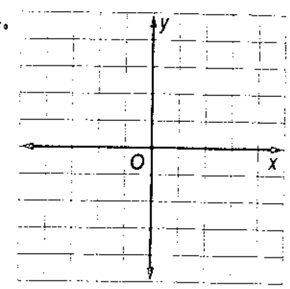
1. Determine whether $y = 2x - 1$ is a linear equation. If so, write the equation in standard form. 1. ______

2. **MULTIPLE CHOICE** What is the y-intercept when $3x - 2y = -6$ is graphed?

   A -3 **B** -2 **C** 2 **D** 3 2. ______

3. The distance d in miles that a car travels in t hours at a rate of 58 miles per hour is given by the equation $d = 58t$. What is the best estimate of how far a car travels in 7 hours? 3. ______

4. Graph $3x - y = 3$. 4.



5. Solve $3x - 45 = 0$. 5. ______

Find the slope of the line passing through each pair of points.

1. (5, 8) and (−4, 6) 2. (9, 4) and (5, −3) 1. ______ 2. ______

3. **MULTIPLE CHOICE** Which value of r gives the line passing through (3, 2) and (r, −4) a slope of $\frac{3}{2}$?

   A -6 **B** -1 **C** 7 **D** 12 3. ______

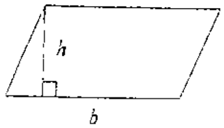
4. Determine whether the function is linear. Write linear or not linear. 4. ______

x	y
0	1
−2	−1
−4	1

5. In 2004, there were approximately 275 students in the Delaware High School band. In 2010, that number increased to 305. Find the annual rate of change in the number of students in the band. 5. ______

Mathematics Reference Sheet

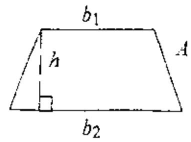
Parallelogram



$P =$ sum of all sides

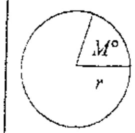
$A = bh$

Trapezoid



$A = \frac{h(b_1 + b_2)}{2}$

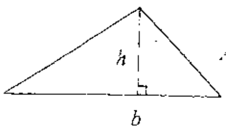
Arc and Sector



Arc Length $= \left(\frac{M}{360}\right) \times 2\pi r$

Sector area $= \left(\frac{M}{360}\right) \times \pi r^2$

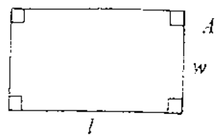
Triangle



$P =$ sum of all sides

$A = \frac{bh}{2}$

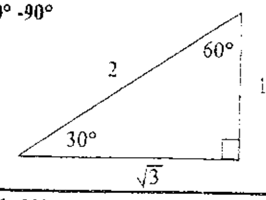
Rectangle



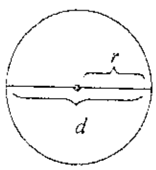
$P = 2l + 2w$

$A = lw$

30° -60° -90°



Circle



$C = 2\pi r$

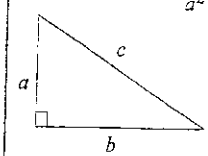
$C = \pi d$

$A = \pi r^2$

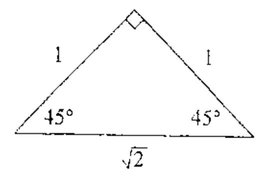
$\pi = 3.14$

Pythagorean Theorem

$a^2 + b^2 = c^2$

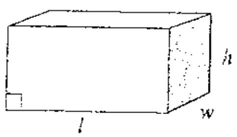


45° -45° -90°



Rectangular Solid

Volume $= lwh$

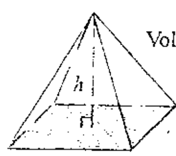


Surface area $= 2lw + 2lh + 2wh$

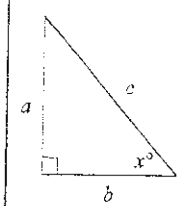
Pyramid

$B =$ *area of base (shaded)*

Volume $= \frac{Bh}{3}$



Trigonometric Ratios

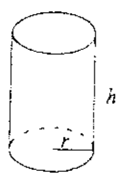


$\sin x° = \frac{a}{c}$

$\cos x° = \frac{b}{c}$

$\tan x° = \frac{a}{b}$

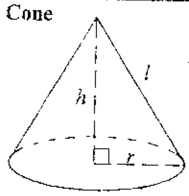
Cylinder



Volume $= \pi r^2 h$

Surface area $= 2\pi rh + 2\pi r^2$

Cone

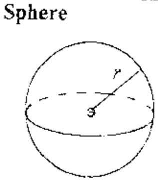


$l =$ slant height

Volume $= \frac{\pi r^2 h}{3}$

Surface area $= \pi rl + \pi r^2$

Sphere



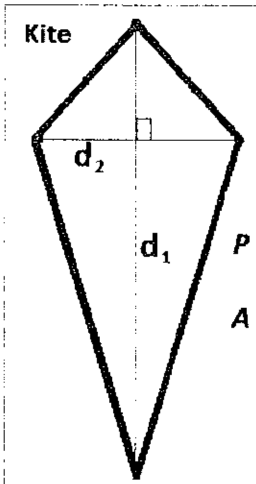
Volume $= \frac{4\pi r^3}{3}$

Surface area $= 4\pi r^2$

Miscellaneous Formulas

Area of an equilateral triangle	$A = \frac{s^2\sqrt{3}}{4}$ s = length of a side
Distance	rate × time
Interest	principal × rate × time in years
Sum of the angles of a polygon having n sides	$(n - 2)180°$
Distance between points on a coordinate plane	$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$
Midpoint	$\left(\frac{x_2 + x_1}{2}, \frac{y_2 + y_1}{2}\right)$
Slope of a nonvertical line (where $x_2 \neq x_1$)	$m = \frac{y_2 - y_1}{x_2 - x_1}$
Slope intercept (where m = slope, b = intercept)	$y = mx + b$
Last term of an arithmetic series Last term of a geometric series (where $n \geq 1$)	$a_n = a + (n - 1)d$ $a_n = ar^{n-1}$
Quadratic formula	$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$
Area of a square	$A = s^2$
Volume of a cube	$V = s^3$
Area of a regular polygon	$A = \frac{1}{2}ap$ a = apothem, p = perimeter

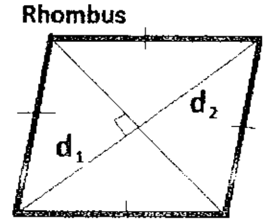
Kite



$P =$ sum of all sides

$A = \frac{1}{2} \cdot d_1 \cdot d_2$

Rhombus



$P =$ sum of all sides

$A = \frac{1}{2} \cdot d_1 \cdot d_2$

AMI Day 11: Algebra I

Equations

Solve Equations A mathematical sentence with one or more variables is called an **open sentence**. Open sentences are **solved** by finding replacements for the variables that result in true sentences. The set of numbers from which replacements for a variable may be chosen is called the **replacement set**. The set of all replacements for the variable that result in true statements is called the **solution set** for the variable. A sentence that contains an equal sign, =, is called an **equation**.

Example 1 **Find the solution set of $3a + 12 = 39$ if the replacement set is {6, 7, 8, 9, 10}.**

Replace a in $3a + 12 = 39$ with each value in the replacement set.

$3(6) + 12 \stackrel{?}{=} 39 \rightarrow 30 \neq 39$ false

$3(7) + 12 \stackrel{?}{=} 39 \rightarrow 33 \neq 39$ false

$3(8) + 12 \stackrel{?}{=} 39 \rightarrow 36 \neq 39$ false

$3(9) + 12 \stackrel{?}{=} 39 \rightarrow 39 = 39$ true

$3(10) + 12 \stackrel{?}{=} 39 \rightarrow 42 \neq 39$ false

Since $a = 9$ makes the equation $3a + 12 = 39$ true, the solution is 9.

The solution set is {9}.

Example 2 **Solve $\frac{2(3+1)}{3(7-4)} = b$.**

$\frac{2(3+1)}{3(7-4)} = b$ Original equation

$\frac{2(4)}{3(3)} = b$ Add in the numerator; subtract in the denominator.

$\frac{8}{9} = b$ Simplify.

The solution is $\frac{8}{9}$.

Exercises

Find the solution of each equation if the replacement sets are $x = \left\{\frac{1}{4}, \frac{1}{2}, 1, 2, 3\right\}$ and $y = \{2, 4, 6, 8\}$.

1. $x + \frac{1}{2} = \frac{5}{2}$

2. $x + 8 = 11$

3. $y - 2 = 6$

4. $x^2 - 1 = 8$

5. $y^2 - 2 = 34$

6. $x^2 + 5 = 5\frac{1}{16}$

7. $2(x + 3) = 7$

8. $(y + 1)^2 = 9$

9. $y^2 + y = 20$

Solve each equation.

10. $a = 2^3 - 1$

11. $n = 6^2 - 4^2$

12. $w = 6^2 \cdot 3^2$

13. $\frac{1}{4} + \frac{5}{8} = k$

14. $\frac{18-3}{2+3} = p$

15. $t = \frac{15-6}{27-24}$

16. $18.4 - 3.2 = m$

17. $k = 9.8 + 5.7$

18. $c = 3\frac{1}{2} + 2\frac{1}{4}$

AMI Day 12: Algebra I

Write an Equation Given the Slope and a Point

Example 1 **Write an equation of the line that passes through (−4, 2) with a slope of 3.**

The line has slope 3. To find the y-intercept, replace m with 3 and (x, y) with (−4, 2) in the slope-intercept form. Then solve for b.

$y = mx + b$	Slope-intercept form
$2 = 3(-4) + b$	$m = 3$, $y = 2$, and $x = -4$
$2 = -12 + b$	Multiply.
$14 = b$	Add 12 to each side.

Therefore, the equation is $y = 3x + 14$.

Example 2 **Write an equation of the line that passes through (−2, −1) with a slope of $\frac{1}{4}$.**

The line has slope $\frac{1}{4}$. Replace m with $\frac{1}{4}$ and (x, y) with $(-2, -1)$ in the slope-intercept form.

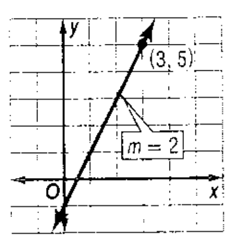
$y = mx + b$	Slope-intercept form
$-1 = \frac{1}{4}(-2) + b$	$m = \frac{1}{4}$, $y = -1$, and $x = -2$
$-1 = -\frac{1}{2} + b$	Multiply.
$-\frac{1}{2} = b$	Add $\frac{1}{2}$ to each side.

Therefore, the equation is $y = \frac{1}{4}x - \frac{1}{2}$.

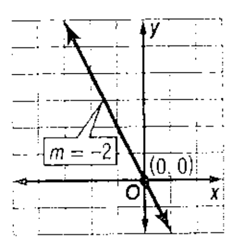
Exercises

Write an equation of the line that passes through the given point and has the given slope.

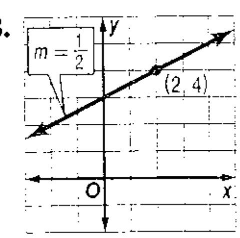
1.



2.



3.



4. (8, 2); slope $-\frac{3}{4}$

5. (−1, −3); slope 5

6. (4, −5); slope $-\frac{1}{2}$

7. (−5, 4); slope 0

8. (2, 2); slope $\frac{1}{2}$

9. (1, −4); slope −6

10. $(-3, 0)$, $m = 2$

11. $(0, 4)$, $m = -3$

12. $(0, 350)$, $m = \frac{1}{5}$

AMI Day 13: Algebra I

Divide Monomials To divide two powers with the same base, subtract the exponents.

Quotient of Powers	For all integers m and n and any nonzero number a, $\frac{a^m}{a^n} = a^{m-n}$.
Power of a Quotient	For any integer m and any real numbers a and b, $b \neq 0$, $\left(\frac{a}{b}\right)^m = \frac{a^m}{b^m}$.

Example 1 **Simplify $\frac{a^4b^7}{ab^2}$. Assume that no denominator equals zero.**

$\frac{a^4b^7}{ab^2} = \left(\frac{a^4}{a}\right)\left(\frac{b^7}{b^2}\right)$ Group powers with the same base.

$= (a^{4-1})(b^{7-2})$ Quotient of Powers

$= a^3b^5$ Simplify.

The quotient is a^3b^5.

Example 2 **Simplify $\left(\frac{2a^3b^5}{3b^2}\right)^3$. Assume that no denominator equals zero.**

$\left(\frac{2a^3b^5}{3b^2}\right)^3 = \frac{(2a^3b^5)^3}{(3b^2)^3}$ Power of a Quotient

$= \frac{2^3(a^3)^3(b^5)^3}{(3)^3(b^2)^3}$ Power of a Product

$= \frac{8a^9b^{15}}{27b^6}$ Power of a Power

$= \frac{8a^9b^9}{27}$ Quotient of Powers

The quotient is $\frac{8a^9b^9}{27}$.

Exercises

Simplify each expression. Assume that no denominator equals zero.

1. $\frac{5^5}{5^2}$

2. $\frac{m^6}{m^4}$

3. $\frac{p^5n^4}{p^2n}$

4. $\frac{a^2}{a}$

5. $\frac{x^5y^3}{x^5y^2}$

6. $\frac{-2y^7}{14y^5}$

7. $\frac{xy^6}{y^4x}$

8. $\left(\frac{2a^2b}{a}\right)^3$

9. $\left(\frac{4p^4r^4}{3p^2r^2}\right)^3$

10. $\left(\frac{2r^5w^3}{r^4w^3}\right)^4$

11. $\left(\frac{3r^6n^3}{2r^5n}\right)^4$

12. $\frac{r^7n^7t^2}{n^3r^3t^2}$

SCHOOL'S OUT!

AMI Day 14: Algebra I

Solve Multi-Step Equations To solve equations with more than one operation, often called **multi-step equations**, undo operations by working backward. Reverse the usual order of operations as you work.

Example **Solve $5x + 3 = 23$.**

$5x + 3 = 23$	Original equation
$5x + 3 - 3 = 23 - 3$	Subtract 3 from each side.
$5x = 20$	Simplify.
$\frac{5x}{5} = \frac{20}{5}$	Divide each side by 5.
$x = 4$	Simplify.

Exercises

Solve each equation. Check your solution.

1. $5x + 2 = 27$

2. $6x + 9 = 27$

3. $5x + 16 = 51$

4. $14n - 8 = 34$

5. $0.6x - 1.5 = 1.8$

6. $\frac{7}{8}p - 4 = 10$

7. $16 = \frac{d - 12}{14}$

8. $8 + \frac{3n}{12} = 13$

9. $\frac{g}{-5} + 3 = -13$

10. $\frac{4b + 8}{-2} = 10$

11. $0.2x - 8 = -2$

12. $3.2y - 1.8 = 3$

13. $-4 = \frac{7x - (-1)}{-8}$

14. $8 = -12 + \frac{k}{-4}$

15. $0 = 10y - 40$

Write an equation and solve each problem.

16. Find three consecutive integers whose sum is 96.

17. Find two consecutive odd integers whose sum is 176.

18. Find three consecutive integers whose sum is -93.

AMI Day 15: Algebra I

Multiplying a Polynomial by a Monomial

Find each product.

1. $a(4a + 3)$

2. $-c(11c + 4)$

3. $x(2x - 5)$

4. $2y(y - 4)$

5. $-3n(n^2 + 2n)$

6. $4h(3h - 5)$

7. $3x(5x^2 - x + 4)$

8. $7c(5 - 2c^2 + c^3)$

9. $-4b(1 - 9b - 2b^2)$

10. $6y(-5 - y + 4y^2)$

11. $2m^2(2m^2 + 3m - 5)$

12. $-3n^2(-2n^2 + 3n + 4)$

Simplify each expression.

13. $w(3w + 2) + 5w$

14. $f(5f - 3) - 2f$

15. $-p(2p - 8) - 5p$

16. $y^2(-4y + 5) - 6y^2$

17. $2x(3x^2 + 4) - 3x^3$

18. $4a(5a^2 - 4) + 9a$

19. $4b(-5b - 3) - 2(b^2 - 7b - 4)$

20. $3m(3m + 6) - 3(m^2 + 4m + 1)$

Solve each equation.

21. $3(a + 2) + 5 = 2a + 4$

22. $2(4x + 2) - 8 = 4(x + 3)$

23. $5(y + 1) + 2 = 4(y + 2) - 6$

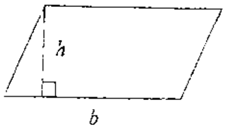
24. $4(b + 6) = 2(b + 5) + 2$

25. $6(m - 2) + 14 = 3(m + 2) - 10$

26. $3(c + 5) - 2 = 2(c + 6) + 2$

Mathematics Reference Sheet

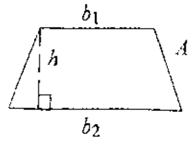
Parallelogram



$P =$ sum of all sides

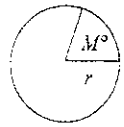
$A = bh$

Trapezoid



$A = \frac{h(b_1 + b_2)}{2}$

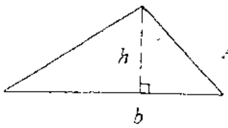
Arc and Sector



Arc Length $= \left(\frac{M}{360}\right) \times 2\pi r$

Sector area $= \left(\frac{M}{360}\right) \times \pi r^2$

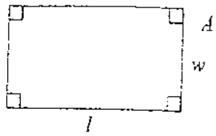
Triangle



$P =$ sum of all sides

$A = \frac{bh}{2}$

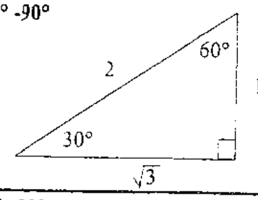
Rectangle



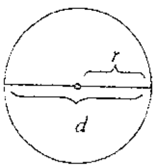
$P = 2l + 2w$

$A = l \cdot w$

30° -60° -90°



Circle



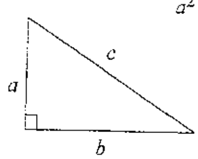
$C = 2\pi r$

$C = \pi d$

$A = \pi r^2$

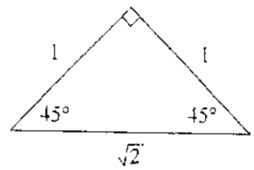
$\pi \approx 3.14$

Pythagorean Theorem

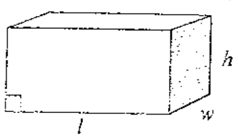


$a^2 + b^2 = c^2$

45° -45° -90°



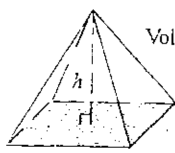
Rectangular Solid



Volume $= lwh$

Surface area $= 2lw + 2lh + 2wh$

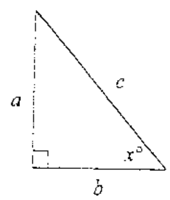
Pyramid



$B =$ *area of base (shaded)*

Volume $= \frac{Bh}{3}$

Trigonometric Ratios

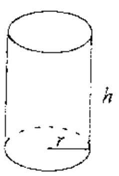


$\sin x° = \frac{a}{c}$

$\cos x° = \frac{b}{c}$

$\tan x° = \frac{a}{b}$

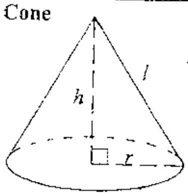
Cylinder



Volume $= \pi r^2 h$

Surface area $= 2\pi rh + 2\pi r^2$

Cone

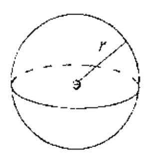


$l =$ slant height

Volume $= \frac{\pi r^2 h}{3}$

Surface area $= \pi rl + \pi r^2$

Sphere



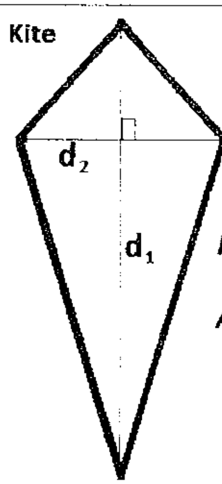
Volume $= \frac{4\pi r^3}{3}$

Surface area $= 4\pi r^2$

Miscellaneous Formulas

Area of an equilateral triangle	$A = \frac{s^2\sqrt{3}}{4}$ s = length of a side
Distance	rate × time
Interest	principal × rate × time in years
Sum of the angles of a polygon having n sides	$(n-2)180°$
Distance between points on a coordinate plane	$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$
Midpoint	$\left(\frac{x_2 + x_1}{2}, \frac{y_2 + y_1}{2}\right)$
Slope of a nonvertical line (where $x_2 \neq x_1$)	$m = \frac{y_2 - y_1}{x_2 - x_1}$
Slope intercept (where m = slope, b = intercept)	$y = mx + b$
Last term of an arithmetic series Last term of a geometric series (where $n \geq 1$)	$a_n = a + (n-1)d$ $a_n = ar^{n-1}$
Quadratic formula	$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$
Area of a square	$A = s^2$
Volume of a cube	$V = s^3$
Area of a regular polygon	$A = \frac{1}{2}ap$ a = apothem, p = perimeter

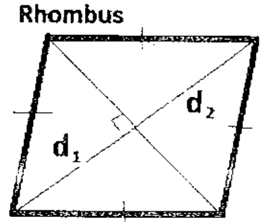
Kite



$P =$ sum of all sides

$A = \frac{1}{2} \cdot d_1 \cdot d_2$

Rhombus



$P =$ sum of all sides

$A = \frac{1}{2} \cdot d_1 \cdot d_2$