1.1 Whole Numbers and Rounding

Roundig-off Rule for Whole Numbers

1. Look at the single digit just to the right of the digit that is in the place of desired accuracy.
2. If this digit is 5 or greater, make the digit in the desired place of accuracy one larger, and replace all digits to the right with zero. All digit to the left remain unchanged unless a 9 is made one larger; then the next digit to the left is increased by 1.
3. If this digit is less than 5, leave the digit that is in place of desired accuracy as it is, and Replace all digits to the right with zeros. All digits to the left remained unchanged.

Round off as indicated.

To the nearest the ten.

1. 41 2. 604 3. 247

To the nearest hundred.

1. 5475 2. 3890 3. 3003

To the nearest thousand.

1. 5500 2. 6455 3. 57,800

To the nearest ten thousand.

1. 125,003 2. 63,300 3. 715,000

1.3 Multiplication and Division with whole Numbers

Find the following product.

1. $47 \times 75$

2. $450 \times 203$

Divide by using the division algorithm.

1. $305 \div 20$

2. $4560 \div 213$

Application

If your income for 1 year was $77,412, what was your monthly income?

1.4 Applications

Key Words That Indicated Operations

| Addition | Subtraction | Multiplication | Division |
|---|---|---|---|

1. The difference between 9000 and 1856 is added to 635. If this sum is multiplied by 400, what is the product?

2. The quotient of 670 and 5 us decreased by 120, what is the difference?

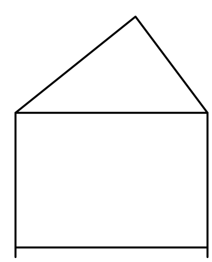
3. Raph decided to go shopping for school clothes before college started in fall. How much id he spend if he bought four pair of pants for $75.00 a pair, five shirts for $45.00 each, three pair of shocks for $6.00 a pair, and two pairs of shoes for $98.00 a pair.

Geometry

1. a) Find the perimeter of (distance around) a rectangle that has a width of 18 meters and a length of 25 meters.

   b) Also find its area

2. An isosceles triangle (two sides equal is placed on top of a square to form a window, as show in the figure). If each of the two equal sides of the triangle is 14 inches long and the square is 18 inches on each side, what is the perimeter of window?



2.3 Subtraction with Integers

Definition: The opposite of an integer is called its additive inverse. The sum of an integer and its additive inverse is 0. For any integer a,

Perform the indicated operation.

1. $-8-(-4)$

2. $(-2)+(-15)$

3. $0-(-9)$

4. $-3-(-3)+(-2)$

5. $-40+15$

6. $-7-(-10)$

7. $-21-5-8+(-2)$

8. $35-22-8+7-30$

2.4 Multiplication and Division with Integers and order of operations
Multiplication Rules

The product of 0 and any integer is 0.

Find the products.

1. $(-6)(4)$

2. $(21)(3)$

3. $(-6)(-3)$

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

5. $(-1)(-2)(-6)(-3)(-1)(-5)(0)$

Division Rules

Find th following quotients.

1. $\frac{-18}{6}$

2. $\frac{-28}{-7}$

3. $\frac{16+8}{-8}$

4. $\frac{9+27}{-9}$

5. $\frac{-13-26}{-13}$

6. $\frac{0}{8}$

7. $\frac{56}{0}$

Find the value of each expression by following the rules for order operations. (PEMDAS)

1. $-36 \div (-2)^2 + 15 - 2(16-17)$

2. $(9-11)\left[(-10)^2 \bullet 2 + 6(-5)^2 - 10^3\right]$

2.5 Applications

Change in Value=(End Value)-(Beginning Value)

1. At noon the temperature at the top of a mountain was $30^0 F$ . By midnight the temperature was $-6^0 F$. What was change in temperature from noon to midnight?

2. On Monday, the stock of a computer company sold at the market price of $\$56$ per share. By Friday, the stock had dropped to $\$48$ per share. Find the change in the price of the stock.

Find the average
The average of a set of number is the set value found by adding the numbers in the set, then dividing this sum by the number of numbers in the set.

For example, find the average: -25, 30, -15, -6, -26, -18

In a weight lifting program, two men bench pressed 300 pounds, three men benched 350 pounds, and 5 men bench pressed 400 pounds. What was the average number of pounds that these men bench pressed?

2.6 Introduction to Like Terms and Polynomials

Like Terms (or similar terms) are terms that contain the same variable (if any) raised to the same powers.

Distributive Property of Multiplication Over Addtion
For any integers $a,b,c$ $a(b+c)=$

Examples
1. $4(x-2)$ 2. $-9(y-4)$

Simplify each of the following expressions by combining like terms whenever possible.
1. $9x-4x$ 2. $-x-x$ 3. $12x+6-x-2$ 4. $x^2-3x^2+5x-3+1$

5. $3(y+4)+5(y-2)$ 6. $2(x^2-x+3)+5(x^2+2x-3)$

7. $8xy^2+2xy^2-7xy+xy+2x$

First simplify each polynomial, and then evaluate the polynomial for $x=-2$ and $y=-1$.
1. $2x^2-3x^2+5x-8+1$ 2. $y^2+2y^2+2y-3y$

First simplify each polynomial, and then evaluate the polynomial for $a=-1$, $b=-2$, and $c=3$.
1. $5ab-7a+4ab+2b$ 2. $-9abc+3abc-abc+2ab-bc+3bc+15$

Find the value of each of the following expressions.
1. $-5^3$ 2. $(-5)^3$ 3. $-5^4$ 4. $(-5)^4$

3.1 Tests for Divisibility
Definition:

Test for Divisibility of Integers by 2, 3, 5, 6, 9 and 10.

For 2: If the last digit (units digit) of an integer is 0, 2, 4, 6, or 8, the integer is divisible By 2.

For 3: If the sum of the digits of an integer is divisible by 3, then the integer is divisible by 3.

For 5: If the last digit of an integer is 0 or 5, then the integer is divisible by 5.

For 6: If the integer is divisible by both 2 and 3, then it is divisible by 6.

For 9: If the sum of the digit of an integer is divisible by 9, then the integer is divisible by 9.

For 10: If the last digit of an integer is 0, then the integer is divisible by 10.

Even and odd integers

Even integers are divisible by 2. (If an integer is divided by 2 and the remainder is 0, the integer is even).

$\{.........-6,-4,-2,2,4,6.....\}$

Odd integers are not divisible by 2. (If an integer is divided by 2 and the remainder is 1, then the integer is odd.

Determine which of the numbers 2, 3, 5, 6, 9 and 10 (if any) will divide exactly into each of the following integers.

1. 92

2. -344

3. 675

3.2 Prime Numbers
Definition:

**A prime numbe**r is a counting number greater than 1 that has only 1 and itself as factors.

A composite number is a counting number with more than two factors (or divisors).

Note: 1 is neither a prime nor a composite number. $1 = 1 \bullet 1$ and 1 is the only factor of $1 \bullet 1$ does not have exactly two factors.

List the first five multiples of each of the following numbers.

1. 6,

2. 12,

List all numbers less than 50.

State the number below. If the number is composite, find at least two pairs of factors whose product is that number.

1. 23 2. 55 3. 205 4. 97

Find two factors of the first number such that their product is the first number and their sum is the second number.

1. 16,10 2. 20,12 3. 36,13

4. 25,10 5. 72, 27 6. 75, 28

## 3.3 Prime Factorization

The Fundamental Theorem of Arithmetic

Every composite number has exactly one prime factorization.

To find the Prime Factorization of a composite number.

1. Factor the composite number into any two factors.
2. Factor each factor that is not prime.
3. Continue this process until all factors are prime.

The prime factorization is the product of all the prime factors.

Find the prime factorization each of the following numbers. Use the tests for divisibility for 2, 3, 5, 6, 9, and 10, whenever they help, to find beginning factors.

1. 44

2. 36

3. 80

4. 125

5. 225

6. 700

7. 216

8. 10,000

## 3.4 Least Common Multiple (LCM)

To find the LCM of a set of counting numbers.
1. Find the prime factorization of each number.
2. Find the prime factors that appear in anyone of the prime factorization.
3. Form the product of these primes using each prime the most number of times it appears in any one of the prime factorization.

Find the LCM.

1. 2, 7, 11

2. 9, 12

3. 10, 12, 20

4. 50, 80

5. 15, 45, 90

6. 35, 40, 72

Find the LCM of each of the following sets of algebraic terms.

1. 25xy, 40xyz

2. $20a^2b,\ 50ab^3$

3. 10x, $15x^2$, 20xy

4. 20xyz, $25xy^2$, $35x^2z$

5. 15x, $25x^2$, $30x^3$, $40x^4$

3.5 Reducing and Multiplication with Fraction

Definition

A rational number is a number that can be written in the form $\frac{a}{b}$ where a and b are integers and $b \neq 0$.

Rules for the placement of Negative Signs

If a and b are integers and $b \neq 0, then \ -\frac{a}{b} =$

To multiply Fractions

1.

2.

Commutative Property of Multiplication

If $\frac{a}{b}$ and $\frac{c}{d}$ are rational numbers, then

Associative Property of Multiplication

If $\frac{a}{b}, \frac{c}{d},$ and $\frac{e}{f}$ are rational numbers, then

1. Find $\frac{1}{3} of -\frac{1}{4}$ 2. Find $\frac{1}{9} of \frac{2}{3}$

Find the following products.

1. $\frac{4}{5} \bullet \frac{3}{7}$ 2. $\frac{3}{8} \bullet \frac{0}{16}$ 3. $\frac{4}{7} \bullet \frac{2}{5} \bullet \frac{6}{13}$

Raise each fraction to higher terms as indicated. Find the values of the missing numbers.

1. $\frac{2}{3} = \frac{2}{3} \bullet \frac{}{} = \frac{}{12}$ 2. $\frac{-3x}{16y} = \frac{-3x}{16y} \bullet \frac{}{} = \frac{}{80xy}$

Reduce each fraction to lowest terms.

1. $\frac{14}{36}$ 2. $-\frac{7n}{28n}$ 3. $\frac{6y^2}{-51y}$ 4. $\frac{-24a^2b}{-100a}$

Multiply and reduce each product to the lowest term.

1. $\frac{-23}{36} \bullet \frac{20}{46}$ 2. $\frac{-42x}{52xy} \bullet \frac{-27}{22x} \bullet \frac{33}{9}$

3. $\frac{17n}{8m} \bullet \frac{-5mn}{42n} \bullet \frac{18}{51} \bullet 4m^2$

3.6 Division with Fractions

Definition

The reciprocal of $\frac{a}{b}$ is $\quad (a \# 0$ and $b \neq 0)$

The product of a nonzero number and its reciprocal is always 1.

Note: The number 0 has no reciprocal. That is $\frac{0}{1}$ has no reciprocal because $\frac{1}{0}$ is undefined.

To divide by any nonzero number, multiply by its reciprocal. In general,

Find the following quotients. Reduce to lowest terms whenever possible.

1. $\frac{1}{3} \div \frac{1}{5}$

2. $\frac{9}{10} \div \frac{10}{9}$

3. $0 \div \frac{5}{6}$

4. $\frac{15}{64} \div 0$

5. $\frac{-15}{27} \div \frac{5}{9}$

6. $\frac{16x}{20y} \div \frac{18x}{10y}$

7. $\frac{19a}{24b} \div \frac{5a}{8b}$

8. $25y \div \frac{1}{5y}$

9. $-50b \div \frac{1}{2}$

10. $\frac{-26x^2}{35} \div \frac{39x}{40}$

3.7 Addition and Subtraction with Fractions

To add two or more Fractions with the same Denominator

1. Add the numerators.
2. Keep the common denominator.
3. Reduce, if possible.

To Add Fractions with Different Denominators

1. Find the least common denominator (LCD).
2. Change each fraction into equal fraction with that denominator.
3. Add the new fractions.
4. Reduce, if possible.

Similar with Subtraction

Find the indicated products and sums.

1 .a) $\frac{8}{9} \bullet \frac{8}{9}$ 2. a) $\frac{6}{10} \bullet \frac{6}{10}$

b) $\frac{8}{9} + \frac{8}{9}$ b) $\frac{6}{10} + \frac{6}{10}$

Find the indicated sums and differences, and reduce all answers to lowest terms.

1. $\frac{1}{10} + \frac{3}{10}$ 2. $\frac{2}{5} + \frac{3}{10}$ 3. $\frac{2}{39} + \frac{1}{3} + \frac{4}{13}$

4. $-\frac{1}{3} - \frac{2}{15}$ 5. $\frac{14}{45} - \frac{12}{30}$ 6. $\frac{1}{8} - \left(-\frac{5}{12}\right) - \frac{3}{4}$

Find the indicated algebraic sums and differences.

1. $\frac{x}{2}+\frac{3}{5}$

2. $\frac{3}{8}+\frac{5}{x}$

3. $a-\frac{5}{16}$

4. $\frac{6}{7}+\frac{1}{x}+\frac{7}{x}$

5. $\frac{1}{a}+\frac{5}{8}+\frac{1}{12}$

4.1 Introduction to Mixed Numbers

A mixed number is the sum of a whole number and a fraction.

Short cut for changing Mixed Numbers to Fraction Form:

1. Multiply the whole number by the denominator of the fraction part.
2. Add the numerator of the fraction part of this product.
3. Write this sum over the denominator of the fraction..

Change each mixed number to fraction form, and reduce if possible.

1. $3\frac{5}{8}$ 2. $12\frac{1}{2}$ 3. $15\frac{1}{3}$

4. $7\frac{2}{5}$ 5. $5\frac{3}{10}$ 6. $3\frac{931}{1000}$

To change an improper fraction to a mixed number:

1. Divide the numerator by the denominator to find the whole number part of the mixed number.
2. Write the remainder over the denominator as the fraction part of the mixed number.

Change each fraction to mixed number form with the fraction part reduced to lowest terms.

1. $\frac{45}{30}$ 2. $\frac{105}{14}$ 3. $\frac{80}{64}$

4. $\frac{87}{51}$ 5. $\frac{70}{14}$ 6. $\frac{125}{100}$

4.2 Multiplication and Division with mixed Numbers

To Multiply Mixed Numbers:

1. Change each number to fraction form.
2. Multiply by factoring numerators and denominators, and then reduce.
3. Change the answer to a mixed number or leave it in fraction form.

Similarly with Divide Mixed Number

Find the indicated products and your answers in mixed number form.

1. $\left(2\frac{1}{3}\right)\left(3\frac{1}{2}\right)$

2. $\left(6\frac{2}{3}\right)\left(5\frac{1}{7}\right)$

3. $\left(6\frac{3}{8}\right)\left(2\frac{2}{17}\right)$

4. $\left(4\frac{3}{4}\right)\left(2\frac{1}{5}\right)\left(1\frac{1}{7}\right)$

5. $\left(-2\frac{1}{16}\right)\left(-4\frac{1}{3}\right)\left(-1\frac{3}{11}\right)$

Find the indicated quotients, and write your answers in mixed number form.

1. $3\frac{1}{10} \div 2\frac{1}{2}$

2. $\left(-2\frac{1}{7}\right) \div \left(2\frac{1}{17}\right)$

3. $7\frac{1}{5} \div (-3)$

4. $\left(-6\frac{3}{11}\right) \div \left(-\frac{3}{4}\right)$

4.3 Addition and Subtraction with Mixed Numbers

To add mixed numbers.

1. Add the fraction parts.
2. Add the whole numbers.
3. Write the mixed number so that the fraction is less than 1.

1. $7\frac{1}{2}+6\frac{1}{2}$

2. $18+1\frac{4}{5}$

3. $3\frac{1}{4}+5\frac{3}{8}$

4. $7\frac{3}{8}+5\frac{7}{12}$

5. $15\frac{1}{4}+5\frac{7}{24}+6\frac{1}{8}$

To subtract mixed numbers:
1. Subtract the fraction parts.
2. Subtract the whole numbers.

1. $8\frac{9}{10}-4\frac{3}{10}$

If the fraction part being subtracted is larger than the first fraction.
1. "Borrow" the whole number, 1, from the first whole number.

2. Add this 1 to the first fraction. (This will always result in an impropert fraction, that is larger than the fraction being subtracted.)

3. Now Subtract.

1. $20\frac{3}{4}-16\frac{3}{4}$

2. $10\frac{5}{16}-7\frac{1}{4}$

3. $71\frac{5}{12}-55\frac{7}{16}$

4. $10-\frac{9}{10}$

5. $-2\frac{1}{4}-3\frac{1}{5}$

6. $-6\frac{1}{2}-\left(-10\frac{3}{4}\right)$

7. $-9\frac{1}{9}+2\frac{5}{18}$

8. $-6\frac{1}{3}-8\frac{3}{7}-4\frac{1}{9}$

4.4 Complex Fractions and Order of Operation

A complex fraction is a fraction in which the numerator or denominator or both contain one or more fractions or mixed numbers.

Simplify.

1. $\dfrac{\frac{5}{8}}{3}$

2. $\dfrac{\frac{a}{6}}{\frac{2a}{3}}$

3. $\dfrac{\frac{5}{12}+\frac{1}{15}}{6}$

4. $\dfrac{1\frac{7}{12}+2\frac{1}{3}}{\frac{1}{5}-\frac{2}{15}}$

5. $\dfrac{-12x}{\frac{1}{2}+\frac{1}{10}}$

6. $\dfrac{31\frac{1}{4}}{20\frac{1}{5}+11\frac{1}{2}}$

Order of Operations
Use the rules for order of operations to simplify each of the following expressions.

1. $\frac{1}{2} \div \frac{1}{4} - \frac{2}{3} \bullet 18 + 5$

2. $\frac{5}{9} - \frac{1}{3} \bullet \frac{2}{3} + 6\frac{1}{10}$

3. $\left(\frac{1}{3} - 2\right) \div \left(1 - \frac{1}{3}\right)^2$

4. $x + \frac{3}{4} + 2\frac{1}{2}$

5. $\frac{a}{3} \bullet \frac{1}{2} - \frac{2}{3} \div 1\frac{1}{3}$

4.5 Solving Equations with Fractions (ax + b=c)

Definition

A first-degree equation in x (or linear equation in x) is any equation tha can be written in the form

ax + b =c, where a, b, c are constant and $a \neq 0$.

Solve each of the following equations.

1. 2(n + 1)=-3

2. 3y + 2( y + 1) =4

3. $\frac{3}{4}x+2=17$

4. $\frac{2}{3}y-\frac{1}{5}=-2$

5. $\frac{x}{8}+\frac{1}{6}=-\frac{1}{10}$

6. $\frac{n}{3}-6=\frac{2}{3}$

7. $\frac{5}{8}x-\frac{3}{4}x=-\frac{1}{10}$

4.6 Solving Equations: Ratios and Proportions

Definition

A ratio is comparison of two quantities by division. The ratio of a to b can be written as:

Definition

A proportion is a statement that two ratios are equal. In general,

Write the following comparisons as ratios reduced to lowest terms. Use common units in the numerator and denominator when possible.

1. 15 nickels to 3 quarters

2. 8 hours to 1 day

3. 12 inches to 2 feet

4. $70 profits to $1000 invested

Solve the following proportions.

1. $\frac{3}{5} = \frac{y}{100}$

2. $\frac{a}{20} = \frac{15}{100}$

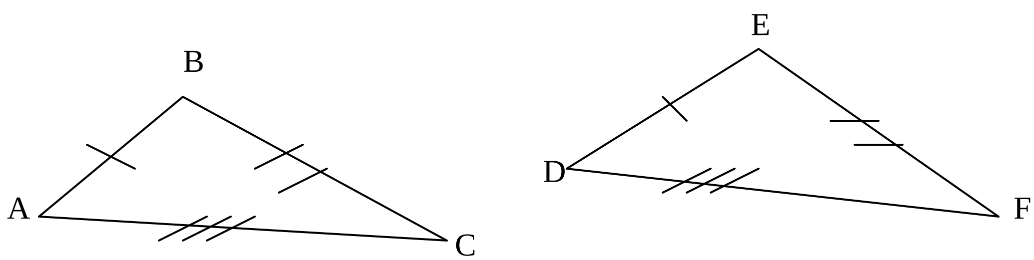
3. $\frac{3}{10} = \frac{x}{100}$

Applications

1. Investor A thinks that she should make $ 9 for every $100 she invest. How much does she expect to make on an investment of $1500.

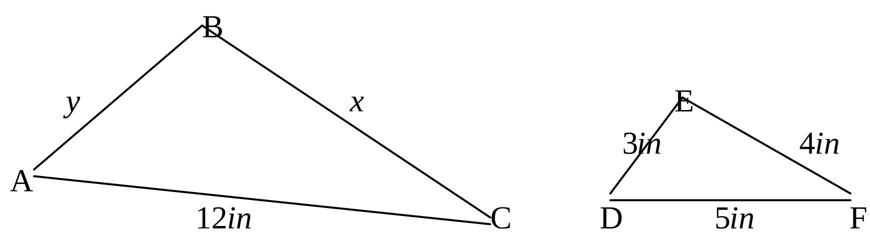
2. An electric fan makes 180 revolutions per minute. How many revolutions will the fan make if it runs for 24 hours.

Two Triangles are similars if:
1. Their corresponding angles are equal. (The corresponding angles have the same measure).
2. Their corresponding sides are proportional.




Example

1.



5.1 Reading, Writing, and Rounding off Decimal Numbers

To Read or Write a Decimal Number:

1. Read (or write) the whole number.
2. Read ( or write) and in place of the decimal point.
3. Read (or write) the fraction part as a whole number with the name of the place of the last digit on the right.

Write the following mixed numbers in decimal notation.

1. $82\frac{3}{100}$ 2. $100\frac{25}{100}$

Write the following decimal numbers in mixed numbers form. Do not reduce the fractional part.

1. 2.57 2. 38.004 3. 50.001

Write the following numbers and decimal notation.

1. Fifteen thousandths 2. Five and twenty-eight hundredths

3. Seventy-three and three hundred forty-one thousandths

4. Seven thousand five hundred and eighty-three ten-thousandths.

Write the following decimals numbers in words.
1. 0.53

2. 6.004

3. 25.4538

Round off

To the nearest tenth.
1. 8.555 2. 46.444

To the nearest hundredth:

1. 0.296

2. 13.1345

3. 6.0035

To the nearest thousandth:

1. 0.6338

2. 1.66666

# 5.2 Addition and Subtraction with Decimal Numbers

Find each of the indicated sums.

1. $0.7 + 0.3 + 2.3$

2. 43.655 + 9.33 + 12 + 30.1

3. 5.0015 + 2.334 + 0.3075 + 3.8771

Find each of the indicated differences.

1. 45.002 – 43.008

2. 40.000 – 6.425

Simplify each expression by combining like terms.

1. $9.54x - x - 12.82x$

2. 77.5y – 43.1 y -56.3y

3. -0.07x + x

4. -8.4x -3.7x + 2y – 0.1y

Solve each of the following equations.

1. x – 27.9 = 18.3 – 20

2. 20.1 + y = 16.8 + 50

3. b – 7.64 = 15.23 – 45.6

5.3 Multiplication and Division with Decimal Numbers

Find each of the indicated product.

1. (0.2) (0.8)　　2. (0.03) (0.03)　　3. (5.48) (0.02)

4. (93.1) (0.57)

To Divide Decimal Numbers

1. Move the decimal point in the divsor to the right so that the divisor is a whole number.
2. Move the decimal point in divident the same number of the place to the right.
3. Place the decimal point in the quotient directly above the new decimal point in the divident.
4. Divide just as with whole number.

Divide

1. $2.73 \div 3$　　2. $-80.24 \div 0.04$

Find the each quotient to the nearest tenth.

1. $5.682 \div 0.37$

Find each quotient to the nearest hundredth

1. $6 \div 3.381$

Find each quotient to the nearest thousandth

1. $0.0116 \div 1.62$

Find each indicated product or quotient mentally by using your knowledge of multiplication and division by powers of 10.

1. 10 (0.619)

2. 100(0.455)

3. $10^3(0.005)$

4. $\frac{169}{10}$

5. $\frac{3.25}{100}$

5.5 Decimals, Fractions, and Scientific Notation

Changing from Decimal Form to Fraction Form:

A decimal number with digits to the right of the decimal point can be written in fraction form by writing a fraction with

1. A numerator that consists of the whole number formed by all the digits of the decimal number and
2. A denominator that is the power of 10 that names the right most digit.

Change each decimal to fraction form. Do not reduce.

1. 0.6 2. 0.48 3. 0.125

Change each decimal to fraction form (or mixed number form), and reduce it if possible.

1. 0.375 2. 1.25

Change each fraction to decimal form.

1. $\frac{5}{16}$ 2. $\frac{5}{18}$

Change each fraction to decimal form rounded off to the nearest thousandth.

1. $\frac{13}{16}$

Perform the indicated operations by writing all the numbers in decimal form. Round off to the nearest thousandth if the decimal is non-terminating.

1. $\frac{3}{100}+8\frac{3}{5}+1\frac{3}{4}$

2. $\left(2\frac{1}{10}\right)^2(1.5)^2$

3. $\left(2\frac{1}{4}\right)\left(-3\frac{1}{2}\right)(4.1)$

4. $\left|22\frac{4}{5}\right|+\left|-5.8\right|$

Evaluate each of the following expressions for $x=\frac{3}{2}$ and y=$\frac{2}{3}$ (Leave your answers in mixed number).

1. $y^2-5y+6$

2. $x^2y^2+2xy-5$

5.6 Circumference and Area of Circles

Definitions:

**Circle**: The set of all points in a plane that are some fixed distance from a fixed point called the center of the circle.

**Radius**: The fixed distance from the center of a circle to any point on the circle.

**Diameter**: The distance from one point on a circle to another point on the circle measures through the center.

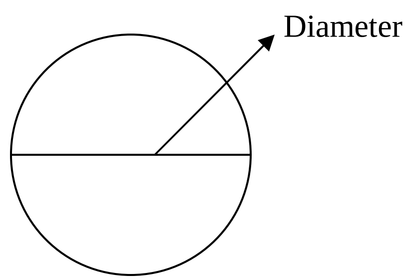
**Circumference**: Perimeter of a circle

Formulas for Circles

Circumference=

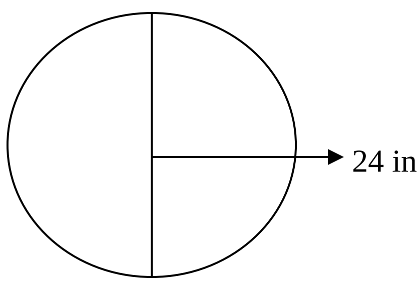
Area=

Diameter=




Find the circumference (perimeter) and the area each of the following figures.

1.

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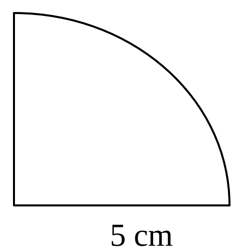
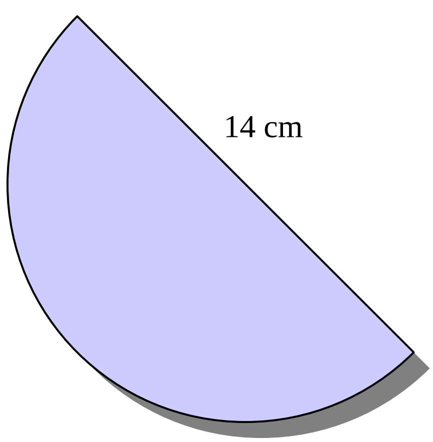
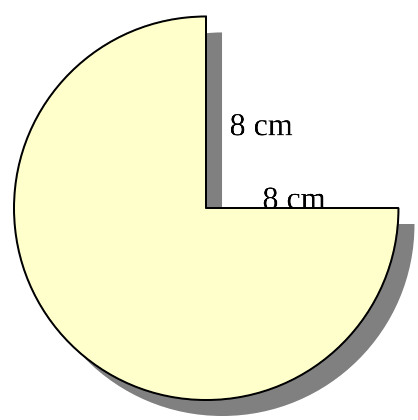



3.




4.



5.7 Square Roots and the Pythagorean Theorem

Square Roots and Real Numbers

A number is squared when it is multiplied by itself.

Perfect Squares

Finding square root.

1. $\sqrt{49} =$ 2. $\sqrt{81} =$

In general, $\sqrt{a^2} =$

Definition:

For any real number a and any nonnegative real number b, a is square root of b if $a^2 = b.$ If a is positive, then we write $a = \sqrt{b}$ . Thus, $\left(\sqrt{b}\right)^2 = b$ .

Find the value of each of the following expressions.

1. $\left(\sqrt{100}\right)^2 =$ 2. $\left(\sqrt{39}\right)^2 =$

Show that $\left(2.236\right)^2 < 5 and \left(2.237\right)^2 > 5$ Tell what these facts indicates about $\sqrt{5}$

Finding square root by using integer.

1. a) $\sqrt{11}$ is between the two integers

b) Using calculator to find $\sqrt{11} =$

2. a) $\sqrt{50}$ is between the two integers

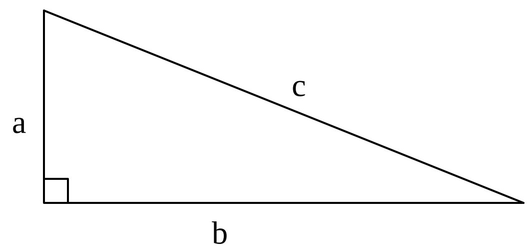
b) Using calculator to find $\sqrt{50}$

Use your calculator to find the value of the following expressions accurate to four decimal places.

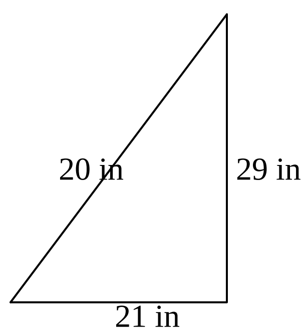
1. $2-\sqrt{5}$ 2. $4-3\sqrt{2}$ 3. $\sqrt{16}+\sqrt{4}$

The Pythagorean Theorem

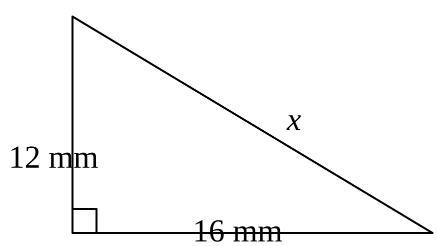
In a right triangle, the square of the hypotenuse is equal to the sum of the squares of the two legs.



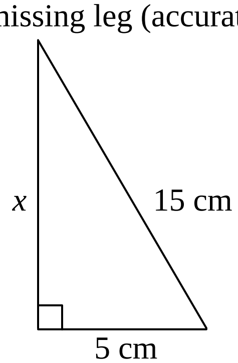

Use the Pythagorean Theorem to determine whether or not each of the following triangles is a right triangle.




Find the length of hypotenuse (accurate to two decimal places) of each of the following right triangles.




Find the length of the missing leg (accurate to two decimal places.)



5.8 Simplifying Square Roots

Properties of square roots.

For positive real numbers a and b,

1. $\sqrt{ab}$ =

2. $\sqrt{\frac{a}{b}} =$

Simplify the radical expressions.

1. $\sqrt{128}$

2. $\sqrt{256}$

3. $-\sqrt{800}$

4. $\sqrt{405}$

5. $\sqrt{200}$

6. $\sqrt{\frac{36}{25}}$

7. $\sqrt{\frac{64}{225}}$

8. $-\sqrt{\frac{72}{25}}$

Simplify by combining like radicals.

1. $2\sqrt{3}-7\sqrt{3}$

2. $6\sqrt{3}+2\sqrt{3}$

3. $12\sqrt{10}-17\sqrt{10}$

4. $14\sqrt{13}-6\sqrt{13}$

5. $8\sqrt{29}-\sqrt{29}$

Simplify each radical and then combine like radicals if possible.

1. $2\sqrt{100}-\sqrt{25}$

2. $\sqrt{49}+\sqrt{81}$

3. $3\sqrt{300}-2\sqrt{75}$

4. $\sqrt{125}+4\sqrt{20}$

6.1 Understanding Percent

The word percent comes from the Latin per centum, meaning “per hunddred.” Change the following fractions to percents.

1. $\frac{90}{100}$ 2. $\frac{17\frac{3}{4}}{100}$

Write the ratio of profit to investment as hundredths, and compare the percents. Tell which investment is better a or b.

1. a) A profit of 300 on a $2000 investment.
   b) A profit of 480 on a $4000 investment.
   c) Which investment is better?

Change the following decimals to percents.

1. 0.3 2. 0.004 3. 2.3 4. 2

Change the following percents to decimals.

1. 8% 2. 15% 3. 50% 4. $15\frac{1}{4}$%

5. 12.5% 6. $19\frac{3}{4}$%

Change the following fractions and mixed numbers to percents.

1. $\frac{7}{10}$ 2. $\frac{1}{9}$ 3. $\frac{5}{6}$ 4. $2\frac{1}{15}$

Change the following percents to fractions or mixed numbers in reduced form.

1. 50% 2. $16\frac{2}{3}$ 3. 140% 4. 0.75%

6.2 Solving Percent Problems
P% of Base is Amount

$$\frac{p}{100} = \frac{A}{B}$$

The Basic Formula: $R \bullet B = A$
R= Rate or percent (As a decimal or fraction)
B= Base (Number we are finding the percent of)
A= Amount or percentage (a part of the base).
A= $Rate \bullet Base$

"of" means to multiply
"is" means equal "="

Using the equation $R \bullet B = A$ (*or* A= $R \bullet B$) and then solve for the unknown quantity.

1. 10% of 80 is __________?
2. 75% of 120 is _________?
3. 70% of 17 is __________?
4. ______% of 150 is 60.

a) Write the related equation, and then
b) Solve the equation for the unknown quantity.

1 __________ is 32% of 86.

2. ________ is 18% of 325.

3. What percen of 100 is 20?

4. $62\frac{1}{2}\%$ of 1600 is what number?

5. Find 25% of 64.64.

6.4 Applications with Percent: Discount, Sales Taxes, Commission, Profit, and Tipping

**Discount**: Reduction in original selling price.

**Sale Price**: Original selling price minus the discount

**Rate of Discount**: Percent of original price to be discounted

**Sale Tax**: Tax based on actual selling price.

**Rate of Sales Tax**: Percent of actual selling price.

A c**ommission** is a fee paid to an agent or salesperson for a service.

1. A car sales man earns a commission of 7% on each car he sells. How much he earn on the sale of a car for $12,500?

2. A computer programmer was told that he would be given a bonus of 5% of any money his programs could save the company. How much would he have to save the company to earn a bonus of $500.00?

3. If sales tax is figured at 7.25%, how much tax will be added to the total purchase price of the three textbooks, price at $25.00, $35.00, and $52.00?

4. A kicker on a professional football team made 45 of 48 field goal attempts.

a) What percent of his attempts did he make?

b) What percent did he miss?

5. You want to purchase a new home for $122,000. The bank wll loan you 80% of the purchase price. How much will the bank loan you? This amount is called your mortage and you will pay if off over several years with interest. For example, a 30-year loan will probably cost you a total of more than 3 times the original loan amount.

6. The Golf Pro Shop had a set of 10 goff clubs that were marked on sale for $560. This was a discount of 20% off the original selling price.

a) What was the original selling price?

b) If the club cost the golf Pro Shop $420, what was its profit?

c) What was the shop’s percent of profit based on cost?

d) What was the percent of profit based on the sale price?

6.5 Applications: Buying a Car, Buying a Home

1. To buy a used car for $7500, you must pay 7% in sales taxes, a license fee of $110, and a down payment of 15% of the purchase price to the bank. How much cash you need to buy the car?

2. You brother has been looking at a used car for $6500, and you have told him that you will buy his old car for $1500. If sales tax is figured at 6% of the selling price and the license fee is $75, how much cash (from his own pocket) will you need to purchase the car?

3. You are planning to buy a home and make an offer, accepted by the seller, of $95,000.00. The bank will loan you 75% of the selling price, and there is no loan fee. If the cost are $250 for fire insurance, $325 for taxes, and $185 for legal fees, how much cash will you need to make this purchase?

4. .  A home is sold for 550,000.00. The buyer must make a down payment of 25% of the selling price and pay a loan fee of 2.5% of the mortgage, $400 for fire insurance, $60 for recording fees, $530 for taxes, $360 for legal fees. How much cash does the buyer need to complete the purchase?

a) What is the amount of the down payment?

b) What is the amount of the mortgage?

c) How much cash does the buyer need to complete the purchase?

7.2 Solving Equations I

Definition:

A first-degree equation in $x$ (or a linear equation in $x$) is any equation that can be written in the form: $ax+b=c$, where $a, b, and\ \ c$ are constants and $a \# 0$.

Solve each of the following equation.

1. $7x+14=10x+5$

2. $1.6n=0.8n$

3. $15y+23y-y=14y$

4. $x-5+4x=4(x-3)$

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

6. $x-0.1x+0.9=0.2(x+1)$

7.3 Solving Equations II
First Degree Equaitons with Fractions.

Solve each of the following equation.

1. $\frac{1}{2}x + \frac{3}{4}x = -15$

2. $\frac{5}{8}x - \frac{1}{4} = \frac{2}{5}x + \frac{1}{3}$

3. $\frac{3}{8}\left(y - \frac{1}{2}\right) = \frac{1}{8}\left(y + \frac{1}{2}\right)$

4. $\frac{y}{4} + \frac{2}{3} = \frac{y}{5} - \frac{1}{6}$

5. $\frac{2y}{3} + \frac{y}{3} = -\frac{3}{4} + \frac{y}{2}$

6. $\frac{3}{7}y + \frac{1}{6}y + \frac{1}{2} = 0$

7.6 First-Degree Inequalities $(ax + b < c)$

Interval of Real Numbers

| Name | Symbolic Representation | Graph |
| --- | --- | --- |
| Open Interval | | |
| Closed Interval | | |
| Half-Open Interval | | |
| Open Interval | | |
| Half-Open Interval | | |

Graph the interval on the number line provided.

1. $3 \le y \le 6$  2. $x > -5$  3. $-12 < x < -7$

Solve each equality and graph it.

1. $x + 5 < 6$  2. $3y \le 4$

3. $x + 3 < 4x + 3$  4. $\frac{1}{2}x - 2 < 6$

5. $-t + 4 < -1$  6. $8t - 2 \ge 5t + 1$

8.1 Integer Exponents

Product Rule:

For any real number a and integers m and n,

Use the product rule to simplify each of the expressions. Leave the expressions in base-exponent form.

1. $3^3 \bullet 3^2 =$ 2. $y^4 \bullet y^5 =$ 3. $(2.1)^2 \bullet (2.1)^5 =$ 4. $(-5)(-5)^3 =$

Power Rule:
For any real number a and integers m and n,

Use the power rule to simplify each of the expressions. Leave the expressions in base-exponent form.
1. $(y^2)^4 =$ 2. $(6^2)^3$ 3. $(3.1^2)^5$ 4. $\left[(-2)^3\right]^3$ 5. $(5^5)^0$

Quotient Rule:
For nonzero real number a and integers m and n,

Use the quotient rule to simply each of the following expressions. Leave the expressions in the base-exponent form.

1. $\frac{8^8}{8^2}$ 2. $\frac{y^6}{y}$ 3. $\frac{x^7}{x^6}$ 4. $\frac{1.6^4}{1.6^2}$ 5. $\frac{(-6)^9}{(-6)^7}$

Negative integer Exponents:
For nonzero real number a and any integer n,

Write each of the following expressions in an equivalent form with positive exponents and simplify. Leave the expressions in base-exponent form.
1. $8^{-2}$ 2. $y^{-11}$ 3. $5^{-5}$ 4. $1.2^{-3}$

Simplify each of the following expressions so that the answer containing only nonnegative exponents. Leave the expression in base-exponent form.

1. $3^{-5} \bullet 3^{3}$

2. $\dfrac{1}{3^{-2}}$

3. $\dfrac{1}{y^{-4}}$

4. $-3x^{5} \bullet 2x^{3}$

5. $\left(x^{4} \bullet x^{5}\right)^{0}$

6. $y^{3} \bullet y^{5} \bullet y^{1}$

7. $y^{-5} \bullet y^{-1} \bullet y^{-2}$

8. $\left(x^{-5}\right)^{3}$

9. $\dfrac{5^{3}}{5^{6}}$

10. $2y^{3} \bullet 4y^{-3}$

11. $\dfrac{x^{-2}}{x^{2}}$

12. $\left(x^{2n}\right)^{-50}$

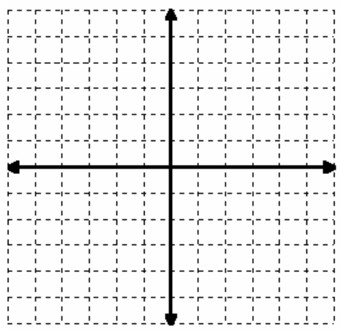
9.2 Graphing Linear Equations $\left(AX + BY = C\right)$

Linear Equations in Standard Form: $AX + BY = C$

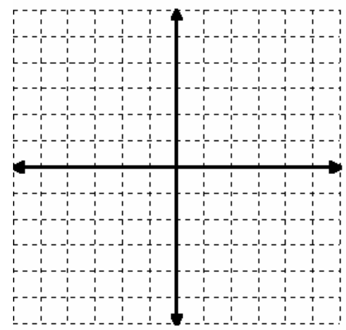
Find the intercepts.
To find y-intercept. Let x=0 and solve the equation for y.
To find x-intercept. Let y=0 and solve the equation for x.

Graph.

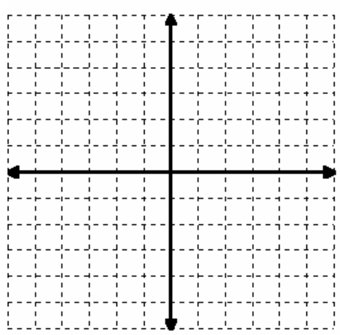
1. $y = x$



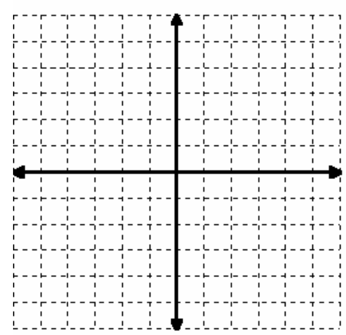
2. $y = x + 3$



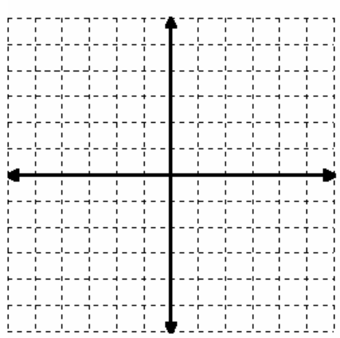
3. $y = 2x - 2$



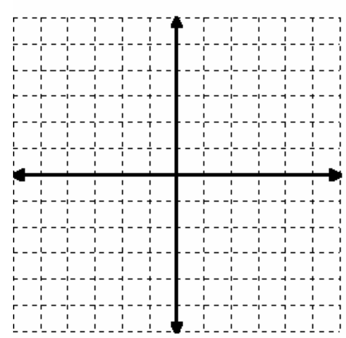
4. $2x - 5y = 10$



5. $x - 4y = 12$



6. $3x + 4y = 12$



1. Basic Geometry Figures
Points, lines, and planes
Geometry is based on three undefined words: point, line, and plane.

Line segments and rays

The line segment AB, denoted as AB, is the part of line that consists of points A and B and all points in between. Points A and B are the endpoints o the segnment.

Every line segment has a **midpoint**, which divides the segment into two parts of equal length.

A ray is the part of a line that begins at some point (say, A) and continue forever in one direction. Point A is the endpoint of the ray.

Angles
An angle is a figure formed by two rays with a common endpoint. The common endpoint is called the vertex, and the rays are called sides.

Classification of Angles
Acute angles: Angles whose measures are greater than $0^0$ but less than $90^0$.
Right angles: Angles whose measures are $90^0$.
Obtuse angles: Angles whose measures are greater than $90^0$ but less than $180^0$.
Straight angles: Angles whose measures are $180^0$.

2. More about Angles

Adjacent angles

Two angles that have a common vertex and a common side are called adjacent angles.

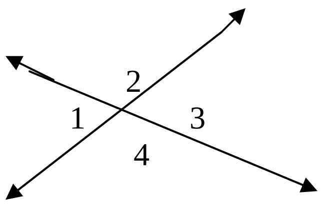
Vertical angles
When two lines intersect, pairs of nonadjacent angles are called vertical angles.
Vertical angles are congruent (have the same measure).

Complementary and supplementary angles
Two angles are complementary angles when the sum of their measures is $90^0$.
Two angles are supplementary angles when the sum of their measures is $180^0$.

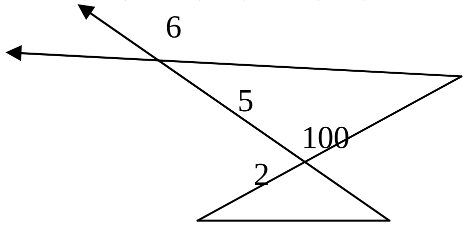
Given $m(\angle 1) = 50^0$. Find the measure of each angle or sum of angle.

1. $m(\angle 3) =$

2. $m(\angle 2) + m(\angle 4) =$

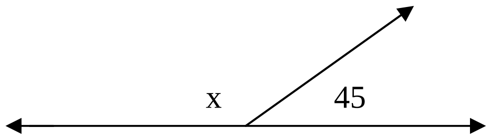



Given $m(\angle 1) + m(\angle 3) + m(\angle 4) = 180^0$, $\angle 3 \cong \angle 4$, and $\angle 4 \cong \angle 5$ Find $\angle 2$ and $\angle 6$

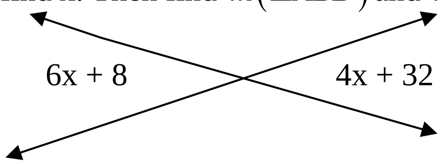



Find x.

1.



First find x. Then find $m(\angle ABD)$ and $m(\angle DBE)$




Write an equation to solve each problem.

.

1. Two angles are vertical angles. The first angle has a degree measure that is three times a number. The other angle has a measure that is $30^0$ less than five times the number. Find the measure of the first angle.

2. Find the supplement of a $30^0$ angle.

3. The measure of an angle is $10^0$ more than three times its complement's measure. What is the measure of the angle?

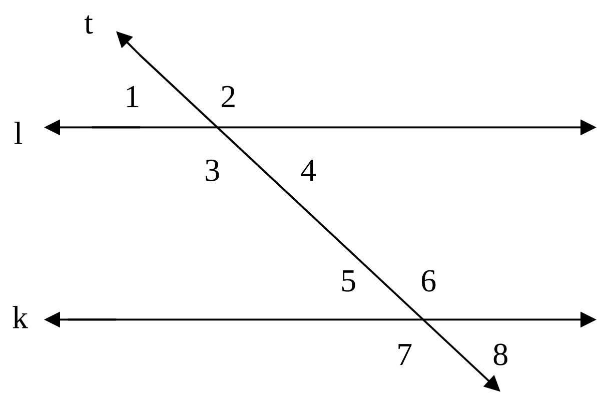
4. The measure of an angle is $20^0$ less than nineteen times its supplement's measure. What is the measure of the angle?

3 Parallel and Perpendicular Lines

**Paralle**l **line**s are coplanar lines that do not intersect.

**Perpendicular lines** are lines that intersect and form right angles.

Transversals and angles.




**Corresponding angles** **Interior angles** **Alternate Interior angles**

**Properties of parallel lines**

1. If two parallel lines are cut by a transversal, corresponding angles are congruent.

2. If two parallel lines are cut by a transversal, alternate interior angles are congruent.

3. If two parallel lines are cut by a transversal, interior angles on the same side of the transversal are supplementary.

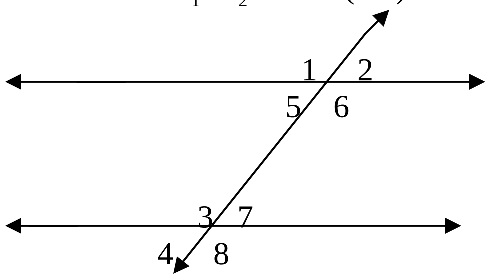
4. If a transversal is perpendicular to one of two parallel lines, it is also perpendicular to other line.

5. If two lines are parallel to a third line, they are parallel to each other.

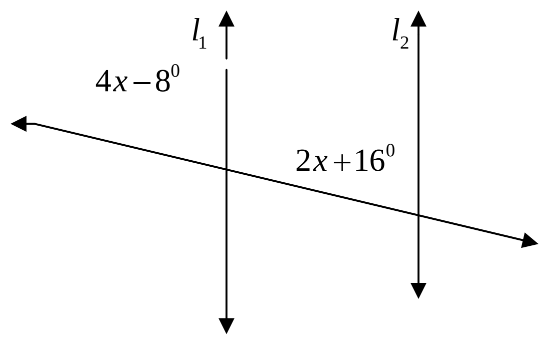
Given two lines cut by a transversal
1. Corresponding angles are congruent if and only if the lines are parallel.
2. Alternate interior angles are congruent if and only if the lines are parallel.

Examples

1. Assume that $l_1 // l_2$ and $m(\angle 2) = 40^0$. Find the measures of the other angles.

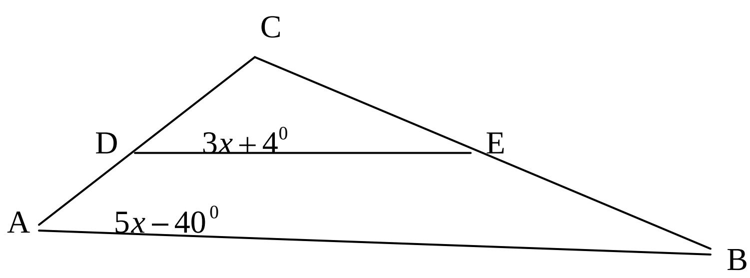



Assume that $l_1 // l_2$. First find x. Then determine the measures of each angle that is labeled in the figure.

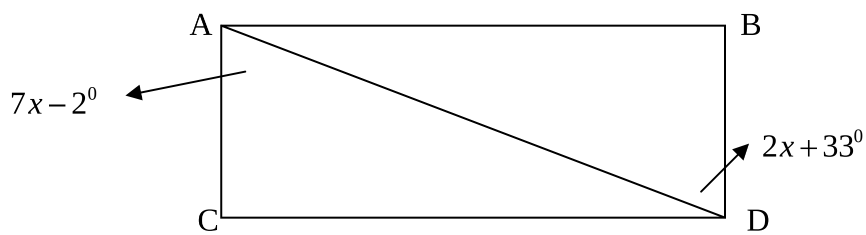



First find x. Then determine the measure of each angle that is labeled in the figure.

$\overline{AB} // \overline{DE}$




$\overline{AC} // \overline{BD}$



4. Triangles

A polygon is a closed geometric figure with at least three line segments for its sides.

Classifying triangles

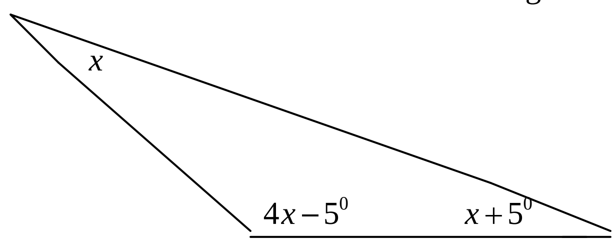
| | | |
|---|---|---|
| Equalateral triangle<br>(allsides equal length) | Isosceles triangle<br>(at least two sides of eqaul length) | Scalene triangle<br>(no sides equal length) |
| Acute triangle<br>(has three acute angles) | Obtuse triangle<br>(has an obtuse angle) | Right triangle<br>(has a right angle) |

Isosceles triangle theorem
If two sides of a triangle are congruent, then the angles opposite those sides are congruent.

The sum of the angle measures of any triangle is $180^0$.

1. The measures of two angles of $\Delta ABC$. Find the measure of $\angle B$.
Given: $m(\angle A) = 45^0$ and $m(\angle C) = 105^0$.

2. The degree measures of the angles of a triangle are represented by algebraic expressions. First find x. Then determine the measure of each angle of the triangle..




3. One angle of a triangle has a measure that is $10^0$ more than twice that of a second angle. The third angle has measure $10^0$ less than the first angle. Find the measure of each angle of the triangle.

4. The measure of a base angle of an isosceles triangle is $85.5^0$. What is the measure of the vertex angle?

5. If the vertex angle of an isosceles triangle measures $3^0$, what are the measures of the base angle.

6. The measure of a base angle of an isosceles triangle is $5^0$ more than eight times the measure of the vertex angle. Find the measure of each angle of the triangle.

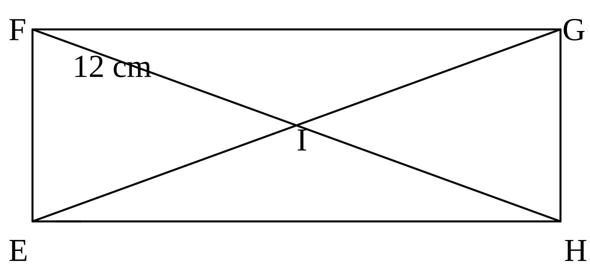
5. Quadrilaterals and Other Polygons
Definition: A quadrilateral is a polygon with four sides.

**Properties of rectangles**
1. All four angles are right angles.
2. Opposite sides are parallel.
3. Opposite sides have equal lengths.
4. The diagonals have equal length.
5. The diagonals intersect at their midpoints.

**Trapezoids**
Definition: A trapezoid is a quadrilateral with exactly two sides parallel.

If the nonparallel sides are the same length, it is called an isosceles trapezoid. In an isosceles trapezoid, both pair of angles are congruent.

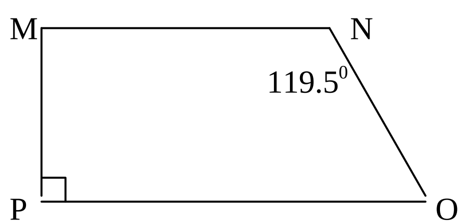
1. In Rectangle EFGH. a. Find $m(FH)$ b) Find $m(EI)$ c) Find $m(EG)$




2. Trapezoid MNOP

a) Find $m(\angle o)$

b) Find $m(\angle M)$



6 Perimeters and Areas of Polygons

Definitions: The perimeter of a polygon is the distance around it. The area of a polygon is the measure of the amount of surface it encloses. Area is measured in square units such as square centimeters.

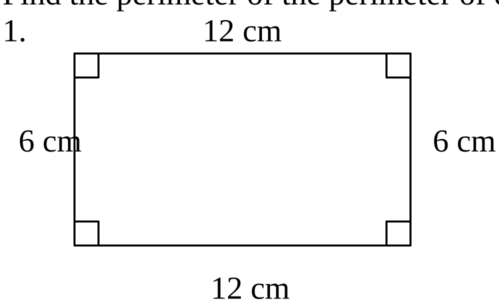
The formulas of the perimeter and the area of the following figures.

1. Square 2. Rectangle 3. Parallelogram

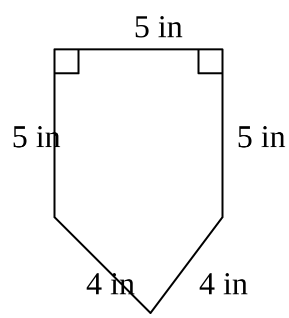
4. Triangle 5. Trapezoid

Find the perimeter of the perimeter of each figure.

1.




2.

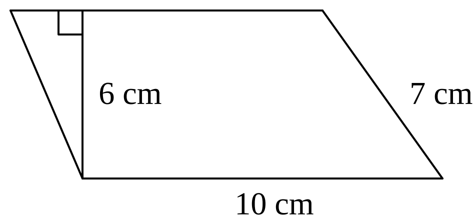



3. The perimeter of an isosceles triangle is 80 meters. If the length of one side is 22 meters, how long is the base?

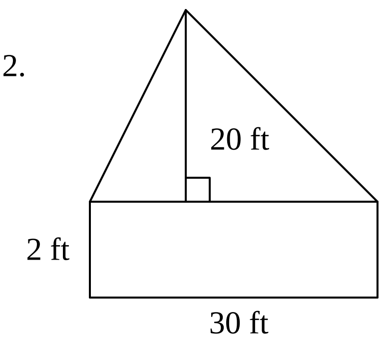
4. The perimeter of a rectangle is 80 millimeters. The length is 8 mm longer than the width. Find its length and width.

Find the area of the following figure.

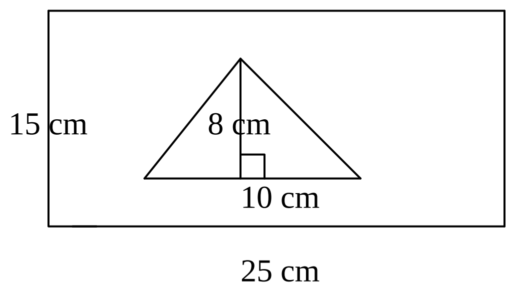
1.




2.




3. Find the area of the shaded region.




Solve each problem

1. The area of a parallelogram is 60 $m^2$, and its height is 15 m. Find the length of its base.

2. The area of a square is 81 $in^2$.

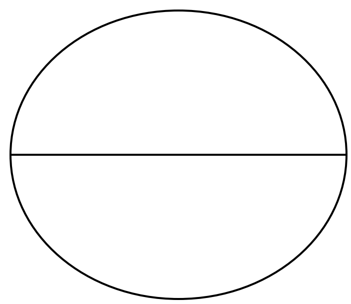
    a. Find the length of a side.
    b. Find the perimeter.

7 Circles

Definition: A **circle** is the set of all points in a plane that lie a fixed distance from a point called its center. A segment drawn from the center of a circle to a point on the circle is called a **radius**. A **chord** of a circle is a line segment that connects two points on the circle. A **diamete**r is a chord that passes through the center of the circle.

Circumference=

Area=

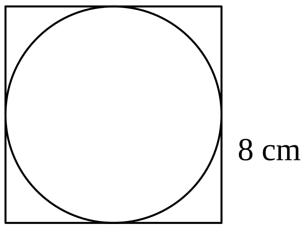


(Note: in this section use $\pi = 3.1416$)

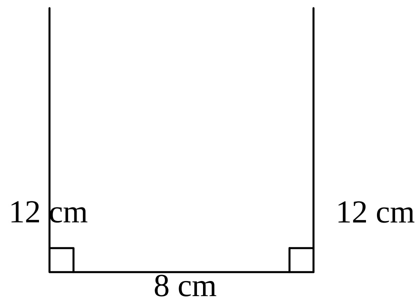
1. Find the radius of a circle that has a circumference of $30\pi$ meters.

2. Find the diameter of a circle that has a circumference of 117 meters. (Round your answer to the nearest tenth).

3. Find the circumference of the circle if the square has sides of length 8 cm. (Round your answer to the nearest tenth).




4. Find the perimeter of this figure to the nearest hundredth.



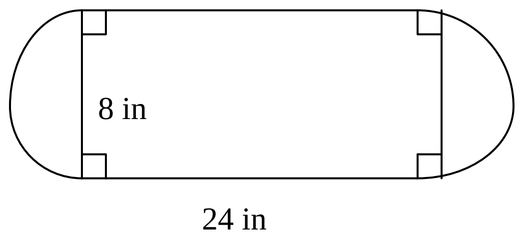
5. Find the radius of a circle that has an area of $64\pi\ cm^2$. (Round your answer to nearest tenth).

6. The area of a circle is 150 $cm^2$. (Round your answer to nearest tenth).

a) What is its radius?
b) What is the diameter?
c) What is its circumference?

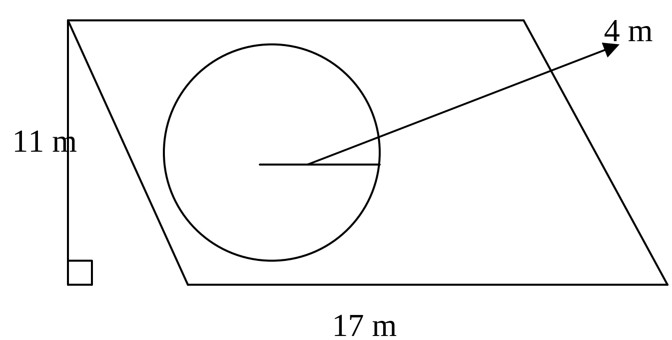
Find the total area of each figure to the nearest tenth.

1.




Find the area of each shaded region to the nearest tenth.

1.




2.