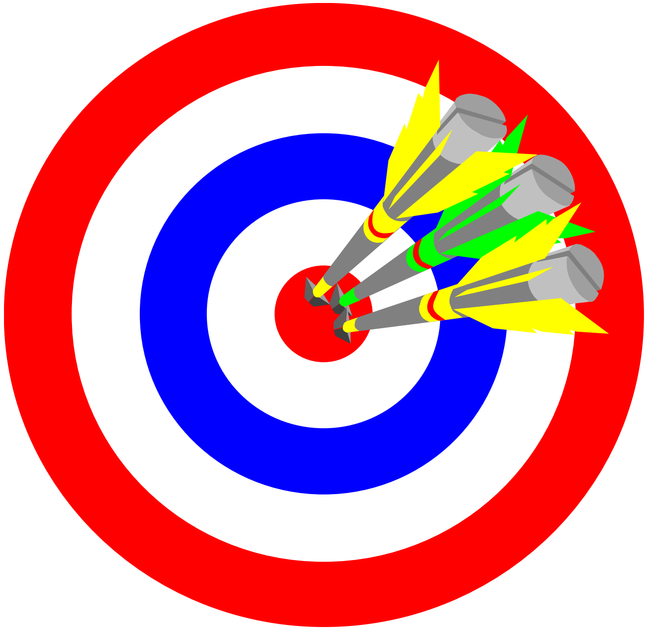
Chapter 8

Right Triangles

Objectives



A. Use the terms defined in the chapter correctly.
B. Properly use and interpret the symbols for the terms and concepts in this chapter.
C. Appropriately apply the properties and theorems in this chapter.
D. Solve for the geometric mean of two values.
E. Recognize and use Pythagorean triples (pattern right triangles).
F. Solve basic trigonometric problems using sine, cosine and tangent ratios.

Section 8-1

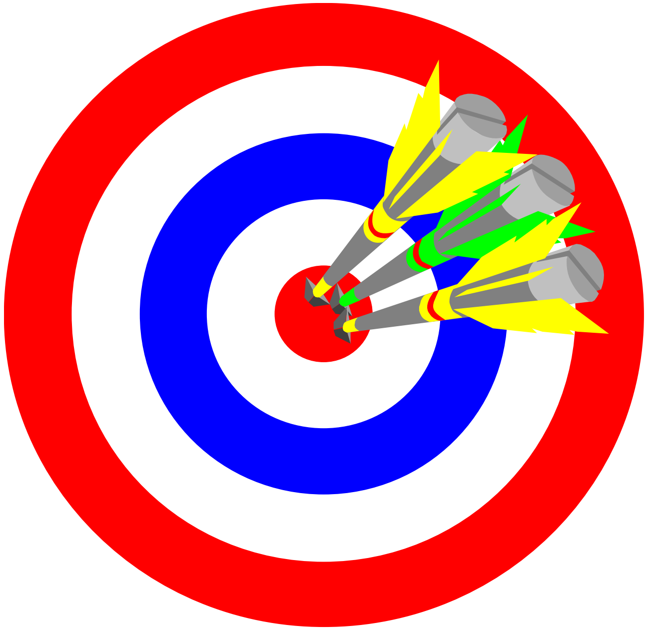
Similarity in Right Triangles

Homework Pages 288-289:

2-40 evens

Excluding 6, 8, 16, 26, 34

Objectives



A. Understand and apply the term ‘geometric mean’ correctly.

B. Understand and apply the theorem and corollaries relating the altitude of the right angle of a right triangle to other components of the triangle.

C. Correctly represent radical expressions.

- ★ geometric means: the geometric means x between two numbers a and b is the number which satisfies the proportion: a : x = x : b or

$$\frac{a}{x} = \frac{x}{b} \text{ or}$$

$$x^2 = ab \text{ or}$$

$$x = \sqrt{ab}$$

Example: Find the geometric mean between 7 and 11.

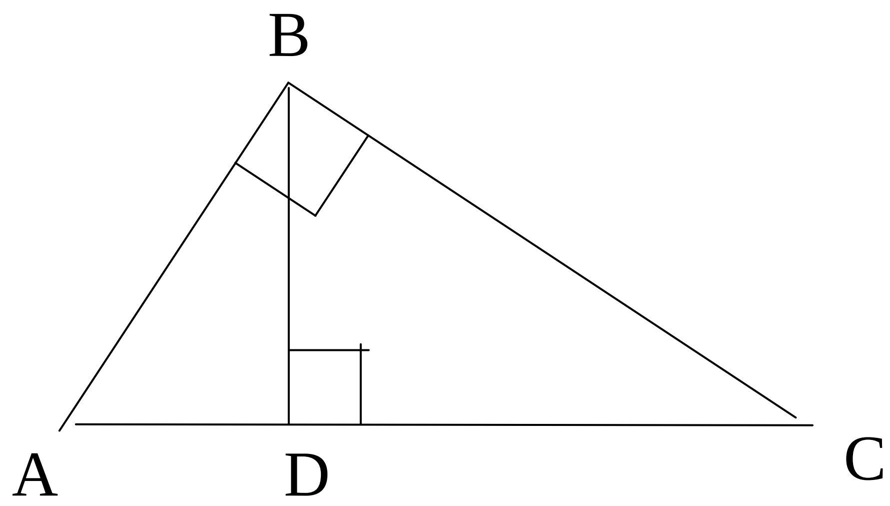
$$\frac{7}{x} = \frac{x}{11} \text{ or}$$

$$x^2 = 77 \text{ or}$$

$$x = \sqrt{77}$$

Theorem 8-1

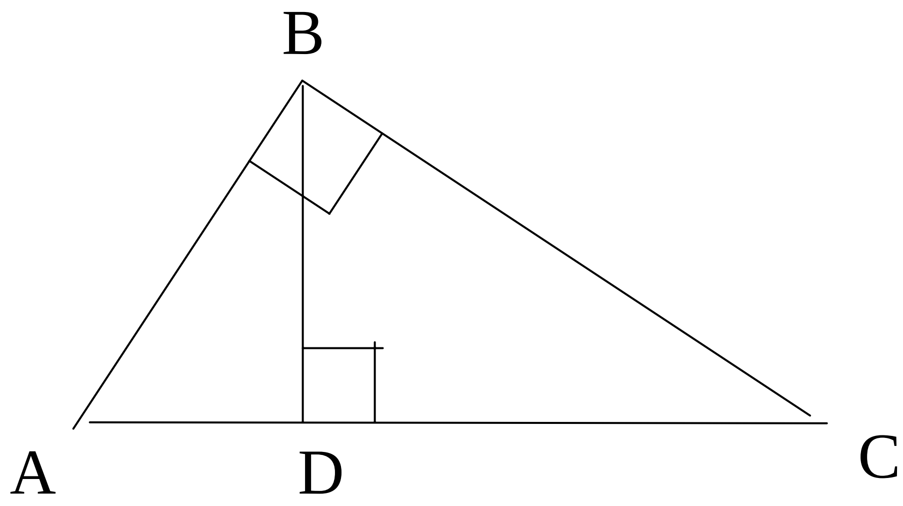
If the altitude is drawn to the hypotenuse of a right triangle, then the two triangles formed are similar to the original triangle and to each other.



$\Delta ABC \sim \Delta BDC \sim \Delta ADB$

★Corollary 1 Theorem 8-1

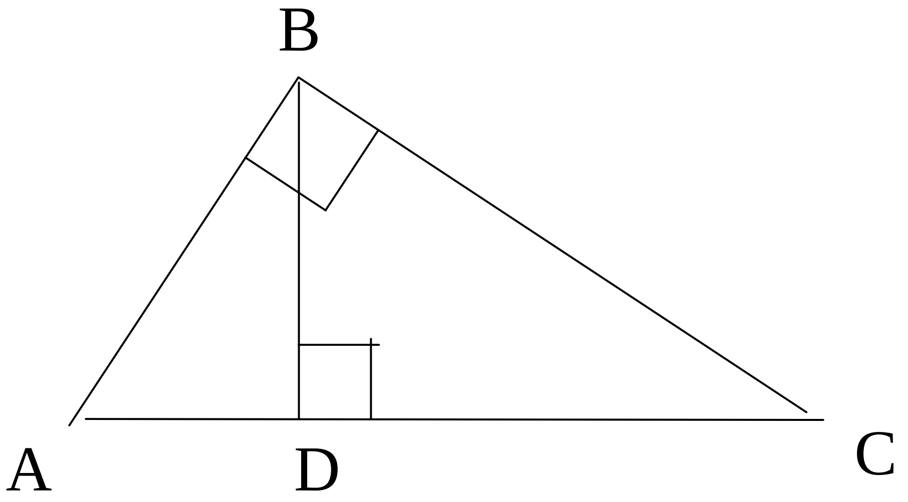
If the altitude is drawn to the hypotenuse of a right triangle, then the length of the altitude is the geometric means between the segments of the hypotenuse.



$$\frac{AD}{BD} = \frac{BD}{DC} \qquad \frac{\text{part of hypotenuse}}{\text{altitude}} = \frac{\text{altitude}}{\text{part of hypotenuse}}$$

★ Corollary 2 Theorem 8-1

If the altitude is drawn to the hypotenuse of a right triangle, then each leg is the geometric mean between the length of the hypotenuse and the segment of the hypotenuse adjacent to the leg.



$$\frac{AC}{AB} = \frac{AB}{AD}$$

$$\frac{AC}{BC} = \frac{BC}{DC}$$

$$\frac{\text{whole hypotenuse}}{\text{leg}} = \frac{\text{leg}}{\text{part of hypotenuse touching leg}}$$

Properties of Radicals

Examples:

$$\sqrt{a} \bullet \sqrt{b} = \sqrt{ab}$$

$$\sqrt{3} \bullet \sqrt{5} = \sqrt{15}$$

$$\sqrt{cd} = \sqrt{c} \bullet \sqrt{d}$$

$$\sqrt{28} = \sqrt{4} \bullet \sqrt{7} = 2\sqrt{7}$$

$$\sqrt{a} \bullet \sqrt{a} = a$$

$$\sqrt{7} \bullet \sqrt{7} = \sqrt{7 \bullet 7} = \sqrt{49} = 7$$

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

$$\sqrt{\frac{5}{11}} = \frac{\sqrt{5}}{\sqrt{11}}$$

★ Simplifying Radicals

Radicals MUST always be expressed in their SIMPLEST form!

- No perfect square factor (other than one) is under the radical sign!
  - A perfect square is the product of a number multiplied by itself. 5 x 5 = 25 ➔ 25 is the perfect square.
- No fraction has a radical in its denominator!
- No fraction is under the radical sign!
- **Radicals may not be converted to rounded decimals!**
  - Properly expressed radicals are the MOST ACCURATE representation of their value

★ Simplifying Radicals

No perfect square factor (other than one) is under the radical sign!

- Find the largest perfect square that divides evenly into the number.
- Break the radical into a product of this perfect square and another number.
- Take the square root of the perfect square, removing the radical, and leave the other number under the radical.

$$\sqrt{63} = \left(\sqrt{9}\right)\left(\sqrt{7}\right) = 3\sqrt{7}$$

★ Rationalizing Radicals

Radicals may not be left in the denominator of a fraction!

- Simplify any radicals in the problem.
- Multiply both the numerator and the denominator by the radical in the denominator.
- Simplify the new fraction.

$$\frac{24}{\sqrt{12}} = \frac{24}{\left(\sqrt{4}\right)\left(\sqrt{3}\right)} = \frac{24}{2\sqrt{3}} = \left(\frac{24}{2\sqrt{3}}\right)\left(\frac{\sqrt{3}}{\sqrt{3}}\right) = \frac{24\sqrt{3}}{(2)\left(\sqrt{9}\right)} = \frac{24\sqrt{3}}{(2)(3)} = \frac{24\sqrt{3}}{6} = 4\sqrt{3}$$

No fraction is under the radical sign!

- Split the radical into a rational expression.
- Follow the directions for eliminating a radical from the denominator of a fraction (previous slide)

$$\sqrt{\frac{4}{27}} = \frac{\sqrt{4}}{\sqrt{27}} = \frac{2}{\sqrt{9}\sqrt{3}} = \frac{2}{3\sqrt{3}}$$

$$\frac{2}{3\sqrt{3}} \bullet 1 = \frac{2}{3\sqrt{3}} \bullet \frac{\sqrt{3}}{\sqrt{3}} = \frac{2\sqrt{3}}{3\sqrt{3}\sqrt{3}} =$$

$$\frac{2\sqrt{3}}{3\sqrt{9}} = \frac{2\sqrt{3}}{9}$$

Sample Problems

Simplify.

1. $\sqrt{12}$ 3. $\sqrt{45}$ 5. $\sqrt{800}$ 7. $9\sqrt{40}$ 9. $\sqrt{30} \bullet \sqrt{6}$

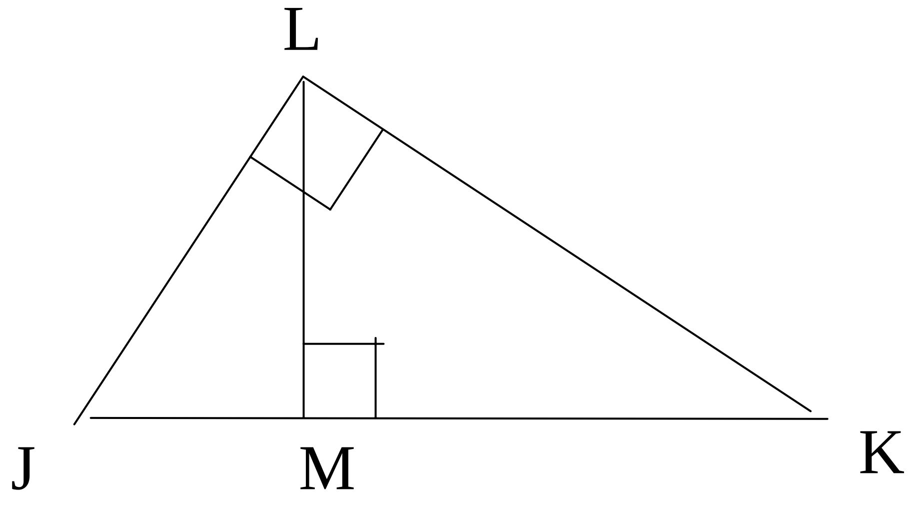
11. $\sqrt{\frac{3}{7}}$ 13. $\frac{18}{\sqrt{3}}$ 15. $\frac{\sqrt{15}}{3\sqrt{45}}$

Find the geometric mean between the two numbers.

17. 3 & 27
19. 1 & 1000
21. 22 & 55

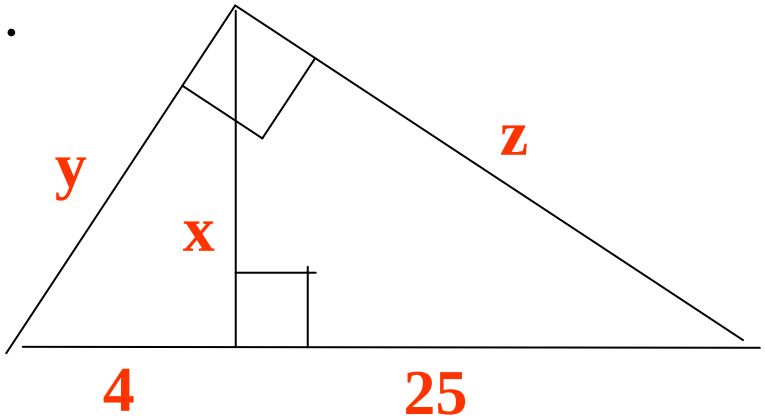
Sample Problems

23. If LM = 6 & JM = 4, find MK.
25. If JM = 4 & JK = 9, find LK.
27. If JM = 3 & JL = 6, find MK.
29. If LK = $3\sqrt{6}$ & MK = 6, find JM.



Sample Problems

31.



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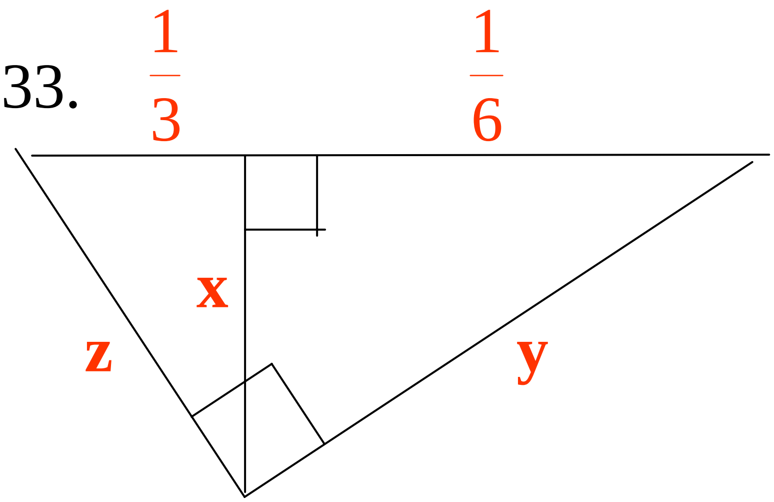

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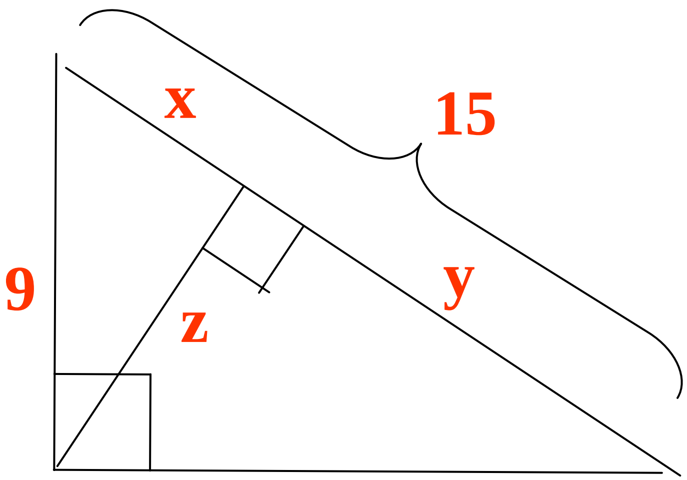
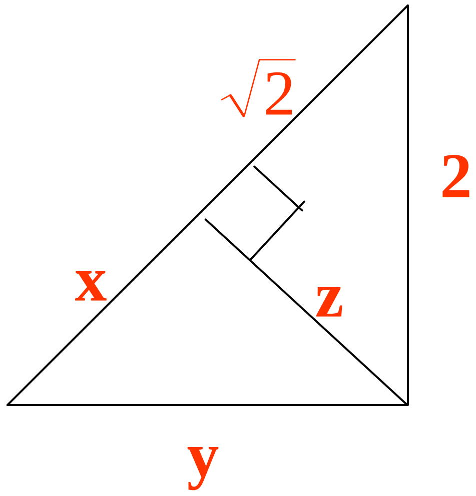


Sample Problems

37.



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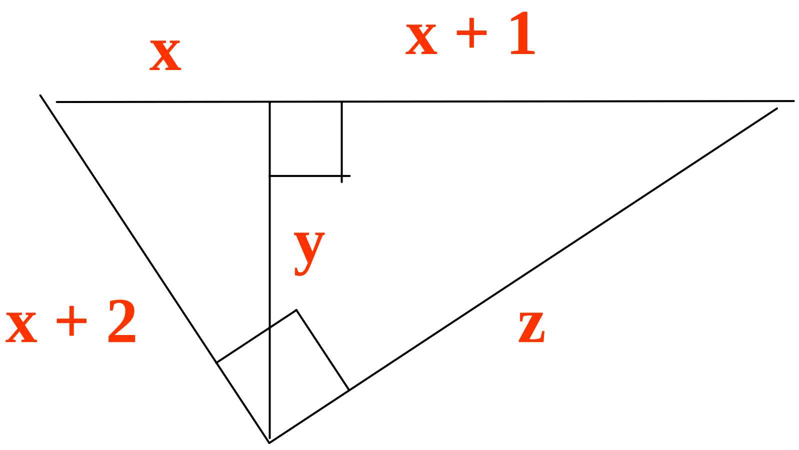


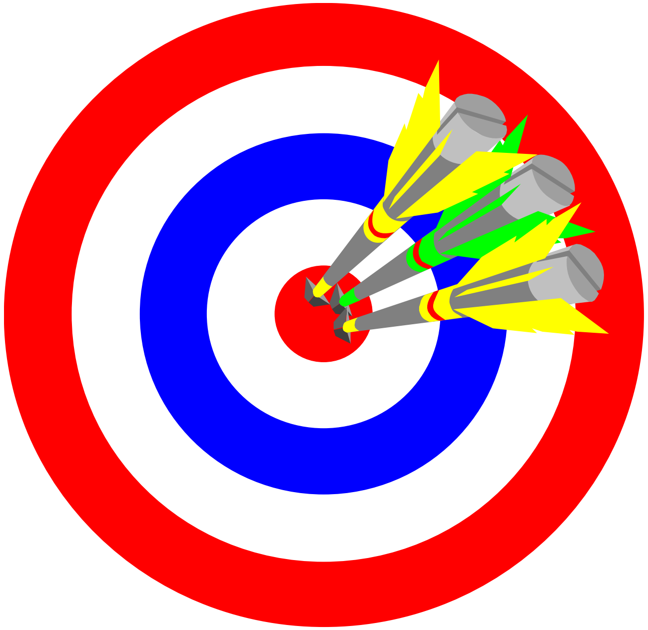
Section 8-2

The Pythagorean Theorem

Homework Pages 292-293:

2-32 evens

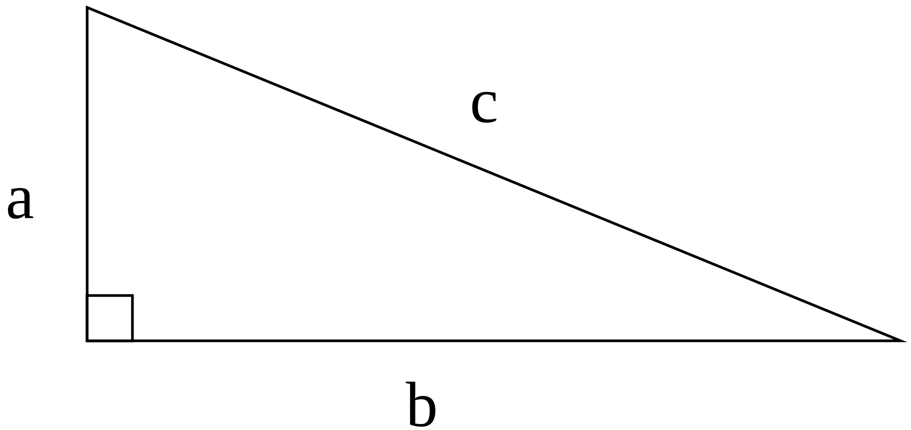
Objectives



A. Understand and apply the Pythagorean Theorem (Theorem 8-2)

★ Theorem 8-2

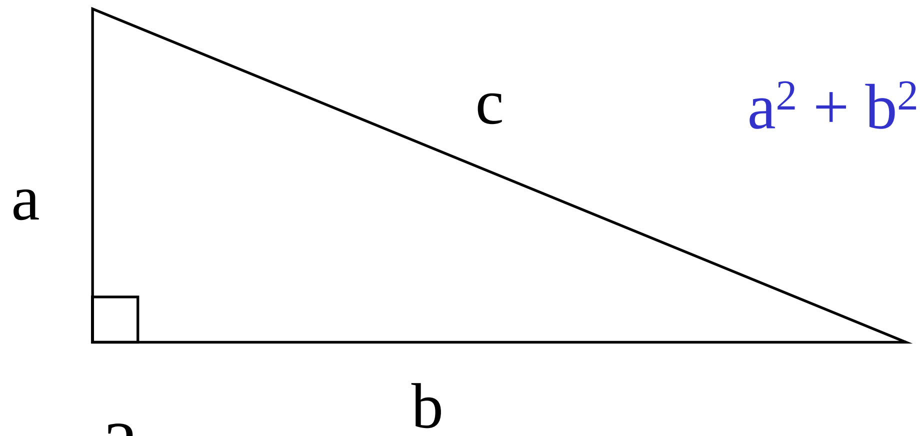
In a right triangle, the square of the hypotenuse is equal to the sum of the squares of the legs.



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

NOTE! By convention, the hypotenuse of the right triangle is denoted by ‘c’.

Examples



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

$$\text{if } a = 5, b = 6, c = ?$$

$$c^2 = 5^2 + 6^2 = 25 + 36 = 61$$

$$c = \pm\sqrt{61} = \sqrt{61}$$

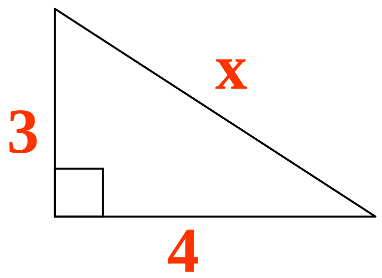
$$\text{if } a = 5, c = 13, b = ?$$

$$b^2 = c^2 - a^2 = 13^2 - 5^2 = 169 - 25 = 144$$

$$b = \pm\sqrt{144} = \pm 12 = 12$$

Sample Problems

1.



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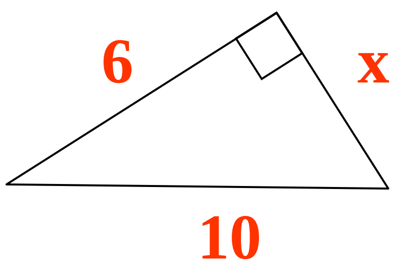

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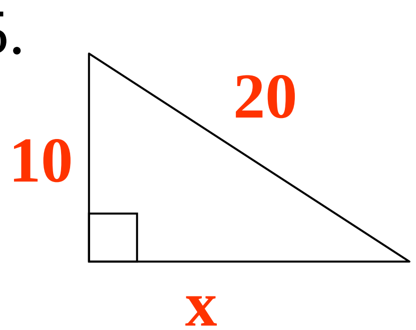

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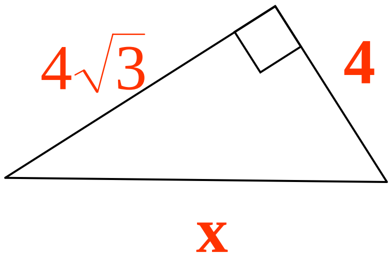

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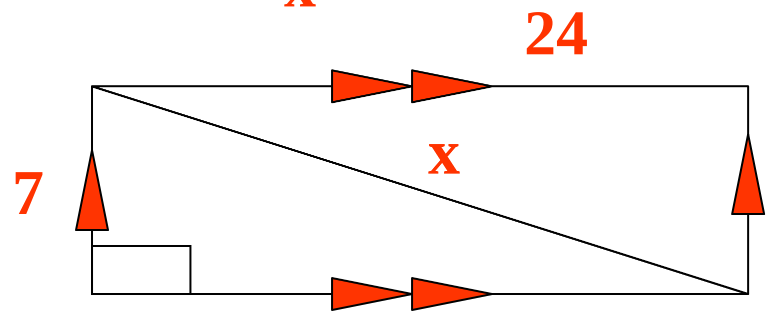

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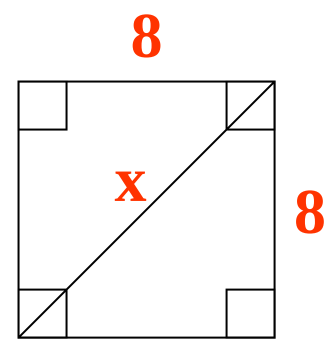
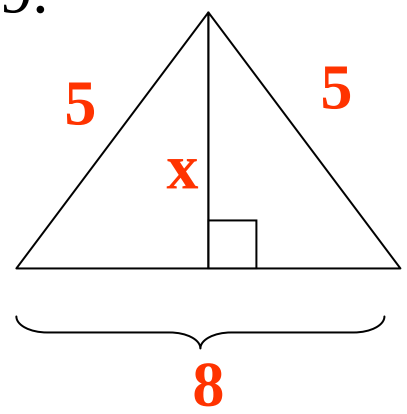


Sample Problems

13. A rectangle has a length 2.4 and width 1.8. Find the length of a diagonal.
15. Find the length of a diagonal of a square with perimeter 16.
17. The diagonals of a rhombus have lengths 16 and 30. Find the perimeter of the rhombus.

Sample Problems

19.



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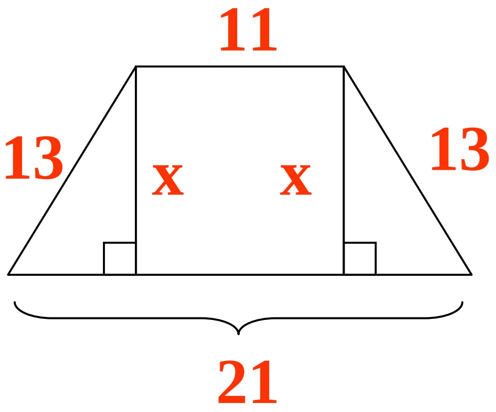

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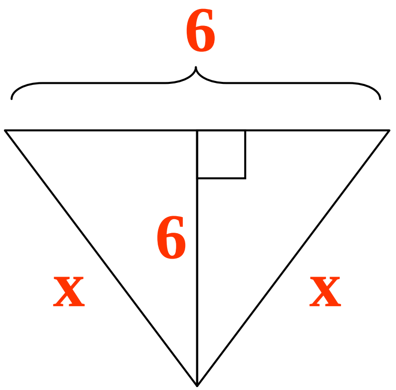

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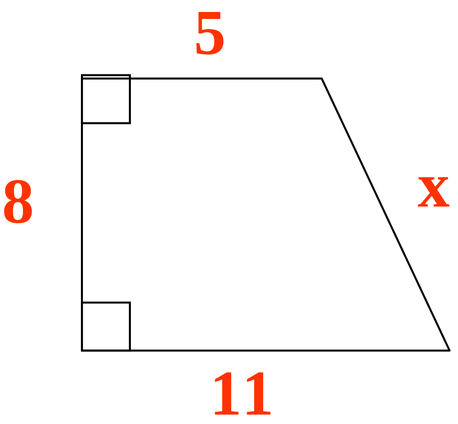
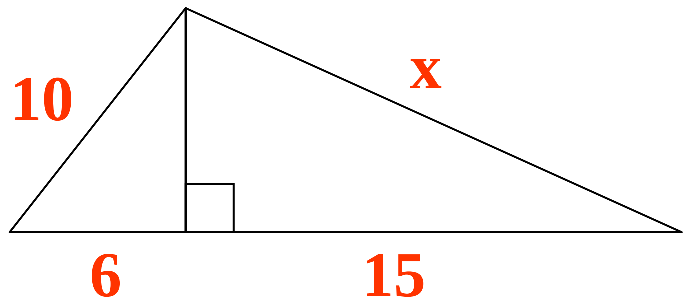


Sample Problems

27.



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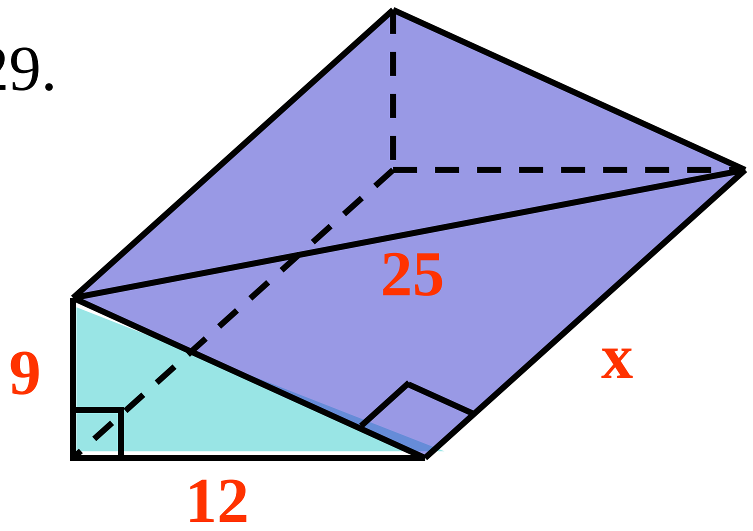
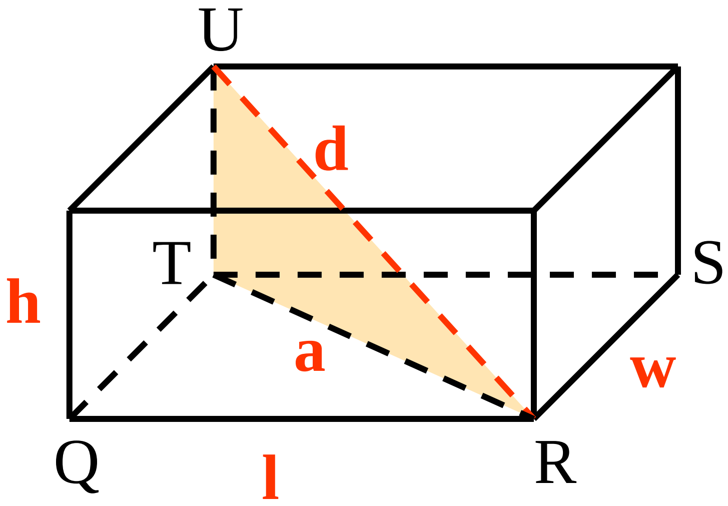
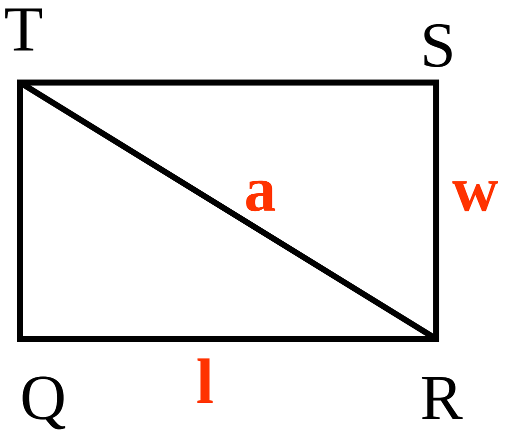


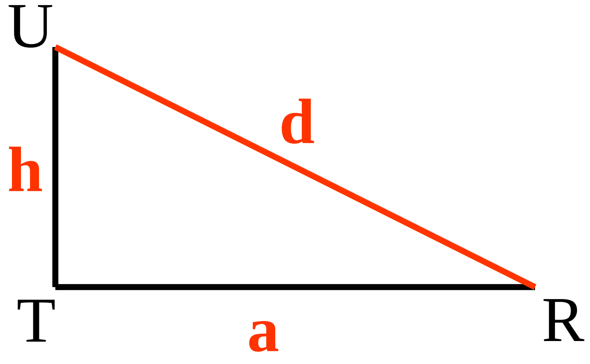
31. A right triangle has legs of 6 & 8. Find the lengths of:

a. the median to the hypotenuse b. the altitude to the hypotenuse

Sample Problems







33. l = 12, w = 4, h = 3

35. l = e, w = e, h = e

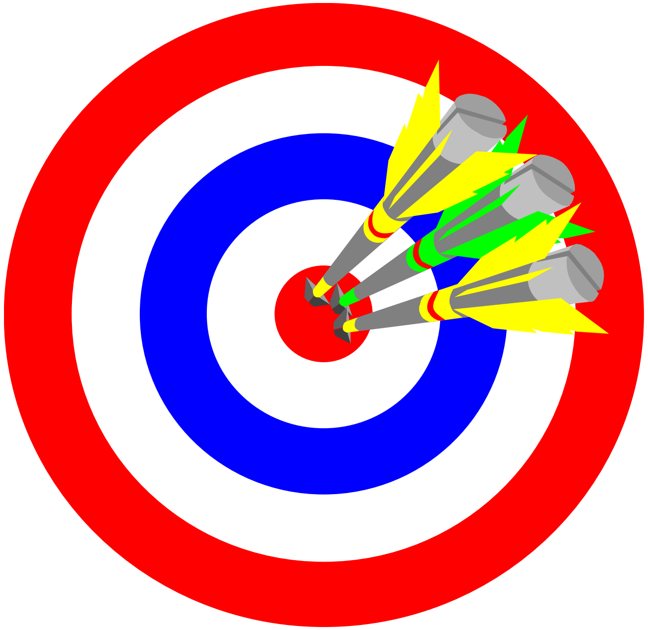
Section 8-3

The Converse of the Pythagorean Theorem

Homework Pages 297-298:

2-18 evens

Objectives



A. Understand the term ‘Pythagorean Triples’.
B. Use Pythagorean Triples to identify right triangles.
C. Understand and apply the converse of the Pythagorean Theorem to identify right triangles.
D. Use characteristics of the converse of the Pythagorean Theorem to identify acute and obtuse triangles.

- ★ Pythagorean triples: right triangle whose three sides are integers.

  3, 4, 5

  5, 12, 13

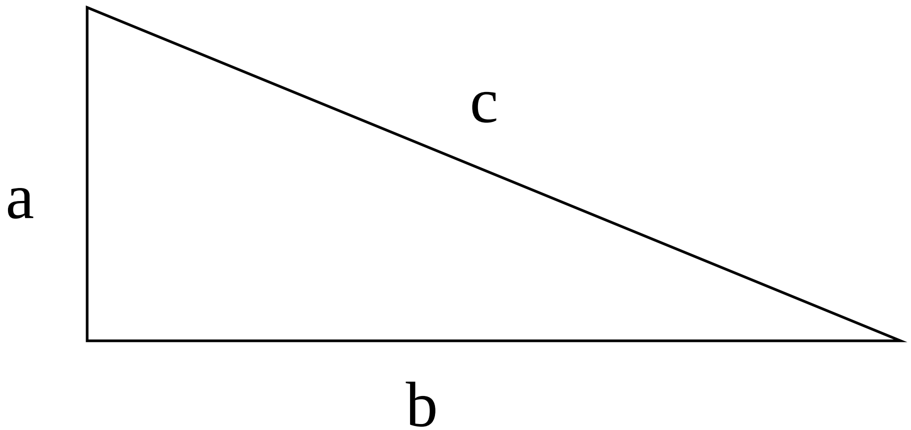
  8, 15, 17

  7, 24, 25

- Pythagorean triples are also part of a larger group known as pattern right triangles.

Theorem 8-3

If the square of one side of a triangle is equal to the sum of the squares of the other two sides, then the triangle is a right triangle.

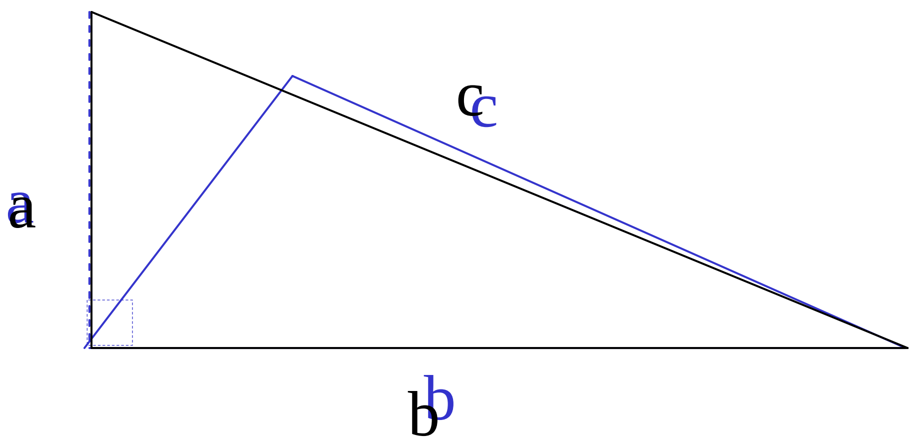


$$a^2 + b^2 = c^2$$

NOTE! By convention, ‘c’ is always the length of the longest side. In the case of a right triangle, it is the hypotenuse.

Theorem 8-4

If the square of one side of a triangle is less than the sum of the squares of the other two sides, then the triangle is acute.

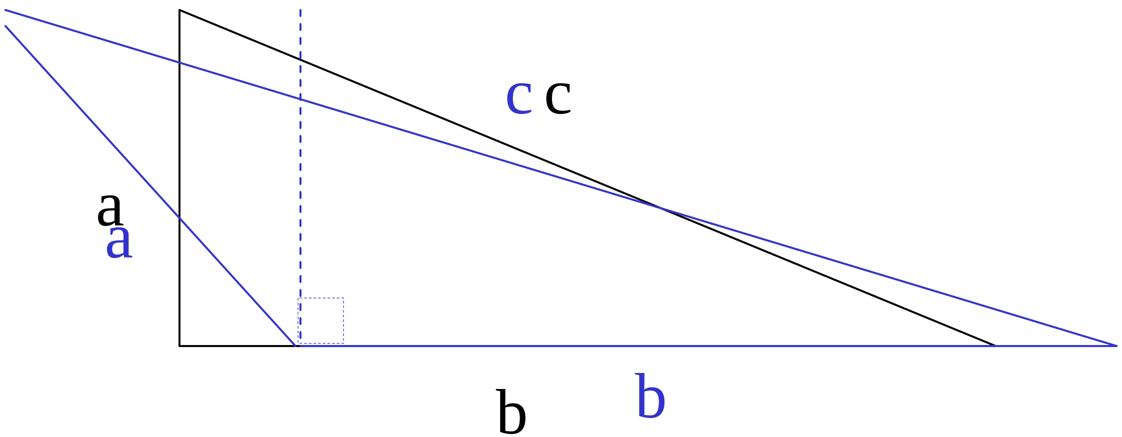


$$c^2 < a^2 + b^2$$

NOTE! By convention, ‘c’ is always the length of the longest side.

Theorem 8-5

If the square of one side of a triangle is greater than the sum of the squares of the other two sides, then the triangle is obtuse.



$$c^2 > a^2 + b^2$$

NOTE! By convention, ‘c’ is always the length of the longest side.

Sample Problems

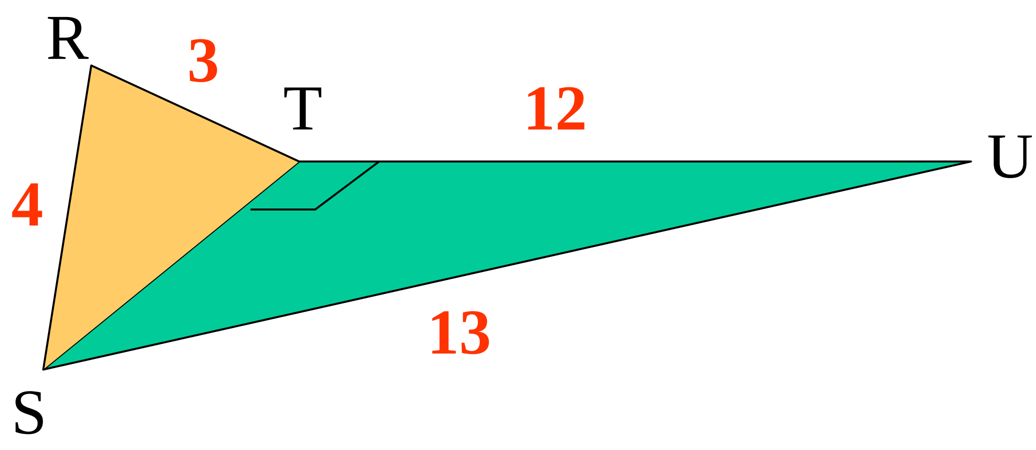
Tell whether a triangle with sides of a given lengths is acute, right, or obtuse.

1. 11, 11,15
3. 8, $8\sqrt{3}$, 16
5. 8, 14, 17

7a. 0.5, 1.2, 1.3

7b. 5n, 12n, 13n where n > 0

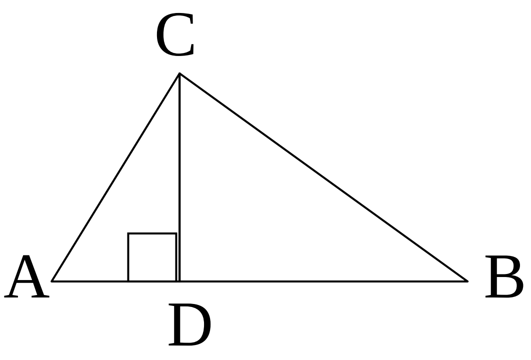
9. Given ∠ UTS is a ∠ rt. Show that Δ RST must be a right Δ



Sample Problems

Use the information to decide if Δ ABC is acute, right, or obtuse.

11. AC = 13, BC = 15, CD = 12
13. AC = 13, BC = $\sqrt{34}$, CD = 3



15. The sides of a triangle have lengths x, x + 4, and 20. Specify those values of x for which the triangle is acute with the longest side 20.
17. Sketch parallelogram RSTU, with diagonals intersecting at M. RS = 9, ST = 20, and RM = 11. Which segment is longer, SM or RM? Explain.

Section 8-4

Special Right Triangles

Homework Pages 302-303:

2-32 evens

Excluding 26

Objectives

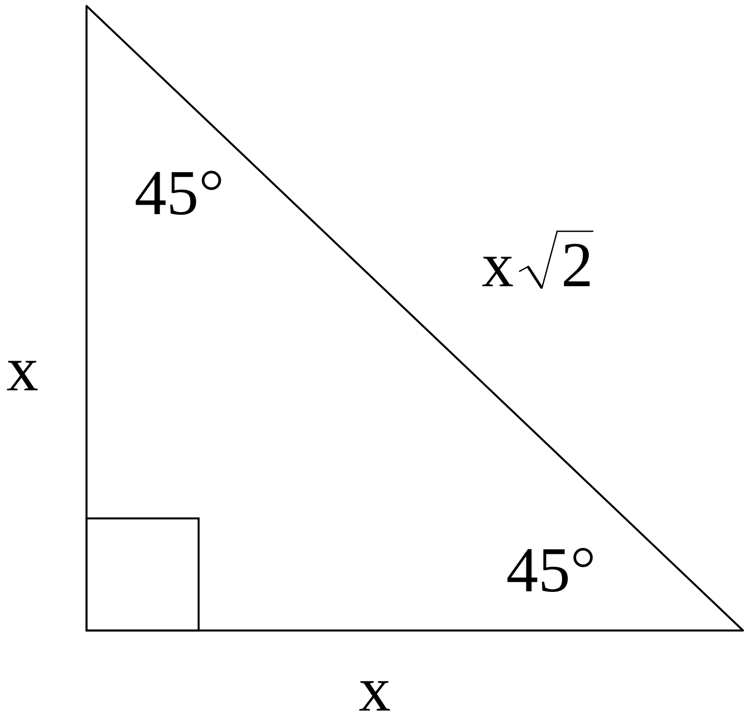
A. Understand and apply the theorem of 45-45-90 Triangles.

B. Understand and apply the theorem of 30-60-90 Triangles.

C. Understand, identify, and use pattern right triangles.

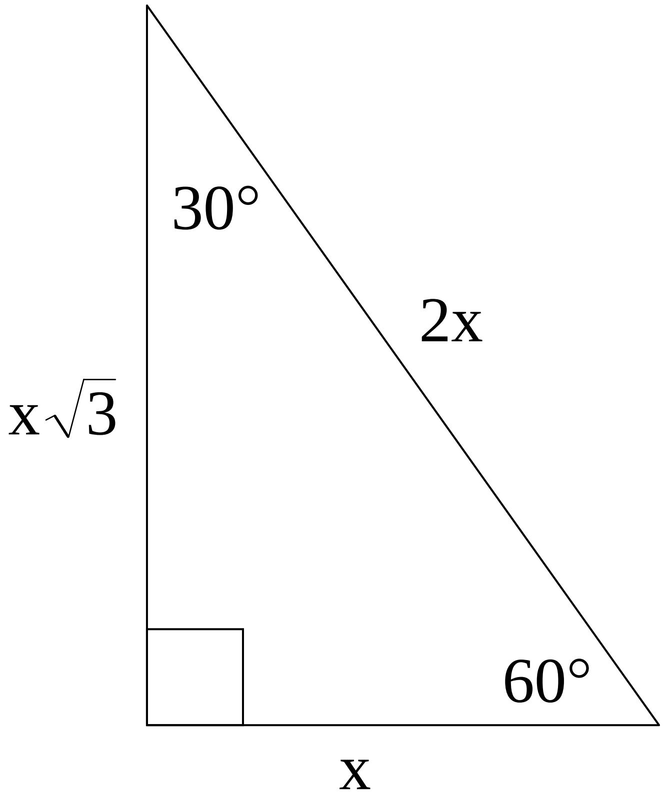
★ Theorem 8-6

In a 45°-45°-90° triangle, the legs are equal and the hypotenuse is $\sqrt{2}$ times as long as the leg.



★ Theorem 8-7

In a 30°-60°-90° triangle, the hypotenuse is twice as long as the shorter leg, and the longer leg is $\sqrt{3}$ times as long as the shorter leg.



Pattern Right Triangles

- Pattern right triangles are made up of
  - The Pythagorean Triples (based on lengths of sides)
    - 3, 4, 5
    - 5, 12, 13
    - 8, 15, 17
    - 7, 24, 25
  - The Special Right Triangles (based on angles)
    - 45-45-90
      - Based on sides → 1, 1, $\sqrt{2}$
    - 30-60-90
      - Based on sides → 1, $\sqrt{3}$, 2

Pattern Right Triangles

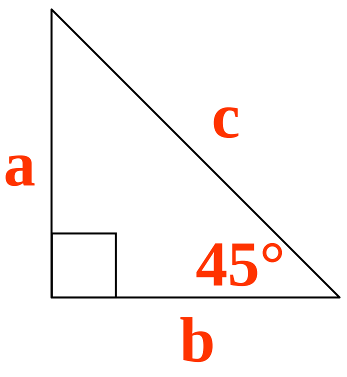
- Pattern right triangles can also be seen as RATIOS!
  - The Pythagorean Triples (based on lengths of sides)
    - 3x: 4x: 5x
    - 5x: 12x: 13x
    - 8x: 15x: 17x
    - 7x: 24x: 25x
  - The Special Right Triangles (based on angles)
    - 45-45-90
      - Based on sides → 1x: 1x, $\sqrt{2}x$
    - 30-60-90
      - Based on sides → 1x: $\sqrt{3}x$: 2x

Pattern Right Triangles

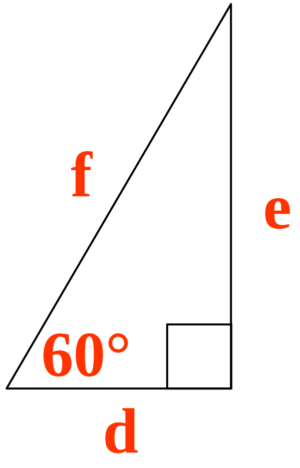
- For example → If X = 3, then each of the following are right triangles:
  - The Pythagorean Triples (based on lengths of sides)
    - 3x: 4x: 5x → 9, 12, 15
    - 5x: 12x: 13x → 15, 36, 39
    - 8x: 15x: 17x → 24, 45, 51
    - 7x: 24x: 25x → 21, 72, 75
  - The Special Right Triangles (based on angles)
    - 45-45-90
      - Based on sides → 1x: 1x, $\sqrt{2}x$ → 3, 3, $3\sqrt{2}$
    - 30-60-90
      - Based on sides → 1x: $\sqrt{3}x$: 2x → 3, $3\sqrt{3}$,6

Sample Problems

	1.	3.	5.	7.
a	4	$\sqrt{5}$	?	?
b	?	?	?	$4\sqrt{2}$
c	?	?	6	?



	9.	11.	13.	15.
d	7	?	?	?
e	?	$5\sqrt{3}$	?	3
f	?	?	10	?



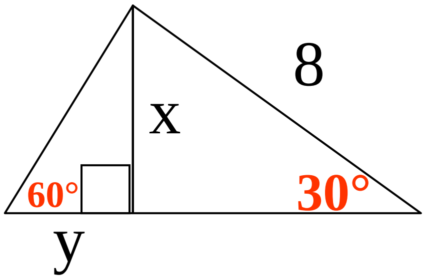
Sample Problems

17. Find the length of the diagonal of a square with perimeter 48.

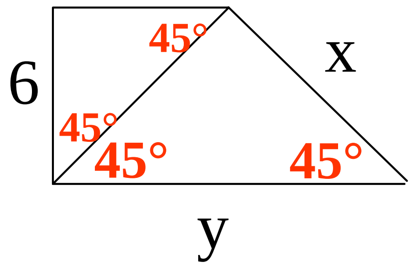
19. An altitude of an equilateral triangle is $6\sqrt{3}$. What is the perimeter?

Find the values of x and y in each diagram.

21.



23.



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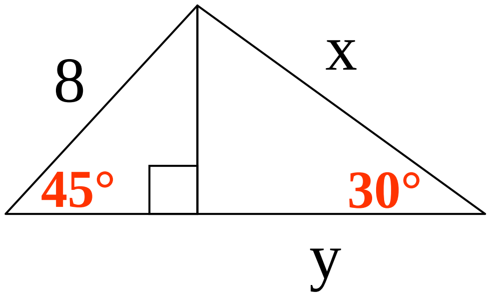
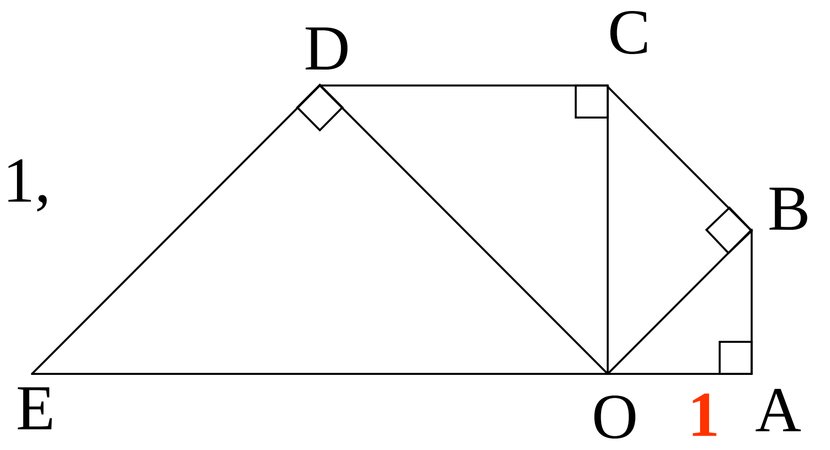


Sample Problems

27. The diagram shows four 45°-45°-90° triangles. If OA = 1, find OB, OC, OD, & OE.

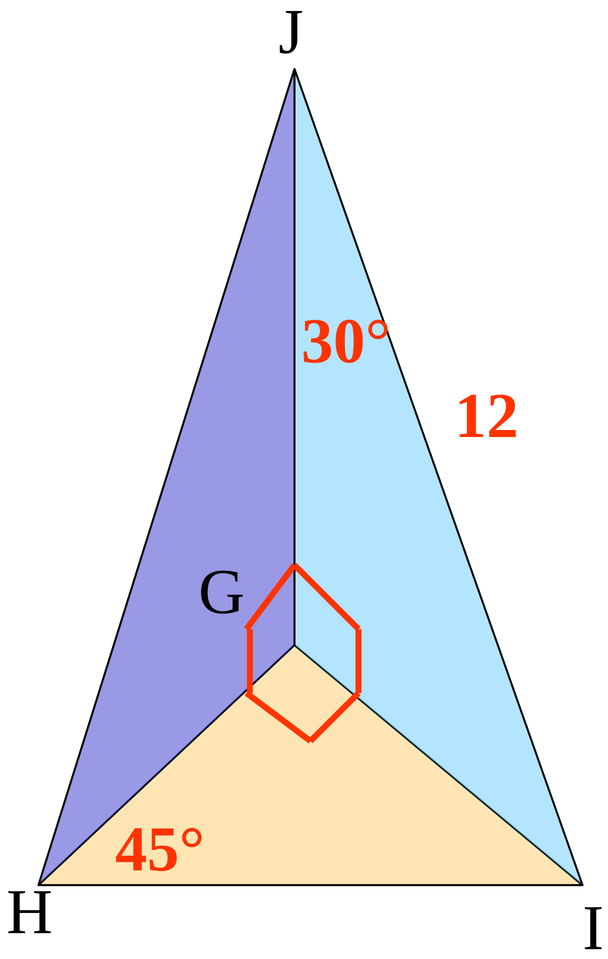


29. The perimeter of a rhombus is 64 and one of the angles measures 120. Find the lengths of the diagonals

31. Explain why any triangle having sides in the ratio $1:\sqrt{3}:2$ must be a 30°-60°-90° triangle.

Sample Problems

Find the lengths of as many segments as possible.



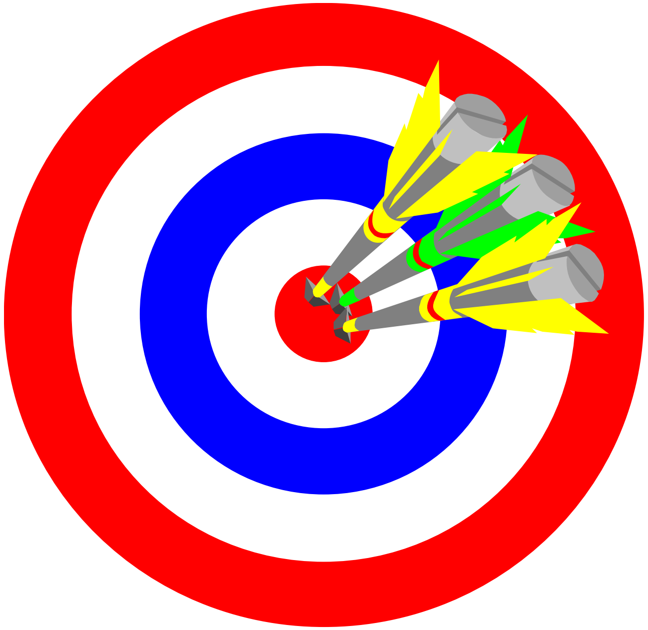
Section 8-5

The Tangent Ratio

Homework Pages 308-309:

2-26 evens

Objectives

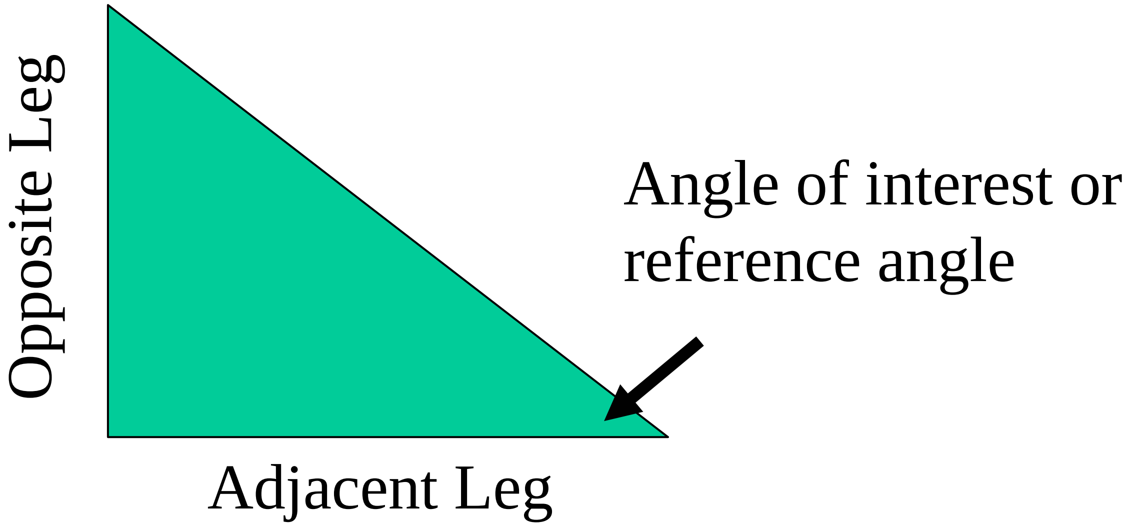


A. Apply the terms ‘adjacent leg’ and ‘opposite leg’ correctly.
B. Understand and apply the tangent ratio.
C. Apply the terms ‘angle of depression’, ‘angle of elevation’, and ‘grade’ to trigonometric problems.

‘Parts’ of a Triangle

Adjacent Leg → the side of a right triangle touching the vertex of a given angle

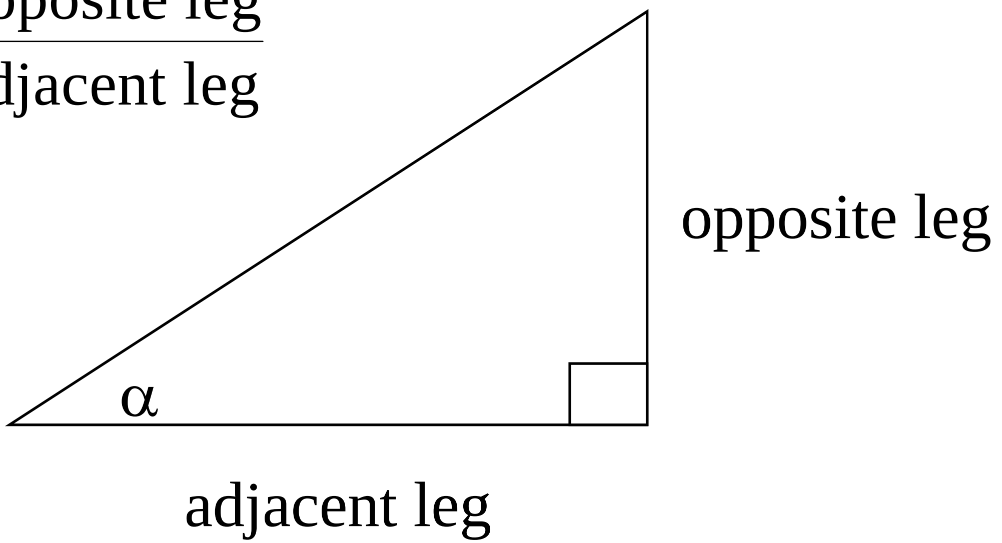
Opposite Leg → the side of a right triangle across from the vertex of a given angle.



★ Sides of a Right Triangle

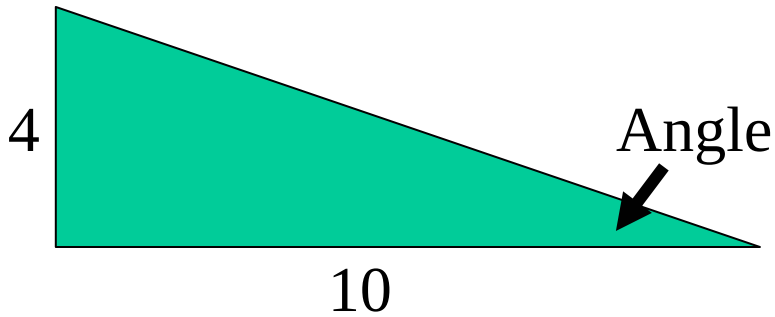
Tangent → the ***ratio*** of the opposite leg to the adjacent leg.

$$\tan \alpha = \frac{\text{opposite leg}}{\text{adjacent leg}}$$



'Types' of Angles

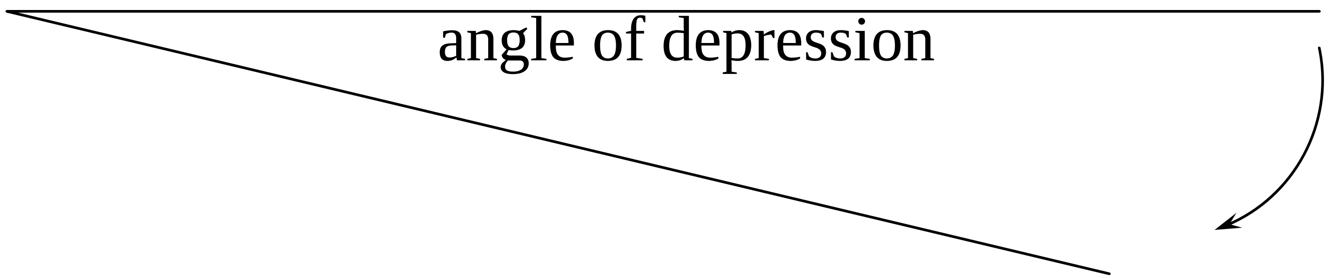
- grade: is the slope of the surface or it equals the tangent of the angle of elevation expressed as a percentage.



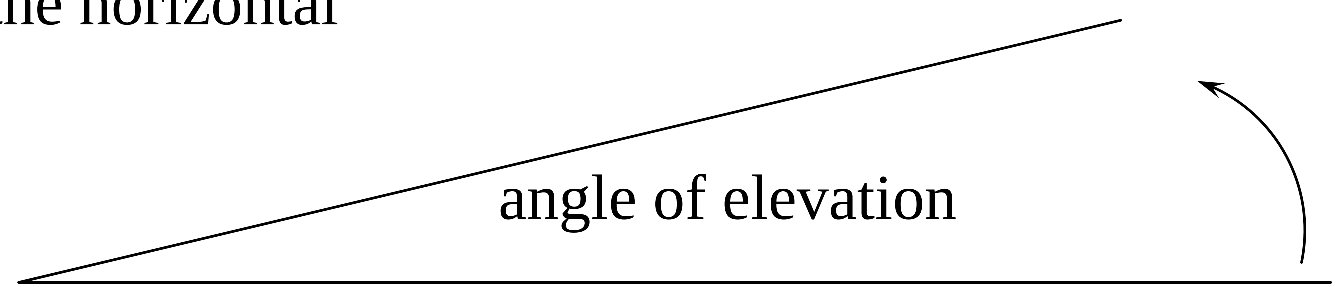
$$\text{Grade} = \frac{rise}{run} = \frac{4}{10} = .40 = 40\%$$

★ Angles of Depression & Elevation

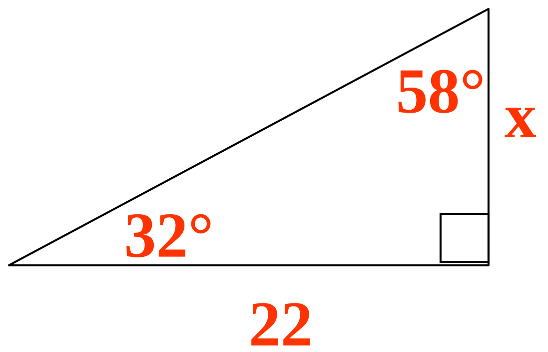
- angle of depression: a line of sight angle measured down from the horizontal



- angle of elevation: a line of sight angle measured up from the horizontal



Sample Problem: Using the Tangent Ratio to Determine Sides

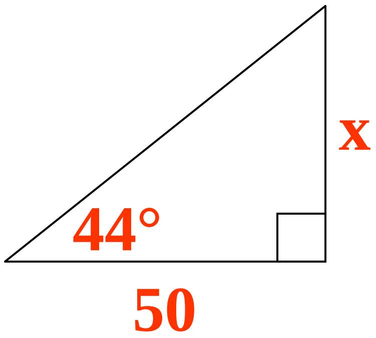


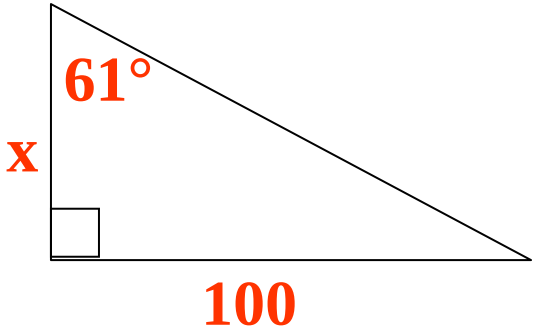
Find the value of x.

1. Setup the tangent ratio.	$\text{tangent } \alpha = \dfrac{\text{opposite}}{\text{adjacent}}$
2. Fill in the known values.	$\text{tangent } 32° = \dfrac{x}{22}$
3. Look up the ratio for the tangent (or put in calculator) (MAKE SURE CALCULAOR IS SET TO DEGREES!)	$\text{tangent } 32° = .6249 = \dfrac{x}{22}$
4. Solve for x.	$x = (.6249)(22) \approx 13.7$

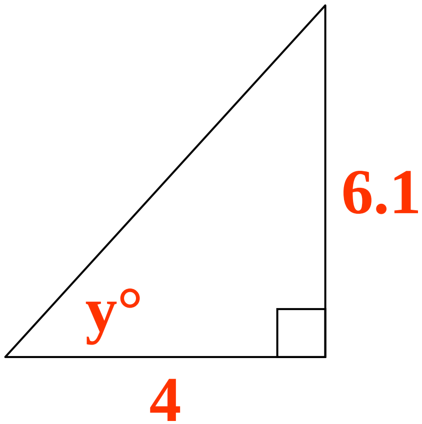
You Try It: Using the Tangent Ratio to Determine Sides

Find the value of x.





Sample Problem: Using Sides to Determine Angle

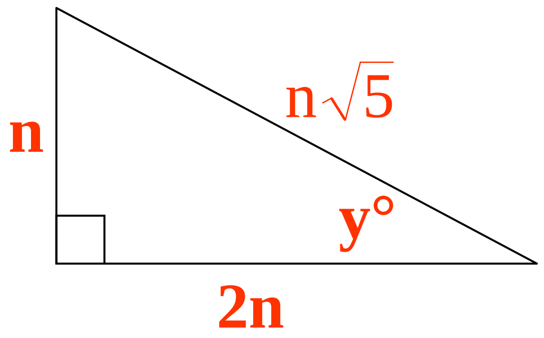


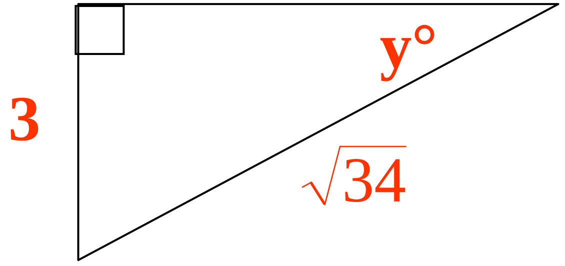
Find the value of y.

1. Setup the tangent ratio.	$\text{tangent } \alpha = \dfrac{\text{opposite}}{\text{adjacent}}$
2. Fill in the known values.	$\text{tangent } y° = \dfrac{6.1}{4}$
3. Divide the ratio.	$\text{tangent } y° = \dfrac{6.1}{4} = 1.525$
4. Look up the ratio in the table to determine the angle (or use the inverse tangent function on your calculator [DEGREES!].	$\text{tangent } 57° \approx 1.5399 \approx 1.525$ $y \approx 57°$

You Try It: Using Sides to Determine Angle

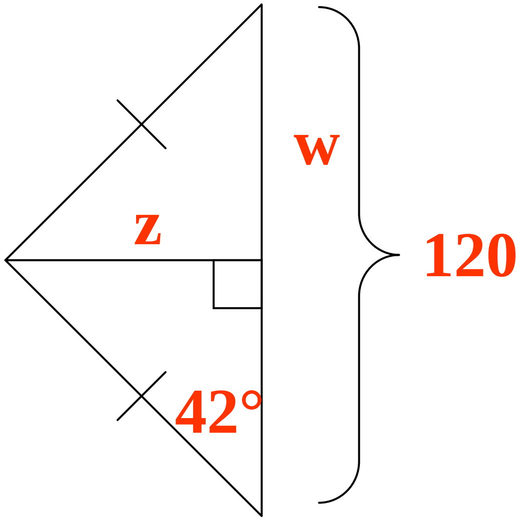
Find the value of y.



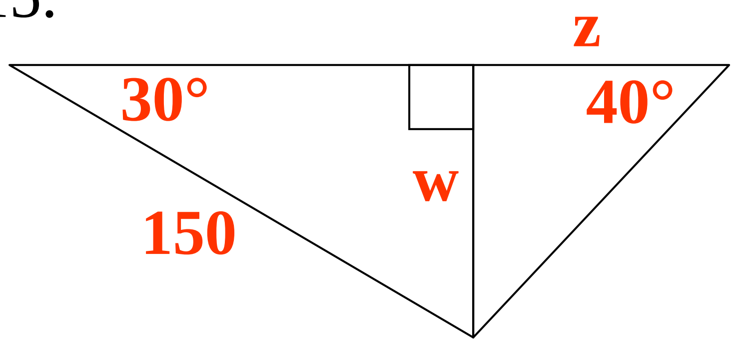


Sample Problems

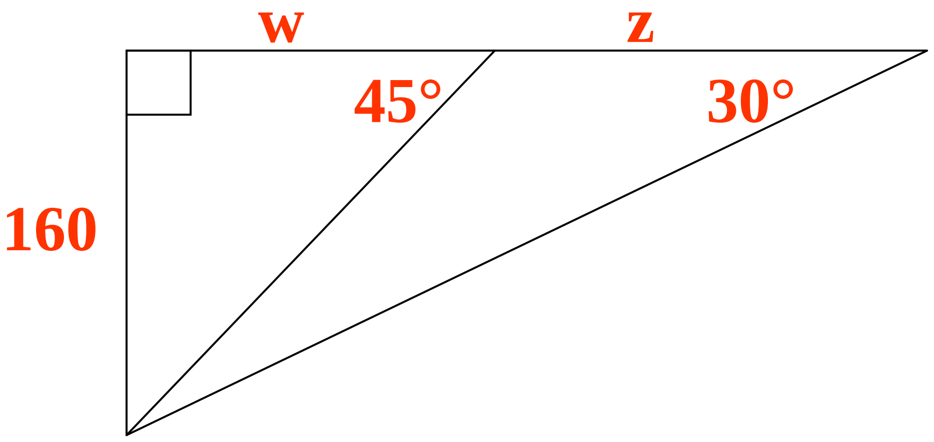
13.



15.



17.



Sample Problems

19. The grade of a road is 7%. What angle does the road make with the horizontal?
21. The base of an isosceles triangle is 70 cm long. The altitude to the base is 75 cm long. Find, to the nearest degree, the base angles of the triangle.
23. The shorter diagonal of a rhombus with a 70° angle is 122 cm long. How long, to the nearest centimeter, is the longer diagonal?
25. Does tan A + tan B = tan (A + B)? Try substituting 35° for A and 25° for B.

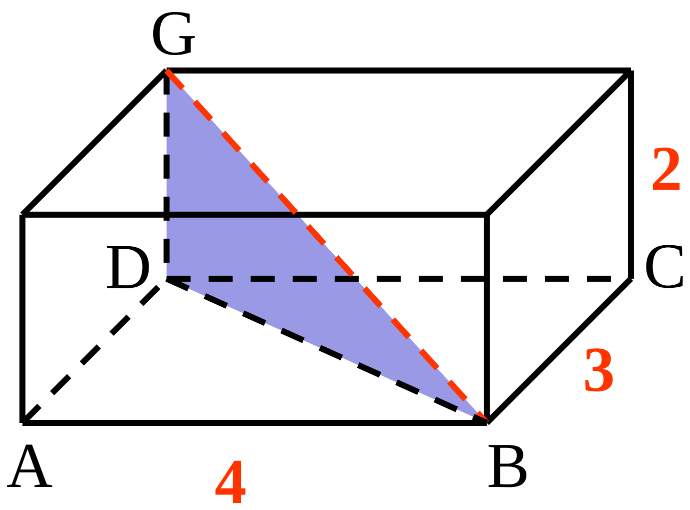
a. tan 35° + tan 25° ≈ ?

b. tan (35° + 25°) ≈ ?

c. yes/no?

d. Do you think tan A - tan B = tan (A - B)?

Sample Problems



27. A rectangle box has length 4, width 3, and height 2.

27a. Find BD.

27b. Find ∠ GBD to the nearest degree.

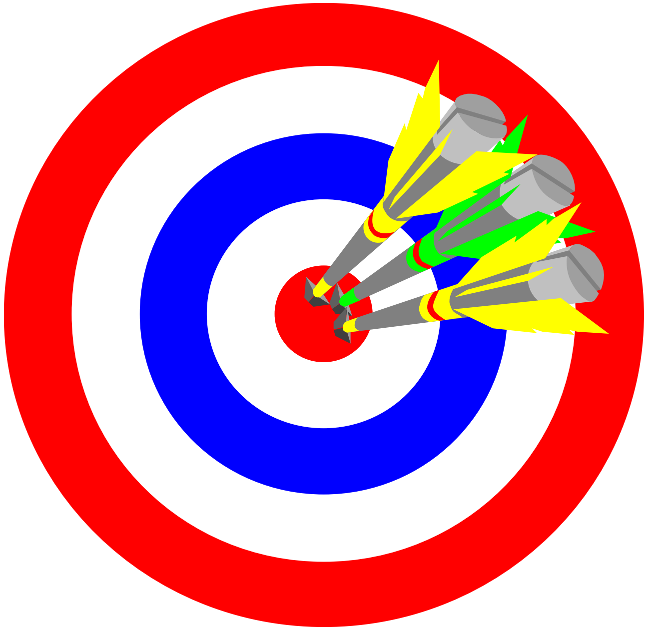
Section 8-6

The Sine and Cosine Ratios

Homework Pages 314-316:

2-22 evens

Objectives



A. Review the terms ‘adjacent leg’, ‘opposite leg’, ‘hypotenuse’, and ‘reference angle’ in regards to a right triangle.

B. Understand and apply the sine and cosine ratios.

C. Understand and apply the concepts of ‘exact values’ as compared to ‘estimated values’.

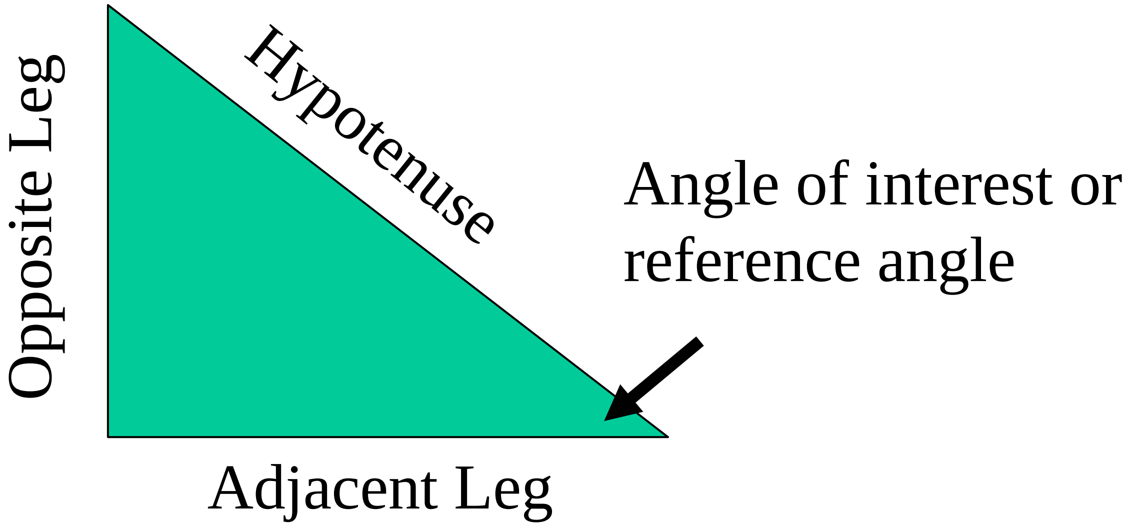
D. Understand and utilize the mnemonic/acronym ‘SOHCAHTOA’.

Reminder! ‘Parts’ of a Triangle

Adjacent Leg → the side of a right triangle touching the vertex of a given angle

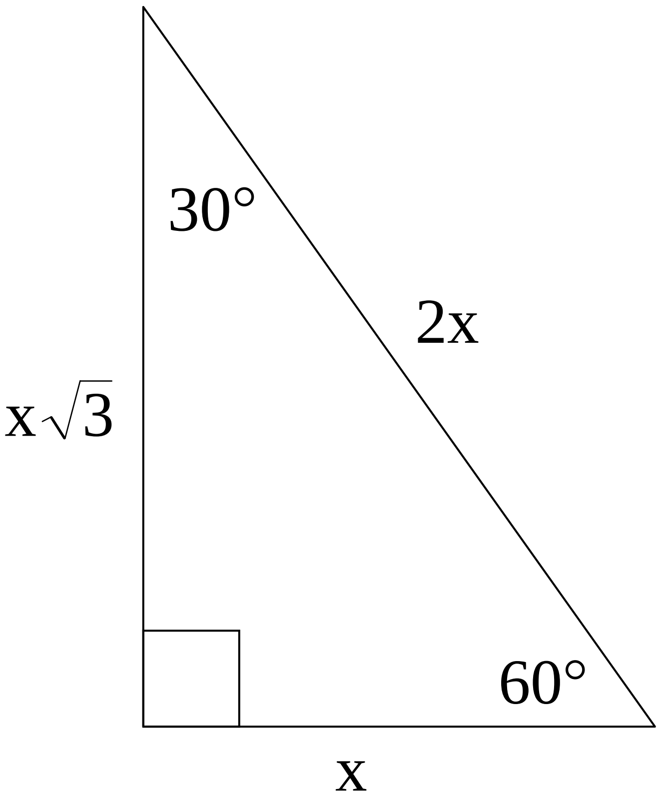
Opposite Leg → the side of a right triangle across from the vertex of a given angle.

Hypotenuse → the longest side of a right triangle opposite the right angle.



Exact Values Versus Estimated Values

Consider the following 30°-60°-90° triangle:



Exact Values:

$$\tan 60° = \frac{x\sqrt{3}}{x} = \sqrt{3}$$

$$\tan 30° = \frac{x}{x\sqrt{3}} = \frac{1}{\sqrt{3}} = \frac{\sqrt{3}}{3}$$

Estimated Values:

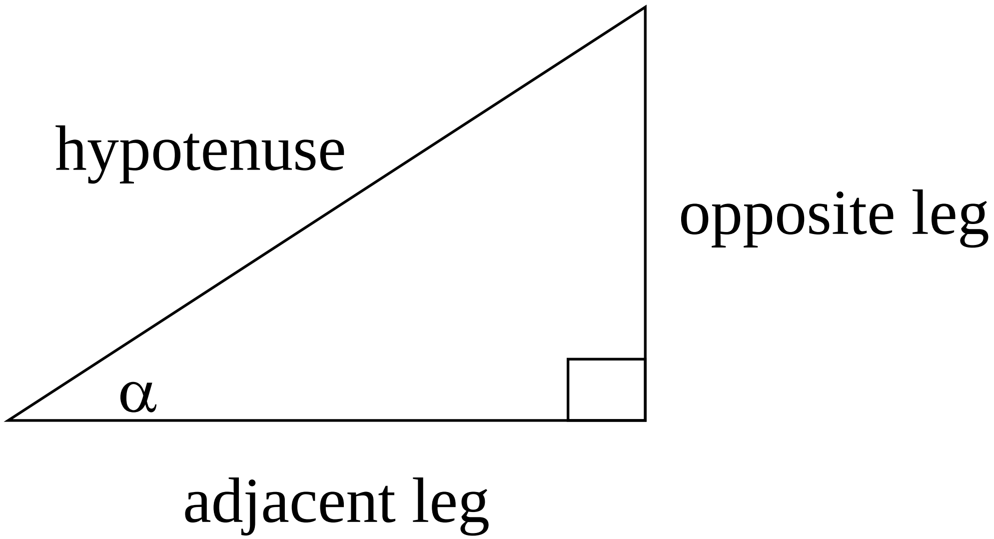
$$\tan 60° = \sqrt{3} \approx 1.73205$$

$$\tan 30° = \frac{\sqrt{3}}{3} \approx 0.57735$$

Sine and Cosine

- sine: the ratio of the opposite leg to the hypotenuse.
- cosine: the ratio of the adjacent leg to the hypotenuse.

★ Sides of a Right Triangle



$$\sin\alpha = \frac{\text{opposite leg}}{\text{hypotenuse}}$$

$$\cos\alpha = \frac{\text{adjacent leg}}{\text{hypotenuse}}$$

$$\tan\alpha = \frac{\text{opposite leg}}{\text{adjacent leg}}$$

★ SOHCAHTOA

Sine (equals)

Opposite Leg (over)

Hypotenuse

Cosine (equals)

Adjacent Leg (over)

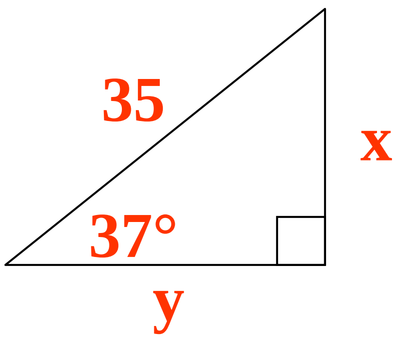
Hypotenuse

Tangent (equals)

Opposite Leg (over)

Adjacent Leg

Sample Problem: Using the Sine/Cosine Ratios to Determine Sides

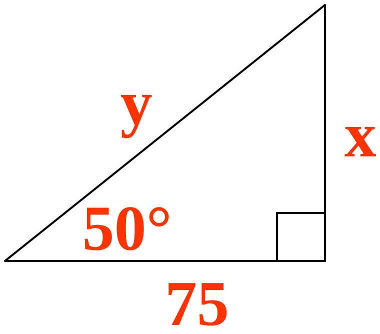


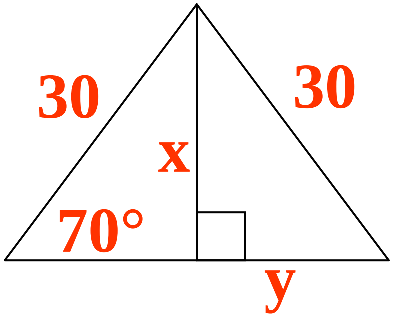
Find the values of x and y.

1. Setup the sine/cosine ratio.	$\text{sine}\ \alpha = \frac{\text{opposite}}{\text{hypotenuse}}$	$\text{cosine}\ \alpha = \frac{\text{adjacent}}{\text{hypotenuse}}$
2. Fill in the known values.	$\text{sine}\ 37° = \frac{\text{x}}{35}$	$\text{cosine}\ 37° = \frac{\text{y}}{35}$
3. Look up the ratio for the sine/cosine (or put in calculator)	$\text{sine}\ 37° = .6018 = \frac{\text{x}}{35}$	$\text{cosine}\ 37° = .7968 = \frac{\text{y}}{35}$
4. Solve for x.	$x = (.6016)(35) \approx 21$	$y = (.7968)(35) \approx 28$

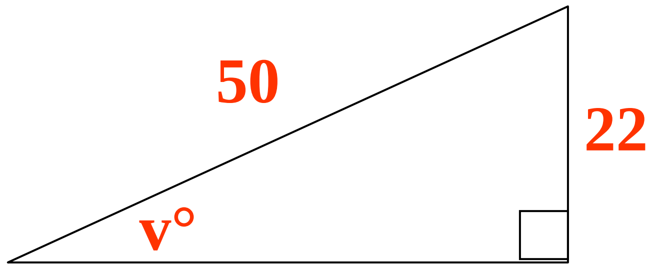
You Try It: Using the Sine/Cosine Ratios to Determine Sides

Find the values of x and y.





Sample Problem: Using Sides to Determine Angle

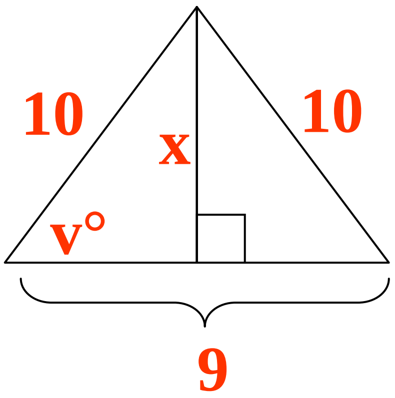


Find the value of v.

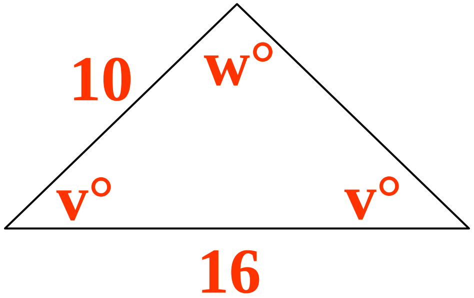
1. Choose the proper trigonometric ratio/function.	$\text{sine } \alpha = ? \text{ cosine } \alpha = ? \text{ tangent } \alpha = ?$
2. Setup the proper ratio.	$\text{sine } \alpha = \dfrac{\text{opposite}}{\text{hypotenuse}}$
3. Fill in the known values.	$\text{sine } \alpha = \dfrac{22}{50}$
4. Divide the ratio.	$\text{sine } \alpha = \dfrac{22}{50} = 0.44$
5. Use table or calculator. Make sure to use proper function!	$\text{sine } 26° \approx 0.4384 \approx 0.44$

You Try It: Using Sides to Determine Angle

Find the value of v and x.



Find the value of v and w.

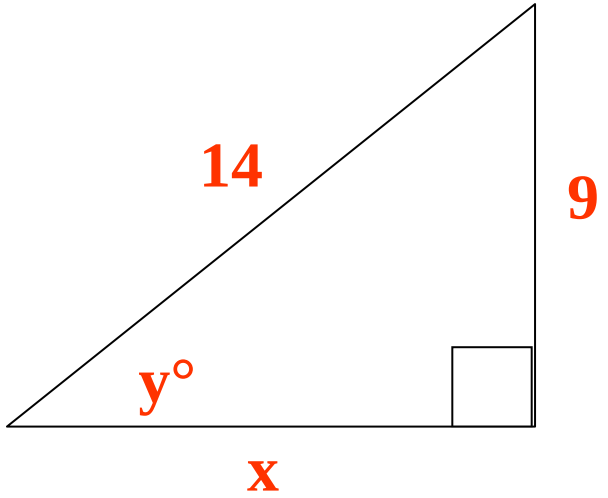


Sample Problems

13a. Use the Pythagorean Theorem to find the value of x in radical form.

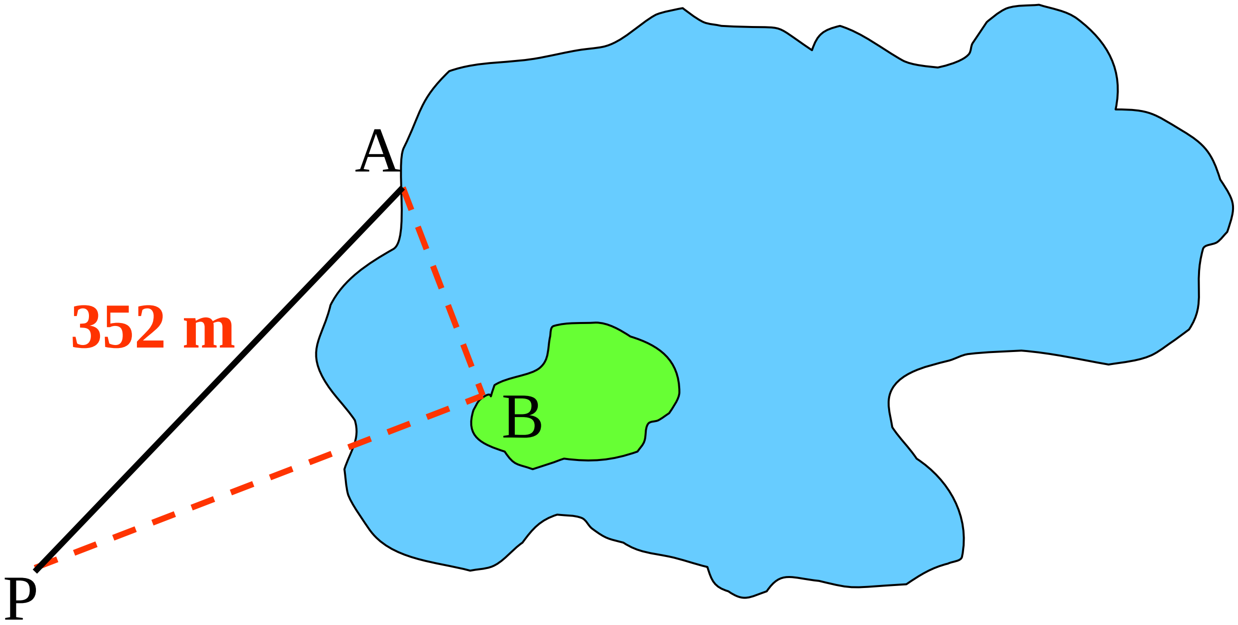
b. Use trigonometry to find the values of y, then x.

c. Are the values of x from parts (a) and (b) in reasonable agreement?



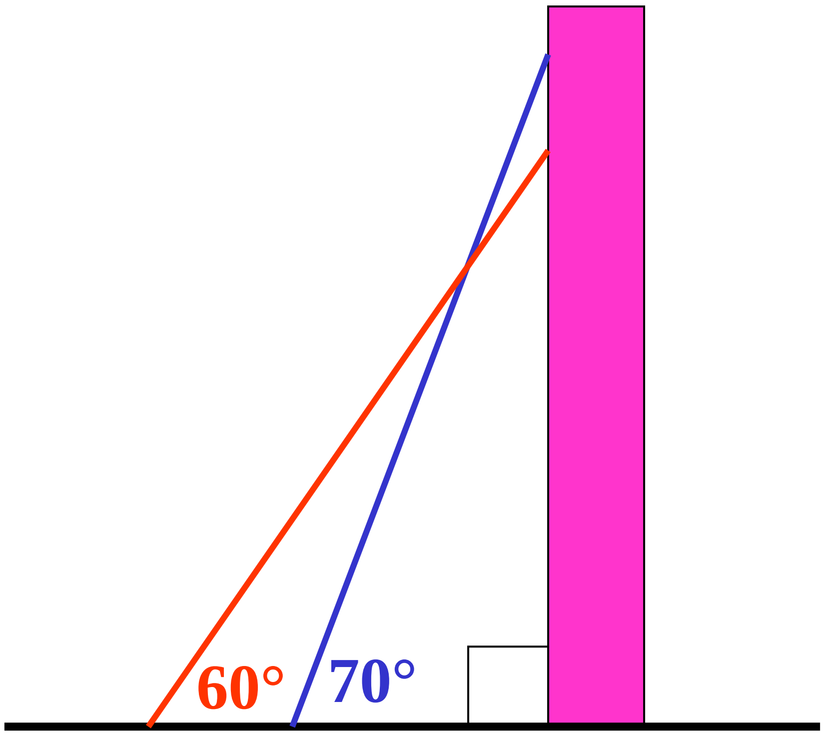
Sample Problems

15. To find the distance from point A on the shore to point B on an island in the lake, surveyors located point P with m ∠ PAB = 65° and m ∠ APB = 25°. By measurement PA = 352 m. Find AB.



Sample Problems

17. A 6 m ladder reaches higher up a wall when placed at a 70° angle than when placed at a 60° angle. How much higher, to the nearest tenth of a meter?



Sample Problems

19. In Δ ABC, m $\angle$ B = m $\angle$ C = 72 and BC = 10.
    a. Find AB and AC.
    b. Find the length of the bisector of $\angle$ A to BC.

21. The diagonals of rectangle ABCD are 18 cm long and intersect in a 34° angle. Find the length and width of the rectangle.

23. Points A, B, C, & D are consecutive vertices of a regular decagon with sides 20 cm long. Ray AB and ray DC are drawn and intersect at X. Find BX.

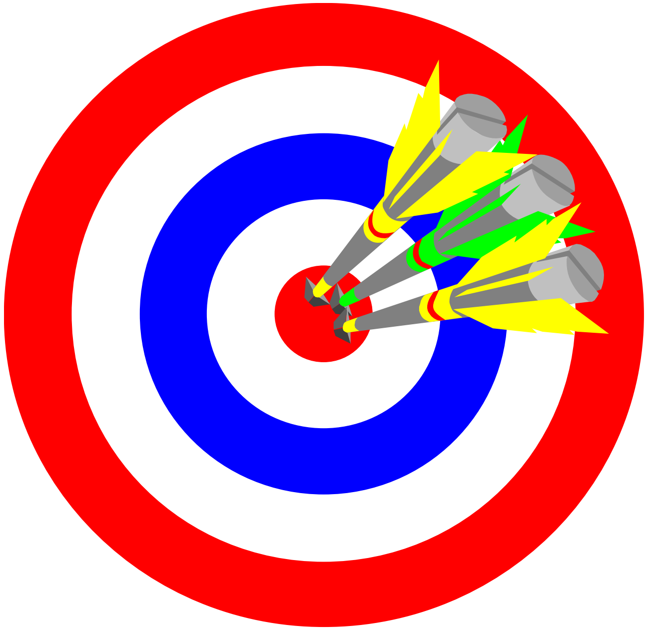
Section 8-7

Applications of Right Triangle Trigonometry

Homework Pages 318-319:

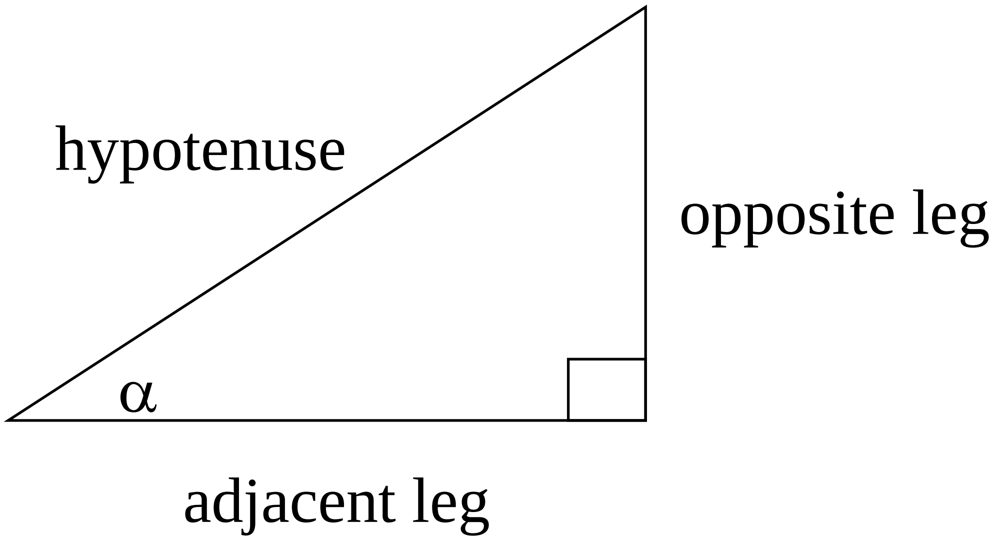
2, 6, 8, 10

Objectives



A. Apply trigonometric ratios and functions to real world problems.

★ Sides of a Right Triangle



$$\cos\alpha = \frac{\text{adjacent leg}}{\text{hypotenuse}}$$

$$\sin\alpha = \frac{\text{opposite leg}}{\text{hypotenuse}}$$

$$\tan\alpha = \frac{\text{opposite leg}}{\text{adjacent leg}}$$

★ SOHCAHTOA

Sine (equals)

Opposite Leg (over)

Hypotenuse

Cosine (equals)

Adjacent Leg (over)

Hypotenuse

Tangent (equals)

Opposite Leg (over)

Adjacent Leg

Sample Problems

1. When the sun's angle of elevation is 57°, a building casts a shadow 21 m long. How high is the building?
3. A kite is flying at an angle of elevation of about 40°. All 80 m of string have been let out. Ignoring the sag in the string, find the height of the kite to the nearest 10m.
5. An observer located 3 km from a rocket launch site sees a rocket at an angle of elevation of 38°. How high is the rocket at that moment?
7. Martha is 180 cm tall and her daughter Heidi is 90 cm tall. Who casts the longer shadow, Martha when the sun is 70° above the horizon, or Heidi when the sun is 35° above the horizon? How much longer?

Sample Problems

9. Scientists can estimate the depth of the craters on the surface of the moon by studying the lengths of the shadows in the craters. Shadows’ lengths can be estimated by measuring them on photographs. Find the depth of a crater if the shadow is estimated to be 400 m long and the angle of elevation of the sun is 48°.

11. A road 1.6 km long rises 400 m. What is the angle of elevation of the road?

Chapter 8

Right Triangles

Review

Homework Pages 324-325:

2-24 evens