

1.4 Right Triangle Review and Dimensional Analysis

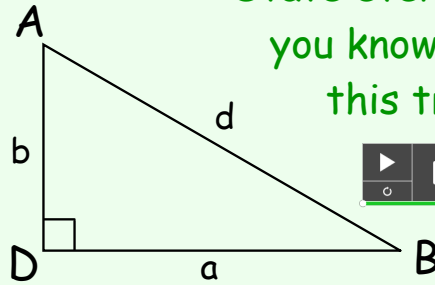
STANDARDS

- 1.5 I can convert physical quantities from one system of units to another.
- 1.6 I can apply the basic trigonometric functions and the Pythagorean theorem in simple physical contexts.



WARM UP

State everything you know about this triangle.

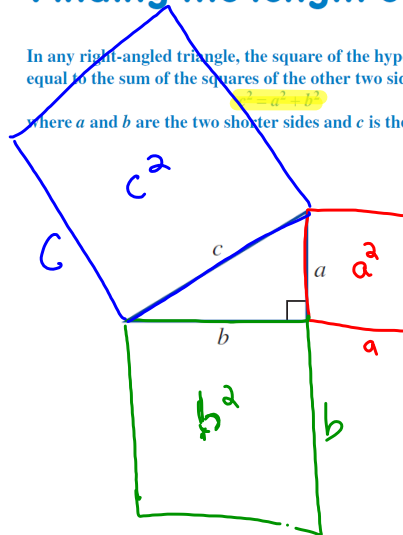


$a^2 + b^2 = d^2$ Right Δ
 $m\angle D = 90^\circ$
 SDH CAH TOA
 $m\angle A + m\angle B + m\angle D = 180^\circ$
 $m\angle A + m\angle B = 90^\circ$

$\frac{\sin A}{a} = \frac{\sin B}{b} = \frac{\sin D}{d}$

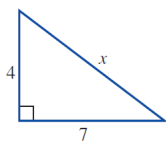
Finding the length of sides

In any right-angled triangle, the square of the hypotenuse is equal to the sum of the squares of the other two sides. The rule is: $c^2 = a^2 + b^2$ where a and b are the two shorter sides and c is the hypotenuse.



Finding the length of sides

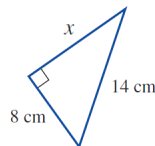
Find the value of the unknown variable. Round your answer to one decimal.



$$4^2 + 7^2 = x^2$$

$$\sqrt{65} = \sqrt{x^2}$$

$$8.1 = x$$



$$x^2 + 8^2 = 14^2$$

$$x = 11.5 \text{ cm}$$

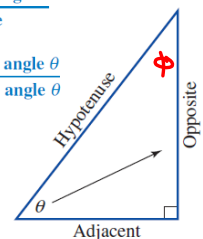
Trigonometric ratios

SDH CAH TOA

$$\text{sine of angle } \theta = \frac{\text{length of the side opposite to angle } \theta}{\text{length of the hypotenuse}}$$

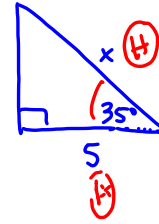
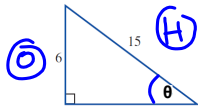
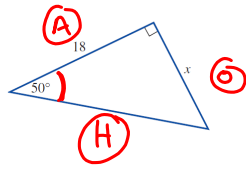
$$\text{cosine of angle } \theta = \frac{\text{length of the side adjacent to angle } \theta}{\text{length of the hypotenuse}}$$

$$\text{tangent of angle } \theta = \frac{\text{length of the side opposite to angle } \theta}{\text{length of the side adjacent to angle } \theta}$$



Trigonometric ratios

Find the value of the unknown variable. Round your answer to one decimal.



$$\cos 35 = \frac{5}{x}$$

$$x = \frac{5}{\cos 35}$$

$$18 \tan 50 = \frac{x}{18} \cdot 18$$

$$\sin \theta = \frac{6}{15}$$

$$18 \tan 50 = x$$

$$\theta = \sin^{-1}\left(\frac{6}{15}\right)$$

$$21.5 = x$$

$$\theta = 23.6^\circ$$

Converting Units

$$1 \text{ kilometer} = \underline{1000} \text{ meters}$$

$$1 \text{ mile} = \underline{5280} \text{ feet}$$

Conversion Factors

A **conversion factor** is a ratio (or fraction) which represents the relationship between two different units.

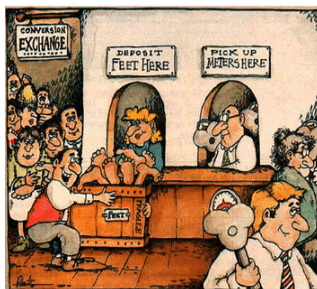
Useful Conversions		
1 in = 2.54 cm	1 kg = 6.02×10^{26} u	1 atm = 101 kPa
1 mi = 1.61 km	1 oz \leftrightarrow 28.4 g	1 cal = 4.184 J
1 m ² = 640 acres	1 kg \leftrightarrow 2.21 lb	1 eV = 1.60×10^{-19} J
1 gal = 3.79 L	1 lb = 4.45 N	1 kWh = 3.60 MJ
1 m ³ = 264 gal	1 atm = 14.7 lb/in ²	1 hp = 746 W
1 knot = 1.15 mi/h	1 atm = 1.01×10^5 N/m ²	1 mol = 6.022×10^{23} items

Dimensional Analysis

Dimensional analysis is a method of unit conversion by treating units as algebraic quantities that can be cancelled.

$$1 \text{ km} = 1000 \text{ m}$$

$$\frac{1 \text{ km}}{1000 \text{ m}} = \frac{1000 \text{ m}}{1 \text{ km}}$$



Dimensional Analysis

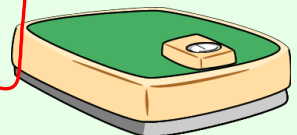
You step on a scale and the reading shows **71.4 kg**. What is your mass in pounds?

$$1 \text{ kg} = 2.2 \text{ lbs}$$

$$\frac{1 \text{ kg}}{2.2 \text{ lbs}} \quad \frac{2.2 \text{ lbs}}{1 \text{ kg}}$$

$$71.4 \text{ kg} \times \frac{2.2 \text{ lbs}}{1 \text{ kg}}$$

$$157 \text{ lbs}$$



Dimensional Analysis

You cross the border into Canada and notice this speed limit sign on the side of the road. How fast can you drive, in mph, without speeding?



$$\frac{120 \text{ km}}{\text{h}} \times \frac{1 \text{ mi}}{1.6 \text{ km}}$$

$$75 \text{ mph}$$

HOMEWORK

UNIT 1 PROBLEMS (10-15) CONVERSION WORKSHEET

PHYSICS 1

Unit 1 Questions

1.4 Right Triangle Review and Dimensional Analysis

Common Conversion Factors:

1 ft = 12 in

1 gal = 4 qt

1 lb = 454 g

1 mi = 5280 ft

1 in = 2.54 cm

1 L = 1.057 qt

1 lb = 16 oz

1 mi = 1.61 km

1 mL = 1 cm³

1) 29.5 inches → feet

2) 245.3 feet → miles

3) 0.11 L → cm³

4) 0.0459 meters → inches

5) 18,268.3 inches → meters

6) 80 km → inches

Attachments

TrigWorksheet.pdf