

1.4 Right Triangle Review and Dimensional Analysis

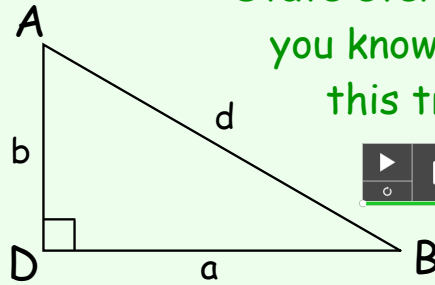
STANDARDS

- 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.



$a^2 + b^2 = d^2$
SOH CAH TOA

Right Δ
3 sides & Angles

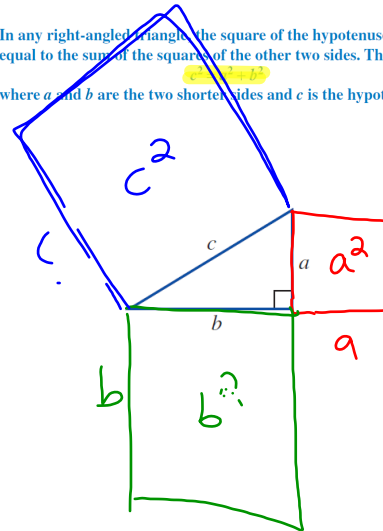
$m\angle A + m\angle B + m\angle D = 180$
 $m\angle A + m\angle B = 90^\circ$

Hypotenuse

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

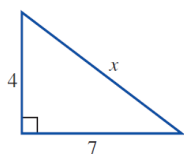
Finding the length of sides

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.

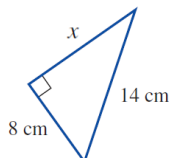


Finding the length of sides

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



$4^2 + 7^2 = x^2$
 $\sqrt{65} = \sqrt{x^2}$
 $8.1 = x$



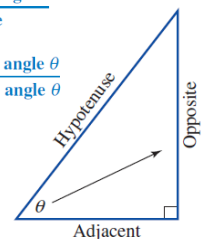
$x^2 + 8^2 = 14^2$
 $x^2 = 132$
 $x = 11.5 \text{ cm}$

Trigonometric ratios

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

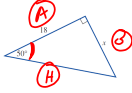
CAH
cosine of angle $\theta = \frac{\text{length of the side adjacent to angle } \theta}{\text{length of the hypotenuse}}$

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



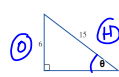
Trigonometric ratios

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



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

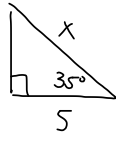
$$21.6 = x$$



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

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

$$\theta = 23.6^\circ$$



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

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

$$x = x_0 + v_0 t + \frac{1}{2} a t^2$$

$$[L] = [L] + \frac{[L]}{[T]} [T] + \frac{1}{2} \frac{[L]}{[T]^2} [T]^2$$

Converting Units

1 kilometer = 1000 meters

1 mile = 5280 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 ↔ 28.4 g	1 cal = 4.184 J
1 m ² = 640 acres	1 kg ↔ 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

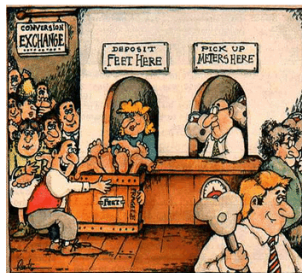
Dimensional Analysis

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

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

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

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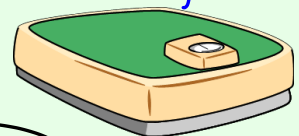
Dimensional Analysis

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? $1 \text{ mi} = 1.609 \text{ km}$



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

$$75 \text{ mph}$$

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