

Worksheet 1.2 Algebra

1. Solve each formula for the variable indicated.

a) $A = lw$, "w"

$$w = \frac{A}{l}$$

b) $A = \frac{1}{2}bh$, "h"

$$h = \frac{2A}{b}$$

c) $g = a + w$, "a"

$$a = g - w$$

d) $P = s - e$, "s"

$$s = P + e$$

e) $v = u + at$, "u"

$$u = v - at$$

f) $W = R + Ht$, "t"

$$t = \frac{W - R}{H}$$

2. Solve for the variable indicated.

a) $d = vt + \frac{1}{2}at^2$, solve for "a"

$$a = \frac{2(d - vt)}{t^2}$$

b) $C = \frac{nE}{nr + R}$, solve for "E"

$$E = \frac{C(nr + R)}{n}$$

c) $F = \frac{mn}{d^2}$ solve for "n"

$$n = \frac{Fd^2}{m}$$

3. The formula for the circumference of a circle is $C = \pi d$, where $\pi = 3.14$.

a) Solve the formula for d.

$$d = \frac{C}{\pi}$$

b) Canada's largest tree is a Douglas fir on Vancouver Island. Its circumference is 12.54 m. Use the formula for find the diameter of Canada's largest tree.

$$d = \frac{C}{\pi} = \frac{12.54 \text{ m}}{3.14} = 3.994 \text{ m}$$

4. Density can be calculated by the formula $D = m/V$, where D = density, m = mass and V = volume. Find the mass of:

a) 55.2 cm³ of aluminum ($d_{\text{Al}} = 2.70 \text{ g/cm}^3$)

$$D = \frac{m}{V} \quad m = DV = (2.70 \text{ g/cm}^3)(55.2 \text{ cm}^3) = 149 \text{ g}$$

c) 82.3 cm³ of mercury ($d_{\text{Hg}} = 11.4 \text{ g/cm}^3$).

$$m = DV = (11.4 \text{ g/cm}^3)(82.3 \text{ cm}^3) = 938 \text{ g}$$

5. The temperature below the Earth's surface, T , in degrees Celsius, is given by the formula: $T = 10d + 20$, where d is the depth in kilometers.

a) The deepest hole in the Earth is a test-drilling hole in Russia. At the bottom of the hole the temperature is expected to reach 170°C. Estimate the depth of the drilling.

$$T = 10d + 20 \quad \begin{array}{l} T - 20 \\ \hline 10 \end{array} = \begin{array}{l} 10d \\ \hline 10 \end{array} \quad d = \frac{T - 20}{10} = \frac{170 - 20}{10} = 15 \text{ km}$$

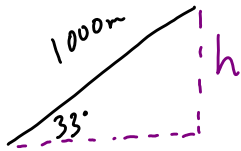
b) Estimate the depth of a mine in which the temperature is 420°C.

$$d = \frac{420 - 20}{10} = 40 \text{ km}$$

Worksheet 1.3: Trigonometry

Draw Diagrams. Show work. Round off all answers to one decimal place.

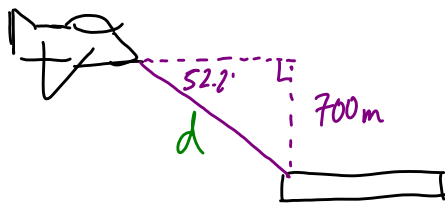
1. The angle of elevation of the summit from the bottom of the lift at Snow Bowl is 33° . If a skier rides 1000 m on this lift to the summit, what is the vertical distance between the bottom of the lift and the summit?



$$\sin 33^\circ = \frac{h}{1000}$$

$$h = 1000 \sin 33^\circ = 544 \text{ m}$$

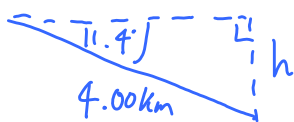
2. The angle of depression (below the horizontal) of an aircraft carrier from an approaching airplane is 52.2° . If the plane is 700 m above level of the deck of the carrier, how far away is the plane from the carrier?



$$\sin 52.2^\circ = \frac{700 \text{ m}}{d}$$

$$d = \frac{700 \text{ m}}{\sin 52.2^\circ} = 886 \text{ m}$$

3. The navigator on a bomber finds that the angle of depression of a target 4.00 km away is 11.4° . At what altitude is the plane flying?

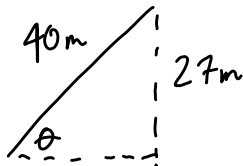


$$\sin 11.4^\circ = \frac{h}{4.00 \text{ km}}$$

$$h = 4.00 \text{ km} \cdot \sin 11.4^\circ$$

$$= 0.791 \text{ km}$$

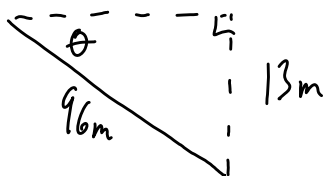
4. Billy's kite has a string 40 m long and is flying 27 m above his eye level. Find the angle of elevation of the kite.



$$\sin \theta = \frac{27}{40}$$

$$\theta = \sin^{-1}\left(\frac{27}{40}\right) = 42^\circ$$

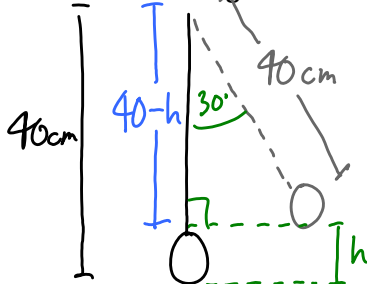
5. At an airport, cars drive down a ramp 96 m long to reach the lower level baggage-claim area 13 m below the main level. What angle does the ramp make with the ground at the lower level?



$$\sin \theta = \frac{13 \text{ m}}{96 \text{ m}}$$

$$\theta = \frac{13}{96} = 7.8^\circ$$

6. A pendulum 40 cm long is moved 30° from the vertical. How high is the lower end of the pendulum lifted?

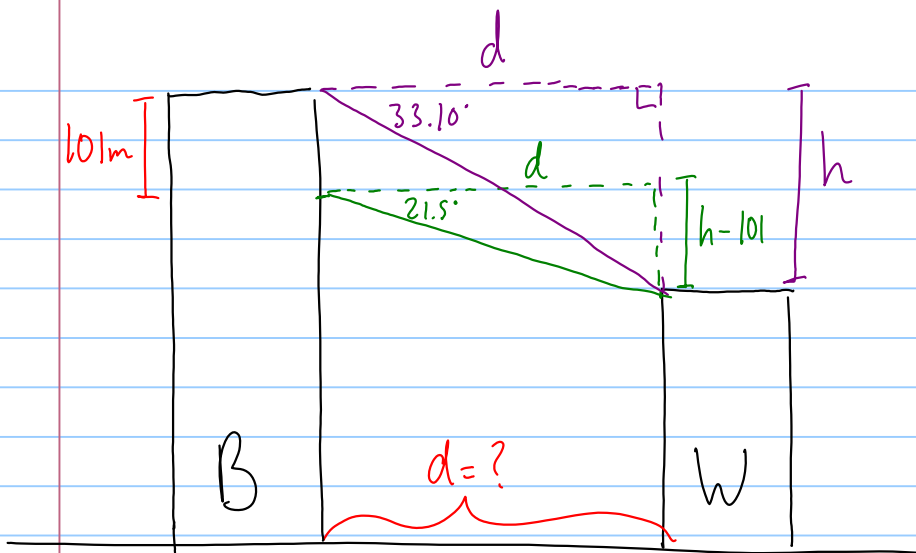


$$\cos 30^\circ = \frac{40-h}{40}$$

$$40 \cos 30^\circ = 40-h$$

$$h = 40 - 40 \cos 30^\circ$$

$$= 5.36 \text{ cm}$$



$$\tan 33.10^\circ = \frac{h}{d}$$

$$\tan 21.5^\circ = \frac{h-101}{d}$$

$$h = d \tan 33.10$$

$$\tan 21.5^\circ = \frac{d \tan 33.10 - 101}{d}$$

Ok... this is going to get ugly!

$$d \tan 21.5 = d \tan 33.10 - 101$$

$$101 = d \tan 33.10 - d \tan 21.5$$

$$101 = d (\tan 33.10 - \tan 21.5)$$

$$d = \frac{101}{\tan 33.10 - \tan 21.5}$$

$$= \frac{101}{0.25798}$$

$$= \boxed{392 \text{ m}}$$