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.

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

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_{Al} = 2.70 g/cm³)

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

   c) 82.3 cm³ of mercury (d_{Hg} = 11.4 g/cm³).

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

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.

   $$T = 10d + 20 \qquad \frac{T - 20}{10} = \frac{10d}{10} \qquad d = \frac{T - 20}{10} = \frac{170 - 20}{10} = 15km$$
 $$-20 \qquad -20$$

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

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

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?
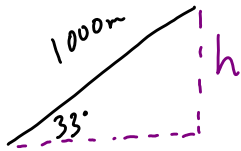
 $\sin 33° = \frac{h}{1000}$

    $h = 1000 \sin 33° = 544 \, m$

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?
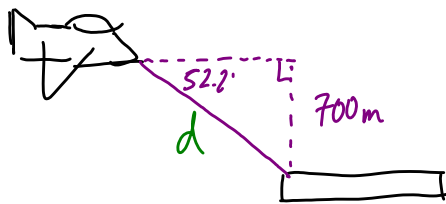
    $\sin 52.2° = \frac{700m}{d}$

    $d = \frac{700m}{\sin 52.2} = 886 \, m$

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?
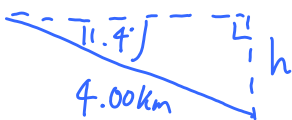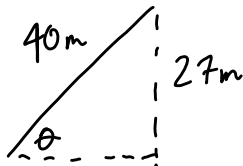
    $\sin 11.4° = \frac{h}{4.00 km}$

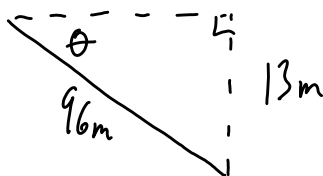 $h = 4.00 \, km \cdot \sin 11.4°$
    $= 0.791 \, km$

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.

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

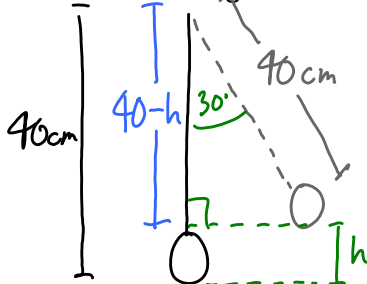 $\theta = \sin^{-1}\left(\frac{27}{40}\right) = 42°$

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?

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

    $\theta = \frac{13}{96} = 7.8°$

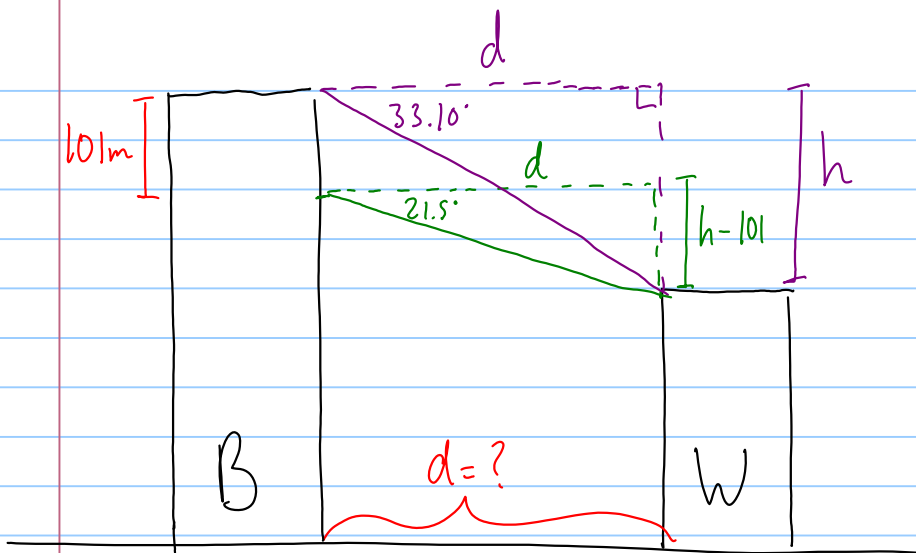6. A pendulum 40 cm long is moved 30° from the vertical. How high is the lower end of the pendulum lifted?

    $\cos 30° = \frac{40-h}{40}$

    $40 \cos 30° = 40 - h$

    $h = 40 - 40 \cos 30°$
    $= 5.36 \, cm$

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

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

Ok ... this is going to get ugly!

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

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

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

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

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

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