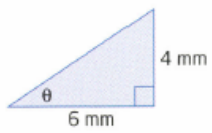
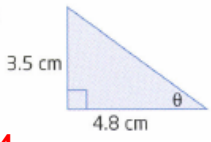
Solutions

1. Find the tangent of the angle indicated, to four decimal places.

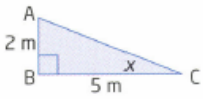
a)



b)



c)



a) $\text{Tan}(\theta) = \frac{4}{6}$

$\text{Tan}(\theta) = 0.6667$

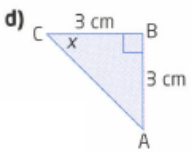
b) $\text{Tan}(\theta) = \frac{3.5}{4.8}$

$\text{Tan}(\theta) = 0.7778$

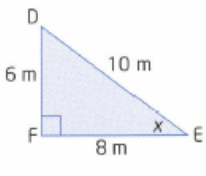
c) $\text{Tan}(x) = \frac{2}{5}$

$\text{Tan}(x) = 0.4000$

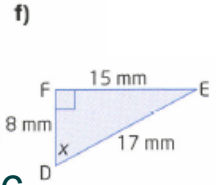
d)



e)



f)



d) $\text{Tan}(x) = \frac{3}{3}$

$\text{Tan}(x) = 1.0000$

e) $\text{Tan}(x) = \frac{6}{8}$

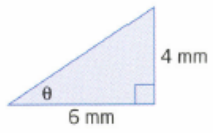
$\text{Tan}(x) = 0.7500$

f) $\text{Tan}(x) = \frac{15}{8}$

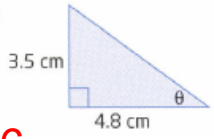
$\text{Tan}(x) = 1.8750$

2. Refer to question 1. Find the tangent of the other acute angle, to four decimal places.

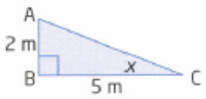
a)



b)



c)



a) $\text{Tan}(\theta') = \frac{6}{4}$

$\text{Tan}(\theta') = 1.5000$

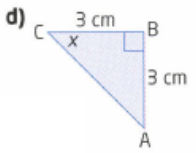
b) $\text{Tan}(\theta') = \frac{4.8}{3.5}$

$\text{Tan}(\theta') = 1.3714$

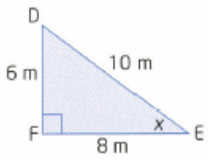
c) $\text{Tan}(A) = \frac{5}{2}$

$\text{Tan}(A) = 2.5000$

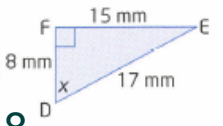
d)



e)



f)



d) $\text{Tan}(A) = \frac{3}{3}$

$\text{Tan}(A) = 1.0000$

e) $\text{Tan}(D) = \frac{8}{6}$

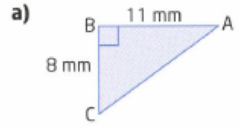
$\text{Tan}(D) = 1.3333$

f) $\text{Tan}(E) = \frac{8}{15}$

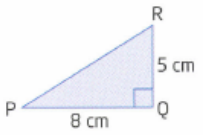
$\text{Tan}(E) = 0.5333$

5. Find the measures of both acute angles in each triangle, to the nearest degree.

a)



c)



a) $\tan(A) = \frac{8}{11}$

$\tan(A) = 0.7272...$

$A = \tan^{-1}(0.7272...)$

$A = 36^{\circ}$

$\tan(C) = \frac{11}{8}$

$\tan(C) = 1.375$

$A = \tan^{-1}(1.375)$

$A = 54^{\circ}$

c) $\tan(R) = \frac{8}{5}$

$\tan(R) = 1.6$

$A = \tan^{-1}(1.6)$

$A = 58^{\circ}$

$\tan(P) = \frac{5}{8}$

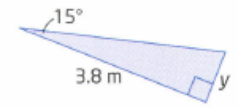
$\tan(P) = 0.625$

$A = \tan^{-1}(0.625)$

$A = 32^{\circ}$

6. Find the length of the unknown side, to the nearest tenth.

b)



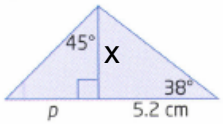
$\tan(15^\circ) = \frac{y}{3.8}$

$3.8\tan(15^\circ) = y$

$1.0182 = y$

$1.0 \text{ m} = y$

d)



$\tan(38^\circ) = \frac{x}{5.2}$

$5.2\tan(38^\circ) = x$

$4.0627 = x$

$4.1 \text{ m} = x$

$\tan(45^\circ) = \frac{p}{x}$

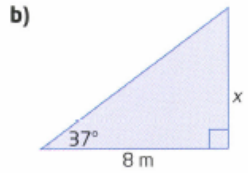
$4.0627\tan(45^\circ) = p$

$4.0627 = p$

$4.1 \text{ m} = p$

7. Find the length of x, to the nearest tenth of a metre.

b)



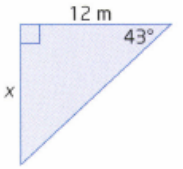
$\tan(37^\circ) = \frac{x}{8}$

$8\tan(37^\circ) = x$

$6.0284 = x$

$6.0 \text{ m} = x$

c)



$\tan(43^\circ) = \frac{x}{12}$

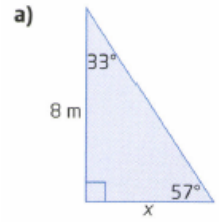
$12\tan(43^\circ) = x$

$11.1902 = x$

$11.2 \text{ m} = x$

8. Find the length of x, to the nearest tenth of a metre.

a)



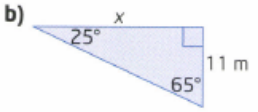
$\tan(33^\circ) = \frac{x}{8}$

$8\tan(33^\circ) = x$

$5.1953 = x$

$5.2 \text{ m} = x$

b)



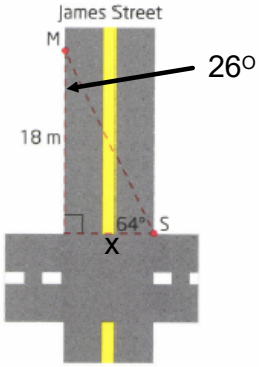
$\tan(65^\circ) = \frac{x}{11}$

$11\tan(65^\circ) = x$

$23.5896 = x$

$23.6 \text{ m} = x$

10. A surveyor is positioned at a traffic intersection, viewing a marker on the other side of the street. The marker is 18 m from the intersection. The surveyor cannot measure the width directly because there is too much traffic. Find the width of James Street, to the nearest tenth of a metre.



$\angle M = 180 - 90 - 64$

$\angle M = 26^\circ$

$\tan(26^\circ) = \frac{x}{18}$

$18\tan(26^\circ) = x$

$8.7792 = x$

$8.8 \text{ m} = x$

OR

$\tan(64^\circ) = \frac{18}{x}$

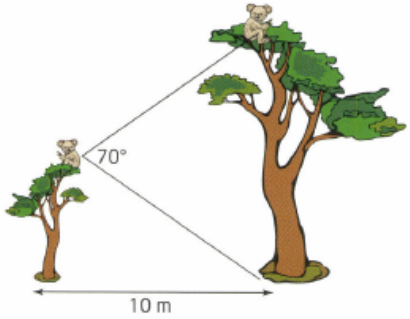
$x\tan(64^\circ) = 18$

$x = \frac{18}{\tan(64^\circ)}$

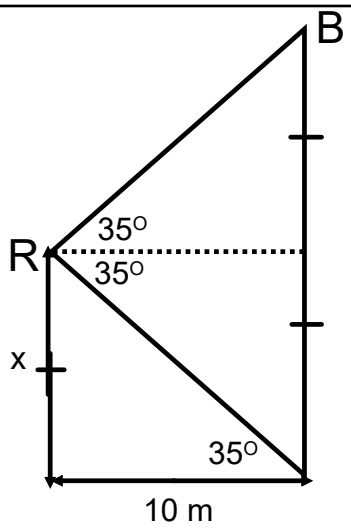
$x = 8.7792$

$x = 8.8 \text{ m}$

11. Rocco and Biff are two koalas sitting at the top of two eucalyptus trees, which are located 10 m apart, as shown. Rocco's tree is exactly half as tall as Biff's tree. From Rocco's point of view, the angle separating Biff and the base of his tree is 70°.



How high off the ground is each koala?



$\tan(35^\circ) = \frac{x}{10}$

$10\tan(35^\circ) = x$

$7.0021 = x$

$7 \text{ m} = x$

Rocco is 7 metres above the ground.

Biff is double this, which is 14 metres above the ground.

15. Comfortable stairs have a slope of $\frac{3}{4}$.

What angle do the stairs make with the horizontal, to the nearest degree?

$\text{Slope} = \frac{\text{Opposite (Rise)}}{\text{Adjacent (Run)}}$

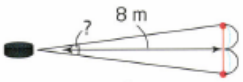
$\tan(x) = \frac{3}{4}$

$x = \tan^{-1}(0.75)$

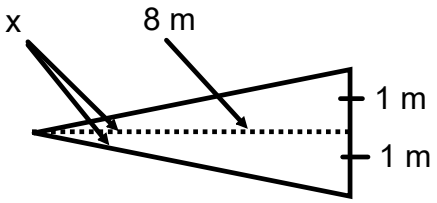
$x = 36.8699$

$x = 37^\circ$

21. At hockey practice, Lars has the puck in front of the net, as shown.



He is exactly 8 m away from the middle of the net, which is 2 m wide. Within what angle must Lars fire his shot in order to get it in the net, to the nearest degree?



Dotted line cuts the goal in half

$\tan(x) = \frac{1}{8}$

$x = \tan^{-1}(0.125)$

$x = 7.1250$

$x = 7.125^{o}$

Lars can shoot within an angle of 2x

$= 2(7.125)$

$= 14.25$

$= 14^{o}$

25. The tangent ratio is used to design the bank angle for a curved section of roadway.

Let θ be the bank angle required for a speed limit, v, in kilometres per hour, and a radius, r, in metres. The angle and the speed limit are related by the formula $\tan\theta = \frac{v^2}{9.8r}$. Find the bank angle required for a highway curve of radius 50 m that will carry traffic moving at 100 km/h.

r = 50, v = 100

$\tan(\theta) = \frac{100^2}{9.8(50)}$

$\tan(\theta) = \frac{10000}{490}$

$\tan(\theta) = 20.4082$

$\theta = \tan^{-1}(20.4082)$

$\theta = 87.1948^{o}$

The bank angle required is 87^{o}