Trigonometry Review

1. Solve the following triangles.

a)

$90-41$
$=49°$

(triangle with angles α, $49°$, $41°$, right angle; sides z, 10, x)
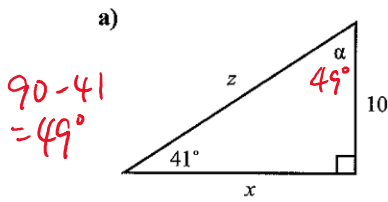
$\alpha = \underline{49°}$
$x = \underline{11.5}$
$z = \underline{15.24}$

$\tan 41° = \dfrac{10}{x}$

$x = 10 \div \tan 41° = 11.5$

$\sin 41° = \dfrac{10}{z}$

$z = 10 \div \sin 41° = 15.24$

b)

(triangle with angles β, α, right angle; sides z, 5, 9)
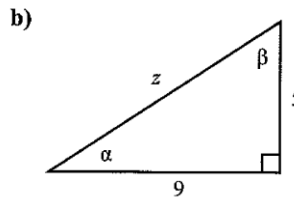
$\alpha = \underline{29.1°}$
$\beta = \underline{60.9°}$
$z = \underline{10.3}$

$\tan \alpha = \dfrac{5}{9}$

$\alpha = \tan^{-1}\left(\dfrac{5}{9}\right) = 29.1$

$\beta = 90° - \alpha$
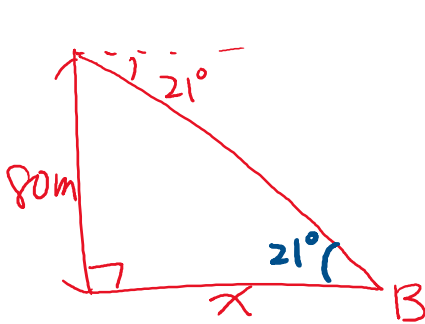$\quad = 90 - 29.1 = 60.9°$

$z^2 = 5^2 + 9^2$
$z^2 = 25 + 81$
$z = \sqrt{25 + 81}$
$\quad = \sqrt{106}$
$\quad = 10.3$

2. The angle of depression from the top of an 80m high cliff to a sailboat is 21°. Determine the distance from the base of the cliff to the sailboat.

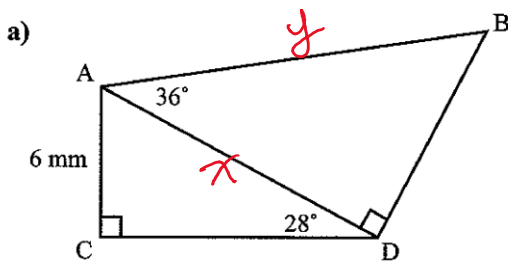(diagram: cliff 80m high, angle 21° at top, angle 21° at B, base x)

$\angle B = 21°$

$\tan 21° = \dfrac{80}{x}$

$x = 80 \div \tan 21° = 208.41\,m$

3. Determine the length of AB to the nearest tenth.

a)

(triangle ACD with A, B, C, D; angle at A = 36°, AC = 6 mm, angle 28° at D, right angle at C, sides y and x)

$\sin 28° = \dfrac{6}{x}$

$x = 6 \div \sin 28°$
$\quad = 12.78$

$\cos 36° = \dfrac{12.78}{y}$

$y = 12.78 \div \cos 36°$
$\quad = 15.80$

b)

(figure with A, B, C, D, E; CD = 45 m, DE = 30 m, angle 35° at D, angle 55° at D, right angles at C and E, sides z, x, y)
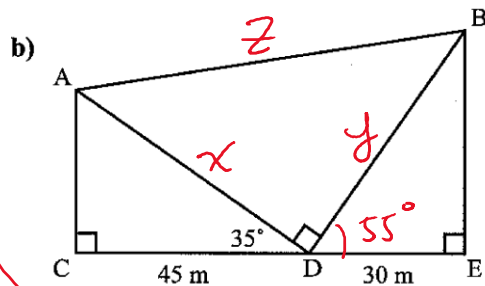
$\cos 35° = \dfrac{45}{x}$

$x = 45 \div \cos 35°$
$\quad = 54.93$

$\cos 55° = \dfrac{30}{y}$

$y = 30 \div \cos 55°$
$\quad = 52.3$

$\angle BDE$
$= 180 - 90 - 35$
$= 55°$

$z^2 = (54.93)^2 + (52.3)^2$

$z^2 = 5752.95 \quad \therefore z = 75.85$

4. What is the length of MN?
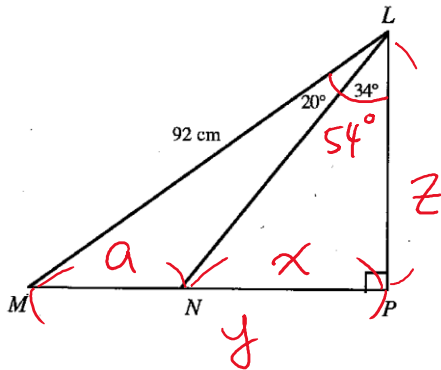
$\sin 54° = \dfrac{y}{92}$

$y = 92 \sin 54°$
$= 74.43$

$\cos 54° = \dfrac{z}{92}$

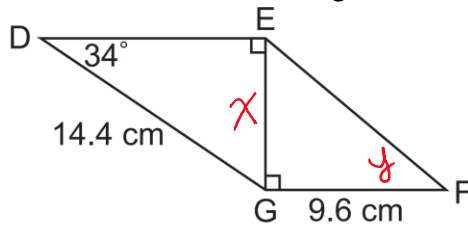$z = 92 \cos 54°$
$= 54.08$

$\tan 34° = \dfrac{x}{54.08}$

$x = 54.08 \times \tan 34°$
$= 36.47$

$a = y - x$
$= 74.43 - 36.47$
$\boxed{= 37.96}$

5. Determine the measure of angle F to the nearest degree.
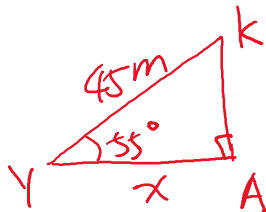

$\sin 34° = \dfrac{x}{14.4}$

$x = 14.4 \times \sin 34°$
$= 8.05.$

$\tan y = \dfrac{8.05}{9.6}$

$y = \tan^{-1}\left(\dfrac{8.05}{9.6}\right) \boxed{40°}$

6. The string on Yuri's kite is 45 m long and makes an angle of 55° with the ground. Yuri's friend, Abdul, is standing directly below the kite.
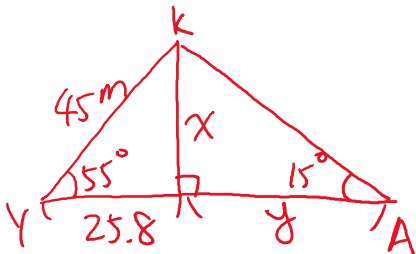a) How far apart are Abdul and Yuri now, to the nearest tenth of a metre?

$\cos 55° = \dfrac{x}{45}$

$x = 45 \times \cos 55° = 25.8\,m$

b) Abdul runs away from Yuri, so that the angle of elevation between Abdul and the kite is 15°.
How far apart are Abdul and Yuri, to the nearest tenth of a metre?

$\sin 55° = \dfrac{x}{45}$

$x = 45 \sin 55°$
$= 36.86.$

$\tan 15° = \dfrac{36.86}{y}$

$y = 36.86 \div \tan 15°$
$= 137.57$

$137.57 + 25.8 = \boxed{163.4m}$