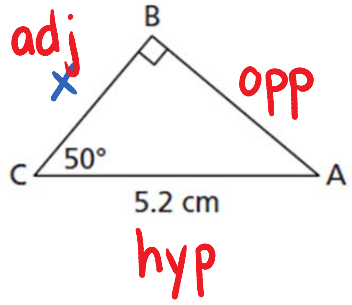
2.4 Using the Sine and Cosine Ratios to Calculate Lengths

$\sin\theta = \frac{\text{opposite}}{\text{hypotenuse}}$ $\cos\theta = \frac{\text{adjacent}}{\text{hypotenuse}}$ $\tan\theta = \frac{\text{opposite}}{\text{adjacent}}$

Examples:

1) Determine the length of the missing side to two decimal places (hundreth).

a) BC

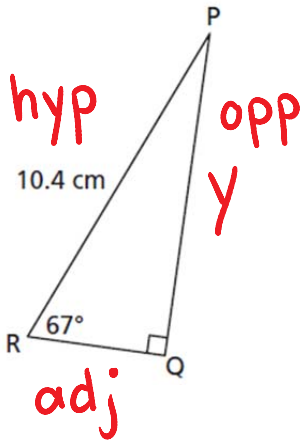


$\cos\theta = \frac{adj}{hyp}$

$(5.2)\cos 50 = \frac{x}{5.2}(5.2)$

$x = 3.34\text{ cm}$

b) PQ

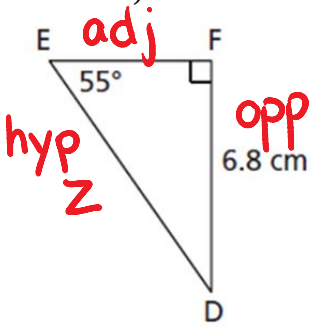


$\sin\theta = \frac{opp}{hyp}$

$(10.4)\sin 67 = \frac{y}{10.4}(10.4)$

$y = 9.57\text{ cm}$

c) DE



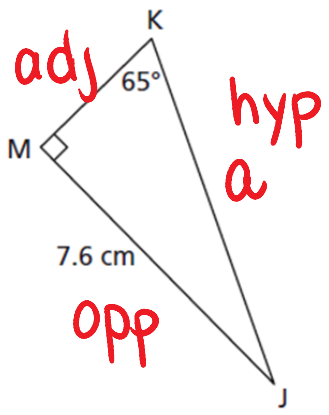
$\sin\theta = \frac{opp}{hyp}$

$\sin 55 = \frac{6.8}{z}$

$z = \frac{6.8}{\sin 55}$

$z = 8.30\text{ cm}$

d) JK

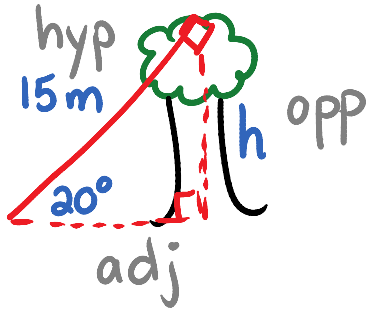


$\sin\theta = \frac{opp}{hyp}$

$\sin 65 = \frac{7.6}{a}$

$a = \frac{7.6}{\sin 65} = 8.39\text{ cm}$

2) A kite with a string 15 m long is stuck in a tree. The string forms an angle of elevation with the ground of 20°. How tall is the tree to the nearest tenth?

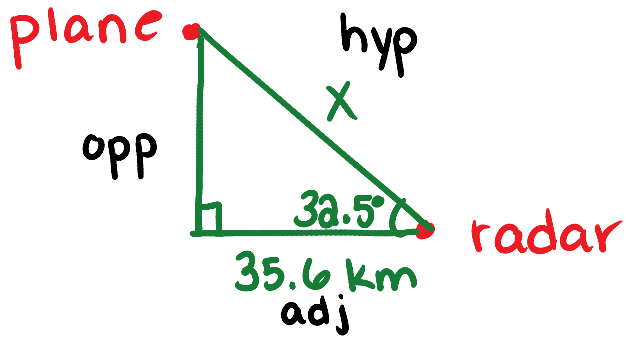


$\sin\theta = \frac{opp}{hyp}$

$(15)\sin 20 = \frac{h}{15}(15)$

$h = 5.1\text{ m}$

3) From a radar station, the angle of elevation of an approaching airplane is 32.5°. The horizontal distance between the plane and the radar station is 35.6 km. How far is the plane from the radar station to the nearest tenth of a kilometer?



$\cos\theta = \frac{adj}{hyp}$

$\cos 32.5 = \frac{35.6}{x}$

$x = \frac{35.6}{\cos 32.5}$

$x = 42.2\text{ km}$

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