MATH DEPT.
SOLUTION TO
TUTORIAL 7

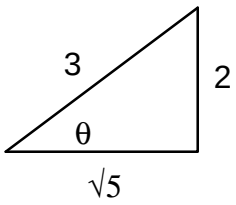
Solution 7: **Trigonometry I: angles, solving triangles, inverse function, some basic identities.**

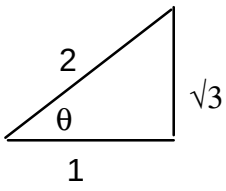
1. (a) Third side has length $\sqrt{5^2 - 4^2} = \sqrt{9} = 3$
Therefore $\sin\theta = 3/5$, $\cos\theta = 4/5$, $\tan\theta = 3/4$, $\cot\theta = 4/3$, $\sec\theta = 5/4$, $\csc\theta = 5/3$

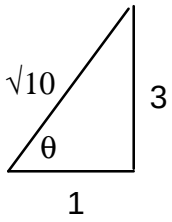
(b) Third side has length $\sqrt{2^2 - 1^2} = \sqrt{3}$
Therefore $\sin\theta = 1/2$, $\cos\theta = \sqrt{3}/2$, $\tan\theta = 1/\sqrt{3}$, $\cot\theta = \sqrt{3}$, $\sec\theta = 2/\sqrt{3}$, $\csc\theta = 2$

(c) Hypotenuse has length $\sqrt{8^2 + 15^2} = 17$.
Therefore $\sin\theta = 15/17$, $\cos\theta = 8/17$, $\tan\theta = 15/8$, $\cot\theta = 8/15$, $\sec\theta = 17/8$, $\csc\theta = 17/15$

2.

(i) 

(ii) 

(iii) 

3. (a) (i) $\tan 60^\circ = \dfrac{\sin 60^\circ}{\cos 60^\circ} = \sqrt{3}$

(ii) $\sin 30^\circ = \cos 60^\circ = \frac{1}{2}$

(iii) $\cos 30^\circ = \sin 60^\circ = \dfrac{\sqrt{3}}{2}$

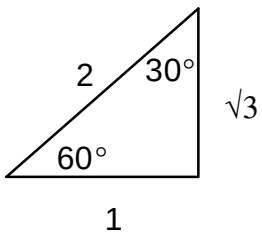
(iv) $\cot 60^\circ = \dfrac{1}{\tan 60^\circ} = \frac{1}{\sqrt{3}}$

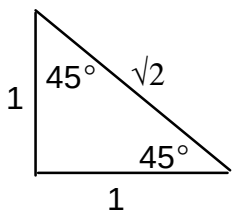
(b) (i) $\cos\theta = \dfrac{1}{\sec\theta} = \dfrac{1}{5}$

(ii) $\cot\theta = \dfrac{1}{\tan\theta} = \dfrac{1}{2\sqrt{6}} = \dfrac{\sqrt{6}}{12}$

(iii) $\cot(90^\circ - \theta) = \tan\theta = 2\sqrt{6}$

(iv) $\sin\theta = \dfrac{\tan\theta}{\sec\theta} = \dfrac{2\sqrt{6}}{5}$

4. 



(i) $\tan 30° = \frac{1}{\sqrt{3}}$

(ii) $\sin 45° = \frac{\sqrt{2}}{2}$

(iii) $\csc 60° = \frac{2}{\sqrt{3}}$

(iv) $\sec 30° = \frac{2}{\sqrt{3}}$

5. (i) $\sin \theta = \frac{1}{2}$; $\theta = 30°$

(ii) $\tan \theta = 1$; $\theta = 45°$

(iii) $\sec \theta = 2$; $\theta = 60°$

(iv) $\sin \theta = \frac{\sqrt{2}}{2}$; $\theta = 45°$

6. (i) $\theta = \arcsin 0.8191 = 55°$

(ii) $\theta = \arccos 0.8746 = 29°$

(iii) $\theta = \arctan 1.1920 = 50°$

(iv) $\theta = \arcsin 0.3746 = 22°$

7. $\tan 30° = \frac{x}{100}$ or $x = 100 \tan 30° = \frac{100}{\sqrt{3}} = \frac{100\sqrt{3}}{3}$

$\cos 60° = \frac{x}{10}$ or $x = 10 \cos 60° = 10 (\frac{1}{2}) = 5$

$\sin 45° = \frac{30}{x}$ or $x = \frac{30}{\sin 45^0} = \frac{30}{\sqrt{2}/2} = \frac{60}{\sqrt{2}} = 30\sqrt{2}$

8. Let h be the height that the ladder reaches. We have that $\sin 75° = \frac{h}{20}$ or $h = 20 \sin 75° = 20 (0.966) = 19.32$ feet

9. To find the height of the street light we use similarity of triangles. We have that $\frac{h}{20} = \frac{6}{8}$ or $h = 20 (\frac{3}{4}) = 15$ feet.

We have that $\tan \theta = \frac{6}{8} = 0.75$ and $\theta = \arctan (0.75) = 36.87°$