

8. $\text{adj} = \sqrt{15^2 - 8^2} = \sqrt{161}$

$$\sin \theta = \frac{\text{opp}}{\text{hyp}} = \frac{8}{15}$$

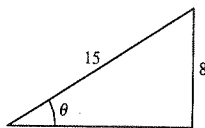
$$\cos \theta = \frac{\text{adj}}{\text{hyp}} = \frac{\sqrt{161}}{15}$$

$$\tan \theta = \frac{\text{opp}}{\text{adj}} = \frac{8}{\sqrt{161}} = \frac{8\sqrt{161}}{161}$$

$$\csc \theta = \frac{\text{hyp}}{\text{opp}} = \frac{15}{8}$$

$$\sec \theta = \frac{\text{hyp}}{\text{adj}} = \frac{15}{\sqrt{161}} = \frac{15\sqrt{161}}{161}$$

$$\cot \theta = \frac{\text{adj}}{\text{opp}} = \frac{\sqrt{161}}{8}$$



$$\text{adj} = \sqrt{7.5^2 - 4^2} = \frac{\sqrt{161}}{2}$$

$$\sin \theta = \frac{\text{opp}}{\text{hyp}} = \frac{4}{7.5} = \frac{8}{15}$$

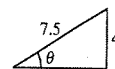
$$\cos \theta = \frac{\text{adj}}{\text{hyp}} = \frac{\sqrt{161}}{2 \cdot 7.5} = \frac{\sqrt{161}}{15}$$

$$\tan \theta = \frac{\text{opp}}{\text{adj}} = \frac{4}{(\sqrt{161}/2)} = \frac{8}{\sqrt{161}} = \frac{8\sqrt{161}}{161}$$

$$\csc \theta = \frac{\text{hyp}}{\text{opp}} = \frac{7.5}{4} = \frac{15}{8}$$

$$\sec \theta = \frac{\text{hyp}}{\text{adj}} = \frac{7.5}{(\sqrt{161}/2)} = \frac{15}{\sqrt{161}} = \frac{15\sqrt{161}}{161}$$

$$\cot \theta = \frac{\text{adj}}{\text{opp}} = \frac{\sqrt{161}}{2 \cdot 4} = \frac{\sqrt{161}}{8}$$



The function values are the same because the triangles are similar, and corresponding sides are proportional.

10. $\cot \theta = \frac{3}{7}$

$$\text{hyp} = \sqrt{7^2 + 3^2} = \sqrt{58}$$

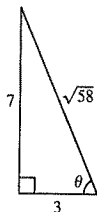
$$\sin \theta = \frac{7}{\sqrt{58}} = \frac{7\sqrt{58}}{58}$$

$$\cos \theta = \frac{3}{\sqrt{58}} = \frac{3\sqrt{58}}{58}$$

$$\tan \theta = \frac{7}{3}$$

$$\csc \theta = \frac{\sqrt{58}}{7}$$

$$\sec \theta = \frac{\sqrt{58}}{3}$$



12. $\cos \theta = \frac{1}{5}$

$$\text{opp} = \sqrt{5^2 - 1^2} = \sqrt{24} = 2\sqrt{6}$$

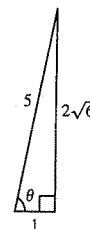
$$\sin \theta = \frac{2\sqrt{6}}{5}$$

$$\tan \theta = \frac{2\sqrt{6}}{1} = 2\sqrt{6}$$

$$\csc \theta = \frac{5}{2\sqrt{6}} = \frac{5\sqrt{6}}{12}$$

$$\sec \theta = 5$$

$$\cot \theta = \frac{1}{2\sqrt{6}} = \frac{\sqrt{6}}{12}$$



14. $\csc \theta = 2$

$$\text{adj} = \sqrt{2^2 - 1^2} = \sqrt{3}$$

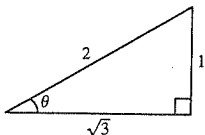
$$\sin \theta = \frac{1}{2}$$

$$\cos \theta = \frac{\sqrt{3}}{2}$$

$$\tan \theta = \frac{1}{\sqrt{3}} = \frac{\sqrt{3}}{3}$$

$$\sec \theta = \frac{2}{\sqrt{3}} = \frac{2\sqrt{3}}{3}$$

$$\cot \theta = \sqrt{3}$$



16. $\sin \theta = \frac{3}{8}$

$$\text{adj} = \sqrt{8^2 - 3^2} = \sqrt{55}$$

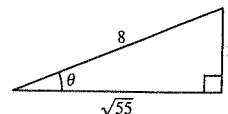
$$\cos \theta = \frac{\text{adj}}{\text{hyp}} = \frac{\sqrt{55}}{8}$$

$$\tan \theta = \frac{\text{opp}}{\text{adj}} = \frac{3}{\sqrt{55}} = \frac{3\sqrt{55}}{55}$$

$$\csc \theta = \frac{1}{\sin \theta} = \frac{8}{3}$$

$$\sec \theta = \frac{1}{\cos \theta} = \frac{8}{\sqrt{55}} = \frac{8\sqrt{55}}{55}$$

$$\cot \theta = \frac{1}{\tan \theta} = \frac{\sqrt{55}}{3}$$



	Function	$\theta(\text{deg})$	$\theta(\text{rad})$	Function Value
18.	cos	45°	$\frac{\pi}{4}$	$\frac{\sqrt{2}}{2}$
20.	sec	45°	$\frac{\pi}{4}$	$\sqrt{2}$
22.	csc	45°	$\frac{\pi}{4}$	$\sqrt{2}$
24.	sin	45°	$\frac{\pi}{4}$	$\frac{\sqrt{2}}{2}$
26.	tan	30°	$\frac{\pi}{6}$	$\frac{1}{\sqrt{3}}$

$$28. \sin 30^\circ = \frac{1}{2}, \tan 30^\circ = \frac{\sqrt{3}}{3}$$

$$(a) \csc 30^\circ = \frac{1}{\sin 30^\circ} = 2$$

$$(b) \cot 60^\circ = \tan(90^\circ - 60^\circ) = \tan 30^\circ = \frac{\sqrt{3}}{3}$$

$$(c) \cos 30^\circ = \frac{\sin 30^\circ}{\tan 30^\circ} = \frac{(1/2)}{(\sqrt{3}/3)} = \frac{3}{2\sqrt{3}} = \frac{\sqrt{3}}{2}$$

$$(d) \cot 30^\circ = \frac{1}{\tan 30^\circ} = \frac{3}{\sqrt{3}} = \frac{3\sqrt{3}}{3} = \sqrt{3}$$

$$30. \sec \theta = 5, \tan \theta = 2\sqrt{6}$$

$$(a) \cos \theta = \frac{1}{\sec \theta} = \frac{1}{5}$$

$$(b) \cot \theta = \frac{1}{\tan \theta} = \frac{1}{2\sqrt{6}} = \frac{\sqrt{6}}{12}$$

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

$$(d) \sin \theta = \tan \theta \cos \theta = (2\sqrt{6})\left(\frac{1}{5}\right) = \frac{2\sqrt{6}}{5}$$

$$32. \tan \beta = 5 \quad (\beta \text{ lies in Quadrant I or III})$$

$$(a) \cot \beta = \frac{1}{\tan \beta} = \frac{1}{5}$$

$$(b) \sec^2 \beta = 1 + \tan^2 \beta \Rightarrow \cos \beta = \pm \frac{1}{\sqrt{1 + \tan^2 \beta}} = \pm \frac{1}{\sqrt{1 + 25}} = \pm \frac{1}{\sqrt{26}} = \pm \frac{\sqrt{26}}{26}$$

$$(c) \tan(90^\circ - \beta) = \cot \beta = \frac{1}{5}$$

$$(d) \csc \beta = \pm \sqrt{1 + \cot^2 \beta} = \pm \sqrt{1 + \frac{1}{25}} = \pm \frac{\sqrt{26}}{5}$$

$$34. \csc \theta \tan \theta = \frac{1}{\sin \theta} \cdot \frac{\sin \theta}{\cos \theta} = \frac{1}{\cos \theta} = \sec \theta$$

$$36. \cot \theta \sin \theta = \frac{\cos \theta}{\sin \theta} \sin \theta = \cos \theta$$

$$38. (1 + \sin \theta)(1 - \sin \theta) = 1 - \sin^2 \theta = \cos^2 \theta$$

$$40. \frac{\tan \theta + \cot \theta}{\tan \theta} = \frac{\tan \theta}{\tan \theta} + \frac{\cot \theta}{\tan \theta}$$

$$= 1 + \frac{\cot \theta}{(1/\cot \theta)}$$

$$= 1 + \cot^2 \theta = \csc^2 \theta$$

42. (a) $\tan 18.5^\circ \approx 0.3346$

(b) $\cot 71.5^\circ = \frac{1}{\tan 71.5^\circ} \approx 0.3346$

46. (a) $\sec 0.75 = \frac{1}{\cos 0.75} \approx 1.3667$

(b) $\cos 0.75 \approx 0.7317$

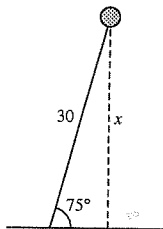
50. (a) $\tan \theta = \sqrt{3} \Rightarrow \theta = 60^\circ = \frac{\pi}{3}$

(b) $\cos \theta = \frac{1}{2} \Rightarrow \theta = 60^\circ = \frac{\pi}{3}$

54. $\cos 60^\circ = \frac{x}{16}$

$x = 16 \cos 60^\circ = 8$

58. (a)



(b) $\sin 75^\circ = \frac{x}{30}$

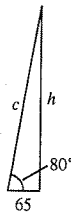
(c) $x = 30 \sin 75^\circ \approx 28.98$ meters

62. $\tan 80^\circ = \frac{h}{65}$

$h = 65 \tan 80^\circ$

≈ 368.6 m

$c = \sqrt{368.6^2 + 65^2} \approx 374.3$ m



44. (a) $\cos(8^\circ 50' 25'') = \cos\left(8 + \frac{50}{60} + \frac{25}{3600}\right)$
 $\approx \cos(8.840278) \approx 0.9881$

(b) $\sec(8^\circ 50' 25'') = \frac{1}{\cos(8^\circ 50' 25'')} \approx 1.0120$

48. (a) $\cos \theta = \frac{\sqrt{2}}{2} \Rightarrow \theta = 45^\circ = \frac{\pi}{4}$

(b) $\tan \theta = 1 \Rightarrow \theta = 45^\circ = \frac{\pi}{4}$

52. (a) $\cot \theta = \frac{\sqrt{3}}{3}$

$\tan \theta = \frac{3}{\sqrt{3}} = \sqrt{3} \Rightarrow \theta = 60^\circ = \frac{\pi}{3}$

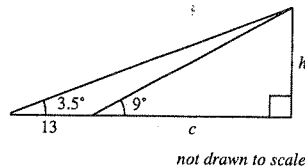
(b) $\sec \theta = \sqrt{2}$

$\cos \theta = \frac{1}{\sqrt{2}} = \frac{\sqrt{2}}{2} \Rightarrow \theta = 45^\circ = \frac{\pi}{4}$

56. $\sin 45^\circ = \frac{20}{r}$

$r = \frac{20}{\sin 45^\circ} = \frac{20}{\sqrt{2}/2} = 20\sqrt{2}$

60.



$\cot 9^\circ = \frac{c}{h}$

$\cot 3.5^\circ = \frac{13 + c}{h}$

subtracting, $\frac{13}{h} = \cot 3.5^\circ - \cot 9^\circ$

$h = \frac{13}{\cot 3.5^\circ - \cot 9^\circ}$

$\approx \frac{13}{16.3499 - 6.3138}$

$\approx 1.295 \approx 1.3$ miles