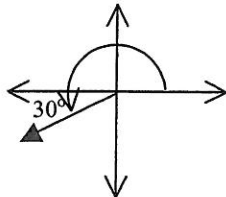


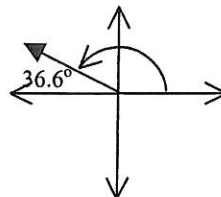
CHAPTER 3 Radian Measure

Problem Set 3.1

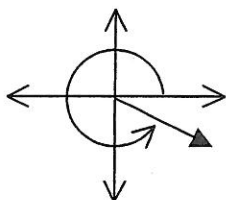
1. $210^\circ - 180^\circ = 30^\circ$



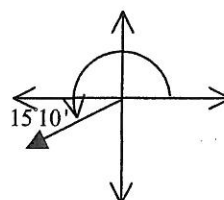
3. $180^\circ - 143.4^\circ = 36.6^\circ$



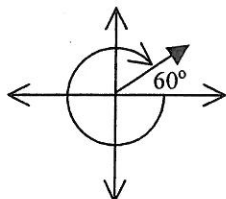
5. $360^\circ - 311.7^\circ = 48.3^\circ$



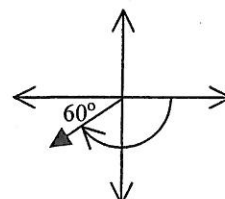
7. $195^\circ 10' - 180^\circ = 15^\circ 10'$



9. $-300^\circ + 360^\circ = 60^\circ$



11. $-120^\circ + 180^\circ = 60^\circ$



13. $\hat{\theta} = 225^\circ - 180^\circ$
 $= 45^\circ$

Since θ terminates in QIII, $\cos \theta$ is negative.
 $\cos 225^\circ = -\cos 45^\circ$

$$= -\frac{1}{\sqrt{2}}$$

15. $\hat{\theta} = 180^\circ - 120^\circ$
 $= 60^\circ$

Since θ terminates in QII, $\sin \theta$ is positive.
 $\sin 120^\circ = \sin 60^\circ$

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

17. $\hat{\theta} = 180^\circ - 135^\circ$
 $= 45^\circ$

Since θ terminates in QII, $\tan \theta$ is negative.

$$\tan 135^\circ = -\tan 45^\circ$$

$$= -1$$

19. $\hat{\theta} = 240^\circ - 180^\circ$
 $= 60^\circ$

Since θ terminates in QIII, $\cos \theta$ is negative.

$$\cos 240^\circ = -\cos 60^\circ$$

$$= -\frac{1}{2}$$

$$21. \quad \hat{\theta} = 360^\circ - 330^\circ \\ = 30^\circ$$

Since θ terminates in QIV, $\csc \theta$ is negative.

$$\csc 330^\circ = -\csc 30^\circ \\ = -2$$

$$23. \quad \hat{\theta} = 360^\circ - 300^\circ \\ = 60^\circ$$

Since θ terminates in QIV, $\sec \theta$ is positive.

$$\sec 300^\circ = \sec 60^\circ \\ = 2$$

$$25. \quad \hat{\theta} = 390^\circ - 360^\circ \\ = 30^\circ$$

Since θ terminates in QI, $\sin \theta$ is positive.

$$\sin 390^\circ = \sin 30^\circ \\ = \frac{1}{2}$$

$$27. \quad \theta = 480^\circ - 360^\circ = 120^\circ \\ \hat{\theta} = 180^\circ - 120^\circ = 60^\circ$$

Since θ terminates in QII, $\cot \theta$ is negative.

$$\cot 480^\circ = -\cot 60^\circ \\ = -\frac{1}{\sqrt{3}}$$

49. First, we find $\hat{\theta}$:

$$\sin \hat{\theta} = 0.3090$$

$$\hat{\theta} = \sin^{-1}(0.3090)$$

$$\hat{\theta} = 18.0^\circ$$

Scientific Calculator: 0.3090 **INV** **SIN**

Graphing Calculator: **2nd** **SIN** **(** 0.3090 **)** **ENTER**

Since θ is in QIII, $\theta = 180^\circ + 18.0^\circ \\ = 198.0^\circ$

51. First, we find $\hat{\theta}$:

$$\cos \hat{\theta} = 0.7660$$

$$\hat{\theta} = \cos^{-1}(0.7660)$$

$$= 40.0^\circ$$

Scientific Calculator: 0.7660 **INV** **COS**

Graphing Calculator: **2nd** **COS** **(** 0.7660 **)** **ENTER**

Since θ is in QII, $\theta = 180^\circ - 40.0^\circ \\ = 140.0^\circ$

53. First we find $\hat{\theta}$:

$$\tan \hat{\theta} = 0.5890$$

$$\hat{\theta} = \tan^{-1}(0.5890)$$

$$\hat{\theta} = 30.5^\circ$$

Scientific Calculator: 0.5890 **INV** **TAN**

Graphing Calculator: **2nd** **TAN** **(** 0.5890 **)** **ENTER**

Since θ is in QIII, $\theta = 180^\circ + 30.5^\circ \\ = 210.5^\circ$

55. Since θ is in QI, $\hat{\theta} = \theta$ $\cos \theta = 0.2644$
 $\theta = \cos^{-1}(0.2664)$
 $= 74.7^\circ$

Scientific Calculator: 0.2644 $\boxed{\text{INV}}$ $\boxed{\text{COS}}$

Graphing Calculator: $\boxed{2\text{nd}}$ $\boxed{\text{COS}}$ $\boxed{(}$ 0.2644 $\boxed{)}$ $\boxed{\text{ENTER}}$

57. First, we find $\hat{\theta}$: $\sin \hat{\theta} = 0.9652$
 $\hat{\theta} = 74.8^\circ$

Scientific Calculator: 0.9652 $\boxed{\text{INV}}$ $\boxed{\text{SIN}}$

Graphing Calculator: $\boxed{2\text{nd}}$ $\boxed{\text{SIN}}$ $\boxed{(}$ 0.9652 $\boxed{)}$ $\boxed{\text{ENTER}}$

Since θ is in QII, $\theta = 180^\circ - 74.8^\circ$
 $= 105.2^\circ$

59. First, we find $\hat{\theta}$: $\sec \hat{\theta} = 1.4325$
 $\cos \hat{\theta} = \frac{1}{1.4325}$
 $\hat{\theta} = \cos^{-1}\left(\frac{1}{1.4325}\right)$
 $= 45.7^\circ$

Scientific Calculator: 1.4325 $\boxed{1/x}$ $\boxed{\text{INV}}$ $\boxed{\text{COS}}$

Graphing Calculator: $\boxed{2\text{nd}}$ $\boxed{\text{COS}}$ $\boxed{(}$ 1.4325 $\boxed{x^{-1}}$ $\boxed{)}$ $\boxed{\text{ENTER}}$

Since θ is in QIV, $\theta = 360^\circ - 45.7^\circ$
 $= 314.3^\circ$

61. First, we find $\hat{\theta}$: $\csc \hat{\theta} = 2.4957$
 $\sin \hat{\theta} = \frac{1}{2.4957}$
 $\hat{\theta} = \sin^{-1}\left(\frac{1}{2.4957}\right)$
 $\hat{\theta} = 23.6^\circ$

Scientific Calculator: 2.4957 $\boxed{1/x}$ $\boxed{\text{INV}}$ $\boxed{\text{SIN}}$

Graphing Calculator: $\boxed{2\text{nd}}$ $\boxed{\text{SIN}}$ $\boxed{(}$ 2.4957 $\boxed{x^{-1}}$ $\boxed{)}$ $\boxed{\text{ENTER}}$

Since θ is in QII, $\theta = 180^\circ - 23.6^\circ$
 $= 156.4^\circ$

63. First, we find $\hat{\theta}$:

$$\cot \hat{\theta} = 0.7366$$

$$\tan \hat{\theta} = \frac{1}{0.7366}$$

$$\hat{\theta} = \tan^{-1}\left(\frac{1}{0.7366}\right)$$

$$\hat{\theta} = 53.6^\circ$$

Scientific Calculator: 0.7366 $\left[\frac{1}{x}\right]$ $[INV]$ $[TAN]$

Graphing Calculator: $[2nd]$ $[TAN]$ $[(]$ 0.7366 $[x^{-1}]$ $[)]$ $[ENTER]$

Since θ is in QII, $\theta = 180^\circ - 53.6^\circ$
 $= 126.4^\circ$

65. First, we find $\hat{\theta}$:

$$\sec \hat{\theta} = 1.7876$$

$$\cos \hat{\theta} = \frac{1}{1.7876}$$

$$\hat{\theta} = \cos^{-1}\left(\frac{1}{1.7876}\right)$$

$$\hat{\theta} = 56.0^\circ$$

Scientific Calculator: 0.1.7876 $\left[\frac{1}{x}\right]$ $[INV]$ $[COS]$

Graphing Calculator: $[2nd]$ $[COS]$ $[(]$ 1.7876 $[x^{-1}]$ $[)]$ $[ENTER]$

Since θ is in QIII, $\theta = 180^\circ - 56.0^\circ$
 $= 236.0^\circ$

67. First, we find $\hat{\theta}$: $\sin \hat{\theta} = \frac{\sqrt{3}}{2}$

$$\hat{\theta} = 60^\circ$$

Since θ is in QIII, $\theta = 180^\circ + 60^\circ$
 $= 240^\circ$

69. First, we find $\hat{\theta}$: $\cos \hat{\theta} = \frac{1}{\sqrt{2}}$

$$\hat{\theta} = 45^\circ$$

Since θ is in QII, $\theta = 180^\circ - 45^\circ$
 $= 135^\circ$

71. First, we find $\hat{\theta}$: $\sin \hat{\theta} = \frac{\sqrt{3}}{2}$

$$\hat{\theta} = 60^\circ$$

Since θ is in QIV, $\theta = 360^\circ - 60^\circ$
 $= 300^\circ$

73. First, we find $\hat{\theta}$: $\tan \hat{\theta} = \sqrt{3}$

$$\hat{\theta} = 60^\circ$$

Since θ is in QIII, $\theta = 180^\circ + 60^\circ$
 $= 240^\circ$

75. First, we find $\hat{\theta}$: $\sec \hat{\theta} = 2$
 $\cos \hat{\theta} = \frac{1}{2}$
 $\hat{\theta} = 60^\circ$
 Since θ is in QII, $\theta = 180^\circ - 60^\circ$
 $= 120^\circ$

77. First, we find $\hat{\theta}$: $\csc \hat{\theta} = \sqrt{2}$
 $\sin \hat{\theta} = \frac{1}{\sqrt{2}}$
 $\hat{\theta} = 45^\circ$
 Since θ is in QII, $\theta = 180^\circ - 45^\circ$
 $= 135^\circ$

79. First, we find $\hat{\theta}$: $\cot \hat{\theta} = 1$
 $\tan \hat{\theta} = 1$
 $\hat{\theta} = 45^\circ$
 Since θ is in QIV, $\theta = 360^\circ - 45^\circ$
 $= 315^\circ$

81. The complement of 70° is 20° because $70^\circ + 20^\circ = 90^\circ$.
 The supplement of 70° is 110° because $70^\circ + 110^\circ = 180^\circ$.

83. The complement of x is $90^\circ - x$.
 The supplement of x is $180^\circ - x$.

85. The side opposite the 30° angle is one-half of the longest side, or $\frac{1}{2} \cdot 10 = 5$.
 The side opposite the 60° angle is $\sqrt{3}$ times the shortest side, or $5\sqrt{3}$.

87. $\sin 30^\circ \cos 60^\circ = \frac{1}{2} \cdot \frac{1}{2}$
 $= \frac{1}{4}$

89. $\sin^2 45^\circ + \cos^2 45^\circ = \left(\frac{1}{\sqrt{2}}\right)^2 + \left(\frac{1}{\sqrt{2}}\right)^2$
 $= \frac{1}{2} + \frac{1}{2}$
 $= 1$