SOLUTION *Section* 1.1 – Angles, Degrees, and Special Triangles

Exercise

Indicate the angle if it is an acute or obtuse. Then give the complement and the supplement of each angle.

a) 10° *b*) 52° *c*) 90° *d*) 120° *e*) 150°

Solution

a) Acute; Complement is $90° - 10° = 80°$; Supplement is $180° - 10° = 170°$.

b) Acute; Complement is $90° - 52° = 38°$; Supplement is $180° - 52° = 128°$.

c) Neither (*right angle*); Complement is $90° - 90° = 0°$; Supplement is $180° - 90° = 90°$.

d) Obtuse; Complement is $90° - 120° = -30°$; Supplement is $180° - 120° = 60°$.

e) Obtuse; Complement is $90° - 150° = -60°$; Supplement is $180° - 150° = 30°$.

Exercise

Change $10°\ 45'$ to decimal degrees

Solution

$$10°\ 45' = 10° + 45'$$

$$= 10° + 45\frac{1}{60}°$$

$$= 10° + 0.75°$$

$$= 10.75°$$

Exercise

Convert $34°\ 51'\ 35''$ to decimal degrees.

Solution

$$34°\ 51'\ 35'' = 34° + 51' + 35''$$

$$= 34° + 51' \cdot \frac{1°}{60'} + 35'' \cdot \frac{1°}{3600''}$$

$$= 34° + 0.85° + 0.00972°$$

$$= 34.85972°$$

Exercise

Convert $274° \; 18' \; 59''$ to decimal degrees.

Solution

$$\begin{aligned} 274° \; 18' \; 59'' &= 274° + 18' + 59'' \\ &= 274° + 18' \cdot \frac{1°}{60'} + 59'' \cdot \frac{1°}{3600''} \\ &= 274° + 0.3° + 0.016389° \\ &= 274.316389° \end{aligned}$$

Exercise

Change $74° \; 8' \; 14''$ to decimal degrees to the nearest thousandth

Solution

$$\begin{aligned} 74° \; 8' \; 14'' &= 74° + \frac{8°}{60} + \frac{14°}{3600} \\ &= 74° + 0.1333° + 0.0039° \\ &= 74.137° \end{aligned}$$

Exercise

Convert $89.9004°$ to degrees, minutes, and seconds.

Solution

$$\begin{aligned} 89.9004° &= 89° + 0.9004° \\ &= 89° + 0.9004° \cdot (60') \\ &= 89° \quad 54.024' \\ &= 89° \quad 54' + 0.024' \\ &= 89° \quad 54' \quad 0.024' \cdot (60'') \\ &= 89° \quad 54' \quad 1.44'' \end{aligned}$$

Exercise

Convert $34.817°$ to degrees, minutes, and seconds

Solution

$$\begin{aligned}34.817° &= 34° + 0.817° \\ &= 34° + 0.817(60') \\ &= 34° + 49.02' \\ &= 34° + 49' + .02(60'') \\ &= 34° + 49' + 1.2'' \\ &= \underline{34°\ 49'\ 1.2''}\end{aligned}$$

Exercise

Convert $34.817°$ to degrees, minutes, and seconds.

Solution

$$\begin{aligned}34.817° &= 34° + 0.817° \\ &= 34° + \ 0.817 \cdot (60') \\ &= 34°\ \ 49.02' \\ &= 34°\ \ 49' + 0.02' \\ &= 34°\ \ 49'\ \ 0.02 \cdot (60'') \\ &= \underline{34°\ \ 49'\ \ 1.2''}\end{aligned}$$

Exercise

Convert $122.6853°$ to degrees, minutes, and seconds.

Solution

$$\begin{aligned}122.6853° &= 122° + .6853° \\ &= 122° + \ 0.6853 \cdot (60') \\ &= 122°\ \ 41.118' \\ &= 122°\ \ 41' + 0.118' \\ &= 122°\ \ 41'\ \ 0.118 \cdot (60'') \\ &= \underline{122°\ \ 41'\ \ 7.1''}\end{aligned}$$

Exercise

Convert $178.5994°$ to degrees, minutes, and seconds.

Solution

$$\begin{aligned}178.5994° &= 178° + .5994° \\ &= 178° + .5994 \cdot (60') \\ &= 178° \quad 35.964' \\ &= 178° \quad 35' + .964' \\ &= 178° \quad 35' \quad 0.964 \cdot (60'') \\ &= \underline{178° \quad 35' \quad 57.84''}\end{aligned}$$

Exercise

Perform each calculation

a) $51°\ 29' + 32°\ 46'$

b) $90° - 73°12'$

c) $90° - 36°\ 18'\ 47''$

d) $75°\ 15' + 83°\ 32'$

Solution

a) $51°29' + 32°46'$

$$\begin{array}{r} 51° \quad 29' \\ +32° \quad 46' \\ \hline 83° \quad 75' \end{array}$$

$$83° \quad 75' = 1°15'$$

$$\boxed{84° \quad 15'}$$

b) $90° - 73°12'$

$$\begin{array}{r} 89° \quad 60' \\ -73° \quad 12' \\ \hline 16° \quad 48' \end{array}$$

c) $90° - 36°\ 18'\ 47''$

$$\begin{array}{r} 90° \\ -36° \quad 18' \quad 47'' \\ \hline \end{array} \quad \Rightarrow \quad \begin{array}{r} 89° \quad 59' \quad 60'' \\ -36° \quad 18' \quad 47'' \\ \hline 53° \quad 41' \quad 13'' \end{array}$$

d) $75^\circ\ 15' + 83^\circ\ 32'$

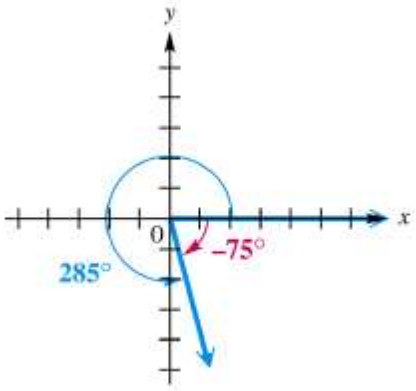
$$\begin{array}{rr} 75^\circ & 15' \\ 83^\circ & 32' \\ \hline 158^\circ & 47' \end{array}$$

Exercise

Find the angle of least possible positive measure coterminal with an angle of -75°.

Solution

$360^\circ - 75^\circ = 285^\circ$



Exercise

Find the angle of least possible positive measure coterminal with an angle of -800°.

Solution

$3(360^\circ) - 800^\circ = 280^\circ$

Exercise

Find the angle of least possible positive measure coterminal with an angle of 270°.

Solution

$360^\circ + 270^\circ = 630^\circ$

Exercise

A vertical rise of the Forest Double chair lift 1,170 feet and the length of the chair lift as 5,570 feet. To the nearest foot, find the horizontal distance covered by a person riding this lift.

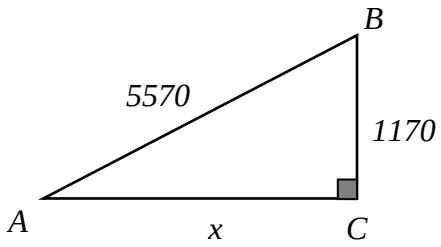
Solution

$$x^2 + 1170^2 = 5570^2$$

$$x^2 = 5570^2 - 1170^2$$

$$x = \sqrt{5570^2 - 1170^2}$$

$$x = 5,445.73 \ \ ft$$



Exercise

A tire is rotating 600 times per minute. Through how many degrees does a point of the edge of the tire move in $\frac{1}{2}$ second?

Solution

$$\frac{1}{2}\,600\,\frac{rev}{\min}\cdot\frac{1\min}{60\sec}\cdot\frac{360°}{1rev} = \underline{1800 \ \ \text{deg/ sec}}$$

Exercise

A windmill makes 90 revolutions per minute. How many revolutions does it make per second?

Solution

$$90\,\frac{rev}{\min}\cdot\frac{1\min}{60\sec} = \underline{1.5 \ \ rev/\sec}$$