Math 002 – Term 052
Recitation hour (5.1 & 5.2)

Q1) Convert: (a) -345° to radian measure. (b) $\frac{3\pi}{10}$ radians to degree measure.

<u>Solution</u>: (a) $-345^{\circ} = (-345)\cdot(\frac{\pi}{180})$ radians $= -\frac{23\pi}{12}$ radians.

(b) $\frac{3\pi}{10}$ radians $= \frac{3\pi}{10}\cdot\frac{180}{\pi} = 54^{\circ}$

Q2) If α is the complementary of the angle $83^{\circ}\ 25'\ 51''$ and β is the supplementary of the angle $44^{\circ}\ 6'\ 2''$, find $\alpha+\beta$.

<u>Solution</u>: $\alpha = 90^{\circ} - 83^{\circ}\ 25'\ 51'' = 89^{\circ}\ 59'\ 60'' - 83^{\circ}\ 25'\ 51'' = 6^{\circ}\ 34'\ 9''$

$\beta = 180^{\circ} - 44^{\circ}\ 6'\ 2'' = 179^{\circ}\ 59'\ 60'' - 44^{\circ}\ 6'\ 2'' = 135^{\circ}\ 53'\ 58''$, then

$\alpha+\beta = 6^{\circ}\ 34'\ 9'' + 135^{\circ}\ 53'\ 58'' = 141^{\circ}\ 87'\ 67'' = 141^{\circ}\ 88'\ 7'' = 142^{\circ}\ 28'\ 7''$

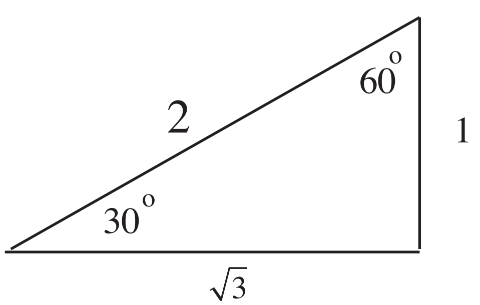
Q3) (a) Find the smallest positive and largest negative angles that are coterminal with $\theta = -750^{\circ}$.

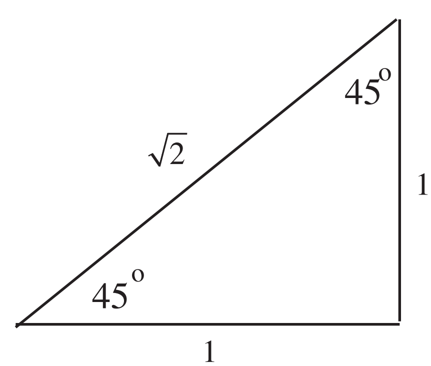
(b) Find the exact value of: $2\sin^2\frac{\pi}{3} + \tan 45^{\circ}$

<u>Solution</u>: (a) The smallest positive angle coterminal with $\theta = -750^{\circ} + 3(360^{\circ}) = -750^{\circ} + 1080^{\circ} = 330^{\circ}$

The largest negative angle coterminal with $\theta = -750^{\circ} + 2(360^{\circ}) = -750^{\circ} + 720^{\circ} = -30^{\circ}$

(b) $2\sin^2 60^{\circ} + \tan 45^{\circ} = 2\left(\frac{\sqrt{3}}{2}\right)^2 + 1 = 2(\frac{3}{4}) + 1 = \frac{3}{2} + 1 = \frac{5}{2}$





Q4) (a) Find the length of an arc that subtends a central angle of 135° in a circle of diameter 40 ft.

(b) A wheel is rotating at 200 revolutions per minute. Find the angular speed of the wheel in radians per second.

<u>Solution</u>: (a) radius = r = $\frac{40}{2} = 20$ ft , $\theta = 135\cdot\frac{\pi}{180} = \frac{3\pi}{4}$ radians. So arc length = S = $r\theta = (20)(\frac{3\pi}{4}) = 15\pi \approx 47.124$ ft

(b) angular speed = $\omega = 200\cdot\frac{2\pi}{60} = \frac{20\pi}{3}$ radians per second.

Q5) Find the height of a building if the angle of elevation to the top of the building changes from 30° to 45° as the observer moves a distance of 80 ft toward the building

<u>Solution</u>: Let h = height of the building. In triangle ABC: $\tan 45^\circ = \frac{h}{x} \implies 1 = \frac{h}{x} \implies h = x.$

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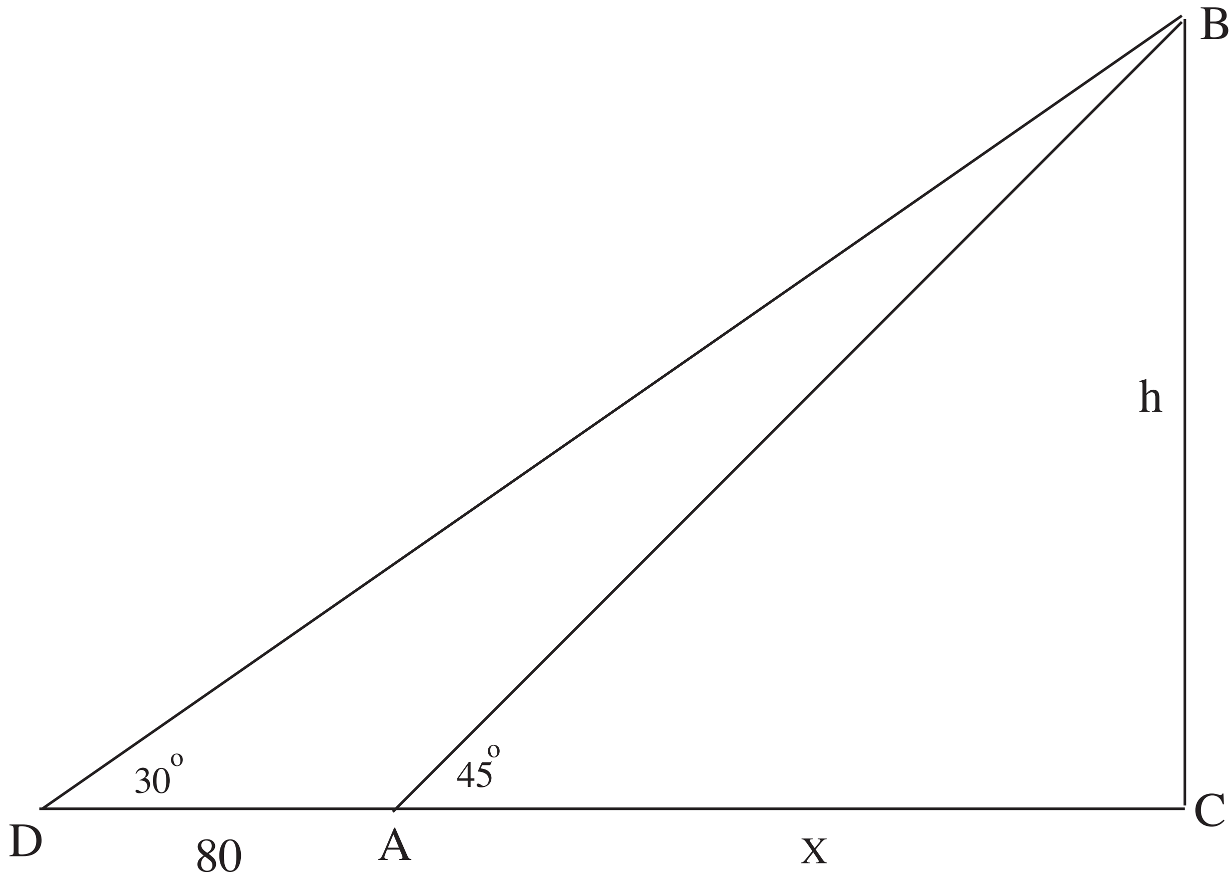
In triangle DBC: $\tan 30^\circ = \frac{h}{x+80} \implies \frac{1}{\sqrt{3}} = \frac{h}{x+80} \implies \sqrt{3}h = x + 80,$ but $x = h$

$\implies \sqrt{3}h = h + 80 \implies \sqrt{3}h - h = 80 \implies (\sqrt{3}-1)h = 80 \implies h = \frac{80}{\sqrt{3}-1} \cdot \frac{\sqrt{3}+1}{\sqrt{3}+1}$

$= \frac{80(\sqrt{3}+1)}{3-1} = 40(\sqrt{3}+1)$ ft.



Solved by: A. Al-shallali