

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

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

**Solution:** (a)  $-345^\circ = (-345) \cdot \left(\frac{\pi}{180}\right)$  radians  $= -\frac{23\pi}{12}$  radians.

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

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

**Solution:**  $\alpha = 90^\circ - 83^\circ 25' 51'' = 89^\circ 59' 60'' - 83^\circ 25' 51'' = 6^\circ 34' 9''$

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

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

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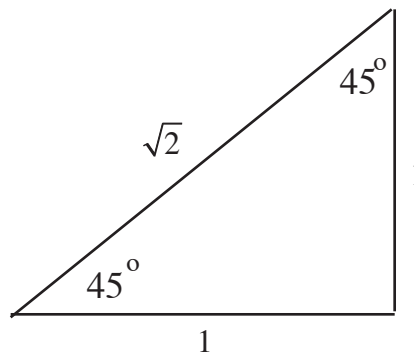
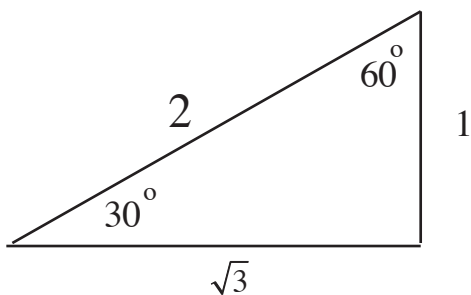
**Q3)** (a) Find the smallest positive and largest negative angles that are coterminal with  $\theta = -750^\circ$ .

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

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



**Q4)** (a) Find the length of an arc that subtends a central angle of  $135^\circ$  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.

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

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

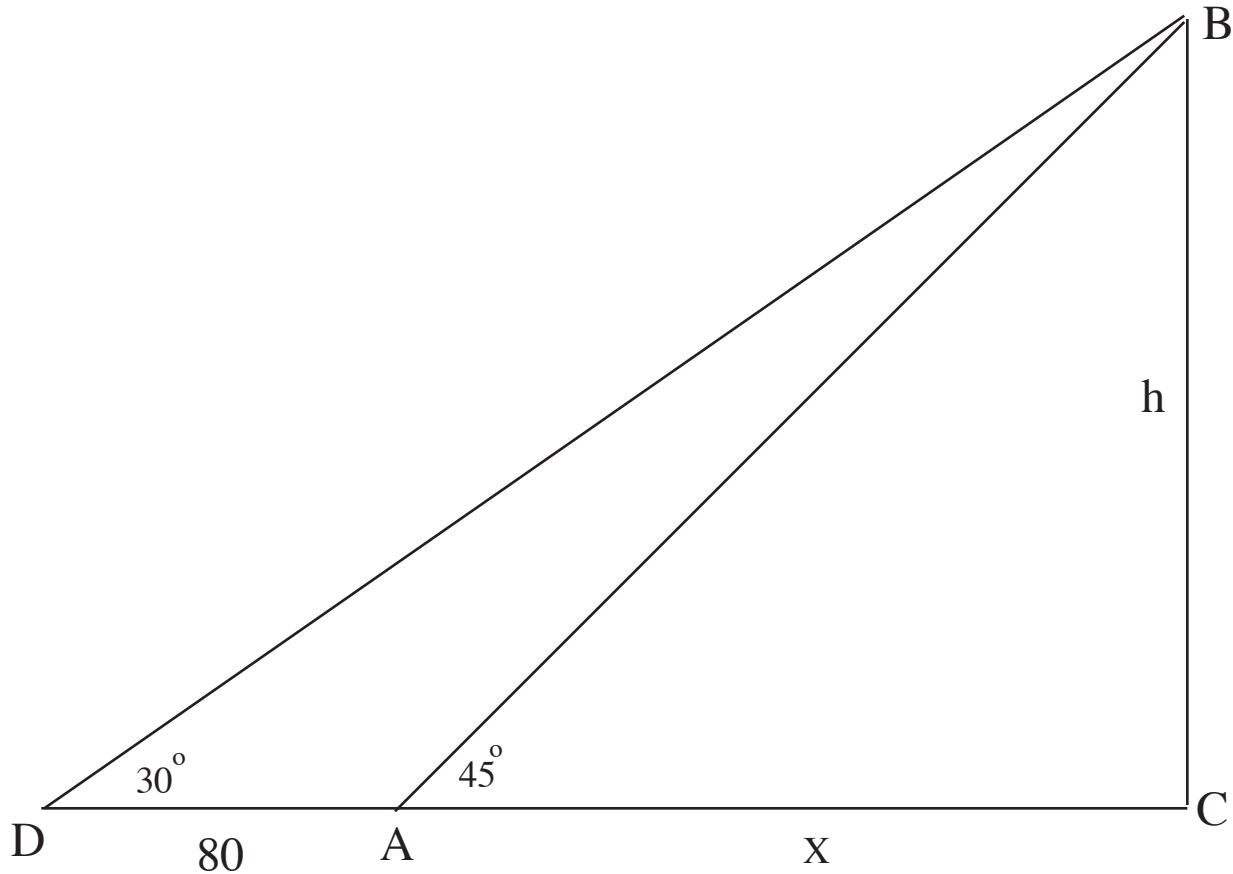
**Q5)** Find the height of a building if the angle of elevation to the top of the building changes from  $30^\circ$  to  $45^\circ$  as the observer moves a distance of 80 ft toward the building

**Solution:** 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