1) Determine mentally the exact radian measure for each angle, given that $30°$ is exactly $\frac{\pi}{6}$ radians.

a) $60°$ **b)** $90°$ **c)** $120°$ **d)** $150°$

2) Determine mentally the exact radian measure for each angle, given that $30°$ is exactly $\frac{\pi}{6}$ radians.

a) $15°$ **b)** $10°$ **c)** $7.5°$ **d)** $5°$

3) Determine mentally the exact radian measure for each angle, given that $45°$ is exactly $\frac{\pi}{4}$ radians.

a) $90°$ **b)** $135°$ **c)** $180°$ **d)** $225°$

4) Determine mentally the exact radian measure for each angle, given that $45°$ is exactly $\frac{\pi}{4}$ radians.

a) $22.5°$ **b)** $15°$ **c)** $9°$ **d)** $3°$

5) Determine the EXACT radian measure for each angle

a) $40°$ **b)** $10°$ **c)** $315°$

d) $210°$ **e)** $300°$ **f)** $75°$

6) Determine the APPROXIMATE radian measure, the nearest hundredth, for each angle.

a) 23°　　　　　　　　　　　　**b)** 51°　　　　　　　　　　　　**c)** 82°

d) 128°　　　　　　　　　　　　**e)** 240°　　　　　　　　　　　**f)** 330°

7) Determine the EXACT degree measure for each angle.

a) $\frac{\pi}{5}$　　　　　　　　　　　　**b)** $\frac{\pi}{9}$　　　　　　　　　　　**c)** $\frac{5\pi}{12}$

d) $\frac{5\pi}{18}$　　　　　　　　　　　**e)** $\frac{3\pi}{4}$　　　　　　　　　　**f)** $\frac{3\pi}{2}$

8) Determine the APPROXIMATE degree measure, to the nearest tenth, for each angle.

a) 2.34　　　　　　　　　　　**b)** 3.14　　　　　　　　　　　**c)** 5.27
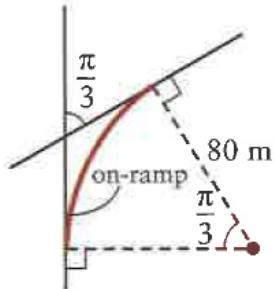
d) 7.53　　　　　　　　　　　**e)** 0.68　　　　　　　　　　　**f)** 1.72

9) A circle of radius 25 cm has a central angle of 4.75 radians. Determine the length of the arc that subtends this angle.

10) Two highways meet at an angle measuring $\frac{\pi}{3}$ radians, as shown. An on-ramp in the shape of a circular arc is to be built such that the arc has a radius of 80 m.

a) Determine an EXACT expression for the length of the on-ramp.

b) Determine the length of the on-ramp, to the nearest tenth of a meter.

11) David made a swing for his niece Sarah using ropes 2.4 m long, so that Sarah swings through an arc length of 1.2 meters. Determine the angle through which Sarah swings, in both radians and degrees.

Answer Key

1)a) $\frac{\pi}{3}$ **b)** $\frac{\pi}{2}$ **c)** $\frac{2\pi}{3}$ **d)** $\frac{5\pi}{6}$ **2) a)** $\frac{\pi}{12}$ **b)** $\frac{\pi}{18}$ **c)** $\frac{\pi}{24}$ **d)** $\frac{\pi}{36}$

3)a) $\frac{\pi}{2}$ **b)** $\frac{3\pi}{4}$ **c)** π **d)** $\frac{5\pi}{4}$ **4)a)** $\frac{\pi}{8}$ **b)** $\frac{\pi}{12}$ **c)** $\frac{\pi}{20}$ **d)** $\frac{\pi}{60}$

5)a) $\frac{2\pi}{9}$ **b)** $\frac{\pi}{18}$ **c)** $\frac{7\pi}{4}$ **d)** $\frac{7\pi}{6}$ **e)** $\frac{5\pi}{3}$ **f)** $\frac{5\pi}{12}$ **6)a)** 0.4 **b)** 0.89 **c)** 1.43 **d)** 2.23 **e)** 4.19 **f)** 5.76

7)a) 36° **b)** 20° **c)** 75° **d)** 50° **e)** 135° **f)** 270°   **8)a)** 134.1° **b)** 179.9° **c)** 301.9° **d)** 431.4° **e)** 39° **f)** 98.5°

9) 118.75 cm   **10)a)** $\frac{80\pi}{3}$ m **b)** 83.8 m

11) 0.5 radians; 28.6°