W1 – 4.1 Radian Measure
MHF4U
Jensen

ANSWERS

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

a) $60° = 2(30°)$
$= 2(\pi/6)$
$= \frac{\pi}{3}$

b) $90° = \frac{3\pi}{6}$
$= \frac{\pi}{2}$

c) $120° = \frac{4\pi}{6}$
$= \frac{2\pi}{3}$

d) $150° = \frac{5\pi}{6}$

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

a) $15° = \frac{(\frac{\pi}{6})}{2}$
$= \frac{\pi}{12}$

b) $10° = \frac{(\frac{\pi}{6})}{3}$
$= \frac{\pi}{18}$

c) $7.5° = \frac{(\frac{\pi}{6})}{4}$
$= \frac{\pi}{24}$

d) $5° = \frac{(\frac{\pi}{6})}{6}$
$= \frac{\pi}{36}$

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

a) $90° = \frac{2\pi}{4}$
$= \frac{\pi}{2}$

b) $135° = \frac{3\pi}{4}$

c) $180° = \frac{4\pi}{4}$
$= \pi$

d) $225° = \frac{5\pi}{4}$

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

a) $22.5° = \frac{(\frac{\pi}{4})}{2}$
$= \frac{\pi}{8}$

b) $15° = \frac{(\frac{\pi}{4})}{3}$
$= \frac{\pi}{12}$

c) $9° = \frac{(\frac{\pi}{4})}{5}$
$= \frac{\pi}{20}$

d) $3° = \frac{(\frac{\pi}{4})}{15}$
$= \frac{\pi}{60}$

5) Determine the EXACT radian measure for each angle

a) $40° \times \frac{\pi}{180}$
$= \frac{2\pi}{9}$

b) $10° \times \frac{\pi}{180}$
$= \frac{\pi}{18}$

c) $315° \times \frac{\pi}{180}$
$= \frac{7\pi}{4}$

d) $210° \times \frac{\pi}{180}$
$= \frac{7\pi}{6}$

e) $300° \times \frac{\pi}{180}$
$= \frac{5\pi}{3}$

f) $75° \times \frac{\pi}{180}$
$= \frac{5\pi}{12}$

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

a) $23° \times \frac{\pi}{180}$

$\simeq 0.40$

b) $51° \times \frac{\pi}{180}$

$\simeq 0.89$

c) $82° \times \frac{\pi}{180}$

$= 1.43$

d) $128° \times \frac{\pi}{180}$

$\simeq 2.23$

e) $240° \times \frac{\pi}{180}$

$\simeq 4.19$

f) $330° \times \frac{\pi}{180}$

$\simeq 5.76$

7) Determine the EXACT degree measure for each angle.

a) $\frac{\pi}{5} \times \frac{180}{\pi}$

$= 36°$

b) $\frac{\pi}{9} \times \frac{180}{\pi}$

$= 20°$

c) $\frac{5\pi}{12} \times \frac{180}{\pi}$

$= 75°$

d) $\frac{5\pi}{18} \times \frac{180}{\pi}$

$= 50°$

e) $\frac{3\pi}{4} \times \frac{180}{\pi}$

$= 135°$

f) $\frac{3\pi}{2} \times \frac{180}{\pi}$

$= 270°$

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

a) $2.34 \times \frac{180}{\pi}$

$\simeq 134.1°$

b) $3.14 \times \frac{180}{\pi}$

$\simeq 179.9°$

c) $5.27 \times \frac{180}{\pi}$

$\simeq 301.9°$

d) $7.53 \times \frac{180}{\pi}$

$\simeq 431.4°$

e) $0.68 \times \frac{180}{\pi}$

$\simeq 39.0$

f) $1.72 \times \frac{180}{\pi}$

$\simeq 98.5°$

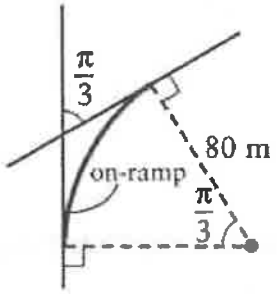
9) A circle of radius 25 cm has a central angle of 4.75 radians. Determine the length of the arc that subtends this angle.

$\theta = \frac{a}{r}$

$4.75 = \frac{a}{25}$

$a = 118.75$ cm

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.

$\theta = \frac{a}{r}$

$\frac{\pi}{3} = \frac{a}{80}$

$a = \frac{80\pi}{3}$ m

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

$\simeq 83.8$ m

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.

$\theta = \frac{a}{r}$

$\theta = \frac{1.2}{2.4}$

$\theta = 0.5$ radians

$0.5 \times \frac{180}{\pi}$

$\simeq 28.6°$

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°