Name_____ Date_____ Period_____

## Worksheet 5.1—Angles and Angle Measure

Show all work on a separate sheet of paper. When you can, give simplified, exact answers, otherwise report 3-decimals. A calculator **is permitted** unless otherwise stated.

**Multiple Choice**

1. What is the radian measure of an angle of $x$ degrees?     $x° \cdot \dfrac{\pi}{180°} = \dfrac{x\pi}{180}$

   (A) $\pi x$     (B) $\dfrac{x}{180}$     (C) $\dfrac{\pi x}{180}$     (D) $\dfrac{180x}{\pi}$     (E) $\dfrac{180}{x\pi}$

2. A central angle in a circle of radius $r$ has a measure of $\theta$ radians. If the same central angle were drawn in a circle of radius $3r$, its radian measure would be  The same

   (A) $\dfrac{\theta}{3}$     (B) $\dfrac{\theta}{3r}$     (C) $\theta$     (D) $2\theta$     (E) $2r\theta$

3. Expressed in radian measure, $235°$ is     $235° \cdot \dfrac{\pi}{180°} = \dfrac{47}{36}\pi$

   (A) $\dfrac{\pi}{235}$     (B) $\dfrac{235}{\pi}$     (C) $\dfrac{47\pi}{36}$     (D) $\dfrac{36\pi}{47}$     (E) $\dfrac{5\pi}{4}$

4. Which of the following angles is coterminal with $\dfrac{14\pi}{5}$?
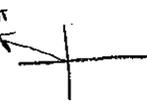
   (A) $-\dfrac{14\pi}{5}$     (B) $\dfrac{23\pi}{10}$     (C) $\dfrac{51\pi}{20}$     (D) $\dfrac{9\pi}{5}$     (E) $-\dfrac{16\pi}{5}$

5. Find the reference angle for $\dfrac{32\pi}{9}$.     $2\pi - \dfrac{14}{9}\pi = \dfrac{4}{9}\pi$
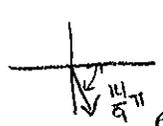
   (A) $\dfrac{2\pi}{9}$     (B) $\dfrac{4\pi}{9}$     (C) $\dfrac{6\pi}{9}$     (D) $\dfrac{8\pi}{9}$     (E) $\dfrac{14\pi}{9}$

6. Two angles are complementary if their sum is $90°$. In radians, find the complement of $\dfrac{\pi}{30}$.     $\dfrac{\pi}{2} - \dfrac{\pi}{30} = \dfrac{7}{15}\pi$

   (A) $\dfrac{7\pi}{15}$     (B) $\dfrac{59\pi}{30}$     (C) $-\dfrac{13\pi}{30}$     (D) $-\dfrac{\pi}{30}$     (E) $\dfrac{22\pi}{15}$

7. Two angles are supplementary if their sum is $180°$. In radians, find the supplement of $\dfrac{11\pi}{60}$.     $\pi - \dfrac{11\pi}{60} = \dfrac{49}{60}\pi$

   (A) $\dfrac{49\pi}{60}$     (B) $\dfrac{109\pi}{60}$     (C) $\dfrac{19\pi}{30}$     (D) $\dfrac{19\pi}{60}$     (E) $-\dfrac{11\pi}{60}$

8. Find a coterminal angle to the angle $137°$.

   (A) $43°$     (B) $-251146°$     (C) $80079°$     (D) $199945°$     (E) $-359503°$

$137°$

Precal Matters
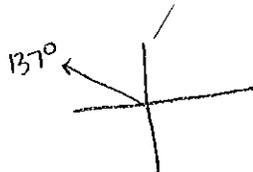
9. Find a coterminal angle to the angle $\dfrac{27\pi}{50}$

(A) $\dfrac{361\pi}{50}$    (B) $-\dfrac{2439\pi}{50}$    (C) $\dfrac{69827\pi}{50}$    (D) $\dfrac{23\pi}{50}$    (E) $\dfrac{73\pi}{50}$

10. Find the reference angle to the angle $\dfrac{27\pi}{50}$

(A) $\dfrac{361\pi}{50}$    (B) $-\dfrac{2439\pi}{50}$    (C) $\dfrac{69827\pi}{50}$    (D) $\dfrac{23\pi}{50}$    (E) $\dfrac{73\pi}{50}$

**Short Answer**

11. Draw the following angles in standard position, then find the reference angle. Be sure to show the terminal ray and label the reference angle in your diagram.

(a) $\theta = -2587.62°$    (b) $\theta = \dfrac{57\pi}{7}$    (c) $\phi = \dfrac{2223\pi}{2}$    (d) $\beta = 12345°67'89''$    (e) $\alpha = 37.603$

a)

$-67.62°$

$\theta_{ref} = 67.62°$

b)

$\frac{1}{7}\pi$

$\theta_{ref} = \frac{1}{7}\pi$

c)

no ref angle
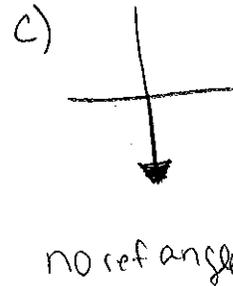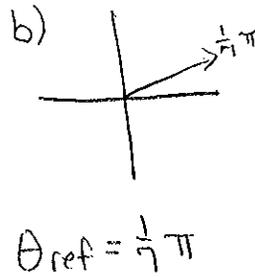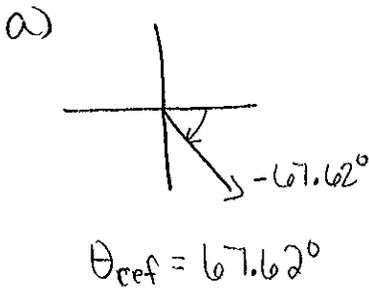
d) $\beta = 12346.141°...$

$73.858°$    $106.141°...$
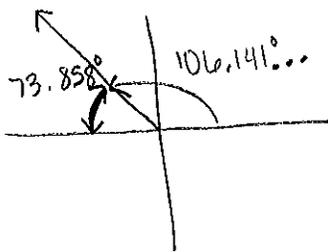
$\beta_{ref} = 73.858°$

e) $\alpha = 37.603$

$\alpha = 1.969\pi$ or $6.187...$
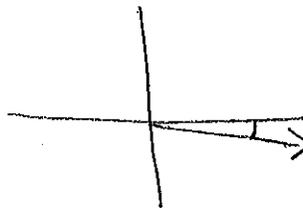
$\alpha = .030\pi$ or $0.096$
or
$.031\pi$

12. Convert 118°44'13" from DMS to decimal radians. Show the work that leads to your answer.

$$118° + \frac{44}{60} + \frac{13}{3600} = 118.736...° \cdot \frac{\pi}{180°} = .659\pi$$

13. Convert $\frac{6341\pi}{17}$ from radians to DMS. Show the work that leads to your answer.

$$\frac{6341\pi}{17} \cdot \frac{180°}{\pi} = 67140°$$

14. Find an angle $\theta \in [0°, 360°)$ that is coterminal with the following given angles.

(a) 744°     (b) −5381.251°     (c) −361°     (d) 800°25'25"

a) $\theta_{cot} = 24°$

b) $-341.251° + 360° =$
$\boxed{\theta_{cot} = 18.749°}$

c) $\boxed{\theta_{cot} = 359°}$

d) $800.4236111°$
$\boxed{\theta_{cot} = 80.426°}$

15. Find an angle $\alpha \in [0, 2\pi)$ that is coterminal with the following given angles.

(a) $\frac{137\pi}{6}$     (b) $-\frac{3679\pi}{3}$     (c) $68\pi$     (d) 20

a) $\alpha_{cot} = \frac{5}{6}\pi$

b) $\alpha_{cot} = \frac{5}{3}\pi$

c) $\alpha_{cot} = 0$

d) $\alpha = 6.366\pi$
$\boxed{\alpha_{cot} = .366\pi}$
or $1.150$