MA 15400

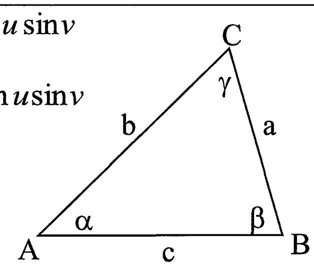
Spring 2014

Exam 2

$\sin(u+v) = \sin u \cos v + \cos u \sin v$

$\cos(u+v) = \cos u \cos v - \sin u \sin v$

$\tan(u+v) = \dfrac{\tan u + \tan v}{1 - \tan u \tan v}$



$\sin(u-v) = \sin u \cos v - \cos u \sin v$

$\cos(u-v) = \cos u \cos v + \sin u \sin v$

$\tan(u-v) = \dfrac{\tan u - \tan v}{1 + \tan u \tan v}$

$\sin(2u) = 2\sin u \cos u$

$\cos(2u) = \cos^2 u - \sin^2 u$

$\tan(2u) = \dfrac{2\tan u}{1 - \tan^2 u}$

$\sin^2\theta + \cos^2\theta = 1$

$1 + \tan^2\theta = \sec^2\theta$

$1 + \cot^2\theta = \csc^2\theta$

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Lesson 12-20, All of Sections 6.7, 7.2, 7.3, and 7.4

1. Given $\triangle ABC$ with $\gamma = 90°, \alpha = 60°$, and $c = 14$, find the exact value of side a.

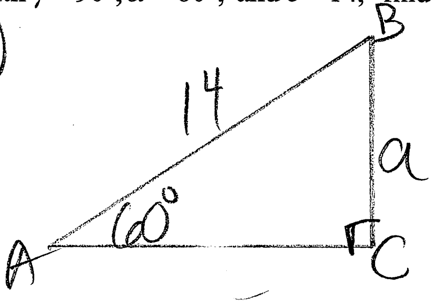
A. $7\sqrt{3}$

B. $\frac{7}{2}$

C. $\frac{7}{\sqrt{3}}$

D. 7

E. None of the above



$\sin 60° = \frac{a}{14}$

$\frac{\sqrt{3}}{2} = \frac{a}{14}$

$2a = 14\sqrt{3}$

$a = \frac{14\sqrt{3}}{2} = 7\sqrt{3}$

2. Given $\triangle ABC$ with $\gamma = 90°, c = 8.1$, and $b = 2.8$, approximate angle α to the nearest tenth of a degree.

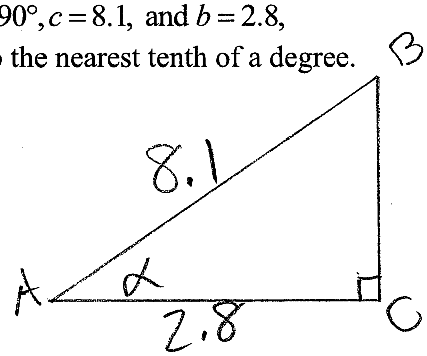
A. 19.1°

B. 70.9°

C. 20.2°

D. 69.8°

E. None of the above



$\cos \alpha = \frac{2.8}{8.1}$

$\alpha = \cos^{-1}(0.346)$

$\alpha = 69.8°$

3. Given the indicated parts of $\triangle ABC$ with $\gamma = 90°$, express the third part in terms of the first two.

$b, \beta;\ c$

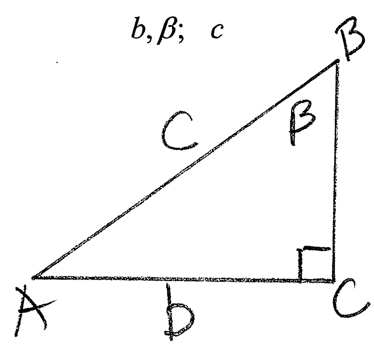
A. $c = b \tan \beta$

B. $c = b \csc \beta$

C. $c = b \sec \beta$

D. $c = b \cos \beta$

E. $c = b \sin \beta$



$\sin \beta = \frac{b}{c}$

$c = \frac{b}{\sin \beta}$

$c = b \csc \beta$

4. A builder wishes to construct a ramp 39 feet long that rises to a height of 8.9 feet above the level ground. Approximate the angle that the ramp should make with the horizontal to the nearest tenth of a degree.

A. 13.5°

B. 12.9°

C. 12.6°

D. 13.8°

E. None of the above

5. A ladder, 27 feet long, leans against the side of a building, and the angle between the ladder and the building is 36°.

If the distance from the bottom of the ladder to the building is increase by 2.0 feet, approximately how far does the top of the ladder move down the building? Round your answer to one decimal place.

A. 1.0 *feet*

B. 1.4 *feet*

C. 1.6 *feet*

D. 1.2 *feet*

E. None of the above

6. Find all solutions of the equation using n as an arbitrary integer: $\sec\theta = \sqrt{2}$

A. $\theta = \frac{\pi}{3} + 2\pi n,\ \theta = \frac{5\pi}{3} + 2\pi n$

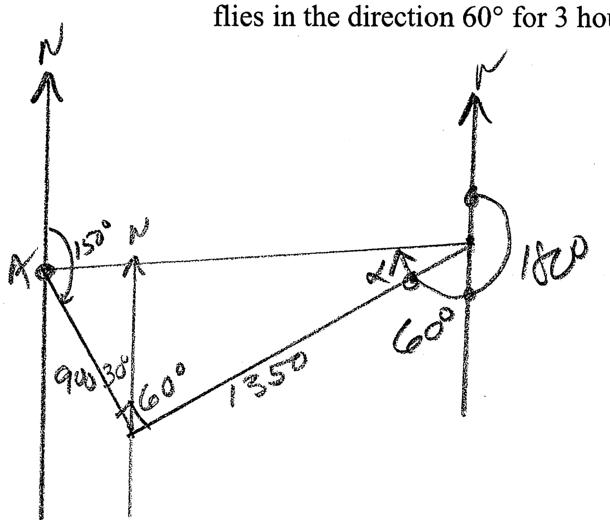
B. $\theta = \frac{\pi}{4} + 2\pi n,\ \theta = \frac{3\pi}{4} + 2\pi n$

C. $\theta = \frac{\pi}{3} + \pi n,\ \theta = \frac{2\pi}{3} + \pi n$

D. $\theta = \frac{\pi}{4} + 2\pi n,\ \theta = \frac{7\pi}{4} + 2\pi n$

E. No Solution

For questions 7 and 8: An airplane, flying at a speed of 450 miles per hour, flies from a point A in the direction 150° for 2 hours, and then flies in the direction 60° for 3 hours.



$D_1 = 450(2) = 900$

$D_2 = 450(3) = 1350$

7. How long will it take for the plane to get back to point A? Round to the nearest tenth of an hour.

A. 3.4 *hrs.*

B. 3.6 *hrs.*

C. 3.8 *hrs.*

D. 3.2 *hrs.*

E. None of the above

$D = rt$ $\quad t = \frac{D}{r}$

$D^2 = 900^2 + 1350^2$

$D = 1622.5$

$t = \frac{1622.5}{450} = 3.6$

8. In what direction does the plane need to fly in order to get back to point A? Round to the nearest degree.

A. 274°

B. 184°

C. 296°

D. 206°

E. None of the above

$\tan \alpha = \frac{900}{1350}$

$\alpha = \tan^{-1}\left(\frac{900}{1350}\right)$

$\alpha = 33.7°$

$180° + 60° + 34° = 274°$

9. Find all solutions of the equation using n as an arbitrary integer:

$$3\tan\left(2x-\frac{\pi}{6}\right)=3\sqrt{3}$$

A. $x=\frac{\pi}{4}+\pi n$

B. $x=\frac{\pi}{6}+\frac{\pi}{2}n$

C. $x=\frac{\pi}{4}+\frac{\pi}{2}n$

D. $x=\frac{\pi}{6}+\pi n$

E. No Solution

$\tan\left(2x-\frac{\pi}{6}\right)=\sqrt{3}$

$2x-\frac{\pi}{6}=\frac{\pi}{3}+\pi n$

$2x=\frac{\pi}{6}+\frac{\pi}{3}+\pi n$

$2x=\frac{\pi}{2}+\pi n$

$x=\frac{\pi}{4}+\frac{\pi}{2}n$

10. Find the solutions of the equation that are in the interval $[0,2\pi)$:

$$\sin\left(2x+\frac{\pi}{3}\right)=1$$

A. $x=\frac{\pi}{12},\frac{13\pi}{12}$

B. $x=\frac{\pi}{6},\frac{2\pi}{3},\frac{7\pi}{6},\frac{5\pi}{3}$

C. $x=\frac{\pi}{6},\frac{7\pi}{6}$

D. $x=\frac{\pi}{12},\frac{7\pi}{12},\frac{13\pi}{12},\frac{19\pi}{12}$

E. No Solution

$2x+\frac{\pi}{3}=\frac{\pi}{2}+2\pi n$

$2x=\frac{\pi}{2}-\frac{\pi}{3}+2\pi n$

$2x=\frac{\pi}{6}+2\pi n$

$x=\frac{\pi}{12}+\pi n$

$x=\frac{\pi}{12}+\frac{12\pi}{12}n$

n	x
0	$\pi/12$
1	$\frac{13\pi}{12}$
2	Too Big
-1	Too small

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11. Find the solutions of the equation that are in the interval $[0, 2\pi)$:

$$\sin^2\theta + 5\sin\theta + 6 = 0$$

$(\sin\theta + 3)(\sin\theta + 2) = 0$

$\sin\theta + 3 = 0$ $\quad$ $\sin\theta + 2 = 0$

$\sin\theta = -3$ $\quad$ $\sin\theta = -2$

no sol. $\quad$ no sol.

A. $\theta = 3, 2$

B. $\theta = \frac{\pi}{4}, \frac{3\pi}{4}$

C. $\theta = -3, -2$

D. $\theta = \frac{2\pi}{3}, \frac{4\pi}{3}$

E. No Solution

12. Express as a trigonometric function of one angle:

$$\cos 31^\circ \cos 20^\circ + \sin 31^\circ \sin 20^\circ$$

$\cos(31^\circ - 20^\circ)$

$\cos(11^\circ)$

A. $\sin(11^\circ)$

B. $\cos(51^\circ)$

C. $\sin(51^\circ)$

D. $\cos(11^\circ)$

E. None of the above

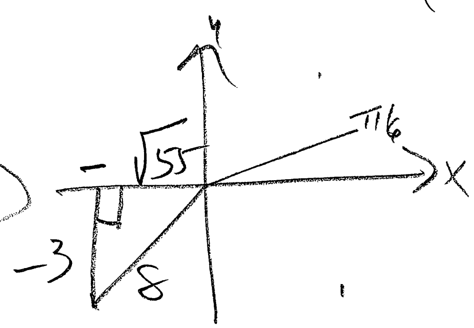
13. If $\sin\alpha = \frac{-3}{8}$ and $\tan\alpha > 0$, find the exact value of $\sin\left(\alpha + \frac{\pi}{6}\right)$.

QIII since $\sin\alpha < 0$, $\tan\alpha > 0$

$8^2 = 3^2 + b^2$

$64 - 9 = b^2$

$b = \pm\sqrt{55}$



A. $\frac{-\sqrt{165} - 3}{16}$

B. $\frac{-3\sqrt{3} - \sqrt{55}}{16}$

C. $\frac{-\sqrt{165} + 3}{16}$

D. $\frac{-3\sqrt{3} + \sqrt{55}}{16}$

E. None of the above

$\sin(\alpha + \pi/6) = \sin\alpha\cos\frac{\pi}{6} + \cos\alpha\sin\frac{\pi}{6}$

$= \left(\frac{-3}{8}\right)\left(\frac{\sqrt{3}}{2}\right) + \left(\frac{-\sqrt{55}}{8}\right)\left(\frac{1}{2}\right)$

$= -\frac{3\sqrt{3}}{16} + \frac{-\sqrt{55}}{16} = \frac{-3\sqrt{3} - \sqrt{55}}{16}$

14. If α and β are acute angles such that $\cos\alpha = \frac{3}{5}$ and $\tan\beta = \frac{8}{15}$, then find $\cos(\alpha+\beta)$.

A. $\frac{77}{85}$

B. $\frac{84}{85}$

C. $\frac{13}{85}$

D. $\frac{36}{85}$

E. None of the above

15. If $\tan\alpha = \frac{-24}{7}$ and $\csc\beta = \frac{-13}{12}$, for *QII* angle α and *QIII* angle β, then find $\sin(\alpha+\beta)$.

A. $\frac{253}{325}$

B. $\frac{-204}{325}$

C. $\frac{323}{325}$

D. $\frac{-36}{325}$

E. None of the above

16. Find the exact value of $\sin(2\theta)$ for $\cos\theta = \frac{-6}{13}; 180° < \theta < 270°$.

A. $\frac{97}{169}$

B. $\frac{-12\sqrt{133}}{169}$

C. $\frac{12\sqrt{133}}{169}$

D. $\frac{-97}{169}$

E. None of the above

17. Express as a cofunction of a complementary angle.

$$\sin(52°42')$$

A. $\cos(37°18')$

B. $\csc(37°58')$

C. $\cos(37°58')$

D. $\csc(37°18')$

E. None of the above

18. Find the solutions of the equation that are in the interval $[0, 2\pi)$.

$$\sin t - \sin 2t = 0$$

A. $t = \frac{\pi}{2}, \frac{3\pi}{2}, \frac{\pi}{3}, \frac{5\pi}{3}$

B. $t = 0, \pi, \frac{\pi}{3}, \frac{5\pi}{3}$

C. $t = \frac{\pi}{2}, \frac{3\pi}{2}, \frac{2\pi}{3}, \frac{4\pi}{3}$

D. $t = 0, \pi, \frac{2\pi}{3}, \frac{4\pi}{3}$

E. None of the above