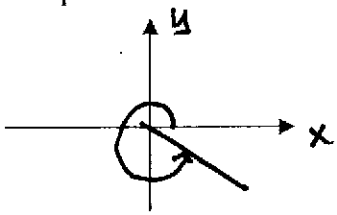
Math 41 Trigonometry Worksheet 1
Spring 2016

1. a. Draw the angle in standard position and convert the angle to degree measure.

$\theta = \frac{11\pi}{6}$

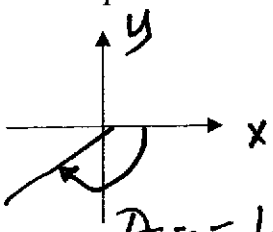


$\theta = 11\pi/6$

$11\pi/6 \times \frac{180^\circ}{\pi} = 330^\circ$

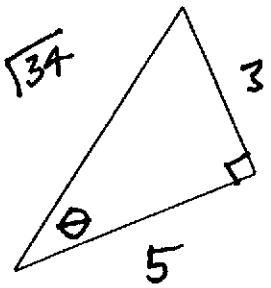
b. Draw the angle in standard position and convert the angle to radian measure

$\theta = -135^\circ$



$\theta = -135^\circ$

$-135^\circ \times \frac{\pi}{180^\circ} = -3\pi/4$



2. Use the right triangle to find each ratio of the angle, θ.

a. $\cos\theta = \frac{5}{\sqrt{34}} = \frac{5\sqrt{34}}{34}$

b. $\cot\theta = \frac{5}{3}$

c. $\csc\theta = \frac{\sqrt{34}}{3}$

$hyp^2 = 5^2 + 3^2$

$hyp^2 = 25 + 9$

$hyp^2 = 34$

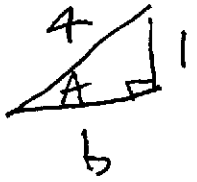
$hyp = \sqrt{34}$

3. Find the exact ratio of the special angle without a calculator:

a. $\sin 45^\circ = \frac{1}{\sqrt{2}} = \frac{\sqrt{2}}{2}$

b. $\sec\frac{\pi}{3} = \frac{1}{\cos \pi/3} = \frac{1}{1/2} = 2$

4. Draw a right triangle find the trig ratios given $\sin A = \frac{1}{4}$.



$1^2 + b^2 = 4^2$

$b^2 = 15$

$b = \sqrt{15}$

$\cos A = \frac{\sqrt{15}}{4}$

$\tan A = \frac{1}{\sqrt{15}} = \frac{\sqrt{15}}{15}$

$\cot A = \sqrt{15}$

$\sec A = \frac{4}{\sqrt{15}} = \frac{4\sqrt{15}}{15}$

5. Find θ, $0^\circ < \theta < 90^\circ$, for each equation. Do not use a calculator.

a. $\sin\theta = \frac{1}{2}$ $\quad \theta = 30^\circ$

b. $\sec\theta = \sqrt{2} \rightarrow \cos\theta = \frac{1}{\sqrt{2}} = \frac{\sqrt{2}}{2}$

$\theta = 45^\circ$

6. Find θ, $0 < \theta < \frac{\pi}{2}$, for each equation. Do not use a calculator.

a. $\cos\theta = \frac{1}{2}$ $\theta = \pi/3$

b. $\cot\theta = 1 \rightarrow \tan\theta = 1/1 = 1$

$\theta = \pi/4$

7. Find θ, $0 < \theta < \frac{\pi}{2}$, and $0^\circ < \theta < 90^\circ$ for each equation. Round to two decimal places.

a. $\cos\theta = 0.7528$

$\theta \approx 0.72$ or $\theta \approx 41.17^\circ$

b. $\cot\theta = \frac{8}{5} \rightarrow \tan\theta = 5/8$

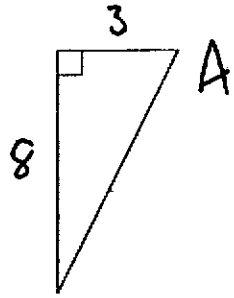
$\theta \approx 0.56$ or $\theta \approx 32.01$

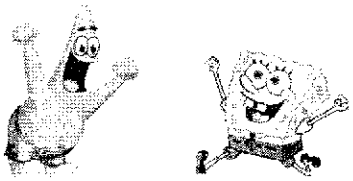
8. Find angle A of the right triangle.

$\tan A = 8/3$

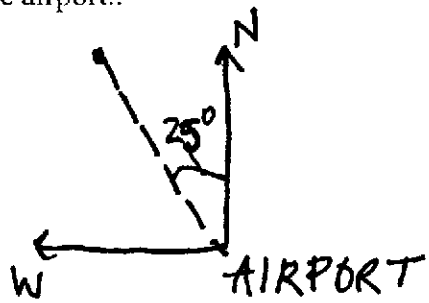
$A = \tan^{-1}(8/3)$

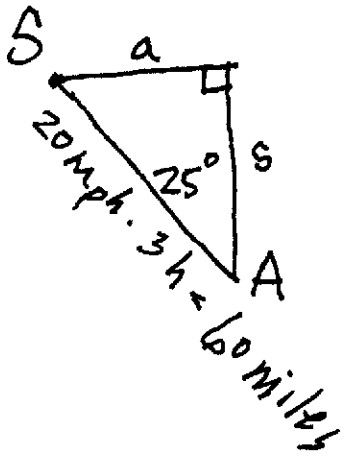
$\approx 69.44^\circ$





9. Patrick and SpongeBob leave Bikini Bottom airport in a ultra-light flying at a bearing of N 25° W flying at 20 mph. Find the distance north and the distance west of the airport Homer is three hours after leaving the airport..





to find side s

$\cos A = \frac{s}{60}$

$60 \cos 25^\circ = s$

$s \approx 54.4$ miles north of airport

to find side a

$\sin A = \frac{a}{60}$

$60 \sin 25^\circ = a$

$a \approx 25.4$ miles west of airport

10. Find the trigonometric functions of the angle θ whose terminal side passes through the point $(-1, 2)$.

$\sin\theta = y/r = \frac{2}{\sqrt{5}} = \frac{2\sqrt{5}}{5}.$

$\cos\theta = x/r = -\frac{1}{\sqrt{5}} = -\sqrt{5}/5$

$\tan\theta = y/x = \frac{2}{-1} = -2$

$r = \sqrt{(-1)^2 + 2^2}$

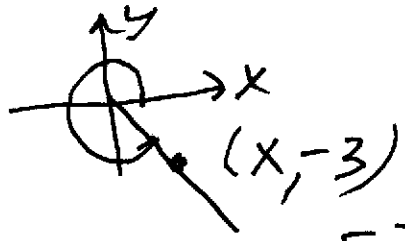
$r = \sqrt{1+4} = \sqrt{5}$

11. Find trigonometric functions of θ satisfying the given conditions

$\sin\theta = -\frac{3}{8}$ and $\cos\theta > 0$.

$\sin\theta < 0$ and $\cos\theta > 0$

Quadrant IV



$r = 8$

$\cos\theta = \sqrt{55}/8$

$\tan\theta = -\frac{3}{\sqrt{55}} = -\frac{3\sqrt{55}}{55}$

Find x

$8 = \sqrt{x^2 + (-3)^2}$

$64 = x^2 + 9$

$55 = x^2$

$\sqrt{55} = x$

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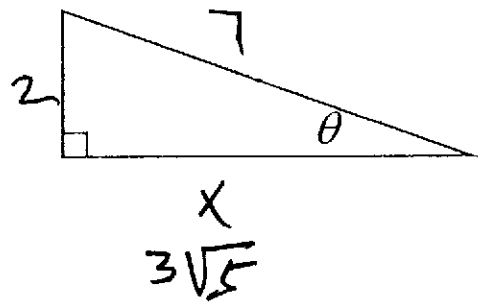
10. Label the right triangle to evaluate, assume the angle is acute.



Given $\csc\theta = \frac{7}{2}$, find $\cos\theta =$.

$x^2 + 2^2 = 7^2$

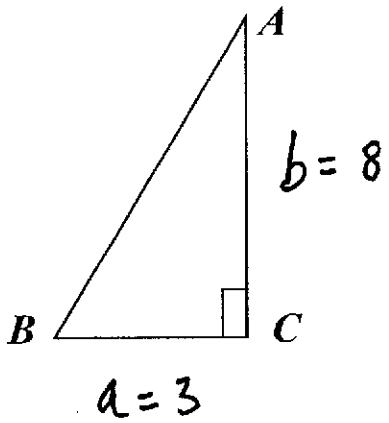
$x^2 + 4 = 49$

$x^2 = 45$

$x = \sqrt{45} = 3\sqrt{5}$

$\cos\theta = 3\sqrt{5}/7$

11. Given side $a = 3$, and side $b = 8$, find angle A of the right triangle in degrees rounded to one decimal.



$\tan A = 3/8$

$A = \tan^{-1}(3/8)$

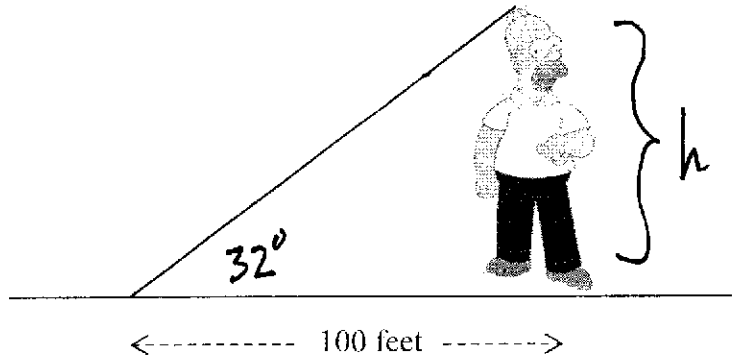
$A \approx 20.6°$

12. The angle of elevation from a point 100 feet from the base to the top of a Homer Simpson Macy's Thanksgiving Day parade balloon is approximately 32°. Find the approximate height of the balloon.

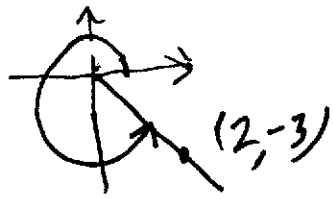
$\tan 32^\circ = \frac{h}{100}$

$100 \tan 32^\circ = h$

$h \approx 62.5$ feet



13. Find $\csc\theta$ given the terminal side of θ passes through the point $(2,-3)$.



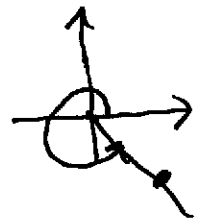
$\csc\theta = r/y$

$= \frac{\sqrt{13}}{-3} = -\frac{\sqrt{13}}{3}$

$r = \sqrt{x^2+y^2}$

$r = \sqrt{2^2 + (-3)^2} = \sqrt{13}$

14. Find the $\tan\theta$ given $\sin\theta = -\frac{3}{8}$ and $\cos\theta > 0$.



$\sin\theta < 0$

$\cos\theta > 0$

Q IV

$(x,-3)$ $r = 8$

$8 = \sqrt{x^2 + (-3)^2}$

$64 = x^2 + 9$ $\quad x^2 = 55$

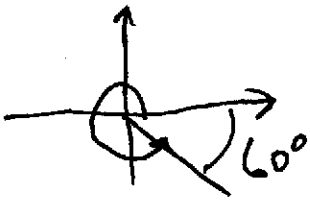
$x = \sqrt{55}$

$\tan\theta = -\frac{3}{\sqrt{55}} = -\frac{3\sqrt{55}}{55}$

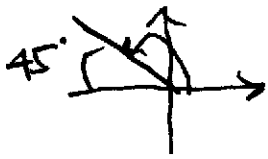
15. Evaluate the trigonometric function without using a calculator:

a. $\sin 300^\circ = -\sin 60^\circ$

$= -\sqrt{3}/2$



b. $\cos 135^\circ = -\cos 45^\circ = -\sqrt{2}/2$



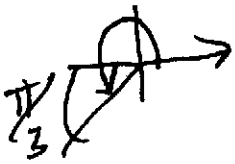
or

$= -\frac{1}{\sqrt{2}}$

16. Evaluate the trigonometric function without using a calculator:

a. $\tan \frac{4\pi}{3} = +\tan \pi/3$

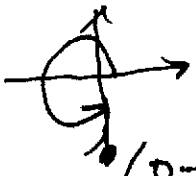
$= \sqrt{3}$



b. $\sin \frac{5\pi}{6} = +\sin \pi/6 = 1/2$

17. If possible, evaluate the trigonometric function of the quadrant angle.

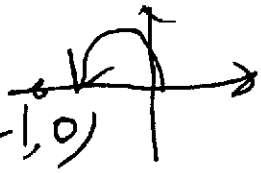
a. $\tan \frac{3\pi}{2} =$ undefined



$(0,-1)$

$r = 1$

b. $\sin 180^\circ = -1/1 = -1$



$(-1,0)$

$r = 1$

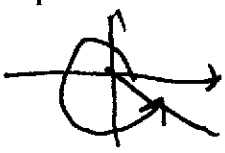
18. Find two solutions in radians $(0 \le \theta \le 2\pi)$ of the equation without using a calculator:

$\sin \theta = -\frac{1}{2}$

Q III, IV

$\theta' = \pi/6$

$\theta = 7\pi/6$



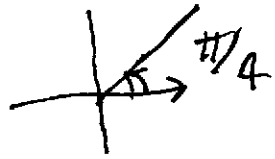
$\theta = 11\pi/6$

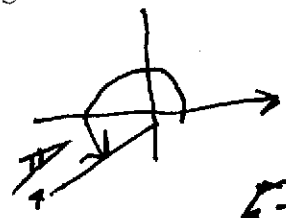
19. Find two solutions in radians $(0 \le \theta \le 2\pi)$ of the equation without using a calculator:

$\cot\theta = 1 \longrightarrow \tan\theta = 1$

QI, III

$\theta' = \pi/4$





$\theta = \pi/4$ $\quad$ $\theta = 5\pi/4$

20. Solve for θ, in radians $0 \le \theta \le 2\pi$ without using a calculator.

$\cos^2\theta - \sin\theta - 1 = 0$

$(1 - \sin^2\theta) - \sin\theta - 1 = 0$

$-\sin^2\theta - \sin\theta = 0$

$-\sin\theta(\sin\theta + 1) = 0$

$\sin\theta = 0 \quad \sin\theta + 1 = 0$

$\theta = 0, \pi, 2\pi \quad \theta = 3\pi/2$

21. Solve for θ, in radians $0 \le \theta \le 2\pi$ without using a calculator..

$2\cos^2\theta - \cos\theta - 1 = 0$

$(2\cos\theta + 1)(\cos\theta - 1) = 0$

$2\cos\theta + 1 = 0 \quad \cos\theta - 1 = 0$

$\cos\theta = -1/2 \quad \cos\theta = 1$

II, III $\theta' = \pi/3 \quad \theta = 0, 2\pi$

$\theta = 2\pi/3, 4\pi/3$

22. Use a calculator to approximate two values of θ in radians $(0 \le \theta < 2\pi)$ that satisfy the equation. Round your answers to two decimal places

$5\tan x - 8 = 0$

$\tan x = 5/8$

I, III

$x' \approx 0.56$

Q I

$x \approx 0.56$

Q III

$x \approx 0.56 + \pi$

≈ 3.70

23. Sketch one full period of the graph of $y = 4\sin(2x - \pi)$, by finding all of the following:

amplitude: 4

period: $2\pi/2 = \pi$

step: $\pi/4$

starting point (phase shift): $2x - \pi = 0$

$x = \pi/2$

key points:

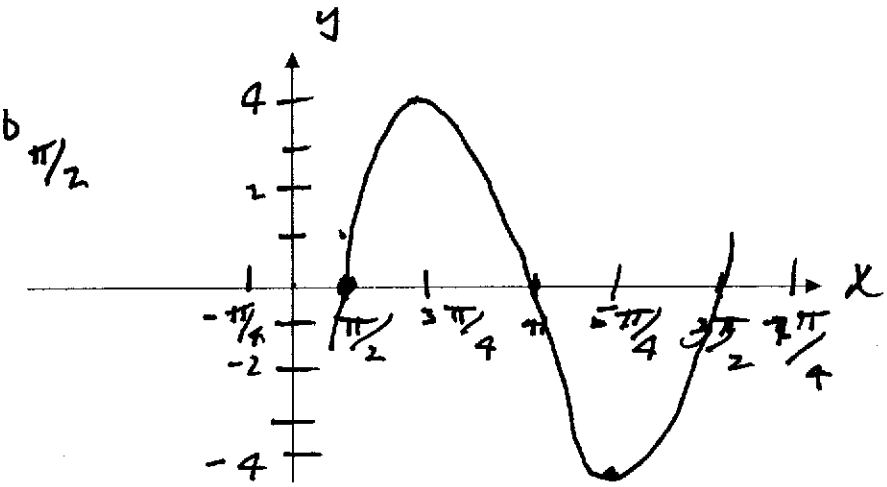
$(\pi/2, 0)$

$(3\pi/4, 4)$

$(\pi, 0)$

$(5\pi/4, -4)$

$(3\pi/2, 0)$



24. Find each of the following without using a calculator.

a. $\arcsin\left(\frac{1}{2}\right) = \pi/6$

b/c $\sin \pi/6 = 1/2$

b. $\arccos\left(-\frac{\sqrt{2}}{2}\right) = 3\pi/4$

b/c $\cos 3\pi/4 = -\sqrt{2}/2$