Exam 2 practice worksheet

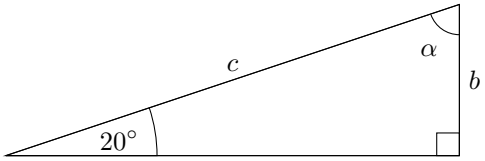
You do not need to turn in this worksheet!

1. Let f be some function with an inverse. If $f(1) = 5$, what's $f^{-1}(5)$?
2. Let f be a function. Suppose I plug angles into f and f spits out numbers between -1 and 1. What do I plug into f^{-1}? What does f^{-1} spit out?
3. Write the domains and ranges of the following three functions:
   (a) arcsin
   (b) arccos
   (c) arctan
4. Sketch graphs of $y = \arcsin(x)$ and $y = \arccos(x)$ without looking at your notes.
5. Find the following, if possible:
   (a) $\arcsin(-1/2)$
   (b) $\arccos(-1/2)$
   (c) $\arctan(\sqrt{3})$
   (d) $\arccos(-\pi)$
6. Find the following:
   (a) $\arcsin\left(\sin\left(\frac{\pi}{6}\right)\right)$
   (b) $\arccos\left(\cos\left(-\frac{\pi}{6}\right)\right)$
   (c) $\arcsin\left(\sin\left(\frac{2\pi}{3}\right)\right)$
   (d) $\arccos\left(\cos\left(\frac{5\pi}{2}\right)\right)$
   (e) $\arctan\left(\tan(\pi)\right)$
   (f) $\sin\left(\arcsin(0.3854)\right)$
   (g) $\cos\left(\arccos(-0.675)\right)$
7. Find the following:
   (a) $\sin\left(\arccos(5/12)\right)$
   (b) $\tan\left(\arcsin(-1/3)\right)$
   (c) $\cos\left(\arctan(24/7)\right)$
8. Find an algebraic expression for each of the following:
   (a) $\sin\left(\arccos(x+1)\right)$
   (b) $\cos\left(\arcsin\left(1/x\right)\right)$
   (c) $\tan\left(\arccos\left(2x\right)\right)$
9. Suppose a frisbee is spinning with an angular speed of 50Hz. If the diameter of the frisbee is 10 inches, what's the linear speed of edge of the frisbee?
10. If the linear speed of a CD 2 cm from its center is 1.2 m/s, what's the rotational speed of the CD?
11. If the rotational speed of a vinyl LP is 33 RPM, what's the linear speed of the LP at 10cm from its center?

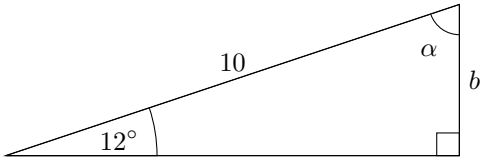
12. A digital speedometer on your bicycle works by measuring the rotational speed of your bike wheels and using that to find the linear speed at the edge of your wheel (which is equal to the speed of the cyclist). Suppose the speedometer measures the rotational speed of your wheels to be 240RPM,
    (a) what's the linear speed at the edge of the wheel if the wheel's diameter is 30 inches?
    (b) What's the linear speed at the edge of the wheel if the wheel's diameter is 20 inches?

13. Solve the triangles below, using trig identities and the table of values on the last page.

(a)

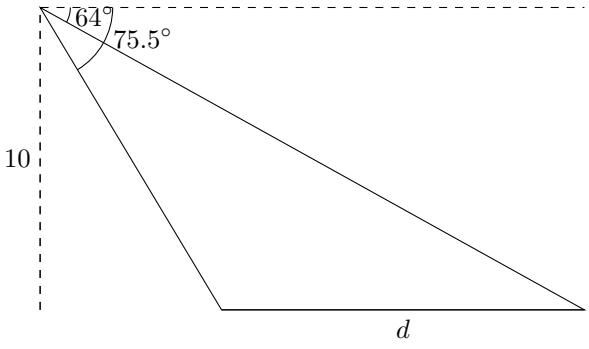


(b)

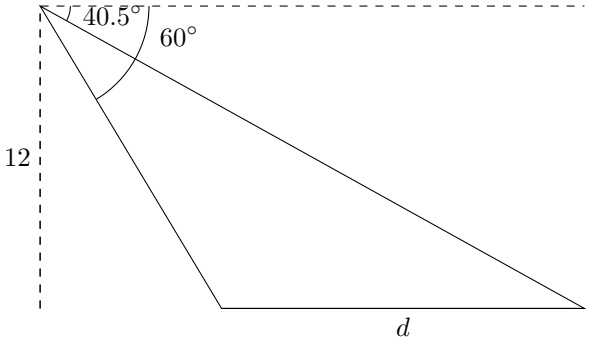


14. In the problems below, find d.

(a)

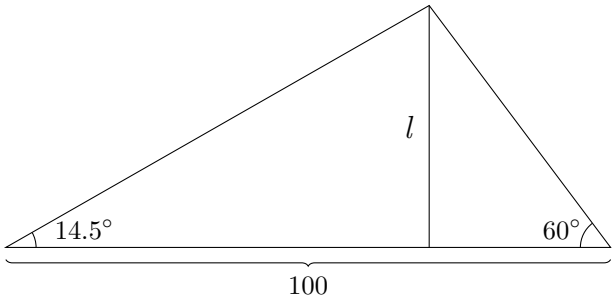


(b)

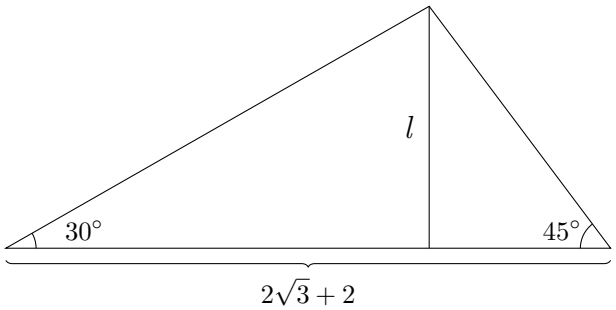


15. In the problems below, find l

(a)



(b)



16. A ball is bouncing on a spring. The lowest is goes is 2 inches below its equilibrium point. Suppose the ball completes 4 cycles in a second and starts at the **bottom** of a bounce at time t=0. Find a model for the displacement of the ball as a function of time.

17. A ball is bouncing on a spring. The lowest is goes is 3 inches below its equilibrium point. Suppose the ball takes 0.1 second to complete a cycle and starts at the **top** of a bounce at time t=0. Find a model for the displacement of the ball as a function of time.

18. A ball is bouncing, yet again, on a spring. The lowest is goes is 3 inches below its equilibrium point. Suppose the ball takes 0.1 second to complete a cycle. At time $t = 0$, the ball is at its equilibrium point and moving upward. Find a model for the displacement of the ball as a function of time.

19. Simplify the expressions in the left column. The possible answers (and some red herrings!) are all in the right column

Expressions	Answers
$\dfrac{\sec^2 x - 1}{\sin^2 x}$	$\csc x$
$\cot^2 x - \csc^2 x$	-1
$\dfrac{\cos^2\left(\frac{\pi}{2} - x\right)}{\cos x}$	1
	$\sin x \tan x$
	$\sec^2 x$
	$\sec^2 x + \tan^2 x$

20. Add and simplify the following:
    (a) $\dfrac{1}{\sec x + 1} - \dfrac{1}{\sec x - 1}$
    (b) $\tan x - \dfrac{\sec^2 x}{\tan x}$
    (c) $\dfrac{\sin x}{1 + \sin x} + \dfrac{\cos x}{\sin x}$

21. Factor the following expressions:
    (a) $\tan^2 x - \tan^2 x \sin^2 x$
    (b) $\sin^2 x \sec^2 x - \sin^x$
    (c) $\cot^2 + \csc x - 1$

Table of values

θ (degrees)	$\sin(\theta)$	$\cos(\theta)$	$\tan(\theta)$
11.5	$\frac{1}{5}$	$\frac{2\sqrt{6}}{5}$	$\frac{1}{2\sqrt{6}}$
14.5	$\frac{1}{4}$	$\frac{\sqrt{15}}{4}$	$\frac{1}{\sqrt{15}}$
19.5	$\frac{1}{3}$	$\frac{2\sqrt{2}}{3}$	$\frac{1}{2\sqrt{2}}$