EXERCISE SET 3: TRIGONOMETRY ANSWER KEY

No Calculator

1. **7/2 or 3.5** The discussion in Lesson 9 about the definition of the sine function and the unit circle made it clear that the value of the sine function ranges from −1 to 1. Therefore, the maximum value of $\frac{8\sin 2x}{2} - \frac{1}{2}$ is $\frac{8(1)}{2} - \frac{1}{2} = \frac{7}{2}$ or 3.5.

2. **1/36 or .027 or .028** An radian measure of π/3 is equivalent to 60°. If you haven't memorized the fact that cos(60°) = ½, you can derive it from the Reference Information at the beginning of every SAT Math section, which includes the 30°-60°-90° special right triangle. Since $a = ½$, $(a/3)^2 = (1/6)^2 = 1/36$.

3. **1.17**

	$(\sin x - \cos x)^2 = 0.83$
FOIL:	$\sin^2 x - 2\sin x\cos x + \cos^2 x = 0.83$
Regroup:	$\sin^2 x + \cos^2 x - 2\sin x\cos x = 0.83$
Simplify:	$1 - 2\sin x\cos x = 0.83$
Subtract 1:	$-2\sin x\cos x = -0.17$
Multiply by −1:	$2\sin x\cos x = 0.17$
Evaluate this expression:	$(\sin x + \cos x)^2$
FOIL:	$\sin^2 x + 2\sin x\cos x + \cos^2 x$
Regroup:	$\sin^2 x + \cos^2 x + 2\sin x\cos x$
Substitute:	$1 + 0.17 = 1.17$

4. **D** sin(π/6) = ½ and cos(π/3) = ½, so sin(π/6)/cos(π/3) = 1.

5. **D** If $\sin\theta < 0$, then θ must be either in quadrant III or in quadrant IV. (Remember that sine corresponds to the y-coordinates on the unit circle, so it is negative in those quadrants where the y-coordinates are negative.) If $\sin\theta\cos\theta < 0$, then $\cos\theta$ must be positive (because a negative times a positive is a negative). Since $\cos\theta$ is only positive in quadrants I and IV (because cosine corresponds to the x-coordinates on the unit circle), θ must be in quadrant IV

6. **B** First, notice that a/b and b/a are reciprocals. Next, we can use the identity in Lesson 10 that $\sin x = \cos\left(\frac{\pi}{2} - x\right)$ to see that choice (B) is just the reciprocal of sin x. Alternately, we can just choose a value of x, like $x = 1$, and evaluate sin 1 = 0.841. The correct answer is the expression that gives a value equal to the reciprocal of 0.841, which is 1/0.841 = 1.19. Plugging in $x = 1$ gives (A) 0.841, (B) 1.19, (C) 0.292, (D) 0.540.

7. **C** Recall from the Pythagorean Identity that $\cos b = \pm\sqrt{1 - \sin^2 b}$. Substituting $\sin b = a$ gives $\cos b = \pm\sqrt{1 - a^2}$. The angle $b + \pi$ is the reflection of angle b through the origin, so $\cos(b + \pi)$ is the opposite of cos b, which means that $\cos(b + \pi) = \pm\sqrt{1 - a^2}$.

8. **D** Recall from the Pythagorean Identity that $\cos^2 x = 1 - \sin^2 x$.

	$\frac{\cos x}{1 - \sin^2 x} = \frac{3}{2}$
Substitute $\cos^2 x = 1 - \sin^2 x$:	$\frac{\cos x}{\cos^2 x} = \frac{3}{2}$
Cancel common factor:	$\frac{1}{\cos x} = \frac{3}{2}$
Reciprocate:	$\cos x = \frac{2}{3}$