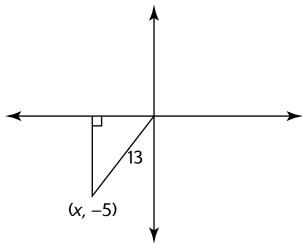
10. D. The 75th percentile is a value at or below which 75 percent of the data fall. Therefore, the best interpretation of Donna's score is that she did as well as or better than 75% of the students who took the exam, Choice D. The statements in the other answer choices are not good interpretations for the concept of percentile.

11. D. Make a sketch to illustrate the problem.



Because the Mathematics CK is a multiple-choice test, for problems of this type a clever approach is to eliminate answer choices based on the information provided. From the sketch, you can see that the $\tan\theta = \frac{y}{x} = \frac{-5}{x}$ and that $x < 0$. Therefore, $\tan\theta > 0$ because it is the quotient of two negative numbers. This allows you to eliminate choices A and B because these answer choices contain negative values. Looking at the two remaining answer choices, you can see that only Choice D has a 5 in the numerator for the tangent, meaning that Choice D must be the correct response. Of course, a more conventional way to work the problem is to use the formulas, $r^2 = x^2 + y^2$ and $\tan\theta = \frac{y}{x}$ (which are provided in the Notation, Definitions, and Formulas pages at the beginning of your test booklet), to determine that $x = \sqrt{13^2 - (-5)^2} = \sqrt{144} = \pm 12$. Since x is to the left of the origin, $x = -12$. Thus, $\tan\theta = \frac{y}{x} = \frac{-5}{-12} = \frac{5}{12}$, Choice D. Choices A and B are incorrect because the tangent is positive in the third quadrant, not negative. Choice C is the $\cot\theta$, not $\tan\theta$.

Tip: Be careful of using the inverse trigonometric function keys on your graphing calculator to work problems of this type. You might get an answer that has the wrong sign.

12. C. The graph of the quadratic function intersects the real axis at two points, indicating the function has two real zeroes. Therefore, the discriminant, $b^2 - 4ac$, must be greater than zero, Choice C. When $b^2 - 4ac = 0$ (Choice A), the graph of the quadratic function intersects the real axis in exactly one point. When $b^2 - 4ac < 0$ (Choice B), the graph of the quadratic function does not intersect the real axis. Choice D is incorrect because the coefficients of the quadratic function are real numbers, meaning $b^2 - 4ac$ is a real number, so it is not undefined.

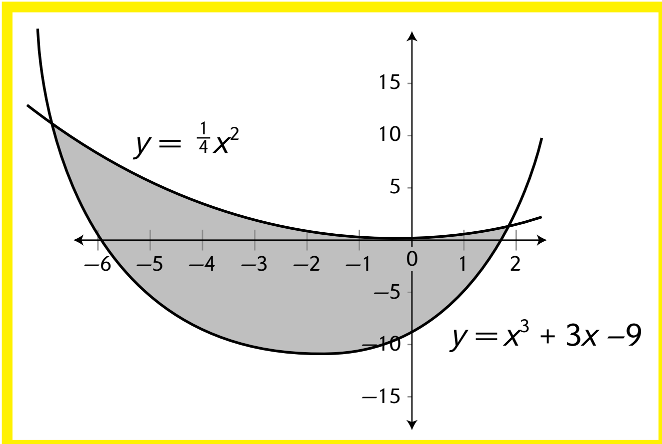
13. B. First, rewrite $y - 2.8 = 4\sin x$ as $y = 4\sin x + 2.8$. The minimum value of the sine function is –1, so the minimum value of $4\sin x$ is –4. Thus, the minimum value of $y = 4\sin x + 2.8 = -4 + 2.8 = -1.2$, Choice B. Choices A and C result if you make a sign error. Choice D results if you mistakenly use 4 as the minimum value for $4\sin x$.

14. A. **Method 1:** Since all the answer choices are given in terms of sine and cosine, rewrite $\frac{\tan\theta + \cot\theta}{\sec\theta\csc\theta}$ as

$$\frac{\frac{\sin\theta}{\cos\theta} + \frac{\cos\theta}{\sin\theta}}{\frac{1}{\cos\theta}\cdot\frac{1}{\sin\theta}} = \frac{\frac{\sin^2\theta + \cos^2\theta}{\cos\theta\sin\theta}}{\frac{1}{\cos\theta\sin\theta}} = \sin^2\theta + \cos^2\theta, \text{ Choice A.}$$

Method 2: Rewrite $\frac{\tan\theta + \cot\theta}{\sec\theta\csc\theta}$ as $\frac{\tan\theta + \frac{1}{\tan\theta}}{\frac{1}{\cos\theta}\cdot\frac{1}{\sin\theta}}$, so that you can use the trigonometric function keys on your graphing calculator to evaluate the expression for a convenient value of θ, say 30°. When you evaluate $\frac{\tan 30° + \frac{1}{\tan 30°}}{\frac{1}{\cos 30°}\cdot\frac{1}{\sin 30°}}$, you get 1 for an answer. You should recognize that Choice A is an identity that equals 1 for all values of θ, so Choice A is the correct response. In a test situation, you should go on to the next question since you have obtained the correct answer. You would not have to check the other answer choices; but for your information, Choice B yields 1.5, Choice C yields .8660 . . . , and Choice D yields 0.5.

49. **A.** Make a quick sketch of the two graphs.



Analyze the problem. The two graphs intersect at two points, and the graph of $y = \frac{1}{4}x^2$ lies above $y = x^2 + 3x - 9$ between the points of intersection. Devise a plan. To find the area of the region bounded by the two graphs will take three steps. First, find the x-values for the points of intersection of the two graphs; next, find the difference between the two functions, being sure to subtract the equation of the lower graph from the equation of the upper graph; and then evaluate the definite integral of the difference of the two graphs between the two x-values of their intersection.

Step 1. Find the x-values for the points of intersection of the two graphs.

Using substitution, you have $\frac{1}{4}x^2 = x^2 + 3x - 9 \Rightarrow 0 = \frac{3}{4}x^2 + 3x - 9 \Rightarrow 0 = 3x^2 + 12x - 36 \Rightarrow 0 = x^2 + 4x - 12 \Rightarrow$ $0 = (x + 6)(x - 2) \Rightarrow x = -6$ and $x = 2$.

Step 2. Find the difference between the two graphs.

Difference = $(\frac{1}{4}x^2) - (x^2 + 3x - 9) = \frac{1}{4}x^2 - x^2 - 3x + 9 = -\frac{3}{4}x^2 - 3x + 9$

Step 3. Evaluate the definite integral $\int_{-6}^{2}\left(-\frac{3}{4}x^2 - 3x + 9\right)dx$.

Method 1: The fastest and most efficient way to calculate this numerical integral is with your graphing calculator. Here are the steps using a TI-83 calculator. Before you enter functions, you must select Func mode from the MODE menu. Enter the function $y = -3/4x^2 - 3x + 9$ into the Y = editor, which is where you define functions. (Note: Check your manual to make sure your calculator treats $-3/4x^2$ as $(3/4)x^2$. If not, include the parentheses around 3/4 when you enter the function.) As a precaution, clear any previously entered functions before you enter the function. Check the viewing WINDOW to make sure that the interval between –6 and 2 falls between Xmin and Xmax. If not, change Xmin and/or Xmax, as needed. Select 7: $\int f(x)\,dx$ from the CALC (calculate) menu. Type –6 as the lower limit and then press ENTER. Type 2 as the upper limit and then press ENTER. The integral value is displayed as 64 (Choice A) and the graph is shaded. (Note: The graph and the shaded region will not look like what you've sketched above because you entered the difference of the two functions into the function editor.)

Method 2: Integrate the function using methods of calculus.

$$\int_{-6}^{2}\left(-\frac{3}{4}x^2 - 3x + 9\right) = \left(-\frac{x^3}{4} - \frac{3x^2}{2} + 9x\right)\Bigg|_{-6}^{2} = \left(-\frac{2^3}{4} - \frac{3 \cdot 2^2}{2} + 9 \cdot 2\right) - \left(-\frac{(-6)^3}{4} - \frac{3 \cdot (-6)^2}{2} + 9 \cdot -6\right) =$$

$(-2 - 6 + 18) - (54 - 54 - 54) = 10 + 54 = 64$, Choice A. The other answer choices result if you make a mistake integrating the function.