

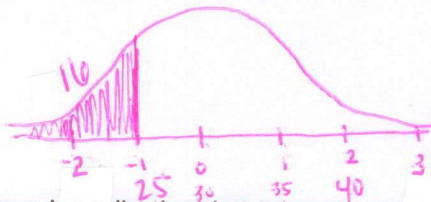
# Chapter 2 Multiple Choice Practice

# ANSWER KEY

**Directions.** Identify the choice that best completes the statement or answers the question. Check your answers and note your performance when you are finished.

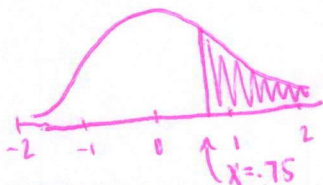
1. The 16<sup>th</sup> percentile of a Normally distributed variable has a value of 25 and the 97.5<sup>th</sup> percentile has a value of 40. Which of the following is the best estimate of the mean and standard deviation of the variable?

- (A) Mean  $\approx$  32.5; Standard deviation  $\approx$  2.5
- (B) Mean  $\approx$  32.5; Standard deviation  $\approx$  5
- (C) Mean  $\approx$  32.5; Standard deviation  $\approx$  10
- (D) Mean  $\approx$  30; Standard deviation  $\approx$  2.5
- (E) Mean  $\approx$  30; Standard deviation  $\approx$  5



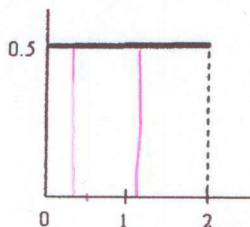
2. The proportion of observations from a standard Normal distribution that take values larger than 0.75 is about

- (A) 0.2266
- (B) 0.2500
- (C) 0.7704
- (D) 0.7764
- (E) 0.8023



normalcdf (.75, ∞, 0, 1)

3. The density curve below takes the value 0.5 on the interval  $0 < x < 2$  and takes the value 0 everywhere else. What percent of the observations lie between 0.4 and 1.08?

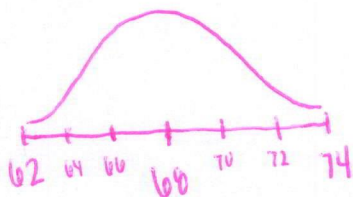


- (A) 25%
- (B) 34%
- (C) 50%
- (D) 68%
- (E) 70%

area of rectangle =  $b \cdot h$   
 $b = 1.08 - .4 = .68$   
 $.68(.5) = .34$

4. The distribution of the heights of students in a large class is roughly Normal. The average height is 68 inches, and approximately 99.7% of the heights are between 62 and 74 inches. Thus, the variance of the height distribution is approximately equal to

- (A) 2
- (B) 3
- (C) 4
- (D) 6
- (E) 9



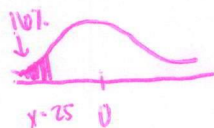
3 standard deviations

standard deviation<sup>2</sup>  
 $2^2 = 4$

### scratch work for #1

$$Z = \frac{\text{value} - \text{mean}}{\text{std. dev.}}$$

16<sup>th</sup> percentile



$$Z = \text{invNorm}(.16) = -1$$

$$-1 = \frac{25 - \mu}{\sigma}$$

97.5<sup>th</sup> percentile



$$Z = \text{invNorm}(.975) = 1.96$$

$$1.96 = \frac{40 - \mu}{\sigma}$$

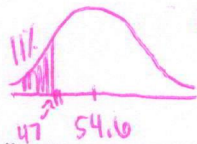
$$\frac{25 - \mu}{-1} = \frac{40 - \mu}{1.96}$$

$$49 - 1.96\mu = -40 + \mu \quad \mu = 30 \quad \sigma = 5$$



5. The mean age (at inauguration) of all U.S. Presidents is approximately Normally distributed with a mean of 54.6. Barack Obama was 47 when he was inaugurated, which is the 11<sup>th</sup> percentile of the distribution. George Washington was 57. What percentile was he in?

- (A) 6.17
- (B) 65.17
- (C) 62.92
- (D) 34.83
- (E) 38.9



$z = \text{invNorm}(.11) = -1.23$

$-1.23 = \frac{47 - 54.6}{\sigma} \rightarrow \sigma = 6.18$



normalcdf(-∞, 57, 54.6, 6.18)

6. Which of the following statements are false?

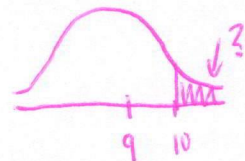
- I. The standard Normal table can be used with z-scores from any distribution
- II. The mean is always equal to the median for any Normal distribution.
- III. Every symmetric, bell-shaped distribution is Normal
- IV. The area under a Normal curve is always 1, regardless of the mean and standard deviation.

- (A) I and II
- (B) I and III
- (C) II and III
- (D) III and IV
- (E) None of the above gives the correct set of true statements.

7. High school textbooks don't last forever. The lifespan of all high school statistics textbooks is approximately Normally distributed with a mean of 9 years and a standard deviation of 2.5 years. What percentage of the books last more than 10 years?

- (A) 11.5%
- (B) 34.5%
- (C) 65.5%
- (D) 69%
- (E) 84.5%

$N(9, 2.5)$



normalcdf(10, ∞, 9, 2.5)

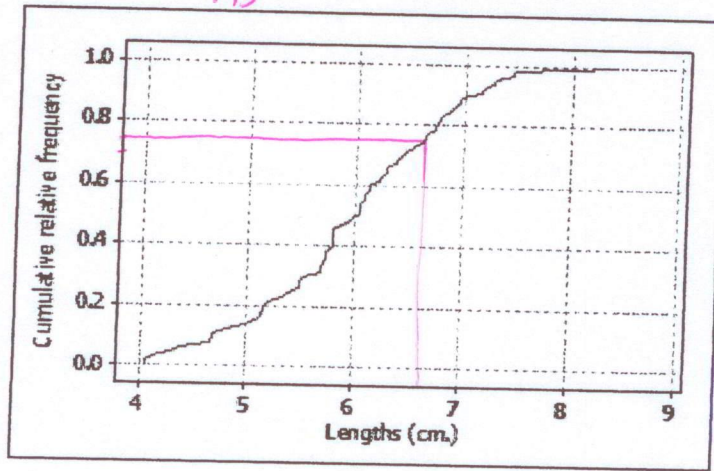
8. The distribution of the time it takes for different people to solve their Strive for a Five chapter crossword puzzle is strongly skewed to the right, with a mean of 10 minutes and a standard deviation of 2 minutes. The distribution of z-scores for those times is

- (A) Normally distributed, with mean 10 and standard deviation 2.
- (B) Skewed to the right, with mean 10 and standard deviation 2.
- (C) Normally distributed, with mean 0 and standard deviation 1.
- (D) Skewed to the right, with mean 0 and standard deviation 1.
- (E) Skewed to the right, but the mean and standard deviation cannot be determined without more information.

same shape as original distribution  
but standardized with  $\mu=0$  and  $\sigma=1$

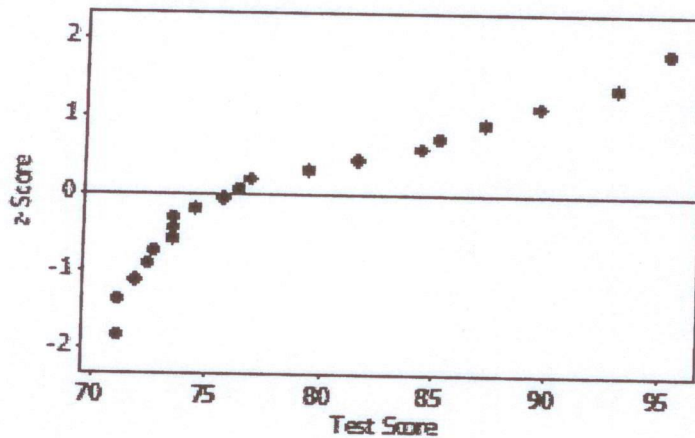
36 **Strive for a 5:** Preparing for the AP® Statistics Examination

9. The cumulative relative frequency graph below shows the distribution of lengths (in centimeters) of fingerlings at a fish hatchery. The third quartile for this distribution is approximately:



- (A) 6.7 cm
- (B) 7 cm
- (C) 6 cm
- (D) 5.5 cm
- (E) 7.5 cm

10. The plot shown below is a Normal probability plot for a set of test scores. Which statement is true for these data?



- (A) The distribution is clearly Normal.
- (B) The distribution is approximately Normal.
- (C) The distribution appears to be skewed.
- (D) The distribution appears to be uniform.
- (E) There is insufficient information to determine the shape of the distribution.

a Normal probability plot looks linear if the distribution is Normal. since this one doesn't look linear the distribution is most likely skewed.

1. E    2. A    3. B    4. C    5. B  
 6. B    7. B    8. D    9. A    10. C



# FRAPPY! Free Response AP® Problem, Yay!

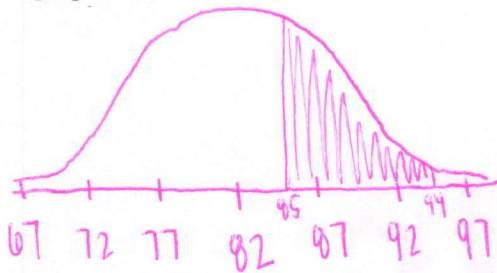
The following problem is modeled after actual Advanced Placement Statistics free response questions. Your task is to generate a complete, concise response in 15 minutes. After you generate your response, view two example solutions and determine whether you feel they are “complete”, “substantial”, “developing” or “minimal”. If they are not “complete”, what would you suggest to the student who wrote them to increase their score? Finally, you will be provided with a rubric. Score your response and note what, if anything, you would do differently to increase your own score.

Final exam grades are determined by the percent correct on the exam. A teacher’s records indicate the performance on the exam is Normally distributed with mean 82 and standard deviation 5. The grades on her exam are assigned using the scale below.

$N(82, 5)$

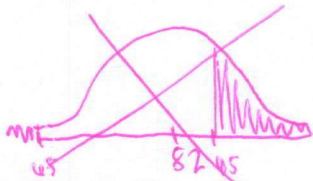
Grade	Percent Correct
A	$94 \leq \text{percent} \leq 100$
B	$85 \leq \text{percent} < 94$
C	$76 \leq \text{percent} < 85$
D	$65 \leq \text{percent} < 76$
F	$0 \leq \text{percent} < 65$

- (a) Use a sketch of a Normal distribution to illustrate the proportion of students who would earn a B. Calculate this proportion.

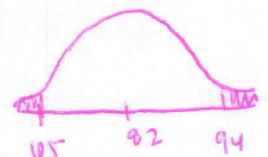


normalcdf(L:85, U:94,  $\mu$ :82,  $\sigma$ :5)  
 $\approx$  27%

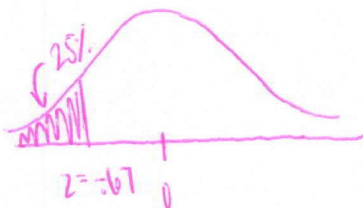
- (b) Students who earn a B, C, or D, are considered to “meet standards”. Based on this grading scale, what percent of students will receive a score that places them in a category other than “meets standards”?



$1 - \text{normalcdf}(L:65, U:94, \mu:82, \sigma:5)$   
 $=$  .0085



- (c) What grade would the student who scored at the 25<sup>th</sup> percentile earn on this chapter? Justify your answer.



$\text{invNorm}(.25) = -0.67$

$-0.67 = \frac{X - 82}{5}$

$X = 78.6$

C