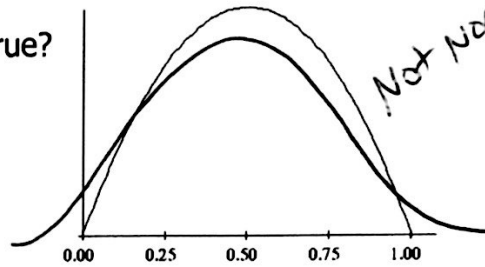


**Directions:** Use the standard Normal table in your book or your calculator.

**Part 1: Multiple Choice.** Circle the letter corresponding to the best answer.

1. For the density curve shown, which statement is true?

- (a) The density curve is symmetric.  
 (b) The density curve is skewed right.  
 (c) The density curve is skewed left.  
 (d) The density curve is Normal.  
 (e) None of the above is correct.

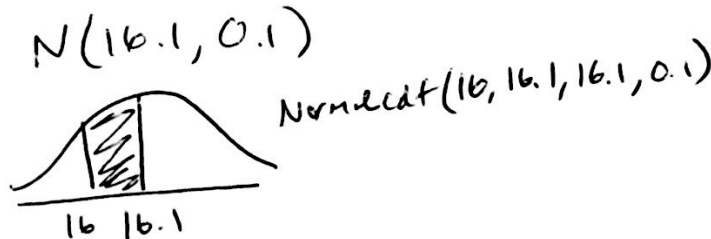


2. For the density curve shown in Question 1, which statement is true?

- (a) The mean is greater than the median.  
 (b) The mean is less than the median.  
 (c) The mean and median are equal.  
 (d) The mean could be either greater than or less than the median.  
 (e) None of the above is correct.

3. Suppose that 16-ounce bags of chocolate chip cookies are produced with weights that follow a Normal distribution with mean weight 16.1 ounces and standard deviation 0.1 ounce. The percent of bags that will contain between 16.0 and 16.1 ounces is about

- (a) 10  
 (b) 16  
 (c) 34  
 (d) 68  
 (e) none of the above



4. This is a continuation of Question 3. Approximately what percent of the bags will likely be underweight (that is, less than 16 ounces)?

- (a) 10  
 (b) 16  
 (c) 32  
 (d) 64  
 (e) none of the above



$50\% - 34\%$

5. Which of these variables is least likely to have a Normal distribution?

- (a) Annual income for all 150 employees at a local high school ← a few will have higher salaries probably.  
 (b) Lengths of 50 newly hatched pythons  
 (c) Heights of 100 white pine trees in a forest  
 (d) Amount of soda in 60 cups filled by an automated machine at a fast-food restaurant  
 (e) Weights of 200 of the same candy bar in a shipment to a local supermarket

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

- (a) 0.2266      (b) 0.7704      (c) 0.7734      (d) 0.7764      (e) 0.8023

$z\text{-score}$   $\text{Normalcdf}(-.75, 10000, 0, 1)$

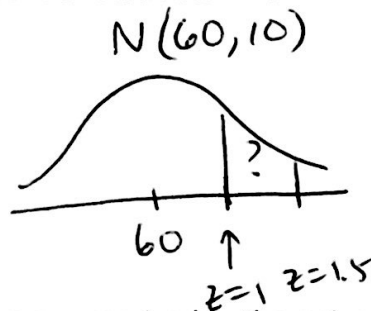
7. Which of the following is NOT CORRECT about a standard Normal distribution?

- (a) The proportion of scores that satisfy  $0 < Z < 1.5$  is 0.4332.
- (b) The proportion of scores that satisfy  $Z < -1.0$  is 0.1587.
- (c) The proportion of scores that satisfy  $Z > 2.0$  is 0.0228.
- (d) The proportion of scores that satisfy  $Z < 1.5$  is 0.9332.
- (e) The proportion of scores that satisfy  $Z > -2.5$  is 0.4938.

*Just use normal calc*

8. In some courses (but certainly not in an intro stats course!), students are graded on a "Normal curve." For example, students within  $\pm 0.5$  standard deviations of the mean receive a C; between 0.5 and 1.0 standard deviations above the mean receive a C+; between 1.0 and 1.5 standard deviations above the mean receive a B; between 1.5 and 2.0 standard deviations above the mean receive a B+, etc. The class average on an exam was 60 with a standard deviation of 10. The bounds for a B grade and the percent of students who will receive a B grade if the marks are actually Normally distributed are

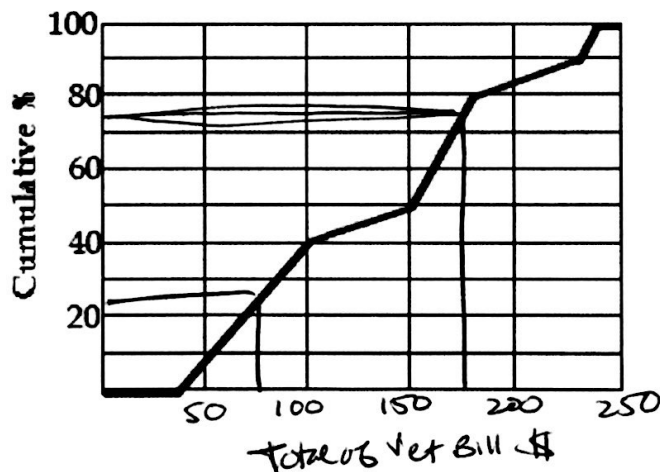
- (a) (65, 75), 24.17%
- (b) (70, 75), 18.38%
- (c) (70, 75), 9.19%
- (d) (65, 75), 12.08%
- (e) (70, 75), 6.68%



$60 + 1S = 70$   
 $60 + 1.5S = 75$   
 $\sigma = \text{normalcdf}(1, 1.5, 0, 1)$

9. The veterinary bills for the dogs are summarized in the ogive below. Estimate the IQR of these expenses.

- (a) \$100
- (b) \$75
- (c) \$200
- (d) \$150
- (e) \$50



$Q_3 \approx 175$   
 $Q_1 \approx 75$   
 $IQR = 175 - 75$   
 $\approx 100$

10. Which of the following data summaries are changed by adding a constant to each data value?

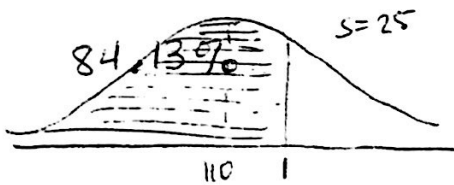
- I. the mean
- II. the median
- III. the standard deviation

- (a) I and III
- (b) I, II, and III
- (c) I only
- (d) III only
- (e) I and II

**Part 2: Free Response** Answer completely, but be concise. Show your thought process clearly.

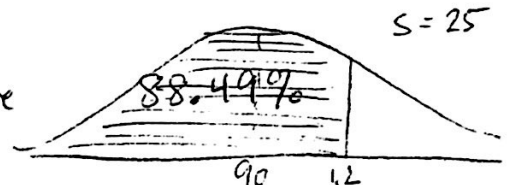
Scores on the Wechsler Adult Intelligence Scale for the 20 to 34 age group are approximately Normally distributed with mean 110 and standard deviation 25. Scores for the 60 to 64 age group are approximately Normally distributed with mean 90 and standard deviation 25.

Sarah, who is 30, scores 135 on this test. Sarah's mother, who is 60, also takes the test and scores 120. Who scored higher relative to her age group, Sarah or her mother? Use raw data, percentiles, and z-scores to help answer this question.



$$z = \frac{135 - 110}{25} = 1$$

Sarah's mother scored higher relative to her age group. Her z-score was 1.2 meaning she was 1.2 st. dev. above the mean while Sarah was only 1 st. dev. above the mean. Sarah's mother also scored at a higher percentile. Her mother scored better than 88.49% of people in her age group while Sarah scored better than 84.13% of her age group.



$$z = \frac{120 - 90}{25} = 1.2$$

10. A study recorded the amount of oil recovered from the 64 wells in an oil field. Here are descriptive statistics for that set of data from Minitab.

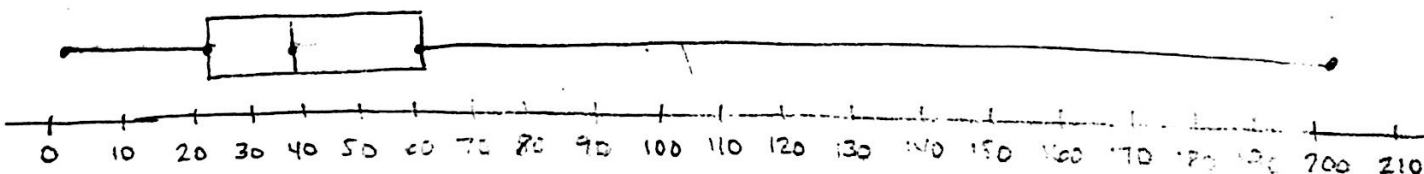
**Descriptive Statistics: Oilprod**

Variable	N	Mean	Median	TrMean	StDev	SE Mean
Oilprod	64	48.25	37.80	43.50	40.24	5.03

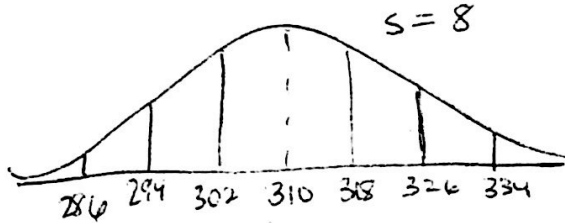
Variable	Minimum	Maximum	Q1	Q3
Oilprod	2.00	204.90	21.40	60.75

Does the amount of oil recovered from all wells in this field seem to follow a Normal distribution? Give appropriate statistical evidence to support your answer.

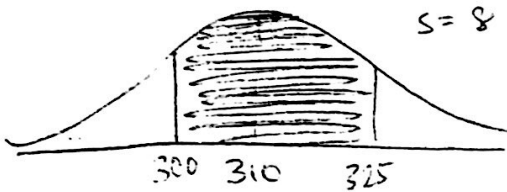
- Large difference in mean and median imply skewed distribution
- Using 1.5 IQR outlier rule: outlier boundaries are  $-37.625 - 119.775$  so the max at 204.9 is an outlier
- Box Plot shows strongly right skewed



11. When Tiger Woods is on the driving range, the distance that golf balls travel when he hits them with a driver follows a Normal distribution with mean 310 yards and standard deviation 8 yards.
- (a) Sketch the distribution of Tiger Woods's drive distances. Label the points one, two, and three standard deviations from the mean.



- (b) What proportion of Tiger's drives travel between 300 and 325 yards? Shade the appropriate area under the curve you drew in (a). Then show your work.

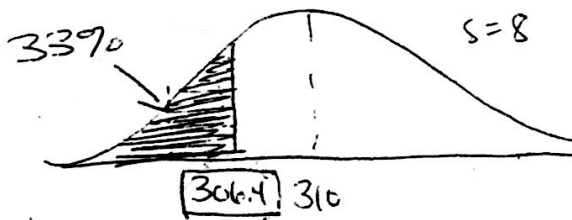


About 86.4% of Tiger's drives travel between 300 and 325 yds.

$$z = \frac{300 - 310}{8} = -1.25$$

$$z = \frac{325 - 310}{8} = 1.875$$

- (c) Find the 33rd percentile of Tiger's drive distance distribution. Show your method.



$$z = \frac{x - \bar{x}}{s}$$

$$-.4399 = \frac{x - 310}{8}$$

The 33<sup>rd</sup> percentile is found when the driving distance is 306.4 yds.