Multiple Choice

1. Which of the following are examples of qualitative data?

A

    a. The airline on which a person chooses to book a flight $\;$ Categories: Alaska, American
    b. The <u>average</u> number of women in chapters of the Gamma Goo sorority $\quad$ etc.
    c. The closing Dow Jones <u>average</u> on 50 consecutive market days
    d. The <u>scores</u> on a given examination
    e. None of the above are examples of qualitative data

2. Free response questions on the AP Statistics Exam are graded on 4, 3, 2, 1, or 0 basis. Question #2 on the exam was of moderate difficulty. The average score on question #2 was 2.05 with a standard deviation of 1. To the nearest tenth, what score was achieved by a student who was at the 90th percentile of all students on the test? You may assume that the scores on the question were approximately normally distributed.

B

    a. 3.5
    b. 3.3
    c. 2.9
    d. 3.7
    e. 3.1

$$\text{inv Norm}(0.9) = 1.282$$
$$z = 1.282 = \frac{x - 2.05}{1} \qquad x = 3.33$$

3. The first quartile (Q1) of a data set is 12 and the third quartile (Q3) is 18. What is the largest value above Q3 in the data set that would not be an outlier?

D

    a. 12
    b. 24
    c. 15
    d. 27
    e. 30

$$IQR = 18 - 12 = 6 \qquad\qquad \text{outliers: } Q1 - 1.5 IQR$$
$$1.5 \cdot IQR = 1.5 \cdot 6 = 9 \qquad\qquad Q3 + 1.5 IQR$$
$$18 + 9 = 27$$

4. In a normal distribution with mean 25 and standard deviation 7, what proportions of terms are less than 20?

C

    a. 0.71
    b. -0.71
    c. 0.24
    d. -0.24
    e. 0.76

$$z = \frac{20 - 25}{7} = -0.714$$
$$P(x < 20) = P(z < -0.714) = 0.238 = 24\%$$

5. What are the mean, median, mode, and standard deviation of a normal curve?

D

    a. Mean = 1, median = 1, mode = 1, standard deviation = 1
    b. Mean = 1, median = 1, mode = 1, standard deviation = 0
    c. Mean = 0, median = 1, mode = 1, standard deviation = 1
    d. Mean = 0, median = 0, mode = 0, standard deviation = 1 $\;$ like on your
    e. Mean = 0, median = 0, mode = 0, standard deviation = 0 $\quad$ calculator.

$\overbrace{70"}$

6. Jenny is 5'10" tall and is wondering about her height. The heights of girls in the school are approximately normally distributed with a mean of 5'5" and a standard deviation of 2.6". What is the percentile rank of Jenny's height? $65"$

E
   a. 59
   b. 65
   c. 74
   d. 92
   (e) 97

$$z = \frac{70-65}{2.6} = 1.923$$

$$P(x < 70) = P(z < 1.923) = 0.973$$

7. A set of 5000 scores on a college readiness exam are known to be approximately normally distributed with a mean of 72 and standard deviation of 6. To the nearest integer value, how many scores are there between 63 and 75?

D
   a. 0.6247
   b. 4115
   c. 3650
   (d) 3123
   e. 3227

$$z = \frac{63-72}{6} = -1.5 \qquad z = \frac{75-72}{6} = 0.5$$

$$P(63 < x < 75) = P(-1.5 < z < 0.5) = 0.6247$$

$$\begin{array}{r} \times \quad 5000 \\ \hline 3123 \end{array}$$

8. One of the values in a normal distribution is 43 and its z-score is 1.65. If the mean of the distribution is 40, what is the standard deviation of the distribution?

D
   a. 3
   b. -1.82
   c. 0.55
   (d) 1.82
   e. -0.55

$$z = \frac{x - \mu}{\sigma}$$

$$1.65 = \frac{43-40}{\sigma} \qquad \sigma = 1.818$$

9. Which of the following statements is (are) true?
   (I.) The median is resistant to extreme values. yup
   II. The mean is resistant to extreme values. nope
   III. The standard deviation is resistant to extreme values. nope

A
   (a) I only
   b. II only
   c. III only
   d. II and III only
   e. I and III only

10. The following histogram pictures the number of students who visited the Career Center each week during the school year. The shape of this graph could best be described as:

E
   a. Mound-shaped and symmetric
   b. Bi-modal
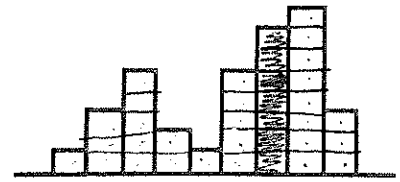   c. Skewed to the left
   d. Uniform
   (e.) Skewed to the right
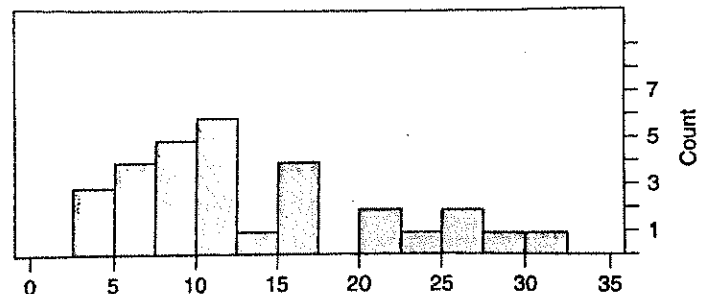
11. Describe the distribution of the histogram below:

S : skewed left, bimodal

O : no outliers

C : median (we have no values) is somewhere in the shaded bar

S : IQR and range would be used (no values to calculate)

Would you expect the mean or median to be larger? Why?

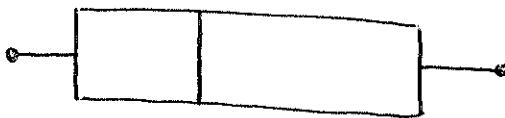the mean is pulled toward the tail so the median would be larger.

12. Find the five-number summary and draw the modified box plot for the following set of data: 12, 13, 13, 14, 16, 17, 20, 28

min — 12
13 — Q_1
15 — med Q_2
18.5 — Q_3
max
28 — outlier
modified max

Calculate outliers:

$Q_1 - 1.5 IQR = 13 - 1.5(5.5) = 4.75$

$Q_3 + 1.5 IQR = 18.5 + 1.5(5.5) = 26.7$
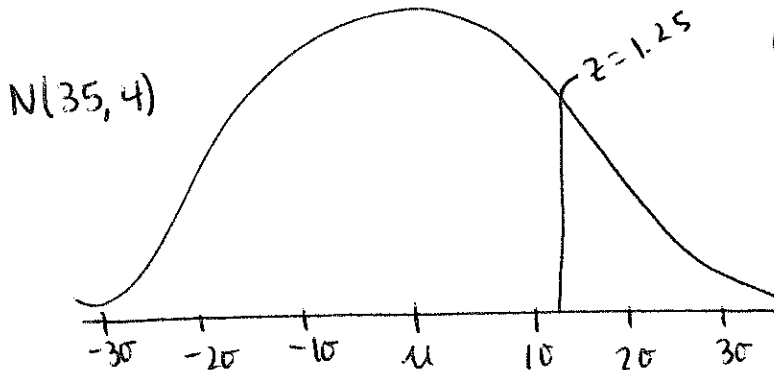
$IQR = Q_3 - Q_1 = 18.5 - 13 = 5.5$

unit 01 boxplot

values of whatever ☺

13. A distribution of quiz scores has $^{mean}m = 35$ and $^{standard\ deviation}s = 4$. Sara got 40. What was her z-score? What information does that give you if the distribution is approximately Normal?

$$z = \frac{40-35}{4} = 1.25 \text{ is sarah's z-score. she scored}$$

$$1.25 \text{ standard deviations above the mean.}$$

Normalcdf $(-\infty, 1.25) = 0.894$

$N(35, 4)$

if the distribution is approximately Normal, we can find that Sara is in the 89.4%·ile.

14. On the first test of the semester, the class average was 72 with a standard deviation of 6. On the second test, the class average was 65 with a standard deviation of 8. Nathan scored 80 on the first test and 76 on the second. Compared to the rest of the class, on which test did Nathan do better?

$$z = \frac{80-72}{6} = 1.\overline{3} \qquad < \qquad z = \frac{76-65}{8} = 1.375$$

first test   second test

Nathan's z-score is higher for the second test. This means he scored better on the second test in comparison to the rest of his class (more standard deviations above the mean).

15. Make a stemplot for the number of home runs hit by Mickey Mantle during his career using the following numbers: 13, 23, 21, 27, 37, 52, 34, 42, 31, 40, 54, 30, 15, 35, 19, 23, 22, 18. Do it first using an increment of 10, then do it again using an increment of 5. What can you see in the second graph that was not obvious in the first?

Home runs #1

Key: 1|3 = 13

S	L
1	3 5 8 9
2	1 2 3 3 7
3	0 1 4 5 7
4	0 2
5	2 4

Home runs #2

Key: 1|3 = 13

S	L
1	3
1	5 8 9
2	1 2 3 3
2	7
3	0 1 4
3	5 7
4	0 2
4	
5	2 4

On the second graph, you can see two peaks and a gap that are not shown by the first graph.

16. The actual weights of 8-oz chocolate bars produced by a certain machine is Normal with a mean of 8.1 oz and a standard deviation of 0.1 oz.
   a. Draw and label the Normal model for the data.

$N(8.1, 0.1)$
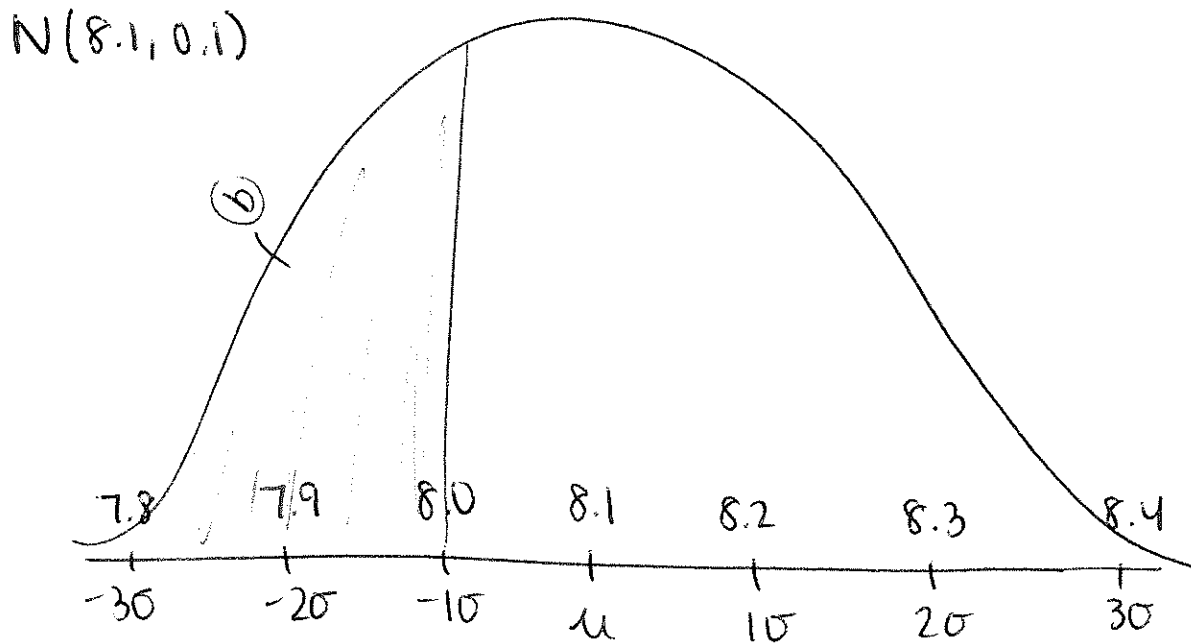
b. What percentage of chocolate bars will be underweight according to their 8-oz label?

$$P(X < 8) = P(z < -1) = 0.1587$$

$$z = \frac{8 - 8.1}{0.1} = -1$$

15.87% of chocolate bars will be underweight according to their 8-oz label.

c. The company that makes the chocolate bars wants to change the mean weight of the chocolate produced so that no more than 8 percent of the chocolate bars are underweight. What mean setting should the company use?

$$invNorm(0.08) = -1.405$$

$$z = -1.405 = \frac{8 - \mu}{0.1} \qquad \mu = 8.1405$$

The company should use a mean setting of 8.14 oz so that no more than 8% of their chocolate bars are underweight.