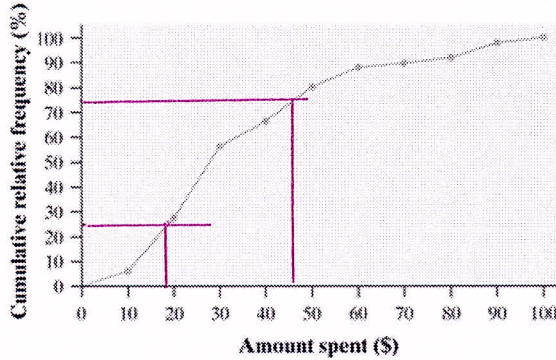


1. The figure below is a cumulative relative frequency graph of the amount spent by 50 consecutive grocery shoppers at a store.



- (a) Estimate the interquartile range of this distribution. Show your method.

$$Q_1 \approx 19 \quad Q_3 \approx 46 \quad IQR \approx 46 - 19 \approx 27$$

- (b) What is the percentile for the shopper who spent \$19.50?

$\approx 27^{\text{th}}$  percentile

2. Eleanor scores 680 on the SAT Mathematics test. The distribution of SAT scores is symmetric and single-peaked, with mean 500 and standard deviation 100. Gerald takes the American College Testing (ACT) Mathematics test and scores 27. ACT scores also follow a symmetric, single-peaked distribution—but with mean 18 and standard deviation 6. Find the standardized scores for both students. Assuming that both tests measure the same kind of ability, who has the higher score?

$$\text{Eleanor } \frac{680 - 500}{100} = \frac{180}{100} = 1.8$$

$$\text{Gerald } \frac{27 - 18}{6} = \frac{9}{6} = \frac{3}{2} = 1.5$$

Eleanor has a higher z-score since she is more standard deviations above the mean.

3. A school system employs teachers at salaries between \$28,000 and \$60,000. The teachers' union and the school board are negotiating the form of next year's increase in the salary schedule.

- (a) If every teacher is given a flat \$1000 raise, what will this do to the mean salary? To the median salary? Explain your answers.

They will both raise by \$1000. Since the mean and median are a measure of center (also location), they will increase the same amount as each individual value.

- (b) What would a flat \$1000 raise do to the extremes and quartiles of the salary distribution? To the standard deviation of teachers' salaries? Explain your answers.

The extremes and quartiles will also rise since they measure location. The standard deviation will not change since it is a measure of spread so it is not affected by a shift (add/subt).

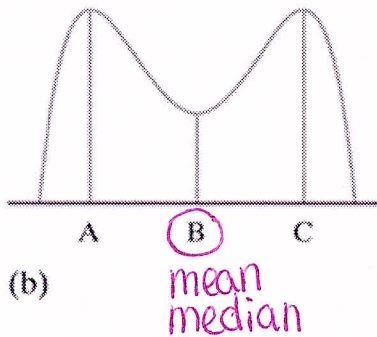
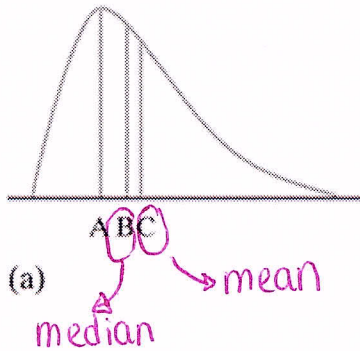
- (c) If each teacher receives a 5% raise instead of a flat \$1000 raise, the amount of the raise will vary from \$1400 to \$3000, depending on the present salary. What will this do to the mean salary? To the median salary? Explain your answers.

The mean and median salary will also increase by 5% since all location values are increased by 5%.

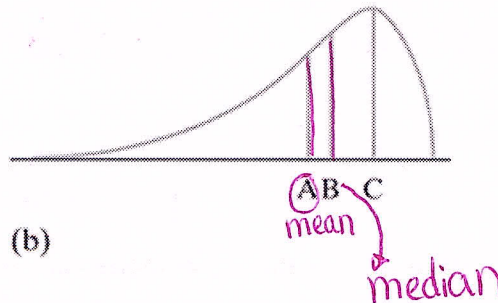
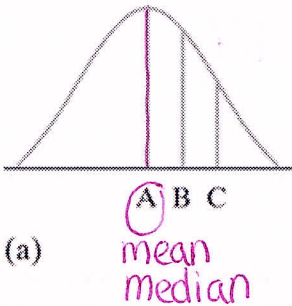
- (d) Will a 5% raise increase the IQR? Will it increase the standard deviation? Explain your answers.

Yes, all measures of spread will be increased by 5%. Since the increase is a multiple of the original and not a flat fee the amount of increases.

4. The figure below displays two density curves, each with three points marked. At which of these points on each curve do the mean and the median fall?



5. The figure below displays two density curves, each with three points marked. At which of these points on each curve do the mean and the median fall?



6. C Scores on the ACT college entrance exam follow a bell-shaped distribution with mean 18 and standard deviation 6. Wayne's standardized score on the ACT was  $-0.7$ . What was Wayne's actual ACT score?  
 (a) 4.2  
 (b)  $-4.2$   
 (c) 13.8  
 (d) 17.3  
 (e) 22.2
- $\downarrow$  of 6
- $$\frac{x-18}{6} = -0.7(6)$$
- $$\frac{x-18}{6} = -4.2$$
- $$\begin{array}{r} x-18 = -4.2 \\ +18 \quad +18 \\ \hline x = 13.8 \end{array}$$

7. d If 30 is added to every observation in a data set, the only one of the following that is *not* changed is
- (a) the mean. ✓  
 (b) the 75th percentile. ✓  
 (c) the median. ✓  
 (d) the standard deviation. ✓  
 (e) the minimum. ✓

8. e If every observation in a data set is multiplied by 10, the only one of the following that is *not* multiplied by 10 is
- (a) the mean.  
 (b) the median.  
 (c) the IQR.  
 (d) the standard deviation.  $S_x$   
 (e) the variance.  $S_x^2$
- $$\text{Var} = (10S_x)^2$$
- $$\text{Var} = 100S_x^2$$