Practice Problems 5 - Solutions

(1) True - If all the data is shifted...
then so will the median.

(2) True - If all the data is scaled, so
will the median.

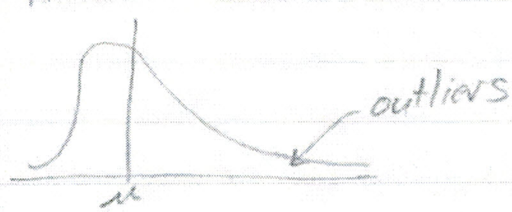
(3) True - If the skew of the distribution
is switched from negative to positive
or vice versa, the sign of the median
will flip.

(4) True - If positive values dominated the
mean, negative values will after changing
the sign (and vice versa).

(5) False - If there are an odd number of
elements in a list, less than half of
them are below the median.

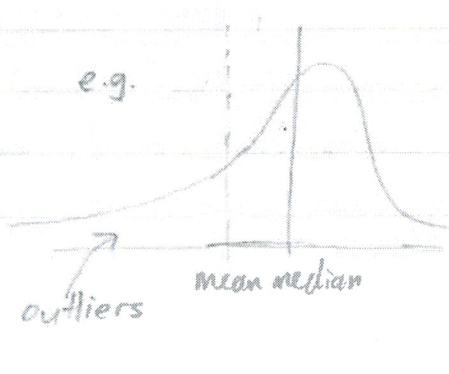
(6) False - They are true only if your data
can be assumed to have a normal
distribution

(7) True



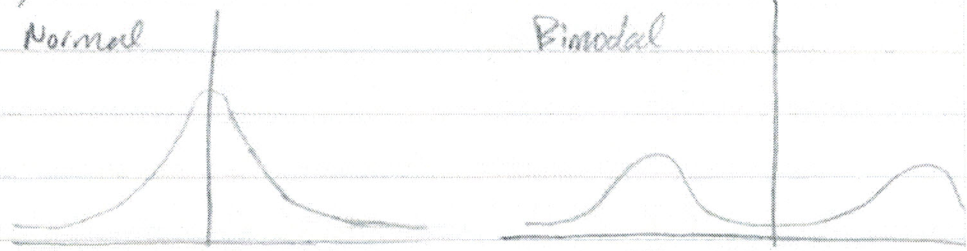
(8) True -
The mean will be
influenced more by
outliers

e.g.



(9) True, unless there are more than one mode.

ex's: Normal Bimodal



still symmetric

(10) True - The group with s.d. = 2 will have a wider range of data within 1 s.d of the mean, but it will still be 68% of the data.

(11) a. $\{8, 9, 9, 10, 12\}$

median $= 9$

mean $= \frac{8+9+9+10+12}{5} = \frac{48}{5} = 9.6$

b. sample variance $= \frac{1}{4}\sum_{i=1}^{5}(x_i - \bar{x})^2$

$= \frac{1}{4}\{(8-9.6)^2 + (9-9.6)^2 + (9-9.6)^2 + (10-9.6)^2 + (12-9.6)^2\}$

$= \frac{1}{4}\{(-1.6)^2 + (-.6)^2 + (-.6)^2 + (.4)^2 + (2.4)^2\}$

$= \frac{1}{4}\{2.56 + .36 + .36 + .16 + 5.76\} = \frac{9.2}{4} = \underline{2.3}$

$s = \sqrt{\frac{9.2}{4}} \approx \cancel{2.03}\ 1.517$

c. mean $= 100$ (old mean) $= 960$

sample var $= \{(-160)^2 + (-60)^2 + (-60)^2 + (40)^2 + (240)^2\}\frac{1}{4}$

$= 1\times10^4\{$old sample var$\}$

$= 1\times10^4\left(\frac{9.2}{4}\right) = \frac{92000}{4} = 23000$

$\Rightarrow s = \sqrt{\frac{92000}{4}} \approx \cancel{303.315}\ \boxed{151.66}$

(12) order data:

$\{18, 22, 23, 28, 29, 29, 33, \underline{35}, 35, 36, 38, 38, 38, 38, 46\}$

a. median = 35

mean = sum of data / 15 = 32.4

b. samp var $= \frac{1}{14}\sum_{i=1}^{15} (x_i - \bar{x})^2 = 55.97143$

(You must show your work on test similar to 11b.)

$s = \sqrt{55.97143} = 7.4814$

(13) a. min = 0.4 Q1 = 1.3 median = 3.8

Q3 = 5.4 max = 40.6

b. IQR = Q3 − Q1 = 5.4 − 1.3 = 4.1

c. $s = \sqrt{\frac{1}{9}\sum_{i=1}^{10} (x_i - \bar{x})^2}$, $\bar{x} = \frac{1}{10}\sum_{i=1}^{10} x_i$;

$\bar{x} = 7.08$, $s = 7.4814$

d. IQR is more resistant to outliers and seems a better description of the spread in this case.

(14) a. $\bar{X}_{10} = 66$ in. $x_{11} = 77$ in.

$\bar{x}_{11} = \frac{10}{11}(66) + \frac{1}{11}(77) = 67$ in.

b. $\bar{x}_{21} = 66$ in. $x_{22} = 77$ in

$\bar{x}_{22} = (21/22)(66) + \frac{1}{22}(77) = 66.5$ in.

* The mean is smaller than for (a) because the first 21 people carry more weight than 10 people in (a.)

c. $\bar{x}_{22} = \frac{21}{22}(66) + \frac{1}{22}(x_{22}) = 67$

$\Rightarrow x_{22} = \{67 - \frac{21}{22}(66)\} 22$

$= 88$ in