**(1)[2 points]** The unemployment rate is the percentage of the labour force unemployed. A decrease in the unemployment rate from one month to the next means that

    (a) a greater number of people have found work.

    (b) a greater number of people have entered the labour force.

    (c) the proportion of people in the labour force looking for work has gone up.

    (d) (a) or (b) (or both) could be true.

    (e) none of (a), (b), (c) or (d) could be true.

(2)[2 points] A measurement is called reliable

    (a) if it eliminates bias altogether.

    (b) only if it gives the true value of the quantity being measured.

    (c) if random error is small.

    (d) if random error and bias cancel each other out.

    (e) if it reports the exact same value twice in a row.

(3)[2 points] Here is a bar graph showing the frequency of student birthdays by month.
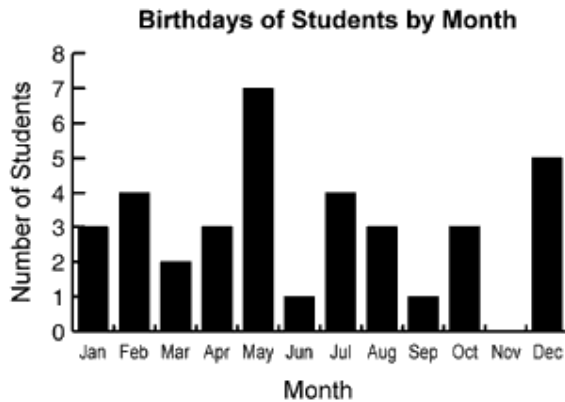
The variable 'month of birth' is called

    (a) a numerical variable.

    (b) a categorical variable.

    (c) an alphabetical variable.

    (d) a monthly variable.

    (e) a time descriptor.

(4)[2 points] Referring to the bar graph in question (3), what percentage of students have birthdays in May, June, September or November.

    (a) 9%

    (b) 10%

    (c) 15%

    (d) 25%

    (e) 35%

(5)[2 points] The stemplot

```
1 | 2  2  2  2  2  8  9  9
2 | 1  1  1  4  4  4
3 | 5  6  6
4 | 3  4  5  5
5 | 9  9
6 | 0
7 |
8 |
9 | 7
```

represents a distribution which is

    (a) skewed to the right.

    (b) skewed to the left.

    (c) symmetric.

    (d) centered.

    (e) spread.

(6)[2 points] The median of the data in the stemplot in question (5) is

    (a) 24.

    (b) 4.

    (c) 3455.

    (d) 19.

    (e) larger than the mean.

(7)[2 points] If a distribution has $s = 0$ then

    (a) $\bar{x} = 0$ also.

    (b) the distribution is strongly skewed.

    (c) all observations have the same value.

    (d) there is an error since s cannot be zero.

    (e) the quartiles must also be zero.

(8)[2 points] For a density curve skewed to the right,

    (a) the median is greater than the mean.

    (b) the median is less than the mean.

    (c) the median is equal to the mean regardless of skew.

    (d) the median is not defined for skewed distributions.

    (e) the difference between the median and mean is one standard deviation.

(9)[2 points] The middle 95% of observations of a certain normal distribution range from 36 to 212. What is the standard deviation?

    (a) 44.

    (b) 62.

    (c) The same as the mean.

    (d) (a) and (c).

    (e) (b) and (c).

(10)[2 points] The z-score (or standard score) for an observation $x = 30$ from a normal distribution with mean 37 and standard deviation 13 is approximately

    (a) -0.5.

    (b) 0.5.

    (c) 24

    (d) 1.0

    (e) -1.0

Question 2 Test scores (out of 50) for five students are as follows:

$$29, 31, 36, 36, 47$$

(a)[4 points] Draw a stemplot for this data and find the first and third quartiles Q_1 and Q_3 .

(b)[4 points] Compute the mean and standard deviation.

(c)[2 points] Suppose 30 more test scores are added to the data, for a total of 35 data values, and these 30 new scores are exactly equal the $\bar{x}$ found in (b). Would you expect the new standard deviation to increase, decrease, or stay the same as what you found in (b)? Explain briefly.

Question 3 One litre containers of bottled water do not always contain exactly one litre of water, but rather a little more or a little less than a litre as a result of the random error made by the bottling machine. Suppose one litre bottles of water leaving the factory have fill volumes (that is, the true volume of water in the bottle) that are normally distributed.

(a)[4 points] Find the mean and standard deviation of the distribution of fill volumes if 95% of bottles with fill volumes closest to the mean contain between 0.96 and 1.04 litres.

(b)[3 points] The bottom $0.15\% = (100\% - 99.7\%)/2$ of the range of fill volumes corresponds to bottles which are considered underfilled and cannot be sent to stores. What is the fill volume below which bottles are considered underfilled?

(c)[3 points] What percentage of bottles have fill volumes between 1 and 1.02 litres?

Question 4 The price charged in Canadian coffee shops for a medium (12 fl. oz.) cup of coffee is normally distributed with a mean of \$1.65 and standard deviation \$0.07. Assume all references to price in this question refer to the price of a medium coffee.

(a)[3 points] The lowest 35% of coffee shop prices are below what level?

(b)[3 points] The middle 90% of coffee shops charge prices in what range?

(c)[4 points] What proportion of coffee shops charge more than \$1.80?