PROBLEM SOLVED

MAKING SENSE OF MATHEMATICS

After watching the video, *Normal Distribution*, complete the following problems.

1. True or false. Explain your reasoning.
   a. If data is normally distributed, it must be symmetric about the mean.
      True. If the data were exactly normally distributed, the data would be symmetric about the mean. If the data were "approximately" normal, then the data would only be close to being symmetric about the mean.

   b. If data is normally distributed, then half of the data falls below the mean.
      True. This is because the mean and median are the same with normally distributed data.

   c. If data is symmetrically distributed about the mean, it is normally distributed.
      False. There could be data sets that contain gaps in the data or peaks in the data far away on both sides of the mean.

   d. If data is normally distributed, then half of the data falls below the median.
      True. This is true for all data sets by the definition of median.

   e. If data is normally distributed, it usually, but not always, forms a bell-shaped curve.
      False. If the data is normally distributed, it always forms a bell-shaped curve.

   f. If data is normally distributed, 68% of the data (a little more than two-thirds) will fall within one standard deviation of the mean.
      True. This is the definition of normally distributed data or the empirical rule.

2. Every July 4, at noon, the temperature in Freedom, Iowa is recorded. The data shows that temperature is normally distributed with a mean of 80° and a standard deviation of 5°. Use this information to fill in the blanks.
   a. Sixty-eight percent (a little more than two thirds) of the measured July 4th temperatures will fall between 75 degrees and 85 degrees.
      Use $\bar{X} \pm s$ or $80 + 5 = 85$ and $80 - 5 = 75$. Approximately 68% of the data falls between $75°$ and $85°$.

   b. Ninety-five percent of the measured July 4th temperatures will fall between 70 degrees and 90 degrees.
      Use $\bar{X} \pm 2s$ or $80 + 2(5) = 90$ and $80 + 2(5) = 70$. Approximately 95% of the data falls between $70°$ and $90°$.

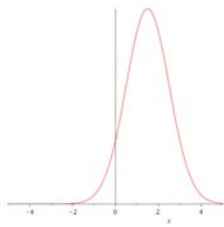   c. Half the temperatures will be above 80 degrees, and half will be below 80 degrees.

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Since the mean is 80 degrees, half of the temperatures will be below 80 degrees and half of the temperatures will be above 80 degrees.

d. The median temperature will be <u>80</u> degrees.
    The median temperature is 80 degrees since the mean and the median are the same for data sets that are normally distributed.

e. <u>34</u> percent of the data will be between 80 degrees and 85 degrees.
    Thirty-four percent of the data will be between 80° and 85° since sixty-eight percent of the data falls between 75° and 85°, so half of these data will fall between 80° and 85°.

3. Which of the following distributions could reasonably be expected to be normally distributed? If the distribution is not normal, explain why.

    a. The number of M & Ms in a one-pound bag
        Normally distributed.

    b. The number of years it takes a person to finish college
        Not normally distributed. Very few people finish in less than 4 years but many people take more than 4 years.

    c. The weight of a standard-sized loaf of Baker Jeff's White Bread
        Normally distributed.

    d. The number of minutes it takes your best friend to return your text message
        Not normally distributed. Sometimes your friend won't return it at all, or after many hours, but never less than zero minutes so there would not be the symmetry of the normal curve.

    e. The amount of money won by participants in the World Series of Poker
        Not normally distributed. The mode is zero and the average is greater than zero. The mode, median, and mean are all the same in a normal distribution.

    f. The distance a marksman gets from the center of the target at a shooting range
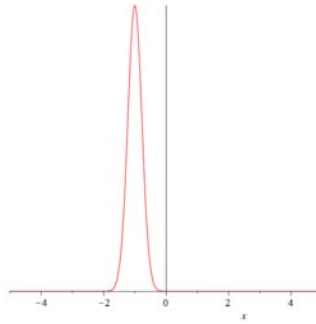   Normally distributed.

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4. Rank these normal distributions from lowest to highest standard deviation.

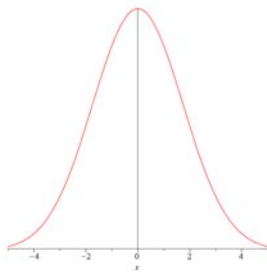b, d, a, c; The more narrow distributions, the smaller the standard deviation.

a.

b.

c.

d.