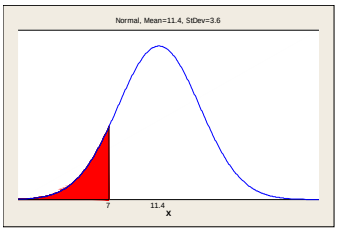
Due: _____ Name:_____

Worksheet 7 – Chapter 4b

Answer the following questions logically and legibly. **Show work and give probability statements** where appropriate. Give all probabilities to 4 decimal places.

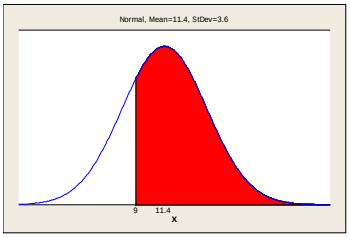
You may want to use the Normal equations in EXCEL or graphing in DDXL to answer these questions (pages 72-81 in Excel Manual).

1. A study conducted by Hershey's discovered that Americans consumed an average of 11.4 pounds of chocolate per year. Let's assume that the annual chocolate consumption follows the normal distribution with a standard deviation of 3.6 pounds.
   a. What is the probability that a randomly selected person will consume
      i. Less than 7 pounds of chocolate next year?



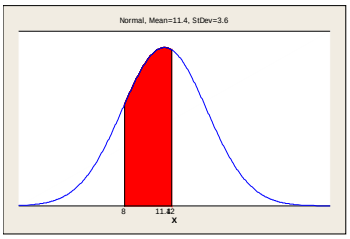
$$z = \frac{7 - 11.4}{3.6} = -1.22$$
$$P(X < 7) = P(z < -1.22) = 0.5 - 0.3888 = 0.1112$$

      ii. More than 9 pounds of chocolate next year?



$$z = \frac{9 - 11.4}{3.6} = -0.67$$
$$P(X > 9) = P(z > -0.67) = 0.5 + 0.2486 = 0.7486$$

      iii. Between 8 and 12 pounds of chocolate next year?

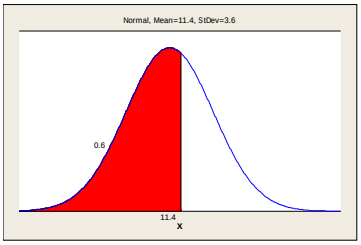


$$z_8 = \frac{8 - 11.4}{3.6} = -0.94 \qquad z_{12} = \frac{12 - 11.4}{3.6} = 0.17$$
$$P(8 < X < 12) = P(-0.94 < z < 0.17) = 0.3264 + 0.0675 = 0.3939$$

      iv. Exactly 10 pounds of chocolate next year?

$$P(X = 10) = 0$$

   b. What is the annual consumption of chocolate that represents the 60th percentile?

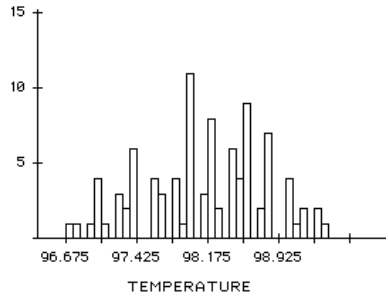


from z-table

$$0.25 = \frac{X - 11.4}{3.6}$$
$$X = 12.3 \text{ pounds}$$

c. Give the Excel formula (with proper input values) for the probabilities found in part (a).
   i. =NORM.DIST(7,11.4,3.6,TRUE)
   ii. =1-NORM.DIST(9,11.4,3.6,TRUE)
   iii. =NORM.DIST(12,11.4,3.6,TRUE)- NORM.DIST(8,11.4,3.6,TRUE)
   iv. N/A

2. A study by researchers at the University of Maryland addressed the question of whether the mean body temperature of humans is 98.6 degrees F. The researchers obtained the body temperatures of 93 healthy humans, provided in the BodyTemp.xls file. Use technology to assess whether the data is normally distributed.
   a. Using DDXL construct a histogram of the data. (attach graph here)



   b. Use descriptive statistics and the dataset to find the actual percentage of data points between one, two and three standard deviations from the mean.

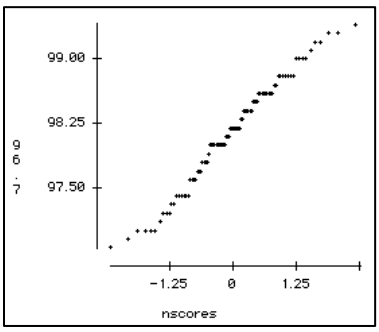
Count	93
Mean	98.124
Median	98.2
Std Dev	0.647
Variance	0.418
Range	2.7
Min	96.7
Max	99.4
IQR	0.925
25th%	97.675
75th%	98.6

$\bar{x} \pm s = 98.124 \pm 0.647 = (97.477, 98.771)$ -> 57/93 = .6129=61.29%
$\bar{x} \pm 2s = 98.124 \pm 2(0.647) = (96.83, 99.418)$ -> 92/93 = .9892=98.92%
$\bar{x} \pm 3s = 98.124 \pm 3(0.647) = (96.183, 100.065)$-> 93/93 = 1 = 100%

   c. Use descriptive statistics to find the value of IQR/s.

IQR/s = 0.925/0.647=1.4297

   d. Using DDXL construct a normal probability plot. (attach graph here)



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e. Based on your finding in part (a)-(d) are the data approximately normally distributed and why?

i. – graph looks approximately mound shape and symmetric
ii. – the percentage of data points within 1 standard deviation of the mean is 61.29%, the percentage of data points within 2 standard deviations of the mean is 98% and the percentage of data points within 3 standard deviations of the mean is 100% - these are close to the 68%, 95%, and 100% criteria
iii. – the value of IQR/s is not really close to 1.3
iv. The normal probability plot looks relatively linear.

You can argue in either direction as long as you do it correctly