Density Curves and Normal Distribution Worksheet SOLUTIONS

1.

*Figured sourced from York University's Economics Department website
<http://dept.econ.yorku.ca/~jbsmith/ec2500_1998/lecture9/Image90.gif>

For the density curve pictured above, identify:

a. Which way is the density curve above skewed?
   Skewed to the right.

b. Identify which letter in the figure above corresponds to the mean, and which the median.
   B is the mean; A is the median

c. The mean splits the area under the density curve. Is this an even split, or uneven?
   The mean splits the area under the curve unevenly.

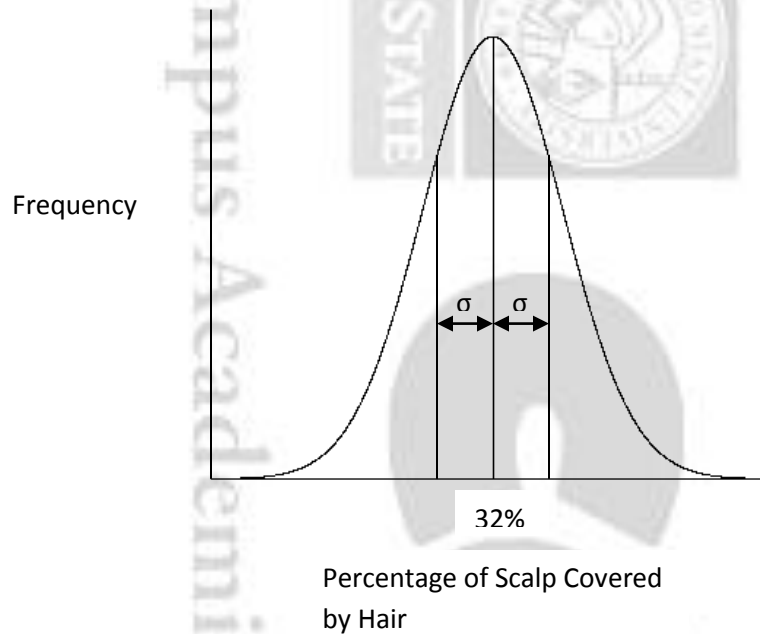d. Which data set that might have been used to make the above density curve?

Student Height	Number of Students
5'6"	47
5'8"	62
5'10"	36
6'0"	14
6'2"	6
6'4"	4
6'6"	2

Student Height	Number of Students
5'6"	5
5'8"	12
5'10"	36
6'0"	55
6'2"	41
6'4"	19
6'6"	2

2.

Frequency

σ σ

32%

Percentage of Scalp Covered
by Hair

The normal curve above describes the percentage of scalp coverage of men who are 50 years of age. The mean value of the data is 32% scalp coverage and the standard deviation is 10%.

a. In which range of values, do the middle 68% of men fall? Middle 95% of the data?

Using the 68-95-99.7 Rule:
68% of the data falls in the range of 22% to 42%
(or within 1 standard deviation of the mean)
95% of the data falls in the range of 12% to 52%
(or within 2 standard deviations of the mean)

b. 7% of a 50-year-old Professor Eliott's scalp is covered by hair. What is the z-score of "Professor E's" scalp coverage?

$$z\ score = \frac{x - \mu}{\sigma}$$

Therefore, the professor's z-score is calculated as follows:

$$z\ score = \frac{7-32}{10} = \frac{-25}{10} = -2.5$$

c. How many standard deviations away from the mean is this professor's hair coverage?

A z-score measures the number of standard deviations a data point lies from the mean. Therefore, this professor's scalp coverage is 2.5 standard deviations away

from the mean. Multiplying the z-score by the standard deviation gives 25, which is the difference between the mean and standard deviation (7-32).

d. A 50-year-old female colleague of the above professor has 60% of her scalp covered by hair. 50 year-old female scalp coverage is described by the normal distribution N(80,10). What is the z-score of the female professor's scalp coverage?

$$z \ score = \frac{60 - 80}{10} = -2$$

e. The female professor has a fuller head of hair than what proportion of 50-year-old women?

We are interested in the proportion of X<-2, which is the female professor's z-score. Therefore, the proportion of 50-year-old women this professor has more hair than is the area under the standard normal curve to the left of the z-score. P(X<-2) = .0228 or 2.28%

f. How about the male professor? Which of the two have more hair than a greater proportion of their respective populations?

We are interested in the proportion of X<-2.5, which is the male professor's z-score. Therefore, the proportion of 50-year-old men this professor has more hair than is the area under the standard normal curve to the left of the z-score. P(X<-2.5) = .0062 or 0.62%

From problem e we know that the female professor has more hair coverage than 2.28% of the female professor population, and the male professor has more hair coverage than 0.62% of the male professor population. Since the female professor's percentage is bigger she has the more hair with respect to her population than the male professor does to his population.
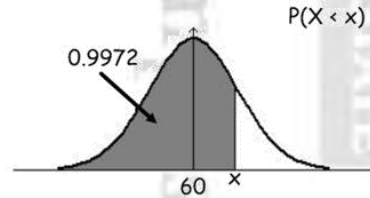
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3.

Find the value of x in each of the following diagrams:

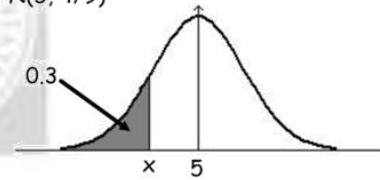(a) X ~ N(60, 25)

P(X < x) = 0.9972

0.9972
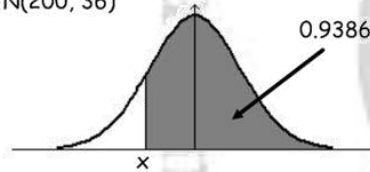
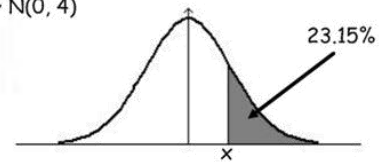60   x

x = 129.25

(b) X ~ N(5, 4/9)

0.3

x   5

x = 4.764

(c) X ~ N(200, 36)

0.9386

x

x = 144.38

(d) X ~ N(0, 4)

23.15%

x

x = 2.94

Note: Your answers may be off from those listed by a few decimal places; so long as you are very close to the listed answer you followed the correct steps to find the answer and are using the correct process.

*Figured sourced from the Math's Teaching website: < http://mathsteaching.files.wordpress.com/2008/02/normal-tables-in-reverse.jpg>