Name:_____

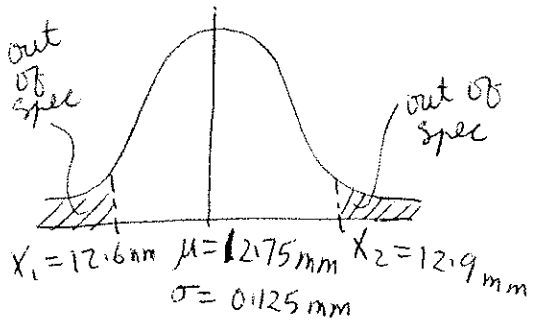
Valencia College
Division of Engineering, computer Programming and Technology
EGN 2440 Probability and Statistics for Engineers;
Spring 2015
Instructor: Dr. Kwabena Ofosu, P.E.

Quiz 5A Name:_____

You will receive credit for showing your steps even if your final answers are incorrect.

The diameters of bolt holes drilled in a structural steel member are normally distributed with a mean of 12.75mm and a standard deviation of 0.125mm. Holes are out of specification if their diameters are less than 12.60mm or more than 12.90.

1. What is the probability that a hole chosen for inspection at random will be out of specification? (3 points)



$$Z_1 = \frac{X_1 - \mu}{\sigma} = \frac{12.6 - 12.75}{0.125} = -1.2$$

$$Z_2 = \frac{X_2 - \mu}{\sigma} = \frac{12.9 - 12.75}{0.125} = 1.2$$

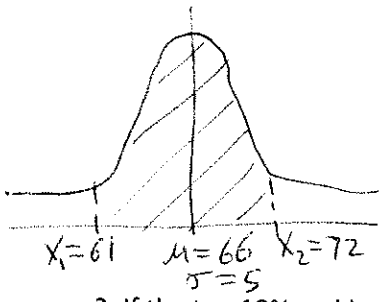
$$P(\text{out of spec}) = P(X < 12.6) + P(X > 12.9)$$

$$= P(Z_1 < -1.2) + P(Z_2 > 1.2) \longrightarrow \text{table}$$

$$= 0.1151 + (1 - 0.8849) = 0.2302$$

An industrial production line turns out fiberglass parts that are normally distributed with a mean of 66 kg and standard deviation of 5 kg.

2. What percent of parts will have a mass between 61 kg and 72 kg? (3 points)



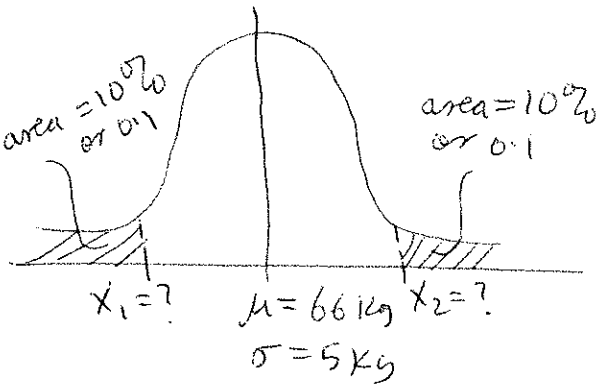
$$Z_1 = \frac{X_1 - \mu}{\sigma} = \frac{61 - 66}{5} = -1.0, \quad Z_2 = \frac{72 - 66}{5} = 1.2$$

$$P(61 < X < 72) = P(-1.0 < Z < 1.2)$$

$$= P(Z_2 < 1.2) - P(Z_1 < -1.0) \longrightarrow \text{table}$$

$$= 0.8849 - 0.1587 = 0.7262$$

3. If the top 10% and bottom 10% of parts are considered defective what is the range of masses over which a part will be accepted? (4 points)



area = 0.1 to the left $\xrightarrow{\text{table}} Z_1 = -1.28$

$$Z_1 = \frac{X_1 - \mu}{\sigma} \Rightarrow -1.28 = \frac{X_1 - 66}{5}$$

$$Z_1 = 59.6 \text{ kg}$$

area = 0.1 to the right or 0.9 to the left

$\xrightarrow{\text{table}}$ $z_2 = 1.28$

so $1.28 = \dfrac{x_2 - 66}{5}$

$\Rightarrow x_2 = 72.4$ Kg

so a product weighing between 59.6 Kg and 72.4 Kg will be accepted, anything else is considered defective.

Note that in this problem we had the same area (10%) shaded in the 'tails'. So since the normal curve is symmetrical, we could have done just one calculation and used symmetry to deduce the other.

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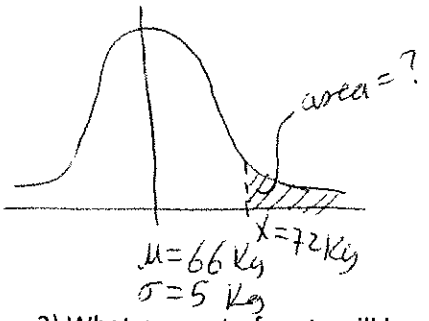
Quiz 5B

Credit shall be awarded for showing your steps, even if your final answers are incorrect.

An industrial production line turns out fiberglass parts that are normally distributed with a mean of 66 kg and standard deviation of 5 kg.

1) What percent of parts will have a mass in excess of 72 kg? **(3 points)**

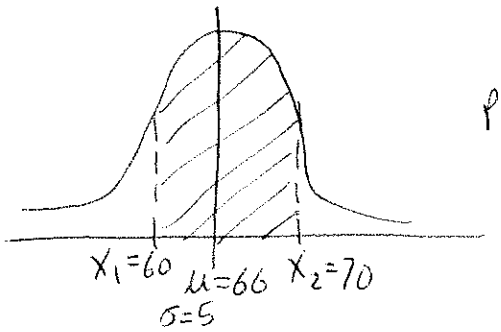
$$z = \frac{x-\mu}{\sigma} = \frac{72-66}{5} = 1.2$$



$$P(X>72) = P(Z>1.2) \xrightarrow{\text{table}}$$
$$= 1 - 0.8849$$
$$= 0.1151$$

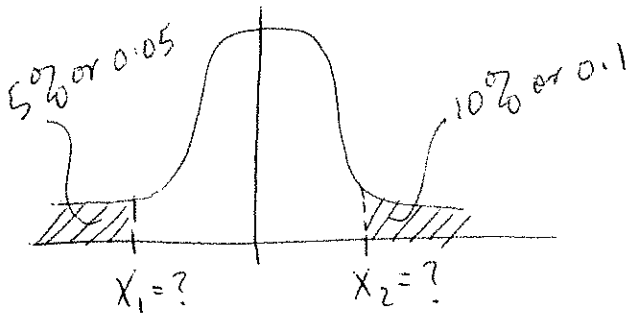
2) What percent of parts will have a mass between 60 kg and 70 kg? **(3 points)**

$$z_1 = \frac{60-66}{5} = -1.2, \quad z_2 = \frac{70-66}{5} = 0.8$$



$$P(60<X<70) = P(-1.2<Z<0.8)$$
$$= P(Z_2<0.8) - P(Z_1<-1.2) \xrightarrow{\text{table}}$$
$$= 0.7881 - 0.1151 = 0.673$$

3) If the top 10% and bottom 5% of parts are considered defective what is the range of masses over which a part will be accepted? **(4 points)**



for probability value (area under bell curve) = 0.05, from table $z_1 \approx -1.64$

So we know that

$$z_1 = \frac{x_1-\mu}{\sigma} \Rightarrow -1.64 = \frac{x_1-66}{5}$$

$$\Rightarrow x_1 = 57.8 \text{ Kg}$$

for area of 0.1, note that area shaded to the left will be 0.9

so from table,

area of 0.9 $\longrightarrow$ $z \approx 1.28$

so $1.28 = \dfrac{X_1 - 66}{5}$

$\Rightarrow X_1 = 72.4$ Kg

so any product of mass between 57.8 Kg and 72.4 Kg will be accepted. Any product beyond this range is considered defective.