

$$X \leftrightarrow Z \leftrightarrow \text{Prob chart}$$

$$Z = \frac{X - \mu}{\sigma}$$

7.3 Areas under Any Normal Curve

Example 1 It is said people eat an average of 10,000 bugs in their lifetime with a standard deviation of 2500 bugs. Find the probability an individual eats between 8,000 and 11,000 bugs per year.

$$P(8,000 \leq X \leq 11,000) = 44.35\%$$

$$Z_1 = \frac{8,000 - 10,000}{2500}$$

$$= -.8$$

$$Z_2 = \frac{11,000 - 10,000}{2500}$$

$$= .4$$

$$P(Z_1 \leq -.8) = .2119$$

$$P(Z_2 \leq .4) = .6554$$

$$P(8,000 \leq X \leq 11,000) = P(-.08 \leq Z \leq .4)$$

$$= P(Z \leq .4) - P(Z \leq -.08)$$

$$= .6554 - .2119$$

$$= .4435$$

Example 2 The average tire lasts 80k miles with a standard deviation of 15k. If Goodyear covers tires under warranty for the first 75k miles, find the probability the tire will be covered.

$$Z = \frac{75 - 80}{15}$$

$$= -.333$$

$$= -.333$$

$$\Rightarrow .3707$$

$$37.07\%$$

Example 3 Widgets R us has determined they can only afford to refund at most 12% of their products. If widgets are found to avg 8 years with a standard deviation of 9 months. How long should they set the guarantee?

$$.12\% \rightarrow z\text{-score } -1.175$$

$$z = \frac{x - \mu}{\sigma} \quad \mu = 8 \quad \sigma = \frac{9}{12} = .75$$

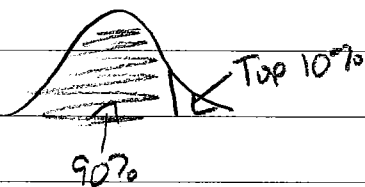
$$-1.175 = \frac{x - 8}{.75}$$

$$-1.88125 = x - 8$$

$$7.119 = x$$

warranty = 7 years

Example 4 In 2005 the average composite ACT score was 20.9 with a standard deviation of 4.7. If Sara wanted to score in the top 10%, what score must she earn.



$$1.28 = \frac{x - 20.9}{4.7}$$

$$z\text{-score } (1.9) = 1.28$$

$$\boxed{x = 26.916}$$