Section 6.3: cont'd

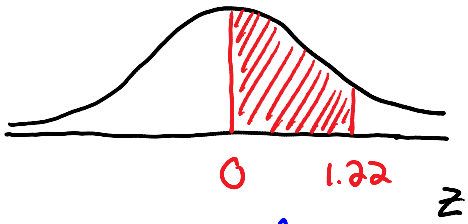
Wednesday, May 29, 2013
11:31 AM

standard normal distribution:

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

z is the number of standard deviations from the mean that the point of interest x is

examples of using the normal table:

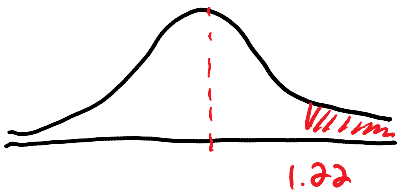


area is 0.3888

What is the probability of having a z-score between 0 and 1.22?

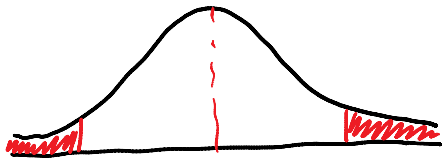
$P(0 < z < 1.22) = 0.3888$
$= 39\%$

what, then, is $P(z > 1.22)$?



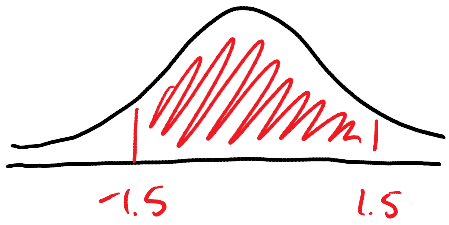
$P(z > 1.22) = 0.5 - 0.3888$
$= 0.1112$
$= 11\%$

what is $P(|z| > 1.22)$?



$P(|z| > 1.22) = 2(0.1112)$
$= 22\%$

what is $P(-1.5 < z < 1.5)$?



$P(-1.5 < z < 1.5) = 2(0.4332)$
$= 0.8664$
$= 87\%$

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example: What is the probability that a normally-distributed variable will have a value within

a) 1 standard deviation of the mean
b) 2 standard deviations of the mean

$P(-1 < z < 1) = 2(0.3413)$
$= 0.6826$
$= 68\%$

$P(-2 < z < 2) = 2(0.4772)$
$= 0.9544$
$= 95\%$

Look! It's the Empirical Rule!

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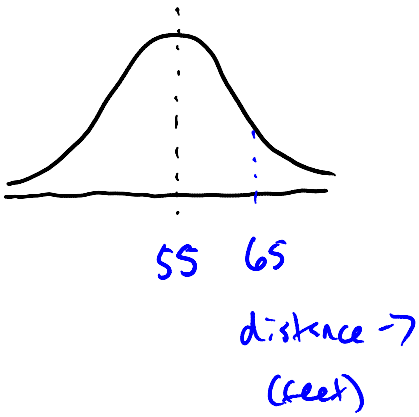
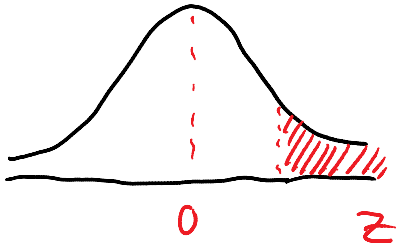
example: For a car traveling at 35 mph, the distance required to brake to a stop is normally distributed with mean of 55 ft and a standard deviation of 8 ft.

a) Suppose you are traveling at that speed and a really big truck suddenly moves into your path 65 feet ahead. What are the odds that you'll smack into the truck?





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

$$= \frac{65 - 55}{8}$$

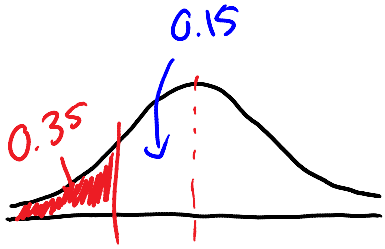
$$= 1.25$$

$$P(z > 1.25) = 0.5 - 0.3944$$

$$= 0.1056$$

$$= 11\%$$

b) Suppose instead that the truck was a distance x away. Calculate x if only 35% of the time you'll be able to avoid the collision



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

1

$z = -0.385$

$x = \mu + z\sigma$

$= 55 + (-0.385)(8)$

$= 51.92$

$= 52$ ft

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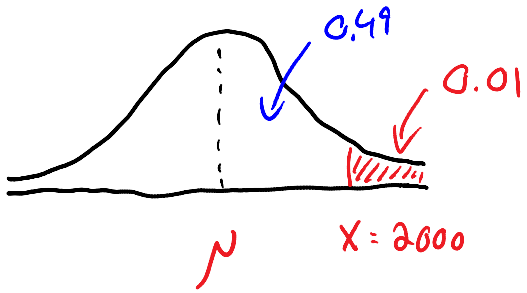
example: A grain loader can be set to discharge grain in amounts that are normally distributed with a standard deviation of 25.7 bushels. If a company wishes to use the loader to fill containers that hold 2000 bushels of grain and wants to overfill only one container in 100, at what mean value should the company set the loader?



$z = 2.33$

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

$\mu = x - z\sigma$

$= 2000 - (2.33)(25.7)$

$= 1940.12$

$= 1940$ bushels