TOPIC: NON-STANDARD NORMAL DISTRIBUTIONS

Finding Z-Scores for Non-Standard Normal Variables

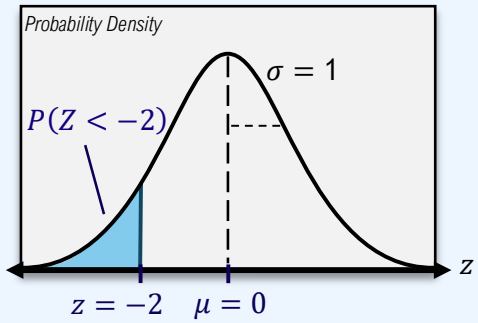
◆ Recall: A z-score is how far away (# of standard deviations) a data point is from the mean.

► When $\mu \neq 0$ and $\sigma \neq 1$, find z-scores & probabilities by _____ X.

EXAMPLE

The graph below shows a distribution of commute times for 1000 people. If the distribution is found to be normal with a mean of 20 minutes and standard deviation of 5 minutes, what is the probability that a randomly selected person commutes for less than 10 minutes?

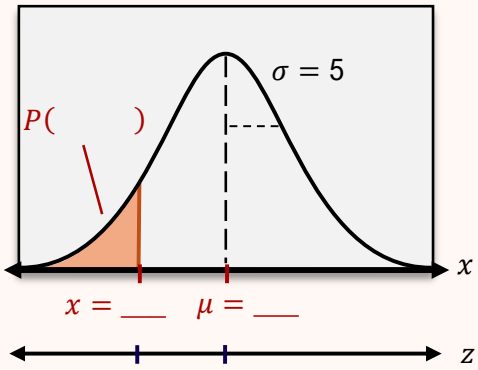
Recall **Prob's for Standard Normal**



Use table or calculator:

$P(Z < -2) = 0.023$

New **Prob's for Non-Standard Normal**



$$z = \frac{x - \quad}{\quad}$$

(z-score)

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PRACTICE

The arrival times of the bus Alex takes to work follow a normal distribution, with μ = 12 min after the scheduled arrival time & σ = 3 min. If the bus is scheduled to arrive at Alex's work 10 min before opening, what is the probability that Alex arrives on time (i.e. the bus is less than 10 min late)?

Recall

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

EXAMPLE

The arrival times of the bus Alex takes to work follow a normal distribution, with μ = 12 min (after the scheduled time) & σ = 3 min. Find the probability that this bus will arrive…

($\boldsymbol{A}$) More than 15 minutes late

($\boldsymbol{B}$) Between 15 and 20 minutes late

Recall

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

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Finding Values of Non-Standard Normal Variables from Probabilities

Recall

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

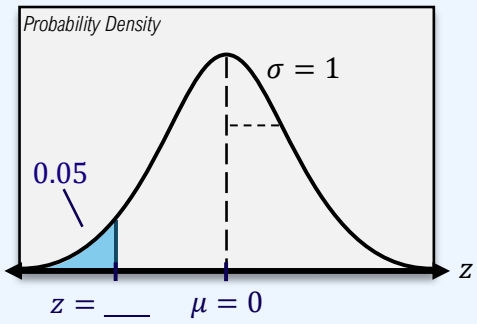
◆ Recall: You can find probabilities of non-standard normal variables by transforming X:

► You can also find the x-value associated with a probability by finding the _____ & **transforming** it into x.

EXAMPLE

The graph below shows a distribution of commute times for 1000 people. Assume this distribution is approximately normal with a mean of 20 minutes and standard deviation of 5 minutes. Find the commute time x, such that only 5% of people have a commute time less than x.

Recall Z – Scores from Prob's

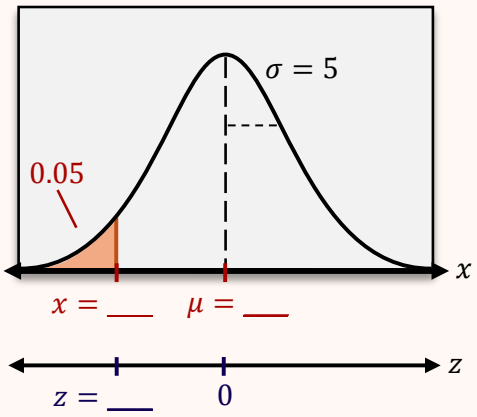


Use table or calculator:

$P(Z < z?) = 0.05$

$z = -1.64$

New X – Values from Prob's



$x = z$ _____

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PRACTICE

The heights of adult women are approximately normally distributed with a mean of 160 cm and a standard deviation of 7 cm. Find the height x such that 5% of women are shorter than x.

Recall

$$x = z \cdot \sigma + \mu$$