TOPIC: NON-STANDARD NORMAL DISTRIBUTIONS

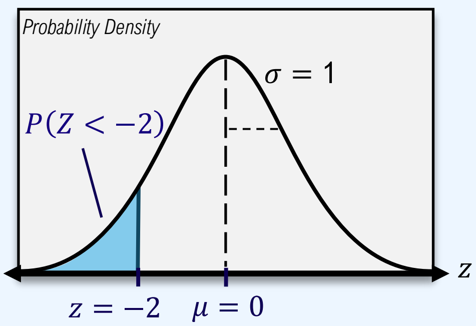
Finding Z-Scores for Non-Standard Normal Variables

- 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?

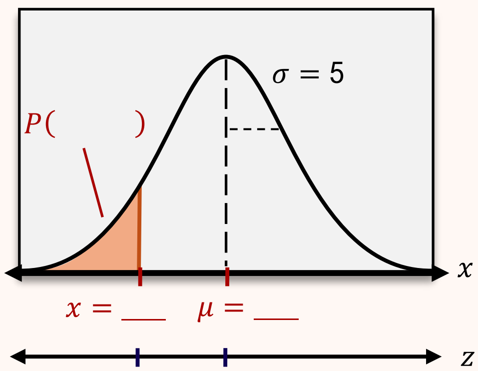
Recall | **Prob's for Standard Normal**



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

A manufacturing plant produces metal rods for automotive assembly. Based on quality control data, rod lengths are normally distributed with μ = 100 cm & σ = 0.8 cm. Rods shorter than 98.5 cm are considered defective. What % of rods are below this tolerance?

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

EXAMPLE

A manufacturing plant produces metal rods for automotive assembly. Based on quality control data, rod lengths are normally distributed with μ = 100 cm & σ = 0.8 cm.

$(\boldsymbol{A})$ Rods longer than 101.3 cm are labelled defective. What is the probability that a randomly selected rod is defective? If they want fewer than 5% of rods to be labelled defective, should this tolerance change?

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

$(\boldsymbol{B})$ The tolerance for non-defective rods is changed to 98.7-101.3 cm. What is the probability that a rod is within this range? The quality control manager wants to buy new equipment if less than 90% of rods are within this tolerance. Should the company invest in the new equipment?

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Finding Values of Non-Standard Normal Variables from Probabilities

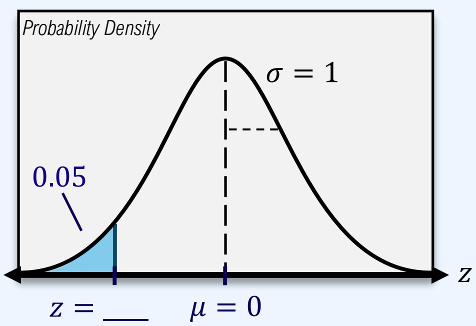
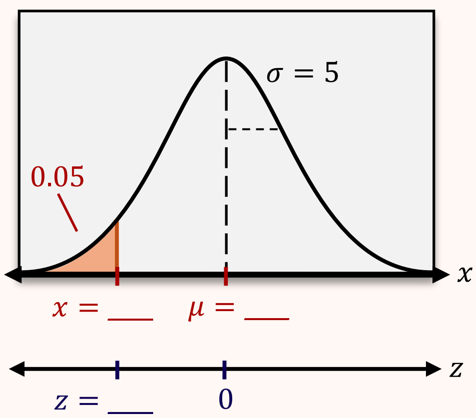
◆ Recall: You can find probabilities of non-standard normal variables by transforming X:

Recall $z = \dfrac{x-\mu}{\sigma}$

► 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	**New** X – Values from Prob's
 Use table or calculator: $P(Z < z?) = 0.05$ $z = -1.64$	 $x = z$ ________

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PRACTICE

A company is launching a new line of smart thermostats & predicts that weekly sales will follow a normal distribution with μ = 4,000 units & σ = 500 units. How many units must be stocked each week to ensure that demand is met 95% of the time?

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

EXAMPLE

A company is launching a new line of smart thermostats and has forecasted that weekly sales will follow a normal distribution with μ = 4,000 units & σ = 500 units. The senior data analyst wants to report a "typical weekly demand range" using the central 80% of weekly sales. What is the range of weekly sales volumes that includes the middle 80% of demand?

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