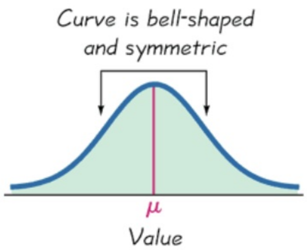
CHAPTER 5

In this chapter, we're going to look at continuous probability distributions. (Chapter 4 was all about discrete probability distributions.)

A continuous random variable has infinitely many values which are often associated with measurements.

If a contiuous random variable has a distribution that is symmetric and bell-shaped, we call it a normal distribution.



5.2 The Standard Normal Distribution

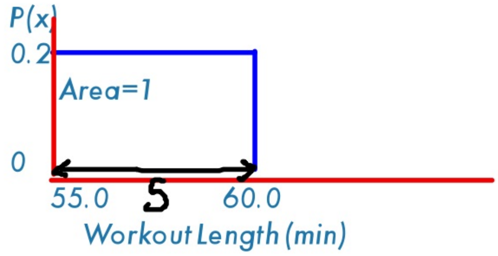
To make things easier we're going to look at a uniform distribution first.

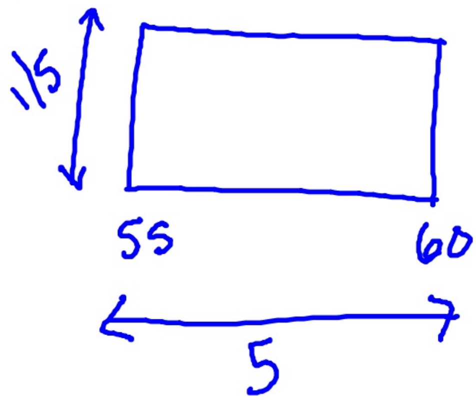
What is a uniform distribution? If the values of a contiunous random variable are evenly spread over the range of possibilities, then the variable has a uniform distribution and the distribution graph is a rectangle.

Example: A certain famous math teacher likes to work out early in the evening. So that she gets a good workout, the lengths of her workouts are uniformly distributed between 55.0 min and 60.0 min.

$$5 \cdot \frac{1}{5} = 1$$

That means that she might excercise for any length of time between 55.0 min and 60.0 minutes and all of the possible values are equally likely. If we randomly pick one of her workouts and let x be the random variable representing the amount of time of the workout, then x has a distribution that looks like:





Assuming that one of this amazing math teacher's workouts is randomly selected, find the probability that the given length is selected. Remember, the workouts are between 55.0 and 60.0 minutes long.

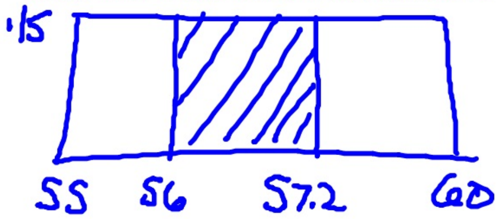
1. *More than 59.5 minutes*

$(.5)(.2) = .10$

2. *Less than 57.25 minutes*

$(2.25)\left(\frac{1}{5}\right) = .45$

3. *Between 56.0 and 57.2 minutes*

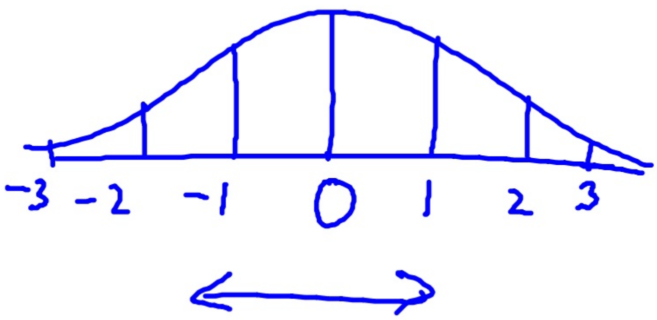


$(1.2)(.2)$

$.24$

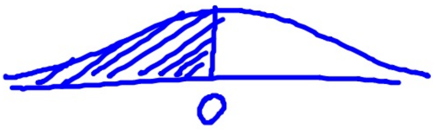
The standard normal distribution is a normal probability distribution that has a mean of 0 and a std dev of 1. Also the total area under the density curve is 1.

(This is the only normal distribution we will be looking at.)



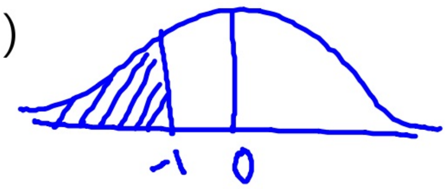
Let's find areas under a normal probability distribution with mean 0 and standard deviation 1.
(You will need the z-score chart)

1. $P(z < 0)$ = .5

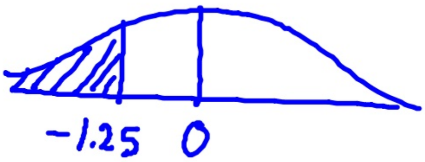


2. $P(z < -1)$

.1587

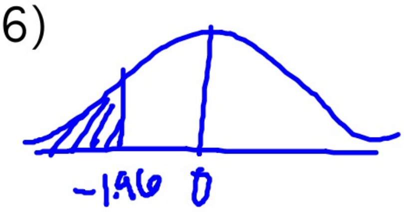


3. $P(z < -1.25)$ = .1056

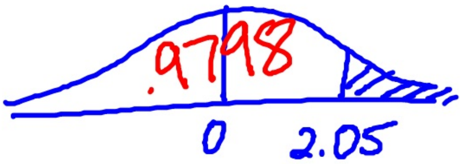


4. $P(z < -1.96)$

.0250

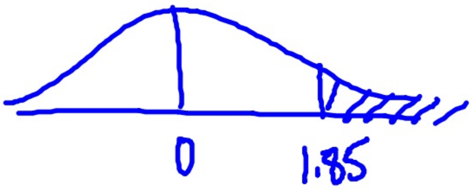


5. P(z > 2.05) = .0202

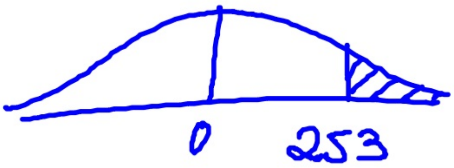


1 − .9798

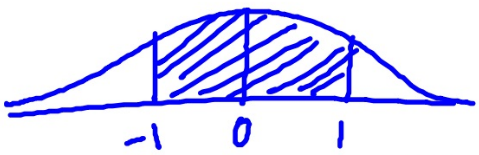
6. P(z > 1.85) = .0322



7. P(z > 2.53) = .0057

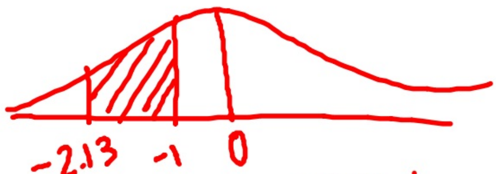


8. $P(-1 < x < 1) = .6826$



$.8413 - .1587$

9. $P(-2.13 < x < -1)$



$.1421$

10. $P(-1.03 < x < 2.36)$

$.8394$

p.237
1-26 All
29-35 odd

Working Backwards: Finding a z-score given a cumulative area

1. .0197

2. .9474

3.   .8910

4. .2013

Percentiles

5. 10th percentile

6. 88th percentile