trial: an occurrence	roll a die	toss a coin	sum on 2 dice
sample space: all the things that could happen in each trial	1, 2, 3, 4, 5, 6	heads tails	2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12
example of an outcome:	4	heads	4 (1&3, 2&2, 3&1)
probability: long-run relative frequency of that event	1/6	1/2	3/36 = 1/12

What's the probability of getting 4 heads in a row with a coin?

What's the probability of rolling 3 consecutive 5's with a die?

What's the probability of getting your first 6 on the third roll of a die?

What's the probability of drawing a King from a deck, replacing the card, re-shuffling, and then drawing another King?

What's the probability of drawing a face card from a deck, replacing the card, re-shuffling, and then drawing another face card?

What's the probability of drawing a heart from a deck, replacing the card, re-shuffling, and then drawing an Ace?

What's the probability of drawing 2 cards from a deck of cards and both of them being aces?

What's the probability of drawing some heart from a deck of cards and then drawing another heart (without replacement)?

Survey of Monday night Introductory Psychology class

	right handed	left handed	
male	43	9	52
female	44	4	48
	87	13	100

What's the probability that a randomly selected...
student is male?

student is right handed?

student is male and is right handed?

student is male or is right handed?

male is right handed?

right handed person is male?

If I select 1 m&m candy at random, what is the sample space?

If I select 2 m&m candies at random, what is the sample space?

What's the probability that a randomly selected plain m&m...

13% 14% 16% 24% 20% 13%

is blue?

is blue or orange?

is blue and orange?

is not brown?

is neither brown nor orange?

Performance on the first 2 problems from a test

	#1 right	#1 wrong	
#2 right	47	12	59
#2 wrong	8	20	28
	55	32	87

What's the probability that a randomly selected...
student got #1 wrong?

student got #2 wrong?

student got #1 or #2 wrong?

student got #1 and #2 wrong?

	#1 right	#1 wrong	
#2 right	47	12	59
#2 wrong	8	20	28
	55	32	87

student got #1 or #2 wrong, but not both?

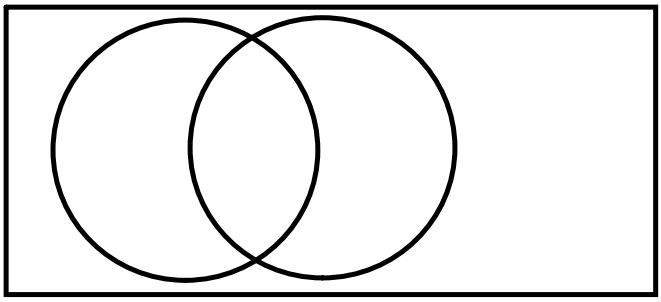
student who got #2 wrong also got #1 wrong?

student got #1 wrong given that he/she got #2 wrong?

student got #2 wrong but got #1 right?

student got #1 wrong given that he/she got #2 right?

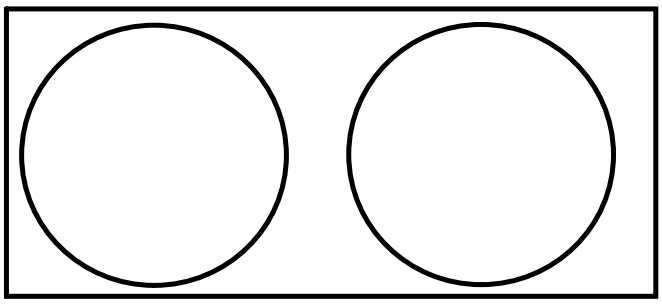
In a class, 54% of students are female, 29% of students have blue eyes, and 25% of students are females with blue eyes.



P(female or blue)=

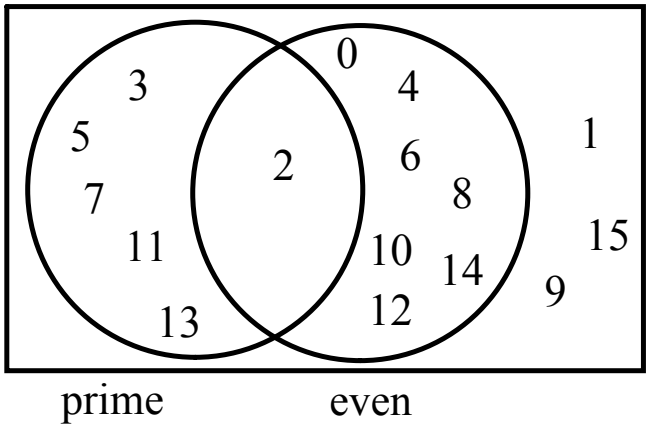
P(blue or not female)=

disjoint or mutually exclusive



pass	fail	P(pass and fail) =0
red	green	P(red m&m and green m&m) =0
mustang	GM product	P(mustang and GM product) =0

The smallest 16 Whole Numbers



counts from the Venn diagram

	prime	not prime	
even			
not even			
			16

What's the probability that a randomly selected...
whole number under 16 is prime?

whole number under 16 is even?

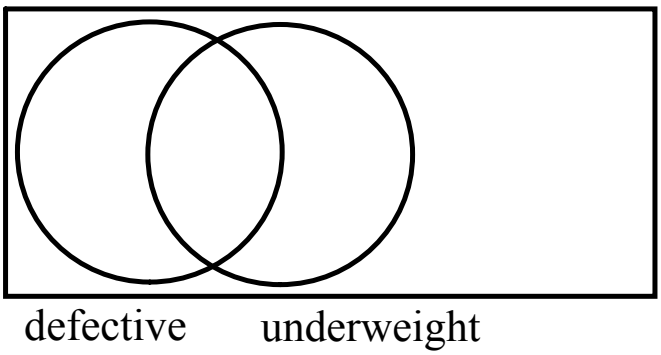
prime under 16 is even?

whole number under 16 is even and prime?

whole number under 16 is even or prime?

whole number under 16 is neither prime nor even?

Quality control testing found 4% of a company's product was defective, 5% was underweight, and 1% was both defective and underweight.

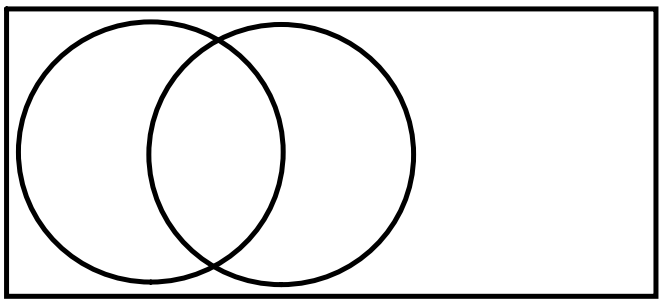


What's the probability that
a randomly selected...
product is underweight
but not defective?

product is defective
but not underweight?

product is defective or underweight?

Quality control testing found 4% of a company's product was defective, 5% was underweight, and 1% was both defective and underweight.



product is defective or underweight, but not both?

defective product is also underweight?

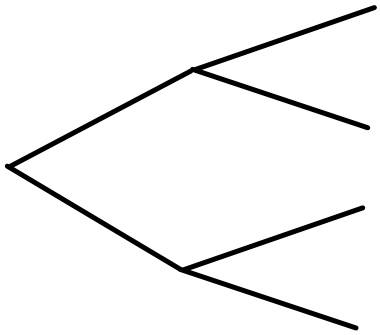
underweight product is defective?

product is neither defective nor underweight?

product is underweight, given that it is defective?

According to the American Red Cross, 40% of the U.S. population has type A blood. Of those, with type A blood, 85% are Rh^+. Of those who do not have type A blood, 83% are Rh^+.

What is the probability that a randomly chosen American...



has type A^- blood?

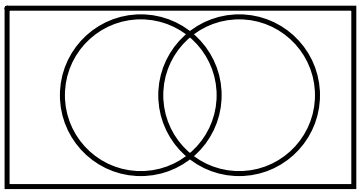
has type A^+ blood?

has blood that is not type A but is Rh^+?

has Rh^- blood that is not type A?

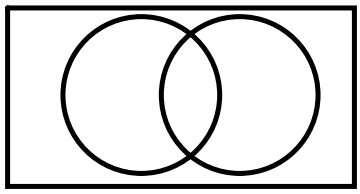
$P(A \mid Rh^+)$=

passed both



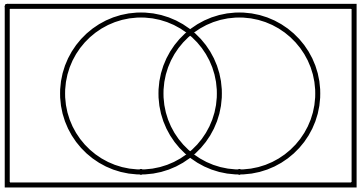
passed 1st test passed 2nd test

failed both



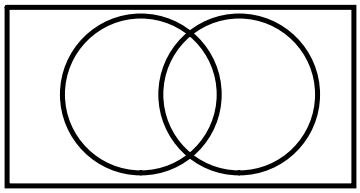
passed 1st test passed 2nd test

passed the 1st, but not the 2nd



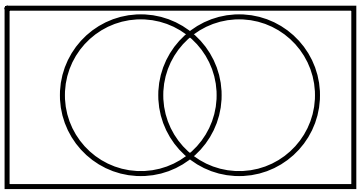
passed 1st test passed 2nd test

passed the 1st

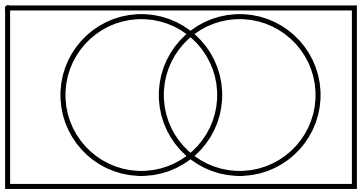


passed 1st test passed 2nd test

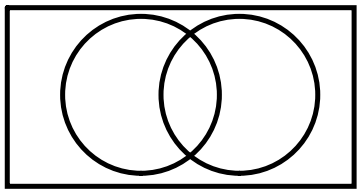
failed the 1st



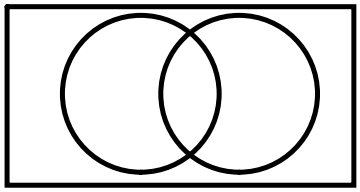
passed
exactly
one



passed the 1st
or the 2nd
(or both)



didn't pass
the 1st



http://www.math.csusb.edu/faculty/stanton/m262/intro_prob_models/intro_prob_models.html

Probability distribution for tossing 2 coins:

x			
P(x)			

Independent events: knowing A occured doesn't tell us any additional information about B.

Events A & B are independent if $P(A)=P(A|B)$

Disjoint events: A and B can't both happen.

Events A & B are disjoint if $P(A\&B)=0$

One trial: Rolling one die...

	Disjoint	Not Disjoint
Independent	Impossible	even & curved number
Not Independent	even & odd	even & prime

Two trials:

	Disjoint	Not Disjoint
Independent	Impossible	heads on a coin & 6 on a die
Not Independent	Dem elected Pres & GOP elected VP	raining & playing baseball

Word order matters!
P(girl|has a pink phone) $\neq$ P(has a pink phone|girl)

What is the probability...

a person is a Canadian who speaks French?	P(Canadian and speaks French)
a Canadian speaks French?	P(speaks French|Canadian)
a person is Canadian if he speaks French?	P(Canadian|speaks French)
a person speaks French if he is Canadian?	P(speaks French|Canadian)

I flip a coin 3 times.
What is the probability "heads" appears at least once?

First, consider the Sample Space

I roll a die 3 times. What is the probability I get at least one 4?

Suppose a test for a genetic disorder is 95% accurate and that 10% of the population has the disorder.
What is P(disorder|positive)?