trial - an occurrence	rolling a die	tossing a coin	rolling a pair of 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
Probability - long-run relative frequency of an 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 a heart
from a deck and then drawing an Ace?

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?

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

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

is blue? .24

is blue or orange? .24 + .20 = .44

is blue and orange? = 0 disjoint

is not brown? 1 − .13 = .87

is neither brown nor orange?

1 − (.13 + .20) = .67

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? $32/87$

student got #2 wrong? $28/87$

student got #1 or #2 wrong? $\frac{32}{87} + \frac{28}{87} - \frac{20}{87} = \frac{40}{87}$

student got #1 and #2 wrong? $20/87$

student got #1 or #2 wrong, but not both? $= \frac{8}{87} + \frac{12}{87} = \frac{20}{87}$ $\cdot \frac{\#1w \text{ \& } \#2w}{\#2w}$

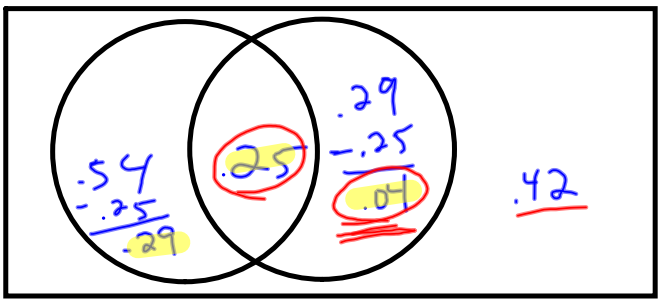
student who got #2 wrong also got #1 wrong? $P(\#1w \mid \#2w) = \frac{20}{28}$

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

student got #2 wrong but got #1 right? $\frac{8}{87}$

student got #1 wrong given that he/she got #2 right? $P(\#1w \mid \#2 \text{right}) \quad 12/59$

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)= .58 = 1 − .42 = .29 + .25 + .04

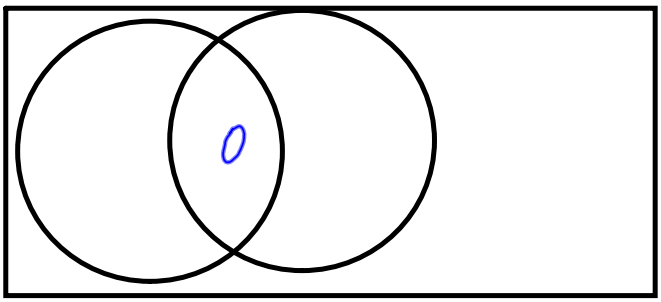
P(female or blue, but not both) = .33

P(female) + P(blue) − P(female & blue) = .54 + .29 − .25

P(blue & not female) = .04

P(blue or not female)=

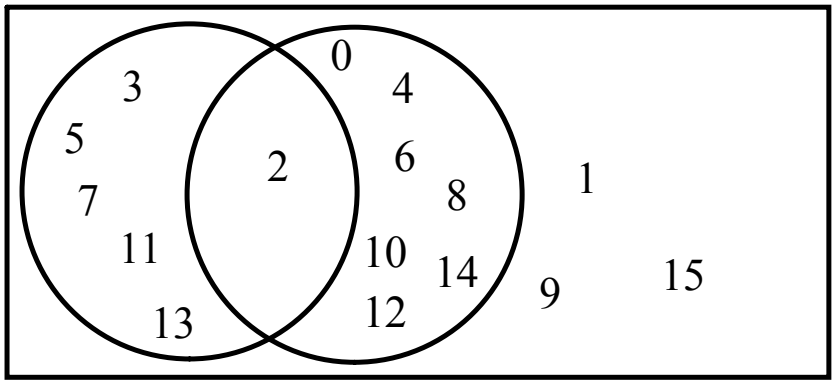
.25 + .04 + .42 = .71



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



What's the probability that a randomly selected...

whole number under 16 is prime? $\frac{6}{16}$

whole number under 16 is even? $\frac{8}{16}$

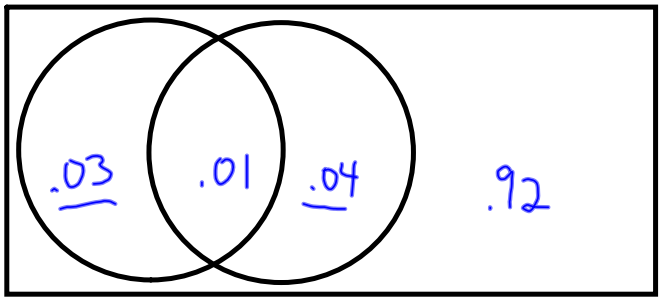
prime under 16 is even? $\frac{1}{6}$ $P(\text{even} \mid \text{prime})$

whole number under 16 is even and prime? $= \frac{1}{16}$

whole number under 16 is even or prime? $\frac{13}{16}$

whole number under 16 is neither prime nor even? $\frac{3}{16}$

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? .04

product is defective but not underweight? .03

product is defective or underweight? .08

product is defective or underweight, but not both? = .07 (under & def)

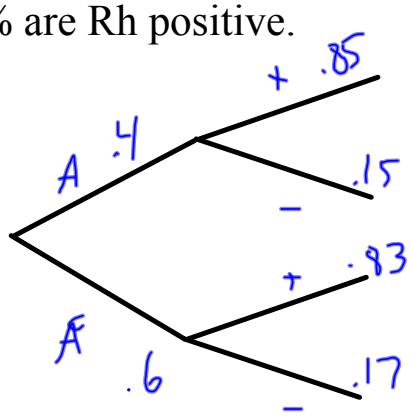
defective product is also underweight? $P(\text{under} \mid \text{def}) = \frac{.01}{.04} = .25$ (def)

underweight product is defective? $P(\text{def} \mid \text{under}) = \frac{.01}{.05} = .2$

product is neither defective nor underweight? = .92

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 positive. Of those who do not have type A blood, 83% are Rh positive.



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

has type A blood and is Rh negative?

$P(A^-) = (.4)(.15) = .06$

has type A^+ blood?

$P(A^+) = (.4)(.85) = .34$

has blood that is not type A but is Rh positive? $P(\text{not A, but } +) = (.6)(.83) = .498$

has Rh negative blood that is not type A? $P(- \text{ but not A}) = (.6)(.17) = .102$

P(A | +)=

learn to use the Venn diagrams/tables/trees, working with diagrams that I provide

move to them constructing the diagram of their choice-- they can draw a picture for almost any problem and then figure out whether to multiply/add/divide.

World Health Organization data on prevalence of smoking among those at least 15 years of age for The Republic of Ireland and for The United Kingdom

	Ireland	UK	totals
female smoker	479,290	7,012,383	7,491,673
female nonsmoker	1,517,751	23,476,239	24,993,990
male smoker	473,404	7,743,342	8,216,746
male nonsmoker	1,499,112	22,038,744	23,537,856
total female	1,997,041	30,488,622	32,485,663
total male	1,972,517	29,782,086	31,754,603
total population	3,969,558	60,270,708	64,240,266

What's the probability that a randomly selected...
woman from this study is a smoker?

smoker from this study is Irish?

smoker from this study is an Irish female?

male from this study is a from the UK?

male from this study smokes?

person from this study is a smoker or is male?

person from this study is a smoker and is male?

person from this study is an Irish woman?

UK citizen is a smoker?

Then ask about the probability of getting two aces in a row from a deck of cards.
Kids will see that they need to adjust the second fraction, multiplying 4/52 * 3/51
Get them to explain in words what

they are multiplying; they'll say something like "The probability of an ace on the first card times the probability we get an ace on the second card after one ace has been removed from the deck."
That provides you with the opportunity to show them conditional notation: P(A1 and A2) = P(A1)*P(A2 | A1)

3) And then you can rewrite the General Rule P(A and B) = P(A)*P(B | A) as P(B | A) = P(A and B) / P(A)... conditional probability.