Class 8 9/11/17
Mendelian Genetics

- Announcements
- Class administration
- Check iLearn for suggested problems
- **REMINDERS:**
  - **If you are not taking a class, drop it by WED Sep 13, OR**
  - **If you are not certain you are taking a class, communicate with your instructor – discuss dropping the class with the understanding that you can request a late add until WED Sep 20**
  - **Class permission numbers expire on WED Sep 13.**

- Office hours HH668C:
  - Mon 2 – 4pm

i>clicker

or

- ❑ Did you bring your clicker remote today? GREAT!!
- ❑ Please check iLearn for your clicker score in gradebook (Should now see only "Session 1")
- ❑ If your clicker score is missing, please e-mail me your clicker remote ID.

Biol 572/872 Ecology, Evolution, & Conservation Biology Colloquium

Tuesday, 9/12/17
HH 543, 2:10pm

http://biology.sfsu.edu/content/EEC

Rebecca Albright
California Academy of Sciences
Coral reefs under ocean acidification

https://www.calacademy.org/explore-science/rebecca-albright

Romberg Tiburon Center Seminar Series

http://rtc.sfsu.edu/seminar/index.htm

Wednesday, 9/13/17
Bay Conference Center, 3:30PM

Jenna Judge
California Sea Grant Extension Fellow
Natural Shoreline Infrastructure: Working with Nature to Increase Coastal Resilience

https://caseagrant.ucsd.edu/profile/jenna-judge

Biol 871 Colloquium in Microbiology, Cell & Molecular Biology

Thursday, 9/14/17
SCI 210, 2:10 pm

http://biology.sfsu.edu/content/MCMB

Aruna Poduri
Stanford University
Coronary artery development and remodeling

http://arunapoduri.com/ https://redhorselab.stanford.edu/people

Monohybrid cross with Punnett Square-2

- Allow the F1 to self-fertilize
  - Gametes: D or d
- 4 possible gamete combinations for F2
- Genotype
  - 1DD:2Dd:1dd
- Phenotype
  - 3 tall:1 dwarf

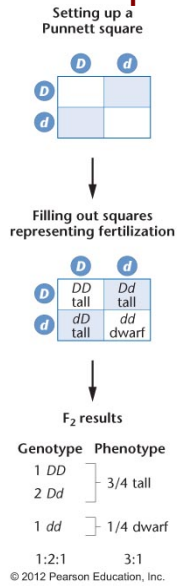
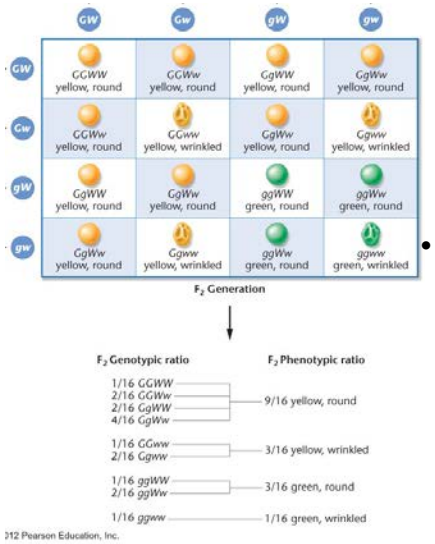


Figure 3.3

Dihybrid Cross F2 phenotypic ratio: 9:3:3:1

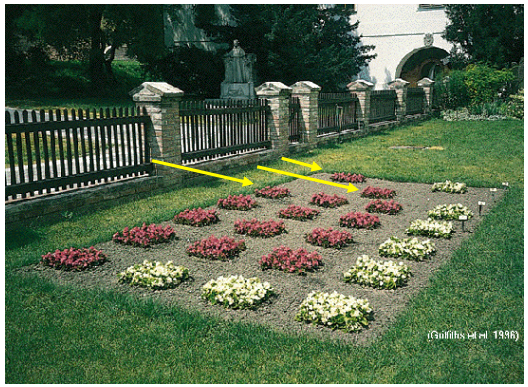


Repeat this analysis using the reciprocal cross

- 4 distinct phenotypic classes (ratio)
  - 9 Yellow, round (G- W-)
  - 3 Green, round (gg W-)
  - 3 Yellow, wrinkled (G- ww)
  - 1 Green, wrinkled (gg ww)

Figure 3.7

Mendel's garden



- Top row = P1
- 2nd row = F1
- 3rd row = F2

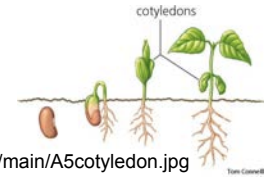
http://www.mun.ca/biology/scarr/Mendels_Garden.html

Clicker Question

- If true-breeding round seed, yellow cotyledon pea plants are crossed with true-breeding wrinkled seed, green cotyledon pea plants, all of the F1 plants are round seed, yellow cotyledon.
  - Round vs wrinkled = W vs w
  - Yellow vs green = G vs g
- In a later cross, round seed, yellow pea plants are crossed with wrinkled seed, green pea plants and the following progeny are observed:
  - 1/4 round, yellow
  - 1/4 round, green
  - 1/4 wrinkled, yellow
  - 1/4 wrinkled, green

Which of the following genotypes describes <u>one</u> of the parents in this cross?

A) GGWw
B) GgWw
C) GgWW
D) GGWW



http://cf.ydcdn.net/1.0.1.67/images/main/A5cotyledon.jpg

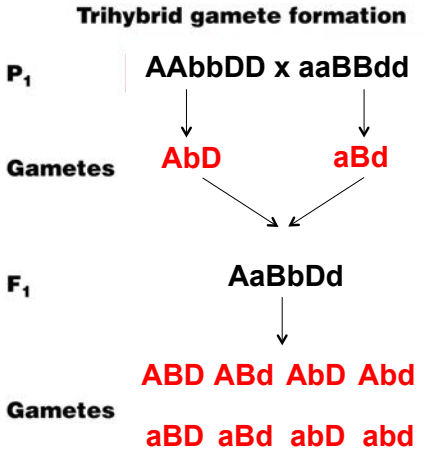
Trihybrid crosses

- **Trihybrid crosses**, or three factor cross, involves three independent traits
- Analysis of F2 phenotypes of trihybrid cross demonstrate that Mendel's rules apply to any number of traits

- With a monohybrid cross - Punnett Square had 4 squares
- With a dihybrid cross - Punnett Square had 16 squares
- How many squares in a Punnett Square for a trihybrid cross???

Predicting F2 generation phenotypes

- P1 parents generate gametes:
  - AbD
  - aBd
- F1 progeny are heterozygous for each trait (3 traits)
- F1 progeny in self-cross will generate 8 different gametes
- What is the predicted probability of each phenotype in the F2 generation?



Trihybrid cross Punnett Square

	ABD	ABd	AbD	Abd	aBD	aBd	abD	abd
ABD								
ABd								
AbD								
Abd								
aBD								
aBd								
abD								
abd								

http://www.science.oregonstate.edu/genbio/otherresources/punnett%20squares.htm

Trihybrid cross Punnett Square filled

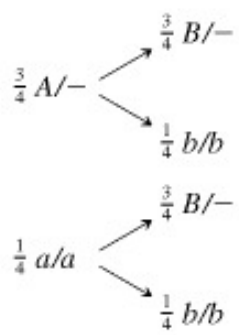
	ABD	ABd	AbD	Abd	aBD	aBd	abD	abd
ABD	AABBDD	AABBDd	AABbDD	AABbDd	AaBBDD	AaBBDd	AaBbDD	AaBbDd
ABd	AABBDd	AABBdd	AABbDd	AABbdd	AaBBDd	AaBBdd	AaBbDd	AaBbdd
AbD	AABbDD	AABbDd	AAbbDD	AAbbDd	AaBbDD	AaBbDd	AabbDD	AabbDd
Abd	AABbDd	AABbdd	AAbbDd	AAbbdd	AaBbDd	AaBbdd	AabbDd	Aabbdd
aBD	AaBBDD	AaBBDd	AaBbDD	AaBbDd	aaBBDD	aaBBDd	aaBbDD	aaBbDd
aBd	AaBBDd	AaBBdd	AaBbDd	AaBbdd	aaBBDd	aaBBdd	aaBbDd	aaBbdd
abD	AaBbDD	AaBbDd	AabbDD	AabbDd	aaBbDD	aaBbDd	aabbDD	aabbDd
abd	AaBbDd	AaBbdd	AabbDd	Aabbdd	aaBbDd	aaBbdd	aabbDd	aabbdd
	Phenotypic Ratio							
	27	9	9	9	3	3	3	1

27 distinct genotypes & 8 distinct phenotypes

http://www.science.oregonstate.edu/genbio/otherresources/punnett%20squares.htm

Product Rule of Probabilities

A/a;B/b x A/a;B/b



- The product rule
  - If the events of A and B are independent, the probability that they occur together is denoted

    P (A AND B) = P (A) x P (B)

Probability of A AND b phenotype

= P (A) x P (b)

= 3/4 x 1/4

= 3/16

Can also use this approach to calculate probability of each genotype…

Suggestion: Review fractions

Forked-line method to analyze inheritance of larger number of traits

F1 self cross: AaBbCc x AaBbCc

Generation of F_2 trihybrid phenotypes

A or a	B or b	C or c	Combined proportion
3/4 A	3/4 B	3/4 C →	(3/4)(3/4)(3/4) ABC = 27/64 ABC
		1/4 c →	(3/4)(3/4)(1/4) ABc = 9/64 ABc
	1/4 b	3/4 C →	(3/4)(1/4)(3/4) AbC = 9/64 AbC
		1/4 c →	(3/4)(1/4)(1/4) Abc = 3/64 Abc
1/4 a	3/4 B	3/4 C →	(1/4)(3/4)(3/4) aBC = 9/64 aBC
		1/4 c →	(1/4)(3/4)(1/4) aBc = 3/64 aBc
	1/4 b	3/4 C →	(1/4)(1/4)(3/4) abC = 3/64 abC
		1/4 c →	(1/4)(1/4)(1/4) abc = 1/64 abc

- Can use forked-line method to predict the genotypic and phenotypic ratios for crosses involving multiple traits
- Can look at the inheritance of each trait or phenotype independent of the other traits: Aa x Aa, Bb x Bb, Cc x Cc

http://bio3400.nicerweb.com/Locked/media/ch03/03_10-forked-line.jpg