Punnett Square Independent Practice
Complete the punnett squares and questions for each of the following genetic crosses.

genotype = genes

1. **Red flowers are dominant to white flowers. (R = red, r = white)**
   a. What letters will represent a homozygous red flowered plant? RR
   b. What letters will represent a homozygous white flowered plant? rr
   c. **Cross** a homozygous red plant with a white plant:

	R	R
r	Rr	Rr
r	Rr	Rr

   d. List the possible **genotypes**? 0 /4 RR, 4 /4 Rr, 0 /4 rr
   e. What is the **genotypic ratio**? 0 : 4 : 0
   f. What are the resulting **phenotypes**? 4 /4 red, 0 /4 white
   g. What is the **phenotypic ratio**? 4 : 0

phenotype = physical expression of trait

2. **In pea plants, round seeds are dominant to wrinkled seeds. (R=round, r=wrinkled)**
   a. Tell the genotype of a pea plant that is heterozygous for round seeds? Rr
   b. Cross a heterozygous plant with another heterozygous plant.
   c. What are the **genotypes** of both parents? **Parent (P)**: Rr **X** Rr

	R	r
R	RR	Rr
r	Rr	rr

   d. List the possible **genotypes**? 1 /4 RR, 2 /4 Rr, 1 /4 rr
   e. What is the **genotypic ratio**? 1 : 2 : 1
   f. What are the resulting **phenotypes**? 3 /4 round, 1 /4 wrinkled
   g. What is the **phenotypic ratio**? 3 : 1

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3. **In pea plants, green pea pods are dominant to yellow pea pods. (G=green, g=yellow)**

	G	g
g	Gg	gg
g	Gg	gg

   a. Cross a heterozygous plant with a yellow plant.
   b. What are the genotypes of both parents? **Parent (P)**: Gg **X** gg
   c. What is the genotypic ratio 2Gg : 2gg
   d. What is the phenotypic ratio? 2:2

Gg = green trait expression

gg = yellow trait expression

Consider the following to answer 4-7:

TRAIT	DOMINANT ALLELE	RECESSIVE ALLELE
Pod shape	N = smooth	n = wrinkled
Pod color	G = green	g = yellow
Flower position	A = axial	a = terminal
Plant height	T = tall	t = short

4. Cross a plant that is heterozygous for axial flowers with a plant that has terminal flowers.

	A	a
a	Aa	aa
a	Aa	aa

Genotypic Ratio: 2:2
2 Aa & 2 aa

Phenotypic Ratio: 2:2
2 axial & 2 terminal

Parent 1: Aa (heterozygous axial)
Parent 2: aa (terminal)

5. Cross two plants that are both heterozygous for green pods.

	G	g
G	GG	Gg
g	Gg	gg

Genotypic Ratio: 1:2:1
1GG; 2Gg; 1gg

Phenotypic Ratio: 3:1
3 green & 1 yellow

heterozygous = 2 different alleles
green pods = dominant (G)
Parents: G & g

6. When a tall plant is crossed with a short plant, some of the offspring are short. What are the genotypes of the parents and the offspring? What would be the expected phenotypic ratio of the offspring? (Hint #1: You may need to work backwards with this problem. #2: You should have two punnett squares drawn to prove your point).

Option 1

	T	T
t	Tt	Tt
t	Tt	Tt

Option 2

	T	t
t	Tt	tt
t	Tt	tt

* only option 2 produces short offspring *

Genotypes of Parents: Tt & tt

Possible genotypes of offspring: Tt & tt

Phenotypic Ratio: 2:2

7. Three-fourths (3/4) of the plants produced by a cross between two unknown pea plants have axial flowers and ¼ have terminal flowers. What are the genotypes of the parent plants? SHOW YOUR WORK! Aa & Aa

work backwards!

	A	a
A	AA	Aa
a	Aa	aa

① you know 1/4 have terminal flowers

② so you can fill in one square & now you know 1/2 of the genotype of each parent

③ if any parent was genotype aa more than 1/4 of offspring would have terminal flowers

NOTES: TEST CROSSES

A **TEST CROSS** is used to determine the unknown genotype of a specific organism.

- In most cases, if you have an organism that is showing the _____ trait, you can not tell if they are homozygous or heterozygous by looking at them.
- It is possible to determine their genotype by crossing (breeding) the unknown with an individual that is homozygous _____. By looking at their offspring you can usually determine the genotype of the unknown parent.