

SCIENCE CONTENT TOPIC: L.e.2  
SCIENCE PRACTICES: SP.1.a, SP.1.b, SP.1.c, SP.3.d, SP.8.b, SP.8.c

## 1 Review the Skill

Some tools are related specifically to certain content areas. For example, Punnett squares and pedigree charts are critical for understanding topics in genetics but are not used in other areas of science. **Understanding content-based tools** will help you comprehend specific science content more clearly.

## 2 Refine the Skill

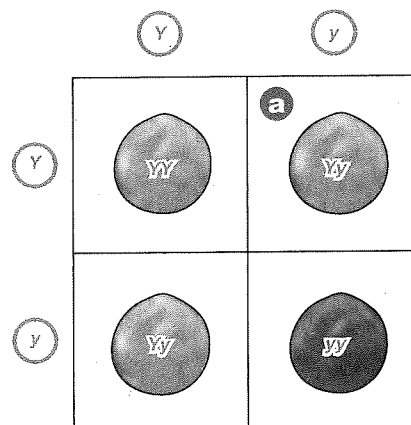
By refining the skill of understanding content-based tools, you will improve your study and test-taking abilities, especially as they relate to the GED® Science Test. Study the information and Punnett square below. Then answer the questions that follow.

### SEED COLOR IN PEA PLANTS

The two alleles that make up a gene pair can differ. When a gene's alleles can differ, the trait produced by the gene can vary. If a dominant allele is present in an organism, the organism has the trait associated with that allele. Genotype, or the makeup of the alleles in a gene pair, is represented by symbols, such as  $YY$ ,  $Yy$ , or  $yy$ . A capital letter indicates a dominant allele. The Punnett square shows the potential genotypes for seed color in the offspring of two particular pea plants.

**a** Punnett squares are useful for predicting traits that offspring will inherit. They show all potential genotypes and the odds of each. Here, 50 percent of the offspring will have the genotype  $Yy$ .

**b** Larger Punnett squares show genotypes for two traits. For example, such a Punnett square may show offspring with the genotype  $YyRr$  for the traits of seed color ( $Yy$ ) and seed texture ( $Rr$ ).



Y = yellow-seed allele  
y = green-seed allele

### CONTENT PRACTICES

On the GED® Science test, you may be asked to determine the probability of events, as in question 2. A Punnett square can be considered a probability model.

- The Punnett square suggests that seed color in pea plants
  - is yellow-green in some plants.
  - is determined by more than one gene.
  - is not passed on to offspring.
  - is controlled by a gene with alleles that can differ.
- Based on the Punnett square, what is the probability of producing a plant with yellow seeds?
  - 25 percent
  - 50 percent
  - 75 percent
  - 100 percent

★ **Spotlighted Item: HOT SPOT**

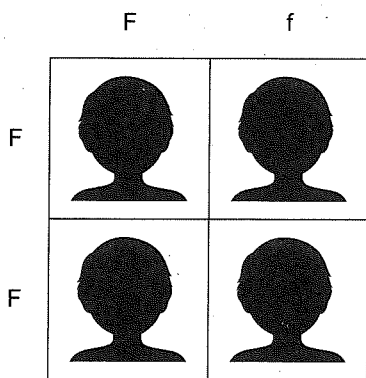
**DIRECTIONS:** Read the passage and question. Then answer by marking the appropriate hot spot or hot spots.

**GENOTYPE, PHENOTYPE, AND FRECKLES**

Genotype is the genetic makeup of an individual. It can refer to the entire genetic makeup of an organism or, more commonly, to the makeup of alleles for a particular gene. A genotype having two identical alleles, such as YY, is homozygous. A genotype having two different alleles, such as Yy, is heterozygous.

Phenotype is the observable expression of a genotype; that is, the observable trait. The phenotype is controlled by the dominant allele of a gene. For example, in humans, freckled skin is a dominant trait, and nonfreckled skin is a recessive trait.

- The incomplete Punnett square represents the breeding of two individuals and shows their genotypes for the trait of freckles. Mark an X on any offspring whose gene for freckles is homozygous.



**DIRECTIONS:** Study the information and table. Then read the question, and answer by marking the appropriate hot spot.

**SEED TEXTURE IN PEA PLANTS**

In the mid-1800s, Gregor Mendel used pea plants to investigate heredity. One trait that Mendel studied was the texture of pea plant seeds. Some pea plants have smooth seeds, and others have wrinkled seeds. The smooth seeds phenotype is controlled by the dominant allele. The table identifies the phenotypes and genotypes of the parent plants in three investigations.

Investigation 1	Investigation 2	Investigation 3
Smooth (RR) × smooth (Rr)	Wrinkled (rr) × wrinkled (rr)	Smooth (RR) × wrinkled (rr)

- Punnett squares can be used to show the potential genotypes of the offspring from Mendel's investigations. Mark an X on the Punnett square below that represents Investigation 2.

