

# 11-2 Probability and Punnett Squares



# Genetics and Probability

The likelihood that a particular event will occur is called **probability**.



**The principles of probability can be used to predict the outcomes of genetic crosses.**

# Punnett Squares

The gene combinations that might result from a genetic cross can be determined by drawing a diagram known as a **Punnett square**.



**Punnett squares can be used to predict and compare the genetic variations that will result from a cross.**

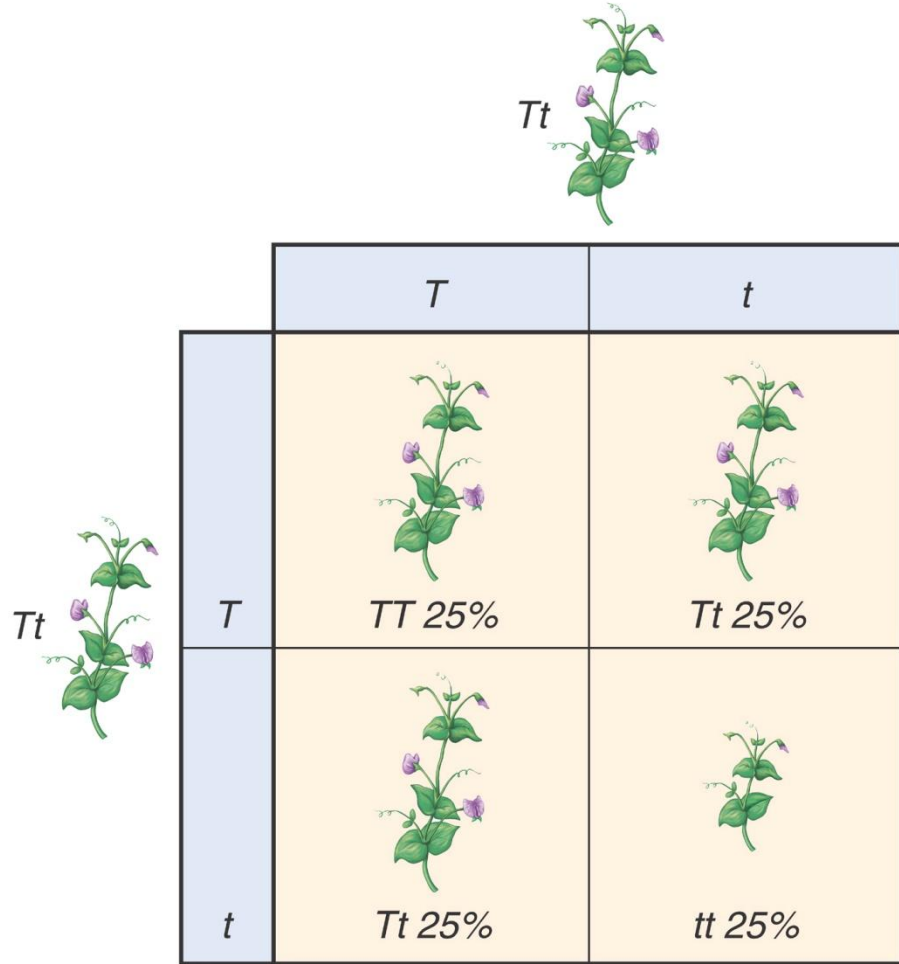
A capital letter represents the dominant allele for tall.

A lowercase letter represents the recessive allele for short.

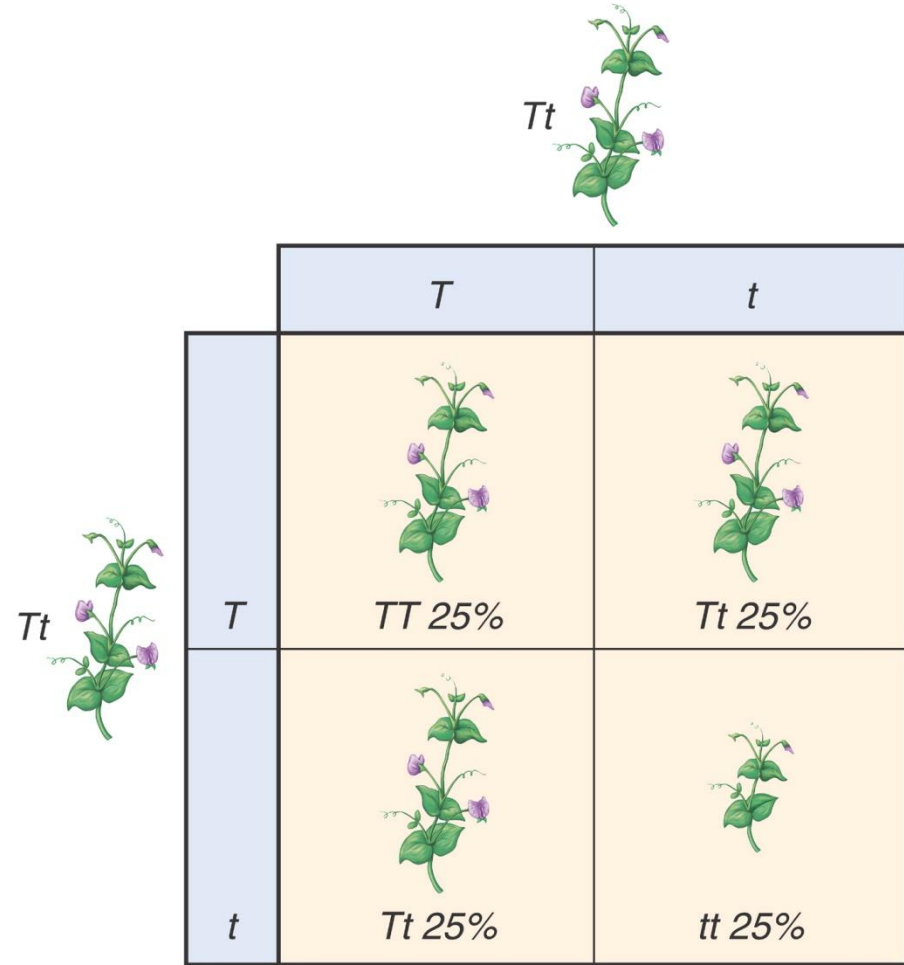
In this example,

$T$  = tall

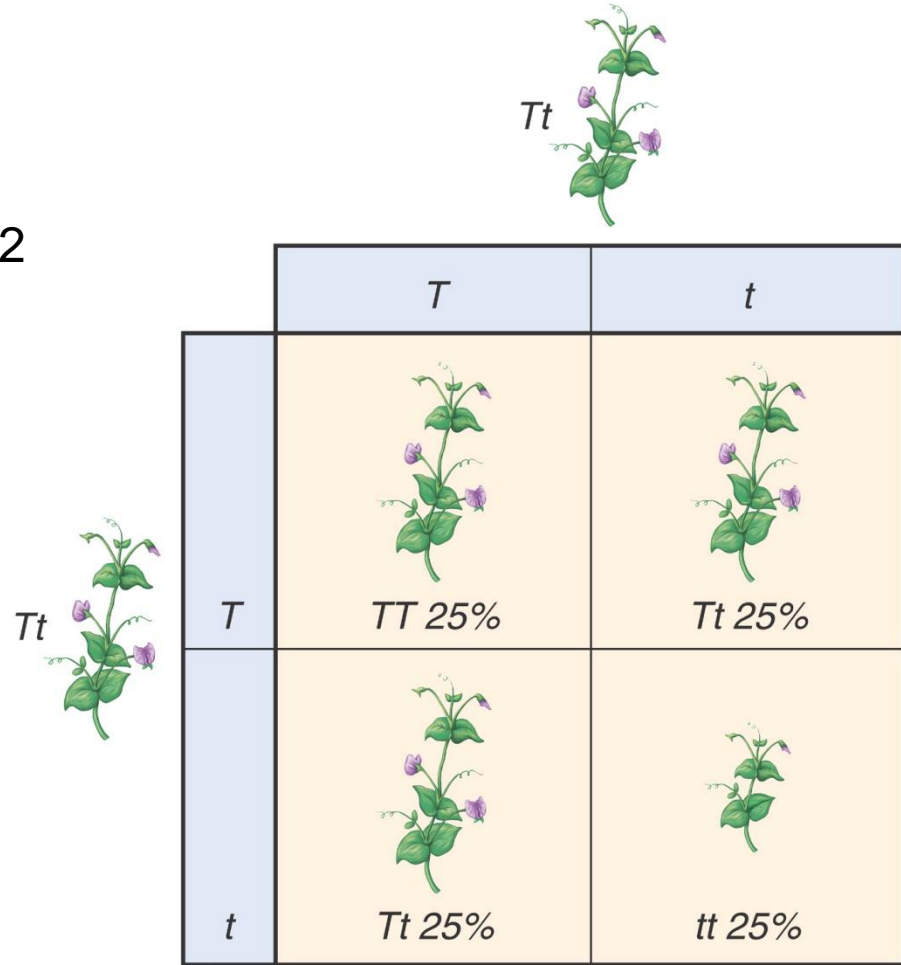
$t$  = short



Gametes produced by each  $F_1$  parent are shown along the top and left side.



Possible gene combinations for the F<sub>2</sub> offspring appear in the four boxes.



The plants have different genotypes ( $TT$  and  $Tt$ ), but they have the same phenotype (tall).

 $TT$ 

Homozygous

 $Tt$ 

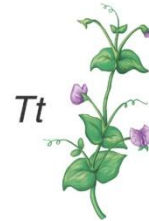
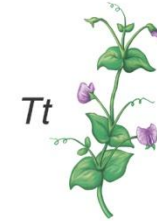
Heterozygous





# Probability and Segregation

One fourth (1/4) of the F<sub>2</sub> plants have two alleles for tallness (*TT*).

2/4 or 1/2 have one allele for tall (*T*), and one for short (*t*).

One fourth (1/4) of the F<sub>2</sub> have two alleles for short (*tt*).



	<i>T</i>	<i>t</i>
<i>T</i>	 <i>TT</i> 25%	 <i>Tt</i> 25%
<i>t</i>	 <i>Tt</i> 25%	 <i>tt</i> 25%



## Probabilities Predict Averages

Probabilities predict the average outcome of a large number of events.

Probability cannot predict the precise outcome of an individual event.

In genetics, the larger the number of offspring, the closer the resulting numbers will get to expected values.

# 11-2 Section QUIZ

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**Section QUIZ**

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## 11-2 Section QUIZ

**1** Probability can be used to predict

- A**
- a. average outcome of many events.
  - b. precise outcome of any event.
  - c. how many offspring a cross will produce.
  - d. which organisms will mate with each other.

## 11-2 Section QUIZ

**2** Compared to 4 flips of a coin, 400 flips of the coin is

- A**
- a. more likely to produce about 50% heads and 50% tails.
  - b. less likely to produce about 50% heads and 50% tails.
  - c. guaranteed to produce exactly 50% heads and 50% tails.
  - d. equally likely to produce about 50% heads and 50% tails.

## 11-2 Section QUIZ

**3** Organisms that have two different alleles for a particular trait are said to be

a. hybrid.

**A** b. heterozygous.

c. homozygous.

d. recessive.

## 11-2 Section QUIZ

**4** Two  $F_1$  plants that are homozygous for shortness are crossed. What percentage of the offspring will be tall?

a. 100%

b. 50%

**A** c. 0%

d. 25%

## 11-2 Section QUIZ

- 5 The Punnett square allows you to predict
- a. only the phenotypes of the offspring from a cross.
  - b. only the genotypes of the offspring from a cross.
  - A** c. both the genotypes and the phenotypes from a cross.
  - d. neither the genotypes nor the phenotypes from a cross.

**END OF SECTION**