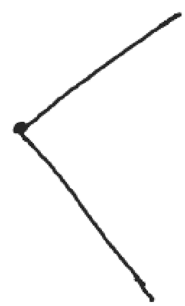
	7. *Tree Graphs* are a way of organizing all possible sequences of outcomes. For example, tree graph below shows all possible families of exactly three children (with no twins or triplets). Each G means a girl was born, and each B means a boy was born. In the United States, the probabilities that a girl is born approximately 49%.  a. Use the graph to find the probability that a family of three children will consist of two girls and a boy (not necessarily born in that order).

What you will learn about:
Finding Probabilities in Situations with Conditions

P(Snakers | Girl)

$\frac{\# \text{Sneakes}}{\text{Girl}} = \frac{8}{13}$

P(Girls | Sneakers)

$\frac{8}{20}$

1. Count the number of students in your classroom who are wearing sneakers. Count the number of girls. Count the number of students who are wearing sneakers and are girls. Record the number of students who fall into each category.

	Wearing Sneakers	Not Wearing Sneakers	Total
9 Boy	12	5	17
6 Girl	8	5	13
Total	20	10	30

$\frac{8}{13} \approx .615$

a. Suppose you select a student at random from your class. What is the probability that the student is wearing sneakers?

$\frac{20}{30} = \frac{2}{3}$

b. Suppose you select a student at random from your class. What is the probability that the student is a girl? $\frac{13}{30}$

P(Sneakers and Girl)

P(Sneakers) · P(Girl)

c. Does the Multiplication Rule correctly compute the probability that the student is wearing sneakers and is a girl?

$\left(\frac{2}{3}\right) \cdot \left(\frac{13}{30}\right) = \frac{26}{90} = \frac{13}{45} \approx .288$

d. How is this situation different from previous situations in which the Multiplication Rule gave the correct probability?

May not be Independent

P(A|B)

Conditional Probability

"Probability of A Given B happens"

2. The phrase "the probability event a occurs given event B occurs" is written symbolically as P $(A|B)$. This **conditional probability** sometimes is read as "the probability of A given B". The table below categorizes the preferences of 300 students in a junior class about plans for their prom.

B → becomes Bottom # of Fraction

$128+153-73$

$73+55+80$

		Preference for Location		
		Hotel	Rec Center	Total
Preference for Band	Hip-Hop	73	80	153
	Classic Rock	55	92	147
Total		128	172	300

Suppose you pick a student at random from this class. Find each of the following probabilities.

a. P(*prefers hotel*) $= \frac{128}{300} = \frac{32}{75}$

b. P(*prefers hip-hop band*) $= \frac{153}{300} = \frac{51}{100}$

c. P(*prefers hotel* *__and__* *prefers hip-hop band*) $= \frac{73}{300}$

d. P(*prefers hotel* *__or__* *prefers hip-hop*) $\frac{208}{300} = \frac{52}{75}$

e. $P(\overset{A}{prefers\ hotel} | \overset{B}{prefers\ hip-hop\ band})$ $\frac{73}{153}$

f. $P(prefers\ hip-hop\ band | prefers\ hotel)$ $\frac{73}{128}$

3. Recall that events A and B are independent if knowing whether one of the events occurs does not change the probability that the other event occurs.

a. Using the data from problem 1, suppose you pick a student at random. Find $P(wearing\ sneakers|is\ a\ girl)$. How does this compare to *P(wearing sneakers)*?

b. Are the events *wearing sneakers and is a girl independent*? Why or why not?