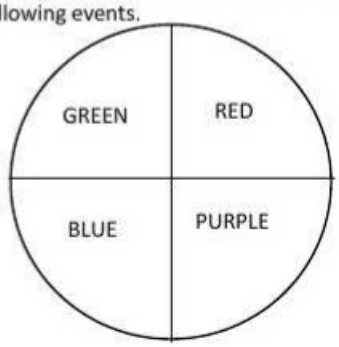
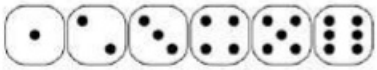
Unit 5: Probability — 5.2 Independent and Dependent Events Notes
Name: _____ Date: _____ Period: _____

Independent Events

- **A** occurring does NOT affect the probability of **B** occurring
- "$\cap$" or "and" means to multiply
- Notation
  - P(A and B) = P(A) · P(B)
  - P(A ∩ B) = P(A) · P(B)

Example 1: Participants in a game must roll a fair, six-sided die, then spin the spinner. Find the probability of the following events.





a) P(6 and red)

$\frac{1}{6} \cdot \frac{1}{4} = \frac{1}{24}$

b) P(odd# and purple)

$\frac{3}{6} \cdot \frac{1}{4} = \frac{3}{24} \div 3 = \frac{1}{8}$

c) P(even # and not green)

$\frac{3}{6} \cdot \frac{3}{4} = \frac{9}{24} \div 3 = \frac{3}{8}$

d) P(multiple of 2 and red or green)

$\frac{3}{6} \cdot \frac{2}{4} = \frac{6}{24} \div 6 = \frac{1}{4}$

Example 2: Cristian is taking art and music as electives. There are 4 art teachers, 3 of which are male, and 5 music teachers, 2 of which are female.

3 male

a) How many possible outcomes are there for his elective schedule?

$4 \cdot 5 = 20$

b) What is the possibility that his music teacher will be female?

$\frac{2}{5}$

c) What is the possibility that both teacher will be male?

$\frac{3}{4} \cdot \frac{3}{5} = \frac{9}{20}$

Dependent Events

- **A** occurring Affect the probability of **B** occurring
- You will see the words "WITHOUT Replacement"
- "2nd" Still means to MULTIPLY!
- Notation
  - P(A and B) = P(A) · P(B given A)
  - $P(A \cap B) = P(A) \cdot P(B \mid A)$

Example 1: A drawer contains 15 socks; 6 of which are blue socks, 8 of which are white socks, and 1 is purple.

a) If two socks are drawn (without replacement), what is the probability that a pair of blue socks will be drawn? ~~15~~ 14 socks, ~~6~~ 5 blue $\frac{6}{15} \cdot \frac{5}{14} = \frac{30}{210} = \boxed{\frac{1}{7}}$

b) If two socks are drawn (without replacement), what is the probability that a pair of white socks will be drawn? ~~15~~ 14 socks, ~~8~~ 7 white $\frac{8}{15} \cdot \frac{7}{14} = \frac{56}{210} = \boxed{\frac{4}{15}}$

Example 2: There are 8 blue marbles, 9 orange marbles, and 6 yellow marbles in a bag. It is equally likely that any marble will be drawn from the bag. 8 + 9 + 6 = 23 marbles

a) What is the probability of drawing a blue marble? $\frac{8}{23}$

b) If three marbles are drawn (without replacement), what is the probability of drawing all orange marbles? ~~23~~ 22 21 marbles, ~~9~~ 8 7 orange $\frac{9}{23} \cdot \frac{8}{22} \cdot \frac{7}{21} = \frac{504}{10626} = \boxed{\frac{12}{253}}$

c) If two marbles are drawn (without replacement), what is the probability of not drawing 2 yellow marbles? ~~23~~ 22 marbles, ~~17~~ 16 not yellow $\frac{17}{23} \cdot \frac{16}{22} = \frac{272}{506} = \boxed{\frac{136}{253}}$

Example 3: Are the events Independent or Dependent?

1: $P(A) = \frac{3}{5}\ P(B) = \frac{3}{5}\ P(A \text{ and } B) = \frac{9}{25}$ ✓

$\frac{3}{5} \cdot \frac{3}{5} = \frac{9}{25}$ same

Independent Events

2: $P(A) = \frac{1}{4}\ P(B) = \frac{1}{2}\ P(A \text{ and } B) = \frac{11}{80}$

$\frac{1}{4} \cdot \frac{1}{2} = \frac{1}{8}$ Not same

Dependent Events