Name: Key Period: Date

Probability with Compound Events (Independent and Dependent)

Compound Events refer to 2 or more events occurring.
To find the probability of **compound events,** multiply the probability of each of the events together.

Ex. 1: Suppose you have a bag containing 2 black marbles and 3 red marbles. You reach into the bag, select a marble, see what color it is and replace it in the bag (Event #1). Then you repeat this process (Event #2). What is the probability of picking a red marble both times?

First you need to find the probability of picking a red marble the first time (or for the Event #1).

$$P(\text{red}) = \frac{3}{5} \quad \left(\frac{3 \text{ red marbles}}{5 \text{ total marbles}}\right)$$

Since the probability of picking a red marble once is $\frac{3}{5}$, the probability of picking a red marble the second time is again $\frac{3}{5}$.

Therefore, the probability of the **compound event** of picking a red marble both times is the product of the two event probabilities.

$$\frac{3}{5} \times \frac{3}{5} = \frac{9}{25}$$

Since the first marble was **replaced** back in the bag before the second marble was drawn, the probability of the second drawing is **independent** of the probability of the first drawing. These are referred to **as independent events** --- in other words, the outcome of one event does not affect the outcome of the other event.

Ex. 2: Suppose you have a bag containing 2 black marbles and 3 red marbles. You reach into the bag, select a marble, see what color it is but **do not replace it** in the bag (Event #1). Then you reach in and select another marble. (Event #2). What is the probability of picking a red marble both times?

The probability of picking a red marble the first time (or for the Event #1) is the same as it was in Ex. 1 ---- 3 out of 5.

$$P(\text{red}) = \frac{3}{5} \quad \left(\frac{3 \text{ red marbles}}{5 \text{ total marbles}}\right)$$

However, since the first marble was not replaced back in the bag, the probability of picking a red marble the second time is **dependent** on the outcome of the first drawing.
Suppose we did pick a red marble and did not put it back in the bag. Now there are only 2 red marbles and 2 black marbles in the bag, and the probability of picking a red marble the second time (Event #2) is

$$P(\text{red}) = \frac{2}{4} \quad \left(\frac{2 \text{ red marbles}}{4 \text{ total marbles}}\right)$$

Therefore, the probability of the **compound event** of picking a red marble both times is the product of the two **dependent event** probabilities.

$$\frac{3}{5} \times \frac{2}{4} = \frac{6}{20} = \frac{3}{10}$$

*** An **Independent Event** occurs with **replacement**.
A **Dependent Event** occurs **without replacement**.

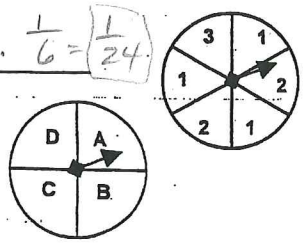
Name _____ Date _____

Probability with Compound Events (Independent and Dependent)
Practice

Describe the events by writing **I** for *independent event* or **D** for *dependent event.*

1. Ann draws a colored toothpick from a jar. Without replacing it, she draws a second toothpick. D
2. John rolls a six on a number cube and then flips a coin that comes up heads. I
3. Susie draws a card from a deck of cards and replaces it. She then draws a second card. I
4. Seth draws a colored tile from a bag, replaces it; draws a second tile from the bag, replaces it; and then draws a tile a third time from the bag. I
5. You draw a red marble from a bag, and then another red marble (without replacing the first marble)? D

Using the two spinners, find each **compound** probability.



6. P(A and 2) $\frac{1}{4} \cdot \frac{2}{6} = \frac{2}{24} = \frac{1}{12}$ 7. P(D and 1) $\frac{1}{4} \cdot \frac{3}{6} = \frac{3}{24} = \frac{1}{8}$ 8. P(B and 3) $\frac{1}{4} \cdot \frac{1}{6} = \frac{1}{24}$
9. P(A and not 2) $\frac{1}{4} \cdot \frac{4}{6} = \frac{4}{24} = \frac{1}{6}$

A box contains 3 red marbles, 6 blue marbles, and 1 white marble. The marbles are selected at random, one at a time, and are **not replaced**. Find each **compound** probability.

10. P(blue and red) $\frac{6}{10} \cdot \frac{3}{9} = \frac{18}{90} = \frac{9}{45} = \frac{1}{5}$ 11. P(blue and blue) $\frac{6}{10} \cdot \frac{5}{9} = \frac{30}{90} = \frac{1}{3}$ 12. P(red and white and blue) $\frac{3}{10} \cdot \frac{1}{9} \cdot \frac{6}{8} = \frac{18}{720} = \frac{1}{40}$
13. P(red and red and red) $\frac{3}{10} \cdot \frac{2}{9} \cdot \frac{1}{8} = \frac{6}{720} = \frac{1}{120}$ 14. P(white and red and white) $\frac{1}{10} \cdot \frac{3}{9} \cdot \frac{0}{8} = \frac{0}{720} = 0$

Suppose that two tiles are drawn from the collection shown at the right. The first tile is replaced before the second is drawn. Find each **compound** probability.

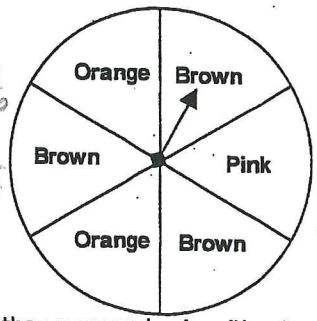
A	R	R	R	C
A	R	R	R	C
E	E	E	E	C

15. P(A and A) $\frac{2}{15} \cdot \frac{2}{15} = \frac{4}{225}$ 16. P(R and C) $\frac{6}{15} \cdot \frac{3}{15} = \frac{18}{225} = \frac{2}{25}$ 17. P(A and not R) $\frac{2}{15} \cdot \frac{9}{15} = \frac{18}{225} = \frac{2}{25}$

Suppose that two tiles are drawn from the same collection shown above. The first tile is **not** replaced before the second is drawn. Find each **compound** probability.

18. P(A and A) $\frac{2}{15} \cdot \frac{1}{14} = \frac{2}{210} = \frac{1}{105}$ 19. P(R and C) $\frac{6}{15} \cdot \frac{3}{14} = \frac{18}{210} = \frac{9}{105} = \frac{3}{35}$ 20. P(A and not R) $\frac{2}{15} \cdot \frac{9}{14} = \frac{18}{210} = \frac{9}{105}$

Use the spinner to the right for the next two problems.



21. If you spin the spinner twice, what is the probability of spinning orange then brown? $\frac{2}{6} \cdot \frac{3}{6} = \frac{6}{36} = \frac{1}{6}$
22. If you spin the spinner twice, what is the probability of spinning brown both times? $\frac{3}{6} \cdot \frac{3}{6} = \frac{9}{36} = \frac{1}{4}$
23. Kevin had 6 nickels and 4 dimes in his pocket. If he took out one coin and then a second coin without replacing the first coin ---
    (a) what is the probability that both coins were nickels? $\frac{6}{10} \cdot \frac{5}{9} \longrightarrow \frac{30}{90} = \frac{3}{9} = \frac{1}{3}$
    (b) what is the probability that both coins were dimes? $\frac{4}{10} \cdot \frac{3}{9} \longrightarrow \frac{12}{90} = \frac{4}{30} = \frac{2}{15}$
    (b) what is the probability that the first coin was a nickel and the second a dime? $\frac{24}{90} = \frac{8}{30} = \frac{4}{15}$

$\frac{6}{10} \cdot \frac{4}{9} =$?

$\frac{18}{225} = \frac{2}{25}$

$9\overline{)225}$ $\quad 25$
$\quad 18$
$\quad 45$