

NAME: \_\_\_\_\_

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PERIOD: \_\_\_\_\_

## How Do You Find the Probability of Independent Events?

(Topic #8)

Compound events may be *independent events* or *dependent events*. Events are **independent events** if the outcome of one event does *not* affect the outcome of another.

*For example*, if you throw a die and a coin, the number on the die does *not* affect whether the result you get on the coin is a head or tail.

### Probability of Independent Events

The probability of two independent events can be found by multiplying the probability of the first event by the probability of the second event.

$$P(A \text{ and } B) = P(A) \cdot P(B)$$

NOTE: The problem will often use the phrase "*with replacement*".

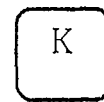
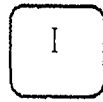
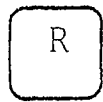
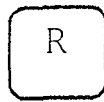
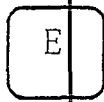
### EXAMPLE 1: Finding the Probability of Independent Events

In a box, there are 12 bells (3 are red, 4 are blue, and 5 are green). What is the probability of picking a red, then a blue, *with replacement*.

**PRACTICE: Read each question carefully. Show your work.**

<p>1. In a file, there are 7 science papers, 9 English papers, and 8 history papers. If you select 2 papers at random, what is the probability of getting a science then a history paper from the file, <i>with replacement</i>.</p>		<p>2. You roll a die and flip a coin. What is the probability of flipping a head and getting a number greater than 2?</p>
<p>3. The letters from the word "distributive" are written on slips of paper. What is the probability of picking a vowel then picking a vowel, <i>with replacement</i>?</p>		<p>4. Two die are rolled. What is the probability of rolling a 2 on one die and a # greater than 4 on the other?</p>
<p>5. If a die is thrown twice, find the probability of rolling two 5's.</p>		<p>6. In a class of 40 students, 8 are in the drama club and 12 are in the art club. If a student is selected at random, what is the probability that the selected student is in the drama club?</p>

7. The following cards are placed into a bag. Find the following probabilities if you pick one card, *replace it*, and then pick another card, without looking:



a)  $P(M, M)$

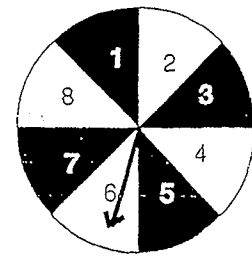
b)  $P(R, \text{vowel})$

c)  $P(\text{vowel, consonant})$

d)  $P(R, D)$

8. Spin the spinner to the right **three** times and find the following probabilities :

a)  $P(\text{Black, black, white})$



b)  $P(\text{even \#, not a 3, 5})$

c)  $P(\text{prime \#, \# less than 9, 9})$

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### **HOMEWORK - (Topic #8)**

#### **Finding the Probability of Independent Events**

Read each question carefully. *Show your work.*

**A number cube is rolled and a marble is selected at random from a bag that contains 2 yellow marbles, 2 red marbles, 2 green marbles, 1 blue marble, and 1 purple marble. Find each probability.**

1. P (1 and red)

2. P (3 and purple)

3. P (even and yellow)

4. P (odd and *not* green)

5. A carnival game wheel has 12 equal sections. One of the sections contains a star. To win a prize, players must land on the section with the star on two consecutive spins. What is the probability of a player winning?

**A number cube is rolled and a letter is selected from the word AMERICA. Find each probability.**

6. P (less than 4 and vowel)

7. P (greater than 1 and a consonant)

8. A number cube is rolled and a coin is tossed. What is the probability of the cube landing on 5 or 6 and the coin landing on heads?

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## How Do You Find the Probability of Independent Events? (Topic #8)

Compound events may be *independent events* or *dependent events*. Events are **independent events** if the outcome of one event does *not* affect the outcome of another.

*For example*, if you throw a die and a coin, the number on the die does *not* affect whether the result you get on the coin is a head or tail.

### Probability of Independent Events

The probability of two independent events can be found by multiplying the probability of the first event by the probability of the second event.

$$P(A \text{ and } B) = P(A) \cdot P(B)$$

NOTE: The problem will often use the phrase "**with replacement**".

### EXAMPLE 1: Finding the Probability of Independent Events

In a box, there are 12 bells (3 are red, 4 are blue, and 5 are green). What is the probability of picking a red, then a blue, *with replacement*.

$$P(\text{red, blue}) = P(\text{red}) \times P(\text{blue})$$

$$\frac{3}{12} \cdot \frac{4}{12}$$

$$\frac{12}{144} = \frac{1}{12}$$

**PRACTICE: Read each question carefully. Show your work.**

1. In a file, there are 7 science papers, 9 English papers, and 8 history papers. If you select 2 papers at random, what is the probability of getting a science then a history paper from the file, with replacement. TOTAL = 24

$$P(\text{science, history})$$

$$P(\text{science}) \times P(\text{history})$$

$$\frac{7}{24} \cdot \frac{8}{24}$$

$$\frac{7}{72}$$

2. You roll a die and flip a coin. What is the probability of flipping a head and getting a number greater than 2?

$$P(\text{head, } \# > 2)$$

$$P(\text{head}) \times P(\# > 2) \leftarrow$$

$$\frac{1}{2} \cdot \frac{4}{6}$$

$$\frac{1}{3}$$

3. The letters from the word "distributive" are written on slips of paper. What is the probability of picking a vowel then picking a vowel, with replacement? TOTAL = 12

$$P(\text{vowel, vowel})$$

$$P(\text{vowel}) \times P(\text{vowel})$$

$$\frac{5}{12} \cdot \frac{5}{12}$$

$$\frac{25}{144}$$

4. Two die are rolled. What is the probability of rolling a 2 on one die and a # greater than 4 on the other?

$$P(2, \# > 4)$$

$$P(2) \times P(\# > 4) \leftarrow$$

$$\frac{1}{6} \cdot \frac{2}{6}$$

$$\frac{1}{18}$$

5. If a die is thrown twice, find the probability of rolling two 5's.

$$P(5, 5)$$

$$P(5) \times P(5) \leftarrow$$

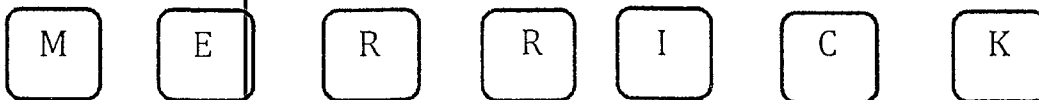
$$\frac{1}{6} \cdot \frac{1}{6}$$

$$\frac{1}{36}$$

6. In a class of 40 students, 8 are in the drama club and 12 are in the art club. If a student is selected at random, what is the probability that the selected student is in the drama club?

$$P(\text{drama}) = \frac{8}{40} = \frac{1}{5}$$

7. The following cards are placed into a bag. Find the following probabilities if you pick one card, *replace it*, and then pick another card, without looking:



a)  $P(M, M) = P(M) \times P(M)$       b)  $P(R, \text{vowel}) = P(R) \times P(\text{vowel})$

$$\frac{1}{7} \cdot \frac{1}{7}$$

$$\frac{1}{49}$$

$$\frac{2}{7} \cdot \frac{2}{7}$$

$$\frac{4}{49}$$

c)  $P(\text{vowel}, \text{consonant})$

$$P(\text{vowel}) \times P(\text{consonant})$$

$$\frac{2}{7} \cdot \frac{5}{7}$$

$$\frac{10}{49}$$

d)  $P(R, D)$

$$P(R) \times P(D)$$

$$\frac{2}{7} \cdot \frac{0}{7}$$

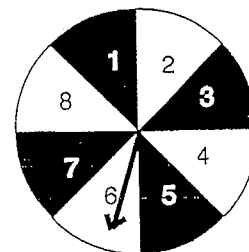
$$0$$

8. Spin the spinner to the right **three** times and find the following probabilities :

a)  $P(\text{Black}, \text{black}, \text{white}) = P(\text{black}) \times P(\text{black}) \times P(\text{white})$

$$\frac{4}{8} \cdot \frac{4}{8} \cdot \frac{4}{8}$$

$$\frac{1}{8}$$



b)  $P(\text{even \#, not a 3, or 5}) = P(\text{even \#}) \times P(\text{not a 3}) \times P(5)$

$$\frac{4}{8} \cdot \frac{7}{8} \cdot \frac{1}{8}$$

$$\frac{7}{128}$$

c)  $P(\text{prime \#, ~~3~~ less than 9, 9})$

$$P(\text{prime \#}) \times P(\# < 9) \times P(9)$$

$$\frac{4}{8} \cdot \frac{8}{8} \cdot \frac{0}{8}$$

$$0$$

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### HOMEWORK - (Topic #8)

#### Finding the Probability of Independent Events

Read each question carefully. Show your work.

A number cube is rolled and a marble is selected at random from a bag that contains 2 yellow marbles, 2 red marbles, 2 green marbles, 1 blue marble, and 1 purple marble. Find each probability. TOTAL = 8

1.  $P(1 \text{ and red}) = P(1) \times P(\text{red})$       2.  $P(3 \text{ and purple}) = P(3) \times P(\text{purple})$

$$\frac{1}{6} \cdot \frac{2}{8} = \frac{1}{24}$$

$$\frac{1}{6} \cdot \frac{1}{8} = \frac{1}{48}$$

3.  $P(\text{even and yellow}) = P(\text{even}) \times P(\text{yellow})$       4.  $P(\text{odd and not green}) = P(\text{odd}) \times P(\text{not green})$

$$\frac{3}{6} \cdot \frac{2}{8} = \frac{1}{8}$$

$$\frac{3}{6} \cdot \frac{6}{8} = \frac{3}{8}$$

5. A carnival game wheel has 12 equal sections. One of the sections contains a star. To win a prize, players must land on the section with the star on two consecutive spins. What is the probability of a player winning?

$$P(2 \text{ stars}) = P(\text{star}) \times P(\text{star})$$

$$\frac{1}{12} \cdot \frac{1}{12} = \frac{1}{144}$$

A number cube is rolled and a letter is selected from the word AMERICA. Find each probability. TOTAL = 7

6.  $P(\text{less than 4 and vowel})$

$$P(\# < 4) \times P(\text{vowel}) = \frac{3}{6} \cdot \frac{4}{7} = \frac{2}{7}$$

7.  $P(\text{greater than 1 and a consonant})$

$$P(\# > 1) \times P(\text{consonant}) = \frac{5}{6} \cdot \frac{3}{7} = \frac{5}{14}$$

8. A number cube is rolled and a coin is tossed. What is the probability of the cube landing on 5 or 6 and the coin landing on heads?

$$P(5 \text{ or } 6, \text{ heads}) = P(5 \text{ or } 6) \times P(\text{heads}) = \frac{2}{6} \cdot \frac{1}{2} = \frac{1}{6}$$