Topic: Measuring Uncertainty with Probability

Probability - Exercise

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Recall: Equally likely outcomes

When all possible outcomes are equally likely,

$$P(E) = \frac{n(E)}{n(S)}$$

where $n(E) =$ no. of outcomes in E;   and
$n(S) =$ no. of outcomes in S

Recall: Conditional Probability

Recall:

Definition: The probability of an event (A) occurring when it is known that some event (B) has already occurred is called a **conditional probability**.

- The **conditional** probability of event A <u>given that event B has occurred</u> is

$$P(A|B) = \frac{P(A \cap B)}{P(B)} \qquad \checkmark$$

Exercise: Probability Solution

Exercise: Two fair dice are rolled.

1. Draw up a table to show all the possible outcomes of the sums.

2. What is the probability of getting a 1 on Die 1 and a 3 on Die 2?

3. What is the probability that the sum of faces is 4?

4. Given that the sum is 4, what is the probability of "doubles"?

Exercise: Probability Solution

1. Table of possible outcomes of the sums.   Die 2.

Die 1

	•	••	•••	••••	•••••	••••••
•	2	3	4	5	6	7
••	3	4	5	6	7	8
•••	4	5	6	7	8	9
••••	5	6	7	8	9	10
•••••	6	7	8	9	10	11
••••••	7	8	9	10	11	12

36 possible outcomes

Exercise: Probability Solution cont.

2. What is the probability of getting a 1 on Die 1 and a 3 on Die 2?

$$P(1, 3) = \frac{1}{36}$$

Exercise: Probability Solution cont.

3. What is the probability that the sum of faces is 4?

$$1 + 3 \overset{sum.}{=} 4$$

$$2 \cdot 2 = 4$$

$$3 + 1 = 4$$

$$P(\text{sum is } 4) = \frac{n(E)}{n(S)}$$

$$= \frac{3}{36}$$

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

	2	3	4	5	6	7
	3	4	5	6	7	8
	4	5	6	7	8	9
	5	6	7	8	9	10
	6	7	8	9	10	11
	7	8	9	10	11	12

Exercise: Probability Solution cont.

(4) Given that the sum is 4, what is the probability of "doubles"?

$$P(\text{doubles} \mid \text{sum is 4})$$

$$= P(A \mid B)$$

$$P(A \mid B) = \frac{P(A \cap B)}{P(B)}$$

$$= \frac{1/36}{1/12}$$

$$= \frac{1}{36} \times \frac{12}{1}$$

$$= \frac{1}{3} \checkmark$$

	•	••	•••	••••	•••••	••••••
•	2	3	4	5	6	7
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•••	4	5	6	7	8	9
••••	5	6	7	8	9	10
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