

Probability

Name: _____

Date: _____

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Modes of Representation and the Enumeration of Possible Outcomes

1. A skate shop in Verdun sells a starter kit. The buyer picks one helmet colour — black, teal or white — and one size of knee pads — medium or large.
 - a) Draw a tree diagram showing every possible kit.
 - b) Write out the complete list of kits, using a pair such as (black, medium).
 - c) How many different kits are possible?

Probability

2. A school raffle sells 40 tickets, numbered 1 to 40, and one winning ticket is drawn at random. Léa bought the 6 tickets numbered 12 to 17.

- a) Describe the random experiment, and say how many outcomes the sample space contains.
- b) Describe the event “Léa wins”, and say how many outcomes it contains.
- c) Find the probability that Léa wins. Give it as a fraction in lowest terms, as a decimal and as a percentage.

Random Experiments Where Order Matters and Where Order Does Not Matter

3. The four members of a robotics team are Anaïs, Bruno, Chloé and Dimitri.

- a) Two of them are chosen to carry the robot to the bus. Here the order of the choice does not matter. List all the possible pairs and count them.
- b) Two of them are chosen instead as captain and then as assistant captain. Here the order does matter. Count the possibilities.
- c) Which of the two counts is larger, and by how many times? Explain why.

Random Experiments With One or More Steps

4. A game has two steps. First you spin a spinner with three equal sectors numbered 1, 2 and 3; then you flip a fair coin.
- a) Build a table showing every possible result of the game.
 - b) Find the probability of getting an even number *and* heads.
 - c) Find the probability of getting an odd number.

Random Experiments With and Without Replacement

5. A bag holds four tokens marked 1, 2, 3 and 4. A token is drawn, then a second one; the two numbers are written down in the order they come out.
- a) How many results are possible if the first token is put back before the second draw? And if it is not put back?
 - b) In each of the two versions, find the probability that the two numbers add up to 5.

Sample Space

- 6.** A carnival game flips a fair coin and rolls a four-sided die numbered 1 to 4.
- a) Write the sample space of this experiment, using set braces and pairs such as $(H, 3)$.
 - b) Event E is “the die shows a number greater than 2”. List the outcomes of E and find $P(E)$.
 - c) Event F is “the coin shows tails and the die shows 1”. Find $P(F)$.

The Concept of “Or” and “And” in Probability

- 7.** Twenty cards numbered 1 to 20 are shuffled and one is drawn at random. Event A is “the number is a multiple of 3” and event B is “the number is a multiple of 5”.
- a) List the outcomes of A and the outcomes of B .
 - b) Find $P(A \text{ and } B)$.
 - c) Find $P(A \text{ or } B)$.

The Intersection and Union of Sets

8. In a group of 30 students, 18 play hockey, 14 play soccer and 7 play both.

- a) Draw a Venn diagram with two overlapping circles and write the correct number in each of its four regions.
- b) How many students play neither sport?
- c) One student is chosen at random. Find the probability that the student plays exactly one of the two sports.

The Types of Probability - Secondary 1 and 2

9. Zoé spins a spinner with four equal sectors — red, blue, green and yellow — 150 times and records where it stops.

Sector	Red	Blue	Green	Yellow
Number of stops	41	36	39	34

- a) Find the theoretical probability of stopping on red.
- b) Find the experimental probability of stopping on red, rounded to three decimal places.
- c) Explain why the two values are not equal, and say which one Zoé should quote if she is asked “what are the chances of red?”

Types of Events - Secondary 1 and 2

10. A box holds ten tokens numbered 1 to 10, and one token is drawn at random. For each event below, give its probability and name the most precise type that applies, choosing from *certain*, *impossible*, *elementary* and *probable*:

- a) A : the number drawn is less than 11;
- b) B : the number drawn is 0;
- c) C : the number drawn is 7;
- d) D : the number drawn is even.

Then say whether D and the event E : “the number drawn is odd” are complementary, and justify your answer.

Synthesis — drawing on several sheets in this topic

11. A vending machine at the arena drops one bottle at random. The flavour is lime, cola or orange, all equally likely, and the size is small or large, both equally likely; the two choices do not affect each other.

- a) Represent the experiment with a table or a tree, and write the sample space.
- b) Find the probability of getting an orange bottle *or* a large bottle.
- c) Are “the bottle is small” and “the bottle is lime” compatible or incompatible? Justify.
- d) Name the event complementary to “the bottle is large”, and give its probability.

Want the harder problems and the worked solutions?

The *Challenge Problems* set and the *Answer Keys* for Probability — with the reasoning written out in full — are available at tutorinmontreal.ca.