

THE DICE RACE

A Grade 8 lesson about probability, intuition, and a fair-looking choice.

Let students make a prediction before calculating. The numbers land harder after the race.

INTEL

TIME: 30 minutes

WHERE IT FITS: Grade 8 Mathematics - probability

MATERIALS: projector, Dice Race simulation, slide with 2 red / 8 blue marbles

CORE QUESTION: If there are more choices, do they always have better odds?

BEFORE CLASS

Open the Dice Race simulation before class. Check that both one-die and two-dice races load, reset, and run to a winner. Prepare the marble-bag slide, then decide how you will collect the class prediction: a show of hands, thumbs up, or a quick verbal poll all work.

THE THINKING ARC

The lesson moves from a simple intuition to a broken intuition, then gives students a formula that explains what just happened. The first race makes “more choices means better odds” feel sensible. The second race makes that rule fail for a reason students can count.

The goal is not to hand students a probability rule first. Let the race create the question, let the marble bag make the idea visible, and then use the formula to close the loop.

PART 1 – THE RACES

STEP 1 – RACE 1: SET UP THE CHALLENGE

6 MIN

Open the one-die race. A die is rolled; the car matching the number moves forward one space. There are six cars, numbered 1 to 6. First to 15 spaces wins. Offer the class a challenge: you take cars 3 and 4; the class takes 1, 2, 5, and 6. Run the race.

TEACHER MOVE

Play this straight. Do not hint that the class has the advantage. The reaction in the next step matters more if the challenge felt like a real one.

STEP 2 – ASK WHO WAS FAVOURED

2 MIN

Ask: “Was I more likely to win, or were you? Why?” Draw out that the class had four cars to your two. Every number on one die is equally likely, so more cars means more ways to win. Name that intuition clearly; the next race is about to challenge it.

STEP 3 – RACE 2: CHANGE THE RULES

5 MIN

Switch to the two-dice race. The dice are added, so the cars are numbered 2 to 12. Ask: “Why is there no car 1?” This time take cars 6, 7, and 8. Give the class the other eight cars: 2, 3, 4, 5, 9, 10, 11, and 12. Run the race, then let pairs talk briefly: why do three cars keep doing so well?

WARNING – LET IT SIT

Race 2 is meant to feel a little wrong. Students have just built a reasonable rule: more cars means better odds. Do not resolve the surprise yet. Let it sit until the formula has something useful to explain.

PART 2 – MAKE THE ODDS VISIBLE

STEP 4 – USE THE MARBLE BAG

4 MIN

Show a transparent bag with 2 red marbles and 8 blue marbles. Ask: “Which colour is more likely to be picked? Why? Is picking red impossible?” This keeps the important ideas - likely, certain, and impossible - visible without the dice combinations getting in the way.

STEP 5 – INTRODUCE THE FORMULA

3 MIN

Name probability as a way to compare how many outcomes help an event happen with how many outcomes are possible altogether.

FORMULA

Probability of an event

$$P(\text{event}) = \frac{\text{favourable outcomes}}{\text{total outcomes}}$$

STEP 6 – CALCULATE P(RED)

3 MIN

Work it out together: 2 red marbles out of 10, so $P(\text{red}) = 2/10$. Ask whether the fraction can be simplified to $1/5$. Keep the focus on what the fraction means: red is possible, but it is not the most likely result.

STEP 7 – RETURN TO THE RACE

4 MIN

Ask: “Why did cars 6, 7, and 8 move so often, while 2 and 12 barely moved?” List the combinations for 2, 7, and 12. There is one way to make 2 and 12, but six ways to make 7. The total number of two-die outcomes stays 36; only the number of favourable outcomes changes.

CLOSING THE LOOP

The two-dice race did not break probability. It exposed a hidden assumption. More cars helped in Race 1 because every car represented one equally likely outcome. In Race 2, each car represents a different number of ways to make a sum.

EXIT TICKET

Exit prompt: In the two-dice race, why is car 7 more likely to move than car 2? Use the words favourable outcomes and total outcomes in your explanation.