



EduTrend Contents

EDUTECH · MATHEMATICS · MIDDLE SCHOOL

Fair Game?

Test a dice game and compare experiment with theory

Ages 12–14

Level: Intermediate

60 minutes

Pairs · up to 30

Activity 04

Inside: activity at a glance · step-by-step session plan · facilitator notes · 3 student worksheets · assessment checklist

ACTIVITY 04 · AT A GLANCE

Fair Game?

Pairs play a game: roll two dice and find the difference. Player A wins on 0, 1 or 2; player B wins on 3, 4 or 5. After 30 rounds they decide if it seems fair. They build a sample space table of all 36 outcomes, calculate probabilities, pool class results and compare experiment with theory.

Learning outcomes

By the end of the session students can:

- record experimental results;
- list a sample space;
- calculate theoretical probability;
- compare experiment with theory.

KEY WORDS

probability · outcome · sample space · relative frequency · fair · expected

CURRICULUM LINKS

Science: repeated trials.
Computing: simulations.
Citizenship: games of chance.

1**NOTICE**

What do we see?

2**REPRESENT**

Concrete, picture, symbol

3**EXPLORE**

Try and look for patterns

4**CONJECTURE**

What might always be true?

5**JUSTIFY**

Explain why

6**CONNECT**

Where else does it apply?

Materials (per pair)

- 2 dice
- Tally chart
- Sample space grid
- Worksheets 1, 2 and 3

Before the session

- Check dice.
- Print grids.
- Prepare a class results table.
- Print worksheets.

SAFETY

Roll dice in a tray or box lid to keep them on the desk.

ACTIVITY 04 · SESSION PLAN

Step by step

Pooling class data shows relative frequency moving closer to theory as trials increase.

Time	What happens	Say or ask
0–8 min Hook	Explain the game.	<i>"Who do you think will win?"</i>
8–22 min Play	30 rounds with tallies.	<i>"Does it seem fair?"</i>
22–38 min Theory	Sample space table.	<i>"How many outcomes give 0, 1 or 2?"</i>
38–50 min Pool	Class data.	<i>"What happens with more trials?"</i>
50–60 min Redesign	Make the game fair.	<i>"How would you change it?"</i>

CHALLENGE CARD (print or copy onto the board)

Decide whether a dice game is fair using experiment and theory, then redesign it to make it fair and justify your design.

ACTIVITY 04 · FACILITATOR NOTES

The maths know-how in brief

The difference between two dice has 36 equally likely outcomes. Differences of 0, 1 or 2 occur in 24 of them, so player A wins with probability $24/36 = 2/3$. The game is not fair.

Relative frequency from an experiment tends to get closer to the theoretical probability as the number of trials increases, but small samples can vary widely.

Common ideas to listen for

- “Each difference is equally likely.” Count the outcomes.
- “Thirty games prove it.” More trials are more reliable.
- “A 6 is harder to roll.” Each face is equally likely on a fair die.

Adapting the activity

Support

Provide a partly completed sample space.

Stretch

Design a fair game using the sum of two dice.

WORKSHEET 1

Game results

Name: _____

Class: _____ Date: _____

Tally 30 rounds.

Game results

Difference	Tally	Total
0		
1		
2		
3		
4		
5		

WORKSHEET 2

Sample space

Outcomes giving each difference.

Sample space

Difference	Outcomes	Probability
0		
1		
2		
3		
4		
5		

WORKSHEET 3

Fair redesign

Make the game fair.

Our new rules and why they are fair

FOR THE TEACHER

Assessment checklist

Use during the session. One sheet covers up to eight students; copy as needed.

Student	Records results	Lists sample space	Compares with theory

Suggested codes: W = working towards · E = expected · G = greater depth

ABOUT THIS ACTIVITY

Fair Game? is a sample activity from the EduTrend Contents Edutech Mathematics programme (middle school, level: intermediate). Every activity in the programme follows the same format: a practical challenge, a clear session plan, facilitator notes and ready-to-print worksheets, so that teachers, club leaders and parents can run it without extra preparation.

Full 15-, 20- and 32-week programmes are available from EduStore at edutrend.org.

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