# Same, same, but different

Students explore equivalent fractions by designing their own spinners and marble bags that have the same probability as a given event.

## Visible learning

Learning intentions should be displayed after the launch.

### Learning intentions

* To be able to recognise equivalent fractions.
* To understand how to generate equivalent fractions.

### Success criteria

* I can identify equivalent fractions.
* I can compare equivalent fractions.
* I can create equivalent fractions.

### Syllabus outcomes

A student:

* develops understanding and fluency in mathematics through exploring and connecting mathematical concepts, choosing and applying mathematical techniques to solve problems, and communicating their thinking and reasoning coherently and clearly **MAO-WM-01**
* represents and operates with fractions, decimals and percentages to solve problems **MA4-FRC-C-01**
* solves problems involving the probabilities of simple chance experiments **MA4-PRO-C-01**

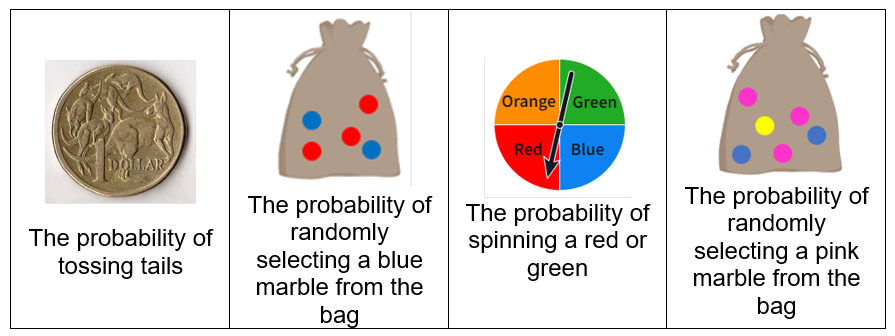
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## Activity structure

### Launch

1. Display the following for all students and ask them to [Think-Pair-Share](https://app.education.nsw.gov.au/digital-learning-selector/LearningActivity/Card/645) which one doesn’t belong.

Figure 1 – Which one doesn’t belong?



1. After [Think-Pair-Share](https://app.education.nsw.gov.au/digital-learning-selector/LearningActivity/Card/645), poll the students using a [Mentimeter](https://www.mentimeter.com/) poll ([mentimeter.com](https://www.mentimeter.com/)) or a similar poll as to which one doesn’t belong.
2. Students could then share their reasoning behind their choices with the class.

This is an activity for students to explore events where some of the probabilities are equivalent fractions.

### Explore

1. In pairs or small groups, students complete Activity 1 of [Appendix A](#_Visual_representations_–). Students are to create visual representations of each event by firstly writing the probability of the events. An example has been provided.

Students could create the diagrams digitally using [Polypad](https://mathigon.org/polypad) fraction bars. ([mathigon.org/polypad](https://mathigon.org/polypad)). Polypad has a tutorial on [how to use the fraction tools](https://mathigon.org/task/tutorial-fractions), ([mathigon.org/task/tutorial-fractions](https://mathigon.org/task/tutorial-fractions)).

1. Students then use these visuals to generate more equivalent fractions by splitting their representations into a given number of parts or combining parts.
2. Prompting questions may include:
3. How many parts do I need in my visual representation?
4. Where is this number represented in the probability of the event, for example, numerator or denominator?
5. How many parts do I need to shade?
6. Where is this number represented in the probability of the event?

Students develop equivalent fractions and explore the relationship between the numerator and the denominator for each new fraction they create.

1. Following this they will complete Activity 2 from [Appendix A](#_Same,_same,_but) where they will create spinners and marble bags that give the same probability as the event in the first column.

Students may find it useful to use the Desmos activity [Fraction comparison](https://www.desmos.com/calculator/e11l4hytrz) ([bit.ly/Fraction\_Comparison](https://bit.ly/Fraction_Comparison)) to assist them to find equivalent fractions.

1. To conclude, conduct a class discussion:
2. Recall creating the marble bags and the spinners. What strategy did you use to create these?
3. Compare the spinners and marble bags to your visual representations and new fractions you have created. What do you notice? What do you wonder?

### Summarise

Using the Same, same, but different PowerPoint, explicitly define and explore equivalent fractions, for example, what they are, how to generate them and where do we see equivalent fractions in probability?

The explicit teaching technique used in the PowerPoint is Your turn. The first slide shows a number of representations of one-half, which should be displayed for the students and then use the following steps for the subsequent slides.

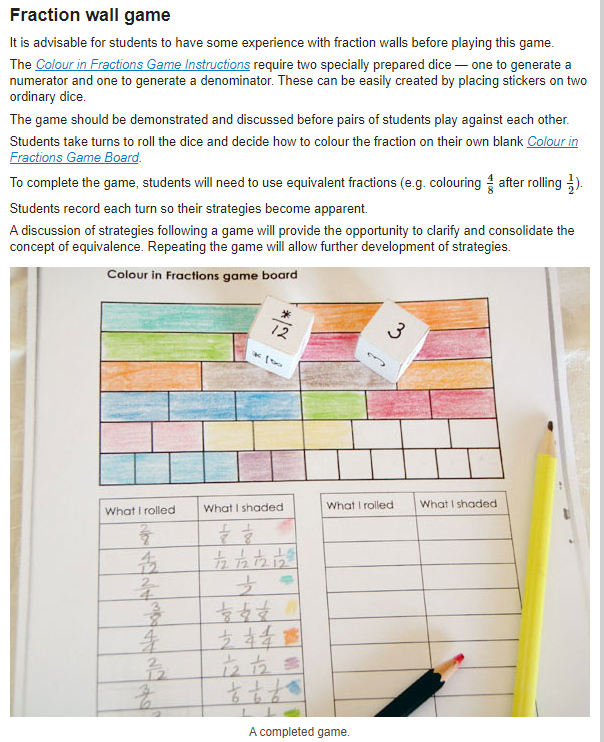
1. Reveal the question to students and its solution.
2. Students read in silence.
3. Students individually think and explain to themselves what is happening in each step.
4. Students give up a thumbs up to the teacher when they have finished reading and have some sort of understanding.
5. [Think-Pair-Share](https://app.education.nsw.gov.au/digital-learning-selector/LearningActivity/Card/645). Students explain the solution to their partner.
6. In pairs, students then answer the self-explanation questions.
7. Finally, randomly select students to share their answers with the whole class.

Students can do further exploring of their own using fraction kits, [Polypad fraction manipulatives](https://mathigon.org/polypad) ([mathigon.org/polypad](https://mathigon.org/polypad)) and/or fraction walls.

### Apply

This activity is based on a resource from [Top Drawer Teachers](https://topdrawer.aamt.edu.au/Fractions/Downloads/Gameboard-for-the-Colour-in-Fractions-game) ([bit.ly/Colourinfractionsgames](https://bit.ly/Colourinfractionsgames)).

Figure 2 – completed Colour in Fractions game



‘[Gameboard for the Colour in Fractions game](https://topdrawer.aamt.edu.au/Fractions/Downloads/Gameboard-for-the-Colour-in-Fractions-game)’ has been adapted from [Top Drawer Teachers](https://topdrawer.aamt.edu.au/) and is licensed under the [Top Drawer Teacher’s copyright](https://topdrawer.aamt.edu.au/About-this-resource#:~:text=Materials%20in%20the,material%20are%20retained.).

Students will play the game Fraction Bingo in pairs.

#### Equipment

* [Appendix B](#_Appendix_B), physical fraction kit or digitally using the [Fraction wall](https://www.visnos.com/demos/fraction-wall) ([visnos.com/demos/fraction-wall](https://www.visnos.com/demos/fraction-wall))
* Two custom made dice or an online custom dice simulator like the app [RollMyDice](https://wychway.studio/roll-my-dice/) ([wychway.studio/roll-my-dice/](https://wychway.studio/roll-my-dice/)):
* numerator dice is labelled 1, 2, 2, 3, 3, 4
* denominator dice is labelled

#### Game

1. Each horizontal strip on the fraction wall gameboard is one-whole.
2. Students roll both dice to create a fraction – one dice generates a numerator and the other, a denominator.
3. Students colour in sections of the wall that correspond to the fraction that they rolled with the dice. For example, if they throw 2 and , then they can colour in of one line, or of one line, or of one line and , or any other combination that is equivalent to .
4. Players take turns with the first player to colour in their whole wall being declared the winner.
5. If a player is unable to use their turn, they can pass.

#### Conclusion

Discuss with students: If you were to play again tomorrow, what would you do differently?

This game can be modified to suit the needs of your students, for example, the game board could just consist of halves, quarters and eighths or include fifths, twelfths, and so on for more of a challenge.

## Assessment and Differentiation

### Suggested opportunities for differentiation

Encourage the use of visual representations throughout the lesson to support students.

**Explore**

* Encourage students to do a [gallery walk](https://app.education.nsw.gov.au/digital-learning-selector/LearningActivity/Card/555) ([bit.ly/DLSgallerywalk](https://bit.ly/DLSgallerywalk)) halfway through the activity.

**Summarise**

* Students are encouraged to create as many equivalent fractions from the starting model of as they can. This open-ended question is designed to challenge students about whether or not there is a finite number of answers.

**Apply**

* Modify the board game to suit the needs of your students, for example, just halves, quarters and eighths or include fifths, twelfths, and so on, for more of a challenge.

### Suggested opportunities for assessment

* Use the mentimeter poll at the beginning of the lesson as formative assessment on students’ prior knowledge of equivalent fractions to guide the support required for students in this lesson.
* Monitor students’ answers during class discussion and [Think-Pair-Share](https://app.education.nsw.gov.au/digital-learning-selector/LearningActivity/Card/645) activities to assess their understanding of the concepts.
* Collect [Appendix B](#_Appendix_B) to use as summative assessment throughout the unit.
* Create an exit ticket asking students to create visual representations that demonstrate that 2 given fractions are equivalent.

## Appendix A

### Visual representations – activity 1

#### Example – tossing a coin



Probability of tossing a tail on a coin =

|  |  |  |  |
| --- | --- | --- | --- |
| Instruction | Visual representation 1 | Visual representation 2 | Fraction |
| Row 1: Represent the probability of tossing a tail | Circle with 2 equal sectors, 1 sector shaded. | A bar model with 2 equal sections, 1 section shaded. |  |
| Row 2: Split each part of the diagrams in row 1 into 3 equal parts | Circle with 6 equal sectors, 3 sectors shaded. | A bar model with 6 equal sections, 3 sections shaded. |  |
| Row 3: Create another representation for the diagrams in row 1 by either splitting or combining parts | Circle with 10 equal sectors, 5 sectors shaded. | A bar model with 10 equal sections, 5 sections shaded. |  |

* What do you notice about each visual representation?
* What do you notice about the relationship between the numerator and the denominator in each of the fractions?
* Can you list any more fractions that represent the same probability as tossing a tail on a coin and draw their visual representation?

#### Sock selection



Probability of selecting the sock with stripes = \_\_.

|  |  |  |  |
| --- | --- | --- | --- |
| Instruction | Visual representation 1 | Visual representation 2 | Fraction |
| Row 1: Represent the probability of selecting the sock with stripes | Circle with the centre shown | rectangle |  |
| Row 2: Split each part of the diagrams in row 1, into 3 equal parts | Circle with the centre shown | Rectangle |  |
| Row 3: Create another representation for the diagrams in row 1 by either splitting or combining parts | Circle with the centre shown | Rectangle |  |

* What do you notice about each visual representation?
* What do you notice about the relationship between the numerator and the denominator in each of the fractions?
* Can you list any more fractions that represent the same probability as selecting the sock with stripes?

#### Rolling a regular die



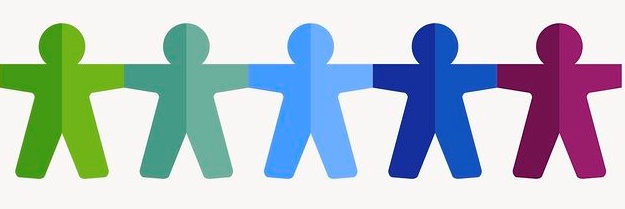
‘Dice png sticker, transparent background’ is licensed under [CC0 1.0](https://creativecommons.org/publicdomain/zero/1.0/).

Probability of rolling a 3 on a regular die = \_\_.

|  |  |  |  |
| --- | --- | --- | --- |
| Instruction | Visual representation 1 | Visual representation 2 | Fraction |
| Row 1: Represent the probability of rolling a 3 on a regular die | Circle with the centre shown | Rectangle |  |
| Row 2: Combine each set of 2 parts of the diagrams in row 1 | Circle with the centre shown | Rectangle |  |
| Row 3: Create another representation for the diagrams in row 1 by either splitting or combining parts | Circle with the centre shown | Rectangle |  |

* What do you notice about each visual representation?
* What do you notice about the relationship between the numerator and the denominator in each of the fractions?
* Can you list any more fractions that represent the same probability as rolling a multiple of 3?

#### Team captain



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Probability of being randomly selected team captain in a team of 5 players = \_\_.

|  |  |  |  |
| --- | --- | --- | --- |
| Instruction | Visual representation 1 | Visual representation 2 | Fraction |
| Row 1: Represent the probability of being randomly selected team captain in a team of 5 players | Circle with the centre shown | Rectangle |  |
| Row 2: Split each part of the diagrams in row 1 into 2 equal parts | Circle with the centre shown | Rectangle |  |
| Row 3: Create another representation for the diagrams in row 1 by either splitting or combining parts | Circle with the centre shown | Rectangle |  |

* What do you notice about each visual representation?
* What do you notice about the relationship between the numerator and the denominator in each of the fractions?
* Can you list any more fractions that represent the same probability as randomly selecting a captain from a team of 5 players?

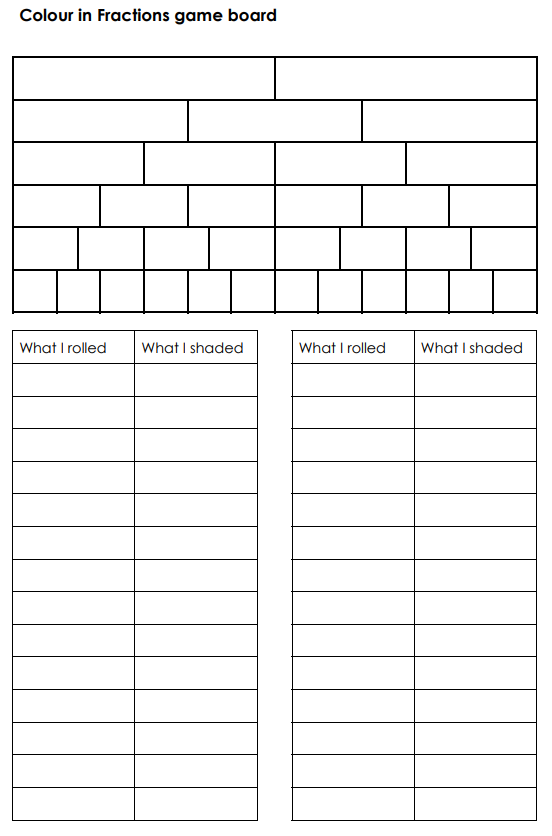
### Same, same, but different – activity 2

Design different spinners and marble bags to represent the same probability as the event.

|  |  |  |
| --- | --- | --- |
| Event | Spinner | Marble bag |
| Tossing a tail on a coin | Spinner with 6 equal sections, 3 are pink, 2 are blue and 1 is green.  Spinning pink | Marble bag with 5 red marbles, 3 green marbles and 2 blue marbles  Selecting a red marble | |
| Randomly selecting the sock with 2 stripes  4 socks, 1 green, 1 purple with stripes, 1 blue, 1 orange | Circle with the centre shown | Marble bag | |
| Rolling a multiple of 3 on a regular dice  Regular 6-sided dice | Circle with the centre shown | Marble bag | |
| Randomly selected as team captain in a team of 5 players  5 people standing in a row | Circle with the centre shown | Marble bag | |

## Appendix B

### Fraction bingo



|  |  |
| --- | --- |
| What I rolled | What I shaded |
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