RICH MATHEMATICAL TASK BOOKLET

PROBABILITY

YEAR 4

Teacher Booklet

Task 1

Maryam is choosing toppings for her ice-cream sundae.

She can choose two toppings from the following list:

Sprinkles, strawberry sauce, chocolate chips, nuts, chocolate sauce, mini marshmallows.

What are the different topping combinations that Maryam could choose?

How many different combinations are there?

Teacher Notes

During the launch, remind students of a tree diagram as a way to record different combinations.

Provide the pictures of the different sundae options to the students.

Notice whether students are able to systematically record the different options for the sundae toppings and work out how many different combinations are possible.

During the connect, the possibility of each sundae topping option could be linked to fractions in relation to the chance of each combination being one fifteenth.

Shareback

Select students to share that have worked systematically to find all the possible combinations.

Select students to share who have used a tree diagram or model this to the students.

Big Ideas

When there is a chance-based situation, there are sets of possible outcomes that can be arranged into events. Probability is the chance of an event occurring. This can be represented with language or values (e.g., 0% - impossible or 100% certain).

Data visualisations can be used to show what outcomes are possible and more likely. They can also be used to represent the results of a probability investigation.

Curriculum Links

During Year 4

Engage in chance-based investigations with equally likely outcomes by:
– generating all possible ways to get each outcome (a theoretical approach), or undertaking a probability experiment and recording the occurrences of each outcome
– creating data visualisations for possible outcomes
– describing what these visualisations show
– finding probabilities as fractions
– reflecting on anticipated outcomes

Connect

What is the chance that Maryam chooses nuts and chocolate sauce?

How many combinations would there be if Maryam could also choose caramel sauce?

Mathematical Language

Probability, chance, unlikely, possible, likely, certain, half, quarter, equal chance.

Suggested Learning Outcomes

Represent the different outcomes for an event.
Find all of the possible outcomes for an event.

Independent Tasks

Hala has to choose two things for her breakfast. The things to eat are:

Cereal

Apple

Muffin

Banana

Toast

Can you show the different combinations that Hala might choose?

How many different combinations are there?

Anticipations

Solutions, Misconceptions

Task 2

Tyrone's Mum has a jar of jellybeans for him and his sister to lucky dip.

There are 8 yellow jellybeans, 5 green jellybeans, and 3 red jellybeans.

Tyrone picks one out without looking. What colour jellybean is Tyrone most likely to get?

Tyrone would like to make sure that he gets one jellybean of each colour. How many times would Tyrone need to lucky dip a jellybean to do this?

If Tyrone picked out a yellow jellybean, would his sister Isla be more likely to pick out a yellow jellybean too or a green or red one?

Now test out your predictions using the beans and a feely bag. Repeat the trial at least five times and record the results.

What do you notice?

Teacher Notes

Before the launch, ask the students to record in a tally-chart the results of a trial with blue and red jellybeans. Put the beans in a feely bag and draw them out one at a time and ask the students to record with tally-marks.

During the launch of the task, establish with the students that when Tyrone or his sister take a jellybean, it is removed from the jar and data set and not returned.

Have plastic beans and feely bags available for the students to use for the trials.

Monitor for students who are able to connect fractions with their predictions (e.g., there are 8 yellow beans which is half of the total set of 16 beans).

Notice students who are able to record and represent the results of the trials accurately using tally marks.

Expect students to use the language of probability with terms such a more likely, less likely, half chance, greater chance.

For the independent task, have beans and feely bags available for the students to use.

Big Ideas

When there is a chance-based situation, there are sets of possible outcomes that can be arranged into events. Probability is the chance of an event occurring. This can be represented with language or values (e.g., 0% - impossible or 100% certain).

For some situations or games, the chance or probability of particular outcomes can be calculated (theoretical probability). Theoretical probability and what happens in an experiment will differ.

For some situations or games using repeated testing can give a sense of which outcomes are more likely (experimental probability).

A probability experiment involves repeated trials. Results can differ in different trials.

Shareback

Select students to share who are able explain their thinking with reference to the data set and number of jellybeans in relation to yellow being half of the total. If no students notice this, then model it for the class.

For the second part of the task, ask different students to share the results of their trial who have used data visualisations such as a tally-chart. If no students have used this, then model how to present the data using a tally-chart.

Connect

Make statements about what you found out in the chance investigation using the data from your trial.

Did the data from your trial match your predictions? Why or why not?

Suggested Learning Outcomes

Identify possible outcomes in a chance situation.
Make a prediction about a chance situation.
Collect and record data for a chance investigation.
Create a data visualisation to represent the results of a chance investigation.

Independent Tasks

Tyrone's Mum has a jar of jellybeans for him and his sister to lucky dip.

There are 6 blue jellybeans, 4 yellow jellybeans, 4 green jellybeans, and 2 red jellybeans.

Tyrone picks one out without looking. What colour jellybean is Tyrone most likely to get?

Tyrone would like to make sure that he gets one jellybean of each colour. How many times would Tyrone need to lucky dip a jellybean to do this?

Now test out your predictions using the beans and a feely bag. Repeat the trial at least five times and record the results.

What do you notice?

Curriculum Links

During Year 4

Engage in chance-based investigations with equally likely outcomes by:
– generating all possible ways to get each outcome (a theoretical approach), or undertaking a probability experiment and recording the occurrences of each outcome
– creating data visualisations for possible outcomes
– finding probabilities as fractions
– describing what these visualisations show
– reflecting on anticipated outcomes

Mathematical Language

Chance, half, more likely, less likely, equal chance, tally-chart, trial.

Anticipations

Solutions, Misconceptions

Task 3

If you are playing a game and you toss two coins together, what possible results could you get?

Make a prediction of which combination will be most common.

Now toss two coins 20 times and record the results.

What do you notice?

Make statements about the results.

Teacher Notes

Before you launch the task, say to the students "the probability of an outcome is half what might the event be?

Have coins available for students to toss for the chance experiment.

Notice whether students are recording the results accurately and systematically and support them to do this.

Facilitate the students to notice that we can express probability as a fraction.

There is a half chance half that the coins will lands on heads and tails. There is quarter chance of both being heads or tails.
Expect students to use the language of probability to describe the results.

For the independent task, have coins available for the students to toss.

Shareback

Select students to share who have used a systematic way of recording the data (tally-charts) to show the results of their chance investigation.

Ensure that you share the results from several pairs of students.
Ask students to discuss why different groups of students got different results.

Big Ideas

When there is a chance-based situation, there are sets of possible outcomes that can be arranged into events. Probability is the chance of an event occurring. This can be represented with language or values (e.g., 0% - impossible or 100% certain).

For some situations or games, the chance or probability of particular outcomes can be calculated (theoretical probability). Theoretical probability and what happens in an experiment will differ.

For some situations or games using repeated testing can give a sense of which outcomes are more likely (experimental probability).

A probability experiment involves repeated trials. Results can differ in different trials.

Connect

Draw a table on the board as below and record the results that each group got on the table.

Pairs	Two heads	Two tails	One head and one tail

Calculate the totals with the students and ask them to discuss what the table shows and why they think it happens.

Connect this to the probability of outcomes in fractions.

Suggested Learning Outcomes

Identify possible outcomes in a chance situation.
Make a prediction about a chance situation.
Collect and record data for a chance investigation.
Create a data visualisation to represent the results of a chance investigation.

Independent Tasks

Coin toss game

What would be the possibilities if you tossed three coins at the same time?

What do you predict is most likely?

Now toss three coins 20 times and record the results.

What do you notice?

Make statements about the results.

Curriculum Links

During Year 4

Engage in chance-based investigations with equally likely outcomes by:
– generating all possible ways to get each outcome (a theoretical approach), or undertaking a probability experiment and recording the occurrences of each outcome
– creating data visualisations for possible outcomes
– describing what these visualisations show
– finding probabilities as fractions
– reflecting on anticipated outcomes

Mathematical Language

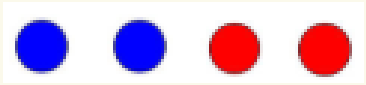
Chance, more likely, less likely, trial, tally-chart, picture graph.

Anticipations

Solutions, Misconceptions

Task 4

Frankie and Zhou are playing a game where they draw two balls out of a bag. The balls are blue, blue, red, and red:



What possible combinations could they get?

What are the chances of getting each combination?

Use the balls and a bag and test the game by picking out two balls 30 times. Record your results.

Represent the results using a tally-chart and a column graph.

Make statements about what you notice.

Teacher Notes

During the launch remind students how to record outcomes using a tally chart.

Have feely bags and red and blue marbles or balls available for each pair to experiment with the chance situation.

Notice whether students are recording the results accurately and systematically and support them to do this.

For the independent task have a feely bag available with 5 red beans and 3 blue bean and squared paper for the graph.

Shareback

Select students to share that are able to represent the different combinations that are possible.

For the second part of the task, choose students to share that have recorded their outcomes systematically and represented these using a column graph.

Connect

What would happen if you added two blue balls to the bag?

What combinations would be possible then?

What would the likelihood be of each combination?

Big Ideas

When there is a chance-based situation, there are sets of possible outcomes that can be arranged into events. Probability is the chance of an event occurring. This can be represented with language or values (e.g., 0% - impossible or 100% certain).

For some situations or games, the chance or probability of particular outcomes can be calculated (theoretical probability). Theoretical probability and what happens in an experiment will differ.

For some situations or games using repeated testing can give a sense of which outcomes are more likely (experimental probability).

A probability experiment involves repeated trials. Results can differ in different trials.

Suggested Learning Outcomes

Identify possible outcomes in a chance situation.
Make a prediction about a chance situation.
Collect and record data for a chance investigation.
Create a data visualisation to represent the results of a chance investigation.

Independent Tasks

Tayla and Lotu are playing beanz. This is what they have in the bag:

Tayla wins if a blue bean and is drawn from the bag. Lotu wins if a red bean is drawn from the bag.

Who do you think is more likely to win?

Play beanz by putting all the beans in a bag and drawing one out. Record the result and put the bean back in.

Repeat this 40 times and record the results.

Represent your results using the graph paper.

What do you notice?

Curriculum Links

During Year 4

Engage in chance-based investigations with equally likely outcomes by:
– generating all possible ways to get each outcome (a theoretical approach), or undertaking a probability experiment and recording the occurrences of each outcome
– creating data visualisations for possible outcomes
– describing what these visualisations show
– finding probabilities as fractions
– reflecting on anticipated outcomes

Agree or disagree with others' conclusions about chance-based investigations.

Mathematical Language

Chance, unfair, fair, likely, unlikely, tally chart, column graph.

Anticipations

Solutions, Misconceptions

Task 5

To raise money for a new playground, the community centre is running a lottery game. The lottery game consists of four tickets numbered from 1 to 4. To enter, you choose one number. You win if your ticket number matches the number that is chosen.

What is the chance of winning this lottery?

How many times do you predict you would win in ten games?

How many times do you predict you would win in 20 games?

How many times do you predict you would win in 100 games?

Use the digit cards and feely bag and test the game twenty times to see if your prediction is correct. Record your results and represent these.

Teacher Notes

Monitor for students who are able to connect fractions with their predictions (e.g., there are four possibilities so you would have a quarter chance of winning). Notice whether students are then able to apply this to the larger number of trials.

Notice students who are able to record and represent the results of the trials accurately using tally marks.

Expect students to use the language of probability with terms such a more likely, less likely, half chance, greater chance.

The connect in this task focuses attention on the difference between theoretical probability and experimental probability and a comparison of this from trials. Support the students to notice that you can have different results for the same trial. Also, that the more trials you have will likely bring the distribution of the experimental probability closer to the theoretical probability.

Shareback

Select students to share who are able to predict that you would have a quarter chance of winning.

Ask students to share how many times they won out of 20 and record this as a tally on the board until you have a total out of 100.

Big Ideas

When there is a chance-based situation, there are sets of possible outcomes that can be arranged into events. Probability is the chance of an event occurring. This can be represented with language or values (e.g., 0% - impossible or 100% certain).

For some situations or games, the chance or probability of particular outcomes can be calculated (theoretical probability). Theoretical probability and what happens in an experiment will differ.

For some situations or games using repeated testing can give a sense of which outcomes are more likely (experimental probability).

A probability experiment involves repeated trials. Results can differ in different trials.

Connect

How did your prediction for 20 game compare to the results of your trial?
How did your prediction for 100 games compare to the results of the tally of the trials from the class?
What do you notice?

Suggested Learning Outcomes

Identify possible outcomes in a chance situation.
Make a prediction about a chance situation.
Collect and record data for a chance investigation.
Create a data visualisation to represent the results of a chance investigation.
Make statements about a chance investigation and use data to support the statements.

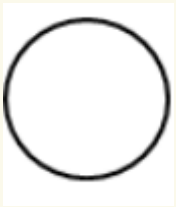
Independent Tasks

Fili and Puawai are playing beanz.

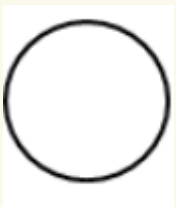
Fili pulls out one bean from the bag and it is blue. He puts it back.
Puawai takes one bean from the bag and it is red. She puts it back.
After ten turns, Fili and Puawai have drawn out 8 blue beans and 2 red beans.

How many beans might be in the bag and how many were blue?
Give a range of different answers with reasons.

Design a spinner where there is one quarter chance of getting blue.



Design a spinner where there is one third chance of getting red.



Curriculum Links

During Year 4

Engage in chance-based investigations with equally likely outcomes by:
– generating all possible ways to get each outcome (a theoretical approach), or undertaking a probability experiment and recording the occurrences of each outcome
– creating data visualisations for possible outcomes
– describing what these visualisations show
– finding probabilities as fractions
– reflecting on anticipated outcomes

Agree or disagree with others' conclusions about chance-based investigations.

Mathematical Language

Chance, fair, unfair, trial, tally-chart, one quarter.

Anticipations

Solutions, Misconceptions

Task 6

The community centre have worked out that the lottery is too easy to win and won't raise enough money. They change the game so that you now have to choose two ticket numbers and to win the numbers must match the two numbers chosen (in any order).

What are the outcomes for the new game?

What is the chance of winning this lottery?

How many times do you predict you would win in twelve games?

How many times do you predict you would win in twenty-four games?

Use the digit cards and feely bag and test the game twenty-four times to see if your prediction is correct. Record your results and represent these.

Teacher Notes

Have digit cards available for the students to use.

Monitor for students who are able to connect fractions with their predictions (e.g., there are six possibilities so you would have one sixth of a chance of winning).

Notice whether students are then able to apply this to the larger number of trials.
Notice students who are able to record and represent the results of the trials accurately using tally marks.

Expect students to use the language of probability with terms such as more likely, less likely, half chance, greater chance.

The connect in this task focuses attention on the difference between theoretical probability and experimental probability and a comparison of this from trials. Support the students to notice that the more trials you have will likely bring the distribution of the experimental probability closer to the theoretical probability.

For the independent task, have digit cards available.

Big Ideas

When there is a chance-based situation, there are sets of possible outcomes that can be arranged into events. Probability is the chance of an event occurring. This can be represented with language or values (e.g., 0% - impossible or 100% certain).

For some situations or games, the chance or probability of particular outcomes can be calculated (theoretical probability). Theoretical probability and what happens in an experiment will differ.

For some situations or games using repeated testing can give a sense of which outcomes are more likely (experimental probability).

A probability experiment involves repeated trials. Results can differ in different trials.

Shareback

Select students to share who are able to predict that you would have one sixth chance of winning.

Ask students to share how many times they won out of 24 and record this as a tally on the board until you have a total out of just over 100.

Ask them to reflect on what they notice about their predictions vs the results of the trials.

Connect

What do you notice about the theoretical probability and the experimental probability when you have a small number of trials?

What about when you have a large number (over 100) of trials?

Suggested Learning Outcomes

Identify possible outcomes in a chance situation.
Make a prediction about a chance situation.
Collect and record data for a chance investigation.
Create a data visualisation to represent the results of a chance investigation.
Make statements about a chance investigation and use data to support the statements.

Independent Tasks

Think about the two lottery games that the community centre designed for their fundraiser.

Create your own version of the lottery which would be harder to win than the other games.

Explain the rules for your lottery game.

Test your game at least ten times to check your results.

How do you know that your game is harder?

Curriculum Links

During Year 4

Engage in chance-based investigations with equally likely outcomes by:
– posing an investigative question
– anticipating and then identifying possible outcomes for the investigative question
– generating all possible ways to get each outcome (a theoretical approach), or undertaking a probability experiment and recording the occurrences of each outcome
– creating data visualisations for possible outcomes
– describing what these visualisations show
– finding probabilities as fractions
– reflecting on anticipated outcomes

Mathematical Language

Chance, fair, unfair, trial, tally-chart, one sixth, theoretical probability, experimental probability.

Anticipations

Solutions, Misconceptions

Task 7

Luci and Mary have made up a dice game. To play, you each choose six different numbers between 1 to 12. You then roll two dice together and add up the total. You can mark the box for the total on the table:

1								
2								
3								
4								
5								
6								
7								
8								
9								
10								
11								
12								

The winner is the first to reach the end of the box.

Play the game a few times and see what you notice.

Are there numbers that seem to win more? Why do you think this is?

Teacher Notes

Have dice available for the students to use.

Notice students who are able to record and represent the results of the trials accurately using tally marks.

Expect students to use the language of probability with terms such as more likely, less likely, half chance, greater chance.

Notice whether students consider the different possibilities when throwing two dice and which may be more likely.

For the independent task, have digit cards available.

Big Ideas

When there is a chance-based situation, there are sets of possible outcomes that can be arranged into events. Probability is the chance of an event occurring. This can be represented with language or values (e.g., 0% - impossible or 100% certain).

For some situations or games, the chance or probability of particular outcomes can be calculated (theoretical probability). Theoretical probability and what happens in an experiment will differ.

For some situations or games using repeated testing can give a sense of which outcomes are more likely (experimental probability).

A probability experiment involves repeated trials. Results can differ in different trials.

Shareback

Select students to share who notice and explain that particular numbers are more likely to be the sum of adding both dice.

Ask students to share which numbers they think are the best to choose.

Connect

Can you work out the possibilities for rolling two dice?

How does this relate to what you found out when playing the game?

Suggested Learning Outcomes

Collect and record data for a chance investigation.
Create a data visualisation to represent the results of a chance investigation.
Make statements about a chance investigation and use data to support the statements.

Independent Tasks

Select one or more of the following assessment tasks (attached at the end of the document) as the independent activity:

Task 1: Lolly game

Task 2: Bean game

Curriculum Links

During Year 4

Engage in chance-based investigations with equally likely outcomes by:
– posing an investigative question
– anticipating and then identifying possible outcomes for the investigative question
– generating all possible ways to get each outcome (a theoretical approach), or undertaking a probability experiment and recording the occurrences of each outcome
– creating data visualisations for possible outcomes
– describing what these visualisations show
– finding probabilities as fractions
– reflecting on anticipated outcomes

Mathematical Language

Chance, fair, unfair, trial, tally-chart, experimental probability.

Anticipations

Solutions, Misconceptions

Assessment Task 1 - Probability - Year 4

A bag contains 4 lollies. There are 2 blue lollies and 1 green lolly and 1 red lolly. If you take out one lolly without looking and then another lolly, what are the different combinations you might get? What is most likely? What is least likely?

Now test your predictions by using the counters and feely bag and pick out one lolly and then another and record the results. Play the game 20 times and record and represent your results. What do you notice?

Assessment Task 2 - Probability - Year 4

A bag contains 5 beans. There is 1 blue bean, 1 red bean, and 3 yellow beans. If you take out one bean without looking and then another bean, what are the different combinations you might get? What is most likely? What is least likely?

Now test your predictions by using the beans and feely bag and pick out two beans one at a time and record the results. Play the game 20 times and record and represent your results. What do you notice?