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 Lesson 1 • How far might my car roll?

**Lesson 1**

**(Y1)**

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# Lesson overview

Students make predictions about how far a toy car might roll.

## Learning goals

We make predictions in response to a question.

## Resources

**Whole class**

* Floor space

**Each student**

* A toy car
* Sticky notes to mark predictions

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| Lesson phase | Estimated time | Lesson type |
| **Activity 1 | Making predictions** | 15 minutes | Whole class |
| **Activity 2 | Playing with toy cars** | 15 minutes | Whole class |
| **Activity 3 | Rolling cars** | 20 minutes | Small group |

# Teach this lesson

## Activity 1 | Making predictions

**Ask**: *Can you predict the future?*

Introduce the idea of prediction and ask students to suggest ways we predict the future. Suggestions might include:

* predicting the weather, such as when it might rain.
* predicting the next events as we read a story.
* predicting classroom activities, such as what might happen next in a day.

Record student responses on the board.

**Ask**: *Which of these are easy predictions to make? Which are more difficult? Why do you think that?*

* We draw from our experience to anticipate something that is likely, such as looking for dark clouds to predict rain. When we don’t have experience of something, or our experience is limited, it is more difficult to make an informed prediction.

Encourage students to refer to the experience that they base their prediction on. They can use their experience as evidence for what they think is likely to happen. Emphasise that a prediction is not expected to be exact, but what ***might*** happen.

## Activity 2 | Playing with toy cars

Convene students together as a whole class in an open space. Show students a toy car.

**Ask**: *What can we find out about a toy car?*

Provide each student with a toy car and allow them time to play with their car so that they can notice some things about it.

Reconvene the class together when students have had time to play. Discuss some things they noticed about their car. Some suggestions might include how fast it went, the colour, if the wheels get stuck, or that it had a big crash.

**Ask**: *How far do you think a toy car might roll?*

Invite students to make a prediction. Having just played with their cars students will have experience to draw on. However, their prediction may be based on how far they would like it to go rather than what is likely based on their prior experience of toy cars so far.

**Pose the activity:** *Let’s see how close our predictions are.*

## Activity 3 | Rolling cars

Divide the students into pairs and provide each student with a toy car and sticky notes/dots.

Explain that one student will be the ‘roller’, and the other student will be the ‘predicter’. The predicter makes a prediction for how far the car might roll, using a sticky note to mark where the car might stop. The roller then rolls their car and both students compare the prediction and where the car actually stops. Students take turns to be the roller and the predicter.

Allow students time to engage in the activity and then convene a class discussion.

**Discuss**:

* *What are some things you noticed about predicting and rolling the cars?*
	+ Some students’ predictions may have been based on how far they would like the car to go rather than what was likely, and so their predictions may have been way off.
	+ Students will have rolled in different ways. Some will have done a gentle roll, while others will have rolled vigorously. The predicter might not know in advance how forcefully the car will be rolled, which makes it hard to predict.
* *Did you change your prediction after you saw the car roll? Why?*
	+ Gettting more experience with rolling cars and seeing how far they go improves the accuracy of predictions.

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 Lesson 2 • Rolling, rolling, rolling!

**Lesson 2**

**(Y1)**

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# Lesson overview

Students collect data to refine their predictions about how far a toy car might roll.

## Learning goals

Data is evidence for a prediction. Recording data allows us to refine our predictions.

## Resources

**Each group**

* Floor space
* Materials to mark the length of car rolls, such as blocks, counters, rulers, different coloured sticky dots, chalk, and sticky notes

**Each student**

* A toy car

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| Lesson phase | Estimated time | Lesson type |
| **Activity 1 | More predictions** | 10 minutes | Whole class |
| **Activity 2 | Collecting data** | 20 minutes | Small group |
| **Activity 3 | Fishbowl** | 10 minutes | Whole class |
| **Activity 4 | Rolling cars again** | 10 minutes | Small group |

# Teach this lesson

## Activity 1 | More predictions

**Revise:** *Making predictions is about thinking about what will happen in the future. In the last lesson we made predictions about how far our toy cars might roll.*

Discuss some of the students’ observations from rolling cars the previous day, and specifically what made it hard to make accurate predictions about how far the car would roll. For example, students might comment on how forcefully the car was rolled, the direction that the car was rolled, or the surface on which the car was rolled.

**Ask:** *How far did our toy cars roll? Were our predictions close?*

Allow the students to share how far their cars rolled and who made accurate predictions.

**Ask:** *How might we improve our predictions?*

Allow students to share their initial thoughts, but leave the question open. Explain that today the students will investigate how they can improve their predictions.

Explain to students that to improve our predictions we need to first roll our cars more consistently. As a class, establish a ‘Car rolling protocol’. An example protocol might be: *The toy car will always be rolled on the wooden floor and in the same direction. The “Goldilocks Principle” applies to the way that we roll our cars—the roll should not be too soft or too hard, the roll should be just right!*

**Pose the question:** *How can we improve our predictions? What might we do to show that our predictions are improving?*

## Activity 2 | Collecting data

Convene the class in an open space. Divide students into groups of 3 or 4 students. Again, one person will be the ‘roller’ and one person the ‘predicter’. The other group member/s will look at how close each prediction is.

Make available materials for recording the length of car rolls, such as blocks, counters, rulers, different coloured sticky dots, chalk, and sticky notes. Explain that you have gathered some materials that might be helpful, but do not tell the students what they should do with these materials. The importance of recording data will emerge through the activity.

Allow students time to start predicting and rolling. At this point, students may not see it as necessary to record how far their car rolled.

**Observe:**

* Are any students using the last roll as their prediction, for example "Last time, the car stopped here, so I'll predict here. Now the car has stopped here, so I'll predict here."
	+ This is progress towards the learning goal of the lesson. They recognise the need to notice where the car stops to inform predictions.
* Are students recording data on their rolls to inform their predictions?
	+ This is the desired learning goal of the lesson; students are using multiple previous rolls to predict the next roll.

If students are not recording where the car previously stopped, ‘seed’ the idea of recording data with a group by marking the floor to show where the car stops each roll.

**Questions to prompt students’ thinking**

Through this activity, it is important that students recognise the need to record data so they can make informed predictions. These questions are designed to prompt students to think about the need to record data.

* *What is the longest and shortest distance that your car has travelled? Where is your evidence?*
	+ The longest and shortest rolls will inform predictions. Students cannot use this evidence if they have not recorded car roll data.
* *Have your predictions become closer to the actual distance rolled, or further away?*
	+ To see if their predictions are becoming more accurate, students need to see the data from the rolls and also know where they predicted their car might roll.
	+ Students will not be able to answer this question easily if they have not kept track of their prediction in some way and data which shows where the car rolled.

## Activity 3 | Fishbowl

Select a group who are recording roll data (this may be your ‘seeded’ group). Conduct a [Fishbowl activity](/pedagogical-tools/learning-community-tools/learning-each-other?utm_source=docx&utm_medium=lesson_2&utm_campaign=how_far_car) so students can see how this group is working. Prompt students to watch for things that are working well and things that are not working so well.

After the Fishbowl, convene a class discussion.

**Discuss**:

* *What things did you notice that were working well?*
	+ Students may have been marking their predictions and also marking how far the car rolled.
* *What things did you notice that were not working so well?*
	+ You might first ask the group being observed this question so they can reflect on their own experience.
	+ Some issues may include using objects such as counters or blocks to record data which caused the car to stop if it hit them, or not distinguishing between the two data types.

## Activity 4 | Rolling cars again

Ask students to meet in their small groups and think about how they would like to record their roll data. They also need to keep track of their predictions in some way. Remind them of the materials you have made available to mark how far the car rolls on the floor, including blocks, counters, rulers, different coloured sticky dots, chalk, and sticky notes.

When students have a plan, allow them time to repeat the activity.

When students are repeating their predictions and rolls this is an opportunity for you to notice whether students mark their prediction as well as mark how far their car rolled. Prompt students to think about why this might be useful data to have:

* *How can you tell how close your car rolled to your prediction?*
* *How can you tell whether or not your predictions are getting closer?*

Discuss how the markings that students are making are the data display of the group's car rolls. When students make a record of their data, they are able to share this data with other students who were not in their group. However, without this record, they only have the observations of the students who did the activity with them which cannot be shared with anyone else.

When they have predicted and rolled their car a few times, ask students to draw a picture of their data representation and/or take a photo of their displays for use in the following lesson.

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 Lesson 3 • Rolls on a ramp

**Lesson #**

**(Y1)**

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# Lesson overview

Students collect data to refine their predictions about how far a toy car rolls down a ramp.

## Learning goals

Recording data allows us to see the story that the data is telling us. We use this story to make predictions.

## Resources

**Each group**

* A toy car
* Materials to make a car ramp, such as a large heavy piece of card and books to prop up the ramp
* Materials to mark predictions and the length of car rolls, such as blocks, counters, rulers, different coloured sticky dots, chalk, and sticky notes

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| Lesson phase | Estimated time | Lesson type |
| **Activity 1 | Rolling toy cars** | 20 minutes | Whole class |
| **Activity 2 | Making predictions** | 20 minutes | Small group |
| **Activity 3 | Our data story** | 10 minutes | Whole class |

# Teach this lesson

**Activity 1 | Rolling toy cars**

**Revise**: *We recorded data to see the story of how far our toys cars rolled. We used this data to make predictions about how far our cars might roll in the future.*

So far, students’ predictions have been based on their experience and the evidence gathered of rolling cars on flat ground. This lesson introduces a variable—a ramp. Introducing this variable provides opportunity for students to collect data using a different context.

Show the students how to use the materials to make a car ramp.

**Ask:**

* *How far will our car go if we roll our car down the ramp?*
	+ Allow students to share their initial predictions. Students may predict how far they want their car to roll, rather than what is likely.
	+ Some students may not realise that the ramp will change the data, while others may anticipate a very big change in how far their car will travel.
* *What evidence do you have to support your claim?*
	+ Students might draw on what they know about their car on the floor, or they may have prior experience of using a toy car on a ramp.

Explain to students that we do not have experience with our toy cars on this ramp and so we need to collect some data. Divide the students into groups of 3-4 students. Provide each group with one car and the materials to make their own car ramp.

Allow the students to experiment with their car on their ramp for a while.

Convene a class discussion.

**Discuss:**

* *What are some things you noticed about rolling your cars down the ramp?*
	+ Students might comment on whether the cars go further or not on the ramp.
	+ Students will have rolled their cars down the ramp in different ways. Some will have just let their car go at the top of the ramp while others will have given it a big push.

Establish a new ‘Car rolling protocol’ for rolling cars down the ramp. An example protocol might be: *Hold the toy car at the very top of the ramp, in the centre of the ramp. Let the toy car go—don’t push it!*

**Pose the task**: *Make predictions about how far your car will roll using the ramp, then roll your car and see how close your prediction is.*

## Activity 2 | Making predictions

Have students return to their groups and their car ramps. Make materials available for students to record the data on their car rolls.

Allow students time to predict and roll the car down the ramp. If students are not recording their car rolls remind them of the previous lesson and what they learnt.

The conversations that you have with groups in this session will be very important. The learning goal for the lesson should guide these conversations: *Recording data allows to see the story that the data is telling us. We use this story to make predictions.*

### Questioning to prompt student thinking

* *Predict where you think the car will stop. What evidence do you base your prediction on?*
	+ Students should be using the recorded data from all their previous rolls.
* *Where do you think the car will stop this time? Why did your prediction change?*
	+ It is likely that students’ predictions will change for each new roll. The new data recorded on the most recent rolls gives a fuller story of how far a car might roll in the future. This data is used to inform future predictions.
* *Is your prediction the same each roll, or does it change? Why does it change?*
	+ As more data is collected, students should be refining their predictions. The more data, the more informed predictions can be. It is important that students see that the data record is the source of authority, and not the teacher. This means that students can use the data as evidence to self-correct and as feedback to make further predictions to test.

At the end of the session remind students that it is important to record the data displays that they have made. Take a photo of each group’s data display, that is, their ramp and the record data that is marked on the floor. Alternatively, students could draw a picture of the display.

### Noticing student thinking

Do students:

* **Make predictions that are improbable—**Prompt students to consider how they can use data from their previous rolls to find where the car might roll next.
* **Use the ‘feel’ of the earlier rolls to inform their prediction—**Prompt students to notice whereabouts the car rolled each time and what this might mean is likely next time.
* **Refer to evidence to change their prediction—**Prompt students to explain what the evidence tells them that made them change their prediction.

## Activity 3 | Our data story

Convene the whole class together for a class discussion. Display some of the photos/drawings of the data displays.

**Discuss**:

* *Were your predictions the same each roll, or did they change? Why did your predictions change?*
	+ As more data is collected, students should be refining their predictions. The more data, the more informed predictions can be.
* Select examples of students’ data displays. *Let’s look at some of the data that we have collected. Based on the data in this display, where do you think the car might roll in each one?*
	+ Ask students to justify their predictions based on the evidence provided in the display.

Discuss the story that the data is telling. In this instance, the data is telling two stories:

1. How far a car is likely to roll when it goes down the ramp.
2. Collecting data allows us to refine our predictions. The more data, the more informed predictions can be.

**Explain**: *The more data we collect, the better our predictions become*.

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 Optional investigations • We can ask more questions about our cars

**Lesson 4**

**(Y1)**

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# Lesson overview

A series of new questions opens up further statistical investigations using the students’ toy cars.

## Learning goals

We can make and test predictions about a different question. We can investigate the effect that specific variables have on how far a toy car rolls. We can collect and record data to tell a different story about our toy cars.

## Resources

**Each student**

* A toy car

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| Lesson phase | Estimated time | Lesson type |
| **Optional activity 1 | Do red cars go further?** | 50 minutes | Whole class/Small group |
| **Optional activity 2 | When does my car go furthest?** | 50 minutes | Small group/Individual |
| **Optional activity 3 | Which car goes furthest?** | 50 minutes | Whole class/Small group |

# Teach this lesson

## Optional activity 1 | Do red cars go further?

You can make use of the sequence structure of **predict, test, refine** to investigate this optional activity. Students can test if the different coloured cars might roll different distances.

Students test whether red cars might roll further than cars with other colours. They record data on how far red cars roll, then repeat this test with a different colour car to compare if the red car rolls further.

Students use the data to decide if red cars roll further than any other cars.

## Optional activity 2 | When does my car go furthest?

You can make use of the sequence structure to investigate this optional activity.

Students can test how far their toy cars roll on different surfaces, such as wooden floors, carpet, concrete or artificial turf.

Students make predictions about how far their car might roll on different surfaces before they roll their car. As students test, they should record data on how far the car travelled and use this to make predictions about future car rolls.

Students use informal units to measure the furthest car roll on each surface. They use this information to decide the surface that the car rolled furthest.

## Optional activity 3 | Which car goes furthest?

You can make use of the sequence structure to investigate this optional activity.

Students can test which car rolls furthest.

Students make predictions about how far their car might roll, compare how far each of their cars rolls, and which rolls the furthest. Students should record data on how far each car rolls.

Students use informal units to measure how far the different cars roll, which requires indirect comparison and the use of a common unit. Students use the measurements collected to determine which car went furthest.

The whole class could have a race off with the furthest rolling car from each group.

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