

Target Ball

Lesson 1: Discover Phase

Australian Curriculum: Mathematics (Year 1)

ACMMG019: Measure and compare the lengths and capacities of pairs of objects using uniform informal units.

Lesson abstract

Students are presented with the real-life context of having to advise the sports teacher on setting up a game of 'Target Ball'. They need to investigate how far a ball rolls and the best type of ball to use in the game. They each choose a ball, roll it and mark where it stops. They use direct comparison of distances rolled to propose factors that may influence the distances rolled, including the type of ball. Students review the class results to decide on the best ball for Target Ball, and come to appreciate that they will need to measure the distances rolled.

Mathematical purpose (for students)

Rolling different types of balls helps us decide which ball type rolls the straightest and furthest.

Mathematical purpose (for teachers)

Students begin to investigate the information that is needed to set up the game: where to place the target and what ball to use. They find that different types of balls tend to roll different distances and that ball attributes of weight, size, shape and surface type could account for some of this variability. They begin by directly comparing distances, but come to appreciate that it is necessary to measure if we are to share that information with others.

At the end of the Discover phase, students will be able to:

- Identify and justify which ball is best to use for the game, using observations to make a good choice.
- Recognise that rolls need to be measured.

Lesson Length 60 minutes

Vocabulary Encountered

- furthest, least
- distance
- compare
- size, weight
- evidence

Lesson Materials

- access to oval or large grassy area outdoors to roll balls
- at least 10 balls of various sizes, weights and shapes and surfaces
- individually named identification markers for each student
- [Maths investigator poster](#) (1 large copy for display)
- iPad or camera to collect photographic evidence of rolls

We value your feedback after these lessons via <https://www.surveymonkey.com/r/CV2TXTT>



Introducing the Inquiry

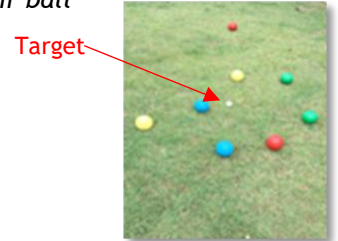
1. Promote engagement in this Inquiry by presenting the following context to students. **Explain** the game of Target Ball, **demonstrating** what it means to be closest to the target.

Our sports teacher, (insert appropriate person for your school), is planning a day of activities for young students at our school (Under Eights' Day or another suitable event such as sports day, fete). He/she has decided to set up a bowling game where the winner is the person who rolls their ball closest to the target. Before the game starts, the position of the target is fixed, then people roll the ball from the starting line. Because this is a game the sports teacher hasn't played before, he/she is wondering:

- Which type of ball will be best to roll in the game?
- How far will a ball rolled by a young student go?
- Where should the target be put?

He/she would like our class to use mathematics to answer these questions.

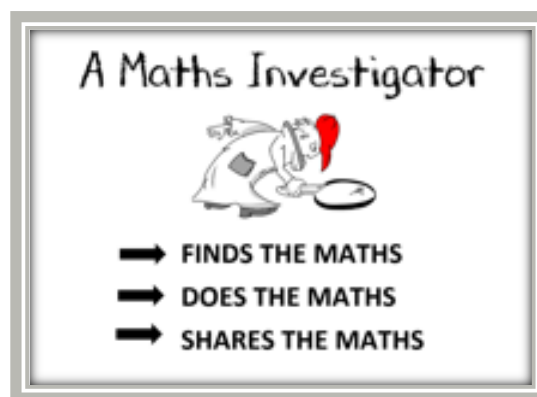
Today we are going to consider what ball is best for the game.



Introducing Maths Investigators

2. Introduce the concept of **Maths Investigators** by asking students what investigators (detectives) do. Link the solving of a problem (crime case) with collecting, organising, interpreting and sharing evidence. Highlight how this evidence is used to justify the conclusion in order to convince others. **Display** the [Maths investigator poster](#) and check that students can give examples of what mathematics is by having them brainstorm what they do in mathematics lessons. (For example: *add numbers, count, find patterns, partition, look at shapes and objects, measure height and weight, use mathematical language.*)

Inform students, as **Maths Investigators**, they will be **finding** mathematics to help them answer a question, **doing** mathematics as they investigate the question and gather evidence, and **sharing** the mathematics and evidence they used and collected.



3. Display today's inquiry question (*How far does a ball roll?*) and inform students their job today is to find mathematics that will help them work out a) how far a ball will roll and b) the best type of ball to use in the game.

Exploring variation in distances rolled

4. Go outside to the grassed area to test how far a ball will roll. Position students so they can all see each roll and establish a starting position and a direction for rolling. (In this lesson, a target is not required.)
5. **Ask** students to go to the place where they think a rolled ball will stop. In explaining how they decided where to stand, some may suggest size, weight and shape of the ball will influence the distance. Acknowledge all suggestions and encourage students, as maths investigators, to look carefully as we test the balls to see what could affect how far a ball rolls.

Teacher: *The size of the ball could affect how far it will roll. As a maths investigator, your job is to check whether this is the case when different sized balls are being rolled.*

6. Invite five students to each choose one ball that they think will roll well. Line these students up and have them roll their ball. Leave the balls in position and as a class directly compare the distances and discuss the rolls. Mark each distance with the student's identification marker before removing the balls. (Identification markers need to remain in place as other groups roll).

Possible discussion questions:

- *Whose ball rolled the furthest/shortest distance? How do you know?*
- *Whose ball travelled about the same distance as Tom's ball? Why do you think that was the case?*

7. In groups of 5, invite all students to choose a ball and roll it once always from the same starting point. **Mark** all distances with the identification markers.
8. Once all students have rolled a ball, have students stand on their identification markers. Discuss the variation with the class, encouraging students to account for the different distances rolled.

Teacher: *Because we marked our distances with identification markers, we can use **directly compare the distances** to discuss how far everyone's ball rolled. Look carefully at where everyone is standing. What do you notice about all the distances rolled?*

Student: *Some people rolled a long distance and some people only rolled a short distance.*

Teacher: *How do you know? Why do you think this happened? What did you notice as the balls were being rolled? Can you tell me something about the balls that rolled the greatest distances?*

As students provide reasons, ask them to show the ball they used and/or demonstrate how they rolled.

Possible student responses:

- Different balls rolled different distances.
- Some balls rolled better than others.
- Some balls rolled in a straight line and others didn't. The footy was really bad.
- Heavier balls rolled better than lighter balls.
- Some people who rolled the same type of ball rolled about the same distance.
- People rolled different ways.
- Taller children rolled further than shorter children.

Introducing the need for measurement

9. Discuss with students whether they have enough evidence from today's rolls to be able to tell the sports teacher how far a ball will roll. Highlight a need to use measurement (informal units) to communicate how far a ball rolls. Measuring will be done in the next lesson.

Teacher: *Now that we have all rolled one ball each, do we have enough evidence to tell the sports teacher how far a ball will roll?*

Student: *Yes, we could take a photo of the identification markers on the ground to show him/ her.*

Teacher: *Let's take a photograph of where all the balls rolled to help convince him/her which ball rolls the best. **Photograph** the class (or the groups) at their markers.*

*The sports teacher will not be able to work out the **distances rolled** just by looking at this photograph. Once we remove the identification markers from the oval, the sports teacher won't see where the balls rolled to and will have no way of knowing just how far our balls rolled or which ball was rolled. Does anyone have another idea about how we could help the sports teacher **know** how far our balls rolled?*

Student: *Everyone could count the number of steps it takes them to get from the start to their ball.*

Teacher: *Your idea to **measure** the distance by counting the number of steps it takes to get to the ball would certainly help. Can anyone think of other ways we could measure the distances the balls rolled? (use paces, use a skipping rope, use cricket bats).*

10. Before returning to the classroom, collect identification markers.

Choosing the best ball to use

11. Initiate a discussion with students about the **best type of** ball to choose for the game and the need to everyone to use the same type of ball for the game to be fair. Have them justify their thinking using today's ball rolling experiences.

Teacher: *Today our class rolled different types of balls and found some rolled better than others. Remember the winner of the Target Ball game will be the person whose ball rolls closest to the target. If students use different types of balls for the game, will it be fair? How will the sports teacher decide where to place the target if we all roll different balls? Why? Share your thinking with your partner.*

Teacher: *Who would like to tell the class which ball they think will be best to use? Why do you think this? (For example: A small hand ball because it is heavy enough to roll on grass in a straight line and small enough to fit easily in the hand.)*

12. After sharing some student suggestions, agree on the best type of ball to use for the Target Ball game. These are the only balls required for future lessons.

Conclusion

13. Summarise the mathematical terminology used. For example: compare, distance, furthest, further, shortest, heavy, weight, size, smallest, shape, measure.

Recall why it will be useful to measure the distances.

Refer students back to the Maths Investigator Poster and ask them: *Did we find any mathematics today?*
Acknowledge responses and then conclude with: *Next time we will DO THE MATHS!*

A Maths Investigator



- ➔ **FINDS THE MATHS**
- ➔ **DOES THE MATHS**
- ➔ **SHARES THE MATHS**