

# Target Ball

## Lesson 4: Defend Phase

### Australian Curriculum: Mathematics (Year One)

**ACMSP262:** Choose simple questions and gather responses and **make simple inferences**.

**ACMSP263:** Represent data with objects and drawings where one object or drawing represents one data value. Describe the displays.

- Describing displays by identifying categories with the greatest or least number of objects.

### Lesson abstract

Students investigate where to position the target in Target Ball to make the game fair. The previously collected measurements from the whole class are categorised into intervals and displayed in a table. Students then make simple inferences to recommend the position of the target. To convince themselves and others that this position is fair, students play the game and use the results in their justification. They reflect on the whole inquiry.

### Mathematical purpose (for students)

Inferences of where to best position the target can be justified with mathematical evidence and by testing it.

### Mathematical purpose (for teachers)

Combining class distances provides more evidence to support decisions on the best placement for the target. Using a table that organises class data into categories assists when making evidence-based predictions as simple inferences. When playing Target Ball, measurement is often necessary to determine which roll is closer to the target. Playing the game also generates evidence to justify whether the agreed placement for the target was fair.

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

- Place their measurements in the correct category in the table.
- Interpret the table to make an inference about the best placement for the target.
- Justify the fairness of the recommended position for the target.

Lesson Length            2 x 45 minutes

#### Vocabulary Encountered

- table
- intervals, categories
- inference
- justify

#### Lesson Materials

- access to grassed area as before.
- one large [printed table](#) (e.g. 4 x A3 sheets stuck together)
- sticky notes
- equipment to play Target Ball (for each group: 1 ball of agreed type and 1 target such as cone or peg)
- identification markers (used in previous lessons, 1 per student)
- cardboard footsteps (from previous lesson)
- Maths Investigators poster (from previous lessons)

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

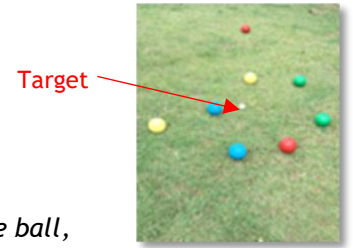




# Where Should the Target Be?

1. Review the purpose for the inquiry. *We investigated which ball would be best to use in Target Ball and how far a Year One student can roll this ball. The sports teacher asked us to investigate this because he/she needs to know where to place the target so the game is fair.*

Refer students to the displays and statements from the last lesson, acknowledging the displays were useful evidence to support the statements that groups made to answer the inquiry question, *How far will a ball roll?*



2. Initiate a discussion on where the best position to place the target would be.

Teacher: *Now we have evidence about how far a Year One student can roll the ball, we need to decide where the sports teacher should put the target to make the game fair. Should the target be placed a really long way away from the rolling position, or close, or somewhere in between? Discuss with your partner where you think the target should be placed. Remember to explain your thinking.*

Share some responses and reasoning, recording general suggestions on the board (examples underlined below).

Macey: *I think it should be somewhere in the middle, between the longest and shortest roll. Children who rolled a short distance could roll a bit harder and children who rolled a long distance could roll a bit slower. That way everyone could have a chance of rolling close to the target.*

Cora: *We think the game would be fair to put the target somewhere close to where a lot of children rolled the ball. That would give lots of children a chance to be the winner.*

## Making a class display

3. Elicit the need to combine the class measures by asking students how they will get the best evidence.

Teacher: *There have been some great suggestions about where the target should be placed. Maja proposed it should be somewhere close to where a lot of children rolled the ball, but how do we know where that is? Our number lines only have information from a group of students, not all the students in the class. How could we show all our measurements?*

4. Once a class display is suggested, have students write down all their distances (number of footsteps from last lesson) on separate sticky notes.
5. Highlight that using the evidence to decide exactly where to put the target will be making an *inference*. An *inference* is a *prediction using mathematical evidence (data)*.
6. Display the prepared table for students to group the measurements in numerical intervals (categories). Use the range of students' distance measurements to determine whether all categories are required or the table needs to be extended.

Less than 10 footsteps	10- 19 footsteps	20 - 29 footsteps	30 - 39 footsteps	40 - 49 footsteps	50 - 59 footsteps	60 - 69 footsteps	70 or more footsteps

Explain the table and the intervals with the class before inviting students to post their sticky notes. This may be done in column order (who has a distance less than 10 footsteps etc) or by having selected students add all their distances at the same time.

Discuss where to put a distance like '19 and a half' or 'nearly 20'. (Answer: in the 10 - 19 category - this heading is not precise. Students who are worried about this could think of a better name (*10 or more, but less than 20; including 10 but not including 20*)).





Once all sticky notes have been added, have students interpret the display. For example:

- 7 students rolled 30-39 footsteps.
- Most students rolled in the 20's, 30's or 40's.
- More students rolled 30 -39 footsteps than 10-19 footsteps.
- Only 7 students rolled 50 or more footsteps.

## Using simple inference to justify the placement of the target

7. Direct students back to the general suggestions on where the target should be positioned (e.g. *somewhere close to where a lot of children rolled the ball*). When a general suggestion has been accepted, challenge students to recommend where to put the target, by using the display as evidence to refine their suggestions and reasoning.

Teacher: *If only seven students rolled more than 50 footsteps, is this the best place to put the target?*

Kai: *Three rolls in our group were 15 footsteps, so that would be a good place to put it.*

Tim: *No, more students rolled in the 20s, 30s and 40s. I think 40 footsteps would be a good distance.*

Leticia: *30 is in the middle and lots of students rolled 30-39 footsteps.*

Teacher: *Leticia and Tim are using our class data to decide where to place the target and Kai is using data that his group collected. These statements are definitely more mathematical now! I would like each of you to come up with your own mathematical statements for where to position the target using the class data. The class data will make sure our inferences use evidence from the whole class, not just one group.*

Provide time for students to record their inferences. Share revised suggestions, encouraging students to challenge the thinking of others respectfully or to build on ideas suggested. (For example: *What do others think about Ari's suggested position of 40 footsteps? Has anyone changed their idea, now they have heard what Ruby said?*).

Work towards an agreed distance for the placement of the target. Record it on the board.

8. Jointly construct class recommendations to assist the sports teacher. Write the statements on the board.

The best ball to roll is a hand ball because it rolls reasonably straight and it is not too big to fit into a Year One hand.

The target should be positioned about 35 footsteps from the starting position because our display shows lots of Year One students rolled around that distance.



# Testing Recommendations: Playing Target Ball

9. Share the rules of Target Ball with the class. Explain there will be 3 rounds, demonstrating what is meant by being closer to the target and providing examples of when a players' marker would be moved and when it would remain where it was placed in the previous round.

How to play Target Ball:

- Mark out a starting position from which to roll the ball.
- Position the target (e.g. cone, peg) at the recommended distance. (Measurement needed here.)
- Players must have both feet behind the starting position when rolling the ball.
- Take turns to roll the ball (Round 1).
  - Place each player's marker where their roll stops.
- Take turns to roll the ball (Round 2).
  - Move a player's marker only if their roll stops closer to the target than before. (Measurement may be needed here.)
- Take turns to roll the ball (Round 3).
  - Again, move a player's marker only if their roll stops closer to the target than before.
- Identify the winner of the game by choosing the identification marker that is closest to the target.
- Replay the game if time permits.

## 10. Play Target Ball.

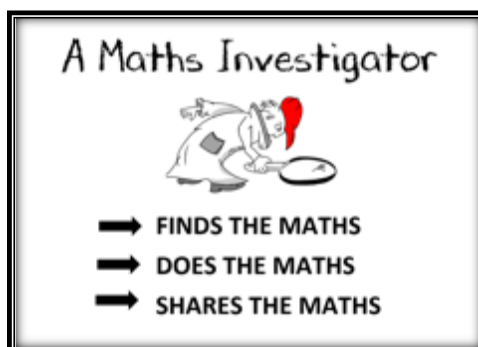
Where possible, have an adult work with each group to capitalise on the opportunities for students to determine by measuring (in footsteps) whether their new roll is closer or further away from the target than their previous roll. If students are unsure, elicit from them, through prompting, the need to compare the distances using an informal measurement unit (footstep).

After Round 1, have students consider and share what they could do with their next roll (Round 2) to get it closer to the target. (*My ball did not roll as far as the target so next time I am going to roll faster.*)

11. Have students briefly report on whether they found that the position of the target was good, or if it should be improved. Are you convinced the recommended position for the target is fair? Explain your thinking. (*At 35 footsteps is a good position for the target because everyone in my group rolled close to the target. If we played the game again, we may have rolled even closer.*)

## Conclusion

12. If necessary, modify the advice to be sent to the sports teacher.
13. Conclude the inquiry by reviewing the steps taken through the lessons, and have students reflect on how they worked as Maths Investigators throughout the inquiry. This may be by having them respond to the questions below with a thumbs up/thumbs down or by asking them for specific responses.
- *Were you a good Maths Investigator?*
  - *Did you investigate the inquiry question using mathematics?* (Finds the maths)
  - *Did you collect, organise and interpret measurements to use as evidence?* (Does the maths)
  - *Did you share evidence to convince others that your answer was a good one?* (Shares the maths)





less than 10 footsteps	10 - 19 footsteps



20 - 29 footsteps	30 - 39 footsteps



40 - 49 footsteps	50 - 59 footsteps



60 - 69 footsteps	70 - 79 footsteps