# Mathletes in motion

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| Year levelStrand(s)Lesson lengthCD Code: | * Year 7
* Number
* 50–60 mins
* [AC9M7N04](https://v9.australiancurriculum.edu.au/f-10-curriculum/learning-areas/mathematics/year-7_year-8_year-9/content-description?content-description-code=AC9M7N04&detailed-content-descriptions=0&hide-ccp=0&hide-gc=0&side-by-side=1&strands-start-index=0&subject-identifier=MATMATY7&subjects-start-index=0&view=quick)
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| Lesson summary | In this lesson, students use mathematical modelling in measurement (comparing and evaluating sports results) to explain equivalence between fractions, decimals and percentages, and represent rational numbers on a number line. |
| Learning intention | * We compare, justify and represent equivalent rational numbers on a number line.
* We can use knowledge of place value to partition numbers in different ways.
* We can use a mathematical modelling process to investigate equivalence between fractions, decimals and percentages.
* We use and apply equivalence to solve practical problems from real life to enhance and communicate understanding in an engaging way.
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| Success criteria | By the end of this lesson, students can:* justify the location of a rational number on a number line
* model the comparison of rational numbers in practical problems
* use knowledge of place value to partition numbers in different ways
* communicate equivalence between different representations of rational numbers.
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| Why are we learning about this? | In this lesson, we will compare quantities and probabilities in sporting contexts. Learning about this not only helps us to make decisions about sporting records, but the same comparisons could be used in other types of problems, for example, dividing up different-sized easter eggs between friends or comparing supermarket pricing. |
| Prerequisite student knowledge and language | Students: * compare and orders fractions and represents these on a number line
* order numbers with more than one decimal place
* connect familiar percentages and fractions to their decimal equivalent
* locate integers on a number line
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| **Resources** | * Teacher’s slides (PowerPoint)
* Mix and match order game (PDF)
* Exploring sporty rational numbers worksheet (Word)
* Blu Tack, Vertical whiteboards or A3 blank paper
* Calculators (each student)
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Curriculum information

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| Achievement standard | Students choose between equivalent representations of rational numbers and percentages to assist in calculations.  |
| Content description(s) | Students find equivalent representations of rational numbers and represent rational numbers on a number line. [AC9M7N04](https://v9.australiancurriculum.edu.au/f-10-curriculum/learning-areas/mathematics/year-7/content-description?subject-identifier=MATMATY7&content-description-code=AC9M7N04&load-extra-subject=MATMATY7&detailed-content-descriptions=0&hide-ccp=0&hide-gc=0&achievement-standard=e8cf72a7-fe7a-458a-a047-35203c17fa90&side-by-side=1&strands-start-index=0&subjects-start-index=0&view=quick) |
| General capabilitiesCross-curriculum priority | Number sense and algebra* Additive strategies ([Level 9](https://v9.australiancurriculum.edu.au/f-10-curriculum/learning-areas/mathematics/year-7/general-capability-snapshot?subject-identifier=MATMATY7&content-description-code=AC9M7N04&general-capability-code=N&element-code=NN&sub-element-index=0&sub-element-code=NNAdS&load-extra-subject=MATMATY7&detailed-content-descriptions=0&hide-ccp=0&hide-gc=0&achievement-standard=e8cf72a7-fe7a-458a-a047-35203c17fa90&side-by-side=1&strands-start-index=0&subjects-start-index=0&view=quick))
* Interpreting fractions ([Level 8](https://v9.australiancurriculum.edu.au/f-10-curriculum/learning-areas/mathematics/year-7/general-capability-snapshot?subject-identifier=MATMATY7&content-description-code=AC9M7N04&general-capability-code=N&element-code=NN&sub-element-index=1&sub-element-code=NNInF&load-extra-subject=MATMATY7&detailed-content-descriptions=0&hide-ccp=0&hide-gc=0&achievement-standard=e8cf72a7-fe7a-458a-a047-35203c17fa90&side-by-side=1&strands-start-index=0&subjects-start-index=0&view=quick))
* Number and place value ([Level 10](https://v9.australiancurriculum.edu.au/f-10-curriculum/learning-areas/mathematics/year-7/general-capability-snapshot?subject-identifier=MATMATY7&content-description-code=AC9M7N04&general-capability-code=N&element-code=NN&sub-element-index=2&sub-element-code=NNNPV&load-extra-subject=MATMATY7&detailed-content-descriptions=0&hide-ccp=0&hide-gc=0&achievement-standard=e8cf72a7-fe7a-458a-a047-35203c17fa90&side-by-side=1&strands-start-index=0&subjects-start-index=0&view=quick))
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| Areas of challenge | Some students may: * not know the meaning of zeros in decimal numbers and the relationship between decimal numbers and fractions
* label the places to the right of the decimal point as tenths and hundredths and write 2.45 as 2 + $\frac{4}{10}$ +$\frac{5}{100}$, for example, but cannot link this with other ways of writing the decimal, such as: 2 + $\frac{45}{100}$
* think decimals with two places are always hundredths and write 2.45 as 2 + $\frac{45}{100}$, but do not link this with the pattern in whole-number place value, and so do not see 2.45 as 2 + $\frac{4}{10}$ + $\frac{5}{100}$often be unable to select a common partitioning (denominator) to enable two fractions to be compared or combined unless an equivalence they already know is involved
* not understand the pattern in the sequence 1, $\frac{1}{10}, \frac{ 1}{100}, \frac{1}{1000}$ is central in understanding decimal notation.
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| Strategies | [Classroom talks](https://www.mathematicshub.edu.au/plan-teach-and-assess/teaching/teaching-strategies/classroom-talks/) [Questioning](https://www.mathematicshub.edu.au/plan-teach-and-assess/teaching/teaching-strategies/questioning/) [Differentiated teaching](https://www.mathematicshub.edu.au/plan-teach-and-assess/teaching/teaching-strategies/differentiated-teaching/)  |

Lesson structure

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| Learning hook5–10 mins | Note: Slides 1–4 in the teacher’s slides introduce the concepts explored in this lesson. Explain that as a class we are using problem-solving strategies in random collaborative groups to model numerical representations of practical problems on a number line. We communicate our findings with mathematical reasoning to justify our choices. Slides 5–7 are based on the common misconceptions that some students may still hold from the primary years. These activities are optional but may be of tremendous help to identify students requiring specific scaffolding on this topic on a particular misconception. **Learning hook** Note: this activity requires pre-preparing (slide 8).The Mix and match and order game is provided as a set of downloadable printouts requiring cutting to create four sports-themed sets of measurement cards: rugby, AFL, netball and swimming. There are 8 measurement cards per set. It is recommended to laminate the cards and number lines before the class begins. Students can use whiteboard markers on the number lines so that they may be used again, or simply print them out for students to mark with pencil. Instructions to students* We are going to compare quantities in four different sporting contexts.
* Ask students, ‘When would we use numbers other than whole numbers in sports or hobbies?’
* Students select a card from the templates provided Swimming, AFL, rugby, netball (4 X 8 rational numbers – 32 students).

**Differentiation** (support all abilities):Note that the cards are differentiated into levels of difficulty. Pre-arrange cards to match the learning needs of students in your class, or simply allow students to choose the sport of their choice to boost engagement in the game, no matter the level of challenge.Level 1 – Rugby players bench lift weights Level 2 – AFL Development Squad Premiership Teams – probability of a winning a grand finalLevel 3 – Netball vertical jump tests (uses mm)Level 4 – Swim times 200 m (times include conversions of decimals of minutes to seconds, or vice versa)Next (slide 9): * Students gather into groups of about 4, and then organise themselves in numerical order of the numbers stated on their cards.
* After this, the teacher asks one student from each group to share one of the strategies they used to justify their choice to the class.
* During discussion, question students to understand their thinking at this moment, ‘Why do you think I asked you to do this task?’
* Students keep their card to use in the next section.

**Differentiation** (notice):Was this task easy or was it difficult? Notice students’ engagement and ability with the game while they are working, and those who have communicated how they found the task. Use this to gauge whether the next section should be modified. |
| Explore30 mins | Note: Pre-prepare by printing the downloadable number lines for the different sporting groups on A3 paper. * Go to slide 10 and as a class, watch the ESA Springboard maths concepts video – [Decimal fractions](https://www.mathematicshub.edu.au/plan-teach-and-assess/teaching/springboard-maths-concepts/decimal-fractions-video-and-teaching-guide/), and pause at 0:23: ‘What is your estimate of the mass of the apples?’ Students are encouraged to think about (not call out) their estimate.
* Now play the video to view the tenths example. Pause at 0:49, ‘Were your estimates close?’
* Play video and pause at 1:17: ‘What is your estimate of the length of the long jump?’ Students are encouraged to think about (not call out) their estimate.
* Play the video to view the hundredths decimal place example and pause at the 5 and 35 hundredths example (1:59). Explicitly demonstrate on the board (this could be written down before the start of the lesson) how 5 and 35/100 can also be written as 5 and 7/20 using cancelling.
* Play video and pause at 2:18. Discuss with your partner (group), ‘Who has the winning jump? ‘
* Play the video to view example on how to choose the winning jump. Common decimal misconceptions are highlighted.
* The student groups are instructed to combine with the other group that has cards from the same sport (slide 11). Using Blu Tack, students collaborate to place their card number on the number line (printed on A3 paper) with an arrow clearly pointing to its place on the number line.
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| Summary and reflection10–20 mins | Provide solutions to one member of each sport group so students can check their placement of the rational numbers on the number line. Encourage students to use reasoning to justify their answers against the solutions, especially if answers are incorrectly placed.Students then complete a gallery walk of the other number lines. Ask students the following prompt questions for reflection and extension of the task (slide 12). * What is similar/different about the numbers in each group? Is there a number type that we haven’t used? Why are there no arrows on the AFL number line?
* Can we combine all these measures on one number line? (Leading to a discussion that comparisons are only possible with same measures.)
* What would you expect the numerical probabilities on the eight AFL Premiership chances to add up to? Can you check with and without a calculator they add up to 1? Why do they add up to 1?
* Could you make up a set of eight numbers that includes negatives? Percentages? What context would you use?
* Can you think of a time in life when we need to know negative fractions on a number line?
* And, for a paradox statement: ‘Between each two points on a number line is an infinite number of points.’

Further optional game-like lessons available online and supporting the learning intention of this content description:* [Fraction Wall Game](https://topdrawer.aamt.edu.au/Fractions/Good-teaching/Equivalence/Linear-models/Fraction-wall-game)
* [Matching Fractions Decimals and Percentages](https://nrich.maths.org/1249)
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| Assessment | The following assessment opportunities are outlined below.* Collect the Number lines used in the Mix and match order game to evaluate students correctly represent rational numbers provided on the number line.
* Observation checklist could be used for personalised recordings of student understanding.
* Exploring sporty rational numbers Ski time worksheet – this includes negative rational numbers.
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