Decimals: Adding and subtracting

|  |  |
| --- | --- |
| Year level  Strand(s)  Lesson length  CD Code: | Year 6  Number, Measurement  45–60 mins  [AC9M6N04](https://v9.australiancurriculum.edu.au/f-10-curriculum/learning-areas/mathematics/year-4_year-5_year-6/content-description?subject-identifier=MATMATY6&content-description-code=AC9M6N04&load-extra-subject=MATMATY4_MATMATY5_MATMATY6&detailed-content-descriptions=0&hide-ccp=0&hide-gc=0&achievement-standard=204b4e36-dafd-4b68-9974-1703f28ab395&side-by-side=1&strands-start-index=0&subjects-start-index=0&view=quick)  [AC9M6N06](https://v9.australiancurriculum.edu.au/f-10-curriculum.html/learning-areas/mathematics/year-6/content-description?subject-identifier=MATMATY6&content-description-code=AC9M6N06&detailed-content-descriptions=0&hide-ccp=0&hide-gc=0&side-by-side=1&strands-start-index=0&subjects-start-index=0&view=quick)  [AC9M6M01](https://v9.australiancurriculum.edu.au/f-10-curriculum.html/learning-areas/mathematics/year-6/content-description?subject-identifier=MATMATY6&content-description-code=AC9M6M01&detailed-content-descriptions=0&hide-ccp=0&hide-gc=0&side-by-side=1&strands-start-index=0&subjects-start-index=0&view=quick) |
| Lesson summary | In this lesson, students learn about place value and how it extends beyond whole numbers. Students play a board game that draws on their knowledge of adding decimals to tenths, hundredths and thousandths with and without regrouping. |
| Learning intention | We are recognising the extension of the place value system to tenths, hundredths and thousandths  We are reading and recognising decimal notation using strategies to help us interpret and calculate using decimals  We are representing and using decimal notation correctly. |
| Success criteria | By the end of this lesson, students can:  read decimals involving tenths, hundredths and thousandths  use decimal notation to represent decimals  develop strategies for adding and subtracting decimals. |
| Why are we learning about this? | Regrouping into a more useful smaller or larger unit size occurs in many everyday situations – money (10 ten-cent pieces = 1 dollar), length (metre, kilometre, millimetre), mass (kilogram, gram) and time. With a base-10 system the regrouping is always 10 littles = 1 big (10 tenths = 1 one) or 1 big = 10 littles (1 hundredth = 10 thousandths). |
| Prerequisite student knowledge and language | **Place value:** the value of a digit as determined by its position in a number relative to the ones place. For integers, the ones place is occupied by the rightmost digit in the number before the decimal point.  **Base-10:** a number system which uses the digits 0-9, and the value of the digit is determined by its face value and its place value.  **Decimal:** used to describe aspects of the base-10 number system. The decimal point separates the whole number part of a number from its decimal part. |
| **Resources** | * Lesson plan (Word) * Printed cards and recording sheet (Word) * Die net with decimals (Word) * Exit Ticket: Target weight! (Word) |

Curriculum information

|  |  |
| --- | --- |
| Achievement standard | Students use all 4 operations with decimals and connect decimal representations of measurements to the metric system. |
| Content description(s) | Students apply knowledge of place value to add and subtract decimals, using digital tools where appropriate; use estimation and rounding to check the reasonableness of answers. [AC9M6N04](https://v9.australiancurriculum.edu.au/f-10-curriculum/learning-areas/mathematics/year-4_year-5_year-6/content-description?subject-identifier=MATMATY6&content-description-code=AC9M6N04&load-extra-subject=MATMATY4_MATMATY5_MATMATY6&detailed-content-descriptions=0&hide-ccp=0&hide-gc=0&achievement-standard=204b4e36-dafd-4b68-9974-1703f28ab395&side-by-side=1&strands-start-index=0&subjects-start-index=0&view=quick)  Students multiply and divide decimals by multiples of powers of 10 without a calculator, applying knowledge of place value and proficiency with multiplication facts; using estimation and rounding to check the reasonableness of answers. [AC9M6N06](https://v9.australiancurriculum.edu.au/f-10-curriculum.html/learning-areas/mathematics/year-6/content-description?subject-identifier=MATMATY6&content-description-code=AC9M6N06&detailed-content-descriptions=0&hide-ccp=0&hide-gc=0&side-by-side=1&strands-start-index=0&subjects-start-index=0&view=quick)  Students convert between common metric units of length, mass and capacity; choose and use decimal representations of metric measurements relevant to the context of a problem. [AC9M6M01](https://v9.australiancurriculum.edu.au/f-10-curriculum.html/learning-areas/mathematics/year-6/content-description?subject-identifier=MATMATY6&content-description-code=AC9M6M01&detailed-content-descriptions=0&hide-ccp=0&hide-gc=0&side-by-side=1&strands-start-index=0&subjects-start-index=0&view=quick) |
| General capabilities  Cross-curriculum priority | General Capabilities: Numeracy  Number and place value [Level 8](https://v9.australiancurriculum.edu.au/f-10-curriculum/general-capabilities/numeracy/slideout?code=NNNPV8&element=0&sub-element=0), [Level 9](https://v9.australiancurriculum.edu.au/f-10-curriculum/general-capabilities/numeracy/slideout?code=NNNPV9&element=0&sub-element=0)  Additive strategies [Level 9](https://v9.australiancurriculum.edu.au/f-10-curriculum/general-capabilities/numeracy/slideout?code=NNAdS9&element=0&sub-element=2)  Multiplicative strategies [Level 9](https://v9.australiancurriculum.edu.au/f-10-curriculum/general-capabilities/numeracy/slideout?code=NNMuS9&element=0&sub-element=3)  Understanding units of measurement [Level 8](https://v9.australiancurriculum.edu.au/f-10-curriculum/general-capabilities/numeracy/slideout?code=NMUuM8&element=1&sub-element=0) |
| Areas of challenge | Some students may:   * have difficulty when dividing or multiplying by a multiple of 10, students are often encouraged to ‘hop the dot’ or ‘add a magic zero’. This is unhelpful language for learning. The decimal point never moves and always remains between the ones and tenths. The language of adding a zero confuses students when fractional numbers are involved: for example, 10 x eighteen and a half is not 180.5 or 108.5 it is 185 * have difficulty when adding and subtracting decimals (and whole numbers) with their head, students often miss that a 1 (or 10) is made when counting on. For example, if finding out how much is needed to reach 100 from 32, they start with 70 because 30 + 70 is 100, not remembering that 2 + 8 will make a 10 so only 60 is needed to start with. The same is with decimals, 0.32 only needs 0.68 to make 1. Starting with adding the next friendly (decade) number will help avoid this by thinking 32 and 8 more make 40; 40 and 60 more make 100 or 0.32 and 8 hundredths makes 0.4, 0.4 and 0.6 make 1 * incorrectly read decimals, again applying their whole number thinking, for example, 0.36 is read as zero point thirty-six, instead of stating that we write zero point three six and read it as thirty-six hundredths. |
| Strategies | • Explicit Teaching   * Differentiation * Concrete, Representational, Abstract model (CRA) |

Lesson structure

|  |  |
| --- | --- |
| Learning hook  5 mins | Where’s the decimal point?’   * Use this warm up activity to focus the students’ attention on where the decimal point should be placed. Say that you have left out some important information. Which you will reveal soon.   Write the following on the board: ‘125 + 34 =’  Allow students time to think, ask for a response and then state that the answer is actually 1.57. Reveal that you did not add the decimal places in the equation. Ask students to write down the numbers with the decimal points in the correct position to make the equation true *(Ans. 1.25 + 0.34 = 1.57).*  By not having the decimal point in the question, it requires students to think about where it should go. Ask students to create a question for the person next to them to solve. Students swap whiteboards or books to solve the challenge created! |
| Explore  35-45 mins | Teacher demonstration   * Explain that you are going to randomly select cards from a bag and record their value. The bag contains 15 randomly chosen cards of value 0.1, 0.01 or 0.001 with no more than 9 of any one value (so there is no regrouping required as the decimals are added). * Starting from zero, a card is drawn and added to the recording sheet. As a card is pulled from the bag, its value is added to the total on the recording sheet. Make explicit place value and that tenths are added to tenths, hundredths to hundredths and thousandths to thousandths. Ask students to help you record the number as a decimal is added each time.   An example of a completed board, starting at zero. First card drawn out, 0.001, next, 0.1, 0.1, 0.001, 0.001. Refer to the example provided.  An example of the lesson's student activity which includes a set of cards that show a of value 0.1, 0.01 or 0.001 and a student worksheet showing a series of boxes in rows with empty spaces below each box to add writing. Students draw cards randomly and add the values cumulatively until they reach the Finish mark.  Practical component   1. Have students work in pairs. Provide each pair with a recording sheet and decimal value cards. Each pair of students gets 15 cards with a selection of 0.1, 0.01 and 0.001 (no more than 9 of any one value). Each pair of students use their bag of 15 cards and recording sheet and find the total. Using a reusable plastic pouch will enable students to reuse the recording sheet. This lesson is best repeated several times - each occasion students can include different cards so decimal values differ from previous round. 2. The teacher can do a simple check of any students’ answer by finding the sum of the digits of the total (as there is no regrouping). This will be 15. In the completed board example this would be 6 + 5 + 4 = 15 but if a total was 653, it would have been incorrect (6 + 5 + 3 = 14). 3. Students note down their total and then repeat the activity at least three times. The students will choose cards in a different order, but the total is always the same.   **Differentiation**  Vary the difficulty of the activity by:   * Changing the start value, written in the pentagon at the top of the recording sheet, with the same 15 cards. * Starting with the total and subtracting the value of each of the 15 cards (which should result in zero if done correctly). * Using a double board and 30 cards which will require regrouping. * Using a dice (made from the Die net decimals template) to roll a random value 0.1, 0.01 or 0.001 which may result in the need for grouping. |
| Summary and reflection  5–10 mins | Have a brief class discussion about what students noticed about the activity.  What strategies did students use to add the decimals 0.1, 0.01 or 0.001?  Discuss how to use place value when adding the decimals. |
| Assessment  5 mins | The following formative assessment items are suggested for this lesson:   * Provide the sheet Exit Tickets. Ask students to choose a month, for example, Month 7 the Koala weighs 3.5 kg. Ask the student how many more kg to reach 10kg? Ask them how they worked that out to see what strategies they used. A follow-up question can include how long do you think it would take to reach 10kg and have them explain their answer. Look for their use of identifying patterns in the data, estimation and doubling strategies. * Note the student responses to Exit Tickets and use this information to further support students in subsequent lessons. |