**It is odd – or is it?**

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| **Year level**  **Strand(s)**  **Lesson length**  **Code** | * Year 4 * Number * 60 mins * [ACM9M4N02](https://v9.australiancurriculum.edu.au/f-10-curriculum/learning-areas/mathematics/year-4_year-5_year-6/content-description?subject-identifier=MATMATY4&content-description-code=AC9M4N02&detailed-content-descriptions=0&hide-ccp=0&hide-gc=0&side-by-side=1&strands-start-index=0&subjects-start-index=0&view=quick) * [AC9M4A02](https://v9.australiancurriculum.edu.au/f-10-curriculum/learning-areas/mathematics/year-4/content-description?subject-identifier=MATMATY4&content-description-code=AC9M4A02&load-extra-subject=MATMATY4&detailed-content-descriptions=0&hide-ccp=0&hide-gc=0&achievement-standard=dcd63472-8bfc-44b2-8873-3cc57a9c5abe&side-by-side=1&strands-start-index=0&subjects-start-index=0&view=quick) * [AC9M4N06](https://v9.australiancurriculum.edu.au/f-10-curriculum/learning-areas/mathematics/year-4/content-description?subject-identifier=MATMATY4&content-description-code=AC9M4N06&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 investigate the properties of odd and even numbers. They use their discoveries to confirm calculations involving addition, subtraction and multiplication. |
| **Learning intention** | We test conjectures involving odd and even numbers to identify and explain patterns that emerge when odd and even numbers are used in computation problems. |
| **Success criteria** | By the end of this lesson, students can:   * test conjectures involving odd and even numbers * identify and explain patterns that emerge when odd and even numbers are used in computation problems to explain the properties of odd and even numbers when adding, subtracting, multiplying whole numbers. |
| **Why are we learning about this?** | When we have knowledge of the properties of odd and even numbers, we can use this information to check our calculations when we solve mathematical problems. This supports our ability and confidence for solving number problems and helps us to develop critical thinking skills. This knowledge also leads us to understand other areas of maths. For instance, it helps us to make connections with fractional parts – links remainders to fractional parts and that odd and even numbers are closely related to divisibility. Knowing properties of odd and even numbers is also useful when performing mathematics involving the identification of multiples, factorisation and simplifying fractions. |
| **Prerequisite student knowledge and language** | It is expected that students can:   * identify odd and even numbers and explain the difference between them * add, subtract and multiply numbers and identifies the ÷ and × symbols * begin to construct arguments and provide elements for choices made. |
| **Resources** | * Teacher’s slides (PowerPoint) * Testing conjectures sheet (Word) * Pre-prepare physical materials (manipulatives) to allow students to perform mathematical processes involving the operations of addition, subtraction, multiplication and division. |

Curriculum information

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| **Achievement standard** | * [Students use the properties of odd and even numbers.](https://v9.australiancurriculum.edu.au/f-10-curriculum/learning-areas/mathematics/year-4?view=quick) Students use their proficiency with addition and multiplication facts to add and subtract, multiply and divide numbers efficiently. |
| **Content description(s)** | Students explain and use the properties of odd and even numbers [ACM9M4N02](https://v9.australiancurriculum.edu.au/f-10-curriculum/learning-areas/mathematics/year-4_year-5_year-6/content-description?subject-identifier=MATMATY4&content-description-code=AC9M4N02&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 develop efficient strategies and use appropriate digital tools for solving problems involving addition and subtraction, and multiplication and division where there is no remainder [AC9M4N06](https://v9.australiancurriculum.edu.au/f-10-curriculum/learning-areas/mathematics/year-4/content-description?subject-identifier=MATMATY4&content-description-code=AC9M4N06&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 recall and demonstrate proficiency with multiplication facts up to 10 x 10 and related division facts; extend and apply facts to develop efficient mental strategies for computation with larger numbers without a calculator [AC9M4A02](https://v9.australiancurriculum.edu.au/f-10-curriculum/learning-areas/mathematics/year-4/content-description?subject-identifier=MATMATY4&content-description-code=AC9M4A02&load-extra-subject=MATMATY4&detailed-content-descriptions=0&hide-ccp=0&hide-gc=0&achievement-standard=dcd63472-8bfc-44b2-8873-3cc57a9c5abe&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 7)](https://v9.australiancurriculum.edu.au/f-10-curriculum/learning-areas/mathematics/year-4/general-capability-snapshot?subject-identifier=MATMATY4&content-description-code=AC9M4N06&general-capability-code=N&element-code=NN&sub-element-index=2&sub-element-code=NNNPV&load-extra-subject=MATMATY4&detailed-content-descriptions=0&hide-ccp=0&hide-gc=0&achievement-standard=dcd63472-8bfc-44b2-8873-3cc57a9c5abe&side-by-side=1&strands-start-index=0&subjects-start-index=0&view=quick) * Additive strategies [(Level 8)](https://v9.australiancurriculum.edu.au/f-10-curriculum/learning-areas/mathematics/year-4/general-capability-snapshot?subject-identifier=MATMATY4&content-description-code=AC9M4N06&general-capability-code=N&element-code=NN&sub-element-index=0&sub-element-code=NNAdS&load-extra-subject=MATMATY4&detailed-content-descriptions=0&hide-ccp=0&hide-gc=0&achievement-standard=dcd63472-8bfc-44b2-8873-3cc57a9c5abe&side-by-side=1&strands-start-index=0&subjects-start-index=0&view=quick) * Multiplicative strategies [(Level](https://v9.australiancurriculum.edu.au/f-10-curriculum/learning-areas/mathematics/year-4/general-capability-snapshot?subject-identifier=MATMATY4&content-description-code=AC9M4A02&general-capability-code=N&element-code=NN&sub-element-index=0&sub-element-code=NNMuS&load-extra-subject=MATMATY4&detailed-content-descriptions=0&hide-ccp=0&hide-gc=0&achievement-standard=dcd63472-8bfc-44b2-8873-3cc57a9c5abe&side-by-side=1&strands-start-index=0&subjects-start-index=0&view=quick) 6)   Critical and Creative Thinking   * Analysing: interpret concepts and problems, draw conclusions, and provide reasons. * Generating: consider alternatives. * Inquiring: identify, process and evaluate information. |
| **Areas of challenge** | Some students may:   * find it challenging to understand the difference between 2 groups and 2 in each group. Support students to use materials to model splitting amounts into 2 groups * have limited number fact knowledge to solve equations involving additive thinking and multiplication. * be confused about the properties of 0 – odd or even. Even – any number divided by 2 to create another whole number. Half of zero = zero. Odd numbers on either side or 0 e.g. –1 and 1 * refer to the whole number and the digits it contains rather than focusing on the last digit (ones) to support recognition e.g. when zero is a digit in the number. Refer to physical models, definitions, 100s chart to recognize pattern and use this to confirm. * be confused about even number identification when the number includes an odd amount of digits e.g. 732 – 3 digits so the number is made up of an odd number of digits but is an even number * not be familiar with testing conjectures. Understanding that a conjecture is a statement that could be true or false. Support students to understand that they need to collect evidence to confirm if the conjecture is true. |
| **Strategies** | * Differentiated teaching * Collaborative learning * Questioning |

**Lesson structure**

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| Learning hook  15 mins | Download and use the teacher’s slides to accompany your teaching. You will find this in the ‘What you need’ section.  It is likely that students are unfamiliar with the term conjecture. Discuss the concept of conjectures and counter examples. Open the Teacher’s slides to introduce the learning intentions and discuss the conjectures and counter examples. The slides give explanations and examples and come with suggested dialogue for class discussion. Modify these examples if required to suit your class context. |
| Explore  35 mins | Pre-prepare concrete manipulatives, drawing materials or digital dynamic software for students to use to test and connect the arithmetic with the critical thinking required for the task. Arrange students into small groups.  Use slide 14 to introduce the example about Millie who forms two mathematical conjectures about odd and even numbers.  Pose the following question: ‘Can you find a counter example to disprove Millie’s educated guess?’  Provide the worksheets What do I notice?  Students systematically test the conjectures recording their results in the worksheets.  **Differentiation (support)**  Begin with adding two odd numbers first, before multiplying. Remind students that they may draw, use concrete materials or dynamic software to help with calculations if needed. Guide students to use the worksheet systematically to notice patterns that emerge.  **Differentiation (extend)**  Ask students to develop their own conjectures using other combinations of adding, subtracting, multiplying or dividing odds and even numbers. Explain that their investigation may reveal their conjectures to be true or to be false. Have them test their hypothesis and record their discoveries under the following headings in a table: Always True, Sometimes True, Never True. Explain to students that they are collecting evidence to support or disprove their claim. |
| Summary and reflection  10 mins | Slide 18 can be used to facilitate discussion and reflection in this part of the lesson.  Ask students to discuss their progress, the challenges they faced and any new discoveries.  Encourage the students to explain their thinking and reasoning about their conclusions.  Take this opportunity to also discuss any misconceptions so that you may clarify concepts to consolidate their learning. |
| Assessment | This lesson is an explorative task. Observe students as they undertake the task. Use questioning and feedback to support learning.   * Does the student use a systematic approach to recording their investigation? Do they need support in creating a table? * Does the student go beyond addition and include other operations of multiplication, subtraction, and division? Are the mathematical operations carried out accurately? Do they require clarification and support for any of the mathematical operations? What feedback do they require to improve their understanding? |