

Unit Overview: Bunches of Balloons

Summary of learning goals

What is the best number of balloons to evenly decorate the room? This Inquiry presents students with an authentic context to develop concepts of division and multiplication. They discover not all numbers can be divided into equal groups and that a solution to the Inquiry question can be found using a variety of processes associated with multiplication and division such as grouping concrete objects, arrays, repeated addition and skip counting. Many properties of multiplication and division can be highlighted in the findings and number sentences can be used for recording. Students also learn to conduct inquiries, including interpreting a question mathematically, gathering and recording evidence, making decisions according to sensible criteria and justifying their choice using evidence gathered.

Australian Curriculum: Mathematics (Year 2)

ACMNA031: Recognise and represent multiplication as repeated addition, groups and arrays.

ACMNA032: Recognise and represent division as grouping into equal sets and solve simple problems using these representations.

Summary of lessons

Who Is This Unit For?

This inquiry is well suited for use before any formal introduction to division and multiplication, as it explores the concepts of dividing a number into equal parts, grouping into equal sets and representing in arrays. Students need a little experience of making equal groups, repeated addition, skip counting and recording number sentences with more than 2 addends. The multiplication sign can be used but is not required.

Lesson 1: Discover

Students are presented with the real-life context of decorating the classroom with 29 balloons. Students use counters to represent the balloons, as they collaboratively work to divide the balloons into equal groups. They record each attempt (draw or photograph) as evidence of their findings and clearly label their representations. They discover that 29 cannot be divided into equal-sized groups.

Lesson 2: Devise

Students confirm that 29 balloons cannot be divided into equal groups, so will not evenly decorate the room. They do this by making arrays to show the counters in groups with left overs. Students refer to the arrays and consider the potential attractiveness of the decoration to choose a good bunch size. Using arrays or otherwise, students record some total numbers of balloons that allow for bunches of that size.

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



Lesson 3: Develop and Defend

In the Develop phase (first session), students test different room arrangements using counters with chosen bunch size. They analyse arrays to decide on the best number of balloons to use. They represent their arrangement using a diagram, array, number sentence and written justification. In the Defend phase (second session), students present their representations to the class and justify why their arrangement is best. They actively listen to others, ask clarifying questions and provide feedback. The class chooses the best option and then decorates the room.

Reflection on this sequence

Rationale

Students often struggle with the jump from repeated addition to multiplicative thinking. This unit provides students with a purposeful context in which both can be explored in multiple ways. It provides opportunities to investigate related multiplication and division concepts and to use arrays. Drawing or photographing arrangements reinforces equal groups. Labelling representations is important to reveal student thinking and misconceptions.

This unit has been developed around the '4D Guided Inquiry model' with four phases—*Discover, Devise, Develop and Defend*. The unit aims to develop content knowledge as well as assisting students to undertake the process of inquiry. The unit is driven by the inquiry question: *What is the best number of balloons to evenly decorate the room?* In the Discover phase, begin to connect the inquiry context with their prior knowledge. In the Devise phase, students make a plan and deliberate on the evidence they will need. They put this plan into practice in the Develop phase and prepare and present their solution in the *Defend* phase. They use the evidence they have gathered (in this case mainly well labelled arrays showing equal groups) to convince their peers of their solution. The 4D Guided Inquiry model requires the teacher to support and scaffold students through each phase. Further information is given in the *Mathematical Inquiry into Authentic Problems Teachers' Guide*.

reSolve Mathematics is Purposeful

Problem Solving: Students formulate an authentic problem mathematically and use mathematical and other evidence to justify their solution. They develop inquiry skills, including clear labelling to assemble evidence. They make models and use number sentences to represent problem situations.

Reasoning: Students are provided with many opportunities to reason about equal groups and strategies for unfamiliar calculations. There is an expectation to justify their reasoning.

Fluency: Students build fluency through making equal groups and practising repeated addition. They use increasing and decreasing number sequences involving 2s, 3s, 5s and 10s and skip counting and make connections between multiplication and repeated addition.

Understanding: Applying mathematical ideas and practices to everyday problems in authentic ways creates connections to deepen students' understanding. Students represent the relationship between multiplication and division by grouping into sets. Even though some of the mathematical ideas are not formally introduced until later, using students' representations provides an opportunity to deepen their understanding. For example, it is possible to draw attention to the commutative property and illustrate it using arrays (e.g. 24 counters in a 3 x 8 array can be described as 3 rows of 8 or turned around to be viewed as 8 rows of 3.)

reSolve Tasks are Challenging Yet Accessible

The familiarity of the context allows students to use their contextual knowledge to make sense of the mathematics and build their multiplicative thinking informally. Starting with a prime number of balloons provides a more challenging problem and creates opportunities for discussion on what to do with remainders.

reSolve Classrooms Have a Knowledge Building Culture

Students work collaboratively through the Inquiry phases as they investigate different possibilities and gather evidence. They take risks and revisit the question to re-evaluate their plans. As they work and plan together, there is an expectation that they support each other, explaining and justifying their thinking to the best of their ability. They may need to change their thinking and be resilient when faced with challenges. Promoting the sharing of ideas helps to develop a classroom environment where individual focus is diminished in favour of joint responsibility for the collective knowledge advancement of the community: all individuals contribute to the advancement of knowledge in the classroom and all receive knowledge.