Going Bananas

Purpose:

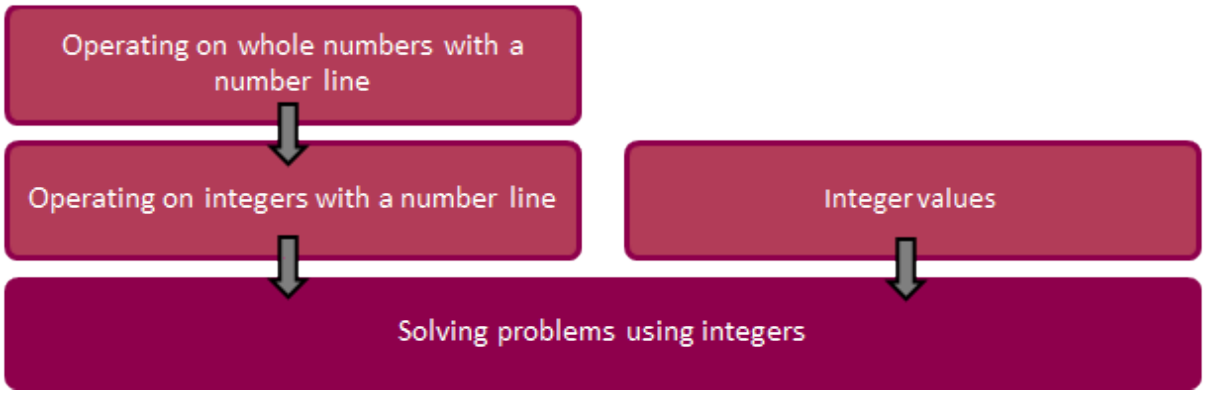
The purpose of this activity is to engage students in solving problems using integer values.

Achievement Objectives:

NA4-2: Understand addition and subtraction of fractions, decimals, and integers.
NA4-7: Form and solve simple linear equations.
NA4-9: Use graphs, tables, and rules to describe linear relationships found in number and spatial patterns.

Description of mathematics:

The background knowledge and skills that need to be established before and/or during this activity are outlined in the diagram below:



Operating on whole numbers with a number line
Show 7 – 5 on the number line.

Operating on integers with a number line
Show 5 – 7 on the number line.

Integer values
If I am at an altitude of 100m I am that high above sea level. Where would I be if my altitude is -12m?

Solving problems using integers
When my bank balance is $250, I withdraw $300 and also am charged $25 overdrawing fees. What is my new balance?

This activity may be carried out with step by step guidance, or by allowing the student to follow their own method of solution. The approach should be chosen in sympathy with students' skills and depth of understanding.

Activity:

To make a frozen banana dessert, Mad Martha drops a banana into a flask of liquid nitrogen, which she measures to be at a temperature of 68°K.

The Kelvin, K, is a unit of temperature that starts at zero (which is the same temperature as -273°C) and goes up at the same rate as degrees Celsius.

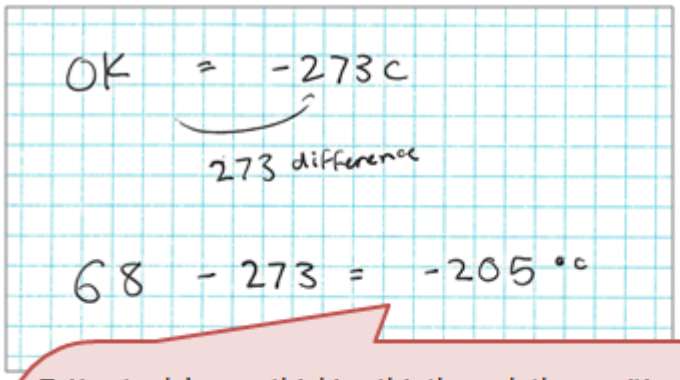
What is the temperature of the liquid nitrogen in the flask, in degrees Celsius?

The arithmetic approach

The student is able to form and solve appropriate integer equations in order to find the solution to the problem.

Prompts from the teacher could be:

1. What does the question mean by saying that the temperature scales go up at the same rate?
2. What does the negative in front of the 273 mean?
3. How many Kelvin would zero degrees Celsius be?
4. What did you do to get this answer?



T: You took longer thinking this through than writing your working down. Talk me through your thinking.

S: I was thinking about clues in the question. Wen I realised what same rate meant then I knew what to do.

T: Why was that?

S: Well, same rate means that each one you go up is the same in K or in C. So then if the start of K is the same as -273°C then 68 K is -273°C plus 10.

T: Which is what?

S: -205°C. I can't do that in my head, so I picture -273 on a number line and then move forward 60 to -213 then another 8 to -205.

The conceptual approach

The student is able to find a method of solution that solves an integer problem.

The students are encouraged to use visual representations for negative numbers, such as number lines, graphs or thermometer diagrams.

Prompts from the teacher could be:

1. How can you represent the information given in this activity?
2. Can you show where the solution is sitting?
3. Can you use your diagram/graph/number line to help you to calculate the exact temperature of the liquid nitrogen?