**Stage 1 Essential Mathematics**

**Assessment Type 2: Folio**

**Consistency in Baking**

**The Task**

In this task you will look at the importance of being consistent when making a product. This would be especially important if you were intending to sell that product commercially. You are going to investigate this by baking muffins. In groups you will choose a method to try to ensure that the muffins you make will be consistent in size and shape. You will then take measurements from your batch of muffins, and by considering your data, and that of other groups in the class, you will determine which method produced the most consistent muffins.

**Part 1**

You will all use the same recipe or the same boxed muffin mixture to ensure that the mixture is as consistent as possible. Decide on how many muffins each group will make from their mixture (e.g. 12 muffins are fairly common from a packet mixture). Now choose the method that your group will use to try to ensure the best consistency in the muffins you make. You could consider one or a combination of the following to try to ensure consistency in your muffins:

* Using a particular size of spoon or scoop to measure the mixture for each muffin
* Using a piping bag for measuring out the mixture for each muffin
* Using different types of patty pans or using a muffin cooking tray without lining when cooking the muffins
* Weighing each amount of mixture on a set of electric scales before cooking.

Every group should use the same procedure when baking the muffins:

* Tapping the trays to level out the mixture or smoothing the top of each muffin so they rise the same
* Using the same temperature to cook the muffins
* Rotating in the oven **once** in case some areas are hotter.

**Part 2**

Now you will take your muffins and analyse them statistically. Use a method to number each muffin in your batch – this will be important when collecting the data.

1. You will need to take measurements of your freshly cooked muffins – this could include: the height, weight and spread (how wide the muffin is across the top). Record all of your measured data for each of the muffins made in a table such as the one below.

|  |  |  |  |
| --- | --- | --- | --- |
| **Muffin No.** | **Weight (gm)** | **Height (cm)** | **Spread (cm)** |
| **1** |  |  |  |
| **2** |  |  |  |

1. Using your group’s collected data calculate the measures of central tendency (mean and median) and the measures of spread (range, interquartile range (IQR) and standard deviation) for each of the characteristics that you measured (weight/height/width).
2. Discuss how consistent your muffins are. Did your method work well? Are there any outliers in your batch of muffins? Use your statistics to support your answers to these questions.

**Part 3**

You will now compare your performance with that of other groups in the class. Obtain a copy of the data table from ***two other groups*** and make a note of what method they used to keep their muffins consistent in each case.

Summarise the statistics (mean, median, range, IQR, standard deviation) of the three groups in a suitable table.

Use parallel box-and-whisker plots to display the three data sets graphically for the different variables measured (weight, height, width).

Compare the performance of the three groups and discuss which group you think produced the best set of muffins and which produced the worst. Support your decisions using evidence from your table and graphs.

**Part 4**

As a **class exercise** have all the batches of muffins displayed and then compared and ranked according to how consistent they *looked*. The class should try to reach a consensus on this ranking and the reasons for it. Write down a summary of what happened in this class exercise.

You should now compare the rank of the three batches in your investigation with the way they ranked in the class exercise. Was it the same or different? Why might this be? What does this suggest about the data you collected? What does it suggest about how people buying muffins might make their decisions about which is the better product?

**Part 5**

Complete the report outlined below and submit it to your teacher.

**The Report**

**Introduction**

Write an introduction that outlines your task and include information about the data you are going to collect. Explain what method your group intends to use to keep the muffins consistent. Discuss what you think are the important things you need to focus on to make your muffins the most consistent. What are the critical steps in the process?

**Mathematical Investigations**

Complete Parts 1-4

Include all calculations, data, graphs and discussions.

Include a photo of your finished muffins.

**Discussion**

After completing all parts of the investigation, discuss why you think the methods used by the groups to keep their muffins consistent may have led to the results of your comparison. Consider what other things may have contributed to differences between the three batches of muffins.

In your conclusion consider the limitations to your investigation. Some possible questions you could consider are:

Which data was the most useful in deciding ‘consistency’ between the muffins?

What would you do differently if you did this again? How could you make it better?

What do you think are the most critical things to do to ensure consistency in making muffins?

**The report is to be a maximum of 6 A4 pages.**

**Performance Standards Stage 1 Essential Mathematics**

|  |  |  |
| --- | --- | --- |
|  | Concepts and Techniques | Reasoning and Communication |
| **A** | Knowledge and understanding of mathematical information and concepts in familiar and unfamiliar contexts.  Highly effective application of mathematical skills and techniques to find efficient and accurate solutions to routine and complex problems in a variety of contexts.  Gathering, representation, and interpretation of a range of data in familiar and unfamiliar contexts.  Appropriate and effective use of electronic technology to find accurate solutions to routine and complex problems. | Accurate interpretation of mathematical results in familiar and unfamiliar contexts.  Highly effective use of mathematical reasoning to draw conclusions and consider the appropriateness of solutions to routine and complex problems.  Proficient and accurate use of appropriate mathematical notation, representations, and terminology.  Clear and effective communication of mathematical ideas and information to develop logical and concise arguments. |
| **B** | Knowledge and understanding of mathematical information and concepts in familiar and some unfamiliar contexts.  Effective application of mathematical skills and techniques to find mostly accurate solutions to routine and some complex problems in a variety of contexts.  Gathering, representation, and interpretation of data in familiar and some unfamiliar contexts.  Mostly appropriate and effective use of electronic technology to find mostly accurate solutions to routine and some complex problems. | Mostly accurate interpretation of mathematical results in familiar and some unfamiliar contexts.  Effective use of mathematical reasoning to draw conclusions and consider the appropriateness of solutions to routine and some complex problems.  Mostly accurate use of appropriate mathematical notation, representations, and terminology.  Clear and appropriate communication of mathematical ideas and information to develop some logical arguments. |
| **C** | Knowledge and understanding of simple mathematical information and concepts in familiar contexts.  Application of some mathematical skills and techniques to find solutions to routine problems in familiar contexts.  Gathering, representation, and interpretation of data in familiar contexts.  Generally appropriate and some effective use of electronic technology to find solutions to routine problems. | Generally accurate interpretation of mathematical results in familiar contexts.  Appropriate use of mathematical reasoning to draw conclusions and consider the appropriateness of solutions to routine problems.  Generally appropriate use of familiar mathematical notation, representations, and terminology.  Appropriate communication of mathematical ideas and information. |
| **D** | Basic knowledge and some understanding of simple mathematical information and concepts in some familiar contexts.  Application of basic mathematical skills and techniques find partial solutions to routine problems in some contexts.  Some gathering, representation, and basic interpretation of simple data in familiar contexts.  Some appropriate use of electronic technology to find solutions to routine problems. | Some interpretation of mathematical results in some familiar contexts.  Attempted use of mathematical reasoning to consider the appropriateness of solutions to routine problems.  Some use of familiar mathematical notation, representations, and terminology.  Attempted communication of simple mathematical ideas and information. |
| **E** | Limited knowledge or understanding of mathematical information or concepts.  Attempted application of basic mathematical skills or techniques, with limited accuracy in solving routine problems.  Some gathering and attempted representation of simple data in a familiar context.  Attempted use of electronic technology in to find a solution to a routine problem. | Limited interpretation of mathematical results.  Limited awareness of the use of mathematical reasoning in solving a problem.  Limited use of mathematical notation, representations, or terminology.  Attempted communication of an aspect of mathematical information. |