

PRODUCT WARS: ULTIMATE SMOOTHIE

These activities are designed for 60-minute lessons. You may need to adapt the materials for use in longer or shorter lessons.

INTRODUCTION

In this activity, pupils are asked to create a range of smoothies choosing from a list of different ingredients. They are then asked to complete a nutrition label for each smoothie and, in some instances, are invited to compare their smoothies, e.g. with Guideline Daily Amount figures.

This activity is mainly ICT based. It has been designed for use with pupils in an ICT suite although it could be adapted for use in a maths classroom equipped with a data projector and whiteboard. It is suggested that pupils work together in pairs or small groups to encourage appropriate levels of participation and discussion.

The activity contains 3 options offering varying degrees of challenge. Different pupil pairs or groups within a class can work at different options. Alternatively, you may prefer to ensure each group has a mix of pupils. This will help to create appropriate conditions for peer support.

These different options are as follows:

- **Option A:** Pupils are presented with a list of potential ingredients and are asked to use 3 different ingredients to make 96g of smoothie. They then calculate the percentage of each ingredient to complete a nutrition label for each smoothie. This option is considered appropriate for learners working at **level 4 – level 5 of the National Curriculum**.
- **Option B:** Pupils are presented with a list of potential ingredients and are asked to use 4 different ingredients to make 360g of smoothie. They then calculate the number of kcals and the amount of protein, fat and carbohydrate in a 100g serving to complete a nutrition label for each smoothie. Pupils are then asked to construct a range of graphs comparing the figures for each smoothie. This option is considered appropriate for learners working at **level 5 – level 6 of the National Curriculum**.
- **Option C:** Pupils are presented with a list of potential ingredients and are asked to use at least 4 different ingredients to make 980g of smoothie. They then calculate the number of kcals and the amount of protein, fat and carbohydrate in a 100g serving to complete a nutrition label for each smoothie. Pupils are then asked to construct a range of graphs comparing the figures for each smoothie with some Guideline Daily Amount (GDA) figures. This option is considered appropriate for learners working **at or above level 6 of the National Curriculum**.

LEARNING OBJECTIVES

Option A

By the end of the lesson, pupils will:

- create a range of smoothies using 3 ingredients;
- calculate the percentage of each ingredient in each smoothie.

Option B

By the end of the lesson, pupils will:

- create a range of smoothies using 4 ingredients;
- calculate the amount of protein, fat and carbohydrate in 100g of each smoothie
- draw a range of graphs comparing their smoothies.

Option C

By the end of the lesson, pupils will:

- create a range of smoothies using at least 4 ingredients;
- calculate the amount of protein, fat and carbohydrate in 100g of each smoothie;
- draw a range of graphs comparing their smoothies with some Guideline Daily Amount (GDA) figures.

LEARNING OUTCOMES**Option A**

Most pupils will:

- use given information to solve a problem;
- calculate percentages of a quantity.

Option B

Most pupils will:

- use given information to solve a problem;
- use the unitary method to solve problems of proportion.

Option C

Most pupils will:

- use given information to solve a problem;
- solve problems of proportion.

NATIONAL CURRICULUM OBJECTIVES**Option A****Ma2 Number and algebra****Using and applying number and algebra**

1. Pupils should be taught to:
 - b) break down a complex calculation into simpler steps before attempting to solve it
 - g) recognise where fractions or percentages are needed to compare proportions.

Numbers and the number system

2. Pupils should be taught to:
 - e) understand that 'percentage' means 'number of parts per 100' and use this to compare proportions; interpret percentage as the operator 'so many hundredths of' [for example, 10% means 10 parts per 100 and 15% of Y means (15 divided by 100)y].

Calculations

3. Pupils should be taught to:
 - e) convert simple fractions of a whole to percentages of the whole and vice versa.

Option B and Option C**Ma2 Number and algebra****Using and applying number and algebra**

1. Pupils should be taught to:

- b) break down a complex calculation into simpler steps before attempting to solve it
- g) recognise where fractions or percentages are needed to compare proportions; identify problems that call for proportional reasoning, and choose the correct numbers to take as 100%, or as a whole.

Equations, formulae and identities

5. Pupils should be taught to:

- g) set up and use equations to solve word and other problems involving direct proportion, and relate their algebraic solutions to graphical representations of the equations.

Links to the revised Programme of Study for introduction in 2008 include:

1 Key concepts**Competence**

- a) Applying suitable mathematics accurately within the classroom and beyond.
- b) Communicating mathematics effectively.
- c) Selecting appropriate mathematical tools and methods, including ICT.

Applications and implications of mathematics

- b) Understanding that mathematics is used as a tool in a wide range of contexts.

Critical understanding

- b) Recognising the limitations and scope of a model or representation.

2 Key processes**Representing**

Pupils should be able to:

- a) identify the mathematical aspects of a situation or problem

Analysing

Pupils should be able to:

- f) explore the effects of varying values and look for invariance and covariance
- g) take account of feedback and learn from mistakes
- h) work logically towards results and solutions, recognising the impact of constraints and assumptions.

Interpreting and evaluating

Pupils should be able to:

- a) form convincing arguments based on findings and make general statements
- b) consider the assumptions made and the appropriateness and accuracy of results and conclusions.

Communicating and reflecting

Pupils should be able to:

- a) communicate findings effectively
- b) engage in mathematical discussion of results.

3 Range and content**Number and algebra**

The study of mathematics should include:

- a) rational numbers, their properties and their different representations
- c) applications of ratio and proportion.

Geometry and measures

The study of mathematics should include:

- g) units, compound measures and conversions.

4 Curriculum opportunities

The curriculum should provide opportunities for pupils to:

- a) develop confidence in an increasing range of methods and techniques
- d) work on problems that arise in other subjects and in contexts beyond the school
- f) work collaboratively as well as independently in a range of contexts.

LESSON PREPARATION

- Familiarise yourself with the different options in order to identify the ones that will best address your pupils' needs.
- Set up the projector or interactive whiteboard to enable the whole class to view the initial brief from Brad King.
- Pupils should be able to work in pairs or small groups at computers so appropriate resources, such as a computer suite, should be arranged for the lesson.
- You may wish to create a certificate of achievement to award to pupils that perform well in the activity.

Vocabulary

Percentage, proportion, pie chart, unitary method.

Materials required

For each option you will need the following:

- Internet access or a downloaded version of this case study
- Microsoft Excel
- Calculators

In addition, for Option A and Option B, you will need some copies of the supporting worksheets.

Prior knowledge required

- Option A pupils should have experience of finding a percentage of a quantity.
- Option B and Option C pupils should have experience of using direct proportion.

LESSON DETAILS**Starter****Option A****Whole-class activity**

- Project the accompanying nutritional information sheet on to the whiteboard or screen.
- Explain that all this information has been taken from a 1 litre container of grapefruit juice.
- Ask pupils questions such as:
 - How much Vitamin C is in 250g of juice?

- What unit is energy measured in?
- How much carbohydrate is not sugars in 100g of juice?
- What is the guideline daily amount of fat?
- How many calories in 100g of juice?
- If you drank the whole carton how much Vitamin C would you get?
- How big is one serving?

Option B and Option C

Whole-class activity

- Project the accompanying nutritional information sheet on to the whiteboard or screen.
- Explain that all this information has been taken from a 1 litre container of grapefruit juice.
- Ask pupils questions such as:
 - How much Vitamin C is in 250g of juice?
 - What unit is energy measured in?
 - How much carbohydrate is not sugars in 100g of juice?
 - What is the guideline daily amount of fat?
 - How many calories in 100g of juice?
 - If you drank the whole carton how much Vitamin C would you get?
 - How big is one serving?
 - How much sugar is in 1 litre of juice?
 - 21% of *what* is 19g?
 - Use the information in the 250g column to find the protein in 1 litre.
 - Use the information in the 100g column to find the protein in 1 litre.
 - What do you notice? Can you explain why the answers are different?

Main

Play the video of Brad King introducing the task to the whole class.

Ensure that pupils are clear on what they will need to do in the lesson.

Option A, Option B and Option C

- Project the accompanying spreadsheet on to the whiteboard.
- Take some time to introduce the features of the spreadsheet to your pupils.
- In particular, emphasise that pupils will be required to:
 - type the name of the ingredients they want to use in column H
 - enter the amount of each ingredient they want to use in column I
 - input the kcals per 100g for each ingredient in column J.
- Demonstrate how changing values in one cell can affect the value in other cells. For example, changing the value in cell I9 will alter the total value in cell I15. Similarly, changing the amount of each ingredient used will result in changes in the cells in column K and in the number of kcals recorded in cell J17.
- Ask pupils to suggest ways in which they could attempt to reduce the number of kcals per 100g.
- Once ready, invite pupils to fill in the spreadsheet by:
 - entering their chosen ingredients in column H
 - enter their chosen amounts in column I
 - ensuring the total amount is 96g for Option A, 360g for Option B or 980g for Option C
 - entering the kcals per 100g values in column J.
- Ask pupils to adjust their ingredients or amounts until they are below 60 kcals per 100g.

- Once ready, pupils should go to the labels sheet and enter their ingredients in the first column and the number of kcals per 100g below the appropriate heading.
- Pupils should then give their smoothie a name and enter it on the label.
- If time allows, encourage pupils to create up to 4 different smoothies.

Option A

- Distribute the accompanying Option A support worksheet.
- Pupils should calculate the percentage of each ingredient used and enter the results on the nutrition labels along with a name for each smoothie.
- Save and print off the completed labels to be used next lesson.

Option B

- Distribute the accompanying Option B support worksheet.
- Pupils should calculate the percentage of each ingredient used and enter the results on the nutrition labels along with a name for each smoothie - pupils should also calculate the amount of protein, fat and carbohydrate per 100g and enter their results on each label.
- If they experience problems with this offer the following support:
 - work out the amount of protein in 100g of your first ingredient
 - work out the amount in 1g of your first ingredient
 - work out the amount in the chosen amount of your first ingredient
 - work out the amount of protein in your other ingredients
 - work out the total amount of protein in the 360g of smoothie
 - work out the amount of protein in 100g of smoothie.
- Ask pupils to draw bar graphs comparing the number of kcals and the amount of protein, fat and carbohydrate in a 100g serving of each smoothie.
- You may prefer your pupils to use the Microsoft Excel Chart Wizard instead.
- Save and print off the labels and graphs to be used next lesson.

Option C

- Ask pupils to calculate the percentage of each ingredient used and enter the results on the nutrition labels along with a name for each smoothie – pupils should also calculate the amount of protein, fat and carbohydrate per 100g and enter their results on each label.
- If they experience problems with this offer the following support:
 - work out the amount of protein in 100g of your first ingredient
 - work out the amount in 1g of your first ingredient
 - work out the amount in the chosen amount of your first ingredient
 - work out the amount of protein in your other ingredients
 - work out the total amount of protein in the 980g of smoothie
 - work out the amount of protein in 100g of smoothie.
- Ask pupils to draw bar graphs comparing the number of kcals and the amount of protein, fat and carbohydrate in a 100g serving of each smoothie – then ask pupils to draw pie charts showing the kcal, fat and carbohydrate figures in a typical 250 ml serving of each smoothie – note that these figures should be expressed as a proportion of the Guideline Daily Amount figures used earlier (kcal = 2000, fat = 70g and sugar = 90g).
- You may prefer your pupils to use the Microsoft Excel Chart Wizard instead.
- Save and print off the labels and graphs to be used next lesson.

Plenary**Option A**

- Ask pupils to imagine that they are trying to sell their smoothie.
- What would they put into an advertisement?
- Would they tell customers about the number of calories? Why would customers want to know this?
- Would they include the percentages of each ingredient? Why?
- Ask each pair or small group to 'sell' their smoothie to the rest of the class.

Option B

- Most of the carbohydrate in a smoothie will be sugar. The guideline daily amount of sugar is 90g. The guideline daily amount of calories is 2000 kcals.
- Ask pupils questions such as:
 - How much carbohydrate is in 100g your smoothie? Compare results across the class.
 - How much of your smoothie would someone have to drink to be over the guideline daily amount?
 - Ask similar questions about the number of calories.

Option C

- There has been a lot of discussion recently about the best way of giving nutritional information on food containers. Some companies prefer to use a traffic light system, colouring a pie chart red, amber or green. Some companies want to use percentages of the guideline daily amount.
- Ask pupils questions such as:
 - What method do you think is easiest to understand?
 - What method gives the information in the clearest way?
 - Would you use a different method of giving the information?
 - Do you look at the nutritional information on food that you buy?
 - Would you look if you were:
 - training for football or some other sport?
 - wanting to look your best for a forthcoming party?
 - trying to lose weight?
 - buying food for your young brother or sister?
- Why do you think that the government wants this information on all packaged food?

Homework

Option A

- Ask pupils to get a nutrition label from any sort of packaged food and stick it on to a piece of A4 paper. The heading on the paper should be the name of the food.
- Under the label they should write down 5 questions that they make up using the information on the label (like the questions in the starter activity).
- Tell pupils that their homework will be displayed and that other pupils will have to answer the questions.

Options B and C

- Ask pupils to find the nutrition labels from 2 or 3 different packaged foods and stick them in their notebooks; recording the name of the food and the weight in the container. They should include all the labels on the pack, including pie charts.
- They should use the information on the label to find the amount of calories, protein, fat and carbohydrate in the whole pack and show their calculations.

- Option C pupils could also find the amount in the pack of any other food values given, e.g. vitamins.

TECHNICAL SUPPORT

Throughout all the activities and support notes you will be asked to open various files in Flash, Microsoft Excel or in Adobe PDF. You may also wish to use Microsoft PowerPoint for presentations. To use these, you will need to have the minimum specification installed. This recommendations list can be found below.

The latest **Adobe Flash Player** (previously know as the Macromedia Flash Player) can be downloaded free from the Adobe website. Support and Help can also be found on this site:

http://www.adobe.com/shockwave/download/download.cgi?P1_Prod_Version=ShockwaveFlash

You will need to have purchased and installed **Microsoft Excel**. It is usually installed with Microsoft Office. You can find help and support on using Microsoft Excel (Versions 2007, 2003, 2002, 2000) on the Microsoft website for Excel. You can also find methods of purchasing or upgrading your Excel here:

<http://office.microsoft.com/en-us/excel/FX100646951033.aspx>

You will be using a version of **Adobe Reader** or Distiller to view these Teacher Notes. If you would like help or to download a newer version, you can find information at Adobe's website:

<http://www.adobe.com/products/reader/>

Training, templates and Product information on **Microsoft PowerPoint** can be found on the Microsoft website for PowerPoint:

<http://office.microsoft.com/en-gb/powerpoint/default.aspx>

Minimum Machine and Software Specifications

PC

P3 800MHz; 128MB RAM; Windows 2000

Screen resolution 1024x768

Browser: Microsoft Internet Explorer 5.5; Firefox 1; Netscape 7; or Opera 7

Microsoft Excel 2000

Microsoft PowerPoint 2000

Macromedia Flash Player 7

Adobe Reader 7

Mac

G3 500MHz; 128MB RAM; OS X 10.2

Browser: Safari 1; Firefox 1; Netscape 7; or Opera 6.2

Screen resolution 1024x768

Macromedia Flash Player 7

Adobe Reader 7