About the Investigation

This Investigation presents a great opportunity to promote healthy eating and teaches students about the careful selection of food groups in their diets. Students must analyse the nutritional content of seven cereals, then choose the best three to serve at a breakfast club. Students will be amazed to discover what some of their favourite breakfast cereals contain as they analyse and interpret the nutritional information on the packaging.

Planning the Investigation

Expected duration of Investigation:
4 weeks

Recommended group size:
2 to 3 students

Students will need:
☆ **Data Page 1** – *iFlakes nutritional values*
☆ calculator
☆ internet access
☆ graph paper
☆ 6 different cereal boxes per group

Topics for this Investigation

Before starting the Investigation, teach the following Topics...

NA16 Place value to thousandths

NA22 Percentages

NA23 Percentages using a calculator

SP2 Interpreting data

SP3 Dot plots

SP4 Discrete data

SP5 Column graphs

Curriculum match for Investigation 5

The table below shows how the Topics in Investigation 5 match the content requirements of the Australian Curriculum.

Content descriptions	iMaths 5 Topics
Number and Algebra **Fractions and decimals** • Recognise that the number system can be extended beyond hundredths. • Compare, order and represent decimals. • Make connections between equivalent fractions, decimals and percentages.*	 **NA16** Place value to thousandths **NA16** Place value to thousandths **NA22** Percentages **NA23** Percentages using a calculator
Statistics and Probability **Chance** • List outcomes of chance experiments involving equally likely outcomes and represent probabilities of those outcomes using fractions. • Recognise that probabilities range from 0 to 1. **Data representation and interpretation** • Pose questions and collect categorical or numerical data by observation or survey. • Construct displays, including column graphs, dot plots and tables, appropriate for data type, with and without the use of digital technologies. • Describe and interpret different data sets in context.	 **SP2** Interpreting data **SP2** Interpreting data **SP3** Dot plots **SP4** Discrete data **SP3** Dot plots **SP4** Discrete data **SP5** Column graphs **SP3** Dot plots **SP4** Discrete data **SP5** Column graphs

*This concept is beyond the Year 5 achievement standard of the Australian Curriculum.

The table below shows how students will apply the proficiency strands during each task in this Investigation.

Proficiency strands	Investigation 5 criteria
Understanding, Fluency and Problem Solving	**Step 2:** Collect class data on favourite cereals and record on a dot plot. **Step 4:** Collect and record the nutritional information from six cereal boxes. **Step 5:** Construct five different column graphs that show the percentages of ingredients.
Reasoning	**Step 6 & 7:** Choose the best three cereals and justify their choice.

Investigation 5 iFlakes

Essential word list

Students will need to understand the following terms:

- ☆ breakfast club
- ☆ nutritious
- ☆ nutritional value
- ☆ protein
- ☆ fat
- ☆ carbohydrate
- ☆ sugar
- ☆ fibre
- ☆ recommendation
- ☆ ingredient
- ☆ interpret
- ☆ analyse

The rubric

Read and discuss the rubric. Discuss the criteria and have students identify which step of the Investigation each one is describing. The rubric should be revisited after the *Understanding the Investigation* stage, both during and after the *Using maths* stage and during the *Reasoning and reporting* stage.

Investigation 5
iFlakes

A primary school parent group is planning to set up a breakfast club. They are looking for three nutritious cereals to serve.

Survey your class to find the cereals that students your age like to eat.

Investigate the nutritional value of at least seven cereals (including iFlakes) by examining the percentages of protein, fat, carbohydrate, sugar and fibre they contain.

Based on your findings, recommend three cereals that should be served at the breakfast club. Should iFlakes be included?

✔ Topics

Before you start the Investigation you need to know...

NA16 Place value to thousandths p62	**SP3** Dot plots... p124
NA22 Percentages... p74	**SP4** Discrete data p126
NA23 Percentages using a calculator.............. p76	**SP5** Column graphs p128
SP2 Interpreting data p122	

Understanding the Investigation

1 **Read and plan.**

Make sure you understand the meanings of: *breakfast club, nutritious, nutritional value, protein, fat, carbohydrate, sugar, fibre, recommendation, ingredient, interpret* and *analyse*.

Read and discuss the rubric.

Download your Investigation plan. This will help you with the organisation and understanding of the Investigation.

> **Teacher note**
> - Comprehensive lesson notes, suggestions and resources are available in *iMaths 5 Teacher Book*.
> - The Data page and Investigation plan for this Investigation can be downloaded from **www.imathsteachers.com.au**.

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1   Read and plan.

Read the introductory text and discuss the premise of the Investigation.

Teach the Topics (concepts) that provide the knowledge required to complete the Investigation.

Re-read the introductory text and each step of the Investigation. Discuss any procedures to be used, how data will be organised and how solutions will be communicated.

Discuss new terms in the context of the Investigation.

Read and discuss the rubric. Clarify the criteria to be assessed. This rubric should be revisited throughout the investigative process.

Go to imathsteachers.com.au and print a copy of the Investigation plan for each student. Work through the plan as a class, in small groups or individually.

Focus questions

- What is this Investigation asking you to do?
- Which Topics are really important to this Investigation?
- What do you think you will be good at?
- What do you think you will need help with?
- Do you understand the meanings of the words on page 16?

Materials

Internet access | Data page 1 | Calculator | Graph paper | 6 different cereal boxes per group

Using maths

2 Collect data and cereal boxes.
Survey the students in your class to collect data on their favourite breakfast cereals. Show the results of your survey on a dot plot.

In groups, select six different cereals to investigate and collect the boxes.

3 Study the nutritional information.
Look at the nutritional information on Data page 1 iFlakes nutritional values (p163).

Locate the same nutritional information on each of the cereal boxes you collected. Look at the amounts per 100 g of each ingredient. How does this relate to percentages?

4 Record your information.
Construct a table to record information for each of the seven cereals, including iFlakes. Record the percentage per 100 g of protein, fat, carbohydrate, sugar and fibre for each cereal.

5 Graph your data.
Use the data from your table to construct five different column graphs. One column graph will show the percentages of protein for each cereal. The other four column graphs will show percentages of fat, carbohydrate, sugar and fibre.

6 Interpret your data.
Analyse the data and decide which cereal has the highest nutritional value.

Choose the best three cereals to be served at the breakfast club.

Reasoning and reporting

7 Display your tables and graphs.
Show the class your tables and graphs.

Justify your choice of cereals. You must be able to explain the reasons for your recommendation.

imathskids.com.au

Go to **imathskids.com.au** – the Investigation 5 area contains the Investigation plan, websites and Data page that you need to complete this Investigation.

Nutritional information
(amounts per 100 g)

Cereal	Protein	Fat	Carbohydrate	Sugar	Fibre

Inquiry
Look more closely at the information on one of your cereal boxes.

What other types of nutritional information are included?

Some ingredients occur in very small amounts.

Find out what each of these different symbols mean: mg, µg and kJ.

2 Collect data and cereal boxes.

As an engaging introduction, discuss any current advertising campaigns for breakfast cereals on television, radio, or in newspapers and magazines.

Students must survey their classmates to find the most popular breakfast cereals. The results of the class cereal survey should be recorded on a dot plot. They will select six of these cereals to examine in the Investigation.

Students should select six cereals that are as diverse as possible. This will lead to better discussion and a range of results. Some cereals may be high in sugar and low in fat, others may be higher in fat and contain little sugar.

It may be necessary at this stage to discuss the requirements of cells in the body. See **Background information about foods** on the next page.

In the classroom, list and display any food-related slogans or proverbs, such as: "The breakfast of champions", "An apple a day keeps the doctor away", "You are what you eat", "An army marches on its stomach".

Focus questions
• What is a balanced diet?
• What foods should we try to eat more/less of daily?
• What are the consequences of a high sugar or fat diet?

Investigation 5 iFlakes

2 Collect data and cereal boxes. *(continued)*

Background information about foods

Carbohydrates and fats are used as an energy source by the body for muscle movement, nerve transmission and for heat (warmth). Proteins are used to build and repair cells. However, excess carbohydrates and proteins in the diet can be converted to fats and stored in the body.

Fats can be classified as saturated or unsaturated. Saturated fats are found in animal products such as meats, full cream milk, cheese, butter, and in processed foods such as biscuits, cakes, pastries and deep-fried foods. Saturated fats contribute to the risk of heart disease by raising blood cholesterol levels.

Unsaturated fats are found in fish, avocados, olives, nuts and seeds, and in processed foods such as some margarines and oils (canola, peanut, linseed, and sunflower). Replacing saturated fats with unsaturated fats can help lower blood cholesterol. Some fats are essential to our diet and aid in the absorption of particular vitamins, such as vitamin A.

Vitamins and minerals
These are required in very small quantities by the body to help in the various cell reactions. Without these substances, the body does not function well and deficiency diseases occur. For example, iron is found in haemoglobin, which carries oxygen in red blood cells, and a lack of iron causes anaemia (shortness of breath and lethargy). Carrots contain carotenoids, which are converted to vitamin A in the body, which is essential to maintain good vision.

Sodium (salt) is important in maintaining a healthy fluid balance. Sodium is also used in muscle movement and nerve transmission. Too much salt in the diet can lead to excess water retention and is also considered a factor in the development of high blood pressure.

Fig 5.1 shows the recommended total daily intake (DI) of food types for adults. The DI will vary with daily activity.

Fig 5.1 – Approx daily intake of food types (for a 70 kg adult)

Food type	Approx daily intake
Carbohydrates Total: Sugars:	300 g 90 g
Fibre	25 g
Protein	60 g
Fats	65 g
Sodium	2400 mg

3 Study the nutritional information.

As a class read and discuss Data Page 1, *iFlakes nutritional value*, on page 163 of the Student Book.

Ask students to locate the same nutritional information label on their collected cereal boxes. Encourage discussion on meanings of the different headings. Understanding the nutritional information will require teacher guidance.

You may wish to integrate the following focus questions in this discussion.

Focus questions
- What is the 'energy' in food?
- Why do you need fibre in your diet?
- How much fat do you need to eat? Are there 'good' fats and 'bad' fats?
- What is sodium? Is it important?

Notes about food types in cereals
Sugars that are added to cereals supply a rapid energy boost for the body, but do not provide a long-lasting effect. They also interfere with the digestion and absorption of more nutritious substances in the cereal. 30% sugar content represents about 2 teaspoons of sugar in a 30 g serve. Aim for less than 25% sugar.

Fat content in cereals should be less than 9% (9 g in 100 g) and the saturated fat component less than 1.6%.

Fibre is an important ingredient in breakfast cereals. The accepted levels of fibre content are:

Very high: >6 g per 30 g serve
High: 3 to 6 g per 30 g serve
Moderate: 1.5 to 3 g per 30 g serve

Cereals containing less than 1.5 g of fibre per 30 g serve are not recommended. Children need their age plus 10 g of fibre in their diet per day.

Sodium (salt) content of greater than 150 mg per 30 g serve is considered to be high. Highly processed foods contain a relatively high proportion of sodium. Dieticians recommend people reduce their sodium intake.

Nutritional labels on food are now required by law. Discuss their purpose with the students.

Focus questions
- Where do you find nutritional information?
- How is the nutritional information set out?
- Why do you think these labels are necessary?
- Do you think many people refer to these labels?
- Who is most likely to read them?

3 Study the nutritional information. *(continued)*

Take time to read and discuss the nutritional panel with the students. Nutritional information on labels can be very confusing. Interpreting food labels makes an excellent reading and viewing activity. Most labels display 3 or 4 columns.

Locate and discuss the columns that show quantity per serve and quantity per 100 g. Note that carbohydrates include sugars, but the sugars are often listed separately.

4 Record your information.

In this step of the Investigation students will construct a table to record nutritional information for each of the seven cereals, including iFlakes.

Using the problem solving strategy, *make a table or chart*, is essential when quantities need to be compared (Steps 4 and 5), then analysed (Step 6). A visual representation of each cereal component per 100 g is an easy way to analyse differences and therefore make more informed judgments.

Many students have difficulty keeping track of information in an organised way. Good record keeping in charts, spreadsheets and graphs ensures better organisation and improves chances of accuracy. This type of record keeping also helps to clarify the task. Accurate record keeping is a life-long skill.

Students will record the percentage per 100 g of protein, fat, carbohydrate, sugar and fibre for each of the seven cereals on their tables.

Make sure students construct an accurate table, with a title and labeled columns or rows. The quantity per 100 g shown on the label relates easily to percentages. For example, a label showing protein in the product at 7.5 g per 100 g contains 7.5% protein in the total product.

5 Graph your data.

Using the data from the table created in Step 4 students will construct five separate column graphs to display the percentage of protein, fat, carbohydrate, sugar and fibre for each of the seven cereals. A good graph should include: an appropriate heading, clearly labelled axes and appropriate intervals (see Fig 5.2).

The cereals should appear in the same order on each column graph for easy comparison.

Fig 5.2 – Protein content per 100 g for breakfast cereal
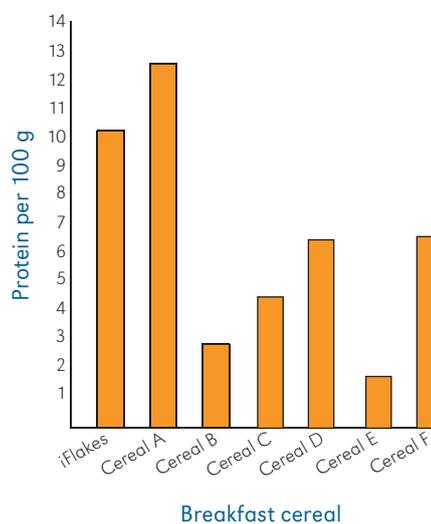
6 Interpret your data.

Students will need to discuss and define what is meant by highest nutritional value. Generally the cereal with a high to very high fibre content, a protein content 10% or greater and low fat, sugar and salt content would be considered to have the highest nutritional value. Some students may argue that reduced sugar is more important than reduced fat. This should evoke vigorous conversations.

Ask students to choose the best three cereals to be served at the breakfast club. Students will have to define what they mean by the 'best' cereal. Some may suggest that best means nutrition, others may suggest that best means taste and presentation; others may think that best means best price. There will probably not be one cereal that is 'best' in all areas. Students need to justify their decision.

Focus questions
- What is meant by highest nutritional value?
- Which ingredients in breakfast cereals are beneficial to good health?
- Which ingredients should we minimize in our diets?

7 Display your tables and graphs.

Students use their tables and graphs to justify their choice of the three best cereals to the class.

Good overall nutritional value, rather than taste or presentation, is of paramount importance when making a wise choice.

This Investigation has no definitive answer. Students' choices will depend on the relative value they place on different ingredients. This could be vigorously debated.

Students should submit

- [ ] a dot plot containing breakfast cereal survey results
- [ ] a table showing the nutritional information of seven cereals (6 cereals + iFlakes)
- [ ] five different column graphs comparing food contents
- [ ] recommendation of the best three cereals to serve at the breakfast club
- [ ] justification for making the recommendation.

Communicating and reflecting

The following questions are designed to help you assess students' proficiency in reasoning.

- How did you use the nutritional information on a cereal packet to calculate the percentage of the five nutrients in the cereal?
- How did you define highest nutritional value?
- How did you decide which three of the seven types of cereals would be served at the breakfast club?

Inquiry

Students who need an extra challenge could be engaged in the following activity, which extends the application of the Topics used in this Investigation.

Look more closely at the information on one of your cereal boxes. What other types of nutritional information are included?

Some ingredients occur in very small amounts.

Find out what each of these different symbols mean: mg, μg and kJ.

Tables showing nutritional information begin with energy content of the cereal measured in kilojoules (kJ). This is a measure of the total chemical energy in the food. For example, a serve of Swiss muesli contains 718 kJ of energy, (remember, the energy increases when you add milk, fruit and sweetener such as honey).

Fats are listed as total fats and saturated fats, and are both measured in grams.

Fibre is often listed as soluble fibre (pectin) and insoluble fibre (cellulose). Some cereals list potassium, which is measured in milligrams (mg).

The smallest unit of mass used in nutrition information is micrograms (μg). Vitamins and minerals, such as iron, are very important in cell reactions, but are required in very small quantities so they are measured in micrograms.

Data pages

Data pages are found at the back of the Student Book. Downloadable Data pages are exclusive to classes that booklist iMaths Student Books and can be downloaded from www.imathsteachers.com.au.

Data Page 1

Rubric

Investigation 5 iFlakes

Name: _____   Due date: _____

Step	Ability to...	A	B	C	D	E
	Collect class data on favourite cereals and record on a dot plot.	Created an efficient method to collect the class data. Used a dot plot with an appropriate heading and clearly labelled axes to accurately record all data.	Used a reasonable method to collect the class data. With prompting created a dot plot with an appropriate heading and labelled axes. Corrected any errors when plotting the data collected.	Needed some help to find a suitable way to collect the class data and create a dot plot, which contained a heading and labelled axes. Made only minor errors when plotting data.	Had difficulty collecting the class data. Needed to be reminded of the features of a dot plot. Information was not always plotted correctly.	Did not collect their own class data. Was unable to design a dot plot with the correct features or plot the information recorded.
	Collect and record the nutritional information from six cereal boxes.	Efficiently collected and recorded the nutritional information. Converted all quantities to equivalent percentages correctly.	Corrected any errors when converting quantities to percentages and recording the nutritional information.	Needed assistance to convert all quantities to equivalent percentages and record the nutritional information.	Had significant difficulty converting the quantities to equivalent percentages and recording these accurately in the table.	Was unable to collect and record the nutritional information. Did not convert the quantities to percentages.
	Construct five different column graphs that show the percentages of ingredients.	Designed column graphs with appropriate headings and clearly labelled axes. Independently calculated suitable intervals which allowed the data to be recorded and easily interpreted. All research data was plotted accurately.	Designed column graphs with headings and clearly labelled axes. Needed only a little prompting to calculate suitable intervals. Needed only minor assistance to plot the research data accurately for easy interpretation.	The column graphs contained headings and labelled axes. Needed help to determine the best intervals for the graphs and to accurately plot the research data on the column graphs.	Needed to be reminded of the features of column graphs eg headings, labelled axes, and intervals. Needed to have the intervals determined. Attempted to plot research information correctly with limited success.	Was unable to design column graphs with the correct features. Made no attempt to plot the research information.
	Choose the best three cereals and justify their choice.	Explained in detail the process for selecting the three 'best' cereals. Was able to describe what was meant by 'best'. Gave detailed reasons for their choice of cereals by referring to the relevant information on the data table and graphs.	Made some references to the information on the data table and graphs when describing how they selected the three best cereals. Provided some logical reasons for the choice of cereals.	Explained briefly how the information on the data table and graphs was used to select the three best cereals. Made a recommendation for the choice of cereals. Gave some simple reasons for their choices.	Had some difficulty explaining what the data table and column graphs were indicating. Made a recommendation for the choice of cereals but was not able to rely on any results to justify it.	Was unable to explain what the data table and column graphs were indicating. Did not make a recommendation.

Proficiency strands: Understanding, Fluency and Problem Solving / Reasoning

Teacher comments

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Overall rating ☐