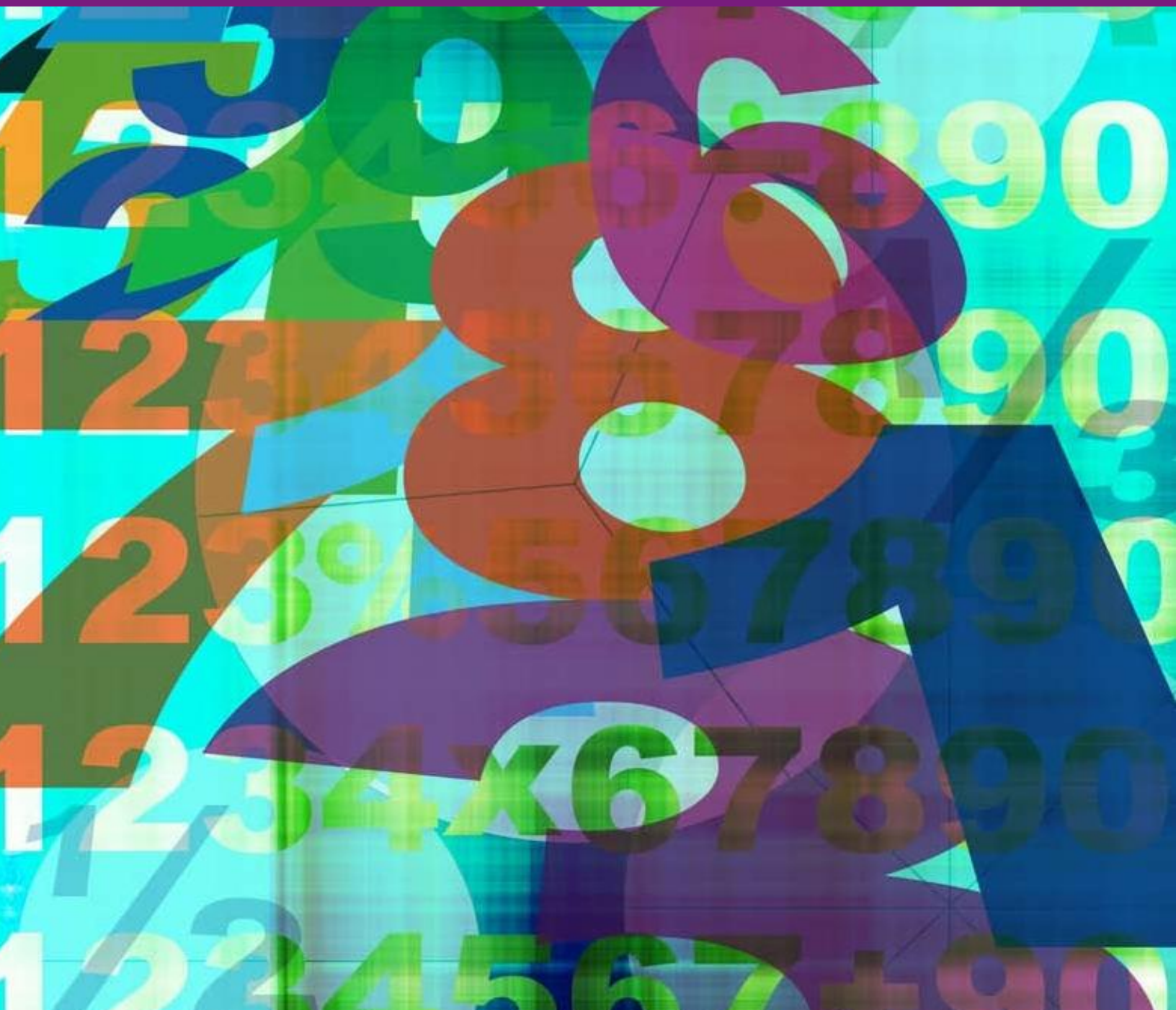
Tutor Guide
Level 4 Mathematics



Tutor Guide

Level 4: Mathematics
Unit 1: Number

Activity # Decorating **Code N1**

This activity links to award learning outcome 1.4.

Learning Outcomes

Perform addition, subtraction, multiplication and division on a calculator.

Use the calculator to compute fractions, percentages and square roots.

Use scientific notation and symbols such as π.

Recognise and apply the order of operations.

Key Learning Points

Calculator

Materials

Scientific Calculator

- This activity introduces the basic ideas of how to use your calculator to perform operations such as addition, subtraction, square roots, fractions.

- Explain what the learners will be able to do after this task.

- The learners have been introduced to using their calculator in Level 3, but they might need a quick revision of some of the buttons that they should know. The ideas and questions presented in this section link up with other sections in Level4. You may not wish to do N1 as one complete activity but may choose to refer back to it when necessary.

- Learners will have different calculators and they may need to be shown specifics individually. For example the fraction button varies between calculators, not only in terms of how it looks but also in the way it is used.

- Learners may need revision of **order of operations** and may also need to look ahead at **square roots** and using **scientific notation**.

- The learners should become competent at using a calculator. However it is also important that they learn not to rely solely on their calculator. For example, having a calculator does not avoid the need to know how to add fractions! Always encourage your learners to work out what they can first before turning to the calculator, or even to use it only to double check their own calculations.

- Practice Sheet N1 allows learners to get some practice at using their calculators. It is likely that learners may have questions about their specific calculator.

- Encourage learners to put new terminology or maths symbols in their personal maths dictionaries.

- Recap on key points and preview the next session.

- Evaluate the session.

Activity **The Telethon** Code N2

This activity links to award learning outcomes 1.1 and 1.4.

Learning Outcomes

Multiply by three digit numbers.

Divide by three digit numbers.

Key Learning Points

Three Digit Numbers

Multiplication

Division

Materials

Calculator

Pen & Paper

- This activity gives learners practice in multiplying and dividing three-digit numbers.
- Explain what the learners will be able to do after this task. This and the previous calculator activity will strengthen important foundations for the rest of this programme.

- Practice Sheet N2 will give learners a chance to enhance their skills in multiplying and dividing three-digit numbers.
- Encourage learners to put new terminology or maths symbols in their personal maths dictionaries.
- Recap on key points and preview the next session.
- Evaluate the session.

Activity # Taxing Goods **Code N3**

This activity links to award learning outcomes 1.1, 1.2 and 1.7.

Learning Outcomes

Understand percentages.

Appreciate the everyday uses of percentages.

Convert percentages to fractions.

Calculate VAT payable.

Key Learning Points

VAT

Percentages

Materials

Information about the different rates of VAT. This is available on http://www.citizensinformation.ie/en/money_and_tax/tax/duties_and_vat/value_added_tax.html)

- Calculator
- Pen & Paper

- Before starting this activity try to gauge what the learners already know about VAT or other taxes and see if they know how to calculate tax amounts.

- It is critical that learners understand the real life applications of percentages and are aware of their importance in the world around them. Stress this point on a regular basis.

- If possible find headlines or advertisements from recent newspapers that refer to percentages. Show these to learners when introducing the topic of percentages.

- If learners need more practice converting percentages to fractions you can find out the tax rates in more American States. These can be found on http://en.wikipedia.org/wiki/Sales_taxes_in_the_United_States
- Before doing Task 2 make sure that learners know that VAT must be charged at each stage. For example when buying from a wholesaler you must pay VAT and then if you go on to sell the good in your store you must add on VAT again. This VAT will then be paid by the customer.

- You could include a group task during this activity. You could give a list of items to learners and ask them to determine what rate of VAT to use. Ask them also to calculate the VAT that must be added to each product.

- Practice Sheet N3 will give learners a chance to enhance their knowledge of converting percentages to fractions and working out different tax amounts. Encourage learners to perform these calculations without using their calculator, but to use their calculator to check their answer.

- Encourage learners to put new terminology or maths symbols in their personal maths dictionaries.

- Recap on key points and preview the next session.

- Evaluate the session.

Activity **He Shoots, He scores !!** **Code N4**

This activity links to award learning outcomes 1.1 and 1.2 and 1.7

Learning Outcomes

Understand how to convert fractions to decimals.

Write word problems in mathematical form and solve them.

Key Learning Points

Word Problems

Conversion

Materials

Calculator

Pen & Paper

Statistics from the English 2009/2010 Premier League season (Available on http://www.premierleague.com/page/Statistics)

- Give the learners some examples of statements that involve fractions. This will help them see how we often need to first understand fractions before we can understand the entire statement.

- Revisit Activity N3 to ensure that students fully understand the term percentage and what it actually represents.

- If learners need to practise more questions the activity can be extended. For example you could assign different teams to learners and ask them to work out what fraction and what percentage of goals were scored by different team members. Also on the website www.premierleague.com/page/Statistics/0,,12306,00.html you can find statistics from previous seasons, so learners could then compare statistics from a number of different years.

- Ask learners to think of other situations when they may be required to use and understand the concept of fractions and percentages in real life. When they come up with other examples try to formulate a real life problem that will require them to use their understanding of fractions and percentages.

- During Task 1 (Chelsea's Firepower) it is important that the learners understand the idea of rounding off. If you feel that learners need to revise this, revisit this topic in the Level 3 resource pack.

- Practice Sheet N4 will give learners a chance to enhance their knowledge of converting fractions to percentages. Encourage learners to perform these calculations without using their calculator but to check their answer using their calculator.

- Encourage learners to put new terminology or maths symbols in their personal maths dictionaries.

- Recap on key points and preview the next session.

- Evaluate the session.

Activity **National Television Awards** **Code N5**

This activity links to award learning outcomes 1.1 and 1.2.

Learning Outcomes

Understand the relationship between decimals, percentages and fractions.

Convert decimals to fractions.

Convert decimals to percentages.

Key Learning Points

Decimals, percentages and fractions

Conversion

Materials

Calculator

Pen & Paper

- Open this activity with a class discussion. Ask learners about where they have encountered decimals before, where would they use decimals on a daily basis and what they know about the link between decimals and fractions.

- Use the number line: show where decimals and fractions should be placed on the number line.

- When converting decimals to fractions ask learners what they know and understand about **place value**. They should be able to identify tenths, hundredths etc. and this will make the task of converting decimals to fractions a lot simpler.

- Reiterate what the term **per cent** means and recap on how to convert a fraction to a percentage.

- Conduct a class survey or ballot to reinforce the concepts from this activity. For example ask which act in the X Factor the learners support or which TV soap they follow. Based on their answers, you can then inform learners what percent/fraction/decimal of the group follows which act or soap. The learners can then work out how many people support each.

- Practice Sheet N5 will give learners a chance to enhance their knowledge of converting decimals to fractions and percentages. Encourage learners to perform these calculations without using their calculator but they should also be encouraged to check their answer using their calculator.

- Encourage learners to put new terminology or maths symbols in their personal maths dictionaries.

- Recap on key points and preview the next session.

- Evaluate the session.

Activity # Salaries and Wages **Code N6**

This activity links to award learning outcomes 1.1, 1.2, 1.4 and 1.7.

Learning Outcomes

Understand the difference between gross and net pay.

Calculate wages, salaries and deductions.

Key Learning Points

Gross Income

Net Income

Materials

Calculator

- This activity outlines the basic concepts of gross and net pay.
- Explain what the learners will be able to do after this activity.
- Discuss tax, tax rates, tax credits etc with the learners. More information about tax rates, credit etc is available at www.revenue.ie
- Before undertaking the task, remind learners that they will need to know how to work the fractions and percentages.
- Talk through and discuss wages and salaries. Break the question down so learners can understand the concepts of each deduction or pay rate, making sure they grasp the idea. Commission and overtime also need to be understood.
- After you explain and discuss the task, ask learners to try an example themselves. Ask them to work in pairs or small groups to discuss their answers. Focus on understanding what the answer means so that they can understand any payslips they get or have to create.
- The 'Now try this' section allows learners to work will real life figures and situations. Always ask the learners to explain their answer (in words not in maths!).
- Practice Sheet N6 allows learners to develop their skills in working with simple interest.
- Encourage learners to put new terminology or maths symbols in their personal maths dictionaries.
- Recap on key points and preview the next session.
- Evaluate the session.

Activity # Profit & Loss **Code N7**

This activity links to award learning outcomes 1.1, 1.2, 1.4 and 1.7.

Learning Outcomes

Understand the concept of profit and loss.

Calculate profit and loss.

Key Learning Points

Profit

Loss

Materials

Calculator

- This activity introduces the basic concepts of profit and loss accounts.

- Explain what the learners will be able to do after this activity.

- Before starting, ask them what they know about profit and loss accounts. Have they ever had to keep profit and loss accounts? Explain that this section looks only at simple profit and loss accounts and in reality they can get more complicated.

- Before undertaking the task, remind learners that they will need to know how to work with fractions, percentages, their calculator and net and gross pay.

- Talk through and discuss the profit and loss tasks. Discuss the different types of operating costs that different occupations might have and the different types of income such as commission.

- After you explain and discuss the task, ask learners to try an example themselves. You might like them to work in small groups to discuss their answers. The focus here is on understanding what the answer means.

- The ‘Now try this’ section which allows learners to work will real life figures and situations. Always ask the learners to explain their answer (in words, not maths!)

- Practice sheet N7 allows learners to develop their skills in calculating profit and loss.
- Encourage learners to put new terminology or maths symbols in their personal maths dictionaries.

- Recap on key points and preview the next session.

- Evaluate the session.

Activity # Tourist Destinations **Code N8**

This activity links to award learning outcomes 1.1 and 1.2.

Learning Outcomes

Understand the concept of ratio.

Convert ratios to fractions.

Key Learning Points

Ratio

Conversion

Materials

Map of Ireland with popular tourist destinations highlighted

Images of popular tourist attractions in Dublin

Calculator

Pen & Paper

- When introducing the topic of ratio start by looking at real life uses of ratio. For example when preparing a bath we have to make sure that the water is at the correct temperature and will not scald anyone. In order to achieve this we must use a mixture of hot and cold water and the ratio of hot to cold water will determine the temperature of the bath. Another example you could use is that when we are required to mix paint we must use a certain amount of one colour and a certain amount of another. In order to get the colour we want we must use the correct proportion of the two different colours. This again is a ratio being used in the real world.

- In order to simplify the ratios it is important that learners understand the idea of common factors. In order to recap on this the tutor should hold a question and answer session to recap on the concept of common factors. Ask learners questions such as: What is a factor? What do we mean by common factor? This will help to enhance their understanding.

- It is critical to ensure that learners understand the relationship between ratio and fractions and what exactly we are finding out when we find the ratio of one group to another. Ask learners what exactly we mean when we say, for example,‘ a ratio of 4:1’.

- In the ‘Practice your skills’ section the recommended survey can be adapted to suit the needs and interests of the class. For example if people in the class have little interest in TV Talent shows this could be changed to a survey about their favourite soap, their favourite football team etc. Any survey will allow students to practise writing 2 numbers as a ratio.

- Practice Sheet N8 will give learners a chance to enhance their knowledge of ratios. Tutors should encourage learners to perform these calculations without using their calculator but they should also be encouraged to use their calculator to check the answers.
- Encourage learners to put new terminology or maths symbols in their personal maths dictionaries.

- Recap on key points and preview the next session.

- Evaluate the session.

Activity **Route 66** **Code N9**

This activity links to award learning outcomes 1.1, 1.2 and 1.3.

Learning Outcomes

Understand the idea of currency exchange and conversion.

Convert dollars to euro and euro to dollars.

Key Learning Points

Currency exchange

Conversion rates

Materials

A map of America highlighting Route 66

Current exchange rates (available on any banks website)

Pen & Paper

Dollars & Euro

Calculator

- In order to introduce this topic get learners involved in a group discussion. You may wish to break into small groups for this. Each group should be asked to name a list of countries that have a currency different to Ireland and to identify the names of different foreign currencies. The suggestions may include England (Sterling), America (Dollars) or Australia (Dollars). Then give the learners a longer list of countries which have a different currency to Ireland. You can visit the foreign exchange section on any banks website to compile that list.

- Ask learners if they have ever had to exchange currency and what they remember about how the bank figured out how much to give them.

- Ensure the learners understand what the banks mean when they say 'We Sell' or 'We Buy'. Learners must understand what each term means in order to really understand the concept and avoid rote learning. Introduce the general rule of thumb only when learners have been given the opportunity to convert money and develop their understanding of these key terms.

- Set up a role play to introduce the idea of currency conversion and to allow learners to practise converting money. One learner could act as a bank clerk while others come in to convert euro to foreign currency or foreign currency to euro. It may be a good idea to have some foreign currency in the class as this would make this activity more real.

- Many times when converting money there are more than two digits after the decimal point. However our currency only has two digits after the decimal point: it only has tenths and hundredths. Therefore we need to **round off**. Explain to learners that even in banks they will round off to the nearest cent. At this stage, revise the whole concept of rounding off (see Level 3 materials).

- The related activity can be adapted or extended if needs be. For example other English stores which have branches in Ireland include Top Shop, Miss Selfridge, Argos. Items on these websites could be priced in both currencies and we could see the difference between the two.

- Practice Sheet N9 will give learners a chance to enhance their knowledge of currency conversion. The last four questions in particular will require students to have a thorough understanding of converting foreign currency to euro and euro to foreign currency. Tutors should encourage trainees to perform these calculations without using their calculator but they should also be encouraged to check their answer using their calculator.

- Encourage learners to put new terminology or maths symbols in their personal maths dictionaries.

- Recap on key points and preview the next session.

- Evaluate the session.

Activity **Planets** **Code N10**

This activity links to award learning outcomes 1.1, 1.2 and 1.4.

Learning Outcomes

Understand the idea of scientific notation.

Convert numbers from standard form to scientific notation.

Convert numbers from scientific notation to standard form.

Key Learning Points

Scientific notation

Materials

Images of different planets in our solar system

Pen and paper

Calculator

- When introducing scientific notation inform learners that it is simply a strategy that allows us to handle really big or really small numbers. Then ask learners about where they may have encountered really big numbers (say greater than one million) or really small numbers (less than one thousandth) before. Some examples may include the Lotto fund, populations or the size of atoms. A good understanding of what an index number actually means may help learners to develop a better understanding of scientific notation, so it may be worthwhile to teach this topic in conjunction with the activity on Indices.

- When determining the power in each example inform learners that this power indicates the number of positions we want to shift the decimal point in order to get back to the number we started with. Also ensure that learners are aware of the significance of a negative or positive power and how the sign actually affects the question.

- Put extra questions to learners during Task 1 by finding out the distance between Earth and other planets or between different planets. All this information can easily be found on the web and will allow you to give learners more real life examples.

- Similar to the last point the related activity could also include many more examples and comparisons which would allow trainees more opportunities to practise their newly acquired skills.

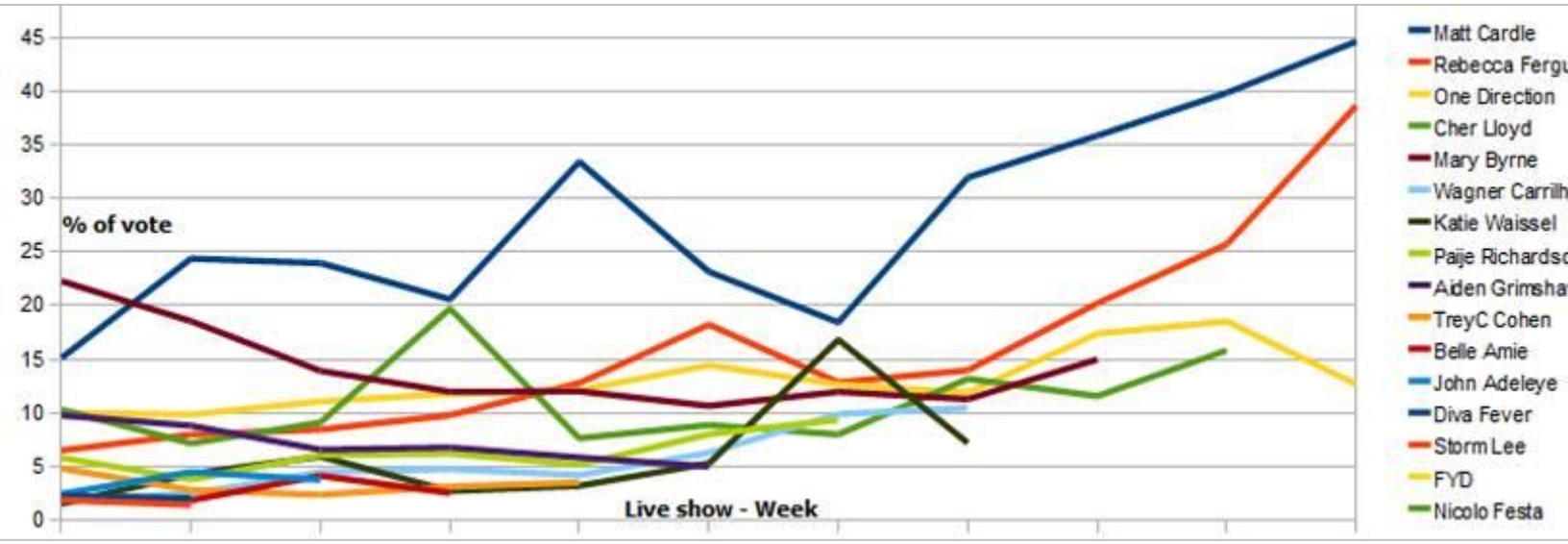
- Practice Sheet N10 will give the learners a chance to enhance their knowledge of scientific notation. Tutors should encourage learners to perform these calculations without using their calculator but also to check their answers using their calculator.

- Encourage learners to put new terminology or maths symbols in their personal maths dictionaries.

- Recap on key points and preview the next session.

- Evaluate the session.

Activity X Factor Voting Code N11



This activity links to award learning outcomes 1.1 and 1.3.

Learning Outcomes

Understand the concept of rounding off.

Round off decimals to two decimal places.

Key Learning Points

Decimals

Round Off

Materials

Number line

Calculator

Pen & Paper

- Before introducing this activity revise the idea of rounding off whole numbers. For example ask questions such as: How did we decide, when rounding off whole numbers to the nearest ten, whether the value of the tens increased or decreased and what digit provided us with this information? Once this concept is recapped and understood, tell learners that rounding off decimals is exactly the same and when rounding off to the nearest tenth it is the number of hundredths that helps us determine our estimated number.

- Then ask learners where they may have to round off decimals or if they have encountered this before. Possible suggestions include when converting money or when working out the cost of bills: for example, working out the cost of using ten units of gas if each unit costs €0.45356.

- As with introducing all other 'Rules of Thumb' only focus attention on the rules outlined here when the learners understand the reasoning behind them. For example, they must first see the logic behind why we round up when a number is five or greater and if it's less than five we do not change the number. Use a number line to help explain this concept.
- When rounding off money it is important for learners to be able to identify what each figure in the monetary figure represents. Highlight that in order to round to the nearest ten cent we must look at how many cents we have. This will help learners understand this concept in real life terms.

- Practice Sheet N11 will give learners a chance to enhance their knowledge of rounding off decimals.

- Encourage learners to put new terminology or maths symbols in their personal maths dictionaries.

- Recap on key points and preview the next session.

- Evaluate the session.

Activity **Antique Roadtrip** **Code N12**

This activity links to award learning outcomes 1.1 and 1.3.

Learning Outcomes

Understand the concept of percentage error.

Calculate percentage error.

Key Learning Points

Percentage error

Materials

Clips from the Antique Road Trip if they are available

Different items of food and/or clothing in order for you to estimate the price

Pen & Paper

- Hold a class discussion on estimating value. Ask learners if they have ever had to estimate the value of something before they have seen its actual value. Other questions could include: How did you work out how accurate your estimate was? Are there any game shows or quizzes that depend on you getting as close as possible to the actual value in order to win a prize? This discussion will allow learners to see that we often need to estimate values and then calculate the difference between the estimate and the actual value.

- Once learners know how they would calculate the difference between an estimate and the actual value (by subtraction) then recap on what we mean by the word percentage before introducing the formula. Explain why the error is placed over the actual value before we multiply by $\frac{100}{1}$.

- If learners need more practice on calculating percentage error you can use more examples from Antique Roadtrip. More clips from the show are available on the BBC website or on You Tube and you could use these clips in order to get learners to calculate more percentage error.

- In the 'Practise your skills' section the class activity should be set up like a game show. Each group will need a number of different items to estimate the price of. Either the tutor or one learner in each group must know the exact price of the items and this person will act as quizmaster. The role of quizmaster should be alternated after every five rounds.

- When calculating percentage error we are often required to round off our resultant percentage to the nearest whole number or to two decimal places. Recap on this concept.

- Practice Sheet N12 will give learners a chance to enhance their knowledge of calculating percentage error. Encourage learners to perform these calculations without using their calculator but they should also be encouraged to check their answer using their calculator.

- Encourage learners to put new terminology or maths symbols in their personal maths dictionaries.

- Recap on key points and preview the next session.

- Evaluate the session.

Activity # Indices **Code N13**

This activity links to award learning outcomes 1.1, 1.4 and 1.5.

Learning Outcomes

Understand the laws of indices.

Apply to laws of indices.

Key Learning Points

Indices

Materials

Calculator

- In order to use, manipulate and work with the laws of Indices the learners will need to be competent with basic algebra.

- The laws of indices are manipulation of multiplication and division. The laws are presented here by means of finding patterns. This will allow the learners to discover the laws of indices themselves. This is much more beneficial than just providing them with the laws.

- Learners may need to revise scientific notation before working on the activity.

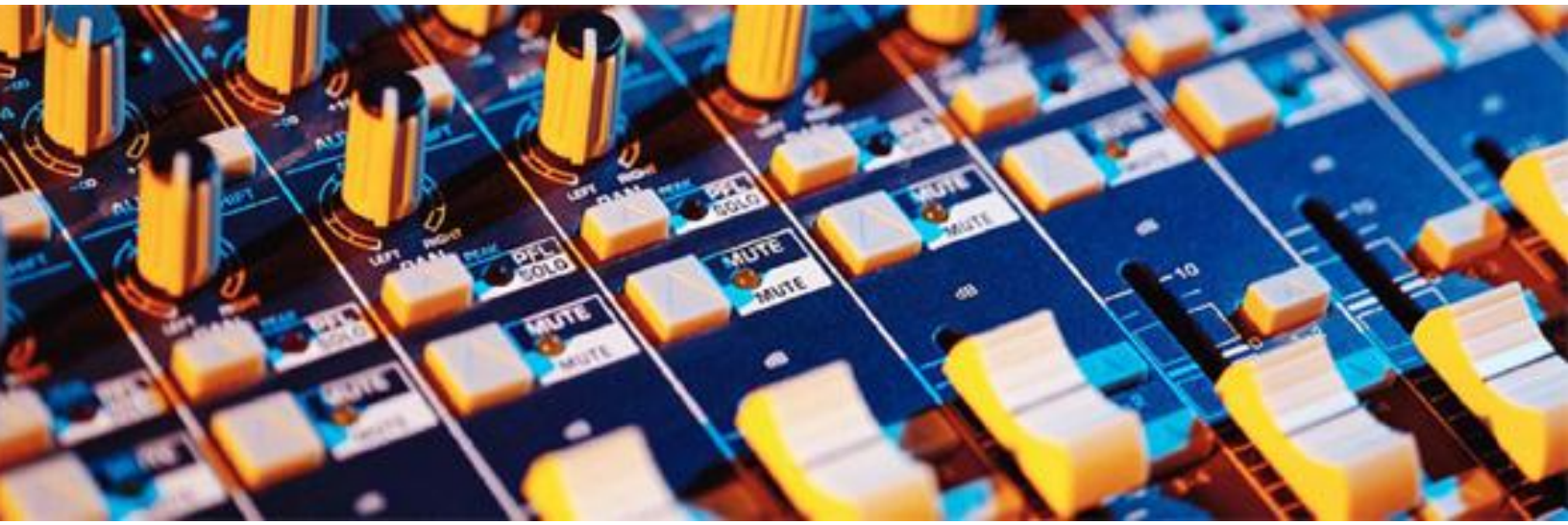
- Practice Sheet N13 allows learners to get some practice at working with and applying the laws of indices.

- Encourage learners to put new terminology or maths symbols in their personal maths dictionaries.

- Recap on key points and preview the next session.

- Evaluate the session.

Activity # Concert Volume **Code N14**



This activity links to award learning outcomes 1.1, 1.4 and 1.5.

Learning Outcomes

Understand the laws of logs.
Apply the laws of logs.

Key Learning Points

Logs

Materials

Calculator
Pen and paper

- In order to use, manipulate and work with the laws of logs the learners will need to be competent with basic algebra and have completed N13.

- The laws of logs are presented by means of using the Richter scale and Decibel scale.

- Before undertaking the task it is important that you determine what the learners know about the Richter scale and decibels. Some may have more knowledge about these than others and it may be necessary for some background research to be done in order to understand what each of these scales measures.

- The website http://www.geogebra.org/cms/ may also be a useful resource here. Graphing the Richter scale or Decibel scale may assist the visual learners.

- It is important here to note that the Richter scale figures make sense and that for the Haiti example the figure is the actual Richter scale measure. However the actual data used to come to these figures requires a greater understanding of earthquakes than is necessary for this task. Hence the actual log values that are being computed are fictitious but they do yield real answers.

- Practice Sheet N14 allows learners to get some practice at working with and applying the laws of logs.

- Encourage learners to put new terminology or maths symbols in their personal maths dictionaries.

- Recap on key points and preview the next session.

- Evaluate the session.

Activity Earthquake Code N15

This activity links to award learning outcomes 1.1, 1.4 and 1.5.

Learning Outcomes

Use logs and indices to solve equations.

Key Learning Points

Logs

Indices

Materials

Calculator

Pen and Paper

- This task is focused on highlighting the relationship between logs and indices.
- It is important to always remind the learners that logs and indices are both just multiplication.
- Before undertaking the task it is important that the learners are competent at N13 and N14.
- Some of the newer calculators allow the base number in the log button to be changed. It will be necessary for you to make decisions about using this calculator function. All calculators will work with log to base ten (new and old calculators) hence the only calculations that were imputed into a calculator in this task are those which have base 10.
- Practise going between logs and indices. It is also important to spend time on the equations which allow logs to solve indices questions and vice versa.
- Practice Sheet N15 allows learners to get some practice at working with logs and indices and solve such equations.
- Encourage learners to put new terminology or maths symbols in their personal maths dictionaries.
- Recap on key points and preview the next session.
- Evaluate the session.

Activity # Interest Free Shopping **Code N16**

This activity links to award learning outcomes 1.1, 1.3, 1.4, 1.6 and 1.7.

Learning Outcomes

Understand the concept of simple interest.

Calculate simple interest.

Key Learning Points

Interest

Repayments

Materials

Calculator

Pen and Paper

- This activity applies the basic concepts of simple interest to the topic of borrowing and saving money.

- Explain what the learners will be able to do after this activity.

- Before asking them what they need to know, ask learners have they encountered simple interest before. Do they know of any financial institutions that offer simple interest?

- Remind learners that they will need to know how to use the power button on their calculator and how to solve equations.

- Talk through and discuss the Simple Interest task. Break the question down so learners can understand the concepts making sure they grasp the idea of earning or paying interest and the different situations where both occur. Ask learners about the rates of interest being applied and the amounts of interest being paid and earned: are they realistic and would they save or borrow at that rate?

- Then ask learners to try an example themselves. You might like them to work in pairs or small groups to discuss their answers. The focus here is on understanding what the answer means so that when they have to make banking decisions for themselves they will be able to do so effectively.

- The 'Now try this' section allows learners to work will real life figures and situations. Always ask the learners to explain their answer (in words not in maths). Ask learners about where they might find information about interest rates from shops or banks and why we might want to know these interest rates.

- Practice Sheet N16 allows learners to develop their skills in working with simple interest.
- Encourage learners to put new terminology or maths symbols in their personal dictionaries.

- Recap on key points and preview the next session.

- Evaluate the session.

Activity # Choosing Bank Products **Code N17**

This activity links to award learning outcomes 1.1, 1.3, 1.4, 1.6 and 1.7.

Learning Outcomes

Understand the concept of compound interest.

Calculate compound interest.

Key Learning Points

Interest

Repayments

Materials

Calculator

Pen and Paper

- Explain what the learners will be able to do after this task. The basic concepts of compound interest are applied to borrowing and saving money. The difference between compound and simple interest is also highlighted.

- Before asking them what they need to know, ask have they encountered compound interest before? Do they know of any financial institutes that offer compound interest? Do they know of any types of compound interest?

- Remind learners that for this activity they will need to know how to use the power button on their calculator and how to solve equations.

- Talk through and discuss the compound interest tasks. Break the question down so learners can understand the concepts making sure they grasp the idea of earning or paying interest, the different situations where both occur and the different types of compound interest.

- Discuss how interest is applied. When moving on to compounding interest more than once in a year use discussion to help learners discover what happens to the interest rate and the time.

- Ask learners about the rates of interest being applied and the amounts of interest being paid and earned: Are they realistic? Would they save or borrow at that rate? Would they choose simple or compounded interest? Which do they think is more profitable for the consumer?

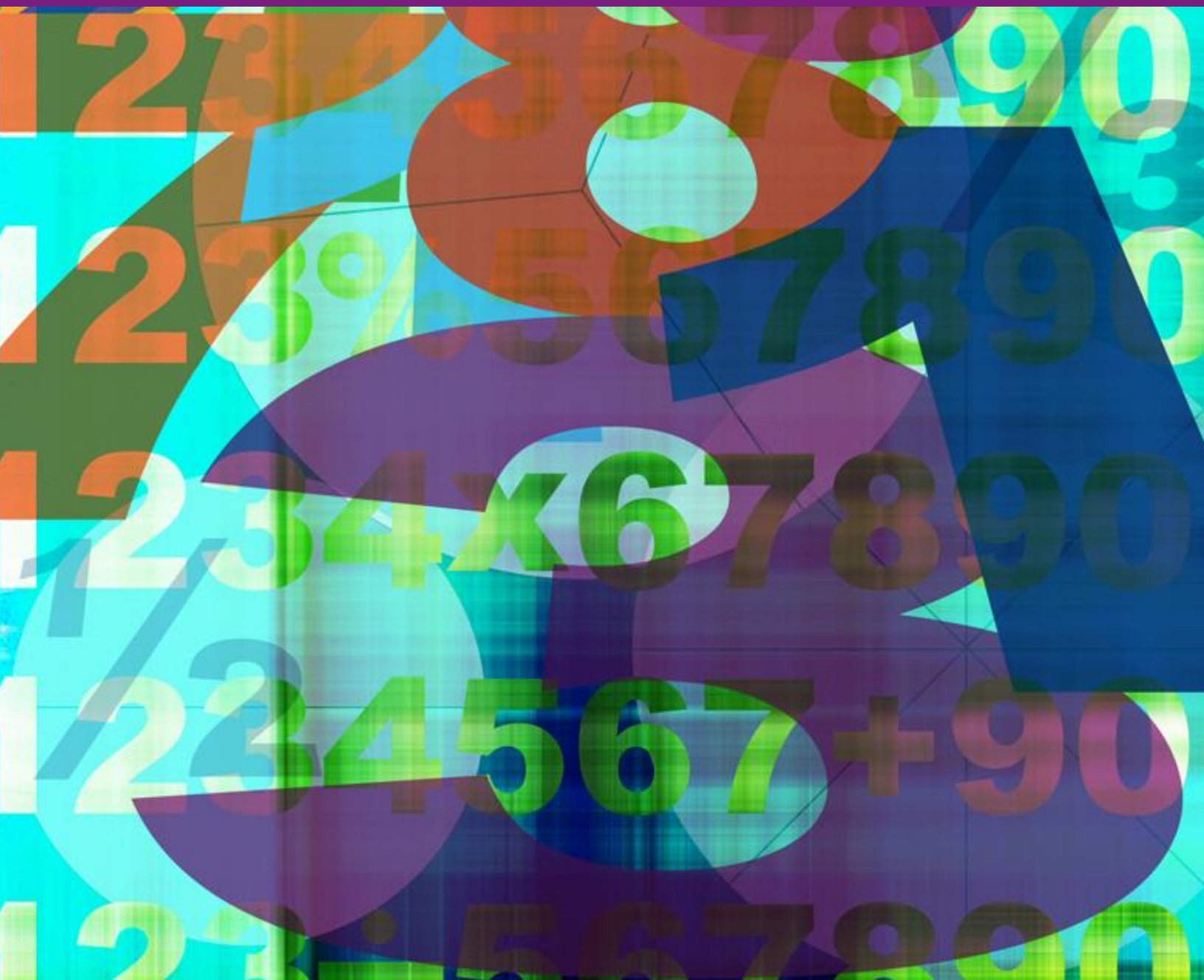
- After you explain and discuss the task, ask the learners to try an example themselves. You might like them to work in pairs or small groups to discuss their answers. The focus here is on understanding what the answer means so that when they have to make banking decisions for themselves that will be able to do so effectively.
- The 'Now try this' section allows learners to work will real life figures and situations. Always ask the learners to explain their answer. Ask where we can find information about interest rates from shops or banks and why we might want to know these interest rates.

- Practice Sheet N17 allows learners to develop their skills in working with compound interest.

- Encourage learners to put new terminology or maths symbols in their personal maths dictionaries.
- Recap on key points and preview the next session.
- Evaluate the session.

Tutor Guide

Level 4: Mathematics
Unit 2: Geometry



Level 4 # Soccer, Snooker and Handball **Code G1**

This activity links to award learning outcome 2.1.

Learning Outcomes

Recognise circles and rectangles.

Recognise rectangles and triangles.

Recognise rectangles and squares.

Key Learning Points

Geometric Shapes

Materials

Pen and paper

- Soccer, Snooker and Handball – Introduce the concept of geometric shapes through activities familiar to the learners.

- Explain what the learners will be able to do after this activity.

- Ask the learners what they already know about geometric shapes. Ask learners to talk in pairs or groups about where they encounter geometric shapes in their lives. Ask them to write down examples. Get the conversations to roam widely over their work study and entertainment.

- Not everyone may be interested in the sports we are using here. Ask to ensure that everyone knows what soccer, snooker and handball are. Assume that there is at least one person who does not know: get volunteers to describe each of these games and the markings on the relevant playing field.

- The activities in this section are mostly about thinking. Get the learners to do these activities in small groups. As you go on make sure that different people become the spokespersons for the groups.

- The related activities involve using the internet. Make sure that everyone is able to do this. Find out what different people are interested in and divide the searches accordingly.

- When you are correcting the Practice Sheet you may get different correct answers to the questions. Use this opportunity to explain that a square is a rectangle, a square is a parallelogram and so on.

- Encourage learners to put new terminology or maths symbols in their personal maths dictionaries.

- Recap on key points and preview the next session.

- Evaluate the session.

Activity # Mirror, mirror on the wall… **Code G2**

This activity links to award learning outcome 2.2.

Learning Outcomes

Recognise when an object can be folded onto itself.

Recognise when an object can be turned around onto itself.

Key Learning Points

Folding symmetry

Rotational symmetry

Materials

Pen & Paper

A mirror

Internet

- Symmetry – Introduce the concept of symmetry by using a blob of ink on a piece of paper, though paint will do fine if you have no ink. If you fold the paper through the blob you will form a very complex shape with line symmetry. This shows how easily symmetry appears.

- Explain what the learners will be able to do after this activity.

- Ask the learners what they already know about symmetry. Point out that almost all living things show approximate reflection symmetry. In pairs or groups the learners should talk about where they encounter symmetry in their lives. Ask them to write down examples. Encourage the conversations to roam widely over their work, study and entertainment.

- At this point the learners may think that reflection symmetry is the only symmetry. Ask can they think of any other sort of symmetry. If you get no suggestions remind them of the Earth, the Sun and the Moon.

- The activities in this section need a mirror. Ask learners to do these activities in small groups. Remind them to print the letters in capitals. If you want to make out more examples it is important to use a sans serif font like Arial or Helvetica. It will not work as well with a serif font such as Times.

- The related activities involve using the internet. Make sure that everyone is able to do this. Find out what different people are interested in and divide the searches accordingly.

- Encourage learners to put new terminology or maths symbols in their personal maths dictionaries.

- Recap on key points and preview the next session.

- Evaluate the session.

Activity # Hanging cups **Code G3**

This activity links to award learning outcome 2.3.

Learning Outcomes

Understand the need for coordinates.

Plot points in the plane.

Read the coordinates of points in the plane.

Key Learning Points

Coordination of the plane

Materials

Pen and paper, including graph paper

Selection of maps

- Ordered Pairs and Graphs – Before you deal with graphs you should introduce the concept of ordered pairs. You could tell the learners that navigation across the oceans only became possible when ordered pairs (Latitude and Longitude) were created.

- Explain what the learners will be able to do after this activity.

- Ask learners what they already know about ordered pairs. They may think that they have never heard of them before but remind them that satellite navigation devices use ordered pairs.

- Are there any games the learners know that involve ordered pairs? Does anyone play chess? Did anyone ever play Battleships? (See http://en.wikipedia.org/wiki/Battleship_(game))

- Get a selection of maps and give them out to the learners. Show how they can estimate the coordinates of places on the map. Give plenty of practice in this, using a variety of maps.

- Encourage learners to put new terminology or maths symbols in their personal maths dictionaries.

- Recap on key points and preview the next session.

- Evaluate the session.

Activity # Cookery lessons **Code G4**

This activity links to award learning outcome 2.3.

Learning Outcomes

Graph ordered pairs.

Read information from a graph.

Key Learning Points

Graphing ordered pairs

Materials

Graph paper

Pen and paper

- Ordered Pairs and Graphs – Recap the concept of ordered pairs.

- Explain what the learners will be able to do after this activity.

- Ask learners what they already know about temperature scales. Where are they used? What temperature scales have they come across? What temperature scale is used on the TV weather forecast? On their oven? On the oven in the centre's kitchen?

- Show some recipes from cook books or magazines. Ask learners to say which temperature scale is used. Ask what would they do if their oven used a different temperature scale to that given in the recipe? Ensure they understand the concept and purpose of converting from one temperature scale to another before introducing the conversion tasks.

- Guide learners through the tasks.

- The Practice Sheet will help learners develop skills in drawing and reading graphs.

- Encourage learners to put new terminology or maths symbols in their personal maths dictionaries.

- Recap on key points and preview the next session.

- Evaluate the session.

Activity # As the Crow Flies… **Code G5**

This activity links to award learning outcomes 2.4, 2.5 and 2.8

Learning Outcomes

Calculate the distance between two points.
Know and use Pythagoras Theorem.

Key Learning Points

Pythagoras Theorem and use of the Pythagorean formula

Materials

Ruler, compass, protractor

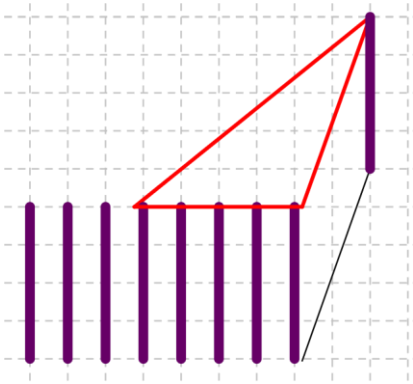
Pen and paper

- Distance – Introduce the concept of the distance formula through the theorem of Pythagoras.

- Explain what the learners will be able to do after this activity.

- Guide learners through the tasks on lines and angles.

- Ask the learners what use the theorem of Pythagoras is. You might get some blank stares here so have some examples ready:
    - Using a 3, 4, 5 triangle marked out on a rope to ensure two sides of a fence are at right angles.



This, as far as we know, was the original use in building the pyramids.

Other examples could include:

- working out areas of ground: areas often have to broken into triangles;
- creating patterns in art;
- calculating the area of a roof when you know the width and height..

- Watch that calculators are used correctly. There is a danger here of the learners assuming that $\sqrt{a^2+b^2} = \sqrt{a^2}+\sqrt{b^2}$. This error may appear by not using brackets properly. Before the learners start the Practice Sheet give then a number of problems to do on their calculators involving getting the square root of the sum of two squares.

- Encourage learners to put new terminology or maths symbols in their personal maths dictionaries.

- Recap on key points and preview the next session.

- Evaluate the session.

Activity **Measuring the world** **Code G6**

This activity links to award learning outcomes 2.4 and 2.5

Learning Outcomes

Calculate the distance between two points given their coordinates.

Key Learning Points

$$d = \sqrt{(x_1 - x_2)^2 + (y_1 - y_2)^2}$$

Materials

Graph paper

Cardboard

Mathematical instruments

- Measuring the World – Remind the learners of the theorem of Pythagoras.

- Explain what the learners will be able to do after this activity.

- Learners need to have light cardboard, scissors and mathematical instruments. Check that these are available for the class.

- Break the class into groups and get them to measure the distance between the given points.

- Ask the learners to think about the problems associated with using physical triangles. Make this a class discussion. Some of the points to bring out include:

    - The triangles may be too big
    - The triangles may be too small
    - You may not be able to physically get to both points
    - The triangles cannot get the distance between all points.

- Encourage learners to put new terminology or maths symbols in their personal maths dictionaries.

- Recap on key points and preview the next session.

- Evaluate the session.

Activity Finding the centre Code G7

This activity links to award learning outcome 2.4.

Learning Outcomes

Find the mid-point of a line segment.

Key Learning Points

$$c = \left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2} \right)$$

Materials

Pen and paper

- Finding the Centre – Introduce the concept of midpoint through activities familiar to the learners.

- Explain what the learners will be able to do after this activity.

- Ask the learners why they might need to find the midpoint of a line. In pairs or groups the trainees should talk about this. Get them to write down examples. You may have to give some hints here.
    - Why does a bus not topple when going around a bend?
    - What is the Plimsoll Line on a ship?
    - Where should you hold a plank when carrying it?

- For the Practice Sheet you may need to remind the learners that the centre of a circle is the midpoint of any diameter. Remind them that the diagonals of a rectangle bisect each other.

- Encourage learners to put new terminology or maths symbols in their personal maths dictionaries.

- Recap on key points and preview the next session.

- Evaluate the session.

Activity **Hills and Valleys** **Code G8**

This activity links to award learning outcomes 2.4.

Learning Outcomes

Find the slope of a line.

Key Learning Points

$$m = \frac{y_2 - y_1}{x_2 - x_1}$$

Materials

Pen and paper

- Hills and valleys – Introduce the concept of slope through activities familiar to the learners.

- Explain what the learners will be able to do after this activity.

- Before undertaking the activity here learners need to know what contour lines on a map are and how to read them. Prepare them for this beforehand by getting them to look up the meaning of contours using the internet or their local library.

- After the activity get some ordnance survey maps and get the learners to use these to work out the slopes of various hills. This could be simplified if you could **get permission** to use the Scoilnet Portal to the Ordnance Survey at http://www.scoilnet.ie/Questions_Scoilnet_maps.shtm

- Encourage learners to put new terminology or maths symbols in their personal maths dictionaries.

- Recap on key points and preview the next session.

- Evaluate the session.

Activity # Optical Illusions **Code G9**

This activity links to award learning outcome 2.4.

Learning Outcomes

Tell when two lines are parallel.

Key Learning Points

If two lines are parallel their slopes are equal

$$m_1 = m_2$$

Materials

Pen and paper

- Optical Illusions – Introduce the concept of parallel lines through activities familiar to the learners.

- Explain what the learners will be able to do after this activity.

- Before undertaking this activity, ask the learners what they already know about parallel lines. Ask them to think of examples from ordinary life. Railway tracks are one example. After they have a chance to discuss these give them examples such as
    - Periscopes: The two mirrors must be parallel.
    - Dress making: The warp is on a stretched frame of parallel lines.
    - Navigation: You need to construct parallel lines on a chart.

- After the activity ask the learners to look up optical illusions on the internet. This will give a rich source of geometric topics. Can they come up with more illusions based on parallel lines.

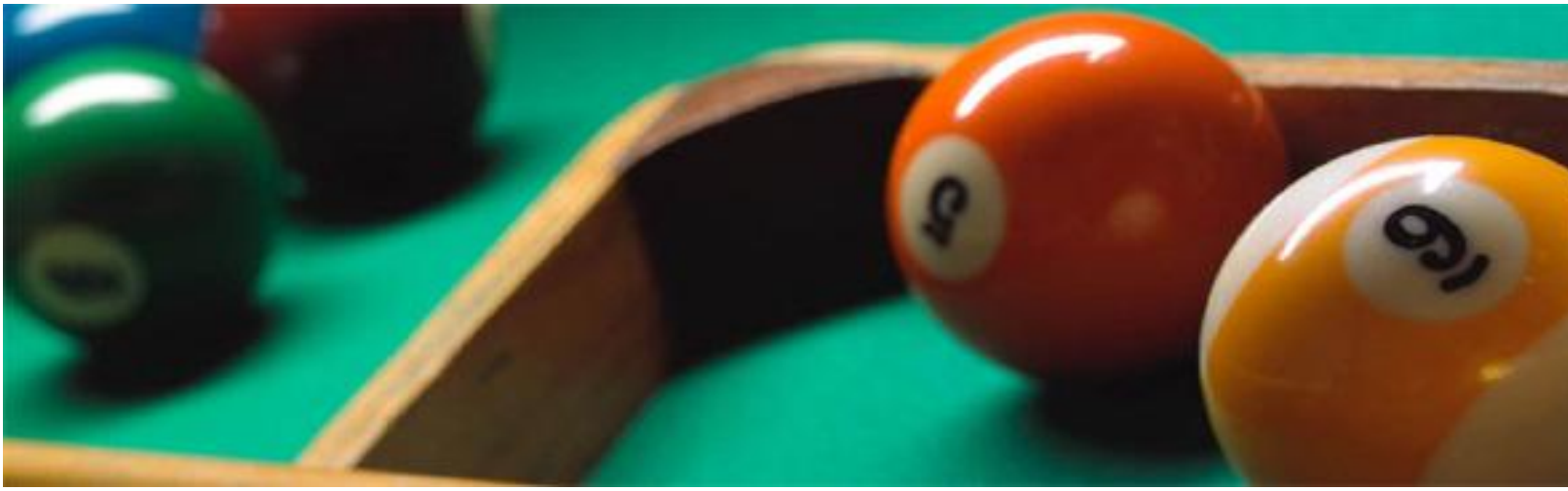
- The Practice Sheet is based on use of the formula. You can get more problems like these from any geometry textbook.

- Encourage learners to put new terminology or maths symbols in their personal maths dictionaries.

- Recap on key points and preview the next session.

- Evaluate the session.

Activity Playing Pool Code G10



This activity links to award learning outcome 2.4.

Learning Outcomes

Tell when two lines are perpendicular.

Key Learning Points

If two lines are perpendicular the product of their slopes is –1

$$m_1 \times m_2 = -1$$

Materials

Pen and paper

- Playing Pool – Introduce the concept of perpendicular lines through activities familiar to the learners.

- Explain what the learners will be able to do after this activity.

- To understand the activity the learners need to understand some of the rules of pool. Get them to look up these.

- Remind them of what is meant by the slope of a line and how to calculate it.

- In the 'Now you try this' section a hill of slope 0.5 is referred to. Take this opportunity to show that problems in the real world often draw from many different areas of mathematics.

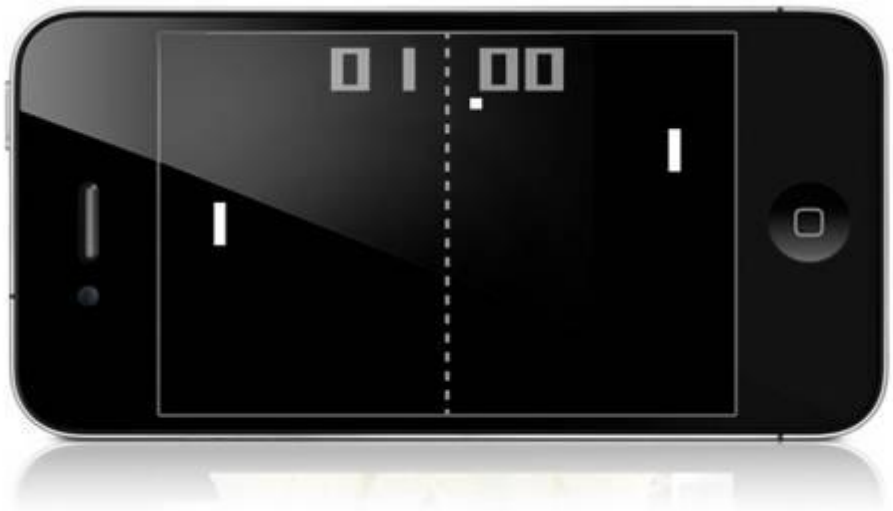
- In the Practice Sheet learners are asked to show a parallelogram is a rectangle. Remind them that a rectangle is always a parallelogram. Is a parallelogram always a rectangle? Encourage the learners to think about this in slopes rather than in lengths.

- Encourage learners to put new terminology or maths symbols in their personal maths dictionaries.

- Recap on key points and preview the next session.

- Evaluate the session.

Activity **Playing Pong on the iPod** **Code G11**



This activity links to award learning outcome 2.4.

Learning Outcomes

Write the equation of a straight line.

Interpret the equation of a straight line.

Key Learning Points

The equation of a straight line with slope *m* passing through the point (x_1, y_1) is given by

$$y - y_1 = m(x - x_1)$$

Materials

Access to internet

- Playing Pong on an iPod – Introduce the concept of the equation of a line.

- Explain what the learners will be able to do after this activity. Tell them that finally everything is coming together. They are using ordered pairs, graphs and slopes to look at lines.

- To understand the activity the learners need to understand some of the rules of Pong. Ask them to visit http://www.xnet.se/javaTest/jPong/jPong.html and play the game online. The computer being used will have to permit the loading of java applets so you may need to clear this with an IT technician first.

- G2 involved folding symmetry. In the 'Now You Try This' section the ball bounces off the wall to make a symmetric pattern. Point this out and link the two different areas together.

- Before the learners attempt the question on finding where the ball meets the wall check that they are able to solve simple linear equations.

- The Practice Sheets are now starting to draw different strands together. In attempting the problems in this section the learners have to get slopes, get midpoints, get perpendicular slopes, solve linear equations as well as getting the equation of a line. These are covered in a series of Practice Sheets.

- Encourage learners to put new terminology or maths symbols in their personal maths dictionaries.

- Recap on key points and preview the next session.

- Evaluate the session.

Activity # Designing a Flower Bed **Code G12**

This activity links to award learning outcome 2.4.

Learning Outcomes

Write the equation of a circle.

Interpret the equation of a circle.

Key Learning Points

Realise that the equation of a circle centred at the origin with radius *r* is given by the equation

$$x^2 + y^2 = r^2$$

Materials

Pen and paper

- Designing a Flower Bed – Introduce the concept of the equation of a circle through activities familiar to the trainees.

- Explain what the learners will be able to do after this activity.

- Ask the learners why they think that circles are important. Ask them to try to define a circle. Guide this discussion to arrive at 'point moving so that it is a fixed distance from a given point'.

- Show how Pythagoras and the distance formula lead to the equation of a circle.

- Before the learners attempt the Practice Sheet remind them of fractions and show them how to express the equation of a circle so that the coefficients of the quadratic terms are 1.

- Encourage the learners to put new terminology or maths symbols in their personal maths dictionaries.

- Recap on key points and preview the next session.

- Evaluate the session.

Activity Playing Shove Ha'penny Code G13

This activity links to award learning outcome 2.4.

Learning Outcomes

Get the equation of a tangent to a circle.

Discover where a tangent meets a circle.

Key Learning Points

Equation of a tangent to a circle $x^2 + y^2 = r^2$ at the point (x_1, y_1) is $xx_1 + yy_1 = r^2$

A tangent $xx_1 + yy_1 = r^2$ meets the circle $x^2 + y^2 = r^2$ at the point (x_1, y_1)

Materials

Wooden board

Paper and coloured markers

Coins

Access to internet

- Playing Shove Ha'penny – Introduce the concept of the equation of a tangent through an enjoyable game.

- Explain what the learners will be able to do after this activity.

- It is possible that this game may not be known to the learners. Ask them if they know the rules and if not get them to research it on the internet. If you are not familiar with the game, research it on internet in advance!

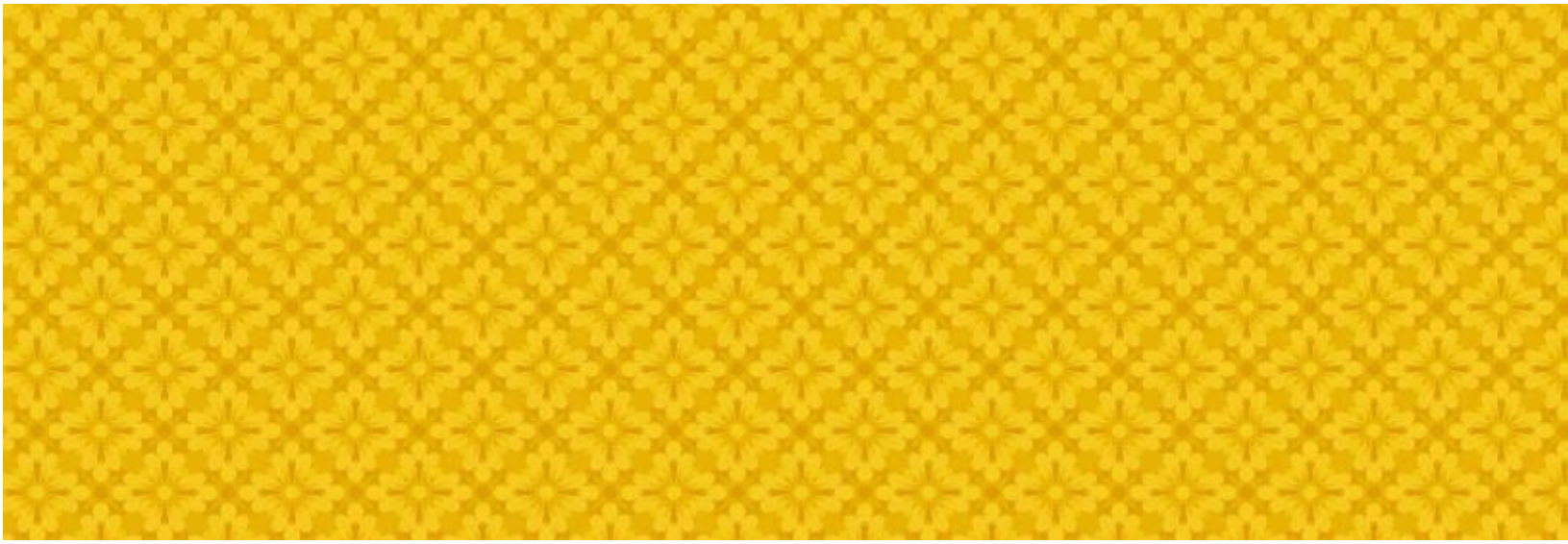
- The learners may not remember exactly what we mean by the word **tangent**. Recap and discuss the concept with them and encourage them to think about examples. You could mention these examples:
    - Discus throwing
    - Map making (Mercator projection uses a cylinder tangent to Great Circle)
    - Gear belts

- Encourage the learners to put new terminology or maths symbols in their personal maths dictionaries.

- Recap on key points and preview the next session.

- Evaluate the session.

Activity **Creating a Pattern** **Code G14**



This activity links to award learning outcome 2.5.

Learning Outcomes

Construct geometric shapes.

Key Learning Points

Simple constructions.

Materials

Pen and paper

Mathematical instruments

Coloured markers

Access to internet

- Creating a Pattern – Introduce the concept of geometric constructions through activities familiar to the learners.

- Explain what the learners will be able to do after this activity.

- Ask the learners find out about geometric art on the internet. You could ask them to do this the day before: plan this in advance with the computer tutor.

- Divide the learners into groups and get them to create simple designs freehand. When they have this done ask them to try to break their patterns down into circles, triangles etc. Ensure that every learner has mathematical instruments and paper and colouring materials.

- When the Practice Sheet is finished ask learners to try to use those methods on their own designs.

- Encourage the learners to put new terminology or maths symbols in their personal maths dictionaries.

- Recap on key points and preview the next session.

- Evaluate the session.

Activity # Measuring a Room **Code G15**

This activity links to award learning outcome 2.6.

Learning Outcomes

Calculate the area of a rectangle.

Calculate the length of the perimeter of a rectangle.

Key Learning Points

The formula for area of a rectangle is $A = l \times b$.

The formula for perimeter of a rectangle is $P = 2(l + b)$.

Materials

Pen and paper

- Measuring a Room – Introduce the concept of area and perimeter through activities familiar to the learners.

- Explain what the learners will be able to do after this activity.

- Discuss the importance of area and perimeter measurement. Mention the problems encountered in painting a room, in particular that paint will often come in containers that measure in litres whereas the walls etc will be measured in square metres.

- Ask the learners to talk amongst themselves about the steps they would take if they were thinking about decorating a room. Is cost a factor? How can you make sure that you do not buy too much paint? Can you calculate whether it is cheaper to buy a 2.5 litre tin for €16.75 or a 1 litre tin for €6.40?

- When the Practice Sheet is finished ask learners to try to use those methods using their own home or the centre as an example. Even if no redecoration is planned at the moment the methods are still useful to practise.

- Encourage the learners to put new terminology or maths symbols in their personal maths dictionaries.

- Recap on key points and preview the next session.

- Evaluate the session.

Activity # Buying a Ladder **Code G16**

This activity links to award learning outcome 2.8.

Learning Outcomes

Use similar triangles to calculate the height of a house.

Use the Theorem of Pythagoras to calculate the length of the required ladder.

Key Learning Points

The application of your knowledge of geometry to practical problems

Materials

Pen and paper

- Buying a Ladder – Introduce the concept of practical problems through activities familiar to the learners.

- Explain what the learners will be able to do after this activity: that is, to use maths to help them with everyday problems.

- Guide learners through the activity.

- Before the learners do the Practice Sheet but after the activity, ask them to think about problems they have come across in ordinary life that might have been helped with maths.

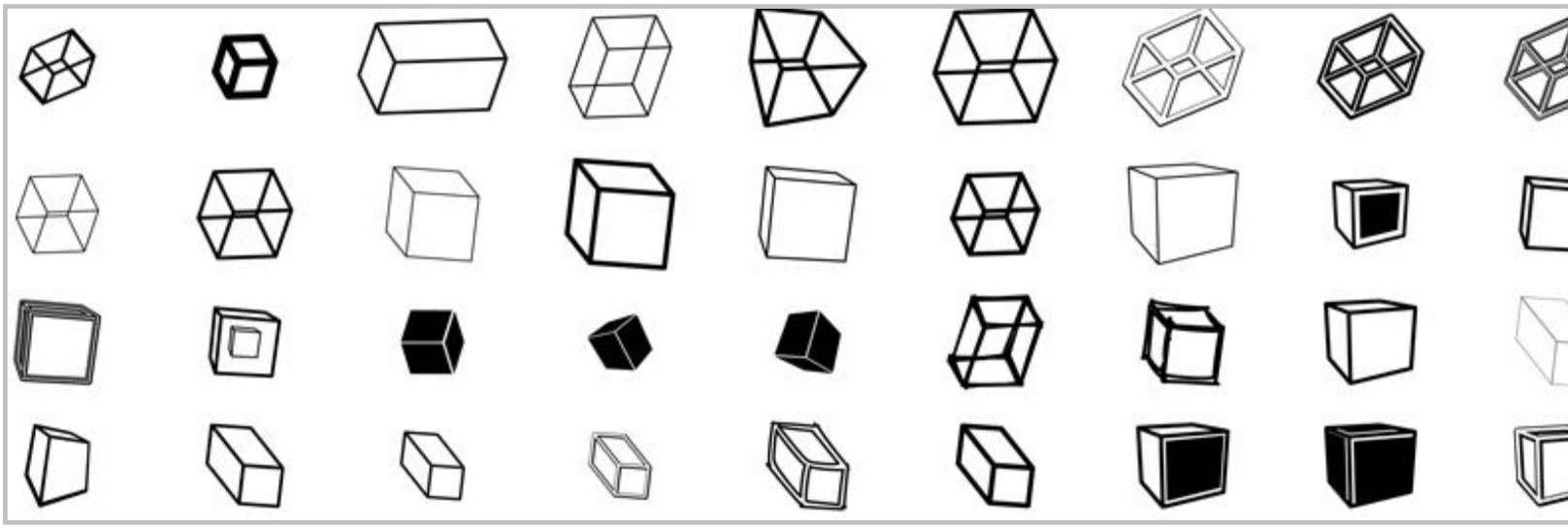
- After the Practice Sheet is finished discuss with the learners what mathematical topics were used here.

- Encourage the learners to put new terminology or maths symbols in their personal maths dictionaries.

- Recap on key points and preview the next session.

- Evaluate the session.

Activity 3-D Shapes Code G17



This activity links to award learning outcomes 2.7.

Learning Outcome

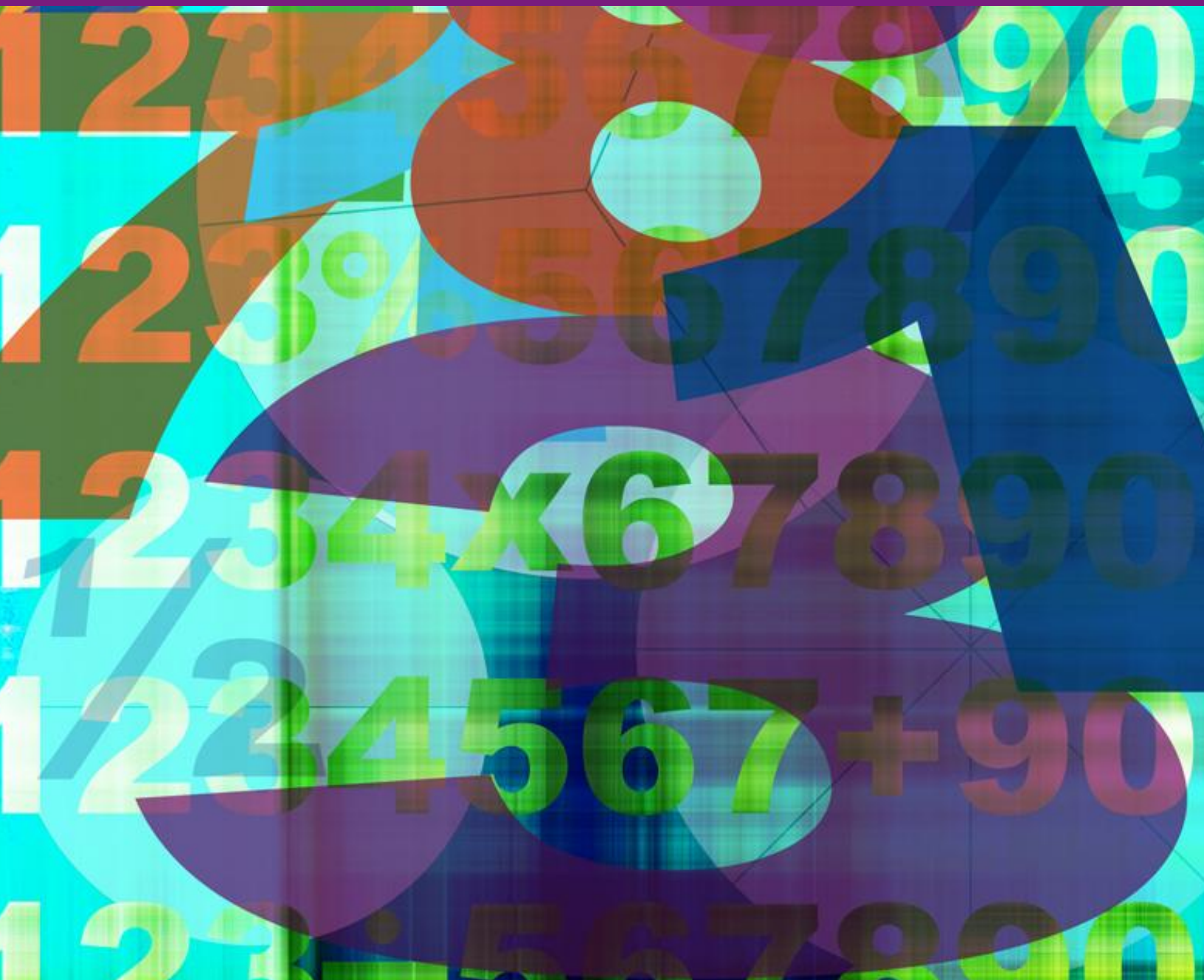
- Solve practical problems by using the correct formulae to calculate the volume/capacity and surface area of a **cube, cuboid, cylinder, cone, and sphere**, giving the answer in the correct form and using the correct terminology.

This Learning Outcome was added to the draft FETAC specification for Level 4 Mathematics after this resource pack was developed and designed.

You will find useful materials and teaching and learning activities relating to this learning outcome on mathematics websites such as http://www.onlinemathlearning.com/geometry-help.html.

Tutor Guide

Level 4: Mathematics
Unit 3: Algebra



Activity Keeping the Score in Rugby Code A1

This activity links to award learning outcome 3.1.

Learning Outcomes

Understand the concept of a variable.

Recognise the presence of variables in real life situations.

Replace variables with values through substitution.

Key Learning Points

Variables

Substitution

Materials

Pen and paper

- Keeping the Score in Rugby – Introduce the concept of variables and substitution through real life activity of interest to the learners.

- Explain what the learners will be able to do after this activity.

- Before asking them what they need to know, ask them what they do already know? In pairs or groups, learners might list how they use variables and substitution in their own lives.

- Before undertaking the activity, learners need to know that **variable** is a letter or a symbol that represents a number (unknown quantity). A variable can be any letter of the alphabet and its value can change depending on the problem or situation. We use **substitution** to replace a variable with a number.

- Learners also need to be aware of how points are scored in rugby. You could set a task for them to look up the rules using the internet or other means before you go through the activity. Perhaps plan this with the computer tutor.

- Following this, there are tasks which allow learners to put their newly learned skills into practice. The example here is of keeping the score in a game of Australian Rules. Before attempting the task, you might ask the learners if anyone knows the rules of the game. Who managed Ireland's team this year?

- The Practice Sheet allows learners to develop their skills is substitution of variables.

- Encourage the learners to put new terminology or maths symbols in their personal maths dictionaries.

- Recap on key points and preview the next session.

- Evaluate the session.

Activity # Lifting Weights **Code A2**

This activity links to award learning outcome 3.2.

Learning Outcomes

Understand the concept of an equation.

Solve linear equations of one variable.

Key Learning Points

Solving

Algebraic Equations

Materials

Pen and paper

- Lifting Weights – Introduce the concept of solving equations through real life activity of interest to the learners.

- Explain what the learners will be able to do after this activity.

- Before asking them what they need to know, ask them what they do already know. In pairs or groups, learners might list where they may need to use and solve equations in their own lives.

- Before undertaking the activity, learners need to know that an equation is a mathematical sentence with an equals sign (=) stating that two expression are equal. An equation is like a balance scale. Everything must be equal on both sides.

- Learners also need to be aware of what a bench press is and how it is used. You could set a task for them to look up the rules using the internet or other means before you go through the activity. Learners also need to be aware of the importance of having an equal amount of weight on each side of the bar. This is vital for balance and also insures a similar build up of muscle on both sides of the body.

- Following this, there are tasks which allow learners to put their newly learned skills into practice. Before attempting the task of calculating how many votes Mary received in the X Factor, you might ask the learners how many watch the X Factor and who their favourite contestant is.

- The Practice Sheet allows learners to develop their skills in solving linear equations.

- Encourage the learners to put new terminology or maths symbols in their personal maths dictionaries.

- Recap on key points and preview the next session.

- Evaluate the session.

Activity **Soap Wars** **Code A3**

This activity links to award learning outcome 3.2.

Learning Outcomes

Understand the concept of an equation.

Solve linear equations of one variable.

Key Learning Points

Solving

Algebraic Equations

Materials

Pen and paper

- Soap Wars – Further develop the concept of solving equations through real life activity of interest to the trainees.
- Explain what the learners will be able to do after this activity.
- Before asking them what they need to know, ask them what they do already know? Recap on previous material from A2.
- Before undertaking the activity, learners need to be aware that Coronation Street, Emmerdale and Eastenders are three main British soap operas and that there are frequent ratings wars and competition between them.
- Following this, the tasks allow learners to put their newly learned skills into practice. The example here is of calculating the daily circulation of The Irish Times and The Irish Examiner. Before attempting the task, you might ask the learners whether any of them read either of these papers. What is their favourite daily paper?
- The Practice Sheet allows learners to further develop their skills in solving linear equations.
- Encourage the learners to put new terminology or maths symbols in their personal maths dictionaries.
- Recap on key points and preview the next session.
- Evaluate the session.

Activity **How much is a ticket?** **Code A4**

This activity links to award learning outcome 3.2.

Learning Outcomes

Understand the concept of simultaneous equations.

Solve simultaneous linear equations of two unknowns.

Key Learning Points

Solving

Simultaneous Equations

Materials

Pen and paper

- How much is a ticket? – Introduce the concept of solving simultaneous equations through real life activity of interest to the learners.

- Explain what the learners will be able to do after this activity.

- Before asking them what they need to know, ask them what they do already know. In pairs or groups, learners might list where they may need to use and solve simultaneous equations in their own lives.

- Before undertaking the activity, learners need to know that simultaneous equations are two equations which both have two unknowns (x and y). In order to solve such equations they must be simultaneously satisfied by particular values of x and y.

- Learners also need to be aware that there are different prices charged for standing tickets and for seated tickets in both the Tallaght Stadium (where Shamrock Rovers play) and in Croke Park. In the cinema there are also different prices charged for an adult ticket and for a student ticket.

- Following this, the tasks allow learners to put their newly learned skills into practice. The example here is of calculating how many MB in a song and how many MB in a video based on what an iPod can hold. Make clear to learners from the outset that there are 1000MB in 1 GB. Before attempting the task, you might ask the learners how many of them have an iPod. What GB is it? Hence what MB is it?

- The Practice Sheet allows learners to further develop their skills in solving simultaneous equations.

- Encourage the learners to put new terminology or maths symbols in their personal maths dictionaries.

- Recap on key points and preview the next session.

- Evaluate the session.

Activity How many text messages can I send? Code A5

This activity links to award learning outcome 3.2.

Learning Outcomes

Understand the concept of inequalities.

Solve linear inequalities of one variable.

Key Learning Points

Solving

Linear inequalities

Materials

Pen and paper

- How many text messages can I send? – Introduce the concept of solving inequalities through real life activity of interest to the learners.
- Explain what the learners will be able to do after this activity.
- Before asking them what they need to know, ask them what they do already know. In pairs or groups, learners might list where they may use and solve inequalities in their own lives.
- Before undertaking the activity, learners need to know the differences between an equation and an inequality. The inequality signs must be made clear along with the rules involved in having to change these signs: that is, multiplying or dividing by a negative number.
- Learners also need to be aware that Meteor, Vodafone and 02 are the top three mobile communication networks in Ireland. Each network currently have a new value plan which allows their customers to make unlimited calls and send a limited number of text messages for a fixed price per month.
- Following this, the tasks allow learners to put their newly learned skills into practice. The example here is of calculating how much Matt is willing to sell his ticket to Bon Jovi for. Before attempting the task, you might ask the learners how many of them like Bon Jovi. Have any of them ever been to a Bon Jovi concert? What is their favourite song?
- The Practice Sheet allows learners to further develop their skills.
- Encourage the learners to put new terminology or maths symbols in their personal maths dictionaries.
- Recap on key points and preview the next session.
- Evaluate the session.

Activity How many Number 1 hits had The Beatles? Code A6

This activity links to award learning outcome 3.4.

Learning Outcomes

Construct algebraic equations for real life situations.

Use correct terminology.

Solve the equation through rearrangement.

Key Learning Points

Construction of algebraic equations

Solving equations

Materials

Pen and paper

- How many Number 1 hits had the Beatles? – Introduce the concept of constructing algebraic equations through real life activity of interest to the learners.

- Explain what the learners will be able to do after this activity.

- Before asking them what they need to know, ask them what they do already know. In pairs or groups, learners might list where they may need to construct and solve algebraic equations in their own lives.

- Before undertaking the activity, learners need to recap on their previous knowledge from A1, that is: what is a variable? In order to construct an algebraic equation for a real life situation they must allow a variable to stand for the unknown value and construct the equation around this. Once the equation is constructed they must also recap on their previous knowledge from A2 and A3, that is: solving algebraic equations.

- Learners also need to know that The Beatles were a highly influential English rock 'n' roll band from Liverpool who dominated the music era of the 1960's. To this day, they remain one of the most critically acclaimed and commercially successful popular music bands in history. They had many Number 1 hits in many countries.

- Following this, the tasks allow learners to put their newly learned skills into practice. The example here is of calculating how many Grammy Awards have U2. Before attempting the task, you might ask the learners how many of them like U2. Have any of them ever been to a U2 concert? What is their favourite U2 song?

- The Practice Sheet allows learners to further develop their skills in constructing and solving algebraic equations.

- Encourage the learners to put new terminology or maths symbols in their personal maths dictionaries.

- Recap on key points and preview the next session.

- Evaluate the session.

Activity How successful are Manchaster United? Code A7

This activity links to award learning outcome 3.4.

Learning Outcomes

Construct algebraic equations for real life situations.

Use correct terminology.

Solve the equation through rearrangement.

Key Learning Points

Construction of algebraic equations

Solving equations

Materials

Pen and paper

- How successful are Manchester United? – Develop the concept of constructing algebraic equations through real life activity of interest to the learners.
- Explain what the learners will be able to do after this activity.
- Before asking them what they need to know, ask them what they do already know. Recap on previous material from A6.
- Before undertaking the activity, learners need to know that Manchester United is an English professional football club and is one of the wealthiest and most widely supported football teams in the world. Each year they compete in the Premier League which is England's primary football competition and also in many other competitions such as the FA Cup and the League Cup, as well as European competitions.
- Following this, the tasks allow learners to put their newly learned skills into practice. The example here is of calculating how old the Taoiseach is. Before attempting the task, you might ask the learners whether any of them have ever met Brian Cowen or any other Taoiseach? Do they have views on how the current Taoiseach is doing in office?
- The Practice Sheet allows learners to further develop their skills in constructing and solving algebraic equations.
- Encourage the learners to put new terminology or maths symbols in their personal maths dictionaries.
- Recap on key points and preview the next session.
- Evaluate the session.

Activity # How wide was that ship? **Code A8**

This activity links to award learning outcome 3.4.

Learning Outcomes

Construct algebraic equations for real life situations.

Use correct terminology.

Solve the equation through rearrangement.

Key Learning Points

Construction of algebraic equations

Solving equations

Materials

Pen and paper

- How wide was that ship? – Further develop the concept of constructing algebraic equations through real life activity of interest to the learners.

- Explain what the learners will be able to do after this activity.

- Before asking them what they need to know, ask them what they do already know. Recap on previous material from A6 and A7.

- Before undertaking the activity, learners need to know that ships are large vessels that float on water. They can serve a wide range of purposes for example commercial, naval and fishing and can range in size pending such purpose. The perimeter of the ship is calculated by the formula: 2(width) + 2(length).

- Following this, the tasks allow learners to put their newly learned skills into practice. The example here is of calculating how long a basketball court is. Before attempting the task, you might ask the learners whether any of them play basketball? What are the rules of the game? How many players on each team?

- The Practice Sheet allows learners to further develop their skills in constructing and solving algebraic equations.

- Encourage the learners to put new terminology or maths symbols in their personal maths dictionaries.

- Recap on key points and preview the next session.

- Evaluate the session.

Note: Learning Outcome 3.3 is not included in this edition of the Learner Pack and Tutor Guide, as it was added to the FETAC specification for Mathematics Level 4 after these resources were developed.

Tutor Guide

Level 4: Mathematics
Unit 4: Data Handling

Activity iPhone Code D1

This activity links to award learning outcomes 4.1 and 4.4.

Learning Outcomes

Understand these concepts involved in collecting data: population, sample, variable and statistic.

Recognise and distinguish between those concepts.

Key Learning Points

Data

Population, Sample, Variable, Statistic

Materials

Magazines, newspapers

- The basic statistical concepts of population, sample, variable and statistic are introduced using a survey related to the iPhone.

- Explain what the learners will be able to do after this activity. Before asking them what they need to know, ask them what they do already know about sampling and statistics? You should get the learners to think about headlines they might see on a newspaper or polls they might read in magazines in relation to fashion, sport etc. Do not focus too much on the definitions for now. They will become clearer when working through the task on the iPhone.

- Before undertaking the task, learners should be reminded that they will need to know how to calculate percentages.

- Talk through and discuss the iPhone task. Break the question down so learners can understand the concepts, making sure they grasp the idea of population versus sample. The term 'variable' should be known to learners from unit 3 (algebra). Therefore the learners should be aware that the variable measured – that is, the question asked - can change from person to person. Ask learners if they think the statistic was a true reflection on the students in the school with iPhones. That is, 35 people filled out the questionnaire, how many more students have iPhones but did not fill out the questionnaire? Learners should be encouraged to think about the information that is **not** provided.

- After you explain and discuss the task, learners are asked to try an example themselves. You might like them to work in pairs to discuss their answers.

- There is an opportunity in the 'Practise your skills' section for learners to use real life data to develop their understanding of sampling and the basic statistical concepts. The population and sample details may not be provided in the headline. However, encourage the learners to explain what they may have been and why it isn't always possible in a survey to look at an entire population. Ask learners how many times they came across statistics on the front page of a newspaper or within a magazine while completing this activity. Why do they think statistics are important? Why is it important to know as much information about as possible about a survey?

- The Practice Sheet allows learners to develop their skills in sampling.

- Encourage the learners to put new terminology or maths symbols in their personal maths dictionaries.

- Recap on key points and preview the next session.

- Evaluate the session.

Activity Cancer Trials Code D2

This activity links to award learning outcomes 4.1 and 4.4.

Learning Outcomes

Understand the concepts of dependent and independent variables.

Key Learning Points

Independent

Dependent

Materials

Internet

Books

Newspapers

Magazines

- The concepts of independent and dependent variables are introduced here. The sports examples (rugby and basketball) demonstrate to learners the concept of one variable depending on another.

- Explain what the learners will be able to do after this activity.

- Before introducing the definitions discuss the basketball free throw example or another real life example that you think your learners can relate to.

- Before undertaking the task, remind learners that they will need to know what the term variable is. They should know this from unit 3 (algebra).

- Progress slowly through the cancer example. Learners may have heard of trials like these in the news or may even have some relevant personal experience from their lives so allow them to have an input.

- After you explain and discuss the task, learners are asked to try an example themselves identifying independent and dependent events.

- There is an opportunity in the 'Practise your skills' section for learners to research the internet, newspaper, books, television etc for studies that look at the effect of one variable on another. They should be able to show evidence of this and identify the independent from the dependent variable.

- The Practice Sheet allows learners to develop their skills in identifying independent and dependent variables.

- Encourage the learners to put new terminology or maths symbols in their personal maths dictionaries.

- Recap on key points and preview the next session.

- Evaluate the session.

Activity # Families: Time watching TV **Code D3**

This activity links to award learning outcomes 4.1 and 4.4.

Learning Outcomes

Understand and distinguish between discrete and continuous data.

Key Learning Points

Discrete

Continuous

Materials

Pen and paper

- The concepts of discrete and continuous data are introduced here using real life examples that learners can relate to.

- Explain what the learners will be able to do after this task.

- Discuss the definitions of discrete and continuous data using examples such as family size and height.

- Progress slowly through both the examples in the task – one focuses on discrete data, the other on continuous. Remind learners that discrete data provides whole numbers. In the second example you may need to remind learners that while the results do contain some whole numbers (10 hours) the data is still continuous since it can be measured and can include decimals/fractions.

- After you explain and discuss the task, learners are asked to try an example themselves identifying whether the sample questions would provide discrete or continuous data.

- There is an opportunity in the 'Practise your skills' section for learners to devise their own short questionnaire that provides discrete or continuous data. Learners can select their own questions and distribute it to family, friends or classmates. Emphasise that the data must be numeric and so the learners must make sure that the questions they devise will produce numeric data.

- The Practice Sheet allows learners to develop their skills in identifying discrete and continuous data.

- Encourage the learners to put new terminology or maths symbols in their personal maths dictionaries.

- Recap on key points and preview the next session.

- Evaluate the session.

Activity **X Factor** **Code D4**

This activity links to award learning outcomes 4.2 and 4.4.

Learning Outcomes

Understand the concept of categorical data.

Represent data graphically using frequency tables and bar charts.

Interpret the data.

Key Learning Points

Bar Charts

Graphs

Materials

Graph Paper

Pencil and ruler

- The concepts of categorical data and representing this data graphically are introduced using the real life activity of X Factor.

- Explain what the learners will be able to do after this task.

- Categorical data and how it can be represented is firstly discussed using the X Factor task. In the first task the data is put in table form. Don't dwell on the terms category and frequency although learners should be introduced to them. Discuss the information in the table with the class.

- Task 2 will help learners to see why bar charts are used to represent data that can be categorised. Make sure to introduce the labelling of x-axis and y-axis, the importance of the width of the bars and the need for a space between the bars. Distinguish between that and a histogram which they may also have seen before. Ask learners if there is any difference between the table and the bar chart.

- Use your own judgement to decide if learners need more time to practise drawing bar charts. More examples are provided in the Practice Sheet.

- After you explain and discuss task 2, ask learners to draw a bar chart themselves based on the same data.

- There is an opportunity in the 'Practise your skills' section for learners to collect data; or learners could ask 10 of their friends about the same topic. You could also choose to change topics if they are not interested in the X Factor. Learners should represent this information graphically. They are provided with a template of the frequency table to ensure this is done before they attempt to draw a bar chart. They should be provided with graph paper to submit their work on.

- The Practice Sheet allows learners to develop their skills in reading, drawing and interpreting frequency tables and bar charts.

- Encourage the learners to put new terminology or maths symbols in their personal maths dictionaries.

- Recap on key points and preview the next session.

- Evaluate the session.

Activity Careers Code D5

This activity links to award learning outcomes 4.2 and 4.4.

Learning Outcomes

Further understand the concept of categorical data.

Interpret data from a pie chart.

Key Learning Points

Pie Charts

Graphs

Materials

Pen and paper including graph paper

- This activity uses real life examples to enhance the learners' understanding of categorical data and how it can be represented graphically not just on a bar chart but also on a pie chart.

- Explain what the learners will be able to do after this task.

- Categorical data and how it can be represented has been discussed in activity D4. In this activity learners will revisit this topic using the same X Factor data. At this stage learners should understand that each sector represents the different categories (judges) and that the data is still the same as that represented on the bar chart in activity D4.

- Task 1 looks at the careers of some young people. Work through this example. The learners should be able to interpret the data and understand why certain sectors have larger angles than other sectors.

- After you explain and discuss the activity, ask learners to interpret more categorical data from a pie chart (recently graduated tutors) and answer questions for their portfolio.

- There is an opportunity in the 'Practise your skills' section for learners to interpret data from a pie chart with very little information provided. This encourages learners to approximate the size of angles and draw conclusions from this.

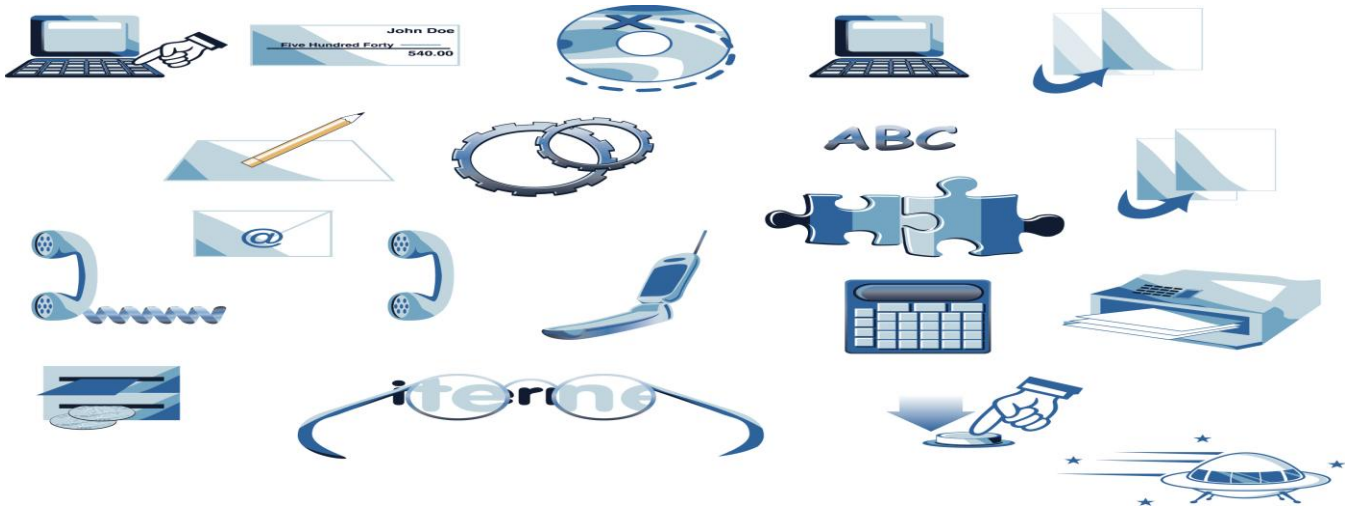
- The Practice Sheet allows learners to develop their skills in reading and interpreting pie charts.

- Encourage the learners to put new terminology or maths symbols in their personal maths dictionaries.

- Recap on key points and preview the next session.

- Evaluate the session.

Activity **Careers 2** **Code D6**



This activity links to award learning outcomes 4.2 and 4.4.

Learning Outcomes

Represent data graphically using pie charts.

Interpret data from a pie chart.

Key Learning Points

Pie Charts

Graphs

Materials

Ruler, pencil

Compass, protractor

- This activity progresses from D5 where by at the end of the activity learners are asked to draw their own pie charts.

- Explain what the learners will be able to do after this activity.

- Learners can interpret and read data from a pie chart as well as drawing conclusions. They are not aware of how to draw a pie chart yet. The mathematics is outlined briefly but is probably best explained through the activity.

- Before progressing to the activity you may need to recap on how to calculate a percentage, how to use a protractor and compass to find angles in a circle and how to find the degrees that represent each category. Use your judgement on whether or not to revisit these concepts in more detail before progressing to the activity.

- In Task 1, you will need to reinforce the idea that if 24 trainees are represented by 360º, then we must divide this number by 24 to get the degree that represents one trainee. We cannot figure out the size of each of our sectors if this is not done. Go slowly through the use of a compass to firstly draw a circle. Then remind learners how to use a protractor to calculate each angle.

- After you explain and discuss the task, ask learners to draw the same pie chart using their compass and protractor. This may take some time since learners may not have used these instruments in some time. Remind learners that the pie chart in the Learner Pack constructed using a computer so their pie chart may not look as well. However remind them too that it is important to be accurate and calculate the angles as best they can.

- There is an opportunity in the 'Practise your skills' section for learners to draw a pie chart based on real life data that they collect from their classmates.

- The Practice Sheet allows learners to develop their skills in drawing and interpreting pie charts

- Encourage the learners to put new terminology or maths symbols in their personal maths dictionaries.

- Recap on key points and preview the next session.

- Evaluate the session.

Activity **Fashion** **Code D7**

This activity links to award learning outcomes 4.2 and 4.4.

Learning Outcomes

Understand how numerical data can be graphed.

Represent numerical data using trend graphs.

Key Learning Points

Trend Graph

Graphs

Materials

Ruler, pencil

Graph paper

- The concept of graphing numerical data using trend graphs is introduced here by using activities learners can relate to.

- Explain what the learners will be able to do after this activity.

- Numerical data was discussed in activity D3. Learners have not yet looked at how numeric data may be represented on a graph. Encourage learners to think about why this graph can be used for numeric data as opposed to a bar or pie chart.

- The task looks at fashion and the sale of leather jackets. T he idea of fashion changing over time should be discussed before starting the activity. Ask them if they would wear the clothes they wore a few years ago today?!

- Work through the drawing of a trend graph. Show learners how to plot the points. Explain how to use space correctly when constructing a trend graph. That is, the greatest number of jackets sold was 10 so the y-axis stops at 12.

  - When discussing the questions based on the graph, you will possibly need to revisit how to calculate the sale of leather jackets on a Wednesday as a percentage of the total number of leather jackets sold.

  - After you explain and discuss the task, ask learners to add more information on the sale of the leather jackets and draw the trend graph themselves. The incomplete table is provided for them to update first before drawing the trend graph.

  - There is further opportunity in the ‘Practise your skills’ section for learners to draw a trend graph based on the money each individual spends a day. They are asked to record their spending over a week. Data should be put into a frequency table followed by a trend graph. Learners should interpret their spending.

  - The Practice Sheet allows learners to develop their skills in drawing and interpreting trend graphs.

  - Encourage the learners to put new terminology or maths symbols in their personal maths dictionaries.

  - Recap on key points and preview the next session.

  - Evaluate the session.

Activity # iPod, Phone Calls **Code D8**

This activity links to award learning outcomes 4.2 and 4.4.

Learning Outcomes

Understand how data collected in the form of numbers can be graphed.

Interpret data from a histogram.

Read and draw a grouped frequency table.

Key Learning Points

Histogram

Graphical Method

Materials

Ruler, pencil

- The concept of graphing numerical data using histograms is introduced here by using activities learners can relate to.

- Explain what the learners will be able to do after this activity.

- Learners are familiar with bar charts, pie charts and trend graphs. They are now introduced to another method of representing numeric data.

- The first task on the iPod is aimed at introducing the learners to histograms and how to read them. Stress that the area of the bar is more important than the height.

- Calculating the number of people with an iPod for each bar should be worked through slowly. This is particularly true for the third bar since it covers two units (double the area of the other bars) so 20 must be multiplied by 2 to get the correct frequency.

- Highlight comparisons and contrasts to bar charts as well as some conclusions about the data. The question is posed 'why do you think that more people surveyed between the ages of 20 and 40 own iPods than those of other ages?' This is to encourage the learners to think about the data and what it means in real terms. Those aged between 20 and 40 are more likely to have an income to buy an iPod than younger people. They may also have more of an interest in music and technology than an older age group.

- The next task on phone calls progresses to reading and creating grouped frequency tables. The data is sorted and put into unequal class intervals so that learners can grasp the importance of the area a bar covers. It is essential to explain to learners that each piece of data can only be represented once and should be placed in one category only. The 'Now you try this' activity will help learners to work on these concepts.

- There is further opportunity in the 'Practise your skills' section for learners to collect their own data and represent it on a grouped frequency table. The example of 'height of classmates ' is provided here, but learners can pick their own topic. Remind learners that the data they collect must be numeric. Remind them that they can pick their own class intervals but ask what factors they need to consider when doing so. They will be asked to draw a histogram for this data in activity D9 so they should keep this in mind also.

- The Practice Sheet allows learners to further develop their skills in reading and interpreting histograms as well as constructing grouped frequency tables.

- Encourage the learners to put new terminology or maths symbols in their personal maths dictionaries.

- Recap on key points and preview the next session.

- Evaluate the session.

Activity Phone Calls, Charity Donations Code D9

This activity links to award learning outcomes 4.2 and 4.4.

Learning Outcomes

Represent data on a histogram.

Key Learning Points

Histogram

Graphical Method

Materials

Graph paper

Ruler, pencil

- This activity progresses from activity D8. It uses some of the same data and some new data to demonstrate how histograms are drawn.

- Explain what the learners will be able to do after this activity.

- Learners are familiar with reading and interpreting histograms and are aware of the importance of the area of each bar.

- The first task uses the data on the length of the phone calls from D8 since learners have already worked through the construction of the grouped frequency table for this data.

    - The height of each bar should be discussed and worked through slowly with the class as this is the aspect they may find most difficult.

    - Explain the procedure for drawing the histogram. As you work through this one you may ask learners to draw it themselves as you go, just to familiarise themselves with the drawing of a histogram.

    - Once this is done, ask learners to construct a histogram based on the grouped frequency table provided.

- There is further opportunity in the 'Practise your skills' section for learners to present the data they collected in D8 on a histogram.

- The Practice Sheet allows learners to further develop their skills in constructing histograms.

- Encourage the learners to put new terminology or maths symbols in their personal maths dictionaries.

- Recap on key points and preview the next session.

- Evaluate the session.

Activity **Profit** **Code D10**

This activity links to award learning outcomes 4.2 and 4.4.

Learning Outcomes

Complete and create a cumulative frequency table based on your knowledge of grouped frequency tables.

Represent data on a cumulative frequency curve.

Key Learning Points

Cumulative Frequency Curve

Graphical Methods

Materials

Graph paper

Ruler, pencil

- This activity uses profit made by business people to introduce the concept of a cumulative frequency table and curve.
- Explain what the learners will be able to do after this activity.
- The example of business people making a profit is used to explain the concept of values accumulating.
- The first task begins with a grouped frequency table which learners are familiar with. It progresses to calculating a cumulative frequency table. Highlight that the data starts with nobody and progresses until everyone is included. It is essential for learners to understand that someone who makes a profit of less than €300 **also** makes a profit of less than €600, €900, €1200 and €1500.
- The learners are provided with an incomplete table to fill in. As their knowledge improves less information will be provided to them.
- Task 2 progresses to drawing the curve. You may need to recap on how to plot points on axes.
- Discuss the finished graph and how to interpret it. An example of estimating the profit made by the 9^{th} business person is provided before learners attempt to interpret the graph themselves.
- There is further opportunity in the 'Practise your skills' section where learners are asked for an example of another type of data that would be useful to plot on a cumulative frequency curve.
- The Practice Sheet allows learners to further develop their skills in constructing cumulative frequency tables and curves.
- Encourage the learners to put new terminology or maths symbols in their personal maths dictionaries.
- Recap on key points and preview the next session.
- Evaluate the session.

Activity **Soccer** **Code D11**

This activity links to award learning outcomes 4.3 and 4.4.

Learning Outcomes

Understand the need for measuring data.

Calculate the mean, mode and median.

Key Learning Points

Mean/Average

Mode

Median

Materials

Pen and paper

- This activity uses soccer to develop the learners' understanding of how data can be measured using mean, mode and median.

- Explain what the learners will be able to do after this activity.

- The definition of each of the three terms can be briefly discussed and introduced. They are best explained by using the soccer tasks. The first task focuses on the mean and uses a well known Liverpool FC soccer player. Learners will be familiar with phrases such as "the average number of goals scored". Make sure to highlight the meaning of the answer. In this case, the mean was 1.4 and so we know that Fernando Torres is averaging 1.4 goals a game.

- Learners can then apply their knowledge to answering a question on the mean age of a group of students. You may need to remind learners that if six students are aged twelve, they must take account of each student when calculating the mean.

- Task 2 progresses to the median and mode. Soccer players' wages are now used as an example since the answer can be interpreted in real terms and makes sense to the learners. The 'Now you try this' section again uses a real life example of a households income. Learners are asked to calculate the mean, mode and median and they must also interpret/explain their answers.

- There is further opportunity in the 'Practise your skills' section where learners are asked to find out the time each person in their group takes to get to their training centre, and to use this information to find the mean time, median time and mode.

- The Practice Sheet allows learners to further develop their skills in calculating the mean, median and mode.

- Encourage the learners to put new terminology or maths symbols in their personal maths dictionaries.

- Recap on key points and preview the next session.

- Evaluate the session.

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