

EXPLORERS – INTERPLANETARY TRADERS

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

INTRODUCTION

In this activity, pupils are invited to trade goods between five planets in a region of space called the Outer Rim. They will be faced with a number of unfamiliar currencies but can maximise their chances of making a profit using the stock market information that is provided.

Pupils will use direct proportion to compare the different currency systems associated with each planet and convert the prices for each good into a common currency. They will also need to manage their budgets, turning their initial allocation of money into a much larger sum.

This activity is mainly paper-based.

LEARNING OBJECTIVES

Pupils will:

- use mathematical problem solving skills in collaboration with each other
- use direct proportion to convert different currencies.

LEARNING OUTCOMES

Most pupils will:

- collaborate within their groups to address the problem
- explore direct proportion in simple contexts using mental or pencil and paper methods
- emerge with a final profit around the set target
- evaluate their strategies and report back to the class.

Pupils making slower progress will:

- collaborate within their groups to address the problem
- explore direct proportion in simple contexts using calculator methods
- emerge with a final profit working towards the set target
- evaluate their strategies and report back to the class.

Pupils making faster progress will:

- collaborate within their groups to address the problem
- explore direct proportion in simple contexts using mental methods
- emerge with a final profit exceeding the set target
- evaluate their strategies and report back to the class.

NATIONAL CURRICULUM OBJECTIVES

Ma2 Number and Algebra

Using and applying number and algebra

1) Pupils should be taught to:

- a) explore connections in mathematics to develop flexible approaches to increasingly demanding problems; select appropriate strategies to use for numerical and algebraic problems
- b) break down a complex calculation into simpler steps before attempting to solve it
- c) use alternative approaches to overcome difficulties and evaluate the effectiveness of their strategies
- d) select efficient techniques for numerical calculation and algebraic manipulation
- e) make mental estimates of the answers to calculations; use checking procedures to monitor the accuracy of their results.

Numbers and the number system

- 2) Pupils should be taught to:
- g) recognise where fractions and decimals are needed to compare proportions; identify problems that call for proportional reasoning and choose the correct numbers to take as 100% or as a whole.

Equations, formulae and identities

- 5) Pupils should be taught to:
- g) set up and use equations to solve word and other problems involving direct proportion and relate their algebraic solutions to graphical representations of the equations.

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

1 Key concepts**Competence**

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

Creativity

- b) Using existing mathematical knowledge to create solutions to unfamiliar problems.

2 Key processes**Representing**

Pupils should be able to:

- a) identify the mathematical aspects of a situation or problem
- d) select mathematical information, methods and tools to use.

Analysing

Pupils should be able to:

- b) use knowledge of related problems
- g) take account of feedback and learn from mistakes.
- l) calculate accurately, selecting mental methods or calculating devices as appropriate.

Interpreting and evaluating

Pupils should be able to:

- g) consider the effectiveness of alternative strategies.

Communicating and reflecting

Pupils should be able to:

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

3 Range and content**Number and algebra**

The study of mathematics should include:

- b) rules of arithmetic applied to calculations and manipulations with rational numbers
- c) applications of ratio and proportion.

Geometry and measures

The study of mathematics should include:

- g) units, compound measures and conversions.

4 Curriculum opportunities

The curriculum should provide opportunities for pupils to:

- a) develop confidence in an increasing range of methods and techniques
- e) work on tasks that bring together different aspects of concepts, processes and mathematical content
- f) work collaboratively as well as independently in a range of contexts.

LESSON PREPARATION

- Read the teacher notes and familiarise yourself with the other materials.
- Ensure that the activity is available to use on your teacher laptop or desktop computer.
- Print off enough copies of the accompanying activity sheets.
- You may wish to create a certificate of achievement for pupils that perform well.

Vocabulary

Convert, conversion, currency, exchange rate, proportion, direct proportion, cost price, selling price, profit, loss.

Materials required

You will need:

- Teacher laptop or desktop computer (to introduce activity)
- Data projector (to introduce activity)
- Printed copies of the accompanying materials
 - Planet Profile Sheets
 - Captain's Log Sheet
 - Mission Results Sheet
 - Paper Money
 - Goods Tokens
- Calculators (optional)

Prior knowledge and skills

Pupils should already:

- be familiar with the rounding of decimals to a given number of decimal places.

Health and Safety

All standard safety procedures with computers need to be in place.

Further information can be found at <http://schools.becta.org.uk>

LESSON DETAILS**Starter Activity**

Project the starter activity onto a whiteboard.

Ask pupils in their groups to consider the concept of currencies and exchange rates.

Give pupils sufficient time to calculate the answers to the questions shown on screen.

Ask selected groups to describe how they obtained their answers.

If time allows, ask pupils some follow-up questions.

- How many £ for €8?
- How many € for £25?
- How many \$ for £38?
- How many £ for \$16?

Ask pupils to consider how many decimal places are sensible when working with money.

Lead into the main activity (see below).

Main Activity

The aim of this activity is to make a profit trading goods between the planets of the Outer Rim.

This can be achieved by buying and selling commodities such as minerals, food, fuel and cloth.

Pupils will only be able to visit each planet once.

Each planet will also have its own unique currency system.

Pupils will need to:

- make sense of the different planetary currencies
- decide which order to visit the planets in
- decide which goods to buy and sell on each planet.

Pupils will receive 'special recognition' if they can:

- find a way to make a profit of more than 10000 Credits .

This activity is based around an open problem with a complexity of potential interpretations.

Opportunities for discussion and group presentations have been incorporated into the activity.

Pupils should be arranged as follows:

- a pair of pupils to represent each of the five Outer Rim planets (the 'planets')
- all remaining pupils to be divided into small groups (the 'crews')

With mixed ability classes, try to ensure that each group has an appropriate mix of pupils.

This will help to create appropriate conditions for peer support.

Each 'planet' group should be given:

- a copy of their planet's 'Trading Profile' sheet
- a mix of trading tokens (Minerals, Food, Fuel, Cloth)
- a pot of paper money (Credits).

Each 'crew' group should be given:

- a copy of the 'Activity 2 - Captain's Log' sheet
- a copy of the 'Activity 2 - Mission Results' sheet
- a copy of each planet's 'Trading Profile' sheet
- a set starting amount of paper money (Credits).

Note that teachers can adjust the challenge presented by this activity in several ways:

- by varying the number of Credits each crew starts with
- by allowing crews to start with a set amount of goods.

The recommended scenario is for each crew to start with 2500 Credits and no goods.

Introduce the activity by projecting it onto a whiteboard.

Set the scene using the introductory narrative and the Captain's Log sheet to help.

Refer pupils to the 'Getting Started' section on the Captain's Log sheet.

This fleshes out the narrative a little more and provides an introduction to the activity interface.

Allow time for all groups to study their 'Trading Profile' sheets as directed.

Refer pupils to the 'Discussion Time' section on the Captain's Log sheet.

Ask pupils to consider the questions listed.

Allow time for pupils to discuss their thoughts and define their strategies.

Try to circulate between groups listening to discussion and asking questions as required.

Encourage pupils to pursue their strategies and to develop the mathematics involved.

Take care, however, not to overly direct the pupils.

Once ready, refer pupils to the 'Recording Your Results' section on the Captain's Log sheet.

Highlight that the activity will be divided into a series of five trading rounds.

Explain that crews will have a strictly limited period of planning time between each round.

Emphasise that this planning time needs to be used wisely.

Draw specific attention to the set rules of the activity - as follows:

- each crew to visit each planet only once
- all transactions to take place at the set buy and sell price for each good
- all transactions to take place in Credits only
- no transactions to occur between crews
- all transactions to be recorded on the 'Mission Results' sheet.

Once ready, start the trading activity.

Adjust the length of each planning period and trading round according to the time available.

Begin with a brief planning period in which each crew can plan their initial purchases.

In the meantime, position the planet groups at different points around the classroom.

During each trading round, allow crews to visit their chosen planet.

Crews will hand over Credits for any goods they buy from a planet.

In return, they will receive the corresponding number of trading tokens.

Crews will receive Credits for any goods they sell.

In return, they must hand over the corresponding number of trading tokens.

Ensure that all transactions are recorded on the Mission Results sheet as directed.

At the end of each trading round, ask the crews to return to their desks.

Each crew will then have a limited period of planning time to plan their next move.

Repeat the process until all five trading rounds are complete.

At the end of the activity, draw the class together.

Refer pupils back to the 'Recording Your Results' section on the Captain's Log sheet.

Ask crews to calculate their overall profit.

Pupils can then determine if they are deserving of the 'special recognition' award.

Ask pupils to review their results and consider the questions listed.

Allow time for pupils to discuss their results and record their responses in the space provided.

Once ready, refer pupils to the 'Finishing Off' section on the Captain's Log sheet.

Again, ask pupils to consider the questions listed.

Allow some time for pupils to discuss their thoughts and reflect on their performance.

Lead into the plenary activity (see below).

Plenary

Draw the class together and ask pupils to reflect on the activity.

Ask each group to report back on their progress, specifically:

- their overall profit or loss
- their most or least profitable transactions.

Ask selected groups to describe and evaluate the strategies they used.

In particular, ask them to identify what they would do differently next time.

If time allows, ask pupils some follow-up questions such as:

- What was the key to success in this activity?
- How would it be possible to work out the most profitable route between the planets?

Finally, ask the class to consider the maths that they have used during the activity.

Ask the class to identify real-life contexts where people may use similar maths.

Homework Suggestions

Ask pupils to ensure that they have completed their Captain's Log reflecting on their transactions and evaluating their performance during the activity as required.

Additionally, pupils could be invited to complete the accompanying homework task sheet. This gives further practice in converting between currencies and in using conversion graphs.

TECHNICAL SUPPORT

This activity makes use of Flash and Adobe PDF files. To access all the resources that are provided, you will need the minimum machine and software specifications as listed below.

Adobe Flash Player (previously known as Macromedia Flash Player) is required to launch the activity. The latest version of Flash and guidance on how to use it can be downloaded from:

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

Adobe Reader or Distiller is required to view these notes. The latest version of Reader and guidance on how to use it can be downloaded from:

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

Minimum Machine and Software Specifications**PC**

P3 800MHz
128MB RAM
Windows 2000
Screen resolution 1024 x 768

Microsoft Internet Explorer 5.5, Firefox 1, Netscape 7 or Opera 7
Macromedia Flash Player 7
Adobe Reader 7

Mac

G3 500MHz
128MB RAM
OS X 10.2
Screen resolution: 1024 x 768
Safari 1, Firefox 1, Netscape 7, or Opera 6.2
Macromedia Flash Player 7
Adobe Reader 7