Fractions, decimals and percentages (Year 7)

Introduction

These two lessons, each 50 to 60 minutes long, could form part of the unit Number 5 (N5) in the *Sample medium-term plans for mathematics* (DfES 0504/2001) towards the end of the summer term in Year 7.

The lessons provide an opportunity to draw together pupils' understanding of the equivalence of fractions, decimals, percentages, ratio and proportion. They are key lessons within the unit and are intended to help teachers review the progress pupils have made in this crucial area of the Year 7 teaching programme.

The assessment sheets (N5b, N5e and N5f), when passed on to Year 8 teachers, can highlight any errors and misconceptions that need to be addressed and should help teachers to pitch work at a suitable level in the Year 8 transition lessons on fractions, decimals and percentages in the autumn term.

Preparation

Lesson N5.1

- Mini-whiteboards or number fans
- Resource N5a 'What's my function?', cut into cards for sorting; one set per three or four pupils
- Assessment N5b 'Mystery functions', one per pupil

Lesson N5.2

- OHT N5c 'Back to the start'
- Resource N5c 'Back to the start', one per pair
- OHP calculator
- Calculators
- Cards from resource sheet N5a 'What's my function?'
- Resource N5d 'Word problems', cut into cards
- Assessment N5e 'Peanut problems', one per pupil
- Assessment N5f 'How well am I doing?', one per pupil

N5.1 Fractions, decimals and percentages (Year 7)

Objectives

- Consolidate and **extend mental methods to include decimals, fractions and percentages**, accompanied where appropriate by suitable jottings; solve simple word problems mentally.
- **Recognise the equivalence of percentages, fractions and decimals.**

Starter

Vocabulary

input

output

function

equivalent

Resources

mini-whiteboards or number fans

Draw a function machine on the board. Explain that the machine uses only multiplication and division. Write ×5 in the function machine and ask pupils to give you the output number for different inputs.

Q What is the output when the input is 12? or $1^1/_4$? or 0.8?

Ensure maximum participation by asking pupils to use number fans or mini-whiteboards to display answers.

Repeat using different functions and whole-number, fraction and decimal inputs.

Now give 320 as the input.

Q What is the output when the function is ÷10, ×0.1, ×10% or $\times^1/_{10}$?

Q What do you notice about the outputs when you use these functions?

Record the equivalent functions on the board.

Repeat using mixed numbers as the functions; for example, use $\times 2^1/_4$, ×225% and ×2.25 with the same input number.

Main activity

Vocabulary

equivalent

relationship

Resources

N5a, cut into cards for sorting; one set per three or four pupils

What's my function?

Draw a 0.5 → 2 'card' on the board. Explain that you want pupils to think of a function machine which has 0.5 as the input and 2 as the output. Again, only the operations multiplication and division are allowed.

Q What is the relationship or 'function' between 0.5 and 2?

Take explanations, drawing out alternatives. Pupils may identify the operation as '×4', or may think in two stages as '×2 then ×2 again'.

Give each group of three or four pupils a set of cards from **resource N5a**, 'What's my function?'; ask them to look through the cards and find other pairs of numbers with the same relationship as 0.5 → 2.

Ask pupils to group cards with the same relationship, to arrange their cards onto a large sheet of paper and to label each set. Encourage pupils to discuss the relationship between the input and output numbers in each set.

Write on the board 20 → 15, 4 → 3, 10 → 7.5. As a mini-plenary, ask:

Q Why have you grouped these cards together?

Q What patterns do you notice? Can you describe them?

Q Can you give another pair of numbers that belong to this set?

Discuss equivalent ways of describing the relationship. Pupils might describe the relationship as ‘divide by 4 then multiply by 3’ or ‘multiply by 3 then divide by 4’ or ‘multiply by ¾’ or ‘multiply by 0.75’ or ‘multiply by 75%’.

Ask pupils in pairs to ask each other the same questions for another set of cards.

Plenary

Resources

N5b, one per pupil

Hand out **assessment N5b**, ‘Mystery functions’, and ask pupils to complete both questions. Encourage them to record the relationship in as many ways as they can, using fraction, decimal and percentage equivalences.

For pupils who manage this easily, encourage them to complete the extension question.

Remember

- It is useful to know that there are different ways of expressing relationships. For example, for 16 $\rightarrow$ 10, the relationship could be described as ‘×5 then ÷8’, $\times {}^{5}/_{8}$, ×0.625, ×62.5%, ÷1.6.
- When solving a problem you need to decide which relationship is the most efficient to use.

N5.2 Fractions, decimals and percentages (Year 7)

Objectives

- Consolidate and **extend mental methods to include decimals, fractions and percentages**, accompanied where appropriate by suitable jottings; solve simple word problems mentally.
- **Recognise the equivalence of percentages, fractions and decimals.**

Starter

Vocabulary

operation

inverse

Resources

N5c as OHT and resource, one per pair

OHP calculator

calculators

Back to the start

Use **OHT N5c** to introduce the game 'Back to the start'. Ask pupils to look at the first two numbers.

Q How can you move from 4 to 6 using multiplication and division only?

Q How can you do this in one step?

Tell pupils they can use a calculator to find the missing function. Give them a minute, and then invite someone to use an OHP calculator to demonstrate how they calculated the answer.

If anyone tackled it in a different way, ask them to demonstrate on the OHP calculator.

Now ask pupils to play the game in pairs. Each pair will need **resource N5c**, 'Back to the start', and calculators. Establish the game's rules.

- This is a game for two players. Each player begins at 'start'. One player moves around the track clockwise, the other moves anticlockwise.
- Players move by performing calculations on the calculator to change the number displayed to the next number on the track. Only multiplication and division can be used. One or several operations can be used; for example, to change 4 to 6 you could multiply by 3 and then divide by 2, or you could multiply by 1.5.
- The aim of the game is to move around the track until you get back to the 'start'. You do not take turns. This is a race to see who gets back to the start first. Start at the same time.

Give pupils time to play the game a couple of times in their pairs. After the game, discuss some of the calculations used when moving clockwise from one number to another. Compare these with the calculations used anticlockwise.

Main activity

Vocabulary

equivalent

relationship

Resources

cards from N5a

N5d, cut into cards

Problem cards

Display the sets of cards from **resource N5a**, 'What's my function?', or ensure that pupils have their recording sheets from the activity.

Write the first word problem from **resource N5d**, 'Word problems', on the board:

A map is drawn so that 1 cm represents 2.5 km in real life.
On the map the length of a road is 14 cm.
How long is the road in real life?

Ask pupils to discuss, in pairs, how to solve the problem. Remind them to think carefully about the units used.

Together, as a class, compare and discuss some of the methods used. Encourage pupils to look at the numbers in the problems and ask themselves whether the answer will be bigger or smaller and to check that the answers to their problems are reasonable.

Point out that the relationship and numbers used in this problem match one of the cards from **N5a** (14 → 35). Ask if anyone had noticed this.

Using the same problem – and referring to the cards on display – ask another question.

Q If a road in real life is 25 km, how long would it be on the map?

Ask pupils to suggest other questions they could ask and answer using cards in the set.

Remind pupils that they can use the patterns within the sets to generate other pairs of numbers with the same relationship; for example, 14 cm represents 35 km so 28 cm represents 70 km.

Choose some of the problems from **N5d** to give to pairs of pupils. Explain that all the problems on the sheet are linked to the sets of cards from **N5a**. Once pupils have answered the given question, encourage them to suggest another question that their partner can answer using the same starting point.

Plenary

Resources

N5e, one per pupil

N5f, one per pupil

Spend some time getting pupils to talk about their methods for solving each other's problems.

Now ask them to complete **assessment N5e**, 'Peanut problems', making up and solving two questions using the fact that has been given, and **assessment N5f**, 'How well am I doing?'.

Remember

- When you start to solve a problem look at the numbers in the question and ask yourself whether the answer will be bigger or smaller.
- When you have a solution, read the question again and check whether your answer is reasonable.