

Developing oral feedback in mathematics

Following the training in the generic unit *Oral feedback*, it is important to consider how the key messages of the training apply to mathematics. As part of the whole-school focus on this, the following subject development material is intended to help you consider the key messages of the training unit and identify any areas requiring development in your department.

The following is a brief summary of the training unit.

Objectives

- To highlight how effective oral feedback develops pupils' learning.
- To consider a range of strategies for giving effective oral feedback that can be both formal and informal.
- To help teachers plan for giving effective oral feedback.
- To help schools develop a whole-school policy clarifying the relationship between oral and written feedback.

Key messages

- Oral feedback is the most regular and interactive form of feedback. It should be constructive and informative in order to help pupils take the next steps in their learning.
- It is both direct (targeted to individuals or groups) and indirect (others listen and reflect on what has been said). At times it will be spontaneous and at other times it should be planned.
- In offering oral feedback, the teacher is modelling the language that pupils can use in giving feedback to their teacher and peers.
- Oral feedback should be developmental. It should recognise pupils' efforts and achievements, and offer specific details of ways forward in relation to the shared learning objectives.
- Oral feedback about pupils' learning occurs in a range of situations on a continuum from the instant informal reply to more formally planned reviews.
- While focusing on specific areas of a response it is important to say when an answer is wrong to avoid confusion or reinforcing misconceptions.
- 'Wait-time' before and after questions or responses encourages pupils to consider and expand on their responses.

The following material builds on the tasks outlined in the 'Ready for more?' section of the *Oral feedback* training unit and it is intended for all those who teach mathematics.

Reviewing existing practice in oral feedback

The table on page 3 provides a tool for a department to self-review current practice and to help identify an appropriate starting point.

As a department, agree and highlight the statements that best reflect the practice of the whole department. At the bottom of each column is a reference to the tasks that will support your current practice and provide the appropriate material to develop from this point.

Having completed this review you should read 'Making effective use of the subject development material' on page 4.

	Focusing	Developing	Establishing	Enhancing
Teachers	<p>There is no clear school or department policy on oral feedback.</p> <p>The subject leader has identified where teacher oral feedback:</p> <ul style="list-style-type: none"> • is informal, ad hoc and unplanned • tends to be teacher-led question-and-answer sessions or generalised comments to the class • does not target individual pupils • is unrelated to the learning objectives. <p>Teachers sometimes provide opportunities for pupils to discuss each other's work, but without reference to learning outcomes.</p>	<p>Departmental planning for oral feedback is becoming more focused on learning objectives and outcomes.</p> <p>Teachers are beginning to consider the role of different types of oral feedback.</p> <p>Teachers are beginning to use questions to probe progress against the learning objectives and outcomes to help pupils improve their work.</p> <p>Teachers are beginning to target specific individuals and groups of pupils for feedback in lessons.</p> <p>Teachers provide opportunities in lessons for pupils to provide feedback to their peers and for teachers to provide feedback to the pupils (in relation to learning outcomes).</p>	<p>The school is reviewing its marking policy to include oral feedback and departmental policy reflects this.</p> <p>Oral feedback is a focus of departmental planning and relates directly to the learning objectives and outcomes and helps clarify the next steps for pupils.</p> <p>Oral feedback opportunities are integral to medium- and short-term planning.</p> <p>Teachers use a varied repertoire of types of oral feedback.</p> <p>The teacher structures and models pupil oral feedback in relation to learning outcomes.</p>	<p>The school and department have a fully integrated assessment policy which values equally the importance of written and oral feedback.</p> <p>Planning for oral feedback at all levels, from full reviews to individual teachers' lessons, is an integral feature of departmental work across the school.</p> <p>Departments ensure that oral feedback from pupil to teacher, teacher to pupil and pupil to pupil forms part of a dialogue that relates directly to learning objectives and outcomes. The feedback provided is constructive and informative and enables pupils to take the next steps in their learning.</p>
Pupils	<p>The subject leader has identified lessons in which pupils:</p> <ul style="list-style-type: none"> • expect teacher feedback in the form of supportive encouragement • do not view oral feedback as an essential part of learning • judge oral feedback to be secondary to written feedback • offer comments on each other's work, but these lack clear focus and are usually unchallenging. 	<p>Most pupils expect feedback to relate to their learning and listen to and respond to what is said.</p> <p>Most pupils know when to expect specific oral feedback as a class, individually or in a small-group setting.</p> <p>Pupils are beginning to see oral feedback as having a distinct value.</p> <p>Most pupils are able to provide useful feedback to other pupils and similarly respond to feedback from their peers.</p>	<p>Pupils recognise fully the value of oral feedback and know it is related to their learning. They listen carefully and respond appropriately.</p> <p>Pupils recognise the strategies for different types of oral feedback.</p> <p>Pupils will readily engage in focused peer feedback, in relation to learning outcomes, and are beginning to develop a vocabulary to do this.</p> <p>Pupil work shows evidence of a response to oral feedback.</p>	<p>All pupils recognise that oral feedback is focused on their learning and is as important as written feedback.</p> <p>Pupils know that feedback is valuable and listen carefully to each other and their teachers. They respond to feedback to engage in dialogue about their learning.</p> <p>Pupils understand well-established strategies for group and guided work that involve feedback.</p> <p>Pupils give regular detailed oral feedback related to learning objectives and outcomes to peers and teachers.</p> <p>Pupils are clear where in their work they have improved in response to feedback.</p>
	Start with Task 4.1A	Start with Task 4.1A	Start with Task 4.1B	Start with Task 4.1B

Making effective use of the subject development material

The tasks you have been referred to are intended to support the development or extension of oral feedback in mathematics and provide guidance on how to embed this into regular practice in mathematics lessons.

The results of the self-review will have suggested the appropriate task(s) that will support your department's development needs.

To make best use of the supporting material the following sequence will be helpful.

1 Read the task and the supporting exemplification.

This describes how a department has approached the task and worked through each of its stages. It is given as an *example* of how the task might be addressed. It is not intended that you follow this approach, which is given as a guide to the process that will support improvements in your subject.

2 Identify what the department did and the impact it had on pupils.

Discuss as a team the example provided and establish the key areas that helped to develop this practice and the impact it had on pupils. It will be helpful to identify the changes in teachers' practice and how these impacted on pupils' learning.

3 Agree and plan the actions that will develop your practice.

As a department, agree how you intend to approach this task. Clarify what you are focusing on and why. The example given will act as a guide, but be specific about which classes, which lessons and which aspects of the curriculum will be your points of focus.

4 Identify when and how you will evaluate its impact on pupils.

The purpose of focusing on this is to improve pupils' achievement and attainment in mathematics. You will need to be clear on what has helped pupils to learn more effectively in your subject. Part of this will be how your practice has adapted to allow this. You should jointly identify what has worked well and which areas require further attention.

5 Having evaluated these strategies, consider what steps are required to embed this practice.

You will need to undertake an honest evaluation of what you have tried and the impact it has had on your teaching and on pupils' learning. One outcome might be that you need to spend longer on improving this area or you may be in a position to consider the next task.

Other departments in the school will have been focusing on this area and you should find out about the progress they have made.

You may find that some teachers in the department will require further time to develop and consolidate new practice, while others will be ready to progress further through the tasks in this area (while continuing to support their colleagues). Practice across a department will need to be consolidated before focusing on a new area of Assessment for learning.

The subject development tasks

Task 4.1A

With a colleague, observe each other teaching and, ideally, record (video/audio) the lessons. Use **handout 4.1.4** and **slide 4.1.5** in the generic unit (see **appendix 4.1A.1**) to record how specific and positive individual pieces of feedback are perceived to be. You should mark a cross in the relevant quadrant to record how positive/negative and specific/non-specific each example of oral feedback is during the lessons.

The scatter of the plotted points will give an overall impression of the nature of the oral feedback and highlight particular development needs for the teacher observed.

Capture specific examples of oral feedback recorded in each quadrant to inform your joint review of the lesson. It is important to focus on the effective practice of the teacher observed before agreeing areas for improvement and how to go about doing this.

Task 4.1B

Refer to **handout 4.1.4** in the generic unit (see **appendix 4.1A.1**) and, as a department, 'traffic light' the types of oral feedback described, e.g.:

- green = frequently used across the department
- amber = occasionally used by individuals
- red = rarely used.

Select an area highlighted amber or red that the department agrees is most likely to impact on learning outcomes.

As a department, plan and teach lessons that incorporate the selected type of oral feedback.

Jointly review the impact of this on pupils' learning.

The following pages provide exemplification of each task.

Task 4.1A

With a colleague, observe each other teaching and, ideally, record (video/audio) the lessons. Use handout 4.1.4 and slide 4.1.5 in the generic unit (see appendix 4.1A.1) to record how specific and positive individual pieces of feedback are perceived to be. You should mark a cross in the relevant quadrant to record how positive/negative and specific/non-specific each example of oral feedback is during the lessons.

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Context

As part of their focus on developing interactive teaching following the Assessment for learning training, one department decided to strengthen the quality of oral feedback in mathematics lessons.

Process

Two teachers volunteered to work together with Year 7 classes. They decided to observe each other teaching using **handout 4.1.4** from the generic unit to record as many examples of oral feedback as they could (see **appendix 4.1A.1**).

After two observations, the two teachers got together to discuss the outcomes. They focused on thinking about ways of making their feedback more specific and more positive using the recorded examples of feedback from their lessons.

Evaluation

The outcomes of these discussions were as follows:

- Both teachers felt the process had made them more aware of their interaction with pupils.
- The teachers felt that the 'negative specific' items could usefully be made more positive by re-phrasing as a question, e.g. 'Can you see what is wrong with the numbers on the y -axis?'
- They recognised that many of the items listed under both positive and negative non-specific responses were used frequently.

The teachers decided they needed to be more focused in their interaction with pupils by being specific with both content and targeting mathematical vocabulary.

Task 4.1B

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As a department, plan and teach lessons that incorporate the selected type of oral feedback.

Jointly review the impact of this on pupils' learning.

Context

In continuing the work on strengthening interactive teaching, one department decided to focus on using oral feedback in targeted group work. This method of oral feedback was used occasionally in the department, but not consistently by all teachers.

Process

The department looked at two sequences from the video for the *Mathematics three-day conference* to introduce the focus:

- a Year 7 lesson on fractions taught by Alison
- a Year 9 lesson on algebra taught by Teresa, with targeted group work led by Asyia.

They decided to explore approaches with two Year 7 intervention groups, as they were using many of the level 3 to 4 lessons from the *Targeting level 4 in Year 7* materials. The two teachers involved with planning and teaching these classes already met regularly to discuss sequences of lessons. They agreed to take this further by focusing on oral feedback during the activity part of the lessons. They decided to start with unit 4.

Both teachers agreed to target a minimum of two groups of four during each of the 8 lessons in this unit. In most lessons they aimed to spend between ten and fifteen minutes with each group. This enabled them to give detailed oral feedback to pupils at least twice during the teaching of the unit. For each lesson, they prioritised the area of focus so, for example, in lesson N4.2 they chose to target pupils' understanding of equivalent fractions. They planned questions to ask pupils while working in groups, some given in the lesson plan and some additional ones they devised for themselves. These included the following.

- What fractions are equivalent to one half/one third/three quarters?
- How do you know?
- How do you know when a fraction is in its simplest form?

Having started the dialogue with a question, the teachers then concentrated on providing specific feedback on pupils' responses. (The lesson plan for N4.2 is included as **appendix 4.1B.1** for reference.)

Evaluation

At the end of the unit the two teachers reviewed the outcomes and impact on pupils' learning. In targeting small groups, the teachers felt that:

- mathematical talk between pupils had increased
- they had a better awareness of individual pupils' levels of understanding and misconceptions
- pupils were more aware of the progress they were making.

They presented their findings at the next department meeting. It was agreed that each of the two teachers would work with another teacher to support planning for targeted group work, and so extend the emerging good practice.

Subject-specific references

Referenced strategy materials

Targeting level 4 in Year 7: mathematics (DfES 0085/2003). These materials can be found at www.standards.dfes.gov.uk/keystage3 by selecting 'mathematics' and then 'mathematics publications'.

Mathematics three-day conference (video, tracks 2 (Alison) and 7 (Teresa), DfEE 0468/2001)

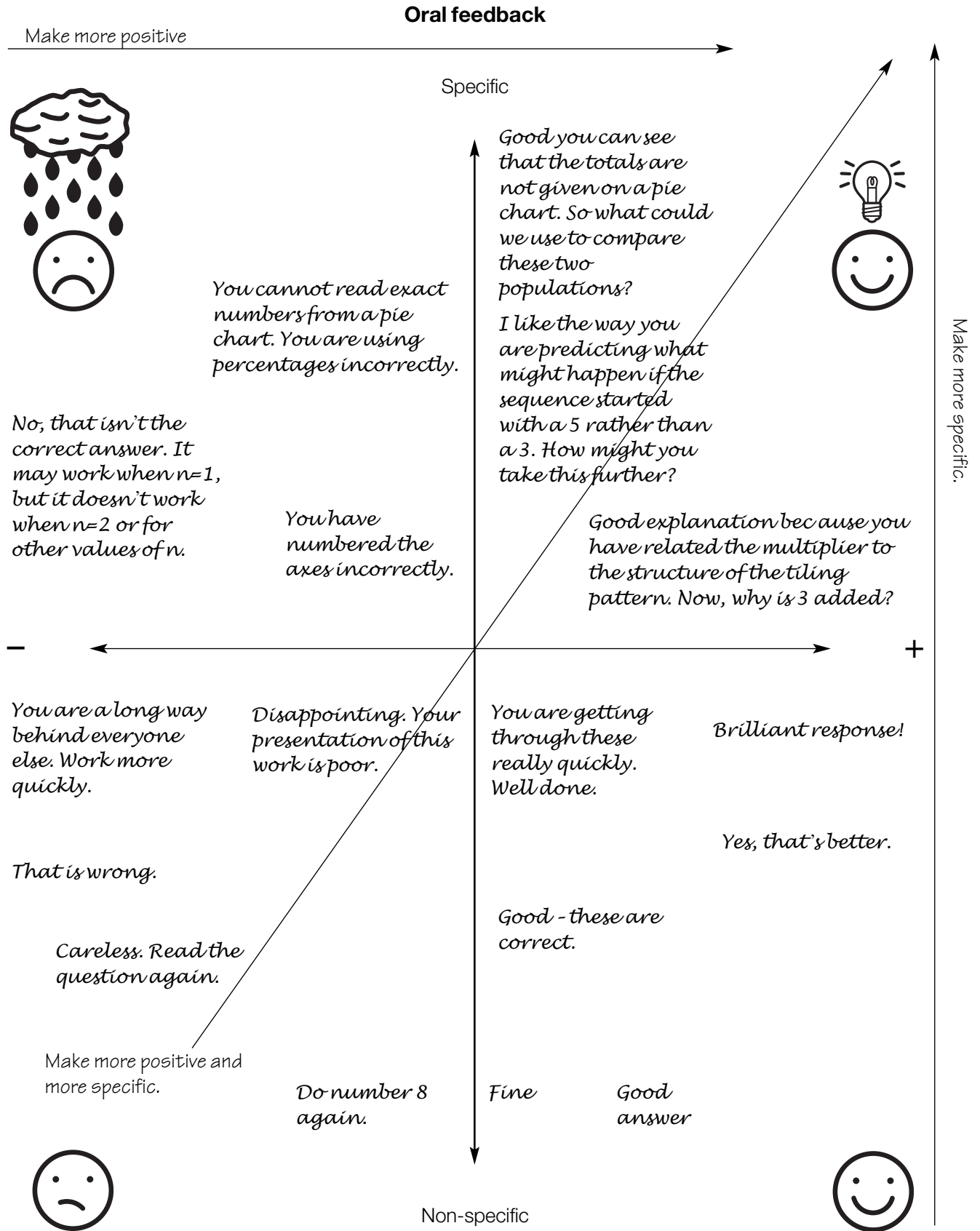
QCA materials

Using assessment to raise standards in mathematics, Section 2: Using effective questioning techniques (QCA, www.qca.org.uk)

Ofsted materials

Good assessment practice in mathematics (Ofsted, www.ofsted.gov.uk)

Mathematics-specific example of handout 4.1.4



N4.2: Equivalence of fractions

objectives

- Recall multiplication facts to 10×10 and derive associated division facts.
- Find simple equivalent fractions.
- Change mixed numbers to improper fractions and vice versa.

starter

Vocabulary

multiplied by
divided by
product
quarters
fifths
numerator
denominator
mixed number
improper fraction

Resources

mini-whiteboards

Chant the four times table, forwards and backwards: one four is four, two fours are eight, three fours are twelve, and so on. Ask a few questions, varying the wording. Ask pupils to write answers on their whiteboards.

Q What is 8 multiplied by 3? What is 32 divided by 4? 6 times 4? Seven fours? 8 shared between 2? The product of 3 and 4? How many fours make 28?

Remind pupils that the numerator is the 'top number' and the denominator is the 'bottom number' of a fraction. The line that separates the numerator from the denominator represents division. The fraction $\frac{1}{4}$ means one whole divided into four equal parts.

Q How many quarters are equivalent to one whole? (four)

Write $1 = \frac{4}{4}$ on the board.

Q How many quarters are equivalent to one and one quarter? (five)

Write $1\frac{1}{4} = \frac{5}{4}$ on the board.

Q How many quarters are equivalent to one and a half? (six)

Write $1\frac{1}{2} = \frac{6}{4}$ on the board.

Explain that numbers like $1\frac{1}{4}$ and $1\frac{1}{2}$ are called *mixed numbers*. A mixed number is the sum of a whole number and a fraction: $2\frac{1}{2}$ and $3\frac{2}{5}$ are examples of mixed numbers. A fraction whose numerator is greater than its denominator is called an *improper fraction*: $\frac{8}{3}$ and $\frac{9}{4}$ are examples of improper fractions.

Demonstrate how to change a mixed number to an improper fraction. Write $3\frac{2}{5}$ on the board. Explain that in each of the three wholes there are five fifths. Altogether, in the three wholes there are 3×5 fifths. So in $3\frac{2}{5}$ there are $(3 \times 5) + 2$ fifths or 17 fifths. Write $3\frac{2}{5} = \frac{17}{5}$ on the board.

Ask pupils to change the following mixed numbers to improper fractions, and to write the answers on their whiteboards: $4\frac{1}{4}$ and $2\frac{5}{8}$.

Q How could we change an improper fraction to a mixed number?

Remind the class that the line that separates the numerator from the denominator represents division. To change $\frac{17}{5}$, or 17 fifths, back to a mixed number, 17 is divided by 5. Since $17 \div 5 = 3 \text{ r } 2$, the answer will be three whole ones and two fifths, or $3\frac{2}{5}$.

Ask pupils to change these improper fractions to mixed numbers, and to write the answers on their whiteboards: $\frac{13}{4}$ and $\frac{73}{10}$.

main activity**Vocabulary**

equivalent
multiple
simplify
cancelling

Resources

OHT or poster of
multiplication square
OHP calculator
ITP *Fractions* (optional)

Draw on the board two circles, marked in quarters, side by side. Write $\frac{1}{4}$ on one of the quarters on the circle on the left. Point to the other circle and invite a pupil to mark one eighth of it. Establish that one eighth can be found by halving each quarter, making eight eighths altogether.

Q How many eighths are equivalent to one quarter? (two)

Draw a third circle, marked in quarters. Invite a pupil to mark one twelfth of the circle. Establish that one twelfth can be found by finding one third of each quarter, making twelve twelfths altogether.

Q How many twelfths are equivalent to one quarter? (three)

Write on the board $\frac{1}{4} = \frac{2}{8} = \frac{3}{12}$. Remind the class that these are equivalent fractions. Repeat for $\frac{3}{4} = \frac{6}{8} = \frac{9}{12}$.

You may wish to support the main activity of this lesson by using the ITP *Fractions* downloaded from www.standards.dfes.gov.uk/numeracy. Select options and ask questions to consolidate pupils' understanding.

Ask the class:

Q Which fractions are equivalent to one half?

Take pupils' suggestions, then write on the board:

$$\frac{1}{2} \quad \frac{2}{4} \quad \frac{3}{6} \quad \frac{4}{8} \quad \frac{\square}{10} \quad \frac{6}{\square} \quad \frac{\square}{14} \quad \frac{8}{\square}$$

Q What are the missing numbers?

Refer to a poster of a multiplication square, or show one on an OHT.

1	2	3	4	5	6	7
2	4	6	8	10	12	14
3	6	9	12	15	18	21
4	8	12	16	20	24	28
5	10	15	20	25	30	35
6	12	18	24	30	36	42
7	14	21	28	35	42	49

Explain that the rows are multiples. Show how to use the square to find fractions equivalent to one half by looking at the first and the second rows of the square.

Now find fractions equivalent to one quarter, using the first and fourth rows of multiples. Write on the board:

$$\frac{1}{4} \quad \frac{2}{8} \quad \frac{\square}{\square} \quad \frac{4}{\square} \quad \frac{\square}{20} \quad \frac{6}{\square} \quad \frac{\square}{28} \quad \frac{\square}{\square}$$

Find fractions equivalent to one third by looking at the first and third rows. Explain that the fractions are produced by multiplying the numerator and the denominator of the first fraction by 2, then by 3, then by 4, and so on.

Write $\frac{4}{20}$ on the board.

Q What is the simplest fraction equivalent to this?

Demonstrate how to show that the simplest equivalent fraction is one fifth. Point to 4 in the first row, and move down the column to find 20 in the fifth row. Look back to the beginning of the two rows, to point at 1 and 5. Write on the board: $\frac{4}{20} = \frac{1}{5}$. Repeat for $\frac{6}{36}$ and $\frac{7}{21}$, showing that the simplest equivalent fractions are $\frac{1}{6}$ and $\frac{1}{3}$ respectively.

Explain that a simpler equivalent fraction is produced by dividing the numerator and the denominator by the same number, and that this process is known as *cancelling*.

other tasks

Springboard 7

Units 5 and 13

Unit 5 section 2: Fractions and whole numbers

4	Changing whole numbers into improper fractions	page 182
5	Changing mixed numbers into improper fractions	page 182
	Star challenge 2: Thirds, fifths and tenths	page 183

Unit 5 section 6: Equivalent fractions

1	Simple equivalent fractions	page 197
	Star challenges 9, 10, 11, 12: Halves, Thirds, Quarters, Fifths	page 198

Unit 13 section 1: Fractions of quantities

	Star challenge 2: Fractions in action	page 426
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plenary

Resources

OHT N4.2a

mini-whiteboards

Write on the board:



Explain that this improper fraction has a two-digit numerator and a one-digit denominator. Ask pupils to work in pairs and to use their whiteboards. They should make improper fractions of this form that are whole numbers. For each fraction, they should use each of the digits 2, 3 and 4 once and only once.

Give the pairs a few minutes to work on the problem, then take feedback. The complete set of fractions is $\frac{34}{2}$, $\frac{24}{3}$, $\frac{42}{3}$ and $\frac{32}{4}$.

Finish by working through the problems on **OHT N4.2a** with the class.

Remember

- Fractions in which the numerator is greater than the denominator are called 'improper fractions'. They can be changed into mixed numbers so that they have a whole-number part and a fraction part.
- You can convert any fraction into another equivalent fraction by multiplying the numerator and the denominator by the same number.
- You can simplify a fraction by dividing the numerator and the denominator by the same number. This process is known as 'cancelling'.