

# Five

sample sessions inside...



# Fractions

# Big Ideas

Multiplying and dividing

Adding and subtracting

Place value

Working with fractions, decimals and percentages

- A programme of additional sessions for children in upper Key Stage 2 not meeting age-related expectations
- Focuses on strong re-teaching of key maths topics using an active, practical approach
- Suitable for delivery by non-specialists

This 12-week programme includes pre- and post-assessments, familiarization activities and 48 step-by-step sessions across 5 key areas: Number and place value, Adding and subtracting, Multiplying and dividing, Fractions, and Working with fractions, decimals and percentages.

This booklet provides a sample session and accompanying photocopy masters from each of the five *Big Ideas* to allow you to see how it could benefit your struggling learners in Years 6 and 7/P7-S1.

OXFORD

# Ordering and comparing numbers: 4-digit and 5-digit numbers

## Session 2



### Educational context

This session builds upon the context of a music concert from the previous session. Here the focus is on gaining a feel for the size of a number and how it relates to others by ordering and comparing.

### Prior learning

Compare and order 3-digit numbers up to 1000

Read and write 3-digit numbers up to 1000 in numerals and words

Recognize the place value of each digit in a 3-digit number

Recognize zero as a place holder

Reduce a column value to zero by taking away from that column

### Making connections

In Unit 2, Session 1, pupils draw, describe and visualize place value and zero as a place holder. This develops an understanding that numbers can be expressed in different ways, e.g. one thousand is the same as ten hundred.

### Objectives

- To understand the quantity and column value of digits in numbers between 1000 and 100 000.
- To recognize the place value of each digit in 5-digit numbers.
- To order and compare numbers up to 100 000.

### Vocabulary

column, place value, base-ten, column value, 5-digit number, ascending

### Have ready

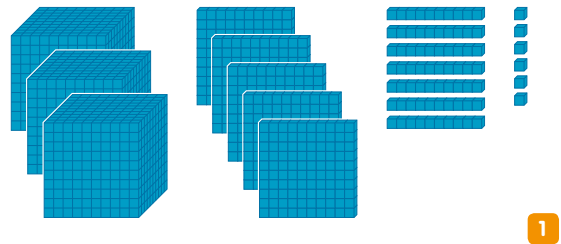
Base-ten apparatus	Place Value Arrow Cards (cut from PCMs 30a–30d)
Sticky notes	Place Value Frame – TThThHTO (PCM 32)
Counters	Written Assessment
Spinner with 0–9 Overlay (PCM 36)	Question Unit 2, 2 (PCM 5a)

### Main learning

#### Step 1

Remind pupils of the music concert scenario in Session 1, where the lower tier of the stadium can seat 3576 people and the upper tier seats 1842 people.

Ask pupils to use base-ten to model these numbers (e.g. 1).



Work together to record these maximum capacity numbers on the place value frame, so that pupils can keep referring back to them.

Ask pupils: Which tier holds more people? (the lower tier) How do you know?

The lower tier can hold more people, because it seats more than 3000 people while the upper tier seats fewer than 2000.

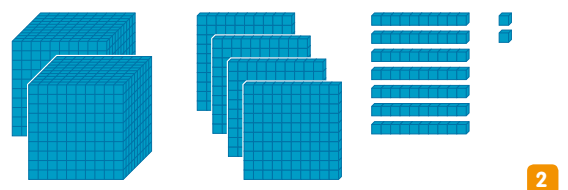
#### Step 2

Say that on each of the seven evenings in one week, the lower tier was not full but had more than 1000 people.

Ask pupils to explore with apparatus to write seven different possible numbers for the lower tier and write each number onto a separate sticky note. (Encourage a range of numbers from 1000 to 3575, and look for suitable responses.)

Ask pupils to read each number aloud. Listen for correct vocabulary.

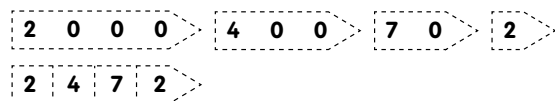
Invite pupils to show the number using base-ten apparatus (see 2, which shows 2472).



What is the largest possible number you could have written? (3575)

## Unit 2: Number and place value

Ask pupils to show the numbers using Place Value Arrow Cards and Counters on the Place Value Frame (e.g. **3** and **4**).



**3**

Ten Thousands	Thousands	Hundreds	Tens	Ones

**4**

Ask pupils to place the seven numbers from their sticky notes into ascending order.

### Step 3

Place 9 Counters into the thousands column (see **5**).

Ten Thousands	Thousands	Hundreds	Tens	Ones

**5**

Ask pupils what number this is. (9000)

Using Counters, count on from 9000 onto the frame, e.g. 9100, 9200, ... 9800, 9900.

If they say '9 thousand *ten hundred*', ask for another way of saying 'ten hundred.' (one thousand)

9 thousand and 1 more thousand is 10 thousand.

Count up again, this time in thousands (1000, 2000, ... 9000, 10 000) and explore this using the Place Value Frame (see **6**).

Ten Thousands	Thousands	Hundreds	Tens	Ones

**6**

### Step 4

Play the game.

### Sowing the seeds for the next session

Ask pupils how many ten thousands is the maximum that can go in the ten thousands column. (9)

Count up from 90 000 in thousands (91 000, 92 000, ... 99 000, 100 000). Listen for 'ninety ten' thousand and encourage 'one hundred thousand'.

### Game

Look and listen for pupils placing the higher value digits in columns on the left-hand side to give larger numbers.

- Use a 0–9 dice (or a Spinner with 0–9 Overlay) and one Place Value Frame per player.
- Take it in turns to throw the dice and decide which column to write the digit into.
- Repeat until each player has written 5 digits.
- The player who has the biggest number is the winner (e.g. **7**).

Player A wins:

Ten Thousands	Thousands	Hundreds	Tens	Ones
9	6	3	1	0

Player B loses:

Ten Thousands	Thousands	Hundreds	Tens	Ones
7	7	5	3	4

Player C loses:

Ten Thousands	Thousands	Hundreds	Tens	Ones
8	5	2	2	1

**7**

At the end of the game ask: can you read your number?

Can you place the numbers in ascending order? (e.g. 77 534, 85 221, 96 310)

Challenge: How far away from 100 000 is each player?

### Varying and repeating

The game can be repeated to provide further practice.

It can be varied so the winner is the player with the smallest number.

### Assessing and reflecting

- Watch the pupils playing the game. Do they know to insert the largest digit into the highest value column that is available. Are they placing low digits into TTh and Th columns too soon, thus making their final number low?
- Written Assessment Question Unit 2, 2.

Discuss how pupils can use their learning outside the session, and complete their Learning Log (PCM 1) to reflect on the maths they have done so far.

### Continuing the learning

Pupils play the game again at home with their friends or parents.

Change the rules, e.g. the winner is the person with the smallest number.

### Further teaching and practice

NPC 4, Numbers and the Number System 2, Activities 2 and 3  
NPC 5, Numbers and the Number System 1, Activities 6 and 7  
MyMaths lessons: Working with thousands (1972); Place value hundreds and thousands (1352)

## Percentages

## Session 3



## Educational context

This session focuses on understanding percentages, including knowing that 'per cent' means 'out of one hundred' and that percentages are a special value fraction: hundredths. This builds on the previous session where pupils explored hundredths as fractions and decimals.

## Prior learning

Dividing by 100

Multiplying by 2, 3, 5, 40

## Making connections

This session looks at percentages as another way of representing quantities less than 1 and provides further links to hundredths as fractions ( $\frac{1}{100}$ ). It links to multiplication of whole numbers by fractions (Session 4) and fractions of amounts.

## Objectives

- To know that percentages are a way of expressing hundredths.
- To be able to work out simple percentages of amounts (e.g. 25% of 200, 1% of 400).
- To know the fraction equivalents of 1%, 50% and 10%.
- To understand that, e.g. 5% is half of 10% when the total amount is the same.

## Vocabulary

per cent ('cent' means '100' and 'per' means 'out of'),  
per cent of, off, equivalent

## Have ready

Numicon Shapes	100 Square – Blank (PCM 7)
Decimal Baseboard Laminate	Written Assessment
Counters	Question Unit 6, 3 (PCM 5b)
100-bead string (or 0–100 cm Number Line)	

## Main learning

## Step 1

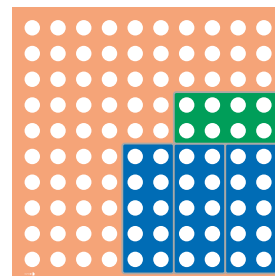
Discuss percentages as another way of expressing fractions.

Draw out from pupils that percentages are hundredths, but instead of writing a fraction, e.g.  $\frac{1}{100}$  or  $\frac{10}{100}$ , a percentage is written as 1% or 10%.

Look and listen for pupils who are able to see that the symbol % looks like it is made from /00 or /100.

Discuss that the Decimal Baseboard has 100 parts of one whole and use Numicon Shapes to help pupils visualize some percentages, e.g. 1%, 10%, 50%, 38% (see **1**).

This shows 38 out of 100.  
It is an image of 38%.



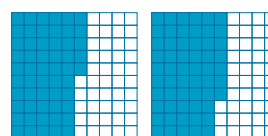
1

Ask pupils to show 20%, 27% and 45%.

## Step 2

Discuss that percentage values are as easy to compare as whole numbers (that's why we use them).

Explore how they can be compared visually, e.g. use two 100 squares and shade the first 100 square to show 55%, then shade in the second 100-square to show 57% (see **2**).

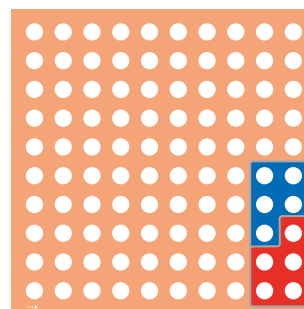


2

## Step 3

Explore further the relationship between percentages using a Decimal Baseboard and Numicon Shapes.

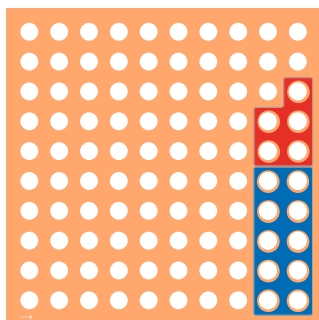
Discuss that  $5\% = \frac{1}{2} \times 10\%$  and look for pupils who can show this with a 10-shape and a 5-shape (see **3**).



3

## Unit 6: Fractions, decimals and percentages

Ask pupils to explore and show that 15% is  $10\% + 5\%$  (see 4).



4

Ask pupils to show how these percentages could be represented in a similar way:

$$20\% = 2 \times 10\% \quad 25\% = \frac{1}{2} \times 50\%$$

$$60\% = 50\% + 10\% \quad 40\% = 50\% - 10\%$$

$$19\% = 20\% - 1\% \quad 2\% = 2 \times 1\%$$

What Shapes will pupils choose to show these percentages on the Baseboard?

### Step 4

Set the scene of a sale in a sofa shop.

Can pupils find out what 40% is of a sofa that costs £2200?

Explore finding percentages of amounts by interpreting the vocabulary and symbols.

Look and listen for pupils who can explain that  $40\% = \frac{40}{100}$  which means  $40 \div 100$ .

Discuss that 'of' means 'multiply' or 'times' ( $\times$ ), so finding 40% of £2200 has two steps:

- $\pounds 2200 \div 100 = \pounds 22$
- $\pounds 22 \times 40 = \pounds 880$

The first operation divides to give 1% of £2200, the second operation multiplies to give 40%.

Look and listen for pupils making the connection that they now need to subtract £880 from £2200 to find the new price of the sofa. (£1320)

Challenge: Another sofa was originally £1900. If the sale reduction is 30%, what is the new price? Which sofa is cheaper?

### Sowing the seeds for the next session

Using 1-shapes, 10-shapes and a Decimal Baseboard, can pupils explain what the equivalent fraction is to 1% and 10%?

### Varying and repeating

Repeat the session using a 100-bead string to show percentages, i.e. 100 beads represent 100%, so how many beads will show 42% or 52%?

Use the bead string to represent £600 and discuss how much 1 bead, or 10 beads, represents.

### Activity

Look and listen for pupils who are able to find percentages totalling 100%.

- Use Blank 100 Squares as your grids for designing a park.
- Work in pairs. Give your partner percentages to use for designing their park, e.g. 50% grass, 20% water, 20% play area, 10% trees, making sure they total 100%.
- Design, shade and label the correct number of squares for each element of your park, and give your design to your partner to check.

### Assessing and reflecting

- Which is more money, 20% of £300 or 40% of £200?
- What is 40% of £1200?
- Written Assessment Question Unit 6, 3.

Challenge:

- If there are 25 cars and 5 of them are red, what percentage of the cars are red? How did you work it out?

Discuss how pupils can use their learning outside the session, and complete their Learning Log (PCM 1) to reflect on the maths they have done so far.

### Continuing the learning

Ask pupils to design a garden area for their school, this time giving each other percentages that are not multiples of ten, e.g. 45% flower beds, 25% paving, 15% shed, and so on.

Can pupils work out what 10% off and 50% off are for some prices of items in a shop? Discuss the savings and the wording of sales signs, e.g. the use of 'off', 'of', and 'up to'.

### Further teaching and practice

Numbers and the Number System 7; Calculating 11  
MyMaths lessons: Percentages of amounts 1 (1030);  
Percentages of amounts 2 (1031)



## Adding and subtracting money

## Session 2



## Educational context

This session focuses on adding and subtracting, using the written column method explored in Unit 3, but with numbers up to two decimal places in the context of money. Pupils calculate with money where regrouping is extended to decimals. Encourage pupils to continue estimating an answer using rounding before carrying out the calculation.

## Prior learning

Secure understanding of place value with numbers up to two decimal places

Using the written column method for adding and subtracting

## Making connections

In Unit 3, pupils are introduced to the column method for adding and subtracting, and in Unit 7, they work on decimals.

## Objectives

- To know that the decimal point separates the whole and fractional parts in decimal notation.
- To add and subtract numbers up to two decimal places using the column method.
- To solve simple money problems involving numbers to two decimal places.

## Vocabulary

estimate, more, column adding, column subtracting, regrouping, redistributing, column value, difference, pence, pound, tenths, hundredths, decimal point, zero as a place holder

## Have ready

Numicon Shapes	Numeral Cards 0–9 (cut from PCM 28)
Decimal Baseboard Laminate	Cafe and Curry Menus (PCM 11)
£1, 10p and 1p coins (or cut from Coins, PCM 13)	Written Assessment Question Unit 8, 2 (PCM 5b)
Place Value Frame – Decimals (PCM 33)	

## Main learning

## Step 1

Look together at the Cafe Menu on the Cafe and Curry Menus sheet (see 1).

Chef's salad	£7.99
Soup	£5.25
Tomato pasta	£7.90
Chunky chips	£2.45
Coffee	£1.90
Orange juice	£1.49
Water	£0.75

1

Ask pupils to choose an item from the Cafe Menu and find the correct amount of money from the coins provided.

Discuss how this can be represented on a place value frame. Ask what the column values would be (ones, tenths, hundredths).

Place the coins on the Decimal Place Value Frame, e.g. Soup £5.25 (see 2). Pupils may also represent the tenths and hundredths using Numicon Shapes on the Decimal Baseboard.

Ones	tenths	hundredths

2

Look and listen for pupils who can interpret coins in terms of decimals and talk about pence as tenths and hundredths of a pound.

When dealing with money, the decimal point separates the pounds from the pence.

Remind pupils that one penny is one hundredth of £1.

Repeat with other amounts, including using zero as a place holder.

Ask pupils if the cost of the tomato pasta could be written as £7.9 instead of £7.90.

Look and listen for pupils who realize that 0 as a place holder is important in the context of money.

We always write money to two decimal places or in whole numbers.














## Step 2

Tell pupils you have chosen one item of food – soup – and one drink – orange juice – and need to find the total. Ask them to estimate the answer (£5 + £1.50 = £6.50).

## Unit 8: Adding and subtracting

Work out the exact calculation using the coins and Place Value Frame (£6.74) and then work through the calculation together, using the column method.

Look and listen for pupils applying their understanding of the written method to decimals when regrouping (see 3).

£ Ones	Tenths	P Hundredths	
	    	        	£5.25  +£1.49 <hr/> =£6.74

$$\begin{array}{r} 5.25 \\ + 1.49 \\ \hline 6.74 \\ 1 \end{array}$$

3

Encourage pupils to record the final answer as £6.74 and check with their estimate.

### Step 3

Ask pupils to choose two items from the menu and find the total cost. Repeat for several calculations to reinforce understanding of decimal places.

### Step 4















Ask the pupils to find the difference between the price of the soup and the tomato pasta.

Look and listen for pupils who realize that this is a subtracting calculation. Ask them to estimate the answer. (£8 – £5 = £3)

Together, explore the calculation using the coins and Place Value Frame (TO-10). Work through the calculation using the column method (£7.90 – £5.25 = £2.65).

Look and listen for pupils understanding the written method for decimals when regrouping for subtraction (see 4).

Encourage pupils to record the final answer as £2.65 and check with their estimate. Discuss whether this calculation could have been calculated mentally, e.g.  $90 - 25 = 65$  and  $7 - 5 = 2$ .

£ Ones	tenths	P hundredths	
	    	       	£7.90  -£5.25 <hr/> =£2.65

$$\begin{array}{r} 7.90 \\ - 5.25 \\ \hline 2.65 \end{array}$$

4

### Step 5

Ask pupils to choose two items from the menu and find the difference. Repeat for several calculations to reinforce understanding of decimal places and regrouping.

### Sowing the seeds for the next session

The label on this bottle reads 1.750 l. This number has three decimal places. How would you say this number? What is the value of each digit? Use 0–9 Numeral Cards on the Place Value Frame to represent the number.

### Varying and repeating

Vary the numbers involved, as appropriate – increasing or reducing the number of digits and the amount of regrouping involved.

### Game

Look and listen for pupils using estimating to find approximate answers and using subtracting (to two decimal places) to find the difference.

- Use the Curry in a Hurry section of the Cafe and Curry Menus sheet. Play in pairs.
- Take turns to choose a curry, rice and side dish. Estimate first and then write the bill, including finding the total cost of the three items.
- Ask a partner to check the total bill by using the inverse.

### Assessing and reflecting

- Benji orders chicken Kung Po £5.35, egg-fried rice £2.55, a vegetable spring roll £1.75 and a glass of lemonade. He spends £11.90. How much does the glass of lemonade cost? (£2.25)
- Written Assessment Question Unit 8, 2.

Challenge:

- Apples cost 56p each and grapes cost £1.50 for 1 kg. Kristie buys 3 apples and 1.5 kg of grapes. How much does she spend? (£3.93)

Discuss how pupils can use their learning outside the session, and complete their Learning Log (PCM 1) to reflect on the maths they have done so far.

### Continuing the learning

Collect menus from restaurants or takeaways. Ask pupils to choose items to make an imaginary order from these, and work out the total cost.

Discuss the importance of reviewing the numbers involved in a calculation to determine whether a mental or written strategy is most appropriate, and that larger numbers or decimals do not automatically make the calculation more complicated.

### Further teaching and practice

NPC 4, Numbers and the Number System 6 and 8

GMS 4, Measurement 2

MyMaths lessons: More written methods (1908); Adding decimals in columns intro (1381)

## Interpreting remainders

## Session 4



## Educational context

This session focuses on dividing that results in a remainder and how to interpret that remainder as a number, as a fraction and as a decimal. This builds on the dividing work covered in Unit 9, Session 3.

## Prior learning

Multiplying and dividing decimal numbers  
 Fraction and decimal equivalents  
 Dividing by 2, 5, 10

## Making connections

Pupils build on previous work on dividing, even and odd numbers, fractions, decimals, money and mixed numbers.

## Objectives

- To recognize a remainder.
- To convert remainders to fractions and decimals.
- To write a remainder as a number, fraction or decimal.
- To write the quotient as a mixed number.

## Vocabulary

divide, equally, left over, remainder, exchange, dividend (the quantity to be divided), divisor (the number divided into another number), quotient (the result of dividing)

## Have ready

Numicon Shapes	Spinners with Dividends and Divisors Overlays (PCM 41)
Baseboard Laminate	
Counters	Written Assessment Question: Unit 9, 4 (PCM 5c)
£1, 20p and 10p coins (or cut from Coins, PCM 13)	

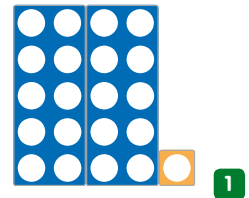
## Main learning

## Step 1

Set out 21 with Numicon Shapes (two 10-shapes and a 1-shape, see 1).

Ask pupils how to divide this into 2 equal amounts.

Twenty-one divided by two equals ten remainder one.

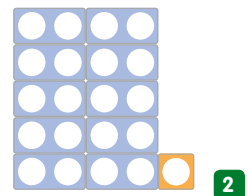


Discuss what happens when 1 is divided by 2.

Listen for pupils recalling that  $1 \div 2 = \frac{1}{2}$  or 0.5.

Set out 21 again, this time with ten 2-shapes and a 1-shape (see 2) and ask pupils to divide these into 10 equal parts.

$21 \div 10 = 2$  remainder 1.



Discuss what happens when 1 is divided by 10.

Listen for pupils suggesting one tenth or  $1 \div 10 = \frac{1}{10} = 0.1$ .

Explore the idea that remainders can be expressed in three ways and ask pupils to make up a context for each:

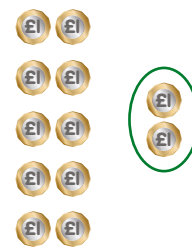
- The number left over (remaining), e.g. 21 people travelling in minibuses with 10 seats
- A fraction, e.g. sharing out pizzas
- A decimal, e.g. sharing money.

Talk about how contexts can affect what to do with a remainder. If a problem asks how many 10-seater minibuses for 21 people, you will need 3 vehicles even though the remainder is only 1. But if there are 21 ice lollies to share equally between 10 people, they can only have 2 each, as they can't share the 1 remaining lolly!

## Step 2

Ask pupils to imagine that five friends had worked together to tidy a garden and were paid £12 altogether.

Discuss how much each friend gets if they share it equally (3).



Give pupils twelve £1 coins to share between the five friends.

Two pounds each, remainder 2.



## Unit 9: Multiplying and dividing

Discuss what to do with the £2 remaining.

Look and listen for pupils exchanging two £1 coins for twenty 10p coins and sharing again (see 4).



Two pounds and forty pence multiplied by five.

4

Discuss how the £2 and 40p can be written (£2.40 or £2 and  $\frac{4}{10}$ ).

Ask pupils to show what fraction is created by the 40p if the 10p coins are exchanged for 20p coins ( $\frac{2}{5}$ ).

Challenge: If the five friends tidy another garden and are given £16, how much does each friend get? (£3.20 or £3 and  $\frac{1}{5}$ )

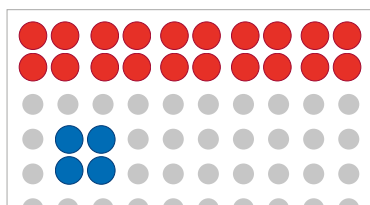
### Step 3

Say that the 5 friends pick 24 apples from their own garden.

Ask pupils to work out how many apples each friend will get if they share them equally.

Listen for pupils who suggest calculating  $24 \div 5$ .

Use a Baseboard and Counters to show that the friends would get 4 apples each with 4 left over (see 5).

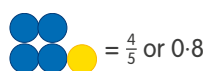


Four apples each, remainder four.

5

Explore writing the answer to  $24 \div 5$  as a mixed number,  $4\frac{4}{5}$  and as a decimal, 4.8 (see 6).

Challenge: Ask pupils to work out sharing 23 apples between the 5 friends ( $4\frac{3}{5}$  or 4.6).



6

### Step 4

Show the dividing calculation  $56 \div 5$ , using the short written method of dividing (see 7).

$$\begin{array}{r} 11 \text{ r } 1 \\ 5 \overline{) 56} \end{array}$$

7

Discuss how the remainder (1) can be divided by 5:  $1 \div 5 = \frac{1}{5}$ , and can also be written as a decimal, 0.2.

Ask pupils to solve the dividing calculation  $46 \div 4$  and to write the remainder as a fraction ( $11\frac{2}{4}$ ).

Look and listen for pupils who can make the connection that the fraction can be simplified to  $11\frac{1}{2}$ , and can also be written as a decimal, 11.5.

### Sowing the seeds for the next session

Discuss that if there are 12 half sandwiches,  $12 \times \frac{1}{2}$  = number of whole sandwiches (6).

Can pupils work out how many quarter sandwiches can be made from them? (24)

### Varying and repeating

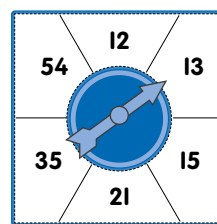
Repeat Step 1 using the Baseboard and Counters.

Pupils divide £18 and £24 between the five friends in Step 2, and 36 apples between the friends in Step 3.

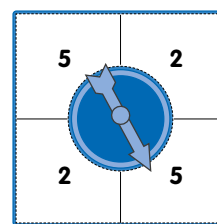
### Game

Look and listen for pupils dividing and identifying remainders correctly.

- Use two Spinners with Dividends and Divisors Overlays.



Dividends



Divisors

- Play the game in pairs. Take turns to spin the two Spinners.

The first Spinner is for the number to be divided (dividend) and the second Spinner is for the divisor, i.e. Spinner 1  $\div$  Spinner 2.

- If the quotient (the result) has a remainder, then you score 1, no remainder scores 0.
- The first player to score 5 wins.

### Assessing and reflecting

- Divide 101 by 5 and write the remainder as a fraction.
- Divide 101 by 10 and write the remainder as a decimal.
- Written Assessment Question Unit 9, 4.

Challenge:

- Divide 67 by 5 and write the remainder as a fraction.

Discuss how pupils can use their learning outside the session, and complete their Learning Log (PCM 1) to reflect on the maths they have done so far.

### Continuing the learning

Pupils play the game again and can score a bonus point if they can express a remainder as a fraction *and* a decimal. The first player to score 10 wins.

Ask pupils if they can say which of these dividing calculations results in a remainder and how they know:

$12 \div 2$	$13 \div 2$	$23 \div 2$
$55 \div 5$	$70 \div 5$	$31 \div 5$
$101 \div 10$	$950 \div 10$	$655 \div 10$

### Further teaching and practice

NPC 5, Calculating 4, 8, 9 and 13

MyMaths lesson: Interpreting remainders (1767)

## Comparing and ordering fractions

## Session 4



## Educational context

This session focuses on comparing and ordering fractions with the same denominator but different numerators, and different denominators but the same numerator. This builds on previous sessions where pupils compared mixed numbers and identified equivalent fractions.

## Prior learning

Equivalent fractions

Decimal equivalent of fractions

## Making connections

This session focuses on comparing proper fractions. It links back to Unit 10, Session 2, where mixed numbers are compared and to Unit 6, Session 2, where comparisons are made with decimals.

## Objectives

- To compare and order fractions with the same denominator and different numerators.
- To compare and order fractions with the same numerator and different denominators.

## Vocabulary

numerator (top number), denominator (bottom number), equivalent fractions

## Have ready

Numicon Shapes

Number rods

Strips of paper

Spinners with Numerators and Denominators  
Overlays (PCM 41)

Written Assessment  
Question: Unit 10, 4  
(PCM 5c)

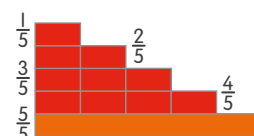
## Main learning

## Step 1

Give pupils number rods to compare fractions with the same denominator.

Can pupils show you how to use a 10-rod to represent 1 and the 2-rods to represent  $\frac{1}{5}$ ? (see 1)

The denominators are the same, so the size of the fraction is determined by the value of the numerator.



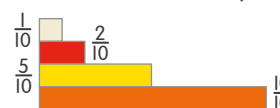
1

Ask pupils how they know that the 2-rod is  $\frac{1}{5}$ .

Listen for pupils reasoning that five 2-rods are the same length as the 10-rod representing 1, so one 2-rod =  $1 \div 5$  or  $\frac{1}{5}$ .

## Step 2

Ask which rods would be best for comparing tenths. Pupils use 1-, 2-, 5- and 10-rods to use to compare tenths (see 2).



2

Use the 10-rod to represent 1. ( $\frac{10}{10}$ )

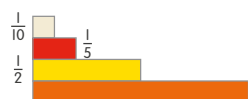
Discuss how we know the 5-rod is  $\frac{5}{10}$  (it represents half of 1, or  $\frac{10}{10} \div 2 = \frac{5}{10}$ ).

Which is the biggest fraction in 2 ( $\frac{10}{10}$ ) and which is the smallest ( $\frac{1}{10}$ )?

## Step 3

Work together to compare fractions with the same numerator.

Use the same number rods as in Step 2 with the equivalent fraction names (see 3).



3

Listen for pupils discussing the relative fraction sizes.

Ask them to identify the biggest fraction less than 1 ( $\frac{1}{2}$ ) and the smallest ( $\frac{1}{10}$ ).

Explore putting the fractions in order of size, starting with the biggest (see 4).

If the numerators are the same, then the bigger the denominator, the smaller the fraction.

$$\frac{1}{2} > \frac{1}{5} > \frac{1}{10}$$

4

## Unit 10: Fractions

### Step 4

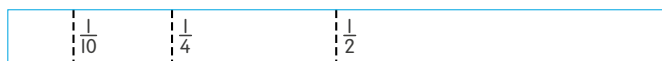
Give pupils a strip of paper to represent 1.

Ask them to fold it in half and write  $\frac{1}{2}$  at the fold.

Then ask them to fold the half into half to make quarters and write  $\frac{1}{4}$  at the first fold.

Discuss where  $\frac{1}{10}$  would be on the strip and ask pupils to mark it on.

Look and listen for pupils identifying the positions of the fractions correctly (see 5).



Ask them to identify the biggest fraction ( $\frac{1}{2}$ ) and the smallest ( $\frac{1}{10}$ ).

Explore putting the fractions in order of size, starting with the biggest (see 6).

$$\frac{1}{2} > \frac{1}{4} > \frac{1}{10}$$

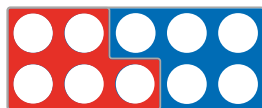
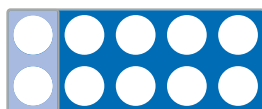
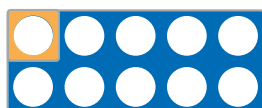
6

### Sowing the seeds for the next session

Using number rods or Shapes to illustrate their thinking, can pupils explain why it is possible to add fractions with the same denominator, but not fractions with different denominators? (The denominators show the kind of fraction being added, so need to be the same.)

### Varying and repeating

Use 10-, 5-, 2- and 1-shapes to set up a Shapes version of the number rods in Steps 2 and 3 (see 7).



7

Fold the paper strip in Step 4 into thirds and sixths to compare, e.g.  $\frac{1}{10}$ ,  $\frac{1}{6}$ ,  $\frac{1}{4}$ ,  $\frac{1}{3}$ ,  $\frac{1}{2}$ ,  $\frac{2}{3}$ .

### Game

Look and listen for pupils identifying the numerators and denominators and comparing fractions correctly.

- Use a Spinner and a Numerals Overlay.
- Take turns to spin the Spinner twice.
- Player 1's first spin gives the denominator of their fraction and the second spin gives the numerator.
- The next player does the same.
- Write down and compare the two fractions (or more, if playing in a group).
- The biggest fraction scores a point.
- Decide how many points to score for a win.

Note that this will generate proper and improper fractions.

### Assessing and reflecting

- Which of these fractions is the biggest:  $\frac{6}{11}$ ,  $\frac{3}{11}$ ,  $\frac{9}{11}$  or  $\frac{5}{11}$ ?
- What are two proper fractions bigger than  $\frac{1}{3}$ ?
- Written Assessment Question Unit 10, 4.

Challenge:

- A running track is 400 m. What fraction of a kilometre is this in tenths and in fifths?

Discuss how pupils can use their learning outside the session, and complete their Learning Log (PCM 1) to reflect on the maths they have done so far.

### Continuing the learning

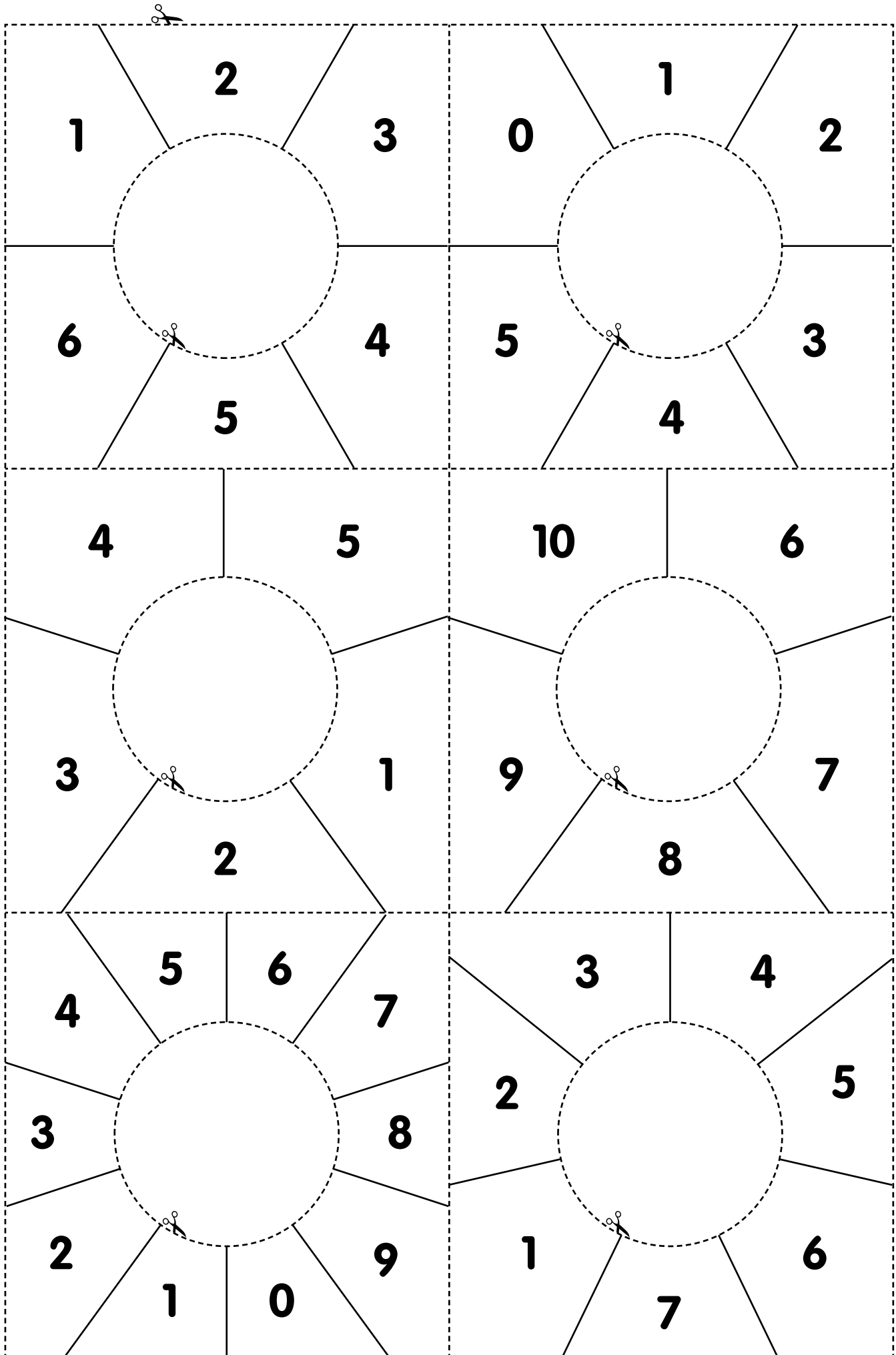
Pupils play the Game again, this time comparing the fractions and the player with the smallest fraction wins a point.

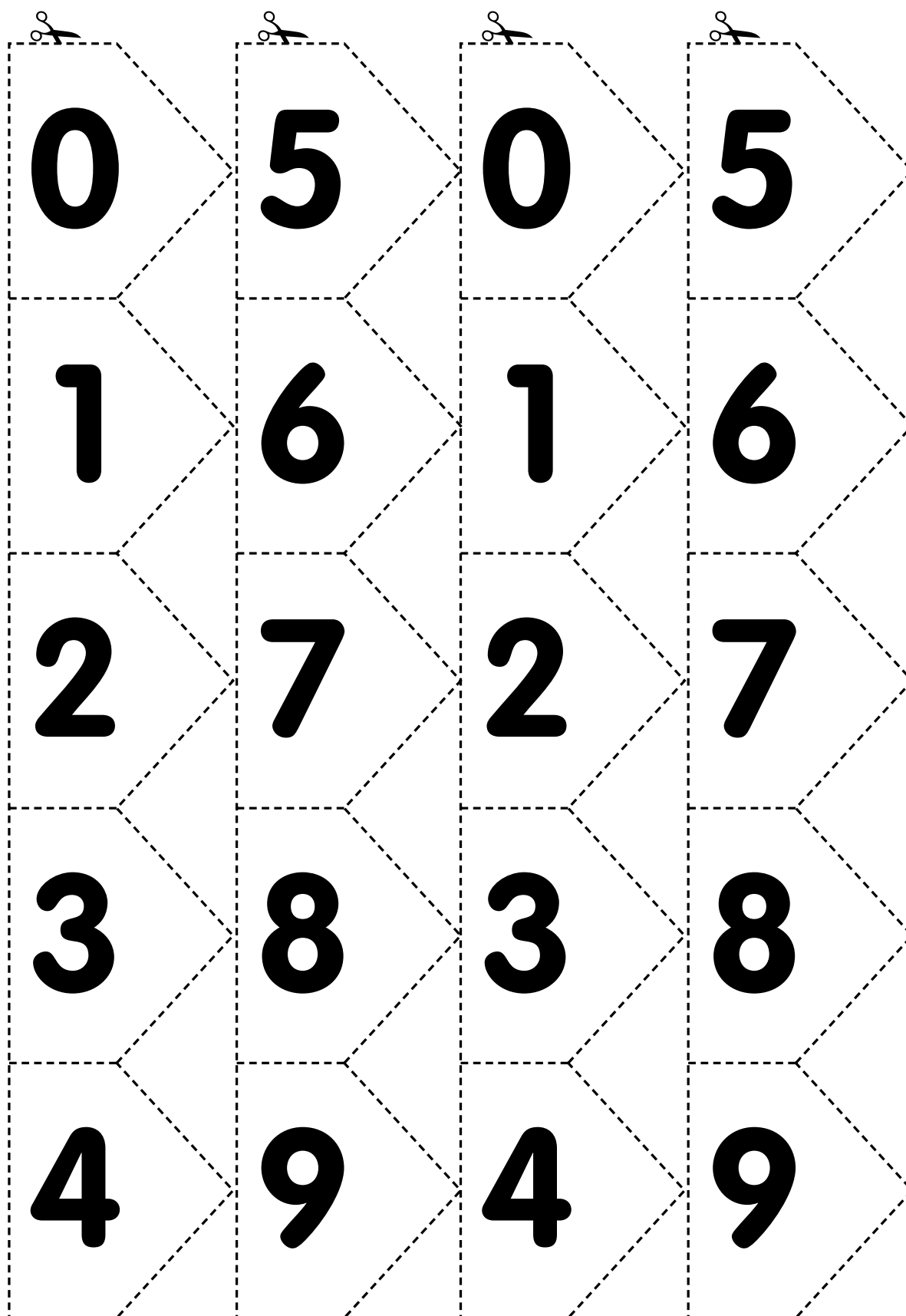
Can pupils collect information to present to a partner using fractions, e.g. there are 20 cars in the car park:  $\frac{12}{20}$  of the cars are silver,  $\frac{4}{20}$  are black,  $\frac{2}{20}$  are red and  $\frac{2}{20}$  are blue?

### Further teaching and practice

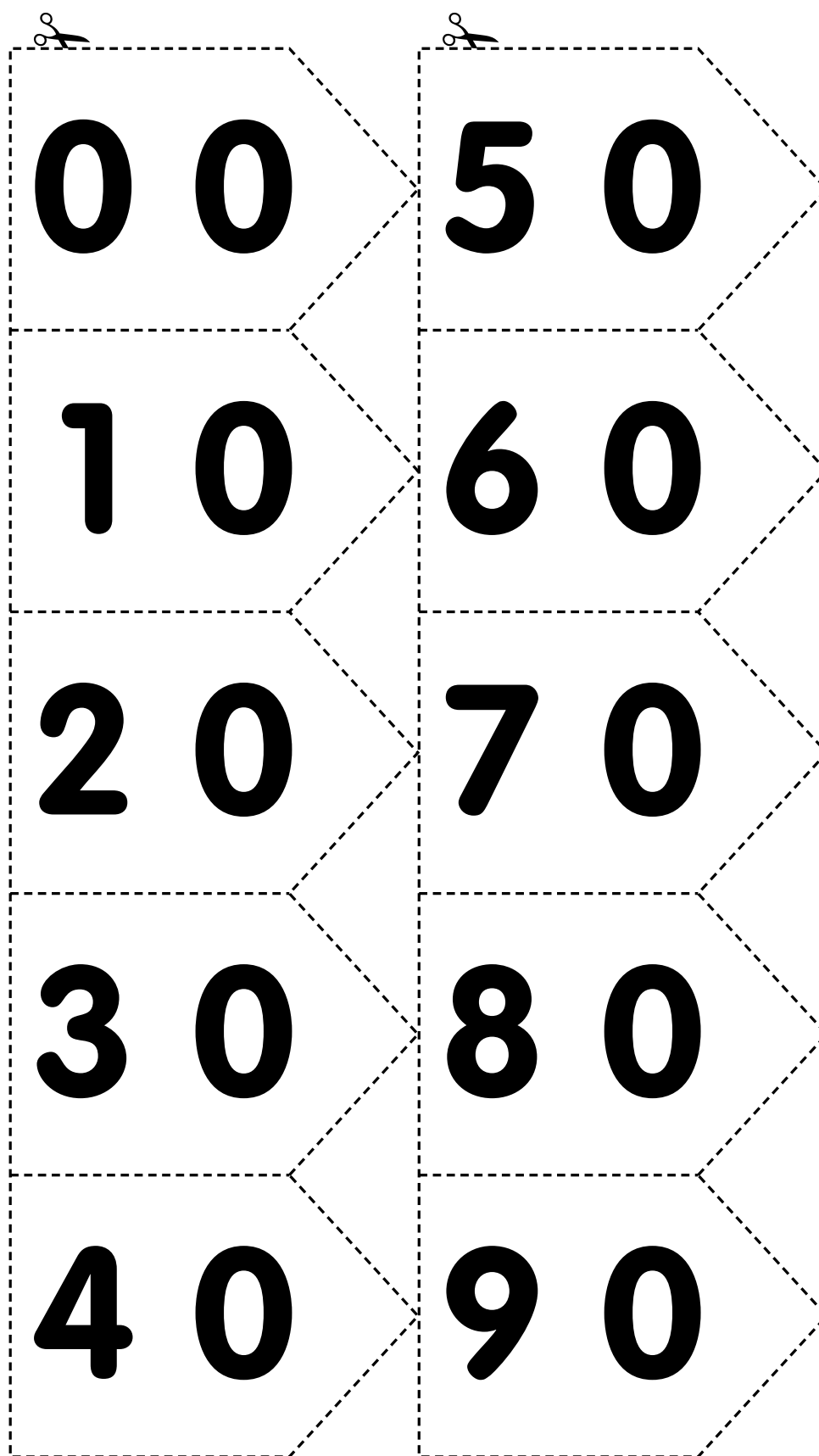
NPC 5, Calculating 4, 14 and 15

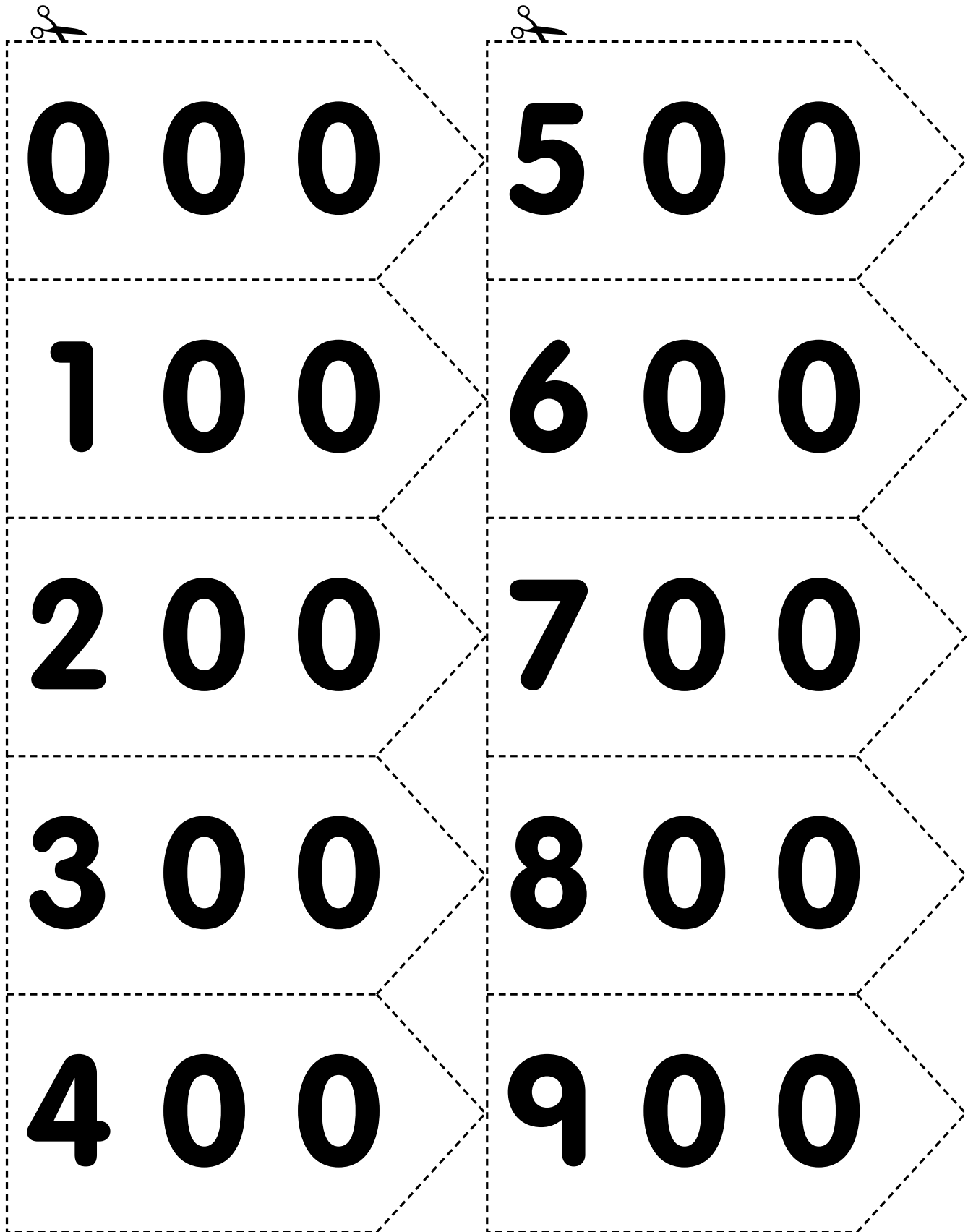
MyMaths lessons: Comparing fractions (1075); Comparing scalable fractions (1844)

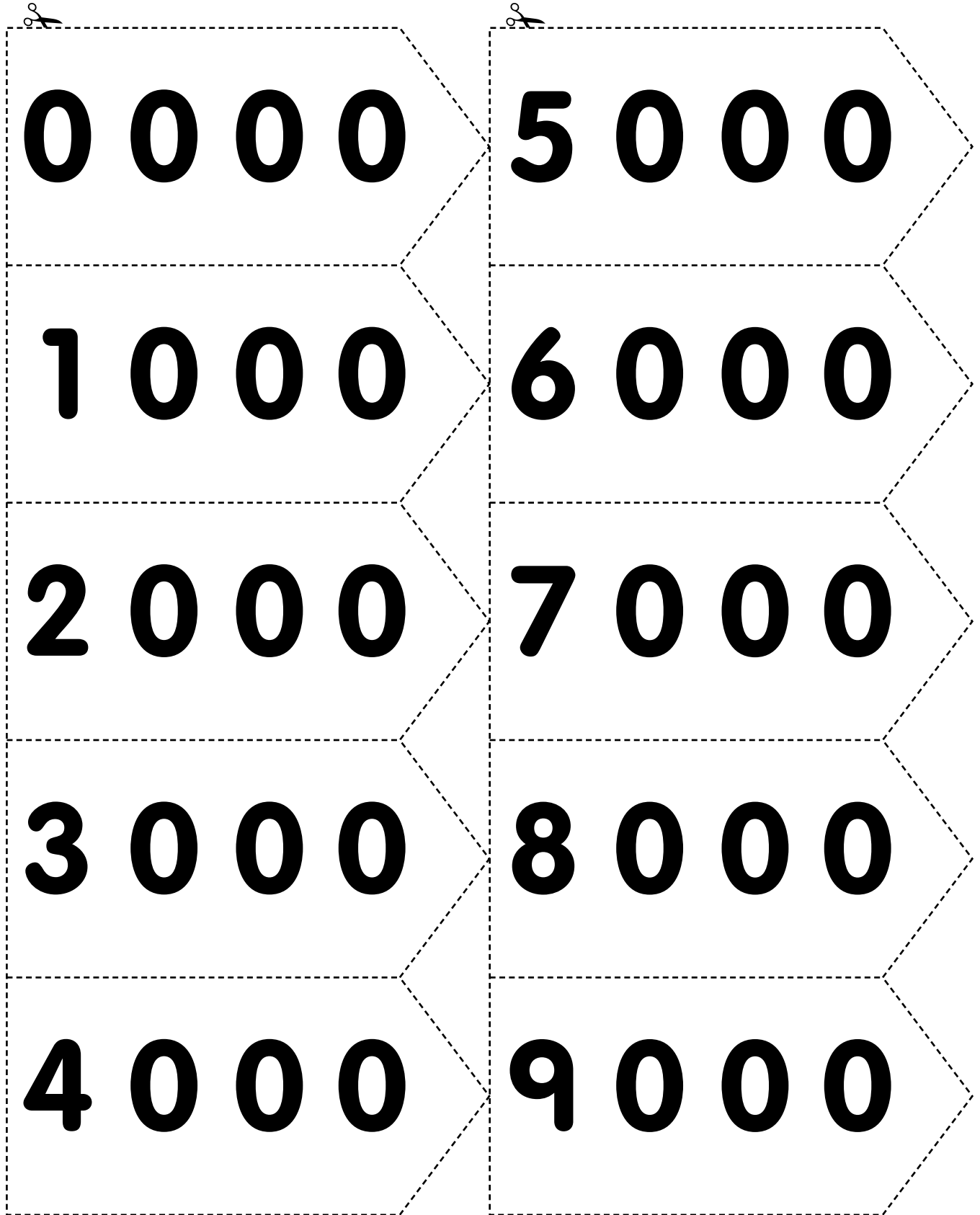












Ten Thousands	
Thousands	
Hundreds	
Tens	
Ones	

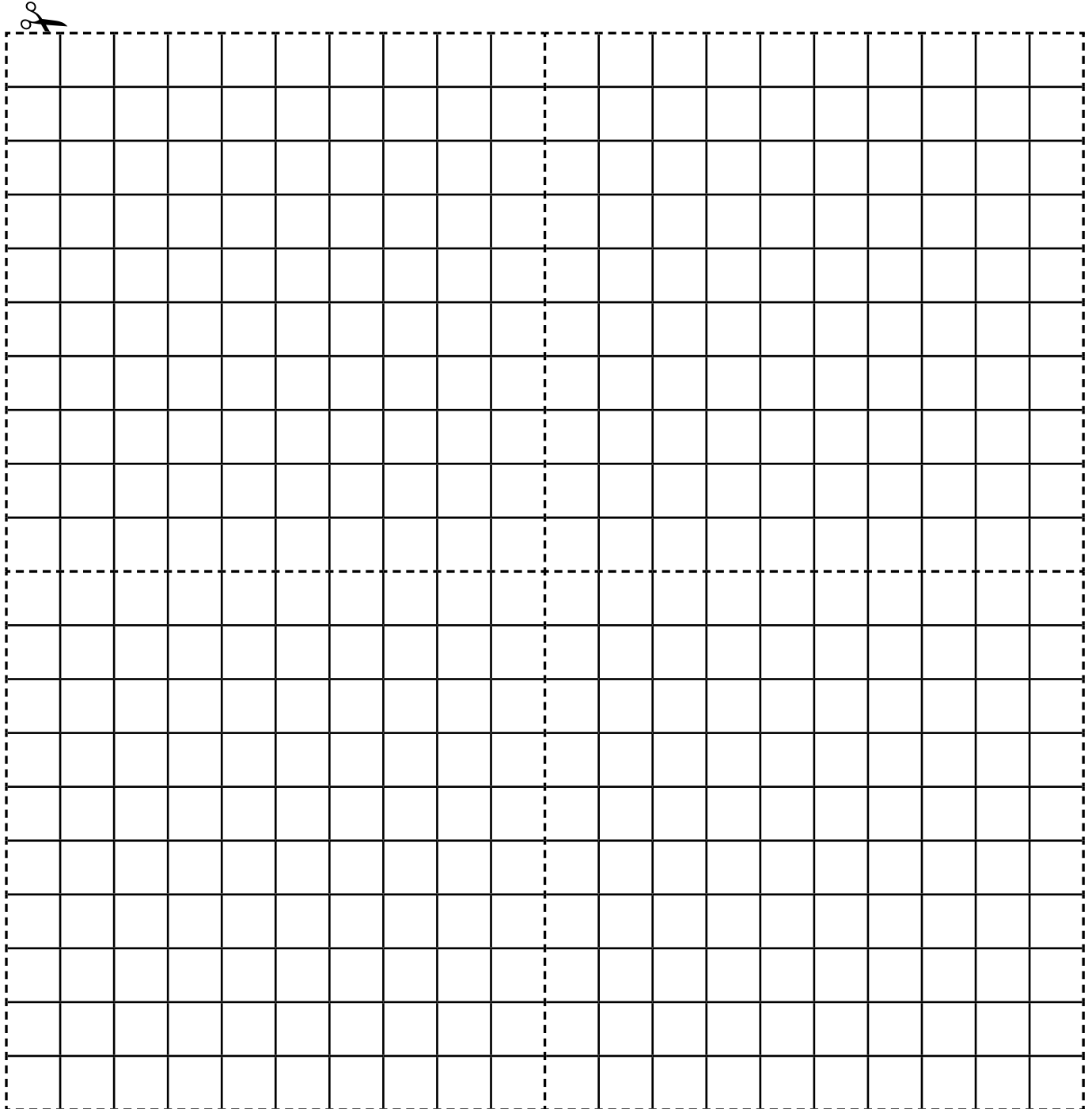
Note: answers to these questions can be found on Written Assessment Answers (PCM 6a and 6b).

Unit	Session	Question									
Unit 2	1	Use the digits 3, 8, 6 and 0 to make as many numbers as possible between 6000 and 7000. Now write them in ascending order.									
Unit 2	2	Write the following numbers in ascending order: 86 343, 34 334, 86 430, 86 403, 86 433, 34 433									
Unit 2	3	Write down 700 000 and subtract 100 000 at a time until you reach 0.									
Unit 2	4	Esme and her three friends went to the 2017 gig and each bought a T-shirt (use Rock Band, photocopy master 34a). (a) Estimate the total cost for Esme and her friends. (b) Find the exact cost for Esme and her friends.									
Unit 3	1	Estimate the answer to $6125 + 2743$ by rounding the numbers to: a) the nearest 1000 b) the nearest 100									
Unit 3	2	Fill in the empty boxes to make the calculation correct. <table><tr><td>3</td><td></td><td>1</td><td>+</td><td></td><td>4</td><td></td><td>=</td><td>500</td></tr></table>	3		1	+		4		=	500
3		1	+		4		=	500			
Unit 3	3	Calculate <table><tr><td></td></tr></table> = $852 - 380$									
Unit 3	4	Solve these calculations: (a) $2143 + \text{ } = 6999$ (b) $1461 = \text{ } - 2573$									
Unit 4	1	Calculate $4 \times 1$ , $4 \times 2$ , $4 \times 5$ , $4 \times 0$ . Write down the steps you took to find the answers.									
Unit 4	2	Calculate $73 \times 100$ . Write down the steps you took to find the answer.									
Unit 4	3	Calculate $213 \times 5$ . Write down the steps you took to find the answer.									
Unit 4	4	Calculate $655 \div 5$ . Write down the steps you took to find the answer.									
Unit 5	1	What fraction of the days of the week is a Saturday? Write down your thinking.									
Unit 5	2	Which is smaller, $\frac{3}{5}$ or $\frac{4}{7}$ ? Explain how you know.									
Unit 5	3	Calculate $\frac{1}{10}$ of 80. Calculate $\frac{1}{5}$ of 80. What do you notice about your answers?									
Unit 5	4	How many equivalent fractions to $\frac{6}{10}$ can you find? Explain your thinking.									



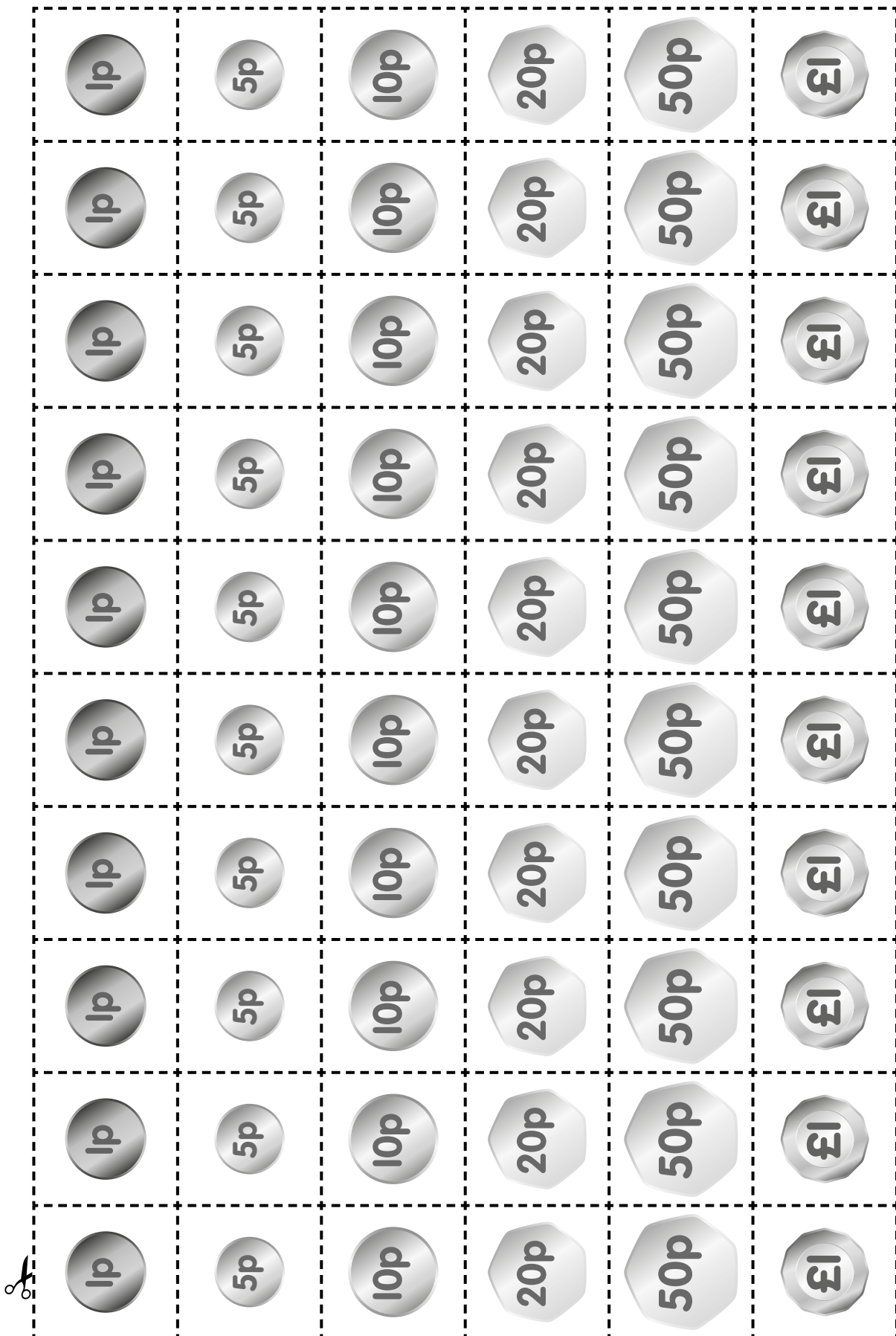
Note: these answers correspond to the Written Assessment Questions (PCMs 5a – 5c).

Unit	Session	Answer
Unit 2	1	6038, 6083, 6308, 6380, 6803, 6830
Unit 2	2	34 334, 34 433, 86 343, 86 403, 86 430, 86 433
Unit 2	3	700 000, 600 000, 500 000, 400 000, 300 000, 200 000, 100 000, 0
Unit 2	4	(a) 4 tickets at approximately £80 = £320, plus 4 T-shirts at approx. £20 = £80; total approx. £320 + £80 = £400 (b) 4 tickets at £83 = £332, plus 4 T-shirts at £17 = £68; total £332 + £68 = £400.
Unit 3	1	$6000 + 3000 = 9000$ $6200 + 2700 = 8900$
Unit 3	2	(using column addition, missing numbers in <b>bold</b> ) $\begin{array}{ c } \hline 3 \\ \hline \end{array} \begin{array}{ c } \hline 5 \\ \hline \end{array} \begin{array}{ c } \hline 1 \\ \hline \end{array} + \begin{array}{ c } \hline 1 \\ \hline \end{array} \begin{array}{ c } \hline 4 \\ \hline \end{array} \begin{array}{ c } \hline 9 \\ \hline \end{array} = 500$
Unit 3	3	(using column subtraction) $852 - 380 = \mathbf{472}$
Unit 3	4	(use the inverse) (a) $6999 - 2143 = \mathbf{4856}$ (b) $2573 + 1461 = \mathbf{4034}$
Unit 4	1	$4 \times 1 = 4$ , $4 \times 2 = 8$ (double $4 \times 1$ ), $4 \times 5 = 20$ (half of $10 \times 5$ ), $4 \times 0 = 4$
Unit 4	2	7300, e.g. $3 \times 100 = 300$ and $70 \times 100 = 7000$
Unit 4	3	1065, e.g. $200 \times 5 = 1000$ , $10 \times 5 = 50$ and $3 \times 5 = 15$
Unit 4	4	131, e.g. $500 \div 5 = 100$ , $100 \div 5 = 20$ , $55 \div 5 = 11$
Unit 5	1	$\frac{1}{7}$ , Saturday is 1 day out of the 7 days in a week.
Unit 5	2	4 is closer to $\frac{1}{2}$ (compare $3\frac{5}{7}$ to $2\frac{5}{5}$ )
Unit 5	3	$\frac{1}{10}$ of 80 = 8, $\frac{1}{5}$ of 80 = 16, $\frac{1}{5} \times 80$ is 2 times bigger than $\frac{1}{10}$ of 80
Unit 5	4	e.g. $\frac{3}{5}$ , $\frac{12}{20}$ , $\frac{120}{200}$ , $\frac{60}{100}$ , $\frac{30}{50}$
Unit 6	2	$0.25 = \frac{1}{4}$ , $0.12 = \frac{3}{25}$ or $\frac{12}{100}$ , $0.33 = \frac{33}{100}$ (accept $\frac{1}{3}$ )
Unit 6	3	The price for one item ends up the same, but with BOGOF you have to buy two items.
Unit 6	4	27, $\frac{3}{5} \times 45$ , $45 \div 5 = 9$ , $3 \times 9 = 27$



Note: answers to these questions can be found on Written Assessment Answers (PCM 6a and 6b).

Unit	Session	Question
Unit 6	1	Calculate $\frac{3}{7} + \frac{2}{7}$ and $\frac{3}{11} + \frac{6}{11}$ . Write down the answers in fractions and words.
Unit 6	2	On a blank 100 Square, shade 0.25, 0.12 and 0.33. Now write each decimal as a fraction.
Unit 6	3	Is 'Buy One Get One Free' the same as '50% off'? Explain your thinking.
Unit 6	4	Find three fifths of 45. Write down the steps you took to find the answer.
Unit 7	1	Place the following decimals in ascending order: (a) 0.8, 0.5, 0.9, 0.1, 0.4, 0.7, 0.3 (b) 0.65, 0.38, 0.27, 0.25, 0.97, 0.01 (c) 0.3, 0.08, 0.6, 0.07, 0.55, 0.64, 0.33 Can you work out: (d) $0.6 + 0.2 =$ (e) $0.05 + 0.03 =$ (f) $0.6 - 0.2 =$ (g) $0.05 - 0.03 =$
Unit 7	2	Alya has $3 \times$ £1 coins and 4 pence. She writes this down as £3.4. Is her answer correct? If not, what would the correct answer be and why?
Unit 7	3	In the number 6.374, what place value does the digit 4 have? Which is bigger, 4.009 or 4.101?
Unit 7	4	What is 7.8 rounded to the nearest whole number? What is 14.17 rounded to the nearest tenth?
Unit 8	1	$71\,953 + 8621 =$
Unit 8	2	Two pairs of football socks cost £10.40, while one pair of football socks costs £7.75. (a) How much more does two pairs of football socks cost? (b) How much would three pairs cost?
Unit 8	3	Two numbers have a difference of 1.25. Both numbers are less than 20. What could the other two numbers be?
Unit 8	4	(a) $11.8 + 9 \cdot \square = 21.7$ (b) $16 \cdot \square - 4.05 = 12.28$



<b>thousandths</b>	
<b>hundredths</b>	
<b>tenths</b>	
<b>Ones</b>	
<b>Tens</b>	
<b>Hundreds</b>	





–	+	–	+
0	5	0	5
1	6	1	6
2	7	2	7
3	8	3	8
4	9	4	9

## Cafe Menu

Chef's salad	£7.99
Soup	£5.25
Tomato pasta	£7.90
Chunky chips	£2.45
Coffee	£1.90
Orange juice	£1.49
Water	£0.75

## Curry Menu

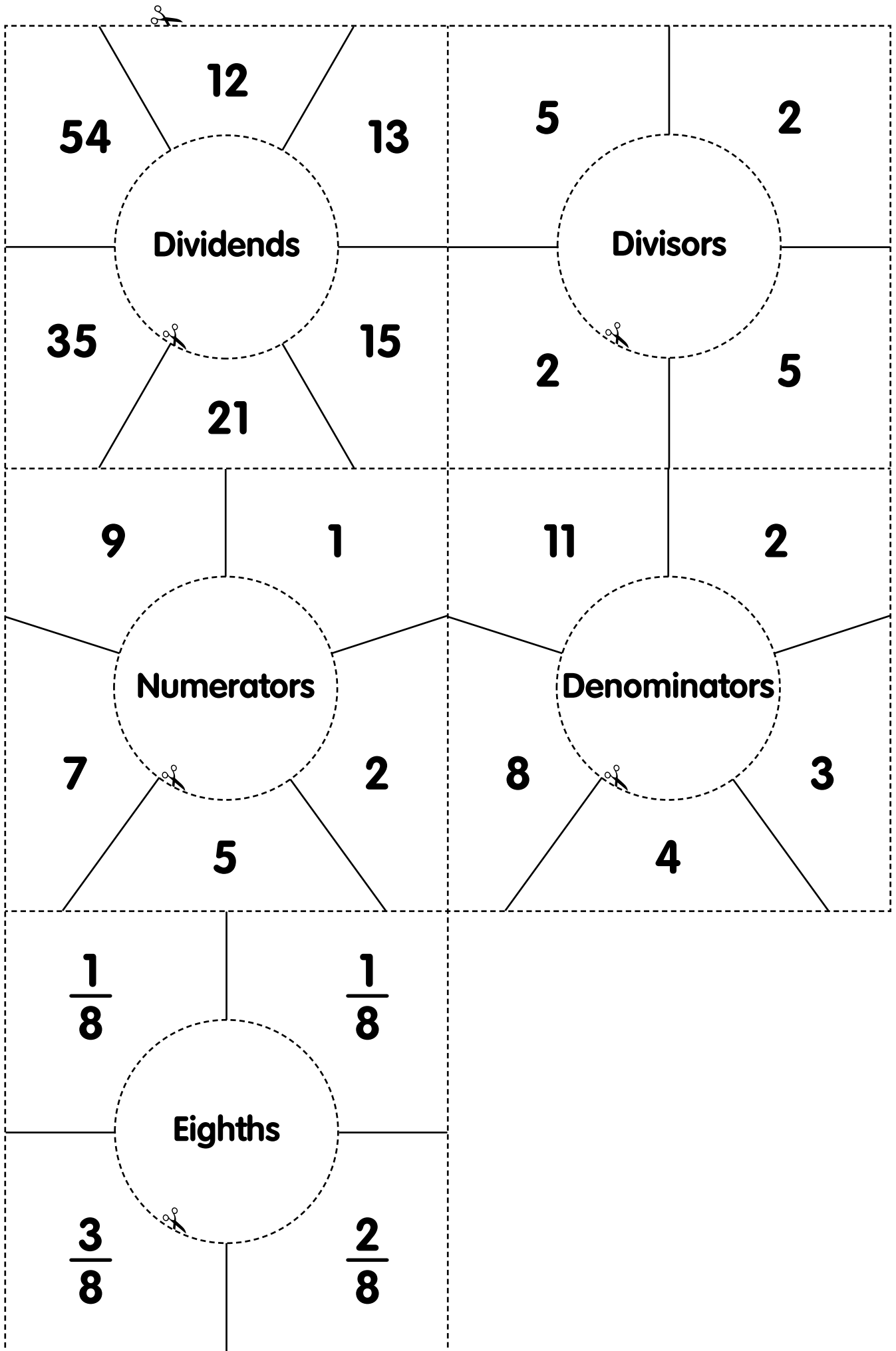
CURRY	Chicken madras curry £7.95
	Prawn korma curry £8.95
	Vegetable balti curry £5.45
	Lamb tikka curry £6.35
RICE	Pilau rice (large) £2.35
	Pilau rice (small) £1.85
	Mushroom rice £2.80
	Egg fried rice £2.55
SIDE	Poppadoms £0.50
	Plain naan £2.40
	Garlic naan £2.70
	Keema naan £3.35
	Peshwari naan £2.95

Note: answers to these questions can be found on Written Assessment Answers (PCM 6a and 6b).

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Unit 8	4	(a) $11.8 + 9 \cdot \square = 21.7$ (b) $16 \cdot \square - 4.05 = 12.28$

Note: these answers correspond to the Written Assessment Questions (PCMs 5a – 5c).

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Unit 7	1	(a) 0.1, 0.3, 0.4, 0.5, 0.7, 0.8, 0.9 (b) 0.01, 0.25, 0.27, 0.38, 0.65, 0.97 (c) 0.07, 0.08, 0.3, 0.33, 0.55, 0.6, 0.64 (d) 0.8 (e) 0.08 (f) 0.4 (g) 0.02
Unit 7	2	Alya's answer is not correct. Money (involving pence) is always expressed with 2 decimal places and this answer has only 1 decimal place. The correct answer would be £3.04, because she had 4 pence, not 40 pence. 40p is written as £0.40, whereas 4p is written as £0.04.
Unit 7	3	(a) 4 thousandths (b) 4.101
Unit 7	4	(a) 8 (b) 14.2
Unit 8	1	Estimate: $72\,000 + 9\,000 = 81\,000$ $71\,953 + 8\,621 = 80\,574$
Unit 8	2	(use adding and subtracting) (a) $10.40 - 7.75 = £2.65$ (b) $10.40 + 7.75 = £18.15$
Unit 8	3	There are many possibilities. Some examples of adding and subtracting are 8 and 9.25, or 18 and 16.7.
Unit 8	4	(use the inverse, missing numbers in <b>bold</b> ) (a) $21.7 - 11.8 = 9.\mathbf{9}$ (b) $12.28 + 4.05 = 16.\mathbf{33}$
Unit 9	1	95.8 seconds, $9.58 \times 10$
Unit 9	2	$420$ , $28 \times 10 = 280$ , $28 \times 5 = 140$ (half of 280), $280 + 140 = 420$
Unit 9	3	$30$ , $15 \div 5 = 3$ , 10 packs: $3 \times 10 = 30$
Unit 9	4	$6\frac{7}{10}$ , 6.7
Unit 10	1	The numerator (top number) is smaller than the denominator (bottom number).
Unit 10	2	6, $5\frac{10}{10}$
Unit 10	3	Yes, $\frac{5}{6} \times \frac{6}{6} = \frac{30}{36}$
Unit 10	4	10, $25 \times \frac{2}{5} = \frac{50}{5} = 10$
Unit 11	1	$\frac{7}{12}$ , $\frac{1}{4} + \frac{1}{3} = \frac{3}{12} + \frac{4}{12} = \frac{7}{12}$
Unit 11	2	$5\frac{6}{10}$ or $(5\frac{3}{5})$ , $3 + 1 = 4$ , $\frac{7}{10} + \frac{9}{10} = \frac{16}{10}$ , $\frac{16}{10} = 1\frac{6}{10}$ , $4 + 1\frac{6}{10} = 5\frac{6}{10}$
Unit 11	3	$£2$ , $40\% = \frac{40}{100} = \frac{2}{5}$ , $\frac{2}{5} \times £5 = £2$
Unit 11	4	$45$ , $\frac{9}{10} \times 50 = 9 \times 5 = 45$





Note: answers to these questions can be found on Written Assessment Answers (PCM 6a and 6b).

Unit	Session	Question
Unit 9	1	If a train travels 100 m in 9.58 seconds, how quickly will it travel 1 km? Write down how you could work that out. What else do you have to think about?
Unit 9	2	There are 28 pens in a pack. How many pens would there be in 10 packs, and in 15 packs? Write down the steps you took to find the answers.
Unit 9	3	If there were 15 carrots divided by 5, what is the answer? What would the answer be if there were ten times as many carrots? Write down the steps you took to find the answers.
Unit 9	4	Divide 67 by 10 and write the remainder as a fraction and as a decimal.
Unit 10	1	Describe how you know when a fraction is a proper fraction and write down an example of one.
Unit 10	2	What happens when you add $\frac{1}{10}$ to $5\frac{9}{10}$ ? Write down what you notice.
Unit 10	3	Is $\frac{5}{6}$ equivalent to $\frac{30}{36}$ ? Explain how you know.
Unit 10	4	A bus has 25 passengers. If two fifths ( $\frac{2}{5}$ ) of the passengers are children, how many children are on the bus? Write down the steps you took to find the answer.
Unit 11	1	In a pack of balloons, $\frac{1}{4}$ are red, $\frac{1}{3}$ are yellow. What fraction are red or yellow? What fraction are neither red nor yellow? Write down the steps you took to find the answer.
Unit 11	2	What is $3\frac{7}{10} + 1\frac{9}{10}$ ? Write down the steps you took to find the answer.
Unit 11	3	Find 40% of £5. Write down the steps you took to find the answer.
Unit 11	4	Calculate $\frac{9}{10}$ of 50. Write down the steps you took to find the answer.

Name ..... Big Ideas Unit .....

<b>Session 1</b>
<b>Session 2</b>
<b>Session 3</b>
<b>Session 4</b>

In the Assessing and reflecting section of the sessions, there is a chance for pupils to reflect on their learning using the Learning Log (photocopiable master 1). These prompts can be used with the log to build up a record of pupils' achievements.

### **Knowledge / skills**

- What do you know now, that you did not know at the start of the session?
- What skills have you used during this session?
- Draw a picture showing what you have learned today.
- Create a mind-map showing what we have learned today.

### **Emotional**

- How has today's session made you feel?
- What difficulties have you encountered today? How have you dealt with them?
- Pick one good thing you have done today. Identify why it was good and how it helped you.

### **Connections**

- How does today's session connect to our previous areas of study?
- How might you combine today's learning with something else you already know?

### **Using the learning in practice**

- How might you use your learning from today's session in the future?
- Who might use what we have learned today in their daily lives?

### **Re-teaching / metacognition**

- If you were going to teach this session to someone else, what would you identify as the key things they would need to know?
- Swap your work with a partner and assess it: What have they done well? How might they improve?
- Write a text message explaining what you have learned this session.
- Write a possible exam question based on today's learning. Swap books with a partner and attempt their question.

### **Learning journey**

- Based on what we have learned today, what do you think we should study next? Why?
- What strengths have you shown in today's session? What areas for improvement can you find?
- Write down any questions you still have about the topic, which you do not feel have been answered yet.

# Numicon Big Ideas

**This sample contains one session from each of the five *Big Ideas*:**

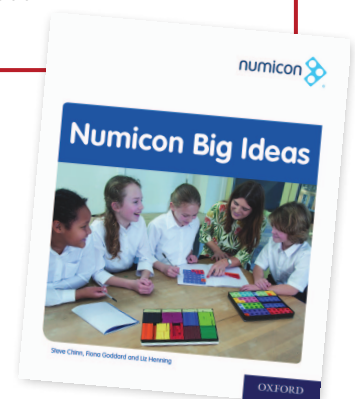
- **Ordering and comparing numbers: 4-digit and 5-digit numbers** *from* Number and place value
- **Percentages** *from* Fractions, decimals and percentages
- **Adding and subtracting money** *from* Adding and subtracting
- **Interpreting remainders** *from* Multiplying and dividing
- **Comparing and ordering fractions** *from* Fractions

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