

Section 4

Consolidation lessons

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Targeting level 4 in Year 7

Mathematics consolidation lessons

This pack contains:

- brief guidance;
- 12 mathematics consolidation lessons targeted at Year 7 pupils working towards level 4.

The pack supplements *Springboard 7: a mathematics catch-up programme for pupils entering Year 7*, issued 06/01, reference DfEE 0049/2001.

Springboard 7 provides teaching points and materials to support pupils who entered Year 7 below level 4 in mathematics but who will, with additional support, attain level 4 by the end of the year.

Why have the lessons been produced?

Following the positive response from schools to *Springboard 7*, we have produced 12 consolidation lessons that focus on the topics that pupils find difficult and that are key to attaining level 4 in mathematics. These lessons also highlight the applications and understanding of mathematical ideas. All the lessons link with and some make use of *Springboard 7* materials. The lessons also refer to the *Framework for teaching mathematics: Years 7, 8 and 9*. The format and style of lessons is similar to that in the *Year 9 booster kit: mathematics*, DfES 0015/2002, with which many teachers will be familiar.

The lessons are available on the Standards website:
www.standards.dfes.gov.uk/keystage3/strands/mathematics/

Copies of the OHTs and resource sheets are supplied on a CD.

The objectives for the lessons are drawn from the yearly teaching programmes for mathematics and are listed below.

1 Place value, addition and subtraction

- Read and write whole numbers in figures and words, and know what each digit represents (Y5)
- Use known number facts and place value to consolidate mental addition/subtraction (Y6)
- Use standard column procedures to add and subtract whole numbers (Y7)

2 Multiplication

- Use informal pencil and paper methods to support, record or explain multiplications. Extend written methods (Y5, Y6)
- Multiply and divide integers and decimals mentally by 10, 100 and 1000, and explain the effect (Y7)

3 Using fractions

- Order fractions ... and position them on a number line (Y6)
- Calculate simple fractions of quantities and measurements (Y7)
- Use names and abbreviations of units of measurement (Y7)

4 Fractions and decimals

- Reduce a fraction to its simplest form by cancelling common factors in the numerator and denominator (Y6)
- Recognise the equivalence between the decimal and fraction forms (Y6)

5 Probability

- Use vocabulary and ideas of probability, drawing on experience (Y7)

6 Calculators

- Round positive whole numbers to the nearest 10, 100 or 1000 (Y7)
- Enter numbers (in a calculator) and interpret the display in different contexts (Y7)
- Carry out calculations with more than one step (Y7)
- Check a result by considering whether it is of the right order of magnitude (Y7)

7 Word problems

- Consolidate the rapid recall of multiplication facts up to 10×10 , and quickly derive associated division facts (Y7)
- Solve word problems (Y7)
- Solve simple problems about ratio and proportion (Y7)

8 Interpreting data

- Extract and interpret data in tables, graphs, charts and diagrams (Y6)
- Interpret diagrams and graphs (including pie charts) and draw simple conclusions (Y7)

9 Shapes and angles

- Use correctly the vocabulary for lines, angles and shapes (Y7)
- Know the sum of angles at a point, on a straight line and in a triangle (Y7)

10 Coordinates and reflections

- Find coordinates of points determined by geometric information (Y7)
- Understand and use the language and notation associated with reflections (Y7)
- Recognise transformation and symmetry of a 2-D shape: reflection in given mirror lines and line symmetry (Y7)

11 Sequences

- Recognise and extend number sequences (Y6)
- Generate sequences from practical contexts (Y7)
- Recognise squares of numbers to at least 12×12 (Y7)

12 Perimeter and area

- Know and use the formula for the area of a rectangle; calculate the perimeter and area of shapes made from rectangles (Y7)
- Use names and abbreviations of units of measurement (Y7)

How should I use the lessons?

These are consolidation lessons – pupils will have met the topics before. You could use the lessons during the year as a key lesson to finish a topic or you may prefer to use them in the summer term in the run up to the progress test.

If you use the lessons as a basis for new teaching and learning, a single lesson, with suitable additional examples, discussion and practice, will need to be spread over two or three sessions. Quick revision is no substitute for sound teaching throughout the year. Remember that none of these lessons can match your pupils' needs exactly: they will need at least some modification.

It is also important to both maintain and develop pupils' mental mathematics skills. These are addressed in the starters in many of the lessons but mental skills should be used in all elements of the lessons.

Many of the lessons incorporate Key Stage 3 test questions. It is a good idea to use such questions in your lessons during the year so that pupils become familiar with the style of questions and the standard required to achieve level 4.

Previous tests on CD-ROM

Previous years' end of Key Stage tests are available on the Testbase CD-ROM produced by QCA/Doublestruck. This can be obtained from Testbase, PO Box 208, Newcastle on Tyne, NE3 1FX; tel 0870 9000 402; fax 0870 9000 403; www.testbase.co.uk.

The CD-ROM is supplied free of charge. Individual Key Stage subjects are accessed using registration codes, at a cost of £25 per subject. Some LEAs have purchased a licence.

Preparing pupils for the Year 7 progress tests

The Year 7 progress tests in mathematics are available from the QCA and will consist of two written papers and a mental mathematics paper.

Each written paper is allocated 45 minutes and carries 40 marks. Test A is to be done without a calculator; a calculator is allowed for Test B. The mental mathematics test is on audio tape and takes 20 minutes. It carries 20 marks.

Pupils are awarded a single level for mathematics.

The tests cover all the aspects of the Key Stage 3 programmes of study. They are designed to measure the overall progress that pupils have made in mathematics during Year 7.

The new progress tests (from 2003) reflect the changes in end of Key Stage mathematics tests. 'Using and Applying Mathematics' (UAM) is a key aspect. Approximately one eighth of the marks will be for questions that require UAM to get a correct answer or where UAM is assessed directly – the most common form being an 'explain' question.

As it is impossible to use and apply mathematics without some mathematical content, all UAM marks will contribute to the content balance of each test. Questions testing problem-solving skills will be similar to those already used in Key Stage 2 and Key Stage 3 tests.

Some questions will have limited structure, with few intermediate steps indicated, to enable pupils to demonstrate their skills. Topics that are developed in Key Stage 3, for example algebra and probability, will be tested at levels 3 and 4.

Pupils should know how long is allowed for each test and should be familiar with the general layout and design, which will be similar to previous tests.

Lesson 1

Place value, addition and subtraction

Objectives

Read and write whole numbers in figures and words, and know what each digit represents (Y5)

Vocabulary

digit, numeral, figures more than, less than

Resources

individual whiteboards
calculator
place-value chart or
place-value cards

Objectives

Use known number facts and place value to consolidate mental addition/subtraction (Y6)

Use standard column procedures to add and subtract whole numbers (Y7)

Vocabulary

sum, difference, complement

Resources

OHT 1.1
number line or 100 square
Springboard 7 Units 1 and 2 (Plenary)
Resource sheet 1.2 (Plenary)

Oral and mental starter

10 minutes

Q Ask pupils to write on whiteboards, in figures, *seven thousand and twenty-three*. Encourage pairs of pupils to compare their results and to sort out errors themselves. Errors will probably involve the zero digit; many pupils will find 7123 easier than 7023. Demonstrate and explain using a place-value chart or place-value cards. Consolidate using similar examples.

In the next questions, say the numbers in words; pupils write their answers in figures.

Q What number is 2 more than 199? ... 2 more than 999?

Q Write in digits the number that is 2 more than 1 999 999.

Check understanding of place value through questioning.

Extend the activity to include questions such as *5 less than 1003*; *7 less than 2 000 004*; *0.3 less than 1.2*; *0.4 less than 9.1*.

Focus on 'bridging' across 10, 100 and 1000 as appropriate:

$$1003 - 5 = (1003 - 3) - 2 = 1000 - 2 = 998$$

Pupils can use a calculator to check results.

Main teaching

40 minutes

Pupils should be able to recall addition and subtraction facts within 20 and complements of 100.

A common error is $100 - 32 = 78$. Model $100 - 32$ using a number line or a 100 square:

- $32 + 8 = 40$ $40 + 60 = 100$

Extend to complements of 1 with one, then two, decimal places, for example:

- $1 - 0.76 = 0.24$

Ask pupils to add and subtract mentally 2 two-digit numbers. If pupils make errors, track back through the progression illustrated by these examples:

- $46 + 50$ (adding tens)
- $43 + 52$ (units within 10)
- $43 + 58$ (units greater than 10)
- $63 + 52$ (tens greater than 100)
- $63 + 58$ (units greater than 10 and tens greater than 100).

Q How did you work out ...?

Discuss the methods pupils use:

$$63 + 58 = (63 + 50) + 8 = 113 + 8$$

$$63 + 58 = (60 + 50) + (3 + 8) = 110 + 11$$

$$63 + 58 = (63 + 8) + 50 = 71 + 50$$

Similarly, check the progression in subtraction illustrated by these examples:

- $48 - 5$
- $46 - 30$
- $67 - 42$
- $64 - 37$

Discuss the methods pupils use:

$$64 - 37 = (64 - 30) - 7$$

$$64 - 37 = (64 - 40) + 3$$

A number line provides useful support.

Springboard 7 Unit 1 pages 53–59 contain further examples if required.

Follow up in future lessons as a starter activity.

Introduce **OHT 1.1**. Pupils need to choose an appropriate calculation method. Allow time for pupils to complete the calculations. Focusing on particular examples, discuss their methods of solution. In question 10, for example, changing the order of calculation makes the question easier.

Plenary

10 minutes

By the end of the lesson

pupils should:

- be able to add and subtract whole numbers.

Framework supplement of examples pages 88, 92, 94, 104 (includes decimals)

Level 4

Identify and discuss particular errors that pupils have made.

The following test questions provide a useful summary:

- $238 + 1487$
- $723 - 154$

Check pupils' understanding and accuracy.

Some pupils will need extra support or time (in lessons or through homework) to become confident with subtraction.

Resource sheet 1.2 lists some mental mathematics questions.

Springboard 7 Unit 2 pages 79–85 provide consolidation.

Addition and subtraction

Work out these calculations without a calculator.

For each question, decide whether you:

- can do it in your head;
- need some jottings to help you to get the answer;
- need to use a written method.

1 $523 + 98$

2 $436 + 253$

3 $345 + 457 + 789$

4 $716 + 897$

5 $1076 + 57$

6 $674 - 233$

7 $547 - 289$

8 $1784 - 98$

9 $6052 - 1567$

10 $7894 - 8792 + 2358$

Mental mathematics test questions

- 1** Write the number three thousand and six in figures.
- 2** Write the number four and a half million in figures.
- 3** Write in figures the number two thousand and two.
- 4** What is fifty-eight multiplied by ten?
- 5** Subtract nineteen from sixty-five.
- 6** What number do I need to add to nine hundred and ninety-four to make one thousand?
- 7** Subtract eighteen from one hundred.
- 8** Subtract one hundred from six thousand and three.
- 9** There are two hundred and fifty people in a cinema. Fifty-five are children.
How many are adults?
- 10** In a group of sixty-three children, twenty-nine are boys. How many are girls?

Lesson 2

Multiplication

Objectives

Multiply and divide integers and decimals mentally by 10, 100, 1000 and explain the effect (Y7)

Vocabulary

digits, tens, hundreds, thousands

Resources

Large number cards made from Resource sheets 2.1a–h

Objectives

Use informal pencil and paper methods to support, record or explain multiplications. Extend written methods (Y5, Y6)

Vocabulary

partition, product

Resources

Large place-value cards
Springboard 7 Unit 6
OHT 2.2 (Plenary)

Oral and mental starter

10 minutes

Give the eight large cards made from **Resource sheets 2.1a–h** to individual pupils. Invite them to show the number 423 at the front of the class.

Q Multiply 423 by 10.

Take pupil suggestions and discuss how each digit is multiplied by 10. Emphasise that the decimal point does not move and that zero acts as a place holder to give 4230.

Repeat with 41.2×10 .

Q Divide 423 by 10.

Take pupil suggestions and discuss how each digit is divided by 10. The decimal point does not move.

Demonstrate the answer (42.3), with pupils manipulating the cards.

Repeat with other two- and three-digit numbers and decimals, and using 100 and 1000 as multipliers and divisors.

Discuss results and encourage pupils to explain their reasoning.

Ensure pupils are confident with place value when multiplying and dividing by 10, 100 and 1000.

Main teaching

40 minutes

Remind pupils of doubles and near doubles.

Instant recall of multiplication facts up to 10×10 is essential to progress with multiplication.

Discuss strategies to help learn multiplication facts, for example:

- $7 \times 8 = (7 \times 7) + 7$; $7 \times 8 = (5 \times 8) + (2 \times 8)$
- 7×8 : double 7 (14), double 14 (28) and double 28 = 56
- Doubling the 3 times table gives the 6 times table.

Use place-value cards to demonstrate that 28 is made up of a 20 and an 8. Partition other two-digit numbers such as 42 and 79.

Q How would you multiply 42 by 7?

Draw out the key concept that 42×7 is equivalent to 40×7 plus 2×7 .

Demonstrate this on a grid:

| | | |
|---|-----|----|
| × | 40 | 2 |
| 7 | 280 | 14 |

Show the sum of $280 + 14$ giving 294; so $42 \times 7 = 294$.

Demonstrate other products using this method and then set questions in the form $tu \times u$, extending to $htu \times u$.

Springboard 7 Unit 6 pages 231 and 232 provide examples.

Use problems in which some figures are missing from a calculation, for example:

| | | |
|---|-----|----|
| × | 30 | ? |
| ? | 180 | 48 |

 or $3\square \times \square = 228$.

Framework for teaching mathematics: from Reception to Year 6 section 6 pages 66 and 67 illustrate the progression in multiplication.

By the end of the lesson

pupils should:

- understand how to multiply and divide by 10, 100 and 1000;
- be able to multiply a two-digit number by a single-digit number.

Framework supplement of examples page 88

Level 4

Plenary

10 minutes

Show OHT 2.2.

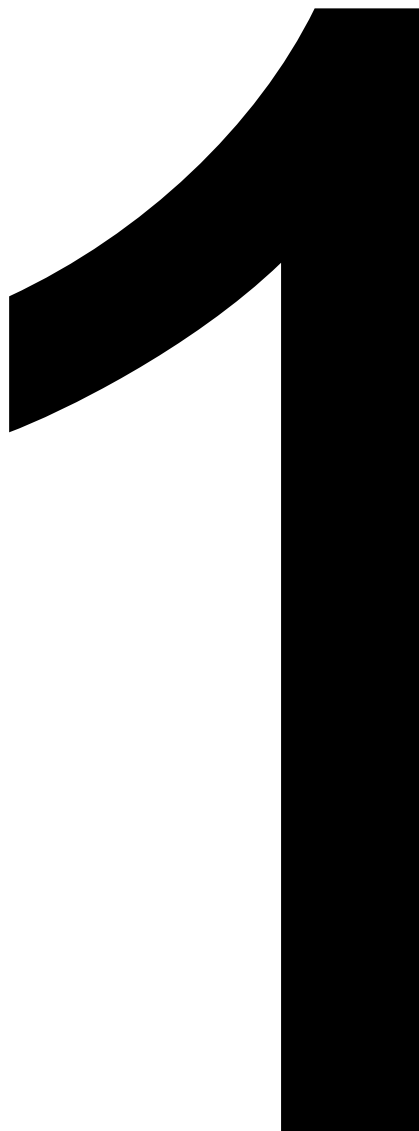
Allow a few minutes for pupils to work out the answers in pairs, then discuss their explanations.

Summarise the explanations of the effect of multiplying and dividing by 10 and 100.

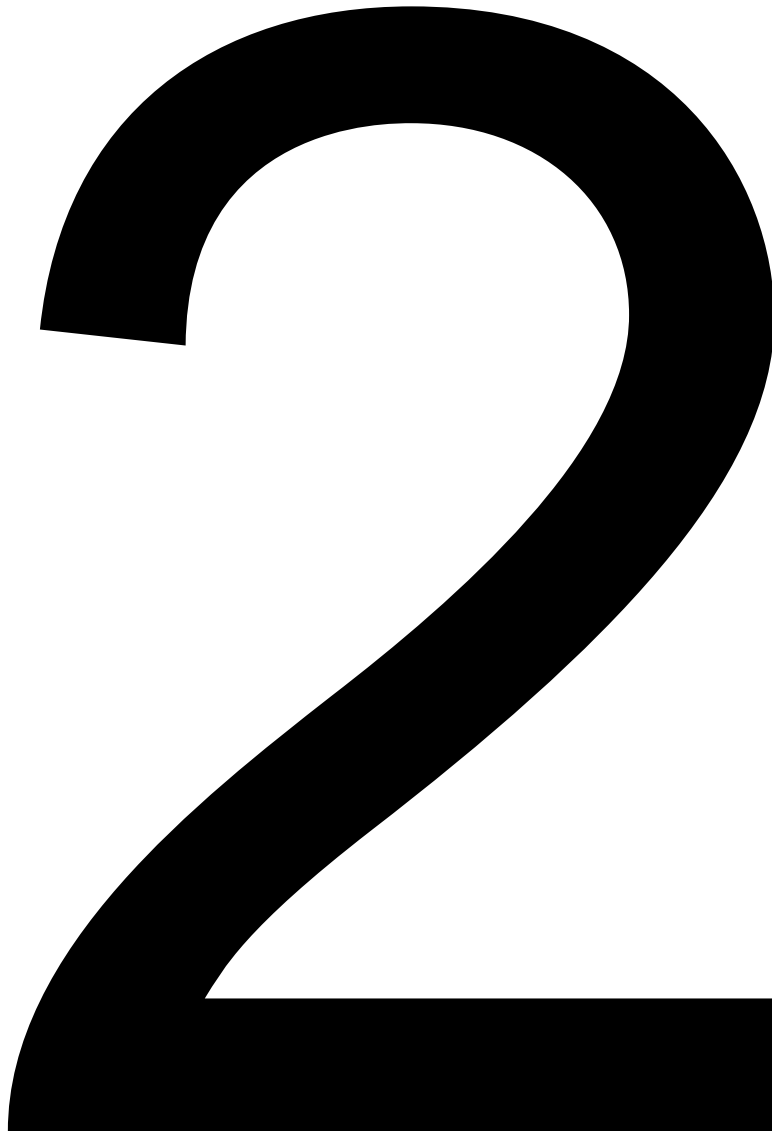
Invite a pupil to demonstrate how they would multiply 743 by 6.

Discuss the partitioning used to break down the question.

Resource sheet 2.1a



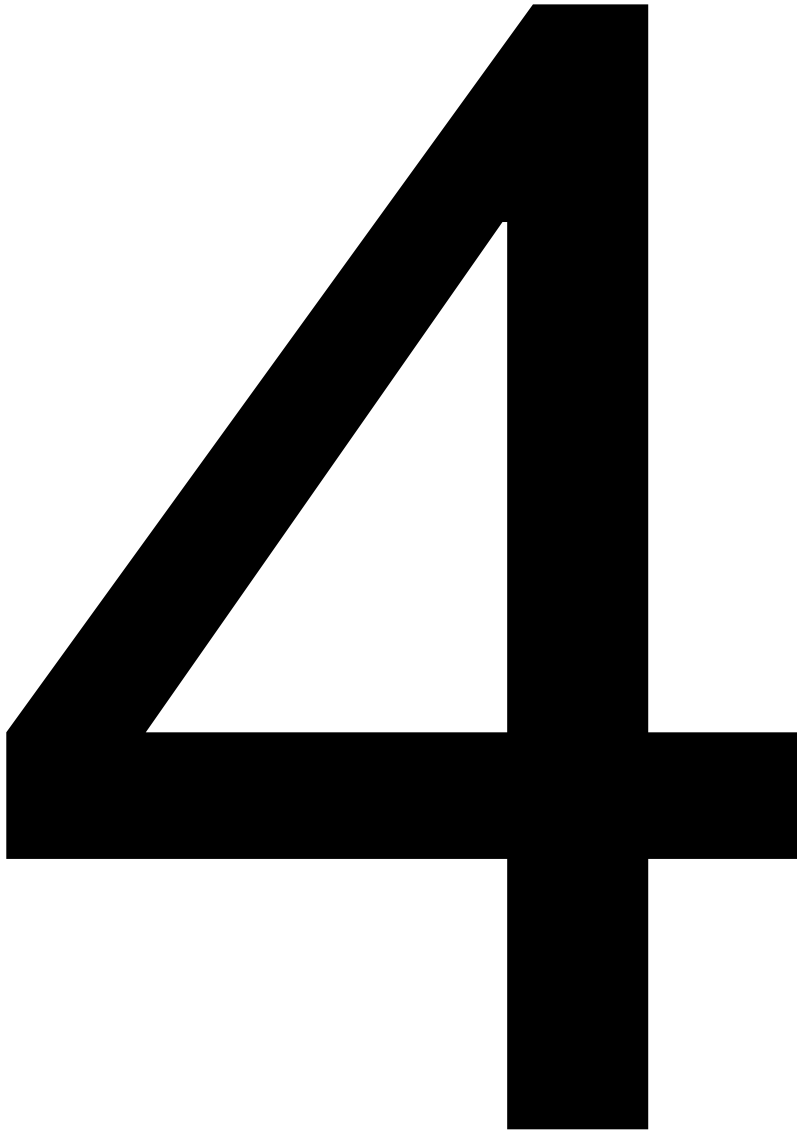
Resource sheet 2.1b



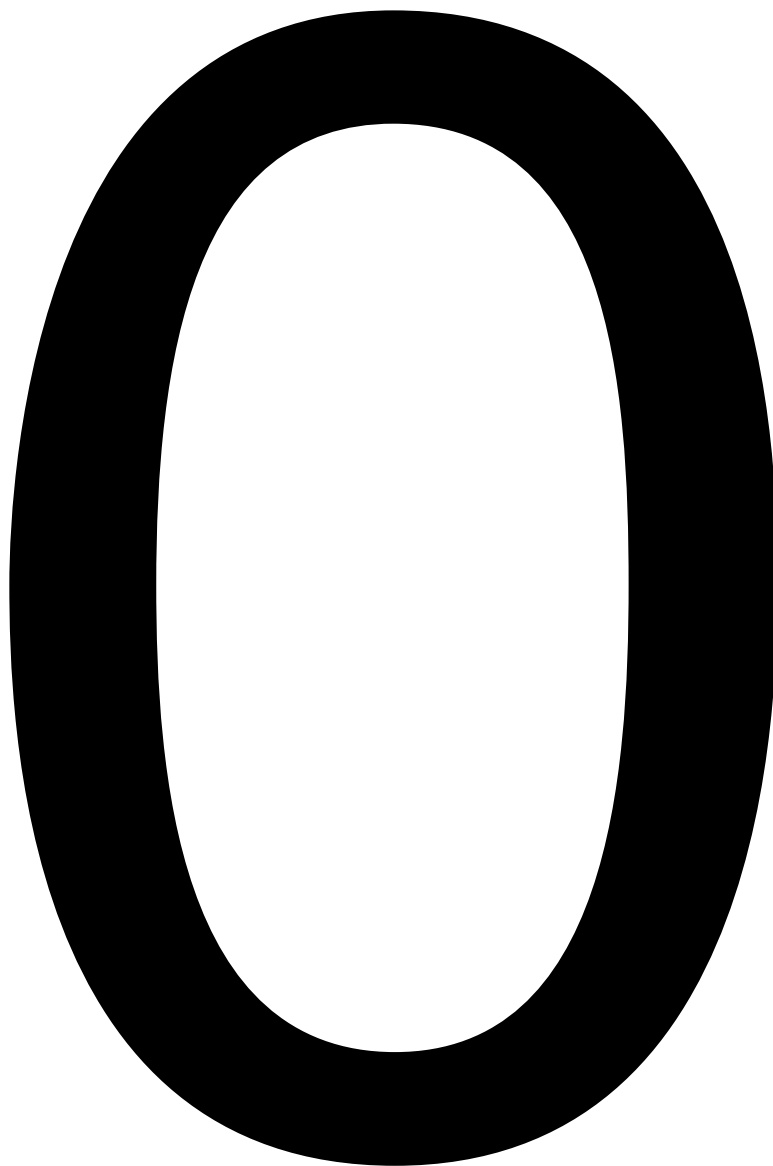
Resource sheet 2.1c



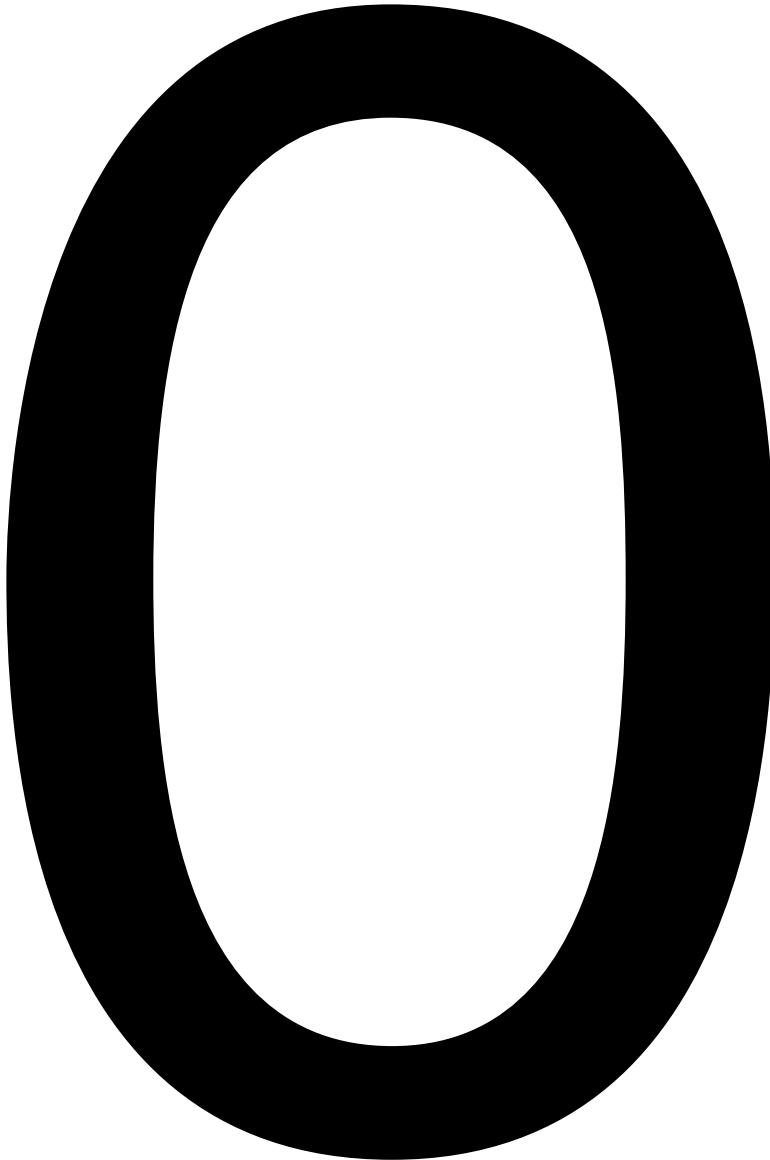
Resource sheet 2.1d



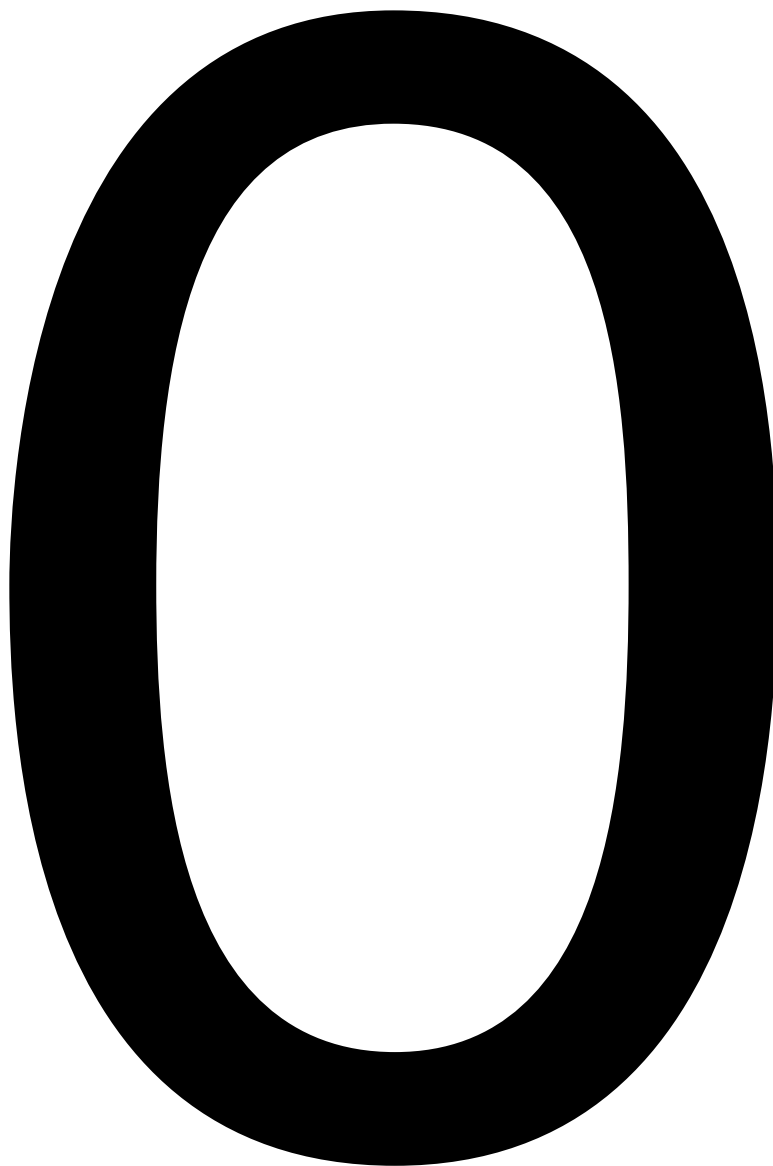
Resource sheet 2.1e



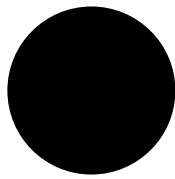
Resource sheet 2.1f



Resource sheet 2.1g



Resource sheet 2.1h



Missing numbers

Complete each equation to make it correct.

Example:

$$300 \times 10 = 30 \times 100$$

1 $40 \times 150 = 400 \times \dots$

2 $140 \times 6 = 14 \times \dots$

3 $37 \times 9 = (30 \times 9) + (7 \times \dots)$

4 $67 \times 75 (\dots \times \dots) + (\dots \times \dots)$

5 $160 \div 10 = 16 \div \dots$

6 $7000 \div 100 = 700 \div \dots$

