QCA Qualifications and Curriculum Authority

# Assessing pupils' progress in mathematics at Key Stage 3: Standards File

## Pupil M

**department for
children, schools and families**

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# Pupil M – Year 7 – High level 3

## Assessing pupils' progress in mathematics at Key Stage 3

## Assessment summary

Pupil M's attainment is best described as high level 3. His performance is between secure and high in all attainment targets.

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**Using the Standards Files**

- The current Standards Files are based on work planned and assessed in relation to the 1999 National Curriculum programme of study. A new set of Standards Files based on the 2008 National Curriculum are currently in production, but the current set will provide useful guidance on making APP assessments against national standards in the transition period as the new programmes of study are introduced.

- The commentaries in the Standards Files are provided for guidance and reference, and are much more extensive than any teacher would be expected to make when carrying out APP assessments. It is also important to remember that APP encourages and enables a broader overview of current learning, and that there is no need to collect special portfolios of pupils' work. Evidence from pupils' written and oral work, backed up by brief teacher's notes where necessary, is all that is required.

- The evidence base presented in each Standards File is necessarily partial, as it would of course be impractical to reproduce all of each pupil's work. Examples of each pupil's work have been selected to provide evidence to support judgements against APP criteria. This evidence should be considered in conjunction with the teacher's notes, which will provide a broader context and further justification for the assessments that are made.

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# Assessment focus

Numbers and the number system

## Context

Homework: To underpin the development of mental calculation skills and checking strategies, pupils used a number line to help them round to the nearest 10.

**Rounding to the nearest 10**

0          5          10          15          20          25          30
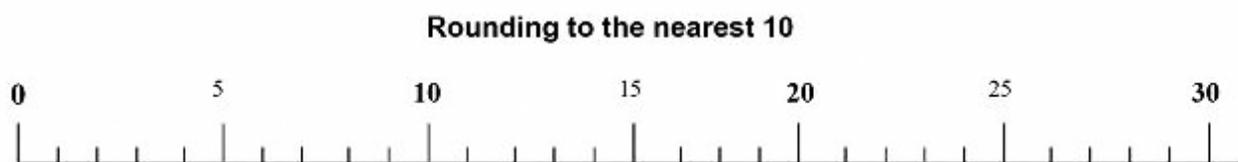
Section A.

| | | | |
|---|---|---|---|
| 1. 11 = 10 | 2. 7 = 10 | 3. 19 = 20 | 4. 13 = 10 |
| 5. 17 = 20 | 6. 8 = 10 | 7. 12 = 10 | 8. 28 = 30 |
| 9. 21 = 20 | 10. 9 = 10 | 11. 5 = 10 | 12. 26 = 30 |
| 13. 6 = 10 | 14. 16 = 20 | 15. 27 = 30 | 16. 29 = 30 |
| 17 15 = 20 | 18 23 = 30 | 19 2 = 0 | 20 18 = 20 |
| 21. 22 = 20 | 22 4 = 0 | 23 25 = 30 | 24 30 = 30 |
| 25. 32 = 30 | 26 3 = 0 | 27 14 = 10 | 28 24 = 20 |
| 29. 33 = 30 | 30 1 = 0. | | |

## Teacher's notes

- with reference to a number line, rounds to the nearest 10

## Next steps

- round without reference to a number line
- round any number with up to three digits to the nearest 10 or 100
- round amounts such as £125.48 to the nearest pound

# Assessment focus

Calculating; Using and applying mathematics

## Context

Classwork: Investigating totals and differences with money. Pupils chose collections of coins and answered four questions about each collection.



## Teacher's notes

- begins by listing coins from greatest to least denomination

- lists coins individually and calculates totals within the first collection correctly

- uses an abbreviated list less accurately to represent his second collection:
  $\times$ 3 (50), $\times$ 3 (20), $\times$ 4 (2), $\times$ 2 (1), $\times$ 1 (5)

- has more difficulty totalling numbers of coins using the abbreviated lists

- does not interpret the fourth question or find differences

## Next steps

- solve money problems that involve finding a difference

- use a blank number line to represent problems

- pose money problems for others to solve

## Assessment focus

Calculating

## Context

Classwork: In a lesson on division pupils derived division facts from known multiplication facts and then completed examples of division.

**D3**
1) $15 \div 3 = 5$      2) $30 \div 5 = 6$      3) $48 \div 6 = 8$
4) $28 \div 7 = 4$      5) $56 \div 8 = 7$      6) $72 \div 9 = 8$
7) $99 \div 11 = 9$     8) $72 \div 9 = 8$      9) $48 \div 8 = 6$
10) $45 \div 5 = 9$

**D4**
1) $95 \div 5 = 19$      2) $96 \div 4 = 24$
3) $255 \div 5 = 51$     4) $228 \div 3 = 74$
5) $616 \div 7 = 88$     6) $525 \div 5 = 105$
7) $272 \div 2 = 136$

48
24

70
× 3
210

7 × 8 =
56

## Teacher's notes

- recalls multiplication facts up to $10 \times 10$ and uses them to complete division calculations

## Next steps

- develop more robust strategies for dividing two and three digit numbers, for example, use of equivalence ($96 \div 4 = 48 \div 2$)
- check division calculations by multiplying
- multiply two-digit and three-digit numbers by a single-digit number

## What the teacher knows about Pupil M's attainment in number and algebra

Pupil M understands place value in numbers with up to five digits. He multiplies whole numbers by 10 and 100. He also divides by 10 or 100 where the answer is a whole number. Pupil M uses a number line as a model of the number system. He understands negative numbers in the context of counting backwards past zero on a number line and for recording temperatures below freezing. He understands decimals in the context of money and orders amounts involving pounds and pence and just pence expressed as pounds (e.g. £0.10). Pupil M continues sequences forwards and backwards, sometimes referring to a 0 to 100 number line or a metre rule marked in centimetres for support.

Pupil M understands rounding to the nearest ten and is beginning to round to the nearest 100 and 1000 with the support of number lines calibrated in different ways, for example:
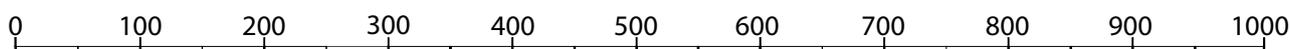


Pupil M writes units of money correctly and rounds amounts of money to the nearest pound. He uses the convention of rounding up amounts such £1.50 to the nearest pound or 50 to the nearest 100. When using a calculator for money calculations he is beginning to interpret amounts such as 1.1 in the display as £1.10.

Pupil M understands unit fractions. He calculates fractions of a number, for example $\frac{1}{3}$ of 24 or $\frac{1}{5}$ of 30. He relates these calculations to division, for example 24 ÷ 3 and 30 ÷ 5. He identifies such fractions of a diagram and knows some fractions that are equivalent to $\frac{1}{2}$. He knows the decimal equivalents of $\frac{1}{4}$, $\frac{1}{2}$ and $\frac{3}{4}$.

Pupil M demonstrates understanding of division as the inverse of multiplication when he uses known multiplication facts to divide. Given an addition calculation, Pupil M generates related addition and subtraction calculations and given a multiplication calculation he generates related multiplication and division calculations. He uses inverse operations and complements to 100 to find unknown or missing numbers, for example, 56 ÷ □ = 7 or finding change from £1.

Pupil M adds and subtracts two-digit numbers mentally and with the support of a number line. He recalls multiplication facts up to 10 × 10 mostly accurately and uses this knowledge to divide two-digit numbers by a single digit number. He uses written column methods to add three-digit numbers and is beginning to use an empty number line for subtraction. When he solves numerical problems involving division, Pupil M is beginning to understand the significance of the remainder and to make appropriate decisions to round up or down in the context of the problem.

## Summarising Pupil M's attainment in number and algebra

Pupil M's attainment in number and algebra is best described as high in level 3. To consolidate level 3 and move into level 4 he should consolidate his knowledge of multiplication facts and begin to develop the concepts of multiple and factor. This will help him to recognise a wider range of number patterns and broaden his mental calculation strategies. He needs to develop understanding of decimals and extend his use of decimals with one and two decimal places in contexts other than money, such as measures. He needs to develop his use of fractions beyond unit fractions and make connections between fractions and division.

# Assessment focus

Shape, space and measures

## Context

Classwork: In a unit on 2-D shapes, pupils described quadrilaterals for a partner to name. Pupils recorded descriptions and their responses.
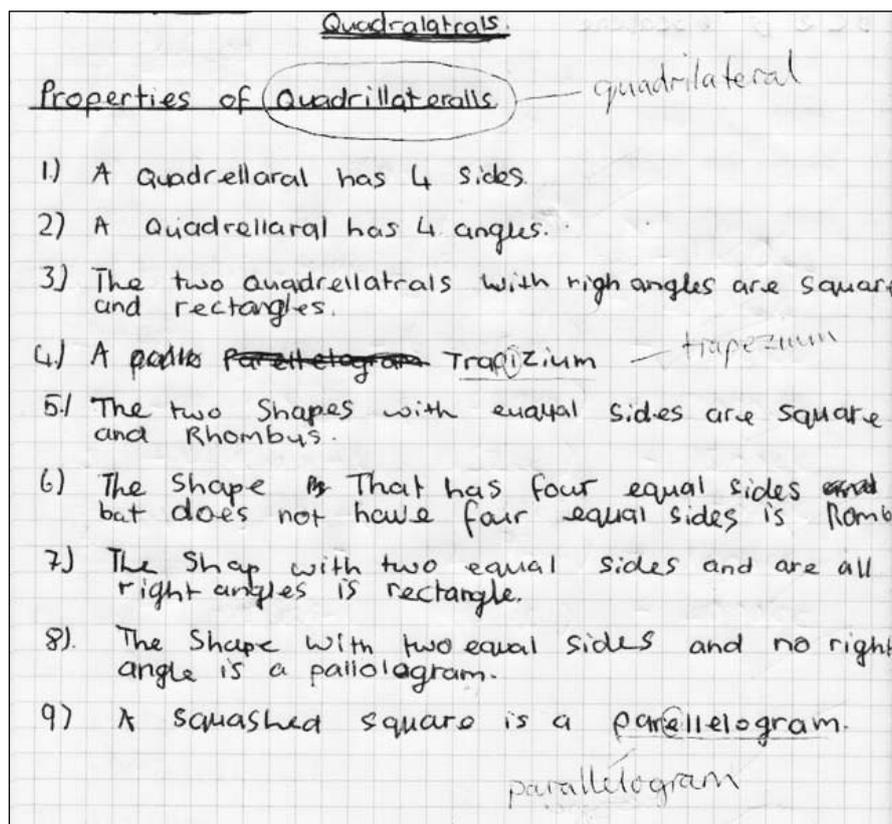


## Teacher's notes

- sorts quadrilaterals

- recognises right angles in quadrilaterals and knows that a rectangle and a square both have four right angles

- uses equal sides to identify the square and rhombus and knows that the rhombus does not have four equal angles

- confuses 'two equal sides' and 'two pairs of equal sides'

## Next steps

- further develop understanding of the properties of shapes and how these relate to the names of shapes

- identify parallel lines within quadrilaterals

- practise spelling the vocabulary of shape and space correctly, using a dictionary and spell checker

## Assessment focus

Shape, space and measures

## Context

Homework: In a unit on transformations, pupils reflected a design of shaded squares in a mirror line.
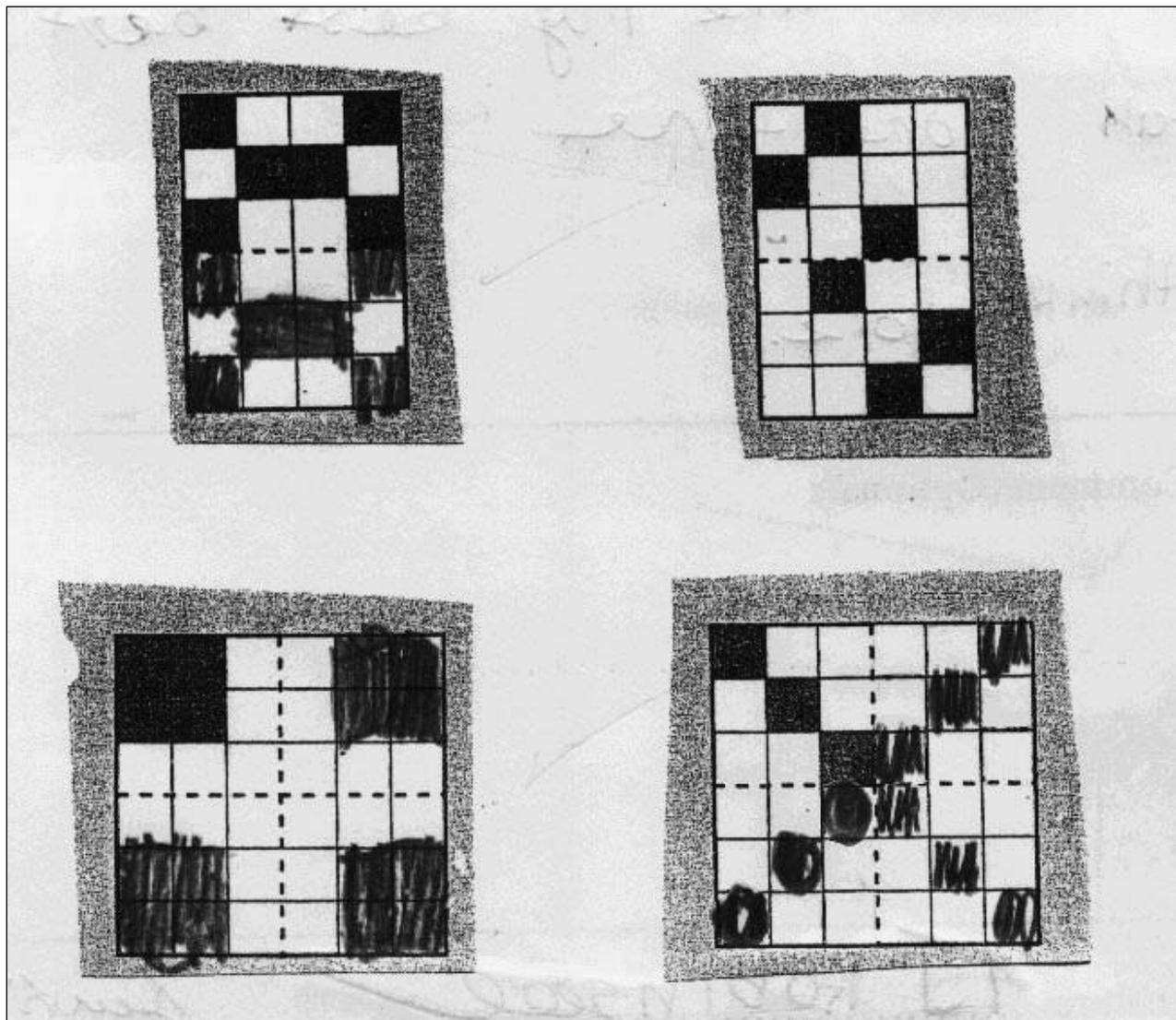


## Teacher's notes

- uses vertical and horizontal mirror lines to reflect three of the four designs

## Next steps

- identify lines of reflection in shapes and designs
- reflect individual squares of a design in turn, using their distance from the mirror line
- reflect shapes by plotting the reflection of each vertex

# What the teacher knows about Pupil M's attainment in shape, space and measures

Pupil M classifies 3-D and 2-D shapes using a range of mathematical properties. He uses numbers of sides, equal angles, equal sides and right angles to sort 2-D shapes. He uses numbers and shapes of faces and numbers of edges and vertices to sort 3-D shapes. He names 3-D shapes such as a cube, cuboid, pyramid, and prism. Pupil M recognises right angles and acute, obtuse and reflex angles in shapes. He names most quadrilaterals and recognises right-angled and equilateral triangles.

Pupil M completes patterns so they are symmetric. He reflects shapes when most edges are parallel or at right angles to a vertical or horizontal mirror line. Pupil M recognises when a shape has been rotated. He uses terms such as left, right, clockwise, anticlockwise, right angle and 90° to describe turns and quarter-turns.

Pupil M uses centimetres and millimetres when he measures and draws lines to the nearest 2mm. He also uses metres and centimetres to measure longer lengths and records his measurements as mixed units, for example, 1m 72cm. He interprets measurements written as decimals such as 1.72m. He also uses millilitres in science. He draws and measures angles to the nearest 2°. He knows units of time and is beginning to use timetables and to calculate how long events last.

He finds areas of rectangles by counting squares and is beginning to use the number in a row multiplied by the number of rows. He finds perimeters of rectangles although he sometimes confuses the perimeter with the number of squares bordering the edges of the rectangle:
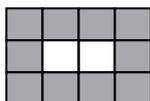


# Summarising Pupil M's attainment in shape, space and measures

Pupil M's attainment in shape, space and measures is best described as high level 3. To consolidate level 3 he needs to develop understanding of reflective symmetry. He also needs to begin to plot the reflection of each vertex of a shape using its distance from the mirror line. To make progress into level 4, Pupil M needs to recognise and use parallel lines in 2-D shapes. He needs to consolidate his understanding of area as a measure of surface and perimeter as a measure of length and to use the terms consistently. He needs to develop strategies for measuring and calculating the perimeter and begin to count squares and part-squares to find the area of shapes other than rectangles. Pupil M also needs to weigh objects and measure volumes of liquid using measuring cylinders calibrated in different ways, to develop his understanding of mass and capacity and the related units. He needs to record measures using decimals.

# Assessment focus

Handling data

## Context

Classwork: In a unit on probability, each pupil was given a statement on A4 card. They sorted themselves into a line to represent the order of probability of the statements. Pupils then worked in pairs placing a selection of the statements using a probability scale from 'impossible' to 'certain' with 'even chance' as the mid-point.
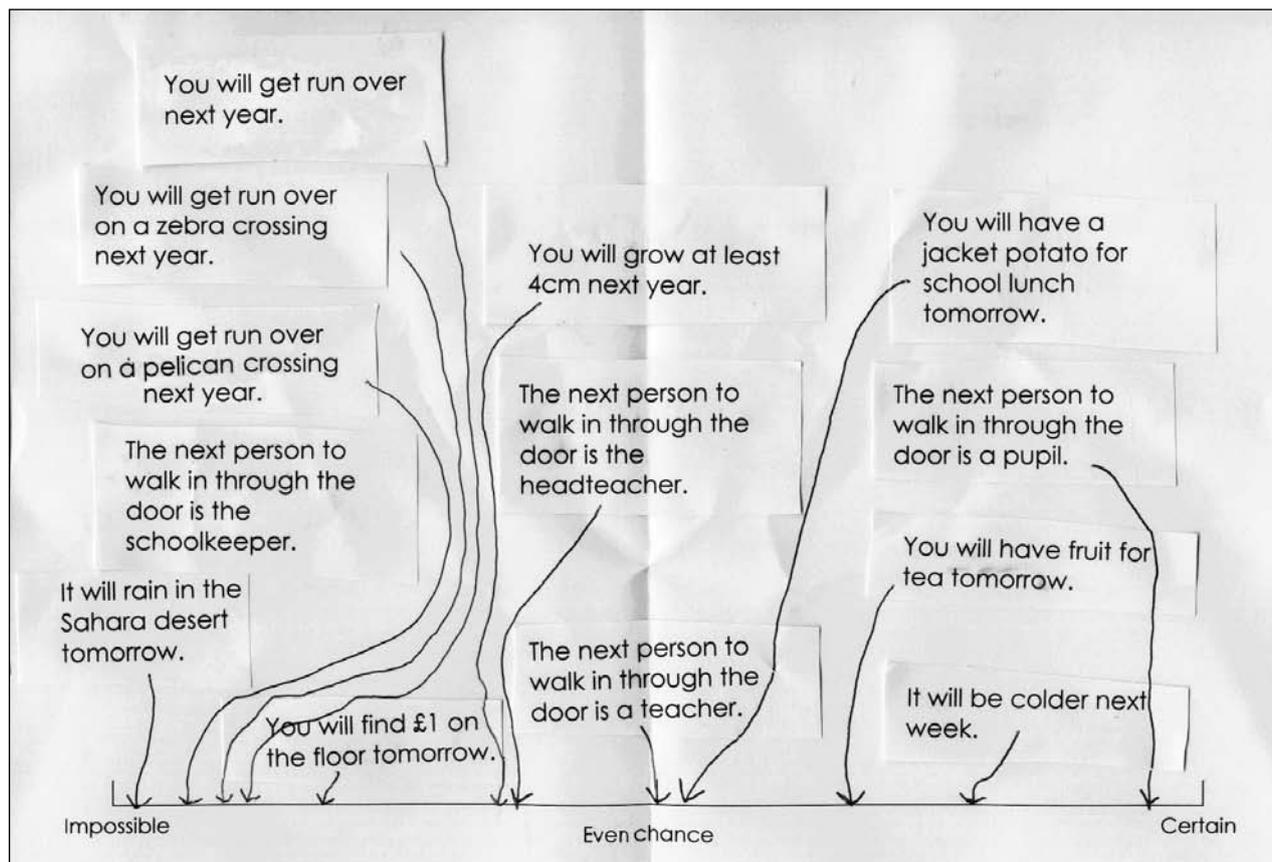


## Teacher's notes

- puts events into a reasonable order of probability
- explains the relative probability of being run over in various circumstances
- uses the language of probability, for example, 'likely', 'unlikely', 'even chance'

## Next steps

- play games which involve throwing dice, for example, Snakes and Ladders and discuss probabilities of various events
- consider probability in situations with a limited number of equally likely outcomes

# Assessment focus

Handling data

## Context

Classwork: In a unit on statistics, groups of pupils collected data on the types of cars in a car park. They used ICT to display information in a pictogram.



## Teacher's notes

- in class discussion, decides on types of car for the data collection sheet including 'other'
- collects data about cars in the school car park
- uses ICT and chooses to represent the data in a pictogram
- uses one symbol to represent two cars
- talks about the most common and least common type of car

## Next steps

- create questions for others to answer using the pictogram
- explore the effect of choosing different scales
- gather and analyse larger sets of data

# What the teacher knows about Pupil M's attainment in handling data

Pupil M decides what data to collect to answer a question such as 'What types of car are there in the school car park?' In group discussion he refines the question by identifying categories for the data collection. Discussing the car park survey, for example, Pupil M decided the most common types of car would be saloon, hatchback, sports and 4x4. He decided to use 'other' to capture information about cars that did not fit his categories.

He uses bar charts and pictograms to represent data. He constructs his own bar charts and uses ICT to create bar charts and pictograms. He is beginning to use different scales on the vertical axis, for example, one division representing one, two or five units. He uses one symbol of a pictogram to represent more than one object when the numbers involved are large. For example, he used one symbol to represent 10 portions when he represented information from the school canteen about the numbers of portions of different vegetables and salads they served in one day.

Pupil M also uses Venn and Carroll diagrams to sort shapes and numbers. When sorting quadrilaterals into a Venn diagram using 'all sides the same length' and 'has a right angle', he placed the square in the intersection of the sets and found a quadrilateral for each region of the diagram.

When interpreting bar charts and pictograms, Pupil M identifies the most and least popular outcomes. He calculates how many in the complete data set, for example, how many portions of vegetables altogether were served in the canteen. He also uses the bar chart or pictogram to work out, for example, how many more hatchbacks than saloons were in the car park. He uses a calculator to work out larger differences such as how many more portions of potato fries were served than portions of carrots.

Pupil M uses the language of probability when talking about everyday situations. For example, he suggested that it was more likely that a pupil would choose potato fries at lunchtime than to choose carrots. Placing events on a probability scale from 'impossible' to 'certain' with 'even chance' as the mid-point, he talked about the relative likelihood of closely related statements such as 'you will get run over next year', 'you will get run over on a zebra crossing next year' and 'you will get run over on a pelican crossing next year'. Recognising that all of these were unlikely to happen, he justified the order in which he placed them, 'Getting run over anywhere is more likely than getting run over on one of the crossings. Pelican crossings should be the safest because they stop the traffic and give you a signal when to cross.'

# Summarising Pupil M's attainment in handling data

Pupil M's attainment in handling data is best described as high level 3. To progress into level 4 he needs to begin to work with larger sets of data and to group data where appropriate. He needs to use the mode and range to describe sets of data and begin to compare sets of data. He should begin to construct and interpret simple line graphs.

## What the teacher knows about Pupil M's attainment in using and applying mathematics

Pupil M selects the mathematics to use in a range of classroom activities. In group discussion he clarifies a problem or investigation and this helps him to make decisions about the approach to use. For example, he discussed the types of cars that might be found in the car park and this helped him to design and use his data collection sheet. He chooses the equipment to use, for example, a ruler marked in millimetres to draw lines accurately or a calculator to calculate with larger numbers or to add a long list of numbers. Pupil M knows various ways to check calculations but does not always notice errors.

Pupil M uses mathematical symbols and diagrams to record his work and is beginning to record in a methodical way. When finding how many portions of vegetables had been served altogether, for example, he ticked the numbers for different vegetables as he entered them into the calculator to be sure that he had entered each number once. He organised his answers in a table when he solved problems about different collections of coins. He also began listing coins from the largest value down, even though he did not sustain the order, and he tried using symbols to represent the number of each type of coin rather than drawing them individually.

He reasons about numbers and shapes. When sorting numbers using 'is a multiple of 5' and 'even', he recognised that numbers in the intersection are multiples of ten. He identifies shapes that fit a description and gives a description that his partner can use to identify an individual shape in a collection. He demonstrates that he understands a general statement by explaining how a particular example fits the rule. For example, given the statement that 'each number in the sequence is one more than a multiple of five', Pupil M explained, '21 is in the sequence and that is one more than 20, which is four fives'. He is beginning to state general rules himself, for example, when he uses different unit shapes to grow larger shapes or designs such as this sequence of linking 'L' shapes:



## Summarising Pupil M's attainment in using and applying mathematics

Pupil M's attainment in using and applying mathematics is best described as secure level 3. To consolidate this and make further progress into level 4, Pupil M needs to develop his checking procedures. He should check his answers to calculations as he works and check that results make sense in the context of the problem. He needs to solve a wider range of problems that relate to mathematical and practical contexts. He needs to be more systematic in his recording by putting results into order, for example, so that he can spot patterns more readily and check results. He should begin to record some of his explanations and conclusions.

Pupil name.............M............Class/group...........................Date............

| | Using and applying mathematics | Numbers and the number system | Calculating | Algebra | Shape, space and measure | Handling data |
|---|---|---|---|---|---|---|
| **Level 4** | • develop own strategies for solving problems<br>• use their own strategies within mathematics and in applying mathematics to practical contexts<br>• present information and results in a clear and organised way<br>• search for a solution by trying out ideas of their own<br><br>☐ | • recognise and describe number patterns<br>• recognise and describe number relationships including multiple, factor and square<br>• **use place value to multiply and divide whole numbers by 10 or 100**<br>• recognise approximate proportions of a whole and use simple fractions and percentages to describe these<br>• order decimals to three decimal places<br>• begin to understand simple ratio<br><br>☐ | • use a range of mental methods of computation with all operations<br>• recall multiplication facts up to 10 × 10 and quickly derive corresponding division facts<br>• use efficient written methods of addition and subtraction and of short multiplication and division<br>• multiply a simple decimal by a single digit<br>• solve problems with or without a calculator<br>• check the reasonableness of results with reference to the context or size of numbers<br><br>☐ | • begin to use simple formulae expressed in words<br>• use and interpret coordinates in the first quadrant<br><br>☐ | • use a wider range of properties of 2-D and 3-D shapes<br>• make 3-D models by linking given faces or edges and draw common 2-D shapes in different orientations on grids<br>• reflect simple shapes in a mirror line, translate shapes horizontally or vertically and begin to rotate a simple shape or object about its centre or a vertex<br>• choose and use appropriate units and instruments<br>• interpret, with appropriate accuracy, numbers on a range of measuring instruments<br>• find perimeters of simple shapes and find areas by counting squares<br><br>☐ | • collect and record discrete data<br>• group data, where appropriate, in equal class intervals<br>• continue to use Venn and Carroll diagrams to record their sorting and classifying of information<br>• construct and interpret frequency diagrams and simple line graphs<br>• understand and use the mode and range to describe sets of data<br><br>☐ |
| **Level 3** | • **select the mathematics they use in a wider range of classroom activities**<br>• **try different approaches and find ways of overcoming difficulties that arise when they are solving problems**<br>• begin to organise their work and check results<br>• **use and interpret mathematical symbols and diagrams**<br>• understand a general statement by finding particular examples that match it<br>• review their work and reasoning<br><br>☑ | • **understand place value in numbers to 1000**<br>• **use place value to make approximations**<br>• **recognise negative numbers in contexts such as temperature**<br>• use simple fractions that are several parts of a whole and recognise when two simple fractions are equivalent<br>• **begin to use decimal notation in contexts such as money**<br><br>☑ | • **derive associated division facts from known multiplication facts**<br>• **add and subtract two-digit numbers mentally**<br>• **add and subtract three-digit numbers using written method**<br>• **multiply and divide two-digit numbers by 2, 3, 4 or 5 as well as 10 with whole-number answers and remainders**<br>• **use mental recall of addition and subtraction facts to 20 in solving problems involving larger numbers**<br>• solve whole-number problems including those involving multiplication or division that may give rise to remainders<br><br>☑ | • **recognise a wider range of sequences**<br>• **begin to understand the role of = (the 'equals' sign)**<br><br>☑ | • **classify 3-D and 2-D shapes in various ways using mathematical properties such as reflective symmetry for 2-D shapes**<br>• **begin to recognise nets of familiar 3-D shapes, e.g. cube, cuboid, triangular prism, square-based pyramid**<br>• **recognise shapes in different orientations and reflect shapes, presented on a grid, in a vertical or horizontal mirror line**<br>• **describe position and movement**<br>• **use a wider range of measures including non-standard units and standard metric units of length, capacity and mass in a range of contexts**<br>• use standard units of time<br><br>☑ | • **gather information**<br>• **construct bar charts and pictograms, where the symbol represents a group of units**<br>• **use Venn and Carroll diagrams to record their sorting and classifying of information**<br>• **extract and interpret information presented in simple tables, lists, bar charts and pictograms**<br><br>☑ |
| **BL** | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| **IE** | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |

Key:   BL–Below Level   IE–Insufficient Evidence

**Overall assessment** (tick one box only)

| Low 3 | Secure 3 | High 3 | Low 4 | Secure 4 | High 4 |
|---|---|---|---|---|---|
| ☐ | ☐ | ☑ | ☐ | ☐ | ☐ |

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