Ma

KEY STAGE
3

LEVELS
4–7

OPTIONAL

Year 8 optional mathematics tests
Teacher's guide

Ma

KEY STAGE
3

TIER
4–6

Year 8 mathematics test

Paper 1
Calculator **not** allowed

First name _____

Last name _____

Class _____

Date _____

Please read this page, but do not open your booklet until your teacher tells you to start. Write your name, the name of your class and the date in the spaces above.

Remember
- The test is 1 hour long.
- You **must not** use a calculator for any question in this test.
- You will need a pen, pencil, rubber, ruler and an angle measurer. You may find tracing paper useful.
- Some formulas you might need are on page 2.
- This test starts with easier questions.
- Try to answer all of the questions.
- Write all of your answers and working on the test paper – do not use any rough paper. Marks may be awarded for working.
- Check your work carefully.
- Ask your teacher if you are not sure what to do.

For marking use only | Total marks |

Paper 1

Ma

KEY STAGE
3

TIER
4–6

Year 8 mathematics test

Paper 2
Calculator allowed

First name _____

Last name _____

Class _____

Date _____

Please read this page, but do not open your booklet until your teacher tells you to start. Write your name, the name of your class and the date in the spaces above.

Remember
- The test is 1 hour long.
- You will need a pen, pencil, rubber, ruler and a calculator.
- Some formulas you might need are on page 2.
- This test starts with easier questions.
- Try to answer all of the questions.
- Write all of your answers and working on the test paper – do not use any rough paper. Marks may be awarded for working.
- Check your work carefully.
- Ask your teacher if you are not sure what to do.

For marking use only | Total marks |

Paper 2

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Introduction

The year 8 optional mathematics tests provide schools with a tool to help monitor pupils' progress against national standards in key stage 3 and an instrument for gathering assessment evidence in support of teacher judgements.

The test materials may be used in whole or in part at any point during key stage 3 to provide valuable qualitative information about pupils' strengths and weaknesses. Teachers may choose to use the materials alongside written work, class discussions and group activities in a variety of contexts. When used in this way the materials can yield evidence in support of teacher assessment, including national curriculum level judgements.

The tests follow a similar structure to the previously statutory end of key stage 3 mathematics tests taken by pupils in year 9. They can be administered and marked formally, and the results may be used to determine a national curriculum level. Even when used in this way, there is still useful additional information that can be discerned from pupils' responses. This guide explains the options in more detail.

The mathematics tests are available in two tiers, covering levels 4–6 and 5–7.

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Supporting teacher assessment

The optional key stage 3 mathematics tests aim to be supportive of school assessment arrangements and can be used as part of an integrated approach to teacher assessment. Assessing Pupils' Progress (APP) material may be used alongside these tests. APP is a structured approach to periodic assessment, enabling teachers to:

- use information about pupils' strengths and weaknesses to improve teaching, learning and rates of pupils' progress;

- track pupils' progress over a key stage or longer.

The optional test materials may be used in a variety of contexts in order to give pupils the broadest opportunities to show what they can do. Individual questions and pupil responses can be used to stimulate class discussions and group activities, contributing to a rich evidence-base for teacher assessment. The notes on individual questions make some specific suggestions for teaching and learning (see Section B).

Section A: Formal administration

Administering the tests

The guidance in this section must be followed in order to produce a national curriculum level for each pupil using the level thresholds supplied (page 60).

This information is provided for anyone who is involved in administering the tests, including teachers, other members of the school staff, and other adults who may be assisting in the test administration.

The tests should be carried out under test conditions; they may be held in a school hall, classroom or any other suitable accommodation.

Who are the tests suitable for?

The year 8 optional tests are aimed at pupils working within levels 4 to 7. The tests are supplied in two tiers, one covering levels 4 to 6 and the other covering levels 5 to 7. The lower tier is more appropriate for pupils working at levels 4 and 5, while the higher tier is for those working at levels 6 and 7.

Test papers – Paper 1 and Paper 2

For each tier there are two written papers, each of 60 marks. Paper 1 is a non-calculator test and Paper 2 is a calculator-allowed test. Both tests are one hour long.

Each test consists of about 30 questions. Where a question part is worth more than one mark, pupils are able to obtain partial credit for their working even if the final answer is incorrect. Pupils write their working and answers in spaces provided within the answer booklets. Questions are of a variety of types. Some are context-free, but others are placed within everyday, classroom or mathematical contexts. Some questions are routine tests of skill, while others assess application or understanding. Pupils may be required to organise a multi-step calculation for themselves. Some questions ask pupils to explain their reasoning.

Summary of the year 8 optional tests

- Paper 1 at tier 4 to 6 or tier 5 to 7, one hour, 60 marks

- Paper 2 at tier 4 to 6 or tier 5 to 7, one hour, 60 marks

- **Total marks available** 120 (60 + 60)

Equipment needed for the tests

In addition to pens, pencils, rubbers and rulers, the following equipment will need to be available to pupils when they take the tests:

Levels 4–6   **Paper 1** Angle measurer, tracing paper (optional)
                    Paper 2 Calculator

Levels 5–7   **Paper 1** Angle measurer, pair of compasses, tracing paper (optional)
                    Paper 2 Calculator, pair of compasses

Pupils must not have access to a calculator during Paper 1.

Timing

Pupils should be given 60 minutes to complete each test. You may indicate to the pupils when they are halfway through the time allowed for the test, and again a few minutes before they have to stop.

Introducing the tests

Teachers are advised to draw pupils' attention to the 'Remember' section on the front cover of the test booklet, and to the instructions and formulas on page 2 or 3.

It is important to brief pupils fully before they begin each paper. Some of the points that you might want to cover are:

- The test is one hour long.

- Check the list of equipment on the front cover of your paper, to make sure you have what you may need.

- If you want to change your answer, put a neat line through the response you don't want. For changes to diagrams use a rubber.

- The test starts with easier questions. Try to answer all the questions in the booklet.

- Write all your answers and working in the test booklet – do not use rough paper. Marks may be awarded for your working even if your answer is wrong.

- Remember to check your work carefully.

- I will tell you when we are halfway through the test and also tell you when we are into the last five minutes. I will tell you when the test is over and you must stop writing.

- If you have any urgent questions during the test you should put up your hand and wait for someone to come to you. You must not talk to each other.

For Paper 2 only:

- Make sure you have the same tier as you had for Paper 1.

- You may use a calculator in this test. Make sure you have your calculator and that it is working properly.

Helping pupils during the tests

Teachers should ensure that pupils are clear about what they have to do but should not provide help with the mathematics being tested. Teachers should not help by explaining specific mathematical terms, nor by interpreting graphs or mathematical tables or diagrams. If a pupil asks for clarification of a mathematical symbol or notation then the teacher may read it to the pupil but should not indicate the operation or process to be used.

Access arrangements

These tests have been designed to be accessible to the great majority of pupils working at levels 4–7 in mathematics. Schools are free to make adaptations to the tests that will improve their accessibility for pupils with special educational needs and pupils for whom English is an additional language. In making any changes to the way the tests are administered, the focus should be on the assessment needs of the individual pupil. Any adaptations should be similar to those made to the materials with which pupils work in the classroom.

Examples of appropriate adaptations

School-based adaptations to the tests may include:

- allowance of up to 25 per cent additional time

- use of readers, signers, amanuenses

- provision of tactile shapes and number cards

- separating the tests into sections, taping, photocopying onto coloured paper, use of coloured overlays, use of apparatus

- enhancing the shading on diagrams, including charts and graphs, to increase visual clarity

- enlarging diagrams, cutting them out, embossing or mounting them on card or other material according to normal classroom practice

- translation of words or phrases in the test papers that are likely to prove difficult for pupils for whom English is an additional language, and also if required for pupils who use British sign language (BSL) or other sign-supported communication

- use of bilingual dictionaries.

Access arrangements should not provide an unfair advantage. It is important to ensure that any assistance given does not alter the nature of the test questions, and that any answer given is the pupil's own.

Modified large print, enlarged print and Braille test papers for visually impaired pupils are available from the QCDA modified test agency. Additional guidance notes for teachers administering the modified versions of the tests are supplied with the test papers. Notes are available from the QCDA modified test agency to assist with administering the written tests to pupils with hearing impairment and pupils who use sign language.

Questions that must not be enlarged

If your school needs to enlarge questions or parts of questions to meet the specific requirements of individual pupils, and has not ordered the enlarged papers from the QCDA modified test agency, the following questions must **not** be enlarged. This is because enlargement may affect the pupils' responses.

Paper 1	Levels 4–6	Levels 5–7
Measure	3	
Fruit Pie	23	15
Cut		21
Rhombus		30

Paper 2	Levels 4–6	Levels 5–7
Paper clip	13	4
Locus		27

If you have any questions about ordering the modified tests, contact the QCDA modified optional test agency on: 0844 500 6727.

For further guidance on access arrangements please refer to *Access arrangements*, available on the QCDA website at: www.qcda.gov.uk/assessment/3798.aspx

Marking the tests

The structure of the mark scheme

Pages 12–19 of this booklet contain guidelines on how to mark the tests.

The guidance in this section must be followed in order to produce a national curriculum level for each pupil using the level thresholds supplied (page 60).

This general guidance should be observed unless specific instructions to the contrary are given, and should be read before marking begins. It could form the basis of departmental INSET to ensure standardisation of marking within, and between, schools.

The marking information for questions within the tests is set out in the form of tables which start on page 20 (Paper 1) and page 40 (Paper 2). The columns to the left of each table provide a quick reference to the question number, question part and the total number of marks available for that question part. There is also an indication of where it may be necessary to refer to the general guidance.

The **Correct response** column usually includes two types of information:

- a statement of the requirements for the award of each mark, with an indication of whether credit can be given for correct working, and whether the marks are independent or cumulative
- examples of some different types of correct response, including the most common.

The **Additional guidance** column indicates alternative acceptable responses, and provides details of specific types of response that are minimally acceptable or unacceptable. Other guidance, such as when 'follow-through' is allowed, is provided as necessary.

Questions with a *Using and applying mathematics* element are identified in the mark scheme by an encircled U with a number that indicates the significance of using and applying mathematics in answering the question. The U number can be any whole number from 1 to the number of marks in the question.

For some graphical and diagrammatic responses, including those in which judgements on accuracy are required, marking overlays have been provided (see the centre pages of this booklet).

Recording marks on the test paper

All questions, even those not attempted by the pupil, should be marked, with a 1 or a 0 entered in each marking space. Where two marks can be split into one mark gained and one mark lost, with no explicit order, then this should be recorded by the marker as 1
0
The total marks awarded for a double page can be written in the box at the bottom of the right-hand page, enabling the correct total to be more easily transferred to the front of the test paper.

Finding levels

A total of 120 marks is available (60 from Paper 1 and 60 from Paper 2). The sum of the marks allocated from these two components indicates the level at which the pupil is working.

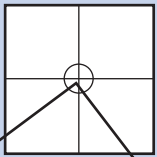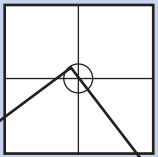The level thresholds can be found on page 60.

General guidance for marking

Answers that are numerically or algebraically equivalent are acceptable unless the mark scheme states otherwise.

In order to ensure consistency of marking, the most frequent procedural queries are listed on the following two pages with the prescribed correct action. This is followed by further guidance relating specifically to the marking of questions that involve money, negative numbers, algebra, time, coordinates, probability, or tick-box and explanation. Unless otherwise specified in the mark scheme, markers should apply the following guidelines in all cases.

Procedural queries

What if …	Marking procedure
The pupil's response does not match closely any of the examples given.	Markers should use their judgement in deciding whether the response corresponds with the statement of requirements given in the **Correct response** column. Refer also to the **Additional guidance** column.
The pupil has responded in a non-standard way.	Calculations, formulae and written responses do not have to be set out in any particular format. Pupils may provide evidence in any form as long as its meaning can be understood. Diagrams, symbols or words are acceptable for explanations or for indicating a response. Any correct method of setting out working, however idiosyncratic, is acceptable. Provided there is no ambiguity, condone the continental practice of using a comma for a decimal point.
The pupil has made a conceptual error.	In some questions, a method mark is available provided the pupil has made a computational, rather than conceptual, error. A computational error is a 'slip' such as writing $4 \times 6 = 18$ in an otherwise correct long multiplication. A conceptual error is a more serious misunderstanding of the relevant mathematics; when such an error is seen no method marks may be awarded. Examples of conceptual errors are: misunderstanding of place value, such as multiplying by 2 rather than 20 when calculating 35×27; subtracting the smaller digit from the larger in calculations such as $45 - 26$ to give the answer 21; incorrect signs when working with negative numbers.
The pupil's accuracy is marginal according to the overlay provided.	Overlays can never be 100% accurate. However, provided the answer is within, or touches, the boundaries given, the mark(s) should be awarded.
The pupil's answer correctly follows through from earlier incorrect work.	Follow-through marks may be awarded only when specifically stated in the mark scheme, but should not be allowed if the difficulty level of the question has been lowered. Either the correct response or an acceptable follow-through response should be marked as correct.
There appears to be a misreading affecting the work.	This is when the pupil misreads the information given in the question and uses different information. If the original intention or difficulty level of the question is not reduced, deduct only one mark. If the original intention is changed or the difficulty level is reduced then do not award any marks for the question part.
The correct answer is in the wrong place.	Where a pupil has shown understanding of the question, the mark(s) should be given. In particular, where a word or number response is expected, a pupil may meet the requirement by annotating a graph or labelling a diagram elsewhere in the question.

General guidance for marking

What if …	Marking procedure	
The final answer is wrong but the correct answer is shown in the working.	Where appropriate, detailed guidance will be given in the mark scheme and must be adhered to. If no guidance is given, markers will need to examine each case to decide whether:	
	the incorrect answer is due to a transcription error	If so, award the mark.
	in a question not testing accuracy, the correct answer has been given but then rounded or truncated	If so, award the mark.
	the pupil has continued to give redundant extra working which does not contradict work already done	If so, award the mark.
	the pupil has continued, in the same part of the question, to give redundant extra working which does contradict work already done.	If so, do not award the mark. Where a question part carries more than one mark, only the final mark should be withheld.
The pupil's answer is correct but the wrong working is seen.	A correct response should always be marked as correct unless the mark scheme states otherwise.	
The correct response has been crossed or rubbed out and not replaced.	Mark, according to the mark scheme, any legible crossed or rubbed out work that has not been replaced.	
More than one answer is given.	If all the answers given are correct, or if a correct range is given, the mark should be awarded unless prohibited by the mark scheme. If both correct and incorrect responses are given, no mark should be awarded.	
The answer is correct, but in a later part of the question the pupil has contradicted their response.	A mark given for one part should not be disallowed for working or answers given in a different part, unless the mark scheme specifically states otherwise.	
The pupil has drawn lines which do not meet at the correct point.	Markers will interpret the phrase 'slight inaccuracies in drawing' to mean 'within or on a circle of radius 2mm with centre at the correct point'.	

within the circle
accepted

on the circle
accepted

outside the circle
not accepted

Marking specific types of question

Responses involving money *For example: £3.20 £7*	
Accept ✓	**Do not accept ✗**
✓ Any unambiguous indication of the correct amount 　　eg　 £3.20(p), £3 20, £3,20, 　　　　 3 pounds 20, £3-20, 　　　　 £3 20 pence, £3:20, 　　　　 £7.00 ✓ The unit, £ or p, is usually printed in the answer space. Where the pupil writes an answer outside the answer space with **no** units, accept responses that are unambiguous when considered alongside the given units 　　eg　 with £ given in the answer 　　　　 space, accept 　　　　 3.20 　　　　 7 or 7.00 ✓ Given units amended 　　eg　 with £ crossed out in the 　　　　 answer space, accept 　　　　 320p 　　　　 700p	✗ Incorrect or ambiguous indication of the amount 　　eg　 £320, £320p or £700p ✗ Ambiguous use of units outside the answer space 　　eg　 with £ given in the answer 　　　　 space, do not accept 　　　　 3.20p outside the answer 　　　　 space ✗ Incorrect placement of decimal points, spaces, etc or incorrect use or omission of 0 　　eg　 £3.2, £3 200, £32 0, £3-2-0 　　　　 £7.0

Responses involving negative numbers *For example: –2*	
Accept ✓	**Do not accept ✗**
	To avoid penalising the error below more than once within each question, do not award the mark for the *first* occurrence of the error within each question. Where a question part carries more than one mark, only the final mark should be withheld. ✗ Incorrect notation 　　eg　 2–

Responses involving the use of algebra
For example: $2 + n$ $n + 2$ $2n$ $\dfrac{n}{2}$ n^2

Accept ✓	**Take care ! Do not accept ✗**
✓ Unambiguous use of a different case or variable eg N used for n x used for n	! Unconventional notation eg $n \times 2$ or $2 \times n$ or $n2$ or $n + n$ for $2n$ $n \times n$ for n^2 $n \div 2$ for $\dfrac{n}{2}$ or $\dfrac{1}{2}n$ $2 + 1n$ for $2 + n$ $2 + 0n$ for 2 Within a question that demands simplification, do not accept as part of a final answer involving algebra. Accept within a method when awarding partial credit, or within an explanation or general working. ✗ Embedded values given when solving equations eg in solving $3x + 2 = 32$, $3 \times 10 + 2 = 32$ for $x = 10$ To avoid penalising the two types of error below more than once within each question, do not award the mark for the *first* occurrence of each type within each question. Where a question part carries more than one mark, only the final mark should be withheld.
✓ Words used to precede or follow equations or expressions eg $t = n + 2$ tiles or tiles $= t = n + 2$ for $t = n + 2$	! Words or units used within equations or expressions eg n tiles $+ 2$ n cm $+ 2$ Do not accept on their own. Ignore if accompanying an acceptable response.
✓ Unambiguous letters used to indicate expressions eg $t = n + 2$ for $n + 2$	✗ Ambiguous letters used to indicate expressions eg $n = n + 2$ for $n + 2$

Responses involving time
A time interval   For example: *2 hours 30 minutes*

Accept ✓	Take care ! Do not accept ✗

✓ Any unambiguous indication
   eg   2.5 (hours), 2h 30
 	
 ✓ Digital electronic time
   ie   2:30
	✗ Incorrect or ambiguous time interval
	   eg 2.3(h), 2.30, 2-30, 2h 3,
	          2.30 min
	
	 ! The unit, hours and/or minutes, is usually printed in the answer space. Where the pupil writes an answer outside the answer space, or crosses out the given unit, accept answers with correct units, unless the question has specifically asked for other units to be used.

A specific time   For example: *8:40 am*   *17:20*

Accept ✓	Do not accept ✗

✓ Any unambiguous, correct indication
   eg   08.40, 8.40, 8:40, 0840, 8 40,
          8-40, twenty to nine, 8,40
 	
 ✓ Unambiguous change to 12 or 24 hour clock
   eg   17:20 as 5:20 pm, 17:20 pm
	✗ Incorrect time
	   eg 8.4 am, 8.40 pm
	
	 ✗ Incorrect placement of separators, spaces, etc or incorrect use or omission of 0
	   eg 840, 8:4:0, 084, 84

Responses involving coordinates
For example: *(5, 7)*

Accept ✓	Do not accept ✗

✓ Unconventional notation
   eg   (05, 07)
          (five, seven)
          $\overset{x \; y}{(5, 7)}$
          (x = 5, y = 7)
	✗ Incorrect or ambiguous notation
	   eg (7, 5)
	          $\overset{y \; x}{(7, 5)}$
	          (5x, 7y)
	          (5^x, 7^y)
	          (x − 5, y − 7)

Responses involving probability

A numerical probability should be expressed as a decimal, fraction or percentage only

For example: 0.7 $\frac{7}{10}$ 70%

Accept ✓	Take care ! Do not accept ✗
✓ Equivalent decimals, fractions and percentages eg 0.700, $\frac{70}{100}$, $\frac{35}{50}$, 70.0%	The first **four** categories of error below should be ignored if accompanied by an acceptable response, but should not be accepted on their own. However, to avoid penalising the first **three** types of error below more than once within each question, do not award the mark for the *first* occurrence of each type of error unaccompanied by an acceptable response. Where a question part carries more than one mark, only the final mark should be withheld
✓ A probability correctly expressed in one acceptable form which is then incorrectly converted, but is still less than 1 and greater than 0 eg $\frac{70}{100} = \frac{18}{25}$	! A probability that is incorrectly expressed eg 7 in 10 7 over 10 7 out of 10 7 from 10
	! A probability expressed as a percentage without a percentage sign
	! A fraction with other than integers in the numerator and/or denominator
	! A probability expressed as a ratio eg 7 : 10, 7 : 3, 7 to 10
	✗ A probability greater than 1 or less than 0

Responses involving tick-box and explanation

For example: ☐ *Yes* ☐ *No* ☐ *Cannot tell*

Explain your answer

Accept ✓	**Do not accept ✗**
✓ Where an incorrect box is ticked and the explanation is correct: Where the tick-box options are Yes/No only, accept a correct explanation that is better than minimally acceptable.	✗ A minimally acceptable response with the incorrect box ticked. ✗ A correct explanation with 'Cannot tell' ticked incorrectly (unless the pupil's intention to tick the correct box is clear from the explanation).

General guidance for marking

Mark scheme for Paper 1

Tier & Question 4–6	5–7			3D
1			**Correct response**	**Additional guidance**
		1m	Makes all three correct entries 1, 4, 0	✓ *Answer line left blank as 0*
		1m	5, 0, 2	

📄 *See General guidance for marking – Money*

Tier & Question 4–6	5–7			DVDs
2			**Correct response**	**Additional guidance**
a		1m	£ 43	
b		1m	4	**!** *Reference to change* Ignore references to change

Tier & Question 4–6	5–7			Measure
3			**Correct response**	**Additional guidance**

		2m
		
		 or
		 1m
			Gives a value between 16.2 and 16.8 inclusive
			
			 Shows all three correct side lengths, in the inclusive ranges:
			
			   5.4 to 5.6
			
			   6.9 to 7.1
			
			   3.9 to 4.1
			
			 or
			
			 Shows two correct and one incorrect side lengths, with an indication that these are to be added
				✓ *Equivalent fraction*
				 eg accept
				
				 • $16\frac{1}{2}$
				
				 • $16\frac{1}{4}$

Buses

Tier & Question			Correct response	Additional guidance
4–6	5–7			
4			**Correct response**	**Additional guidance**

4				
a		1m	Gives a correct explanation The most common correct explanations: Indicates that this is too many buses eg ■ Too many buses ■ More coaches than people ■ Not enough people ■ There are empty buses ■ There aren't even 21660 people altogether Indicates that the number is too large eg ■ The answer's too big ■ 21660 is bigger than 570 ■ They only need 15 to 20 buses ■ It should be 15 ■ Too many digits Indicates that the wrong operation was used eg ■ He just did 38 × 570 ■ He has multiplied the numbers ■ Dividing makes the answer smaller, not bigger ■ 570 ÷ 38 can't be 21660 (U1)	✓ *Minimally acceptable explanation* Explanations that imply but do not state an interpretation of the numbers of people or buses eg accept ◆ There are only 570 people ◆ They don't need that many ◆ There is no way they can use 21660 buses ✗ *Incomplete explanation* Explanations that merely repeat the figures given in the question with no implied or stated interpretation eg do not accept ◆ There are 570 people ◆ They don't need 21660 buses ◆ You cannot get that many buses (not a mathematical explanation) ✗ *False statement* eg do not accept ◆ Tom multiplied, but he should have added
b		1m	He multiplied 38 by 570	

Sorting

Tier & Question			Correct response	Additional guidance
4–6	5–7			

5				
a		2m	Sorts all four triangles correctly, ie [E] [A C] [B] [D] *or* **1m** Sorts three triangles correctly	
b		1m	Sorts all four triangles correctly E A C B D (U1)	✓ *Follow-through from part (a)* Accept their answer to part (a) correctly transferred to part (b), provided all four shapes have been placed

Sequences

Tier & Question				
4–6	5–7			
6			**Correct response**	**Additional guidance**
a		1m	Gives all three correct values in correct positions, ie 40, 60, 80, 100, 120	
b		2m	Gives all three correct values in correct positions, ie 40, 20, 10, 5, $2\frac{1}{2}$, $1\frac{1}{4}$ *or* 1m At least one correct entry	✓ *Equivalent decimals*

Minting

Tier & Question				
4–6	5–7			
7			**Correct response**	**Additional guidance**
		1m	600 000	**!** *Punctuation* Accept commas or semicolons in any position, but do not accept full stops as these could be decimal points

Large

Tier & Question				
4–6	5–7			
8			**Correct response**	**Additional guidance**
		1m	9 ÷ 2	

Tier & Question 4–6	5–7		Correct response	Additional guidance

📄 *See General guidance for marking – Time*   **Timetable**

Tier & Question			Correct response	Additional guidance
9	**1**			
a		**1m**	(Saturday) November 5	✓ *Format* Accept any correct, unambiguous format eg accept • 5/11, or American 11/5 ✗ *The wrong day* eg do not accept • Friday, 5th November ✗ *Missing month or date* eg do not accept • Saturday 5th • Saturday, November
b		**1m**	10am – 6pm	✓ *Alternative notations* Accept provided the intention is clear eg accept • 10 to 6 ✗ *Incomplete responses* eg do not accept • 10am
c		**2m**	Completes all five rows correctly	

	certain	likely	unlikely	impossible
June	✓			
July	✓			
August	✓			
September		✓		
October		✓		
November			✓	

or
1m Completes four rows correctly

Mark scheme for Paper 1
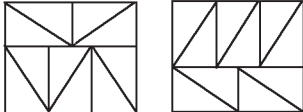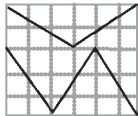
Tier & Question 4–6	Tier & Question 5–7		Rules	
10	**2**		**Correct response**	**Additional guidance**
a		**1m**	2	
b		**1m**	2	
c		**1m** (U1)	2	

Tier & Question 4–6	Tier & Question 5–7		Hats	
11	**3**		**Correct response**	**Additional guidance**
		2m	Makes all four correct entries	✓ *Tally marks* Accept tally marks instead of numbers

	Wearing hats	Not wearing hats
Adults	*8*	*5*
Children	*11*	*6*

✓ *Fractions out of 13 and 17*
ie for 2m accept

	Wearing hats	Not wearing hats
Adults	*8/13*	*5/13*
Children	*11/17*	*6/17*

or
1m   Makes three correct entries

or

Row for adults sums to 13
and
row for children sums to 17

Tier & Question					
4–6	**5–7**			**Dog food**	
12	**4**		**Correct response**		**Additional guidance**

	3m	8	✓ *Indication that there will be some food left after 8 days*
	or		

	2m	Shows (or clearly implies) in working that the total for both dogs for one day is 600g, and Shows that 5000 must be divided by 600, or that 5 must be divided by 0.6 eg
		 ▪ $8\frac{1}{3}$
		 ▪ $5000 \div 600$
		 ▪ $10 \times 0.6 = 6$
		  $5 \times .6 = 3$
		  $6 \times .6 = 3 + 0.6 = 3.6$
		  $7 \times .6 = 3.6 + 0.6 = 4.2$
		 ▪ 4800 (grams)	

	or		
	1m	Shows in working that the total for both dogs for one day is 600g eg ▪ $120 + 210 + 110 + 160 = 600$ ▪ $5 \div 600$ or Correctly divides 5000 by their incorrect total in grams for both dogs for one day eg ▪ Total for one day: *500g (incorrect)* Answer: 10 days or Correctly divides 5 by their incorrect total in kilograms for both dogs for one day or Completes the calculation correctly, but fails to convert units, leading to an answer with the digits 8(33...) eg ▪ 833 ▪ 0.8	**!** *Correct division of an incorrect total:* the answer must be rounded to the nearest integer
U1			

Year 8 optional tests in mathematics

Tier & Question				Fill
4–6	5–7			
13	**5**		**Correct response**	**Additional guidance**
a	a	**1m** ⓤ₁	8	✓ *Tiles drawn* Accept tiles correctly drawn, but no number written in the answer space
b	b	**1m**	Draws tiles correctly eg 	✓ *Unambiguous diagram* eg accept only the diagonal lines drawn ✗ *Missing or incorrect diagram* Do not accept only the number of tiles given, with no diagram or an incorrect diagram

Tier & Question				Blackberries
4–6	5–7			
14	**6**		**Correct response**	**Additional guidance**
a	a	**1m**	6	
b	b	**1m**	1.2(00...) or $1\frac{1}{5}$	✓ *Follow-through from part (a)* Accept their (a) ÷ 5, provided the result of their division is not a whole number
c	c	**1m** ⓤ₁	1.2(00...) or $1\frac{1}{5}$	✓ *Follow-through as their (b) given in part (c)*

Tier & Question				
4–6	5–7			
15	7		**Correct response**	**Additional guidance**

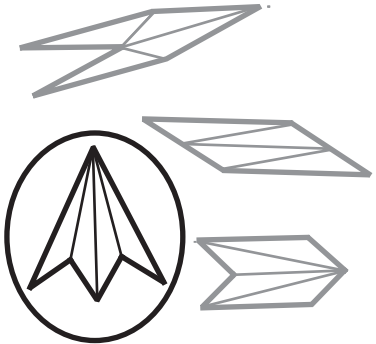|				
a	a	1m	Gives correct explanation for method 1 eg - She split the pentagon into smaller triangles, worked out their areas and added them up - She's counted the squares in each section and added them up - She draws a line through the pentagon and then another and worked out the area for each part and then added them together	✓ *Minimally acceptable response* eg - She splits the inside up - She's added them all up to make 8 - She counted the squares - She added up the numbers - She found the area of each section ✗ *Incomplete explanation* eg do not accept - She has counted the squares approximately - She added up the sides ✗ *Incorrect explanation* eg - She's added them all up
b	b	1m	Gives correct explanation for method 2, with reference to subtraction eg - She drew a rectangle around the pentagon. She worked out the area of the rectangle that is not part of the pentagon. She took that away from the area of the rectangle. - She counted the whole shape including the outside. The total area adds up to 15. Then she takes away the area of the parts around the shape. - She found the area of the grid and found the area of the outside. The area of the grid minus the area of the outside = total	✓ *Minimally acceptable response* eg - She has taken the total amount of squares (covered and uncovered), and has subtracted numbers of squares that she has divided into triangles to find the area ! *Condone* - She has taken away the area on the outside of the pentagon (no reference to the area of the rectangle) ✓ *Minor inaccuracy* eg - She drew a square (*incorrect*) around the pentagon and worked out the area of it and worked out the area of the outside. Then took it away from the rectangle. - She has made her pentagon into a quadrilateral and then worked the area out of that. Then she works out the areas of the 3 (*incorrect*) triangles that she drew on and added them together. Then she subtracted the triangles from the quadrilateral. ✗ *Incomplete explanation* eg - She splits the outside up - She counted the outside squares - She counted the squares - She drew a rectangle and counted all the squares in it - The difference between it and a rectangle
	(U2)			

Area

Mark scheme for Paper 1

Tier & Question				Wire
4–6	5–7			
16	8		**Correct response**	**Additional guidance**

2m	21	✗ *Place value errors*
		eg do not accept
or		◆ $1300 \div 6 = 216$
1m	Shows a complete correct method with not more than one computational error	
	eg	✗ *Incomplete response*
	▪ $\begin{array}{r} 2\ 3 \\ 6\,\overline{)1\ 3\ ^20} \end{array}$	Calculation given but no answer attempted
	(carried 2 is incorrect)	eg
	Answer: 23	◆ $13 \div 6$
	▪ 10 is 6 tonnes	
	20 is + 6 tonnes	! *Condone*
	12 tonnes	◆ use of incorrect units
	21 is + 6 tonnes *(incorrect)*	
	18 tonnes	
	Answer: 20	
	▪ Answer: 12.6 (tonnes)	
	or	
	Gives an answer greater than 21 but less than or equal to 22	
	eg	
	▪ 22	
	▪ 21 and a bit	
	▪ $21\frac{1}{2}$	
(U1)	▪ 21.666…	
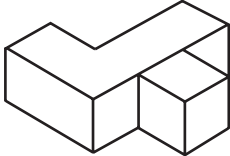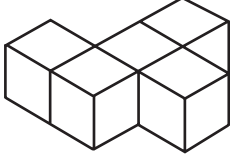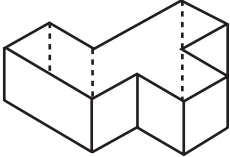
Tier & Question				**Steps**
4–6	**5–7**			
17	**9**		**Correct response**	**Additional guidance**

1m	Gives a correct explanation The most common correct explanations: Indicates that the height of the steps or of the flights of steps could vary eg ■ The height/ depth/ rise/ slope/ steepness of the steps could be different ■ It depends on the height of each step ■ 1 step in Castle could be 2 steps in Windy ■ The height of one flight could be different Indicates that the total height of the steps does not equal the height of the tower eg ■ The steps don't go to the top ■ There's a dungeon ■ There could be steps up the hill to the tower Indicates that the shape of the staircase could be different eg ■ The steps might not go straight up ■ There could be more than one staircase in the tower ■ It's got a lift/ ramp/ slope	✓ *Minimally acceptable explanation that refers to the size of the steps* eg accept ♦ Different sized stairs ♦ The steps could be different ♦ How big are the steps? ♦ The staircase could be uneven ♦ More little steps ✓ *Reference to other dimensions of the steps if the height is also mentioned* eg accept ♦ The steps could be wider or longer or taller ✗ *Explanation that refers specifically to the width or length of the steps, and not to the height* eg do not accept ♦ The steps could be wider ✗ *Explanation that could refer to the towers rather than the steps* eg do not accept ♦ You cannot tell how big they are ♦ They could be different heights ✗ *Explanation that the height of the tower is not directly proportional to the number of steps* eg do not accept ♦ Half the stairs doesn't mean half the height*
(U1)	

Mark scheme for Paper 1

Year 8 optional tests in mathematics

Tier & Question				Folding
4–6	5–7			
18	10		**Correct response**	**Additional guidance**
		1m	Indicates the correct shape, ie	
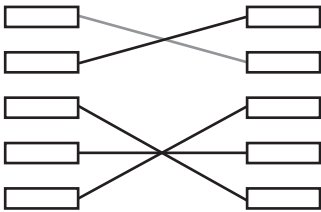
Tier & Question				Fish pond
4–6	5–7			
19	11		**Correct response**	**Additional guidance**
a	a	**1m**	6	
b	b	**1m**	6000	✓ *Follow-through as their (a) × 1000*
c	c	**1m**	200 or 0.2	✓ *Follow-through as their (b) correctly divided by 30 or by 30000*
		1m	Correct units given for their response, ie (200) millilitres or ml or cm³ or cubic centimetres or cc, or (0.2) litres or l, or (20) centilitres or cl	✓ *Follow-through* Accept the correct units for their answer, provided the answer is in the range 10 to 900 for millilitres, or 0.01 to 0.9 for litres, or 1 to 90 for centilitres

Tier & Question				
4–6	5–7			**Drawing**
20	**12**		**Correct response**	**Additional guidance**

2m Draws a complete and correct outline, correctly oriented, anywhere on the grid, with all edges marked as shown in the question
eg

or
1m Draws a complete and correct outline, correctly oriented, but either with one or more hidden lines showing or with one or more edges missing
eg

  (complete outline with hidden lines showing)

  (complete outline but edge missing)

or

Draws a complete and correct outline in a different orientation from that indicated in the question
eg

✓ *Shape divided into whole parts*
eg

! *Lines not ruled*
Accept provided the pupil's intention is clear

! *Drawing not accurate*
For 2m, accept vertices within 2mm of the dots of the grid

For 1m, accept a less accurate drawing provided the pupil's intention is clear.

! *For 2m, hidden lines shown*
Do not accept unless the lines are clearly identified as hidden lines
eg for 2m, accept

eg for 2m, do not accept

Year 8 optional tests in mathematics

Tier & Question			Correct response	Additional guidance
4–6	5–7		**Crates**	
21	**13**		**Correct response**	**Additional guidance**
a	a	**1m**	45	
b	b	**1m**	5	**!** *Measurements interchanged* Award the first mark only for the two correct measurements, in the wrong order
		1m	30	
c	c	**1m**	12	

Tier & Question		📄 *See General guidance for marking – Negative numbers*		**Negative**
4–6	5–7			
22	**14**		**Correct response**	**Additional guidance**
		1m	8	✓ *+8*
		1m	−16	

Tier & Question				Fruit pie
4–6	5–7		*Marking overlay available*	
23	15		**Correct response**	**Additional guidance**

	3m	Draws a correct line within the smaller tolerance as shown on the overlay and labels the larger sector 'banana' and the smaller sector 'other'
	or	
	2m	Draws a correct line within the larger tolerance as shown on the overlay and labels the larger sector 'banana' and the smaller sector 'other'
		or
		Draws a correct line within the smaller tolerance as shown on the overlay but does not label both sectors or labels them incorrectly
		or
		Shows evidence of $\frac{16}{36} \times 360$ or $\frac{6}{36} \times 360$, or 160° or 60° or 300°
	or	
	1m	Draws a correct line within the larger tolerance as shown on the overlay but does not label both sectors or labels them incorrectly
		or
		Shows that one unit is represented by 10°

Tier & Question				Seventeen
4–6	5–7			
24	16		**Correct response**	**Additional guidance**

	2m	Matches all four calculations correctly, ie

	or	
	1m	Matches at least two calculations correctly

Tier & Question			Spinner	
4–6	5–7			
25	17		**Correct response**	**Additional guidance**
		1m	75	✓ *An indication that the estimate is approximate* eg accept • About 75 ✗ *A probability* eg do not accept • $\frac{75}{100}$ • 75%
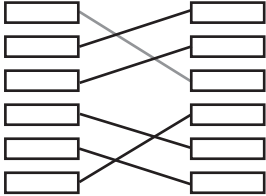
Tier & Question			Possible shapes	
4–6	5–7			
26	18		**Correct response**	**Additional guidance**
		2m	Makes all seven correct entries, ie	! *Ignore drawings, whether correct or incorrect*

Number of sides	One right angle	Two right angles	Three right angles	Four right angles	Five right angles
4 sides	✓	✓	✗	✓	✗
5 sides	✓	✓	✓	✗	✗

		or **1m**	Makes six correct entries	

Tier & Question		📄 *See General guidance for marking – Algebra*		Tiles
4–6	5–7			
27	19		**Correct response**	**Additional guidance**
	a	**1m**	$n^2 + 2$	✓ *Throughout the question, accept algebraically equivalent unsimplified expressions*
	b	**1m** (U1)	$2n^2 + 2$	

Tier & Question		Air traffic	
4–6	5–7		
	20	**Correct response**	**Additional guidance**
	1m	Describes a positive correlation eg ▪ The more flights, the more passengers ▪ They go up together ▪ There are about 10,000 passengers for every 100 flights ▪ Passengers = 100 × flights	✓ *Minimally acceptable explanation* eg accept ◆ A good correlation ◆ It's positive ◆ Directly proportional ◆ They both go up ✗ *A description that does not imply a relationship* eg do not accept ◆ They go up

Tier & Question		*Marking overlay available*	Cut
4–6	5–7		
	21	**Correct response**	**Additional guidance**
	1m	Draws a correct rectangle within the tolerance as shown on the overlay	

Tier & Question		Matching	
4–6	5–7		
	22	**Correct response**	**Additional guidance**
	3m	Matches all five calculations correctly, ie *or* **2m** Matches at least three calculations correctly *or* **1m** Matches at least two calculations correctly (U1)	

Tier & Question			Averages	
4–6	5–7			
	23		**Correct response**	**Additional guidance**
		1m	maximum	
		1m	mean	
		U1		

Tier & Question			Simultaneous	
4–6	5–7			
	24		**Correct response**	**Additional guidance**
		1m	Indicates correct step, ie	

Indicates correct step, ie

(4t - r) =13
- (2t + r) = 2

**(4t - r) =13
+ (2t + r) = 2**

(2t + r) =13
- (4t - r) = 2

2(2t + r) = 2 x 2

2(4t - r) = 2 x 13

Tier & Question			Crisps	
4–6	5–7			
	25		**Correct response**	**Additional guidance**
a	2m	Completes all four rows correctly, ie		

	True	Either	False
		✓	
			✓
		✓	
	✓		

	or 1m (U1)	Completes three rows correctly		
b	1m	Gives a correct statement eg		✗ *Statements that either must be true or must be false* eg do not accept
		▪ Some, girls ▪ None, girls ▪ Both, genders/ sexes ▪ Most, boys/ girls ▪ A fraction, boys/ girls ▪ Half, boys/ girls ▪ Not all girls ▪ [a specific positive whole number], boys/ girls ▪ More, boys/ girls ▪ Fewer, boys/ girls		◆ Most, pupils

Mark scheme for Paper 1

Tier & Question			Percent	
4–6	5–7			
	26		**Correct response**	**Additional guidance**
a	1m	25; 400		
b	1m	500		

Year 8 optional tests in mathematics

Tier & Question			
4–6	5–7		**Pi**
	27	**Correct response**	**Additional guidance**
	1m	Indicates the correct sentence, ie ☑ The circumference of a circle divided by its diameter. ☐ ☐ ☐	

Mark scheme for Paper 1

Tier & Question		📄 *See General guidance for marking – Tick-box and explanation*	**Price change**
4–6	5–7		
	28	**Correct response**	**Additional guidance**
	1m U1	Indicates No and gives a correct explanation eg Explains that the amount in the first and the second step are different ▪ The saving is 50% from a bigger amount Gives a specific example ▪ £5 last year, £7.50 this year, £3.75 next year Gives the correct percentage ▪ It will cost 75% of last year	✓ *Minimally acceptable response* eg ♦ No, because you would find 50% of this year's price (*implies different amount*) ♦ No – 10 15 7.5 ✗ *Ambiguous explanation* eg ♦ No, the price would change anyhow

Tier & Question			
4–6	5–7		**Inequalities**
	29	**Correct response**	**Additional guidance**
	a	1m	Indicates the correct inequality, ie x ≥ 100 (x > 100) 100 > x 100 ≥ x	
	b	1m U1	Indicates the correct inequality, ie x ≤ 10 (x < 10) 10 < x 10 ≤ x	

Tier & Question		Marking overlay available	**Rhombus**
4–6	**5–7**		
	30	**Correct response**	**Additional guidance**

	2m	Constructs a completed rhombus, sides ruled, with the fourth vertex within the region as shown on the overlay, with construction arcs shown	**!** *Use of overlay* Markers should use their judgement to determine whether the construction arcs are genuine, but may use the dashed lines on the overlay as a guide
	or *1m*	Draws a completed rhombus, sides ruled, with the fourth vertex within the region as shown on the overlay, but no construction arcs shown or Draws a completed quadrilateral, sides ruled and construction arcs shown, with the two new sides drawn of an equal but incorrect length	

Mark scheme for Paper 2

Tier & Question			Correct response	Additional guidance
4–6	5–7		📄 *See General guidance for marking – Negative numbers*	**Thermometer**
1			**Correct response**	**Additional guidance**
a		1m	Gives a value between 7 and 8 inclusive	
b		1m	Gives a value between –2 and –3 inclusive	! *Follow-through from part (a)* Accept follow-through from part (a), provided the result is negative ✗ *Unlabelled mark*

Tier & Question			Correct response	Additional guidance
4–6	5–7			**Square patterns**
2			**Correct response**	**Additional guidance**
a		1m	4	
b		1m (U1)	19	
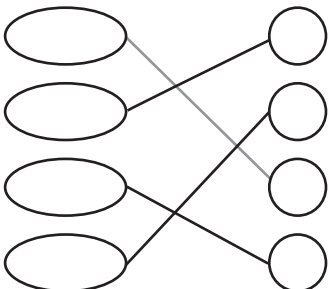
Tier & Question			Correct response	Additional guidance
4–6	5–7			**Hummus**
3			**Correct response**	**Additional guidance**
		1m	3 $\frac{1}{4}$ $\frac{1}{4}$ 2	✓ *Equivalent decimals*
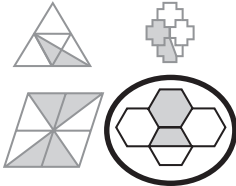
Tier & Question			Diagrams	
4–6	5–7			
4			**Correct response**	**Additional guidance**
		2m	Gives both correct values for both diagrams, ie 0.25 25% and 0.17 17%	**!** *Ignore incorrect or missing fractions over 100* Pupils are not required to complete the fractions for the award of the mark
		or **1m**	Gives both correct values for one diagram or Gives both correct decimals or Gives both correct percentages or Gives a complete correct answer for the unshaded parts of both diagrams, ie 0.75 75% and 0.83 83%	
	(U1)			

Tier & Question				Hexagons
4–6	5–7			
5			**Correct response**	**Additional guidance**
a	**1m**			
b	**1m**		Draws a diagram of seven tiles joined 'end-to-end', or variations eg	
	(U1)			

Tier & Question				Angle
4–6	5–7			
6			**Correct response**	**Additional guidance**
	1m		Matches all three diagrams correctly, ie	

Tier & Question				**Fraction**
4–6	5–7			
7			**Correct response**	**Additional guidance**
		1m	$\dfrac{3}{8}$	
		1m	Indicates the correct shape, ie	

Tier & Question				**Line graph**
4–6	5–7			
8			**Correct response**	**Additional guidance**
a		1m	Gives a value between 13.1 and 13.4 inclusive	✓ *Equivalent fractions*
b		1m	Midnight on Tuesday	
c		1m	Gives a value between 11.4 and 11.6 inclusive	✓ *Equivalent fractions*
d		1m	Indicates the correct time, ie noon on Monday midnight on Monday (noon on Tuesday) midnight on Tuesday	
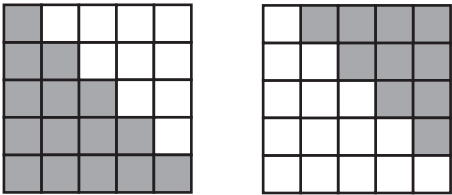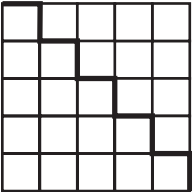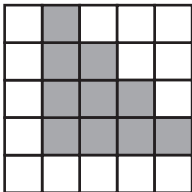
Tier & Question			Picture	
4–6	5–7			
9			**Correct response**	**Additional guidance**
	1m (U1)		39	

Tier & Question			Factors	
4–6	5–7			
10	**1**		**Correct response**	**Additional guidance**
a		**1m**	Gives all six correct values in any order, ie 1, 2, 3, 4, 6, 12 and Gives the correct value, ie 6	
b		**2m**	Completes all four sentences with a correct value, ie 4 factors: gives 6 or 8 3 factors: gives 4 or 9 2 factors: gives 2, 3, 5 or 7 1 factor: gives 1	
		or **1m**	Completes three sentences with a correct value	

Tier & Question			Towers	
4–6	5–7			
11	**2**		**Correct response**	**Additional guidance**
a		**1m**	8	
b		**1m**	14	

Harris

Tier & Question 4–6	Tier & Question 5–7		📄 *See General guidance for marking – Time and Money*	
12	**3**		**Correct response**	**Additional guidance**
a		1m	1 hour and 40 minutes	**!** *Condone* • $1\frac{2}{3}$ hours and …minutes • … hours and 100 minutes
b	a	1m	Gives the correct time, ie 16:00	✓ *Alternative notation of the correct time* eg 4(pm)
c	b	1m	£ 86.80	

Paper clip

Tier & Question 4–6	Tier & Question 5–7		**Correct response**	**Additional guidance**
13	**4**			
		1m	Gives a value in the range 8 to 13 inclusive	

Triangle and square

Tier & Question 4–6	Tier & Question 5–7		**Correct response**	**Additional guidance**
14	**5**			
a	a	1m	Square correctly and clearly split into triangle numbers 10 and 15, in any orientation eg 	✗ *Triangle placed inappropriately* eg
b	b	1m	36 and 45 (in either order)	
c	c	1m	45, 9 (must be in this order)	
d	d	1m	66, 11 (must be in this order)	

Tier & Question				
4–6	**5–7**			**Shading**
15	**6**		**Correct response**	**Additional guidance**
a	a	**1m**	$\dfrac{7}{9}$	✓ *Unsimplified equivalent fractions* eg for part (a) accept ◆ $\dfrac{28}{36}$ eg for part (b) accept ◆ $\dfrac{24}{36}$
b	b	**1m**	$\dfrac{2}{3}$	

Tier & Question				
4–6	**5–7**			**Values**
16	**7**		**Correct response**	**Additional guidance**
		1m	32	
		1m	40	

Tier & Question				Car park
4–6	5–7			
17	8		**Correct response**	**Additional guidance**

1m	Gives a correct explanation The most common correct explanations: Indicates that the information was collected only at the times shown eg ▪ Because she wasn't there at that time ▪ He only marked a cross at the times when he was there ▪ Because he did not take a reading for 10:30 ▪ She didn't count them then ▪ She didn't do it every half hour Explains that nothing is known about the numbers of cars between the points given on the graph eg ▪ There could be any number of cars at 10:30 ▪ Cars could have come or gone between the times he checked ▪ The number of cars cannot be fixed from the number before or after ▪ The number of cars might not go up evenly Explains that unwarranted assumptions cannot be made about the graph itself eg ▪ You can't fill in between the crosses ▪ The graph is a scatter graph, not a line graph ▪ You can't join the crosses with a line ▪ There might not be a pattern in it	✓ *Minimal explanations* Indicates that nothing is known about the number of cars (at the relevant time) eg accept • You don't know how many cars there were ✗ *Incomplete explanations* Do not accept explanations that relate only to the absence of a cross at the relevant point on the graph, and do not refer in any way to the process of collecting the data eg do not accept • Because there is no mark/ star/ cross at (10:30, 15) ✗ *False statements* Do not accept false statements, even if these are accompanied by a correct explanation eg do not accept • Because she recorded every hour, not every half hour, so he does not know what happened between times • It could be anywhere between 13 and 17 cars, so you don't know exactly how many were there at 10:30 ! *Ignore irrelevant statements* eg ignore • There is no line of best fit
(U1)		

Tier & Question		📄 *See General guidance for marking – Money*	Decoration
4–6	5–7		
18	9	**Correct response**	**Additional guidance**

a	a	**1m**	£10	
b	b	**2m** *or* **1m** (U1)	20, 8, 24 and £10.80 5, 2, 6 and £2.70 or 10, 4, 12 and £5.40 or 15, 6, 18 and £8.10	

Tier & Question 4–6	Tier & Question 5–7		📄 *See General guidance for marking – Tick-box and explanation*	**First aid**
19	**10**		**Correct response**	**Additional guidance**
a	a	**1m**	Gives a value between 37 and 43 inclusive	
b	b	**1m**	Gives a value between 540 and 660 inclusive	
c	c	**1m** ⓤ1	Indicates Yes and gives a correct explanation The most common correct explanations: Indicates that the total of the percentages is greater than 100 eg ■ The bars don't add up to 100 ■ It's 160% ■ 50% went to Basic, and 110% did other things ■ Just Tuesday is 100% Indicates that the number of pupils attending a course is greater than the number in the school eg ■ It doesn't add up to 1200 pupils ■ More people than there are in the school went on a course	**!** *Ignore incorrect addition* Accept percentages not totalling 160, or number of pupils not totalling 1920, if they conclude correctly that the total is not 100% or is not 1200 eg accept ◆ If you add up all the bars, it makes 150% ◆ There are only 1200 students but altogether 1320 attended **✗** *No reference to totals* Do not accept explanations that refer to the percentages, but do not refer, directly or indirectly, to their total eg do not accept ◆ The percentages do not work out **✗** *False statements* eg do not accept ◆ Tuesday had more than 100%

Mark scheme for Paper 2

Tier & Question				
4–6	5–7	📄 *See General guidance for marking – Algebra*		**Expressions**
20	11		**Correct response**	**Additional guidance**
		1m	7	
		1m	An expression equal to 21, where n = 3 eg ▪ 6n + 3 7n	✓ *Algebraically equivalent unsimplified expressions* eg accept ♦ n + 21 – n ♦ 4n + 2 + 2n + 1

Tier & Question				
4–6	5–7			**Perimeter**
21	12		**Correct response**	**Additional guidance**
		1m	18	
		1m	18	

Tier & Question				
4–6	5–7			**Prime**
22	13		**Correct response**	**Additional guidance**
		1m	Gives 2 as a counter-example	✗ *Extra, incorrect counter-examples* eg do not accept ♦ 2 and 10 ! *Incorrect prime numbers* Ignore, provided these are not presented as counter-examples, eg accept ♦ 1, 2, 3, 5, 7, 9 are all prime, and 2 is even

Tier & Question			Absence	
4–6	5–7			
23	**16**		**Correct response**	**Additional guidance**
	a	**1m**	4	
	b	**1m**	Gives a correct explanation The most common correct explanations: Indicates that people were off for longer in Luke's class eg ■ Fewer pupils were off, but they were off for longer ■ Absences were for a longer time ■ More people were off for the whole week ■ He had two 5s in his table ■ More students had more than one day off ■ There was never a day with everyone there ■ More days were missed Calculates the total number of days of absence in Luke's class eg ■ In Luke's class they were away for 15 days altogether	✓ *Minimally acceptable explanations* Relates to attendance in Nia's class eg accept • No one was off for all five days in Nia's class ✗ *False statements, even if accompanied by a correct statement* eg do not accept • There were more pupils in Luke's class than in Nia's, and two of them were off all week • 15 pupils missed school in Luke's class ✗ *Misinterpretation of the table* Do not accept suggestions that the table shows the number of pupils absent on each day of a five-day week eg do not accept • More people were absent in Nia's class on the first, second and fourth days • On some days more people were off in Luke's class, and on some days more were off in Nia's
		1m	Explains that Nia could be right because a greater number of pupils were absent at some time in her class eg ■ Fewer people were there for the whole week ■ More students were ill ■ More pupils had no time off in Luke's class ■ Only 18 had 0s ■ 7 were absent sometime ■ 28% of her class were away ■ More people weren't there	
		(U1)		

Tier & Question				
4–6	**5–7**			**x and y**
24	**14**		**Correct response**	**Additional guidance**
		1m	32	
		1m	2	
		1m	4	

Tier & Question				
4–6	**5–7**			**Triangle**
25	**15**		**Correct response**	**Additional guidance**
		2m	A = 20°, B = 60°, C = 100°	
		or		
		1m	Gives three values in the correct ratio, with a sum between 90 and 360 inclusive eg ▪ 18, 54, 90 ▪ 10, 30, 50 or Gives the correct values to the wrong angles eg ▪ A = 100°, B = 20°, C = 60°	The correct ratio is: 1 : 3 : 5

Tier & Question				
4–6	**5–7**			**Tetrahedron**
26	**17**		**Correct response**	**Additional guidance**
a	a	**1m**	Indicates the correct name, ie Adam (Bala) Chris Delia	
b	b	**1m** (U1)	Gives all four correct names in the correct positions, ie Bala, Chris, Adam, Delia	

Mark scheme for Paper 2

Tier & Question				**Similar**
4–6	5–7			
	18		**Correct response**	**Additional guidance**
a	1m		Gives a property that is true for every square and every oblong	✗ *Incorrect response*
			eg	eg
			▪ Two pairs of equal sides	◆ flat sides/faces
			▪ Opposite sides are the same length	
			▪ All angles are the same	✗ *Incorrect property*
			▪ All angles 90 degrees	eg
			▪ 2 pairs of parallel lines	◆ One line of symmetry
			▪ Parallel sides	◆ A pair of parallel lines
			▪ 2 of the sides are the same and the other two are the same	◆ Four points
				◆ 4 parallel sides
			▪ Straight lines/sides/edges	
			▪ 4 vertices/corners/angles	✗ *Incomplete description*
			▪ All the degrees add up to 360º	eg
			▪ Symmetrical	◆ 2 of the sides are the same length
			▪ Have lines of symmetry/at least two lines of symmetry	◆ at least 2 sides are the same length
				◆ at least 2 sides are the same
			▪ 2D	◆ all sides are even (ambiguous)
				◆ they have at least one right angle
				✗ *Repetition of the property given in the question stem*
				eg
				◆ They are both quadrilaterals
				◆ Four sides
				✗ *Responses relating to 3-D shapes (cube/ cuboid), indicated through explanation or diagrams*
b	1m		Gives a property that is true for every square and that is not true for any oblong	✗ *Incorrect property*
			eg	eg
			▪ All sides are the same length	◆ It has right angles
			▪ Regular polygon	
			▪ Four lines of symmetry	✗ *Incomplete description*
			▪ More than two lines of symmetry	eg
	(U2)		▪ Forms a regular tessellation	◆ all equal measures (ambiguous – angles or sides?)
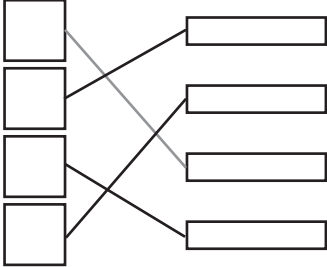
Tier & Question		Activities	
4–6	5–7		
27	**19**	**Correct response**	**Additional guidance**

3m	Indicates the correct name in all six rows, ie	

Joe	Eva
Joe	Eva
Joe	Eva
Joe	Eva
Joe	Eva
Joe	Eva

2m	Indicates the correct name in five rows	
or		
1m	Indicates the correct name in four rows	
U1		

Tier & Question			📄 *See General guidance for marking – Tick-box and explanation*		**Sunscreen**
4–6	**5–7**				
28	**20**		**Correct response**		**Additional guidance**
	a	**1m**	95		✓ *Accept 95%*
	b	**1m**	Indicates No and gives a correct explanation The most common correct explanations: Show that it is not double eg ■ 29/30 is not double 14/15 ■ 30: 96.6 15: 93.3 ■ Because it's 94% and 96% ■ It's only 3% more Explains that the relationship is not proportional eg ■ The difference between SPF20 and SPF4 was only 20 ■ SPF20 is not 5 times SPF4 ■ SPF15 is about 90, and you can't have 180%		✓ *Minimal explanations* Accept only the percentages given eg accept 　◆ No, Lucy – 93 　　 Kate – 96 ✗ *Inaccurate figures* Do not accept figures accurate to less than 1 significant figure eg do not accept 　◆ 14/15⟶ 60% 　　29/30⟶ 90%
	c	**1m**	Indicates No and gives a correct explanation The most common correct explanations: Indicates that $p - 1$ cannot be equal to p eg ■ $p - 1$ is not p ■ Because you take 1 away ■ $p - 1$ can't be 100% of p Indicates that $\dfrac{(p-1)}{p}$ cannot equal 1 eg ■ $p - 1$ divided by p isn't 1 ■ $(p - 1) \div p \neq 1$ ■ It would have to be $\dfrac{p}{p}$ to get 100% ■ 100% would have to be 1 divided by 1 ■ Even $\dfrac{9999}{10000}$ is less than all... ■ When p gets bigger it gets closer to 100 but it never gets there ■ You can't end up with 1 ■ You are dividing by a larger number ■ $100 \times \dfrac{(p-1)}{p}$ is always under 100		✗ *False statements* eg do not accept 　◆ The highest you can get is 99% ✗ *Vague explanations* Do not accept vague references to 'the number' where it is not clear what number is being referred to eg do not accept 　◆ No matter how high the number it will never be 100% ✗ *Incorrect algebraic expression* eg do not accept 　◆ $p - 1 \div p$ isn't 1

Mark scheme for Paper 2

Tier & Question			See General guidance for marking – Algebra	**Area formulas**
4–6	5–7			
29	21		**Correct response**	**Additional guidance**

a	a	1m	3r²	✓ *Unconventional notation*
				eg accept
				    • 3 × r²
				    • r²3
				    • r² + r² + r²
				
				✓ *Unsimplified expressions*
				eg accept
				    • 2r × r + r²

b	b	1m	πr²	✓ *Numerical value for π*
				eg accept
				    • 3.14(159...)r²
				
				✓ *Unconventional notation*
				eg accept
				    • π × r²
				    • r²π

	c	1m	Indicates the area of the circle and explains or implies that π is greater than 3
			eg
			   ■ π is more than 3
			   ■ π is 3.14
			   ■ If r = 2 then the area of the three squares is 3 × 4 = 12, but the area of the circle is 12.56
			
			(U1)	

Tier & Question				**Graphs**
4–6	5–7			
	22		**Correct response**	**Additional guidance**
	a	1m	A and C (in either order)	✓ *Throughout the question any unambiguous indication of the correct response* eg accept • The linear equations stated
	b	1m	B and E (in either order)	✗ *In part (b) identical lines* ie do not accept A and C
	c	1m	D and E (in either order)	

Tier & Question				L-shape
4–6	5–7			
	23		**Correct response**	**Additional guidance**
		1m	Matches all three diagrams correctly, ie	

Tier & Question				Counting
4–6	5–7			
	24		**Correct response**	**Additional guidance**
		1m	April	✓ *Any unambiguous indication of the correct month* eg accept • The fourth month • 4

Tier & Question			Walk	
4–6	5–7			
	25		**Correct response**	**Additional guidance**
	a	1m	24	
	b	1m	Gives a correct explanation The most common correct explanations: States that the mean speed was 8km an hour Indicates that the total time taken was 3 hours eg ▪ She cycled one hour and walked 2 hours ▪ He should divide the total distance by 3 Explains that the second part of the journey took twice as long as the first eg ▪ It takes twice as long to walk back ▪ She walked at 6 km an hour for 2 hours Calculates the total distance at 9 km an hour as 27 km Indicates that the total time at 9 km an hour would be less than three hours	✗ *Incomplete explanations* eg do not accept • It takes longer to walk back at 6 kmph

Tier & Question			See General guidance for marking – Algebra	Area algebra
4–6	5–7			
	26		**Correct response**	**Additional guidance**
a	**1m**		n² 4n 3n	
b	**2m**		$n^2 + 7n + 12$ or $(n + 3)(n + 4)$ or $(n + 3) \times (n + 4)$	✓ *Follow-through from part (a)* Accept the sum of their values in part (a), provided this involves some collection of like terms (a quadratic reference) ✗ *For 2 marks, further incorrect working which contradicts an earlier correct expression* eg do not accept • $(n + 4)(n + 3) = n^2 + 7$

	or
	1m
			Shows that the vertical side is n + 3 (this can be shown on the diagram by the labelling of the shorter edge of the smallest rectangle as '3')
			
			or
			
			Gives a correct, unsimplified expression for the area
			eg
			  ■ $n^2 + 4n + 3n + 3 \times 4$
				✗ *Algebraically non-equivalent expressions*
				eg do not accept
				  • $n + 4 \times n + 3$
				
				✗ *The vertical side as n + 4*
				eg do not accept for 1m
				  • $(n + 4)^2$

Tier & Question		Marking overlay available	Locus
4–6	5–7		
	27	**Correct response**	**Additional guidance**
	3m	A completely correct locus, within the limits of the overlay	
	or **2m**	All four lines and at least one curve correctly drawn	
		or	
		Three correct curves	
	or **1m**	All four straight lines correctly drawn as correct length or longer	
		or	
		Two correct curves	

Section B: Using the outcomes of the tests

The following sections provide information about interpreting the outcomes of the year 8 optional mathematics tests. They explain how teachers can use the test scores to find out more about pupils' attainment in the national curriculum. They also present a number of key findings and useful information obtained during the development of the tests that may be used in support of teacher judgements.

Level thresholds

In order to make use of the information in this section, you should administer the tests according to the guidance in Section A: Formal administration. It is particularly important that you observe the time limits given, follow the test instructions, and mark the questions according to the mark scheme. If you have used the tests in a different context to provide qualitative information about pupils' strengths and weaknesses then the information derived from this section will not be applicable and you should refer to the Key findings and useful information section on page 62.

In a formal administration pupils need to take both test booklets in order for the total marks to be translated into a valid national curriculum level for mathematics overall.

The following tables give an indication of the national curriculum levels for pupils attaining each of the mark ranges in the tests.

Levels 4–6		Levels 5–7	
Level	**Mark range**	**Level**	**Mark range**
Below 4	0 – 21	Below 5	0 – 24
4	22 – 44	5	25 – 40
4C	22 – 29	5C	25 – 29
4B	30 – 36	5B	30 – 35
4A	37 – 44	5A	36 – 40
5	45 – 67	6	41 – 71
5C	45 – 51	6C	41 – 50
5B	52 – 59	6B	51 – 61
5A	60 – 67	6A	62 – 71
6	68 –120	7	72 –120
6C	68 – 85	7C	72 – 88
6B	86 – 104	7B	89 – 105
6A	105 –120	7A	106 –120

Variability of results

Any scores derived from a test are subject to some variation according to the precise circumstances under which the test had been sat and marked. This does not mean that pupils get 'incorrect' test results, but it does mean that some caution should be exercised in translating scores which are very close to the threshold mark into an overall mathematics level for the pupil. The level thresholds provided are indicative and teachers should be aware that differences in the status, administration and marking procedures open the tests to a potentially broader range of variation than the former statutory national curriculum tests.

Section B: Using the outcomes of the tests

Key findings and useful information

This section provides further support to teachers in making level-related judgements based on the outcomes of these tests.

Year 8 Paper 1

Question number	L4-6 tier: 15	L5-7 tier: 7
Question name	Area	
Marks	2	
Programme of Study	Geometry and measures	
The question	This question shows an irregular pentagon on a squared grid, followed by examples of two strategies that could be used in order to calculate the area of the pentagon. Pupils are asked to explain the method used in each case.	
	Pupils answering correctly demonstrate that they recognise the methods used and can explain them. This involves engaging with implicit mathematical reasoning and making it explicit. This requires the ability to recognise and understand the mathematical reasoning, as well as the ability to communicate that understanding mathematically.	
Related teaching points	It is likely that pupils will find the first strategy easier to explain than the second. The second involves more mathematical steps (adapting the shape, calculating a total area, calculating a partial area and subtracting one from the other). In contrast, the first involves the less complex procedure of splitting the shape, calculating the area of each section and adding to reach the total.	
	Pupils who find the first method difficult would benefit from work based on calculating the area of compound shapes, perhaps starting from rectilinear shapes and progressing to those that include triangles.	
	Pupils who explained the first method correctly but struggled with the second would benefit from exploring a variety of irregular shapes and developing strategies to turn them into shapes where the area can more easily be calculated.	

Year 8 Paper 1

Question number	L4-6 tier: n/a	L5-7 tier: 28
Question name	Price change	
Marks	1	
Programme of Study	Number and algebra	
The question	This question focuses on a common misconception in calculating percentages. It tells pupils that a game costs 50% more this year than last year and that it will cost 50% less next year. Mike therefore concludes that the game will cost the same next year as it did last year. Pupils are asked to say whether this statement is correct and to explain their reasoning.	
Related teaching points	The most common error on this question is to answer that Mike is correct: that the game will revert to its original price next year. Pupils who make this mistake do not understand that percentages are about proportional relationships and the base value for each year is different. Pupils may benefit from working on similar problems and evaluating the outcomes. A useful way of encouraging pupils to engage with such an exercise is to ask them to find a way to explain the concept to younger pupils. Pupils who answer the question correctly explain their reasoning in different ways. Some make explicit the fact that the total price in each year is different and that this will therefore affect the percentage calculation. Others give a numerical example of the price change. Pupils who only give a numerical example may benefit from exploring ways of explaining the concept more generally in verbal or written form, and in forming a convincing argument using a more general statement.	

Year 8 Paper 2

Question number	L4-6 tier: 14	L5-7 tier: 5
Question name	Triangle and square	
Marks	4	
Programme of Study	Number and algebra	
The question	This question requires pupils to manipulate triangle numbers to (a) form a square number, and to derive a given total using different rules (items (b), (c) and (d)). Pupils who answer part (a) correctly can use a diagram to demonstrate the relationship between square and triangle numbers. Those who answer items (b) to (d) correctly demonstrate an ability to use triangle numbers in more abstract contexts.	
Related teaching points	Pupils who answered item (a) incorrectly might need to spend time developing their understanding of the concept of a triangle number and/or a square number, perhaps using multilink cubes to help make the link between the concrete shape and the more abstract number. Those who answered some of items (b) to (d) correctly and others incorrectly show partial understanding and may benefit from consolidation activities. Depending on the nature of their errors, this may include exploring the triangle number series, following rules for devising a sequence, or following more complex rules that refer, for example, to both a number and its position.	

Year 8 Paper 2

Question number	L4-6 tier: 18	L5-7 tier: 9
Question name	Decoration	
Marks	3	
Programme of Study	Number and algebra; Geometry and measures	
The question	In this question, two characters are tiling a 1m by 1m space, using three different tiles. Item (a) asks pupils to calculate the cost of Jack's proposed design using 100 of tile 1, while item (b) asks them to say how many of each tile Vanessa will need in order to repeat her design, and to calculate the total cost. Pupils answering (a) correctly demonstrate that they can refer back to the correct price information, accurately calculate the cost and convert from pence to pounds. Pupils answering (b) correctly can make appropriate mathematical decisions when generating a repeated pattern, calculating the number of each type of tile needed, referring accurately to the relevant information for each tile and calculating the final price. Partial credit is available for pupils who carry out some of these steps appropriately but not all of them.	
Related teaching points	Pupils who answer item (a) incorrectly may need to practise calculation in context, in particular selecting relevant information from a 'menu' of information. Some pupils will have made calculation or conversion errors in their totals and these pupils might need further practice in these areas. Teaching points for pupils who made errors in item (b) will vary according to the type of error but might include practice in the areas identified for part (a). Additionally, some pupils might demonstrate a need to consolidate their ability in developing effective strategies to tackle a multi-step problem.	

Year 8 Paper 2

Question number	L4-6 tier: n/a	L5-7 tier: 18
Question name	Similar	
Marks	2	
Programme of Study	Geometry and measures	
The question	This question tells pupils that a square and an oblong each have four edges. It then asks them (a) to give another property common to every square and every oblong and (b) to give a property of the square that is not a property of the oblong. Pupils who answer this question correctly are able to recognise the relevant properties, to generalise from a single instance of each shape to the entire class of that shape, and to make their understanding explicit by describing the relevant properties.	
Related teaching points	There are many possible correct answers to this question, commonly focusing on properties related to angle, edge length, number of vertices, parallel sides and symmetry. A common error in part (a) is to describe the property in an ambiguous way that might apply to both shapes (eg '2 of the sides are the same length'). Pupils who make such errors may have the mathematical understanding required but find it difficult to express or generalise it. They could usefully focus on developing their skills in describing their understanding more effectively. One way to do this is to generate a series of labels showing properties that the pupil thinks are applicable to one specified shape but not to another, and to use them to label the shapes. This might highlight the fact that a property which a pupil thought was applicable to only one shape is actually applicable to both, encouraging generalisation and reflection of how best to refine descriptions. Trialling indicated that some pupils do not understand the term 'oblong'. For such pupils it might be useful to investigate the properties of oblongs. Some might also be able to consider why the term 'rectangle' was not used in this question instead of 'oblong' (the term 'oblong' refers to any shape with four right angles and two pairs of parallel sides, each pair of a different length; while the term 'rectangle' applies to any shape with four right angles, thus including both oblongs and squares). Another relatively common error is to answer this question in relation to cubes or cuboids rather than squares and oblongs. Pupils who make this mistake might need to consolidate their understanding of the difference between 2D and 3D shapes.	