REASONING

7ER18MS

Marking the test

and understanding performance

165114

Llywodraeth Cymru
Welsh Government

Marking the reasoning test

This document comprises:

- the markscheme for the National Numeracy Test (Reasoning) for Year 7 together with marking guidance
- additional information to support teachers' understanding of their learners' responses, providing a platform for growth.

For learners using the modified large print or Braille test materials, some questions have been adapted or replaced. When marking a modified large print or Braille test, please use this markscheme alongside the adapted markscheme which is included in the *Notes for teachers* that accompany the modified tests.

All items within this test require numerical reasoning and therefore most are open, allowing the learner to select what they consider to be an appropriate strategy. This means that there may be a range of ways of arriving at a solution.

As a consequence, marking the reasoning tests may not be as straightforward as simply checking whether or not the final answer is correct since the methods used are also of importance.

Understanding the markscheme

To ensure the accessibility of the markscheme, the focus is primarily on key pointers that indicate the learner's understanding. For example, the markscheme may state 'Shows the value **12**' or 'Links **36** to **9**'.

These values generally credit intermediate stages, showing partial understanding.

Alongside this, commentary is provided as appropriate, to enable markers and teachers to understand their learners' responses and also to support marking.

Common errors are also flagged up, as well as explanations as to why certain responses are awarded partial credit.

Exemplars

To help schools not only with marking but also in interpreting their learners' responses, a range of exemplars is provided for each item, as appropriate.

These exemplars are actual responses from learners (taken from a trial of the reasoning tests) so include spelling mistakes and numerical inaccuracies. They have been typed to ensure anonymity.

Assessing and building on test performance

Marking the test gives teachers an overall score for each learner.

However, this score in isolation is unlikely to provide a great deal of information relating to the strengths of individual learners, or evidence of those areas of numerical understanding and reasoning skills that require improvement.

Equally, comparing learners' scores may mask significant differences in their performance. For example, two learners may both score 12. However, within that overall score Learner A may show a clear ability to communicate effectively but need support to review their work, while Learner B may show the exact opposite.

For this reason, the markscheme and the accompanying materials are designed to provide teachers with a deeper assessment of both individual and class performance.

Diagnostic tool

To assist in interpreting and building on test performance, a diagnostic tool is provided.

This can be accessed via gov.wales/learning

At its simplest level, the diagnostic tool provides markers with a check on the total score for that particular learner.

However, completing the full set of data on each learner gives the teacher an overview of class performance, identifying group or individual strengths and problem areas and hence indicating further teaching needs.

Building on the test: classroom activities

Having assessed learners' ability to apply numerical reasoning and identified areas for both individual and class development, teachers may then wish to build on the test experience and materials through accessing gov.wales/learning

This site provides sample test items and associated markschemes, but also includes additional materials with suggestions for linked classroom activities to extend the learning.

In addition, further activities supporting the learning and teaching of numerical reasoning can be found on gov.wales/learning

Markscheme

General marking rules

It is essential that you apply this markscheme, the marking guidance and the general marking rules given below to your own marking, in order for the standardised scores to be valid.

- The marking guidance shown within the markscheme should be applied to find the relevant score for each question. No half marks are awarded.
- At the end of each double-page spread of marking, record the total number of marks in the 'total' box in the bottom right-hand corner. Check that the mark recorded does not exceed the maximum number of marks available.
- Once the marking has been completed, add up the total number of marks awarded. This is the total score and should be recorded on the cover of the test booklet and input onto the relevant mark sheet on the school's management information system, together with the details and date of the test taken.
- Markers should record their initials on the cover of the test booklet to assist quality assurance.

This data should then be submitted as part of the Welsh National Tests Data Collection (WNTDC). Further details are available from the *National Reading and Numeracy Tests – Test administration handbook 2018* on the Learning Wales website and in *Welsh National Tests Data Collection and reporting arrangements 2017/18* available on the Welsh Government website.

Marking guidance

It is important that the tests are marked accurately. The questions and answers below help to develop a common understanding of how to mark fairly and consistently.

Must learners use the answer boxes?

Provided there is no ambiguity, learners can respond anywhere on the page. If there is more than one answer, the one in the answer box must be marked, even if incorrect. However, if the incorrect answer is clearly because of a transcription error (e.g. 65 has been copied as 56), mark the answer shown in the working.

Does it matter if the learner writes the answer differently from that shown in the markscheme?

Numerically equivalent answers (e.g. eight for 8, or two-quarters or 0.5 for half) should be marked as correct unless the markscheme states otherwise.

How should I mark answers involving money?

Money can be shown in pounds or pence, but a missing zero, e.g. £4.7, should be marked as incorrect unless the markscheme states otherwise.

How should I mark answers involving time?

In the real world, specific times are shown in a multiplicity of ways so accept, for example, 02:30, 2.30, half past 2, etc. Do not accept 2.3 as this is ambiguous. The same principle should be used for marking time intervals, e.g. for two and a half hours accept 2.5 but not 2.5pm.

What if the method is wrong but the answer is correct?

Unless the markscheme states otherwise, correct responses should be marked as correct even if the working is incorrect as learners may have started again without showing their revised approach.

What if the learner has shown understanding but has misread information in the question?

It is important that learners select the appropriate information and review their work. However, for most questions, method marks can still be obtained.

What should I do about crossed-out work?

Working which has been crossed out and not replaced can be marked if it is still legible.

What is the difference between a numerical error and a conceptual error?

A numerical error is one in which a slip is made, e.g. within 86×67 the learner works out $6 \times 7 = 54$ within an otherwise correct response. A conceptual error is a more serious misunderstanding for which no method marks are available, e.g. if 86×60 is recorded as 516 rather than 5160
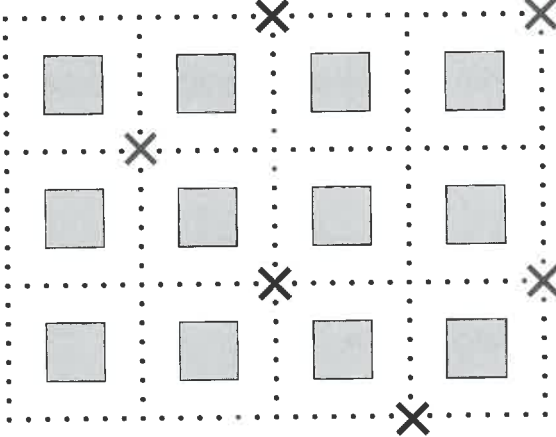
What if learners use a method that is not shown within the markscheme?
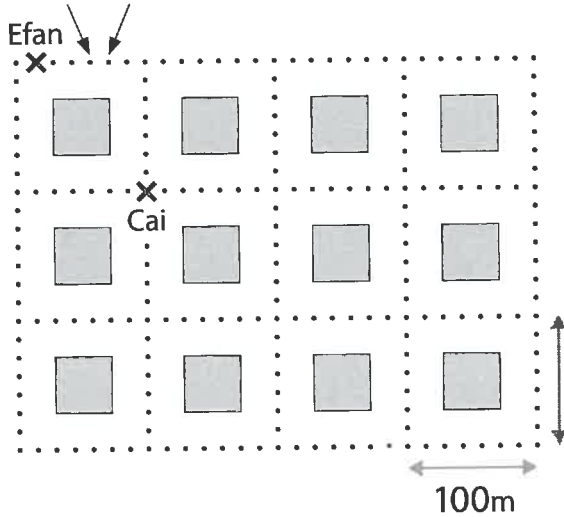
The markscheme shows the most common methods. However, there can be a wide range of approaches to a question and any correct method, however idiosyncratic, is acceptable.

In all questions, the correct answer should be given full marks, whatever the method used, unless the markscheme states otherwise.

Most questions give partial credit for responses that show a correct method but the answer is incorrect or incomplete: a correct method is one that would lead to a correct answer if there were no numerical errors.

Q	Marks	Answer
1i	2m	Shows all six possible positions with none incorrect, i.e.
	Or 1m	Shows five correct positions with not more than one incorrect

1ii	1m	Indicates a position between three and four dots (inclusive) to the right of Efan, as shown by the arrows

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Question 1i: Exemplars

Correct; **2 marks**

- The use of dots not crosses is unambiguous.

5 correct, 1 incorrect; **1 mark**

- The lines can be ignored, but one position is 300m, not 200m, from the start.

Question 1ii: Exemplars

Correct; **1 mark**

- This learner shows good understanding by drawing the construction line.

Correct; **1 mark**

- The marker is clearly intended to be centred on the fourth dot to the right of Efan, so is accepted.

Incorrect; **0 marks**

Common error This common error ignores that Efan will be visible before reaching the intersection.

Q	Marks	Answer
1iii	3m	States that there is not enough because they need **3100m** (or 3.1km) Or Gives a complete justification with no incorrect statements or conversions, e.g. • 1600m for the horizontals 1400m left 300m for each vertical so only enough for 4 verticals
	Or 2m	Shows or implies that there are **31** 'sections' (each 100m) of road, e.g. • Shows 31 (or 3100) • Shows both 16 and 15 (or 1600 and 1500) • Shows both 17 and 14 (or 1700 and 1400)

	Or 1m	Shows both **400** and **300**
		
		Or
		
		Shows any of the following, but not as part of counting on:
		
		  16 (or 1600)
		  15 (or 1500)
		  17 (or 1700)
		  14 (or 1400)

◄ Accept units omitted provided there is no ambiguity

◄ For 3m, do not accept incorrect statements or conversions, e.g. They need 3100m = 31km so no

◄ Throughout, the relevance of a number must be clear, e.g. do not accept 31 if part of counting on beyond 31

◄ 16 is the number of horizontals, 15 the number of verticals

17 is the number of internals, 14 the number on the perimeter

◄ Lengths of a horizontal and a vertical

Note: Although extremely unlikely, learners could assume a width for the carpet and then remove overlaps. For this approach to gain marks, the assumed width of the carpet must be made explicit. Mark the work to the spirit of the markscheme.

Question 1iii: Exemplars

Down = 5 lines/300m
across = 4 lines/400m

400
400
400
400
1600

400m
× 4
= 1600

5
× 300m = 1500m

1500m
+ 1600m

no it wont she will need 100m more

Correct; 3 marks

- This work is explained and the justification is correct.

---

250   180   110   40

250 190 120 100 :50
270   200   130   30

280 210 140 90 :60
290   220   150   20

300 230 160 80 10 100m
310   240   170   10

100m
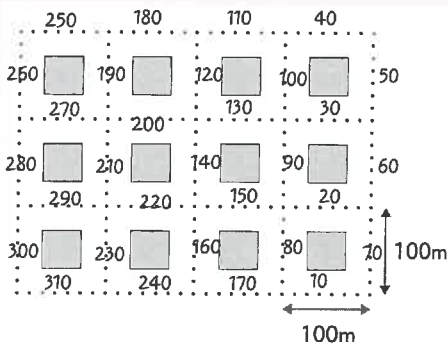
Shows or implies 31 sections; 2 marks

- It is clear that this learner is counting in 10's not 100's. However, 310 is the highest number on their grid, which is sufficient to imply that there are 31 sections of road.

1.4km for the outskirts

900m
800m

1400
900
800
3100

Its enough.

Shows or implies 31 sections; 2 marks

The working is correct but the conclusion 'its enough' is wrong.

3km   there is enough
                    2.8km
400m across × 2 = 800m
300m down × 2 = 600m
    || || +
                    1400m
                    =
800m × 2 = 1600m   1600
600 × 2 = 1200m   1200
                      2800

Shows 400 and 300 (or 1600 or 1400); 1 mark

- One vertical is omitted.

3000m = 3km
not enough carpet

Incomplete; 0 marks

- 3000m refers to the carpet length. There is no evidence to show that this learner has engaged with the road length.

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Q	Marks	Answer
2	3m	**13** passengers
	Or 2m	Shows **270** or **288**
	Or 1m	Shows **15.7**(...) Or Answer **15** or **16** with **283 ÷ 18** shown

◀ **Number of passengers on 15 or 16 full trips**

◀ **283 ÷ 18**

Question 2: Exemplars

283 ÷ 18 = 15.7 so 15 full trips.
15 × 18 = 270
283 − 270 = 13

| 13 | passengers |

Correct; 3 marks

Efficient method The method is clear and concise.

There would be ~~There~~ 13 people on the last trip because the most eighteens that go up to 283 adds up to 270 leaving 13 remaining.

18	)1
36	)2
54	)3
72	)4
90	)5
108	)6
126	)7
126 (252) × 2	)14
270	)15

13

| ~~15~~ | passengers |

Correct; 3 marks

- This learner counts on in 18's. This time-consuming method is shortened by realising that time and effort can be saved by doubling 7 lots to get closer to the total required.

283
÷ 18
‾‾‾‾‾
15.72
2

There will be about 15 passengers on the last trip

Shows 15.7(...); 1 mark

Common error A correct first step is shown, but this learner is unable to interpret the result.

| 5 | passengers |

Incorrect; 0 marks

- This learner needs support to understand division. Subtracting 18's is inefficient and it is unsurprising that in doing so an error is made.

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Q	Marks	Answer
3	2m	**25**% orange juice, **75**% lemonade
	Or 1m	**One** correct Or Values in incorrect order, i.e. **75**% orange juice, **25**% lemonade Or Shows the correct proportions for both, e.g. • $\frac{1}{4}$ orange, $\frac{3}{4}$ (or $\frac{1}{4}+\frac{1}{2}$) lemonade

Q	Marks	Answer
4	2m	**360**cm
	Or 1m	Shows or implies that the side length of the hexagon is **20**(cm) Or Shows a method that would lead to 360cm if calculated correctly, e.g. • $3 \times 120 = 260$ (error) • $120 \div 6 = 18$ (error) $18 \times 18 = 316$ (error)

Question 3: Exemplars

50% + 50% makes full
drink half 25%
of each then adds
another 50% of lemonade

__25__% orange juice, __75__% lemonade

Correct; 2 marks

$\frac{1}{2}$L $\frac{1}{2}$L
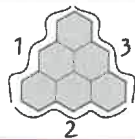
$\frac{1}{2}$O $\frac{1}{4}$L $\frac{1}{4}$O

_____% orange juice, _____% lemonade

Correct proportions; 1 mark

- Although the modelling is simplistic (the liquids are mixed), the learner clearly shows that $\frac{1}{4}$ will be orange and $\frac{3}{4}$ will be lemonade.

Question 4: Exemplars

What is the perimeter of the new shape?

$3 \times 120 = 360$

cm

Correct; 2 marks

- This learner uses their spatial awareness to reason that the perimeter of the new shape is $3 \times$ the perimeter of the hexagon.

$120 \div 6 = 20$
$19 \times 20 = 380$

380 cm

Side length 20(cm); 1 mark

Common error It is likely that 19 is a miscount for the number of edges on the perimeter of the new shape.

120	240	480
120	240	240
240	480	720

720 cm

Incorrect; 0 marks

Common error Finding six lots of 120 ignores the fact that the hexagons have joined edges that are not part of the shape's perimeter. This learner may need support to understand perimeter.

Q	Marks	Answer
5i	1m	$25 \times 12 = 300$

Q	Marks	Answer
5ii	1m	$768 \div 24 = 32$

Q	Marks	Answer
6	2m	£**1.90**

	Or 1m	Answer **1.9**
		
		Or
		
		Shows **4.7(0)** or **470**
		
		Or
		
		Shows a method that would lead to £1.90 if calculated correctly, e.g.
		
		• 6.6 – 2.8 = 2.8 (error)
		  2.8 ÷ 2 = 1.4
		  Answer £1.40

◀ **Amount, in £ or pence, that each girl has**

Questions 5i and 5ii: Exemplar

| 2 | 5 | × | 1 | 2 | = | 3 | 0 | 0 |

| 2 | 6 | 8 | ÷ | 2 | ~~3~~²⁰ | = | 3 | 2 |

168 ÷ 26 = 6.46   168 ÷ 21 = 8   168 ÷ 22 = 7.63
168 ÷ 27 = 6.22   168 ÷ 20 = 84   168 ÷ 23 = 7.30
168 ÷ 28 = 6   168 ÷ 25 = 6.72   168 ÷ 24 = 7
168 ÷ 29 = 5.793

Part i correct; **1 mark**
Part ii incorrect; **0 marks**

- This learner wastes a lot of time trying different divisors. Number sense should have led this learner to realise that a 3-digit number beginning with 1 or 2 cannot give the answer 32 when divided by twenty-something.

Question 6: Exemplars

6.60 – something = 2.80 + same something
3.80 = 2 of them
3.80 ÷ 2 = £1.90

£

Correct; **2 marks**

- This learner uses a pre-algebraic approach to solve the problem. The answer is clearly shown in the working.

take 10p off   then
Kim. and   they
give it to   will
nadeen.   both
take £2   have
off nadeen   £4.70
and give it
to kim.   £ 2.30

Correct method (or shows 4.70); **1 mark**

- The method is correct as £2 – 10p = £1.90 but the learner then gets confused.

£6.60   £9.40 ÷ 2 = £4.90
+ £2.80   ⁵.⁷
─────   6̸.60
£9.40   − 4.90
               ─────
               1.70

£ 1.70

Correct method; **1 mark**

- The only error is that half of £9.40 is £4.70 not £4.90 as shown here. Checking work is an essential part of becoming numerate.

Q	Marks	Answer	
7	3m	**50** minutes	

	Or 2m	Shows **300** (or 5 × 60)
		
		Or
		
		Lists times that show each lesson is 50 minutes
		
		Or
		
		Shows a method that would lead to 50 minutes if calculated correctly, including correct conversion of hours to minutes, e.g.
		
		• 9:30 to 3:45 is 5 hours 15 minutes (error)
		  less 1 hour 15 minutes
		  = 4 hours for lessons
		  $4 \div 6 = \frac{2}{3}$ hour = 40 minutes
			◀ **Total number of minutes for lessons**
			For 2m, do not accept 5 hours

	Or 1m	Shows **375** (minutes)
		
		Or
		
		Shows **5 hours**
		
		Or
		
		Either of the following answers:
		  62.5 (accept 62 or 63) minutes
		  52.5 (accept 52 or 53) minutes
			◀ **Length of the school day**
			Do not accept 6 hours 15 minutes
			
			◀ **Total time for lessons**
			
			◀ **Has ignored times for:**
			break and lunch, or
			break only
			(if lunch only is ignored the calculations are much easier so no marks can be given)

Question 7: Exemplars

$6\frac{1}{4} - 1\frac{1}{4} = 5$

$5 \div 6 = 0.83$

$0.83 \times 60 = 49.8$ $\boxed{50}$ minutes

Correct; 3 marks

- Had 49.8 minutes been given as the answer, 2 marks would have been given for showing a correct method.

10.30	10:15
10.45	~~11:60~~
11.45	11:00
12.45	11:15
1.45	12:00
2.45	12:45
3.45	1:45
	2:30
10:10	3:15
10:50	
11:05	9:30
11:45	10:20
12:25	11:10
1:25	11:25
2:05	12:15
2:45	1:05
	2:05
lesson – 50mins	2:55

$\boxed{}$ minutes

Correct; 3 marks

- This learner trials different lesson times, inserting a morning break and a lunch hour. Although the correct answer is found, the method is time-consuming. Finding efficient ways of solving problems is part of becoming numerate.

9:30

9:45

10:45 to 3:45 is 5 hours

$5 \div 6 = 0.83333$ $\boxed{83}$ minutes

Shows 5 hours; 1 mark

- The positioning of break and lunch can be ignored – in this context it is a good problem-solving technique to deal with these first. The method is incomplete as it does not include correct conversion of hours to minutes, so only 1 mark can be given.

2.5   3.45

9:30   12:00   3:45

2.5 + 3.45 = 5.95 hours

$5.95 \times 60 = 357$ minutes

$357 \div 6 = 59.5$ $\boxed{60}$ minutes

Incorrect; 0 marks

- This learner ignores break and lunch. No correct values are seen so no marks can be given.

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