REASONING

7ER15MS

Marking the test

and understanding performance

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.

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 learning.wales.gov.uk

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 learning.wales.gov.uk

This site provides the 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 learning.wales.gov.uk

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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 2015* on the Learning Wales website and in *Welsh National Tests Data Collection and reporting arrangements 2014/15* 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, for example 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.

7ER15 Reasoning test: Markscheme

Q	Marks	Answer
1i	1m	$76 - 73 = 3$

Q	Marks	Answer
1ii	1m	$73 - 67 = 6$

Q	Marks	Answer
1iii	1m	$16 \times 6 = 96$

Q	Marks	Answer	
1iv	2m	Gives a correct number sentence for each of the four operations Multiplication and division each use **three 1's** and **two 0's**, e.g. $10 \times 1 = 10$ $10 \div 1 = 10$ $111 \times 0 = 0$ $1 = 10 \div 10$ Addition and subtraction each use **two 1's** and **three 0's**, e.g. $10 + 0 = 10$ $10 - 0 = 10$ $01 = 0 + 01$ $10 - 10 = 0$	◀ **Each sentence must include =**
	Or 1m	Gives a correct number sentence for **at least two** of the four operations	

Question 1iv: Exemplars

A number sentence using **multiplication:**

$$10 \times 0.1 = 1$$

A number sentence using **division:**

$$1 \div 0.1 = 10$$

A number sentence using **addition:**

$$10 = 10 + 0$$

A number sentence using **subtraction:**

$$10 - 10 = 0$$

All four correct; 2 marks

- Provided the correct number of each digit is shown, the inclusion of a decimal point is acceptable.

A number sentence using **multiplication:**

$$11 \times 1 \times 0 = 0$$

A number sentence using **division:**

$$1 \div 10 = 10$$

A number sentence using **addition:**

$$11000 \quad 10 \; is \; 10 + 0$$

A number sentence using **subtraction:**

$$10 - 10 = 0$$

Three correct; 1 mark

- Accept 'is' for '=', and 11000 by the side of the addition is this learner's record of the digits to be used so can be ignored. However, the response for division is incorrect.

A number sentence using **multiplication:**

$$01 = 01 \times 1$$

A number sentence using **division:**

$$1 = \frac{10}{10}$$

A number sentence using **addition:**

$$10 + 1 = 11$$

A number sentence using **subtraction:**

$$10 - 10 = 0$$

Three correct; 1 mark

- The addition is incorrect as it uses four 1's. The others are correct as we allow the use of 01 to indicate 1

A number sentence using **multiplication:**

$$101 \times 10$$

A number sentence using **division:**

$$101 \div 10$$

A number sentence using **addition:**

$$100 + 01$$

A number sentence using **subtraction:**

$$100 - 10$$

None correct; 0 marks

common error This learner appears not to know the meaning of 'number sentence'. Although the frequency of each set of digits is correct, no marks can be given.

Q	Marks	Answer
2	2m	**4.5**cm
	Or 1m	Shows a method that would lead to 4.5 if calculated correctly, e.g. • 6 × 3, then ÷ 4 • 18 ÷ 2, then ÷ 2 again

Q	Marks	Answer	
3	2m	**17.7** seconds	
	Or 1m	Gives the answer **18.7** seconds	◀ **Has added 0.5 seconds rather than subtracting**

Question 2: Exemplars

$4\frac{1}{2}$ cm	**Correct; 2 marks** • $4\frac{1}{2}$ is numerically equivalent to 4.5 so the answer is acceptable, but this learner would benefit from understanding why working should be shown.
6 + 6 + 6 = 18 5 + 5 + 5 + 5 = 20 4 + 4 + 4 + 4 = 16 4.5 + 4.5 + 4.5 + 4.5 = 18 **4.5** cm	**Correct; 2 marks** • This learner uses repeated addition and trial and improvement, suggesting that they may not be confident with division and multiplication.
6 × 3 = 24 24 ÷ 4 = 6 **6** cm	**Correct method; 1 mark** • Had this learner stopped to reflect, they would have realised that the answer 6cm could not be correct as it is the height of the orange block. However, the method is correct.
the orange is 6cm and it is sightly bigger and the blue is 5cm **5** cm	**Incorrect; 0 marks** Guessing, and measuring, are both common errors.

Question 3: Exemplars

17.7 18.7 seconds	**Shows both 17.7 and 18.7; 1 mark** • This response would gain 2 marks if 17.7 was the answer, but 18.7 scores only 1 mark. As we cannot be sure which value is intended to be the answer, only 1 mark can be given.
$18.1\frac{1}{2}$ seconds	**Incorrect; 0 marks** This learner needs support to understand decimals.
18.3 seconds	**Incorrect; 0 marks** This is another common error which assumes that half a second is 0.1
9.1 seconds	**Incorrect; 0 marks** 'Half a second faster' has been misinterpreted as 'half as fast'.

Q	Marks	Answer
4	3m	**£18.30**
	Or 2m	Shows **18.30** (accept 18.3 and 1830) Or Shows both **12.75** and **31.05** (accept 1275 and 3105) Or Shows both **20.70** and **2.40** (accept 20.7, 2070, 2.4 and 240) Or Shows a method, using multiplication, that would lead to 18.30 or 1830 if calculated correctly, e.g. • $45 \times 69 - 15 \times 85$ • $(45 - 15) \times 69 - 16 \times 15$
	Or 1m	Shows any of the following: **12.75** (accept 1275) **31.05** (accept 3105) **20.70** (accept 20.7 and 2070) **2.40** (accept 2.4 and 240)

◁ Cost of making the cards, and the income from selling them

◁ Profit on 69 cards sold and loss on 16 cards not sold

Question 4: Exemplars

85 × 15 = 1260
69 × 45 = 3105

3105 – 1260 = 1845

£ 1845

Correct method; 2 marks

- The answer to 85 × 15 is incorrect, but the method would lead to 1830. However, this learner needs encouragement to sense-check their answer – the omission of a decimal point means that the profit is unrealistic.

Each card gets 30p profit, they sold 69 of them so I did 30 × 69 on the calculator and that gave me 20.7 so then I knew to do the cards they didn't sell so then I did 85 – 69 = 16 which I timesed by 15 because that is the cost to make which is 3.1 and 20.7 take away 3.1 is 17.6

£ 17.60

Correct method; 2 marks

- This learner finds the profit on the cards sold then subtracts the cost of making the other 16 cards (which should be £2.40).

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45 – 15 = 30
30 × 69 = 2070
acording to calculater

£20.70p
£ 2070p

Shows 20.70; 1 mark

Common error — This is a common error – the learner has forgotten that another 16 cards were made.

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69 × 45 and it gives you 31.05

£ 31.05

Shows 31.05; 1 mark

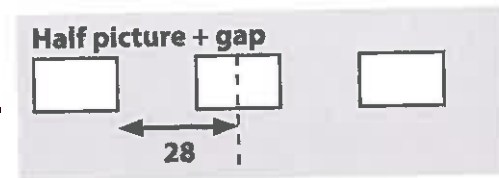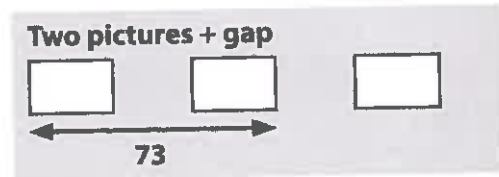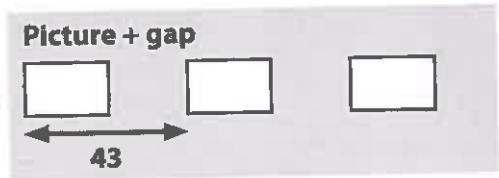Common error — This learner may not understand 'profit' – they have worked with income only, not costs.

£45 | 1
£90 | 2
135 | 3
180 | 4
225 | 5
270 | 6
315 | 7
360 | 8
405 | 9
450 | 10
495 | 11
540 | 12
585 | 13
630 | 14

£

Incorrect; 0 marks

- This learner tries to work with repeated addition of 45's. As the method does not include multiplication and no key values are shown, no marks can be given.

Q	Marks	Answer
5	4m	**13**cm
	Or 3m	Shows a method that would lead to 13cm if calculated correctly
	Or 2m	Shows **26** Or Shows **43** Or Shows **73** Or Shows **28**
	Or 1m	Shows **56** Or Shows a method that would lead to 26, 43, 73 or 28 if calculated correctly

Both gaps

◀ [ ] ↔ 13 [ ] ↔ 13 [ ]

Picture + gap

◀ [ ] [ ] [ ]
↤ 43 ↦

Two pictures + gap

◀ [ ] [ ] [ ]
↤ 73 ↦

Half picture + gap

◀ [ ] [¦] [ ]
↤ 28 ↦ ¦

Gap between the existing pictures

◀ [ ] ↔ 56 ↔ [ ]

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Question 5: Exemplars

$$13$$
$$116$$
$$2\overline{)26}$$
$$-90$$
$$26$$
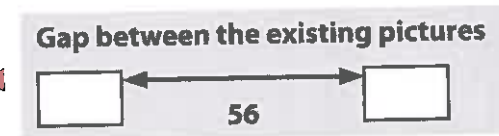
13 cm

Correct; 4 marks

- This learner shows a clear and concise method.

$$116 - 30 = 86$$
$$86 \div 2 = 43$$
$$43 - 30 = 13$$

cm

Correct; 4 marks

- This method is correct, but surprising – the learner has subtracted the width of the picture to be hung from the total distance, then halved to find the width of a picture and a gap, then subtracted 30, the width of the picture already hanging.

Well what I did was I did do 30 + 30 = 60 then I did do 116 − 60 = 46 and I did half it to find the middle = 23 and then I thought I draw a picture like this

$$\xleftarrow{23}$$

and I minus 15 to get my answer

8 cm

Correct method; 3 marks

- This learner would benefit from working more concisely and checking their calculations. However, the method, $(116 - 60) \div 2 - 15$, would lead to 13 if calculated correctly.

They should be 28²cm because the width of the wall is 116²cm the pictures are 30cm so 30 + 30 = 60
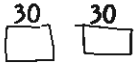$$116 - 60 = 56$$

half 56 = 28

28 cm

Shows 28; 2 marks

- '²cm' in the working can be ignored, though this learner would benefit from discussion about units and why lengths are not measured in cm²

$$30 \quad 30 \qquad 58$$
$$\qquad\qquad\qquad 15\,-$$
$$\qquad\qquad\qquad 43$$
$$116 \div 2 = 58$$
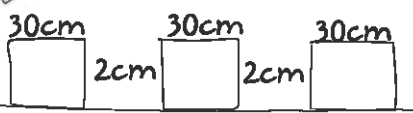$$30 \div 2 = 15$$

43 cm

Shows 43; 2 marks

- This learner has not subtracted 30cm to account for a picture that is already on the wall.

30cm   30cm   30cm

2cm   2cm

116cm

2 cm

Incorrect; 0 marks

- Drawing a diagram is a good strategy, but no correct values or method is shown.

Q	Marks	Answer
6	4m	**45** minutes
	Or 3m	Shows or implies both journey times, i.e. **30** minutes to cycle **up** (accept 10:20) and **10** minutes to cycle **down** (accept 11:05)
	Or 2m	Shows or implies **10** minutes to cycle **down** (accept 11:05) Or Their answer is **55 minus their time down**, e.g. • 15 minutes down (error) answer 40 minutes
	Or 1m	Shows or implies **30** minutes to cycle **up** (accept 10:20) Or Shows **85** (accept 1h 25)

◁ **Throughout, accept units omitted**

◁ **Their time down must be less than 30 minutes**

◁ **Total time available, in minutes**

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Question 6: Exemplars

9:50am - leave house
2.5 miles to library
1 hours = 5 miles
2.5 miles = 30 minutes
1 hour = 15 miles downhill
30 mins = 7.5 miles downhill
15 mins = 3.75 miles downhill
5 mins = 1.25 miles downhill
10 mins = 2.5 miles downhill

9:50am : house
10:20am : library
11:05am : Leaving library
11:15am : home

45 minutes

Correct; 4 marks

- Each step of the working is clearly shown and interpreted correctly.

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uphill = 5mph   downhill = 15mph

takes him $\frac{1}{2}$ hour   9:50am + $\frac{1}{2}$ hour = 10:20am

5mph x 3 = 15mph   30min ÷ 3 = 10mins

10min + 30minutes = 40m

$\begin{array}{r} 11:15 \\ -9:50 \\ \hline 1.65 \end{array}$

11:15am - 9:50am = 1.65

165min - 40mins = 125 mins   1.25 hours minutes

30 minutes up, 10 minutes down; 3 marks

Common error This learner clearly shows both journey times (half hour and 10 minutes) but has then worked as if there are 100 minutes in one hour rather than 60

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1 = 15 miles down
1 = 5 miles up
30 mins = 5 miles down
30 mins = uphill
15 mins = downhill
45 mins
1 hr 25 mins
40 mins

40 minutes

Their answer is 55 minus their time down; 2 marks

Common error As their answer, 40, is 55 minus their time down (15) we know that the only error is in the time down, which is why this warrants 2 marks. Assuming that the time down is 15 minutes is a common error.

2.5 miles uphill
1 hour = 5 miles uphill
$\frac{1}{2}$ hour = 2.5 miles uphill
uphill = $\frac{1}{2}$ hour

9:50 am ⌢ 10:20 am
$\frac{1}{2}$ hours

1 hour = 15 miles downhill
$\frac{1}{2}$ hour = 7.5 miles downhill
$\frac{1}{4}$ hour = 3.75 miles downhill

10 minutes

30 minutes up; 1 mark

- Although 10 minutes is shown, it is not clear that this is the time downhill so it cannot be credited.

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miles   time
5   =   1 hour
2.5   =   half an hour

9:50 + 1 hour = 10:50
10:50 to 11:15 is 25

there and back is 1 hour
half an hour there

25 minutes

30 minutes up; 1 mark

- This learner has assumed that the time downhill is 30 minutes. As this results in an easier calculation, follow-through is not allowed; the time down must be less than 30 minutes.