REASONING

7ER14

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 teaching and learning of numerical reasoning can be found on learning.wales.gov.uk

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 National Data Collection (NDC). Further details are available from the *National Reading and Numeracy Tests – 2014 test administration handbook* on the Learning Wales website and in *National Data Collection and reporting arrangements 2013/14* 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
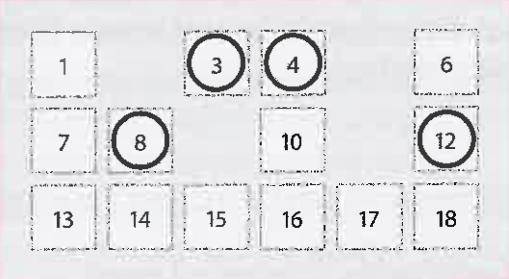
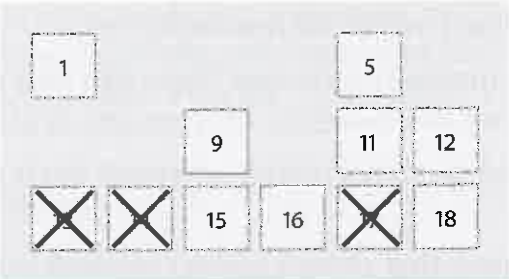### What if learners use a method that is not shown within the markscheme?

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.

7ER14 Reasoning test: Markscheme

Q	Marks	Answer
1i	1m	**3**, **4**, **8** and **12**, with no additional incorrect values, i.e. 1 (3) (4) 6 7 (8) 10 (12) 13 14 15 16 17 18

Q	Marks	Answer
1ii	2m	**13**, **14** and **17**, with no additional incorrect values, i.e. 1 5 9 11 12 ✗ ✗ 15 16 ✗ 18
	Or 1m	Any **two** of 13, 14 and 17, with no additional incorrect values Or 13, 14 and 17, with not more than one additional incorrect value

Q	Marks	Answer
1iii	2m	Identifies the incorrect bullet as **even ÷ even** and makes a correct statement, using an example, to justify why, e.g. • The divide is wrong, $4 \div 4$ is 1 which is odd not even • The last one because $6 \div 2 = 3$
	Or 1m	Identifies the incorrect bullet as even ÷ even, even if the justification is omitted or incorrect

Question 1ii: Exemplar
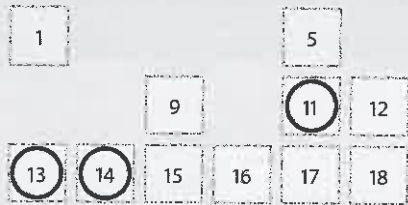
11 ✗ 13 ✓ and 14 ✓; 0 marks

- The use of circles rather than crosses is unambiguous. However, there are only two of 13, 14 and 17; 11 is an additional incorrect value so there are two errors which scores no marks.

Question 1iii: Exemplars

Even ÷ even is not correct because $\overset{0\ 5}{4)\ \cancel{20}}$ $4)\ \dfrac{05\,r2}{22}$	**Correct; 2 marks** • The use of a remainder (or fraction or decimal) shows that the outcome is not even.
It's divide because 10 ÷ 4 is not even	**Correct; 2 marks** • '10 ÷ 4 is not even' is a correct statement (ignore the fact that 10 is not on the dice).
it's dividing because $\begin{array}{l}2 + 2 = 4\\ 2 \times 2 = 4\\ 4 - 2 = 2\end{array}$ and dividing is always odd because $2 \div 2 = 1$	**Division identified; 1 mark** • This learner shows a correct counter-example, $2 \div 2 = 1$, but 'dividing is always odd' is an incorrect statement.
Bullet 4 is incorrect because 10 ÷ 4 can't be done also 20 ÷ 6 can't be done	**Division identified; 1 mark** • 'Bullet 4' clearly identifies division. However, that the divisions 'can't be done' is an incorrect statement.
even ÷ even because when divide something it could be any number of how many time it goes into something	**Division identified; 1 mark** • No example is given.
6 + 4 = 10 6 − 4 = 2 6 × 4 = 24 6 ÷ 4 = 0r4	**No operation identified; 0 marks** • This work shows poor numerical communication as it is not clear which operation has been chosen (and 6 ÷ 4 = 0r4 is an incorrect statement).

Q	Marks	Answer
2	3m	All six of the following, in any order, with no incorrect times: **03:33** **03:42** **03:51** **04:05** **04:14** **04:23**
	Or 2m	Shows **four** or **five** correct times, with not more than one incorrect time
	Or 1m	Shows **two** or **three** correct times, with not more than two incorrect times

Q	Marks	Answer
3	2m	**432** glass tiles
	Or 1m	Shows clearly that the area of the rectangle is **3 times** that of the square Or Shows **10800** and **3600** Or Shows **24** and **18** Or Shows a method that would lead to 432 if calculated correctly, e.g. • 144 + 144 + 72 + 72

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Question 2: Exemplars

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Times 3:23 3:42 3:51 ~~3:60~~ 4:00 4:05	**Four correct times; 2 marks** • This learner shows a systematic approach but has omitted 04:14 and 04:23 • Times written with the leading 0 omitted are unambiguous, so are acceptable.
03:51=9 04:41=9 03:15=9 04:14=9	**Two correct times; 1 mark** • 03:51 and 04:14 are correct. The others are not within the relevant time frame so can be ignored.
3:30 3:43 3:57 4:10 4:22 3:31 3:44 3:58 4:11 4:23 3:32 3:45 3:59 4:12 4:24 3:33 ✓ 3:46 4:00 4:13 4:25 3:34 3:47 4:01 4:14 4:26 3:35 3:48 4:02 4:15 4:27 3:36 3:49 4:03 4:16 4:28 3:37 3:50 4:04 4:17 4:29 3:38 3:51 4:05 ✓ 4:18 4:30 3:39 3:52 4:06 4:19 3:40 3:53 4:07 4:20 3:41 3:54 4:08 4:21 3:42 3:55 4:09 3:56	**Two correct times; 1 mark** • This learner has used a time-consuming approach, listing every minute. The ticks clearly identify the answers so those without ticks need not be taken as incorrect times.

Question 3: Exemplars
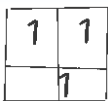
1 | 1 | 1 3 x 144 = 432 **432** glass tiles	**Correct; 2 marks** • This learner has worked efficiently, identifying the spatial relationship between the square and rectangle.
each individual tiles are 5cm because 60 ÷ 12 = 5 ~~to~~ and 120 ÷ 5 = 24 and 24 + 18 = 42 **420** glass tiles	**24 and 18 seen; 1 mark** • This method is correct until the final line where there is a conceptual error: the learner has added rather than multiplied the number of tiles.

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Q	Marks	Answer
4	4m	**12** bricks
	Or 3m	Shows a method that would lead to 12 if calculated correctly, e.g. 1 brick is 5 so the cat is 30 90 − 30 = 50 (error) 50 ÷ 5 = 10
	Or 2m	Shows **30** (but not from counting on in fives) ◄ **Height of the cat, in cm** Or Counts on in **fives** correctly, showing at least three consecutive terms, e.g. 45, 50, 55 … 5, 10, 15, 20
	Or 1m	Shows the intent to count on in **fives**, even if there are errors Or Clearly links **5** to the height of one brick Or Gives the answer **18** bricks ◄ **The number of bricks that would give a height of 90cm**

Question 4: Exemplars

40 – 35 = 5cm (one brick)
35 – 5 = 30cm (how tall the cat is)
90 – 30 = 60cm (how tall the bricks are)
60 ÷ 5 = 12 (number of bricks)

| 12 | bricks |

Correct; 4 marks

- This learner shows very clear numerical communication.

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18 x 5 = 90 so it would be
18 bricks high without the cat
but the cat is 6 bricks so 12

| | bricks |

Correct; 4 marks

- This is a correct alternative method. The answer is clearly shown in the working.

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5   6   7   8   9   10   11   12   13
25 30 35 40 45 50   55   60   65
5   10 15 20
1   2   3   4

Now the cat sits on more bricks.

You cannot see all the bricks.

The total height is 90cm.

Work out how many bricks there are.

height
90cm

Counts on in fives correctly; 2 marks

- This learner has understood that the height of each brick is 5cm but has not used that knowledge to solve the problem.

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5 times table to ninty

| 18 | bricks |

Answer 18; 1 mark

The answer 18 shows understanding of the height of each brick, but the height of the cat has not been taken into account.

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cat = 3.6cm

bricks = $\frac{1}{2}$ cm

see 5 bricks

| 49 | bricks |

Incorrect; 0 marks

- The dimensions 3.6cm and $\frac{1}{2}$ cm suggest that this learner has used a ruler to measure the diagrams. Although the value 5 is shown, it is not linked to the height of a brick so no credit can be given.

Q	Marks	Answer
5i	4m	Shows or implies what is to be bought and gives the correct total cost in £, with units, i.e. **5 tubs** ice cream (accept 5 × 1.75 or equivalent), and **10 packets** cones (accept 10 × 40 or equivalent), and total cost **£12.75**
	Or 3m	Shows or implies that **5 tubs** of ice cream and **10 packets** of cones are needed, e.g. • Shows 12.75 (or 1275) • Shows 8.75 (or 875) and 4 (or 400) • Shows 5 × 1.75, 10 × 40
	Or 2m	Shows or implies that **5 tubs** of ice cream are needed, e.g. • Shows 8.75 (or 875) • Shows 5 × 1.75
	Or 1m	Shows or implies that **10 packets** of cones are needed (as there are 10 cones in a packet, do not accept sight of 10 without further evidence), e.g. • Shows 4 (but not if clearly linked to other than 10 packets of cones) • Shows 10 × 40

5ii	2m	**£37.25** Or Their answer is **50 – their total cost from 5i**
	Or 1m	Shows **£50** or **5000p** (as the cost of one ice cream is 50p, do not accept units omitted)

Question 5: Exemplars

2| tub = 20 ice creams
4| 4
5 tubs 6| 6   £1.75   £1.75+
       8| 8   5x   £1.75
_____ 10| 10   £1.75
£8.75   £1.75
£4 = 10 packs of cones   £1.75
                               _____
  £4.00   100 ic   £8.75
  £8.75   50p each 50.00
 _____   12.75
 £12.75   _____
total cost   £50   38.75

£38.75

Part i, correct; **4 marks**
Part ii, £50 shown; **1 mark**

- Although this work is not well laid out, 5 tubs and 10 packs of cones are shown as is the correct cost of £12.75

- The method for the second question part can be seen in the first question part. Although a calculator is available, this learner has subtracted incorrectly.

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5 tubs - £1.75
        £1.75
        £1.75
        £1.75
        £1.75
       _____
        £8.75

10 cone packs - 40 x 10 = 400p - £4.00

£5.00
(5 x 10 = 50p)
(50p x 100 = £5.00)

Part i, £8.75 and £4; **3 marks**
Part ii, incorrect; **0 marks**

- The total cost is omitted. The use of repeated addition, as with the learner above, suggests a lack of confidence with multiplication.

- Learners need to consider whether their answers are sensible: 50p × 100 = £5.00 shows a lack of reflection.

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they   need to buy 5 tubs
of 2 litres tubs and 10 cones

total = £10.75

sell for £50

profit = £39.25

Part i, 5 tubs; **2 marks**
Part ii, correct follow-through; **2 marks**

- As the cones are bought in packets of 10, '10 cones' is not enough to show that 10 packets are needed without 'packets' or supporting working.

- £50 – £10.75 = £39.25 so this question part shows correct follow-through.

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one packet of 10 cones cost 40p
one 2 litre tubs cost £1.75
They will put 100ml into each cone
They will need 10 packets of
10 cones
        £400 total cost

£350 lose

Part i, 10 packets of cones; **1 mark**
Part ii, correct follow-through; **2 marks**

- This learner has confused £ and pence and has not engaged with the cost of ice cream.

- As their cost is greater than £50 the profit is negative. '£350 lose' is acceptable, but £350 would be incorrect and score no marks.