REASONING

8ER15MS

Marking the test

and understanding performance

National Numeracy Tests

Llywodraeth Cymru
Welsh Government

Marking the reasoning test

This document comprises:

- the markscheme for the National Numeracy Test (Reasoning) for Year 8 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

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.

8ER15 Reasoning test: Markscheme

Q	Marks	Answer
1i	1m	**B, A, C**

Accept distances (within tolerances shown below) or unambiguous descriptions, e.g.
- 12 ± 0.2, 20 ± 0.4, 28.5 ± 0.4
- Lake, mountains, grassland

1ii	4m	Justifies their answer of **C, B, A** by clearly showing the correct comparative total for each route, i.e. **41.5** for **C** (accept 40.9 to 42.1 inclusive) **45** for **B** (accept 42.6 to 47.4 inclusive) **51** for **A** (accept 50 to 52 inclusive) (but see note below)
	Or 3m	Shows at least **two** correct totals
	Or 2m	Shows **one** correct total
	Or 1m	Answer **C, B, A** even if there is no, or incorrect, working Or Shows at least one of: Start to north of lake: 33 (± 0.6) North of lake to treasure: 18 (± 0.4) South of lake to treasure: 26 (± 0.4) Horizontal on lake: 31.5 (± 1.8) Horizontal from lake to treasure: 10 (± 0.4)

Accept correct totals that are not explicitly linked to routes, but do not accept a total linked to an incorrect route, e.g.
- 45 linked to A or C

Throughout, ignore assumed or incorrect units, e.g. for 45 accept
- 45 hours or 45cm

Has correctly measured and scaled part of the route through mountains, forest or lake

Note: Although unlikely, as values are comparative accept them in the correct ratio, e.g. for 4m, accept C, B, A with C linked to 83, B linked to 90 and A linked to 102

Question 1ii: Exemplars

	M	F	G	L	total
A	11x3	9x2			51
B		5x2	3.6	3.6x9	46
C		13x2	15.5		41.5

41.5	46	51

fastest time

Correct; 4 marks

- This learner sets out their work effectively and all values are within tolerance. Showing the correct order by using totals rather than letters is acceptable.

51

45

41.5

At least two correct totals; 3 marks

- Annotating the map is an effective and common strategy. All three correct totals are shown, but as this learner has not shown or implied the correct order only 3 marks can be given.

$$15.2$$
$$26 +$$
$$\overline{41.2\text{km}}$$

$$3.5$$
$$31.5$$
$$\underline{10.0}$$
$$45.0$$

$$3.5$$
$$9 \times$$
$$\overline{31.50}$$

$$11$$
$$18 +$$
$$\overline{29\text{km}}$$

A	C	B

fastest time

Two correct totals; 3 marks

- The lack of clear communication makes it difficult to follow this learner's response. 41.2km is within tolerance for C and 45.0km is correct for B. However, 29km is incorrect for A – scaling has not been applied to the distance of 11km through mountains.

I used my ruler and worked out that C was the shortest because it has so much grassland and it is 45

C	A	B

fastest time

Incorrect; 0 marks

- Although 45 is shown, it is linked to C not B so cannot be credited, and the order C, A, B is incorrect.

10km of mountains x 3 = 30km and it is x 9 for the lake so 4km = 36km

fastest time

Incorrect; 0 marks

- Although this learner uses the appropriate scaling for mountains and the lake, the measurements are incorrect so no marks can be given.

Q	Marks	Answer
2	2m	**2, 3** and **10**, in any order
	Or 1m	Gives any three values that **multiply to 60**, in any order, e.g. • 1, 6, 10 • 2, 6, 5

Ignore units, even if incorrect

Q	Marks	Answer
3	2m	**4**cm, with a correct method shown
	Or 1m	Answer 4cm, with no evidence of an incorrect method Or Clearly links a **blue** brick to **3** and a **yellow** brick to **5** Or Shows a correct method that would lead to 4 if calculated correctly, e.g. • 15 ÷ 5 then × 3 = 10 (error) 15 ÷ 3 = 5 10 − 5 = 5

Accept drawing (full size or to scale) as a correct method

As 3 and 5 also represent the number of bricks, the linking must be unambiguous

Question 2: Exemplars

$3 \times 2 \times 10 = 60$
$3 + 2 + 10 = 15$

Correct; 2 marks

- Although the answer boxes are blank, the correct ages are clearly identified within the working.

These three dogs are different ages.
$7+5+3=15$ $8+4+3=15$
$7\times5\times3=105$ ✗ $8\times4\times3=96$
- Their ages, in years, add up to 15
- Their ages, in years, multiply together to make 60
$5+7+3=15$ $8+5+2=15$
How old is each dog? $5\times7\times3=105$ $8\times5\times2=80$

Incorrect; 0 marks

- This learner has tried to use trial and error with numbers that add to 15. This is inefficient as most do not give zero as the units digit when multiplied.

$4\times3=12$ -05 18
$5\times3=15$ $15÷3=5 years$ $3\overline{)150}$ 15
$6\times3=18$ $12\times5=60$ 12+
                           45

| 4 | 5 | 6 |

Incorrect; 0 marks

Common error This learner shows a lack of understanding of how three numbers are multiplied together.

Question 3: Exemplars

$15 ÷ 5 = 3$ blue
$15 ÷ 3 = 5$ yellow
$3 \times 3 = 9$ 3 blues
$9 - 5 = 4$ | 4cm | cm

4 with correct method; 2 marks

- This learner shows good communication skills. The duplication of cm in the answer box can be ignored.

Blue is 3 and yellow is 5 and A looks half way in between | 4 | cm

Links blue to 3 and yellow to 5; 1 mark

- There is no correct method for finding A, so 2 marks cannot be given.

The diagram shows five identical blue bricks and three identical yellow bricks. A marker is on each row.

15cm

Now the markers join.

Work out the length of A.

Links blue to 3 and yellow to 5; 1 mark

Common error This learner shows some understanding but is not then able to continue to the solution.

5 bricks = 15cm = 3cm each
3 bricks = 15cm = 5cm each
          | ? | cm

Links blue to 3 and yellow to 5; 1 mark

- Although the colours are not stated, the working makes it clear which bricks are being referred to.

Q	Marks	Answer
6	4m	**Friday, 11:00** and **am**

	Marks	Answer
	Or 3m	Shows or implies the correct total time in **days** and **hours**, e.g.

- 4 days and 4 hours
- 24 + 24 + 24 + 24 + 4

Or

Gives the answer **Friday, 10:00** and **am**

| | Or 2m | Shows 6000 ÷ 1440, or 100 ÷ 24, or any value between 4.16 and 4.17 inclusive |

Or

Shows a method that would lead to **Friday, 11:00** and **am** if calculated correctly

| | Or 1m | Shows **100** |

Or

Shows **1440** or **720**

Question 6: Exemplars

There are 60 × 24 = 1440 minutes in a day 6000 ÷ 1440 = 4.166666667 days
.166666667 × 24 = 4 hours
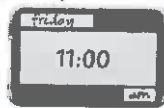so it will be Friday, 11:00am

11:00
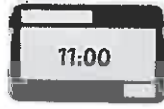
Correct; 4 marks

- The method is correct and efficient, and the complete correct time is shown in the working. As this is not contradicted by the final answer, this is acceptable for 4 marks.

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10 = 5pm mon	70 = 5am thu
20 = 3am tue	80 = 3pm thu
30 = 1pm tue	90 = 1am fri
40 = 11pm tue	100 = 11am fri
50 = 9am wed	
60 = 7pm wed	

11:00

Correct; 4 marks

- This learner uses the inefficient method of counting on in intervals of 10 hours.
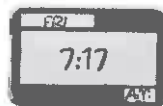

6000 minutes = 100 hours (6000 ÷ 60)
1 day = 24 hours
2 days = 48
4 days = 96
So another 4 hours

11:00

Shows 4 days and 4 hours; 3 marks

- The numerical communication is very clear but Thursday is incorrect.

$60 \times 24 = 1440$
$6000 \div 1440 = 4.17$

7:17

Shows 4.17; 2 marks

This learner interprets the decimal part of an hour as the number of minutes. This is a common error.

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60 Mon 8am	60	1740
120 Mon 9am	12	1440
180 Mon 10am	720	3080 3080
240 Mon 11am	720	1440
300 Mon 12am	1440	4520
1740 Tues 12am		
3080 Wed 12am	4520	
4520 Thurs 12am	1440	**12:40**
5960 Fri 12am	5960	

Correct method; 2 marks

- This learner uses the inefficient method of counting on, starting with 60-minute intervals then progressing to intervals of one day. The method is correct but 1740 + 1440 has been added incorrectly, even though a calculator is available.

$6000 \div 60 = 100$

8:40
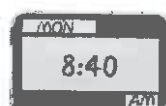
Shows 100; 1 mark

- The start of this calculation is correct, but 100 has been interpreted as 100 minutes rather than 100 hours. Why this learner thinks such an easy calculation is worth 4 marks would form the basis of an interesting discussion.

15