National Numeracy Tests

REASONING

8ER18MS

Marking the test

and understanding performance

165124

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.

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.

8ER18 Reasoning test: Markscheme

Q	Marks	Answer
1i	1m	Total = £**75**

1ii	2m	All four entries correct, i.e. Red: £ **2.5(0)** Blue: £ **9(.00)** Yellow: £ **5(.00)** White: £ 0.00 Board and lollies: £ 26.00 Total expenditure: £ **42.5(0)**
	Or 1m	Total expenditure £42.5(0), or £16.5(0), or their red, blue and yellow + 26

Do not accept this follow-through if any of their red, blue or yellow are zero

1iii	1m	£**32.50** (the 0 must be present) Or Their total income (part i) – their total expenditure (part ii)

Do not accept this follow-through if their income or expenditure is zero, or if the final zero is omitted

Questions 1i, 1ii and 1iii: Exemplars

Income:

50p per go, **total** = £ 75.00

Expenditure (money for prizes, the board and lollies):

Colour of stick	Number of sticks	Price per stick	Total amount
Red	1	£2.50	£ 2.50
Blue	9	£1.00	£ 1.00
Yellow	20	25p	£ 0.25
White	120	0p	£ 0.00
Cost of the board and lollies			£ 26.00
		total =	£ 42.50

Profit = £ 32.50

Part i correct; **1 mark**

Part ii expenditure £42.50; **1 mark**

- The correct total means that the component parts must have been worked out correctly, but the learner has inserted unit costs. Only 1 mark can be given.

Part iii correct; **1 mark**

Income:

50p per go, **total** = £ 75

Expenditure (money for prizes, the board and lollies):

Colour of stick	Number of sticks	Price per stick	Total amount
Red	1	£2.50	£ 2.50
Blue	9	£1.00	£ 9
Yellow	20	25p	£ 4.50
White	120	0p	£ 0.00
Cost of the board and lollies			£ 26.00
		total =	£ 42

Profit = £ 33

Part i correct; **1 mark**

Part ii expenditure correct follow-through; **1 mark**

- Their yellow is 50p less than it should be, so their expenditure follows through correctly.

Part iii correct follow-through; **1 mark**

- 75 – 42 = 33

Income:

50p per go, **total** = £ 7500

Expenditure (money for prizes, the board and lollies):

Colour of stick	Number of sticks	Price per stick	Total amount
Red	1	£2.50	£
Blue	9	£1.00	£
Yellow	20	25p	£
White	120	0p	£ 0.00
Cost of the board and lollies			£ 26.00
		total =	£ 16.5

Profit = £ 7483.5

Part i incorrect; **0 marks**

- 7500 is the number of pence not £

Part ii £16.5; **1 mark**

- £16.50 is the total for red, blue and yellow sticks. The missing zero is condoned for this question part.

Part iii incorrect; **0 marks**

- Although £7500 – £16.50 = £7483.50, omission of the final zero means that the mark cannot be given.

Q	Marks	Answer
1iv	1m	States that the number of coloured sticks to be given out is unknown, e.g. • They can't be sure how many coloured sticks will be won • The red stick might not be won • People might just win white sticks

Accept implicit reference to coloured sticks, e.g.

- **They don't know which lollies they will sell**

Do not accept vague or ambiguous responses, e.g.

- **They might not sell them all**

1v	1m	Maximum possible profit £**34(.00)**

1vi	2m	Minimum possible profit £**17.5(0)** Or Wrong order, i.e. maximum £17.5(0) **and** minimum £34(.00) Or Their minimum is £16.5(0) less than their maximum, e.g. • Maximum £60, minimum £43.5(0)
	Or 1m	Shows (£)**60** Or Wrong order, i.e. maximum £17.5(0) **or** minimum £34(.00)

Accept 60 – their total expenditure in part ii, provided the expenditure is not zero

Both incomes incorrect, but consistent

Income

Question 1iv: Exemplars

They don't know what sticks will be picked.	Correct; **1 mark** • 'What sticks will be picked' is an implicit reference to colour as that is the only thing about the sticks that varies.
Because you don't know if they're going to get all the prizes or not.	Correct; **1 mark** • As prizes link to coloured sticks this response is also acceptable.
They might give out 1 red, 8 blue and 18 yellow which is £14	Correct; **1 mark** • As the numbers of blue and yellow are less than the numbers available, this response is acceptable. The incorrect cost can be ignored.
There will still be lollies left over.	Incorrect; **0 marks** • There is no reference, explicit or implicit, to the colour of sticks. All lollies left over could have white sticks.

Questions 1v and 1vi: Exemplars

If 120 people play,
work out their **maximum** and **minimum** possible profit.

Maximum
0.50 × 120 = £60
Red Stick = 0/1
Blue Stick = 0/9
Yellow Stick = 0/20
White Stick = 120/120
If they all choose a white stick, then they won't have to give any money away.

60
− 26
34

Maximum possible profit
£ 34

Minimum
0.50 × 120 = £60
Red Stick = 1/1
Blue Stick = 9/9
Yellow Stick = 20/20
White Stick = 90/120

60.00
− 2.50
^{4}57.50
9
48.50
− 5
43.50

^{3}43.50
− 26
17.50

Minimum possible profit
£ 17.50

Part v correct; **1 mark**
Part vi correct; **2 marks**

- This learner shows very clear communication skills.

If 120 people play,
work out their **maximum** and **minimum** possible profit.

Maximum

120 × 50 = 6000
6000 ? = £60

Maximum possible profit
£ 60

Minimum

£60 −2.50 − £9 − £5
£43.50

Minimum possible profit
£ 43.50

Part v incorrect; **0 marks**
Part vi maximum − minimum = £16.50; **2 marks**

common error In both parts, this learner has omitted the cost of the board and lollies. This is a common error.

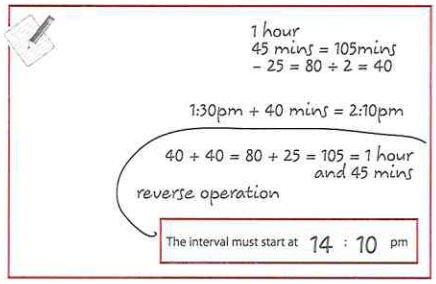
Q	Marks	Answer
2	3m	**2:10**pm or equivalent, but not if from 100 minutes in 1 hour
	Or 2m	Answer **2:10**pm or equivalent even if 1 hour as 100 minutes has been used Or Shows or implies that each part lasts **40 minutes** Or Shows all four solution steps with not more than one error, i.e. – finds time interval from 1:30pm to 3:15pm – subtracts 25 minutes for interval – halves the result – adds that number of minutes to 1:30pm (or equivalent)
	Or 1m	Shows either of the following: **1 hour 20 minutes** (or 80 minutes) **1 hour 45 minutes** (or 105 minutes) Or Shows all four solution steps with not more than two errors

Throughout, accept pm omitted

Accept units omitted within working (minutes and/or hours) provided there is no ambiguity

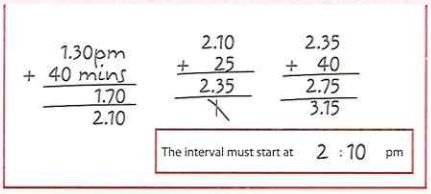
Total time excluding or including interval

Question 2: Exemplars



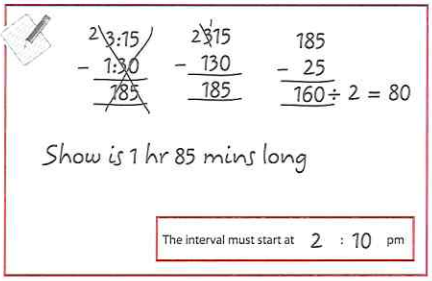
Correct; **3 marks**

- Checking solutions is a mark of a good mathematician. Giving the answer as 14:10 is accepted, even though pm is in the answer box.



Correct; **3 marks**

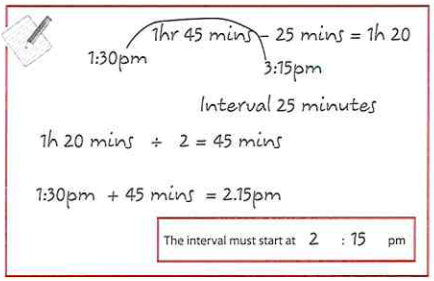
- It is not clear how this learner has derived 40 minutes but the adjustment from 1.70 to 2.10 and from 2.75 to 3.15 shows understanding that there are 60 not 100 minutes in an hour. All 3 marks can be given.



Answer 2:10pm; **2 marks**

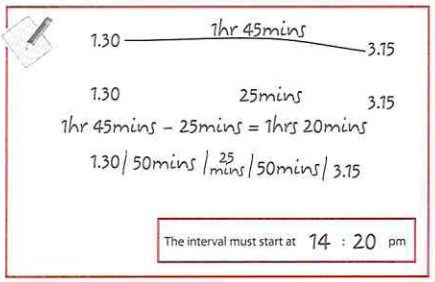
Common error

This learner is working as if using decimals which is a common error when working with time. Although the answer (surprisingly given the working) is correct, only 2 marks can be given.



Four solution steps with one error; **2 marks**

- The only error is that half of 1 hour 20 minutes is not 45 minutes.



Shows 1 hour 20 minutes (or 1 hour 45 minutes); **1 mark**

- The first two steps are correct but the next two are not explicit. Had this learner checked they should have realised that each part cannot be 50 minutes.

Q	Marks	Answer
3i	1m	**20**

3ii	2m	**15**
	Or 1m	Shows a correct equation in words or symbols, e.g. • 5A – 60 = A • Four of his number is 60 Or Shows 15 × 5 – 60 = 15 or equivalent Or Shows at least three correct trials, excluding 20, e.g. • 50 → 190 10 → –10 30 → 90

Question 3i: Exemplar

Siwan's answer is 40

What number did Siwan start with?

$40 + 60 \div 5 = 52$ | 52

Incorrect; **0 marks**

Common error

Although this learner shows some understanding of inverse operations, the answer should be $(40 + 60) \div 5$ rather than $40 + (60 \div 5)$. Checking solutions is an important part of becoming numerate.

Question 3ii: Exemplars

$5y - 60 = y$
$4y - 60 = 0$
$4y = 60$
$y = 15$

Correct; **2 marks**

Efficient method

This learner uses algebra effectively. The answer is clearly shown in the working so can be accepted.

$5 \times 100 = 500 - 60 = 440$
$5 \times 50 = 250 - 60 = 190$
$5 \times 25 = 125 - 60 = 65$
$5 \times 20 = 100 - 60 = 40$
$5 \times 15 = 75 - 60 = 15$

15

Correct; **2 marks**

- Here we see trial and improvement that leads to a correct solution.

$12 \times 5 = 60 - 60 = 0$
$15 \times 5 = 75 - 60 = 15$

75

Shows $15 \times 5 - 60 = 15$; **1 mark**

- The correct solution, 15, is shown in the working (the incorrect use of = can be ignored). However, the answer 75 is incorrect.

$10 \times 5 = 50$ $\quad 25 \times 5 = 125 - 60 = 65$
$20 \times 5 = 100$
$40 \times 5 = 200$

~~42~~ $11 \times 5 = 55$
$12 \times 5 = 60$
$13 \times 5 = 65$
$14 \times 5 =$

One correct trial; **0 marks**

- To be accepted as a trial the start and finish numbers must be shown.

Q	Marks	Answer
4	3m	**31** concerts
	Or 2m	Shows **30** or **30.8(...)** Or Shows **2 295 000 ÷ 74 500** Or Shows a method, including rounding up to the integer above, that would lead to 31 if there were no numerical errors
	Or 1m	Shows **2 295 000** Or Shows **÷ 74 500**

For 3m, do not accept 30.8(...)
For 3m, only accept 30 if accompanied by qualifying text that justifies rounding down, e.g. that some people are likely to be unwell

Question 4: Exemplars

74500 visitors

3100000 − 805000 = 2295000
180000 + 625000 = 805000

1d.p
2295000 ÷ 74500 = 30.8
round↑ 1s.f.
40

40 concerts

Shows 30.8; **2 marks**

- This learner needs support to understand what rounding is applicable in real-life situations.

~~805000~~
3100000
805000
2205000

2205000 ÷ 74500 =
29.59731544

you need a full number

~~26~~ 30 concerts
~~370~~

Correct method; **2 marks**

- 805000 is the sum of 180000 and 625000 but the subtraction from 3100000 is incorrect even though a calculator is available. The method is completed by dividing by 74500 and the answer is rounded up to the integer above.

3100000 − 625000 = 2475000

2475000 − 180000 = 2,295,000

2,295,000 − 74500 = 2,220500
2,220500 − 74500 = 2140000
= 2071500
= 1997000
= 19225000
= 1848000
=17
=

concerts

Shows 2295000; **1 mark**

- The first step is correct but this learner uses repeated subtraction rather than division by 74500. The method is time-consuming and leads to inaccuracies.

2,295,000 people

170,977,511

170,977,511 concerts

Shows 2295000; **1 mark**

- Almost 171 million concerts would be a challenge for any concert givers! Deciding whether answers make sense is an essential part of becoming numerate.

Q	Marks	Answer
5	3m	**55**cm
	Or 2m	Links: 1 yellow to 35 (cm), or 3 yellow to 105 (cm) Or Shows a method that would lead to 55cm if there were no numerical errors, e.g. • 2B = 185 – 145 = 50 (error) so 3Y = 145 – 50 = 95 95 ÷ 3 = 31 (truncated) B + Y = 25 + 31 = 56 • 6 yellows and 6 blues is 185 + 145 = 320 (error) 320 ÷ 6 = 53.333
	Or 1m	Links: 1 blue to 20 (cm), or 2 blue to 40 (cm) Or Shows 35 or 105 without any linking Or From their incorrect height for 1 blue, follows through correctly to find the height of 1 yellow

Question 5: Exemplars

185 ÷ 3 = 61.6cm 185 ÷ 4 = 46.25cm 185 − 145 = 40 = 35 1 blue = 20 × 4 3 yellow ~~1 yel~~ = 105 ? = 55 cm	Correct; **3 marks** • It is not clear why 185 is divided by 3 and 4, but the learner then starts again and progresses to the correct solution. However, encouragement is needed to show working more effectively.
185 − 145 40 145 − 40 105 2 blue = 40 1 = 20 3 yellow = 105 1 y = 34 ? = 54 cm	Links 105 to 3 yellow; **2 marks** • There is an error in the final step when finding y.
185 − 40 = 145 145 − 40 = 105cm ? = 105 cm	105 without linking; **1 mark** • There is no evidence to show that 105 is linked to three yellow, so only one mark can be given.
185 − 145 = 40 ÷ 4 = 10 ← blue block ~~145 ÷ 3~~ 125 ÷ 3 = 41.66666667 + 10 = 52 ? = 52 cm	Blue incorrect, finds height of 1 yellow; **1 mark** • This learner gets confused between blue and yellow so does ÷ 4 rather than ÷ 2 which means that the method is incorrect. However, the height of yellow follows through correctly. Rounding is acceptable.
185 − 145 = 40cm ? = 65 cm	Incorrect; **0 marks** Common error Although this could form part of a correct method, there is no evidence of linking 40cm to two blue, so no marks can be given.