National Numeracy Tests

REASONING
7ER16MS

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.

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 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 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 2016* on the Learning Wales website and in *Welsh National Tests Data Collection and reporting arrangements 2015/16* 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.

7ER16 Reasoning test: Markscheme

Question 1: There are two main ways to solve this problem: see below.

Note: The conclusion 'Forest, by £4' with no supporting working gains 3 marks.

Method A: Find **total costs** for both activities, then work out the difference (very common method)

Marks	Answer		
First mark values for **Climbing**			
3m	Total cost **344**		
Or 2m	Travel **219**	and	Entrance **125** (or 105 and 20)
Or 1m	Travel **219**	or	Entrance **125** (or 105 and 20)
Then mark values for **Forest**			
3m	Total cost **340**		
Or 2m	Travel **48**	and	Entrance **292** (or 252 and 40)
Or 1m	Travel **48**	or	Entrance **292** (or 252 and 40)
If the total is 6 marks, check that their conclusion is **Forest, by £4.** If **yes**, give all 6 marks. If **no**, give 5 marks only.			

If **both travels** are incorrect, 1m for **109.5(0)** with **24** (one way)

If **both entrances** are incorrect, 1m for **105** with **252** (young people only)

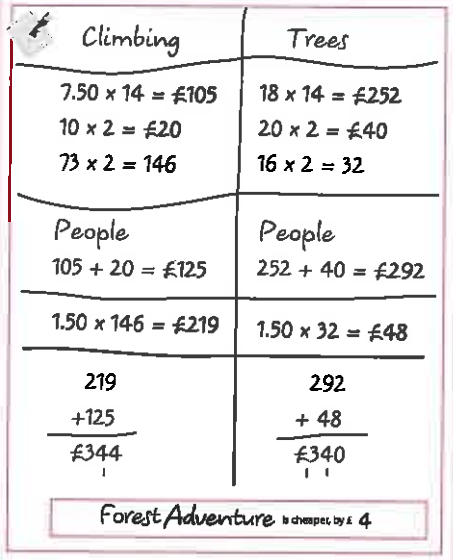
Method B: Find **difference** in entrance fees and also in travel, then work out the overall difference

First mark values for **both entrances**			
3m	Difference in costs **167** (or –167)		
Or 2m	Climbing **125** (or 105 and 20) Or Young **147** (or 10.50 × 14)	and and	Forest **292** (or 252 and 40) Adults **20** (or 2 × 10)
Or 1m	Climbing **125** (or 105 and 20) Or Young **147** (or 10.50 × 14)	or	Forest **292** (or 252 and 40)
Then mark values for **both travels**			
3m	Difference in costs **171** (or –171)		
Or 2m	Climbing **219** Or Half difference **85.5(0)** or correct working for 171	and	Forest **48**
Or 1m	Climbing **219** Or (73 – 16) × 1.50	or	Forest **48**
If the total is 6 marks, check that their conclusion is **Forest, by £4.** If **yes**, give all 6 marks. If **no**, give 5 marks only.			

If **both entrances** are incorrect, 1m for **105** with **252** (young people only)

If **both travels** are incorrect, 1m for **109.5(0)** with **24** (one way)

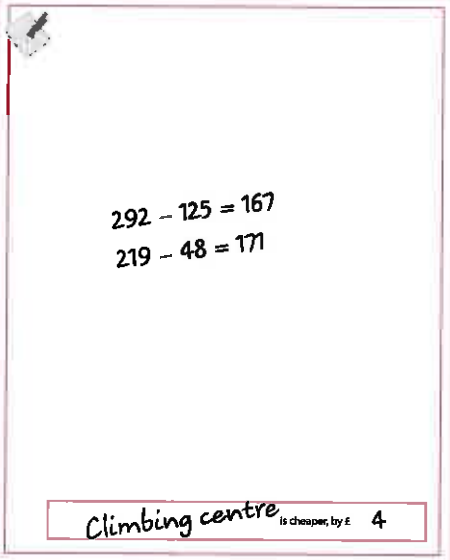
Question 1: Exemplars



Climbing	Trees
7.50 x 14 = £105 10 x 2 = £20 73 x 2 = 146	18 x 14 = £252 20 x 2 = £40 16 x 2 = 32
People 105 + 20 = £125	People 252 + 40 = £292
1.50 x 146 = £219	1.50 x 32 = £48
219 +125 £344	292 + 48 £340

Forest Adventure is cheaper, by £ 4

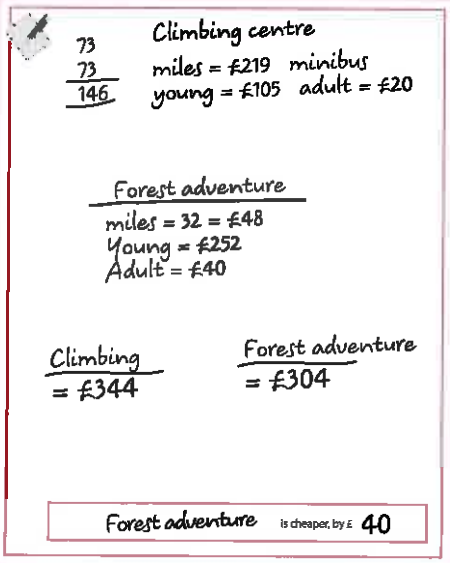
Method A
Climbing: total cost 344 (3m)
Forest: total cost 340 (3m)
Total 6 marks and conclusion correct; **6 marks**



292 – 125 = 167
219 – 48 = 171

Climbing centre is cheaper, by £ 4

Method B
Entrances: difference in costs 167 (3m)
Travels: difference in costs 171 (3m)
Total 6 marks but conclusion incorrect; **5 marks**



73
73
146
Climbing centre
miles = £219 minibus
young = £105 adult = £20

Forest adventure
miles = 32 = £48
Young = £252
Adult = £40

Climbing
= £344

Forest adventure
= £304

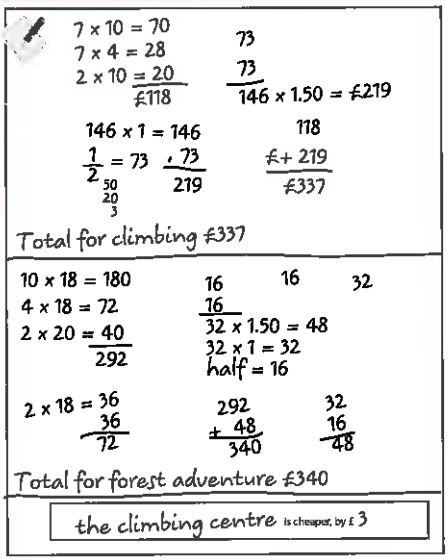
Forest adventure is cheaper, by £ 40

Method A
Climbing: total cost 344 (3m)
Forest: both travel 48 and entrance (252 and 40) (2m)
Total **5 marks**

- All the correct component parts are shown but the total for forest is incorrect.

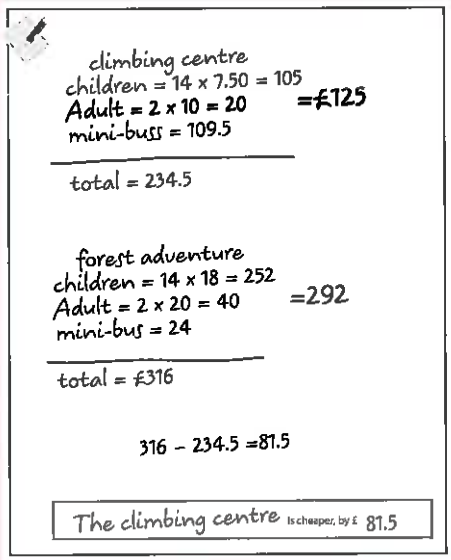
Continued overleaf

Question 1: Exemplars (continued)



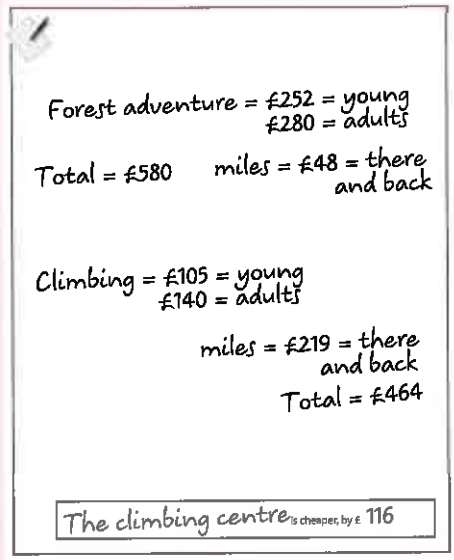
Method A
Climbing: travel 219 (1m)
Forest: total cost 340 (3m)
Total **4 marks**

- This work shows 14 × 7 not 14 × 7.50 for the entrance fees for climbing. The use of a calculator would help the learner's attention to remain on the correct values. It would also enable the learner to work more quickly, giving greater thinking time for the remaining questions within the assessment.



Method A
Climbing: entrance 125 (1m)
Forest: entrance 292 (1m)
Both travels incorrect: 109.50 with 24 shown (1m)
Total **3 marks**

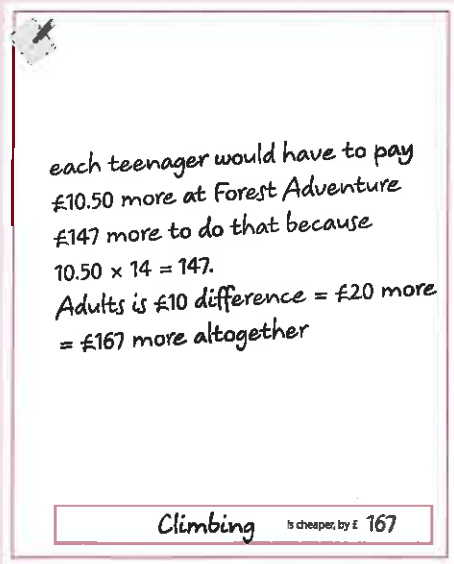
Common error This learner works with the outward journey only but gains a mark for showing both 109.50 and 24 (half the actual travel costs). This is a common error.



Method A
Climbing: travel 219 (1m)
Forest: travel 48 (1m)
Both entrances incorrect: 105 with 252 shown (1m)
Total **3 marks**

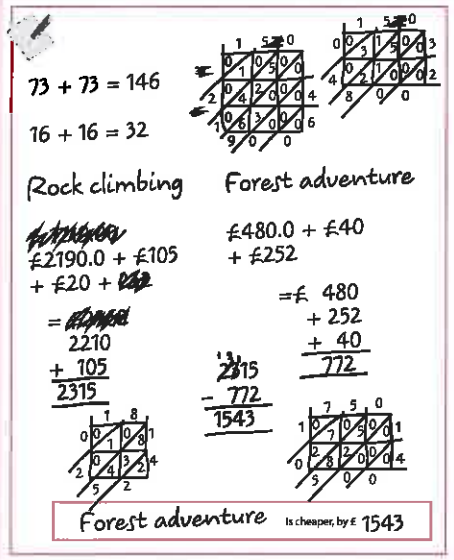
- Both adult entrance fees are incorrect. However, as both 105 and 252 (entrance fees for young people) are shown, this gains a mark.

Question 1: Exemplars (continued)



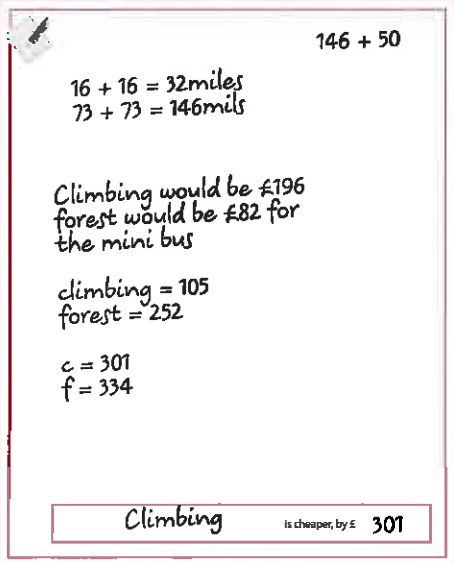
Method B
Entrances: difference in costs 167 (3m)
Travels: difference in costs not attempted (0m)
Total **3 marks**

- This method of finding the difference in entrance fees is rarely seen, but is correct. However, the learner has not engaged with the costs of travel.



Method A
Climbing: entrance 105 and 20 (1m)
Forest: entrance 252 and 40 (1m)
Both travels incorrect: 109.50 with 24 not shown (0m)
Total **2 marks**

- Although this learner shows understanding of what to do, there are both place value errors and numerical errors. Knowing when to use a calculator is an essential part of becoming numerate.



Method A
Both entrances incorrect: 105 and 252 shown (1m)
Both travels incorrect: 109.50 with 24 not shown (0m)
Total **1 mark**

- The costs of travel are incorrect, but both entrance fees for young people are correct, gaining 1 mark. This learner needs support and encouragement to show their working and check their calculations.

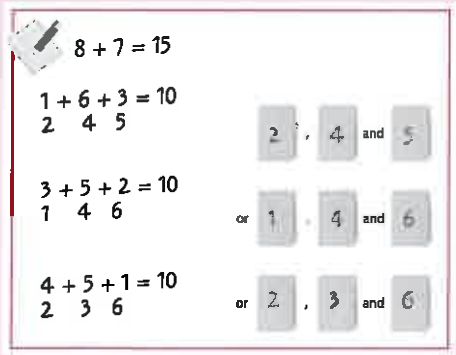
Q	Marks	Answer
2	3m	The three correct solutions, in any order, and no others, i.e. **2 4 5** **2 3 6** **1 4 6**
	Or 2m	At least **two** correct solutions Or Shows or implies that the cards inside B are as follows, in any order: **1 3 6** **1 4 5** **2 3 5**
	Or 1m	**One** correct solution Or Shows any **two** of the sets inside B

Note that each correct solution:
- **sums to 11**
- **uses only the digits 1 to 6**

Note that each set of cards:
- **sums to 10**
- **uses only the digits 1 to 6**

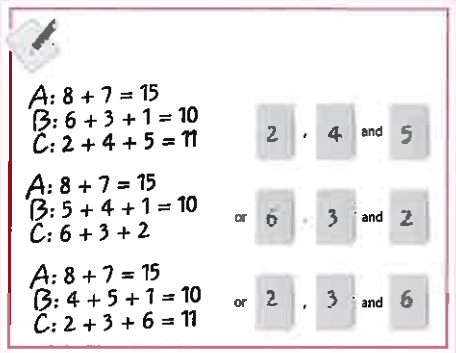
Accept these values in the answer boxes

Question 2: Exemplars



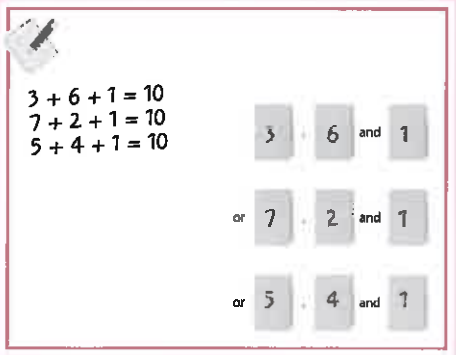
Correct; **3 marks**

- This learner sets out their work effectively, allowing them to find all three correct solutions.



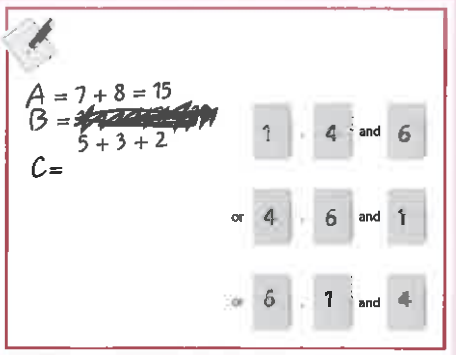
Two correct; **2 marks**

- The third answer is a repeat of the digits used in the second answer.



Two sets from B; **1 mark**

- The answers show sets from B, not C, but the second answer includes 7 which must be in A. Sight of 7 or 8 within B or C signals that the set of cards must be incorrect.



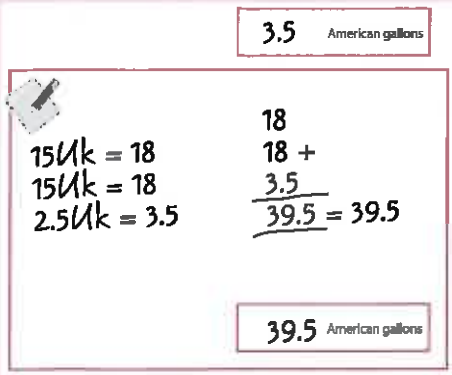
One correct; **1 mark**

- The set of cards 1, 4, 6 is correct for C, but instead of looking for different combinations this learner has given permutations of those cards.

Q	Marks	Answer
3i	1m	**3** American gallons

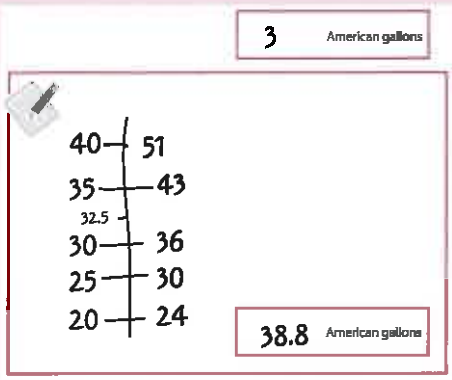
3ii	2m	**39** American gallons Or Their answer is **36 + their answer to part i** Or Their answer is **13 × their answer to part i**	
	Or 1m	Shows or implies that 30 UK gallons = 36 American gallons Or Shows a method that would give 39 if calculated correctly, e.g. • 32.5 = 3 lots of 10 + 2.5 so 3 lots of 12 + 3	**Accept follow-through from their answer to part i**

Questions 3i and 3ii: Exemplars



3i: Incorrect; **0 marks**
3ii: 36 + their answer to 3i; **2 marks**

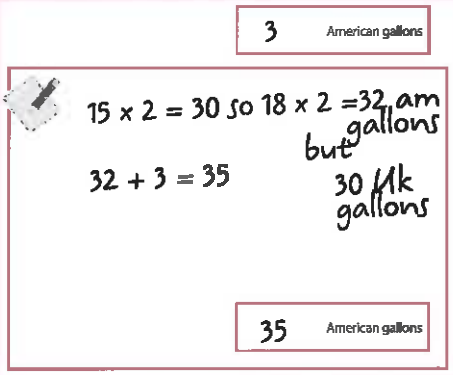
- Although 3.5 is incorrect, this learner shows full understanding in the second question part by using 3.5 and therefore both marks can be given.



3i: Correct; **1 mark**
3ii: 30 UK = 36 American; **1 mark**

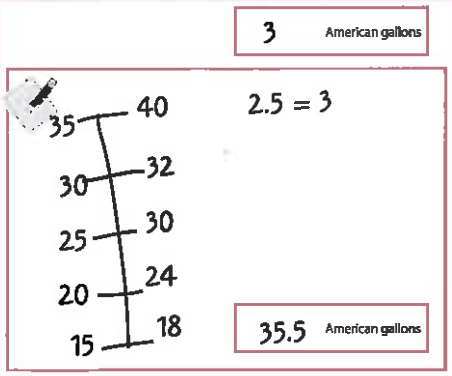
Common error

Their scale shows the equivalence of 30 UK gallons and 36 American gallons, but this learner has not made the connection between the two question parts.



3i: Correct; **1 mark**
3ii: Correct method; **1 mark**

- Had 18 × 2 been calculated correctly, the correct solution, 39, would have been reached. Checking work is an essential part of becoming numerate.



3i: Correct; **1 mark**
3ii: Incorrect; **0 marks**

- The increases in American gallons are +6, +6, +2 and +8 so this does not show a correct method, and in any case 3.5 not 3 has been added to 32

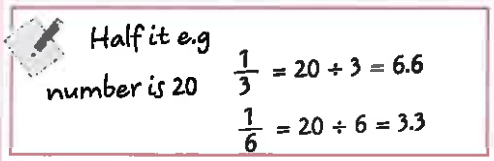
Q	Marks	Answer
4	1m	Divide by 2, e.g. • Halve it Or Multiply by 3 then divide by 6 (or equivalent calculation)

Do not accept examples without a correct statement, e.g.

- **$\frac{1}{3}$ of 36 = 12, $\frac{1}{6}$ of 36 = 6 with no recognition of the relationship between 12 and 6**

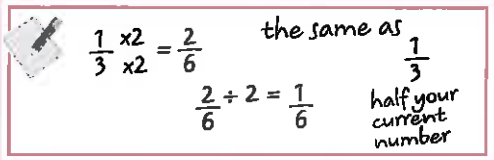
Examples alongside a correct statement can be ignored, even if incorrect

Question 4: Exemplars



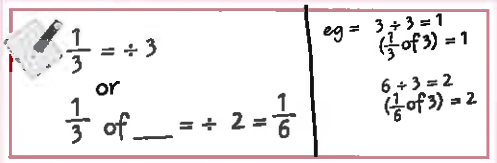
Correct; **1 mark**

- The calculations are used to support 'half it' so can be ignored, even though the degree of accuracy for 6.6 is incorrect. It would be interesting to know why this learner chose 20, a number that is not a multiple of 6



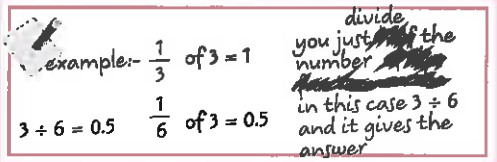
Correct; **1 mark**

- This learner shows equivalent fractions to support their thinking. 'Half your current number' is correct.



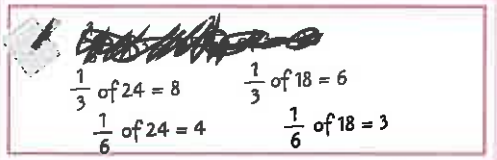
Correct; **1 mark**

- This work is poorly explained, but '÷ 2' in the final line shows sufficient understanding. The error in the example can be ignored.



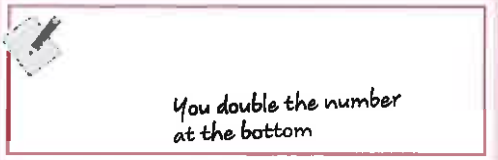
Incorrect; **0 marks**

- Although it is likely that this learner does understand the relationship, because what to divide by is not explicit no marks can be given.



Incorrect; **0 marks**

- Although two examples have been worked out correctly, the relationship between $\frac{1}{3}$ and $\frac{1}{6}$ is not identified.

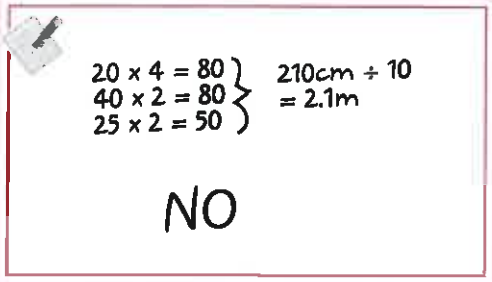


Incorrect; **0 marks**

- 'You double the number at the bottom' describes the relationship between the fractions, but there is no indication that the number itself should be halved.

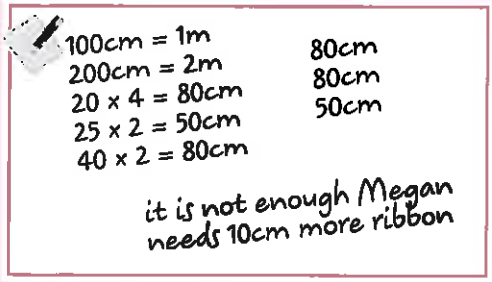
Q	Marks	Answer	
5	3m	Shows or implies **210** and clearly states there is **not** enough ribbon	**Accept values given in metres, but for 3m do not accept 210 converted incorrectly**
	Or 2m	Shows **210** Or Shows a method that would lead to 210 if there were no computational errors, e.g. • $4 \times 20 + 2 \times 40 + 2 \times 25$ Or Any of the following answers: **170** and **yes** **260** and **no** **290** and **no**	**Throughout, accept repeated addition for multiplication** **170: two 20's missing** **260: two extra 25's** **290: two extra 40's**
	Or 1m	Shows or clearly implies any **two** of the following: 4×20 (or 80) 2×40 (or 80) 2×25 (or 50) Or Shows **170**, **260** or **290** Or Shows **340** and **no**	**Four of each dimension**

Question 5: Exemplars



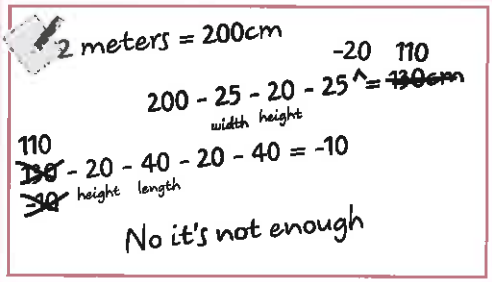
Correct; **3 marks**

- Because 2.1m is correct the incorrect divisor can be taken as a slip. Had 21m been shown, this work would have scored 2 marks since for 3 marks a conversion, if done, must be correct.



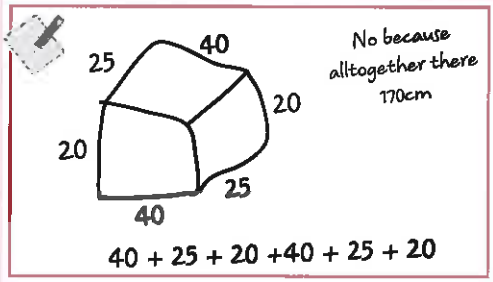
Correct; **3 marks**

- Although 210 is not shown, the conclusion 'needs 10cm more' is sufficient to imply 210cm.



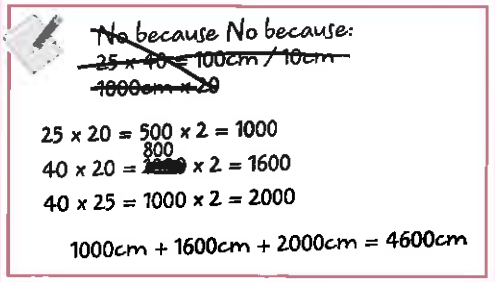
Correct; **3 marks**

- This is an unexpected, but correct, method showing the dimensions subtracted from 200. As above, –10 is sufficient to imply 210



Shows 170; **1 mark**

- This learner has omitted two 20's which is why the answer is 170cm. Their conclusion is that there is not enough ribbon, but 170cm < 200cm. The learner may not understand conversion of units, or it may be a slip.



Incorrect; **0 marks**

Common error

Multiplying dimensions is a common error, showing a fundamental lack of understanding of shape.