CR_12280_051017145748

National Numeracy Tests

REASONING

7ER17

First name _____

Last name _____

School _____

Class _____

Date of birth ○○ ○○ ○○○○

Date of test ○○ ○○ 2017

Total score ( ) (maximum 20)

150291

Llywodraeth Cymru
Welsh Government

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1

To find the total score for a dive:

- remove the highest and lowest marks
- **raw score** = sum of the other three marks
- **total score** = raw score × dive difficulty

Alun's five marks are:

6.5 6.0 5.5 6.5 7.0

His dive difficulty is 1.8

What is his **total score** for the dive?

Total score =

2m

Tom's raw score is 24.5 His dive difficulty is 2.0

Dylan's raw score is 22.0 His dive difficulty is 2.5

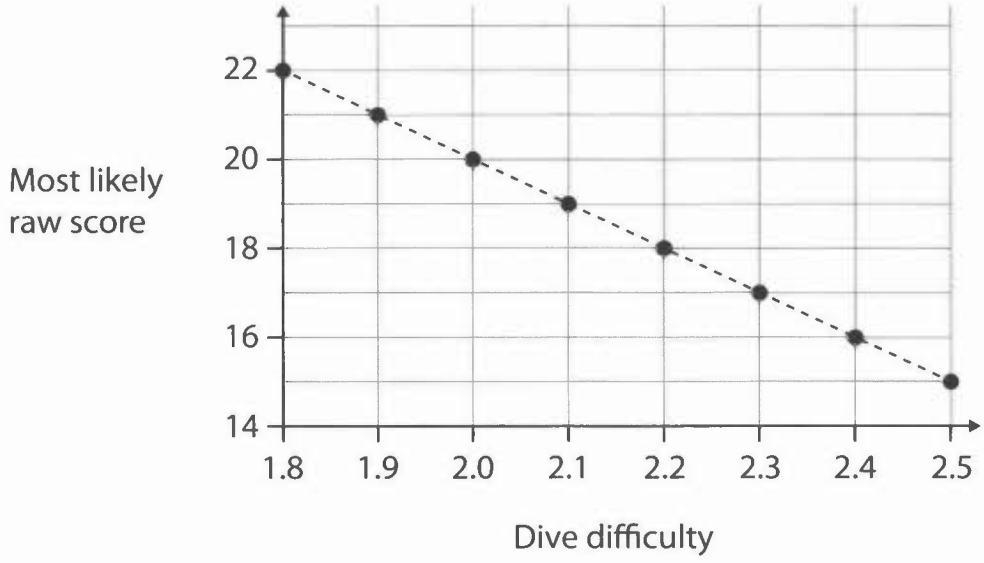
Compare Tom's and Dylan's **total scores**.

Whose total score is higher, and by how many points?

by points

2m

The graph shows Jamal's most likely raw score for each dive difficulty.



He wants the highest **total score** possible.

Which of these dive difficulties should he choose?

You **must** show calculations to explain your answer.

3m

TOTAL

7m

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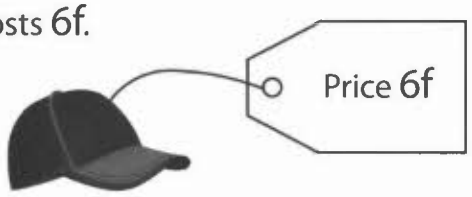
2 In a game people use coins called f, n and r.

1f = 4n

1n = 3r

In the game a hat costs 6f.



Lara has 60r.

Is this enough to buy the hat? Show how you know.

2m

3

The first fairground ride starts at 2pm.

20 people go on each ride.

A new ride starts every 5 minutes.

Just before the ride opens, 200 people are in the queue.

A group of 50 young people join the back of the queue.

They know the last ride they can go on is the one that starts at 2.55pm.

Will **all** the young people in the group have time to go on the ride?

Show how you know.

3m

TOTAL

5m

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4 ★ and ⬟ represent **whole numbers**.

★ + ⬟ = 11

Work out the greatest possible answer to ★ × ⬟

★ × ⬟ = ☐

2m

◆ and ✚ are **not** whole numbers.

◆ + ✚ = 11

Work out the greatest possible answer to ◆ × ✚

◆ × ✚ = ☐

3m

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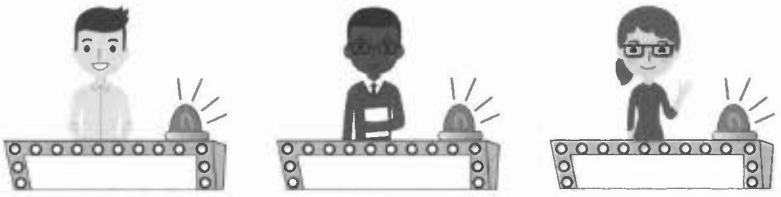
5 A school runs a quiz.

Each game has 3 players.

The winner of each game takes part in the next round in a new group of 3



Rules:

Round 1	All winners from Round 1 take part in Round 2
Round 2	All winners from Round 2 take part in Round 3
Round 3	All winners from Round 3 take part in Round 4
Round 4	The winner of Round 4 wins the quiz

The quiz starts with 81 players in Round 1

By the end of the quiz, how many games have been played?

games altogether

3m

TOTAL

8m

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National Numeracy Tests

REASONING

7ER17MS

Marking the test

and understanding performance

150292

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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.

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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

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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 2017* on the Learning Wales website and in *Welsh National Tests Data Collection and reporting arrangements 2016/17* 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.

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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.

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7ER17 Reasoning test: Markscheme

Q	Marks	Answer	
1i	2m	**34.2**	**Accept 34 provided 34.2 or other correct working is also shown**
	Or 1m	Answer **34** with no correct working Or Shows **19** × **1.8** or (6 + 6.5 + 6.5) × 1.8	**Condone brackets omitted, e.g. accept 6 + 6.5 + 6.5 × 1.8**
1ii	2m	**Dylan**, by **6** points	
	Or 1m	Answer **55**, by **6** points Or Shows **49** and **55** Or Shows one correct and one incorrect total then follows through correctly to show their correct winner, with their correct number of points, e.g. • T 57 (error) D 55 T wins by 2 points	**Total scores for Tom and Dylan**

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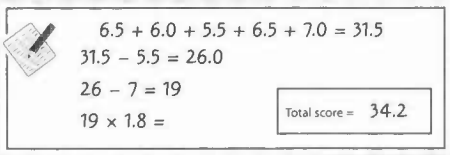
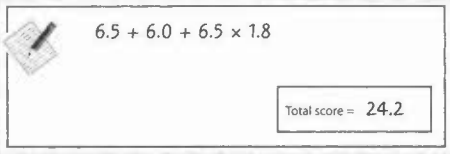
Question 1i: Exemplars



Correct; **2 marks**

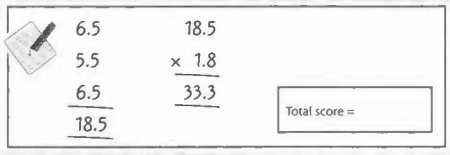
- This learner works inefficiently, adding all five marks then subtracting the two that are not needed. Seeking ways to work efficiently is part of becoming numerate.



(6.5 + 6.0 + 6.5) × 1.8; **1 mark**

Common error

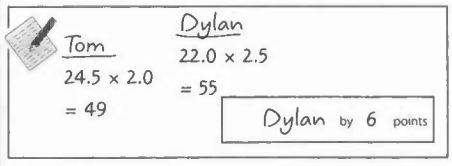
Omission of brackets is condoned. However, this learner needs support to understand order of operations: because multiplication takes precedence over addition only part of the calculation, 6.5, has been multiplied by 1.8



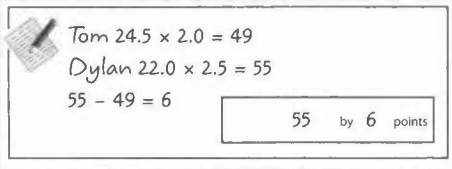
Incorrect; **0 marks**

- The set of marks selected is incorrect. Checking is an integral part of becoming numerate.

Question 1ii: Exemplars

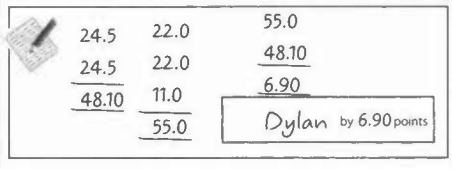


Correct; **2 marks**



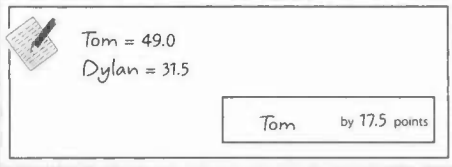
Answer 55 by 6 points; **1 mark**

- The answer shows poor numerical communication which is why the markscheme allows just 1 mark.



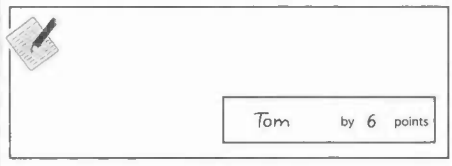
55 with correct follow-through; **1 mark**

- 48.10 shows a common misconception in how to add decimals, but 55.0 is correct and the subtraction follows through correctly.



49 with correct follow-through; **1 mark**

- Note that if Tom's score is greater than Dylan's, the answer must show Tom with the learner's correct difference.



Incorrect; **0 marks**

- Tom is incorrect and there is no working to support 6 points. No marks can be given.

<table>
<tr><th>Q</th><th>Marks</th><th>Answer</th></tr>
<tr><td>2</td><td>2m</td><td>Justifies why 60r is not enough through one of the following:

<table>
<tr><th>Conversion</th><th>Decision</th></tr>
<tr><td>6f = 72r
(enables comparison with 60r)</td><td>No</td></tr>
<tr><td>60r = 5f
(enables comparison with 6f)</td><td>No</td></tr>
<tr><td>6f = 24n
60r = 20n
(enables comparison of n's)</td><td>No</td></tr>
</table>

Or 1m

The only error is that the decision is incorrect or omitted

Or

Shows any correct equivalence of f and r, e.g.
• (1)f = 12r

Or

Shows a complete, correct method with not more than one conversion error, and a correct decision for their values, e.g.
• 6f = 18n (conversion error)
18n = 54r (correct follow-through)
so she has enough</td></tr>
</table>

◀ **There must be a correct decision, e.g. for 2 marks do not accept**
- **6f = 72r**

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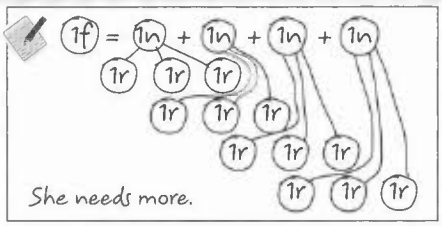
Question 2: Exemplars

$6 \times 4 = 24$ $24 \times 3 = 72$ but she only has 60	Correct; **2 marks** • Although units are omitted, as the amounts being compared are both in r there is no ambiguity and 2 marks can be given.
She has 60 r and that is the same as $60 \div 3 = 20$ n and 20 n is the same as $20 \div 4 = 5$ f but she needs 6 f so the answer is that she does not have enough money to buy the hat she will need to play the game some more or buy something that is cheaper.	Correct; **2 marks** • This learner changes 60r to 5f and shows a correct decision so scores 2 marks. However, writing a 'mini-essay' is time-consuming. Support is needed to show how to present a mathematical argument concisely.
She is short of 4n	Correct; **2 marks** • The numerical communication is poor, but this learner is comparing 24n (6f) to 20n (60r).
	1f = 12r; **1 mark** • 1f = 12r is shown, albeit informally, but this is insufficient to show why 'she needs more'.
60r = 20n 20n = 10f which is more than 6f so yes	One conversion error, correct decision; **1 mark** • This learner is converting 60r to get an answer in f. The first step, 60r = 20n, is correct but the second step should be 20n = 5f. However, the decision follows through correctly so 1 mark can be given.
1f = 4n so 6f = 10n 1n = 3r so 10n = 13r She has loads of money she could get more hats about 4?	Two conversion errors; **0 marks** • This learner is converting 6f to get an answer in r. Both conversions are incorrect showing that support is needed to understand multiplicative relationships.

Q	Marks	Answer
3	3m	Shows or implies any of the following, with no additional incorrect statements or working: – 10 young people can't ride – 65 minutes needed but 60 available – 13 rides (accept $12\frac{1}{2}$) needed but time for only 12 rides
	Or 2m	Shows or implies any of the following (ignore errors elsewhere): – 10 young people can't ride – 65 minutes needed (accept $62\frac{1}{2}$) – 13 rides (accept $12\frac{1}{2}$) needed Or The only error is that time available is 55 minutes not 60, i.e. shows or implies the following, with no additional incorrect statements or working: – 30 young people can't ride
	Or 1m	Shows or implies any of the following (ignore errors elsewhere): – 12 rides per hour – 200 people take 50 minutes – 50 people take 15 minutes – 30 young people can't ride

The learner may refer to rides filled which is why $12\frac{1}{2}$ is accepted for 13

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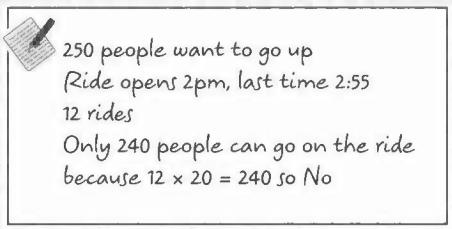
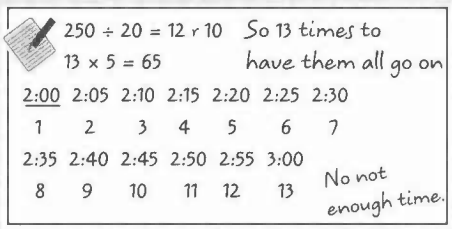
Question 3: Exemplars



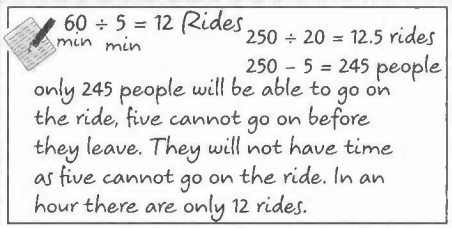
10 can't ride, no errors; **3 marks**

- 250 and 240 clearly imply that 10 young people can't ride.



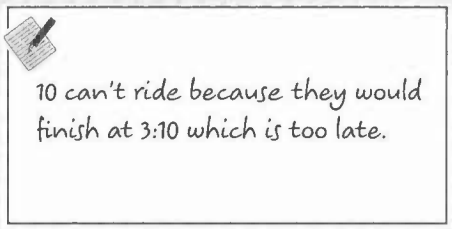
13 rides but time for 12, no errors; **3 marks**

- '13 times' implies 13 rides and 2:55 linked to 12 is sufficient to imply there is time for only 12 rides. However, this learner needs support to understand the importance of explaining their conclusions.



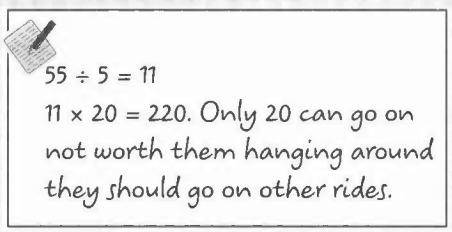
12.5 rides needed; **2 marks**

- This learner shows both 12 and 12.5 but misinterprets 12.5 and states that 245 people can ride. Only 2 marks can be given.



10 can't ride; **2 marks**

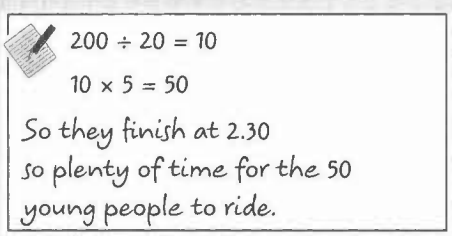
- The numerical communication is poor as we have no evidence as to why '10 can't ride'. Nonetheless, without the incorrect statement about finishing at 3:10 this learner would have scored 3 marks.



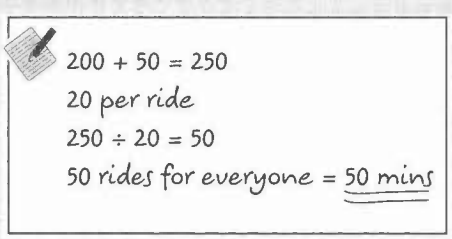
30 can't ride, no further errors; **2 marks**

Common error

'Only 20 can go on' implies that 30 can't since there are 50 young people altogether. It is a common error to not realise that because there is a ride at 2pm there are 12 available rides not 11



200 people take 50 minutes; **1 mark**



Incorrect; **0 marks**

- Here '50 mins' links to 250 people not 200 so is incorrect. No marks can be given.

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Q	Marks	Answer
4i	2m	**30**
	Or 1m	Shows or implies that the numbers are **5** and **6**, in either order Or Shows at least **two** of the rows below, linking pairs of numbers with their product

Pair of numbers, in either order	Product
1 and 10	10
2 and 9	18
3 and 8	24
4 and 7	28
5 and 6	30

4ii	3m	**30.25** or equivalent
	Or 2m	Shows or implies that the numbers are **5.5** and **5.5** Or Answer between 30.24 and 30.25 exclusive, or 30.24 Or Shows at least two pairs of numbers that sum to 11, with both between 5 and 6 exclusive, e.g. • 5.1 and 5.9 5.45 and 5.55
	Or 1m	Shows one pair of numbers that sum to 11, with both between 5 and 6 exclusive

◀ **Has assumed the two symbols cannot be equal in value**

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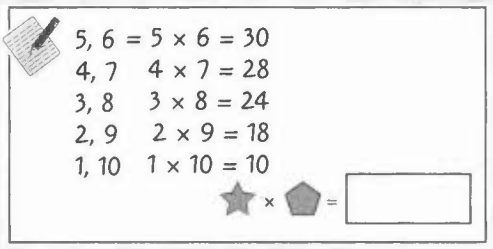
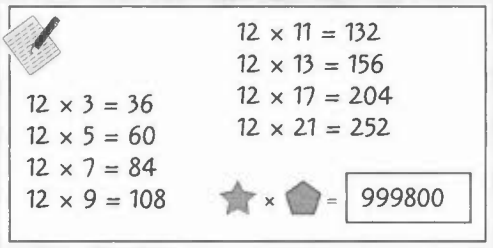
Question 4i: Exemplars



At least two pairs with their products; **1 mark**

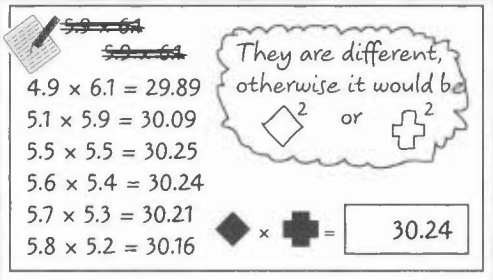
- This learner works systematically, but because it is not explicit that 30 is the highest product only 1 mark can be given.



Incorrect; **0 marks**

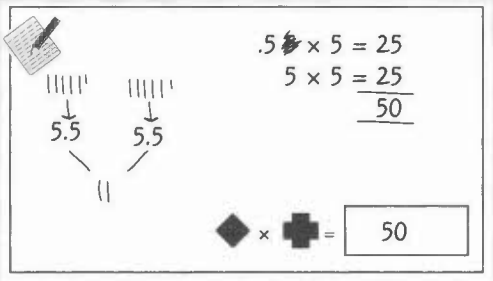
Common error — Ignoring the condition that the symbols add to 11 is a common error, yet without it there is an infinite number of products as any two numbers can be chosen.

Question 4ii: Exemplars



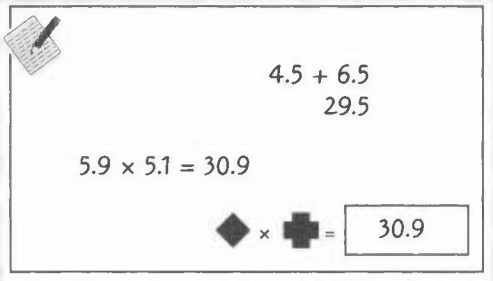
Answer 30.24; **2 marks**

Common error — It is a common error to assume that two symbols cannot be equal in value. 30.24 results from 5.4 × 5.6, which assumes that each value has just one decimal place.



Implies the numbers are 5.5 and 5.5; **2 marks**

Common error — This learner shows understanding of the numbers required, but is unable to multiply them together.



One pair within required range; **1 mark**

- Although 4.5 + 6.5 = 11, the values are not within the range 5 to 6 exclusive. The incorrect product of 5.9 and 5.1 can be ignored.

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Q	Marks	Answer
5	3m	**40** games altogether
	Or 2m	Answer **121** or **39** Or Shows or implies **at least three** repeated divisions by 3, e.g. • 81 ÷ 3, then ÷ 3, then ÷ 3 again • 27, 9, 3
	Or 1m	Shows or implies ÷ 3, e.g. • 27

Has included the number of players at the start or omitted the final game

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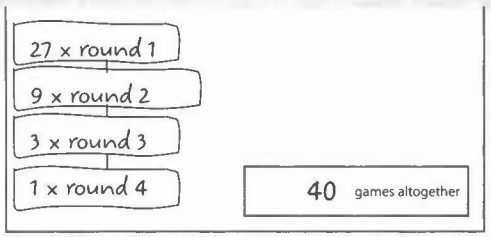
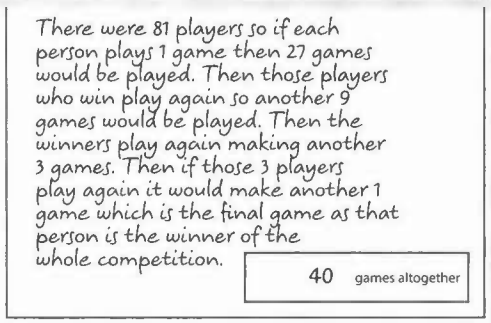
Question 5: Exemplars

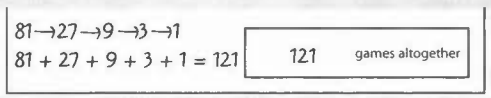


Correct; **3 marks**



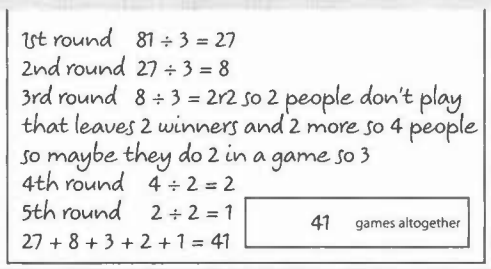
Correct; **3 marks**

- This learner understands the numeracy being assessed but needs encouragement to work concisely.



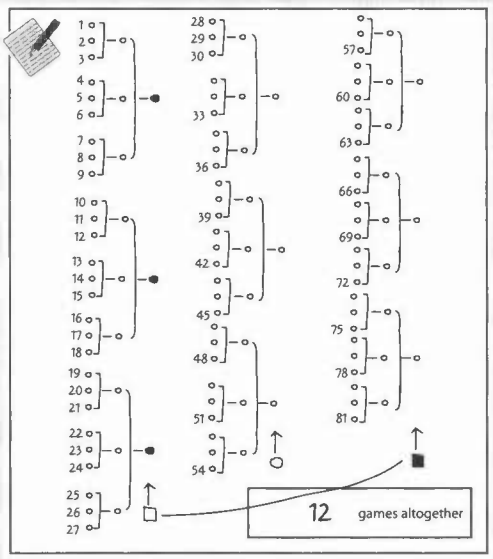
Answer 121 (or repeated ÷ 3); **2 marks**

Common error It is a common error to include the number of players at the start.



At least three repeated ÷ 3; **2 marks**

- The need for five rounds contravenes information given in the question so this learner should have recognised the need to check their work (27 ÷ 3 does not equal 8).



At least three repeated ÷ 3; **2 marks**

- This learner adopts the time-consuming approach of grouping in 3's (equivalent to ÷ 3 for three rounds) but gets confused when finding the total number of games. Actively seeking efficient ways of working is part of becoming numerate.

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