

NUMERACY

Y6

Reasoning
sample
materials

National Numeracy Tests



Llywodraeth Cymru
Welsh Government

Reasoning sample materials: Guidance for teachers

The reasoning tests will be first introduced in schools in 2014. It is therefore important that teachers and learners become increasingly familiar with the requirements in the framework to identify processes and connections, to represent and communicate, and to review.

Sample items have been produced for each year group to illustrate different question types and formats for response. Each year group contains one stimulus item, presented through PowerPoint, which requires information to be shown by the teacher immediately before the test begins.

The purpose of the stimulus material is to allow learners to engage with unfamiliar contexts. A teacher script is provided but teachers may use their own words provided no help is given with the numeracy that is to be assessed.

The sample items are representative of the anticipated level of demand. However, they are not complete papers: the number of marks within the live tests will be about 20 for each year group, with one stimulus item followed by between four and eight additional questions. In 2014 each reasoning test will last 30 minutes. The time taken to deliver the stimulus is in addition to this assessment time.

• *How to use the sample items*

The sample items can be printed and used for practice before the tests. Strengths and areas for improvement can then be identified and used to provide additional classroom learning and teaching activities, where appropriate.

The reasoning sample items can also be used as a basis for classroom discussion, to illustrate good test techniques. These include the importance of reading the question carefully, where to write the answers, the importance of showing working to enable others to understand the reasoning applied, good time management and the benefits of checking answers.

As importantly, the sample items can be used to promote understanding of good responses to open questions. For example, teachers could anonymise and photocopy a range of responses and ask learners to work in small groups to rank from 'best' to 'worst', identifying what is good about each and why.

• *Marking of the sample items*

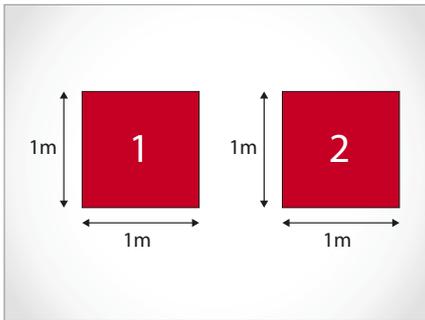
A markscheme is provided which is typical of those to be used alongside the live tests. It includes a range of likely responses with clear guidance on when and how partial credit should be applied. General marking guidance provides principles of marking to facilitate consistency across schools.

Presentation to be shown to learners before doing question 1

The text in the right-hand boxes should be read to learners. Teachers can use their own words, or provide additional explanation of contexts, if necessary. However, no help must be given with the numeracy that is to be assessed.

Slide 1		<p>Do you know where this photograph was taken?</p> <p>It's the Millennium Stadium in Cardiff. Newspaper reports said about eighty thousand people watched the match that is shown in the photograph. How would they know how many people were there?</p> <p><i>(Discuss. Learners are likely to refer to tickets sold, entry gates, etc. Draw out that this allows the organisers to be able to know the exact number even though it has been rounded.)</i></p>
Slide 2		<p>This photograph shows another crowd, but this time it was in Monmouth. The photograph shows people waiting to see the Carnival procession.</p> <p>There were far too many people to count them individually, and there were no tickets sold, so we need to think about how to estimate the number of people in the crowd.</p>
Slide 3	<p>77 000?</p> <p>150 000?</p>	<p>Whenever you see an estimate of the number of people in a crowd you need to think about who has made the estimate.</p> <p>For example, there was a rally in Hong Kong remembering Chinese people who died. Here are two different estimates of the number of people who attended. One estimate was made by the people who organised the event. The other estimate was made by the police. Which do you think was made by the organisers of the event?</p> <p><i>Discuss, drawing out that organisers may over-estimate to show how much support they have.</i></p>

Slide 4



Estimating the number of people in a crowd is difficult and mathematicians and scientists have spent a long time trying to find the best method.

One way is to think about how much space people take up.

For light crowds – that means crowds where people are not too jammed together – they estimate that each person takes up about this amount of space, a square that is one metre by one metre (*point to the left hand square*).

But when the crowds are more tightly packed together, they estimate that two people will fit in the same space. So for each square that is one metre by one metre, they estimate there will be two people.

Slide 5



You are going to use that information to estimate the size of a crowd that stood along a wide road in London called The Mall. They were standing there in front of Buckingham Palace for the royal wedding of Prince William and Kate Middleton.

All the information you need is in your booklet. When you have finished there are other questions to answer.

Remember that for some of the questions you will need to use your calculator, and it is very important to show your working so that someone else can understand what you are doing and why.

- 1 Estimate the number of people standing on The Mall for the Royal Wedding.



Assume:

- two people for each square, 1 metre by 1 metre
- the Mall is 30 metres wide.

Use the map on the opposite page and explain each step of your reasoning.

Give your answer to the nearest **thousand** people.

4m



2

Ambulances have

AMBULANCE

not

AMBULANCE

on the front.



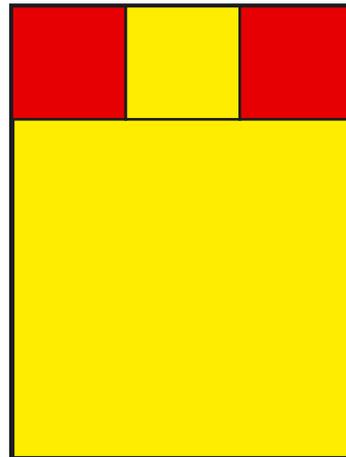
Why?



1m

3

This quilt cover is made from two red and two yellow squares.



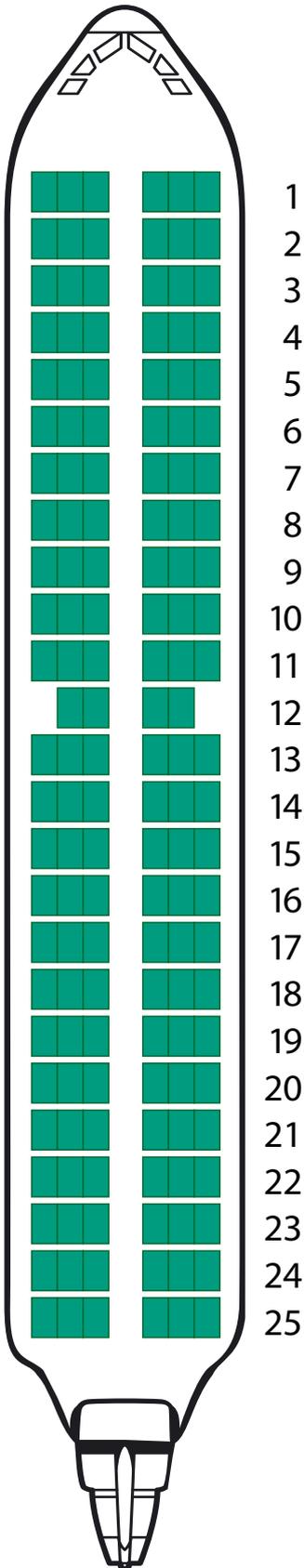
What fraction of the quilt cover is red?



2m

4

Plan of the inside of a plane



Each green rectangle  shows a seat.

How many seats are there?



What is the quickest way to work out this number?





It costs a lot of money to fly a plane.

They must get **at least £25 000** for tickets.

So far, **80** people have bought tickets.

Each ticket costs **£250**

How many **more** tickets must they sell to get £25 000?



more tickets



Reasoning sample materials: 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.

- ***What if learners use a method that is not shown within the markscheme?***

The markschemes show the most common methods, but alternative approaches may deserve credit – use your professional judgement. Any correct method, however idiosyncratic, is acceptable.

- ***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.

- ***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?***

For a two (or more) mark item, if an incorrect answer arises from misreading information given in the question and the question has not become easier as a result then deduct one mark only. For example, if the 2 mark question is 86×67 and the learner records 96×67 then gives the answer 6432, one mark only should be given. In a one mark question, no marks can be given.

- ***What should I do about crossed out work?***

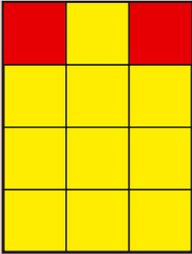
Working which has been crossed out and not replaced can be marked if it is still legible.

- ***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

Year 6 Reasoning sample materials: Markscheme

Q	Marks	Answer	Comments
1	4m	Shows the following steps to justify their answer of 56 000 (or 55 000, see comments section) <ol style="list-style-type: none"> 1. Measures and uses the scale to convert to metres 2. Multiplies by 30 to find the area of the Mall 3. Doubles to find the number of people 4. Rounds to the nearest thousand e.g. <ul style="list-style-type: none"> • 18.6cm is 930m $930 \times 30 = 27\,900\text{m}^2$ 2 people per m^2 so 55 800 Answer 56 000 people	Throughout, condone units that are incorrect or omitted Accept 920 to 940m inclusive Accept 27 600 to 28 200 inclusive Accept 55 200 to 56 400 inclusive Must follow from their number of people, i.e. from 55 200 their answer must be 55 000
	Or 3m	Shows a value between 54 000 and 57 000 inclusive Or Rounds their (double their incorrect length \times 30) to the nearest ten thousand	
	Or 2m	Shows a value between 27 600 and 28 200 inclusive Or Doubles their (incorrect length \times 30)	
	Or 1m	Shows a value between 920 and 940 inclusive Or Multiplies their incorrect length in metres by 30	

Q	Marks	Answer	Comments
2	1m	<p>Gives an explanation that includes drivers and a mirror, e.g.</p> <ul style="list-style-type: none"> • So drivers can see the word ambulance in their mirror • So that when you are in your car you see it the right way when the ambulance is behind (mirror implied) 	<p>Do not accept partial explanations, e.g.</p> <ul style="list-style-type: none"> • So drivers can see it • Because of the mirror
3	2m	One sixth, or equivalent fraction	
	Or 1m	<p>Shows that the large yellow square contains nine of the smaller yellow squares, e.g.</p> <ul style="list-style-type: none"> •  	<p>Lines need not be accurate provided the learner's intention is clear</p>

Q	Marks	Answer	Comments
4i	1m	148	
4ii	1m	<p>Groups seats, using multiplication to give a correct calculation, e.g.</p> <ul style="list-style-type: none"> • $25 \times 6 - 2$ [or $50 \times 3 - 2$] • $24 \times 6 + 4$ [or $48 \times 3 + 2 + 2$] • $11 \times 6 + 4 + 13 \times 6$ • $11 \times 3 + 11 \times 3 + 4 + 13 \times 3 + 13 \times 3$ 	<p>Provided a correct method is shown, accept numerical errors, e.g.</p> <ul style="list-style-type: none"> • $24 \times 6 = 124$ (error), $124 + 4 = 128$ <p>Do not accept repeated addition</p>
4iii	3m	20	
	Or 2m	<p>Shows that another £5000 of tickets must be sold</p> <p>Or</p> <p>Shows a complete correct method even if there are numerical errors, e.g.</p> <ul style="list-style-type: none"> • $80 \times 250 = 18\,000$ (error) $25\,000 - 18\,000 = 7\,000$ $7\,000 \div 250$ 	
	Or 1m	<p>Shows that the total sales to date is £20 000</p> <p>Or</p> <p>Shows a correct method to find the total amount left to be sold, e.g.</p> <ul style="list-style-type: none"> • $80 \times 250 = 18\,000$ (error) $25\,000 - 18\,000 = 7\,000$ <p>Or</p> <p>Shows their total amount left to be sold $\div 250$</p>	

