NUMERACY

Y8 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.
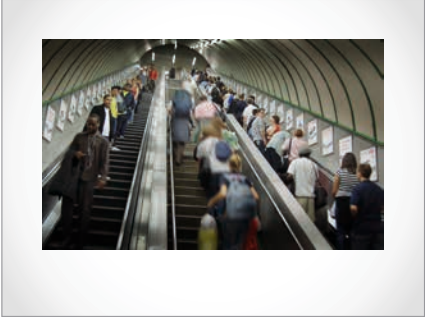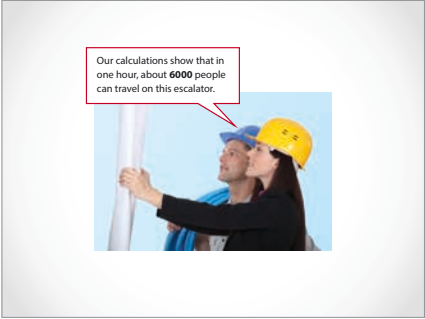
As importantly, the sample items can be used to promote understanding of good responses to open questions. For example, teachers could anonymise and photocopy a range of responses and ask learners to work in small groups to rank from 'best' to 'worst', identifying what is good about each and why.
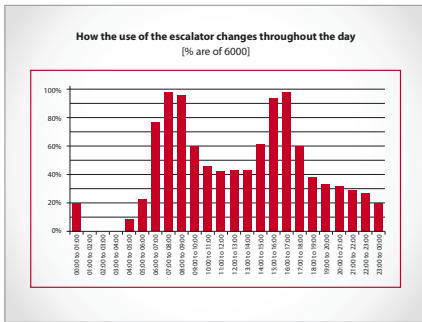
● *Marking of the sample items*

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		Have any of you have travelled on the London Underground? If so, you will have seen long escalators that take people down to the trains and back up to ground level.
		Why do you think most Underground stations use escalators rather than lifts?
		(Help learners realise that escalators, which run continuously, can move many more people per hour than lifts where people must wait for the next lift to come.)
		When architects and engineers are designing underground stations they need to think very carefully about how many escalators to install. Too many and they have wasted money. Too few and people have to queue for a long time and it can become dangerous with crowds of people on the platform. Let's think about one particular escalator that has already been built …
Slide 2	Our calculations show that in one hour, about **6000** people can travel on this escalator.	The architects and engineers use their knowledge of mathematics to work out the greatest number of people that can use the escalator in one hour. By using speed they estimate the maximum number of people that can travel on that escalator in one hour is about six thousand.

| Slide 3 | | Of course the number of people using the escalator is not always six thousand per hour – it is not always that busy.

This graph from Transport for London shows how the use of the escalator changes throughout the day.

What do the numbers on the horizontal axis show? *(time of day)*

How long is each time interval? *(one hour)*

What does the vertical axis show? *(% of the maximum number of people who could use the escalator, i.e. of 6000)*

So what does this bar show? *(Point to the bar representing 11:00 to 12:00 and agree together that just over 40% of the 6000 people that could use the escalator do so at that time). Do **not** work out percentages, or discuss the shape of the graph or otherwise interpret the bars as this forms part of the assessment.*

You are going to answer some questions about people travelling on one escalator in the London Underground. 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 Use the information on the opposite page.

What time in the morning do you think the Underground station opens?
Explain **why** you chose that time.

When are the **busiest** times?

Estimate the number of people who use the escalator between **6am** and **6pm**.
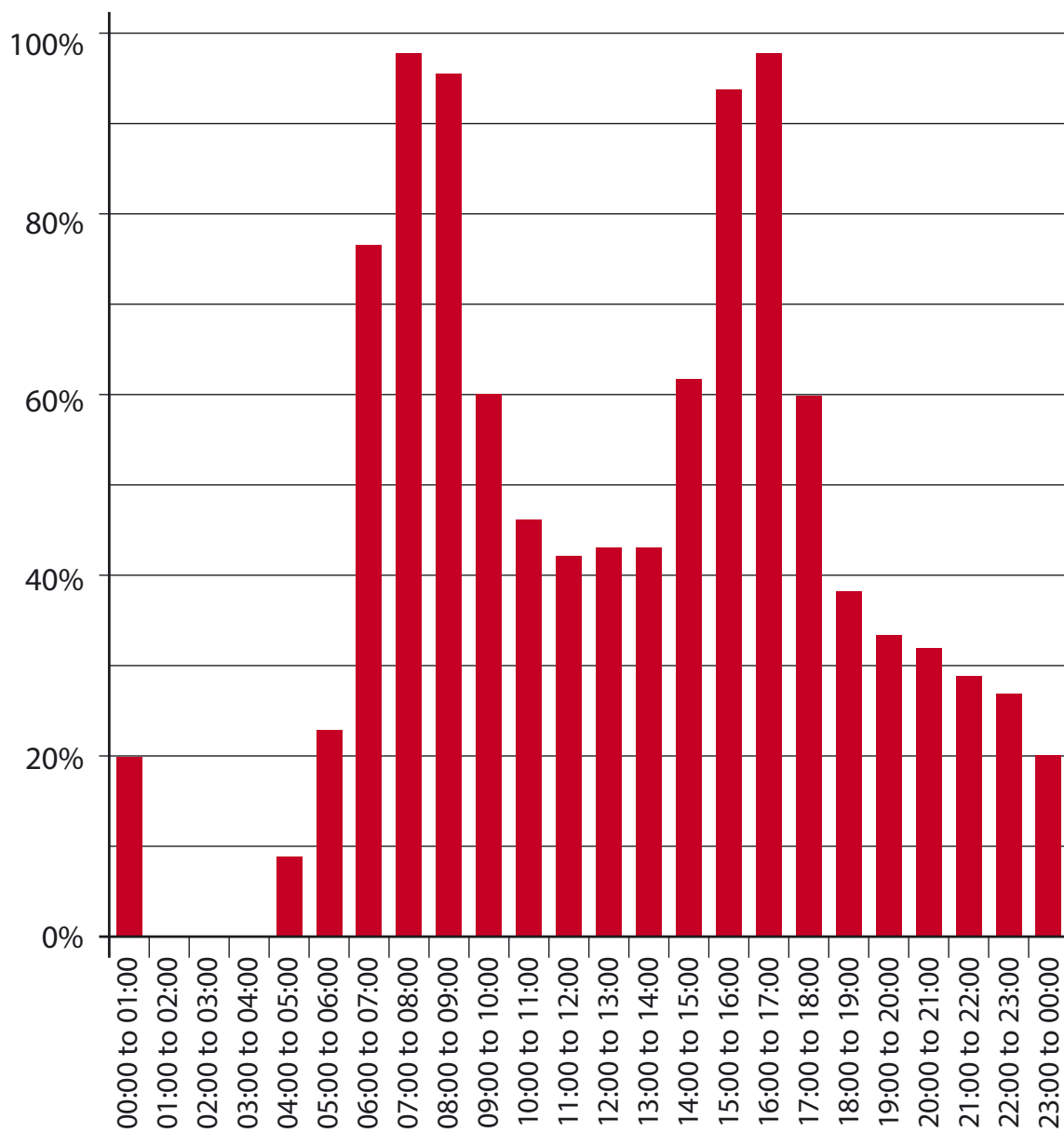Show your method clearly and give your answer to the nearest ten thousand.

Information

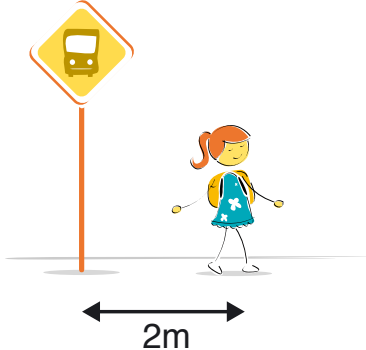The greatest number of people that can use the escalator in one hour is **6000**

How the use of the escalator changes throughout the day
[% are of 6000]

This maths question was in a newspaper.

Amy is **2m** from the bus stop.

2m

Ben is **6m** from the bus stop.

What is the distance between them?

The newspaper claimed the answer was 4m.

Show why there are many more possible answers.

2m

3

The picture shows the world's biggest lolly.

It weighs **3175 kilograms**.

It takes me five minutes to eat a small lolly like this.

It weighs **20 grams**.

If I never stopped eating, how many days would it take me to eat this HUGE lolly?

Work out how many days it would take.

days

4m

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?*

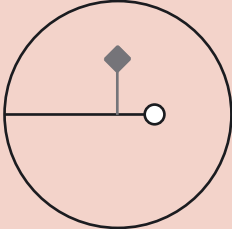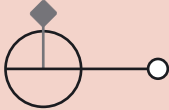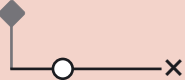Working which has been crossed out and not replaced can be marked if it is still legible.

- *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 8 Reasoning sample materials: Markscheme

Q	Marks	Answer	Comments
1i	1m	Gives a time between 03:45 and 05:30 with an accompanying justification, e.g. • 04:00, that's when the first people arrive • Just before 4, where the bar starts • 5am because people wait for the first train • Half past 5 because the people using the escalator before that are the station staff	Accept a time between 00:00 and 01:00 provided it is clearly stated that the station closes after that
1ii	1m	Identifies the two peaks, e.g. • 07:00 to 08:00 and 16:00 to 17:00 • 7 to 9 in the morning and 3 till 5 in the afternoon	Do not accept the time of day not identified, e.g. • 7 to 9 and 3 to 5

Q	Marks	Answer	Comments
1iii	4m	Gives a clear justification for their estimate of 50 000 The most common methods are to use the nearest 20%, e.g. • Some can round up and some can round down, so $4 \times 100\% + 1 \times 80\% + 3 \times 60\% + 4 \times 40\%$ gives a total of 820% $8.2 \times 6000 = 49\,200$ so 50 000 to the nearest ten thousand Or to use the nearest 10%, e.g. • 3 at 100%, $3 \times 6000 = 18\,000$ 1 at 90, 5400 1 at 80%, 4800 3 at 60%, 10800 1 at 50%, 3000 3 at 40%, 7200 Total about fifty thousand Or to estimate each value, e.g. • $4600 + 5800 + 5700 + 3600 + 2800 + 2500 + 2600 + 2600 + 3700 + 5600 + 5800 + 3600 = 48\,900$ which rounds to 50 000	
	Or 3m	Gives an estimate of between 45 000 and 55 000 inclusive with a clear justification Or Gives an estimate of 50 000 but without a clear justification	
	Or 2m	Shows the ability to calculate a percentage of 6000 correctly **and** shows the ability to round to the nearest ten thousand correctly	
	Or 1m	Shows the ability to calculate a percentage of 6000 correctly Or Shows the ability to round to the nearest ten thousand correctly	

Q	Marks	Answer	Comments
2	2m	Shows at least four possible positions, e.g. • He could be anywhere on this circle • She could be anywhere on this circle • They could be 	Diagrams need not be to scale but Ben must be further from the bus stop than Amy
	Or 1m	Gives a partial explanation, e.g. • He (or she) could be on the other side of the bus stop	

Q	Marks	Answer	Comments
3	4m	551 or 552	Accept 551 with any decimal, e.g. • 551.215
	Or 3m	Shows 13 229 [total number of hours] Or Shows the digits 551, e.g. • 55.12 days	Accept 13 230 or 13 229 with any decimal, e.g. • 13,229.2
	Or 2m	Shows 793 750 [total number of minutes] Or Shows the digits 13230 or 13229, e.g. • 132.29999	
	Or 1m	Shows a correct conversion between kg and grams, e.g. • 3175000 seen Or Shows the digits 79375, e.g. • 793.75	