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FOR WALES



# Key skills application of number Level 3

Monday 13th November 2006

## Test Paper

### YOU NEED

- This test paper
- An answer booklet
- A pen with black or blue ink
- Pencils
- An eraser
- A ruler marked in mm and cm
- 2mm squared paper
- A scientific calculator

You may use a bilingual dictionary

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Do NOT open this paper until you are told to do so by the supervisor

### THERE ARE TWO PARTS TO THIS TEST

Part A (total 35 marks) consists of 5 short-answer questions

Part B (total 15 marks) consists of 1 extended-answer question

Total marks available: 50

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### INSTRUCTIONS

You have 15 mins to read through the paper prior to starting the test.

Use this time to read through all the questions carefully, consider how you will attempt them and make rough notes if you wish.

Do not start writing in the answer book until you are told you can.

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YOU WILL THEN HAVE 1 HOUR 30 MINUTES TO FINISH THE TEST

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Try to answer ALL the questions and:

- Make sure your personal details are entered correctly in the answer booklet
  - Write in black or blue ink
  - Make sure that your writing is clear, and show all your working
  - If you need extra paper, use a second answer booklet. Make sure you put your personal details on the front of the second answer booklet
  - At the end of the test, hand the test paper, your answer booklets and all notes to the supervisor
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**REMEMBER: YOU HAVE 1 HOUR 30 MINUTES TO FINISH THE TEST**

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**Part A - Short-answer questions**

- 1 In the United Kingdom (UK) an increasing number of people use mobile phones to text messages.

In the year 2004 a total of 25 billion text messages was sent in the UK compared with only 20.5 billion text messages sent in 2003.

1 billion is 1 000 000 000

- a What was the percentage increase in the number of text messages sent in 2004 compared with the number of text messages sent in 2003?

**1 mark**

In 2004 the population of the UK was 59.835 million

- b On average, how many text messages were sent per person in 2004 in the UK?

**1 mark**

On New Year's Day 2005 a record 133 million text messages were sent. This was an increase of 19.8% over the number of text messages sent on New Year's Day 2004.

- c How many text messages were sent on New Year's Day 2004?

**2 marks**

A total of 2.5 billion text messages was sent during the month of January 2005 compared with a total of 2.4 billion sent during the month of December 2004.

- d How many more text messages were sent **each minute** during January 2005 than **each minute** during December 2004?

**1 mark**

**Total 5 marks**

**Please go on to the next page**

- 2 In 2005 a new pipeline more than a thousand miles long was opened to bring oil from central Asia to a Mediterranean port for export to Europe and the USA.

The cylindrical pipeline is 1090 miles long and 42 inches in diameter.

1 mile is equivalent to 1 609 metres  
1 inch is equivalent to 2.54 centimetres  
1 cubic metre is equivalent to 6.29 barrels

- a What is the maximum volume of oil that the pipeline can hold?  
Give your answer to the nearest thousand barrels.

**3 marks**

Output from the pipeline is expected to reach one million barrels a day.  
A typical oil tanker using the Mediterranean port can carry 200 000 tonnes of oil.

An average barrel of oil weighs 0.125 tonnes

- b How many of these tankers can be filled per year by the pipeline when oil output is one million barrels per day?

**1 mark**

Some experts estimate that there may be 220 billion barrels of oil in the underground reserve that feeds the pipeline.

1 billion is 1 000 000 000

- c How many years will a reserve of 220 billion barrels of oil last if output from the pipeline is one million barrels per day?

**1 mark**

- d Show how to check your answer to part c by estimation without using a calculator.

**1 mark**

**Total 6 marks**

**Please go on to the next page**

- 3 In 2004 the total value of sales of BBC publications was estimated at £341.2 million. The table below shows the value of sales of different categories of publication.

**The value of sales of BBC publications in 2004**

Category	Value of sales (£million)
Magazines	141.2
Video and DVD	82.3
Books and Audio	47.0
Children's	39.9
Other	30.8

- a Approximately, what fraction of the total value of sales of BBC publications, in 2004, was from the sales of books and audio products? Give your answer in a simple form.

1 mark

- b For every £100 spent on BBC publications in 2004, how much was spent on magazines?

1 mark

The table below gives the value of sales of BBC publications and the number of employees involved in BBC publications for 2003 and 2004.

**The value of sales of BBC publications and the number of employees involved in 2003 and 2004**

Year	Value of sales of BBC publications (£millions)	Number of employees
2003	338.0	1564
2004	341.2	1588

- c How did the value of sales of BBC publications **per employee** change between 2003 and 2004? Show calculations to support your answer.

2 marks

The value of sales of BBC publications reached £341.2 million in 2004.  
This value was forecast to increase by 1.38% in 2005.

- d If the value of sales of BBC publications continues to increase at 1.38% per year, in which year will the value of sales of BBC publications exceed £1 million **per day**?

**2 marks**

**Total 6 marks**

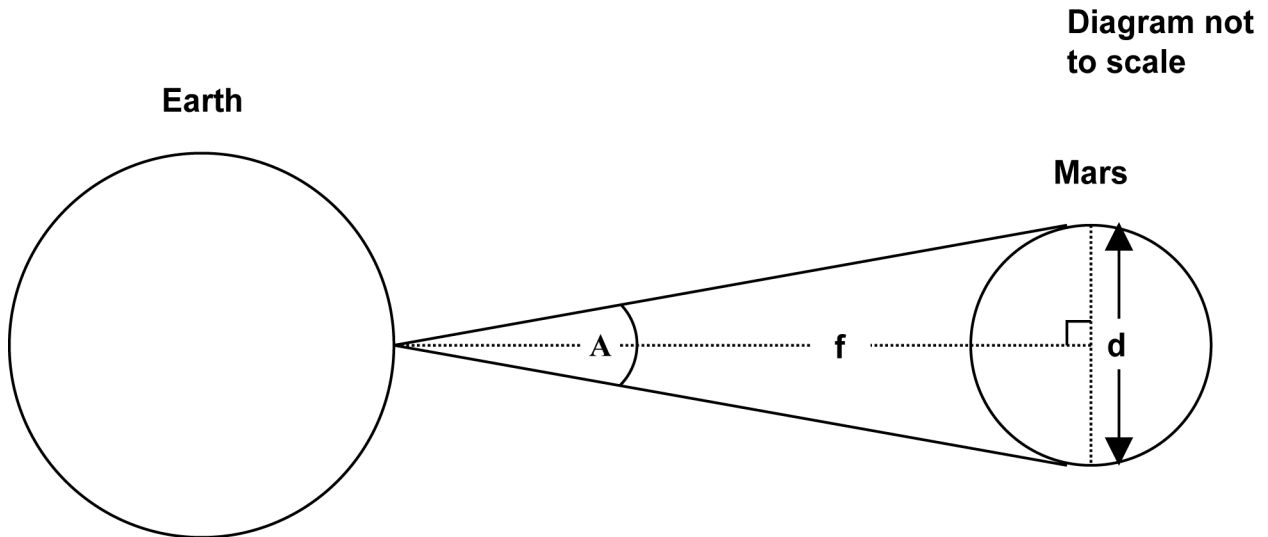
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4 In 2003 the following headline appeared on an internet website.

*On the 27th August 2003 Mars will be the closest it has been to Earth in nearly 60 000 years.*

On that night, an amateur astronomer measured the small angle shown as  $A$  (the angular diameter) on the simplified diagram below, as  $0.007^\circ$

**Simplified diagram showing the angular diameter ( $A$ ) of Mars**



The diameter ( $d$ ) of Mars is 6 794.4 kilometres

- a How far (distance  $f$ ) was the centre of Mars from the surface of Earth on the 27th August 2003? Give your answer to the nearest million kilometres.  
**2 marks**

The distance from Mars to Earth is usually greater than it was on the 27th August 2003.

The Mars Exploration Rover, *Spirit*, was launched on the 10th July 2003. By the time it reached Mars after 207 days in space, it had travelled 96 million kilometres.

- b What was the average speed of the Mars Exploration Rover, *Spirit*, on its journey to Mars, in kilometres per second?  
**2 marks**

The amateur astronomer writes an article, comparing Mars with Earth, for his local newspaper. He states that an approximate value for the surface area of Mars can be found using the formula below.

$S = 4\pi r^2$		
where	S is the surface area in square kilometres	
	r is the radius of Mars in kilometres	

The diameter of Mars is 6 794.4 kilometres.  
The surface area of Earth is 509.6 million square kilometres.

- c What is the approximate ratio of the surface area of Mars to the surface area of Earth?

**2 marks**

Information about the temperature on Mars and on Earth is given below.

<b>Temperature extremes</b>		
Mars	Maximum	20°C
	Minimum	-140°C
Earth	Maximum	58°C
	Minimum	-69°C

The amateur astronomer writes

*'The range of temperatures on Mars is more than 25% greater than the range of temperatures on Earth'*

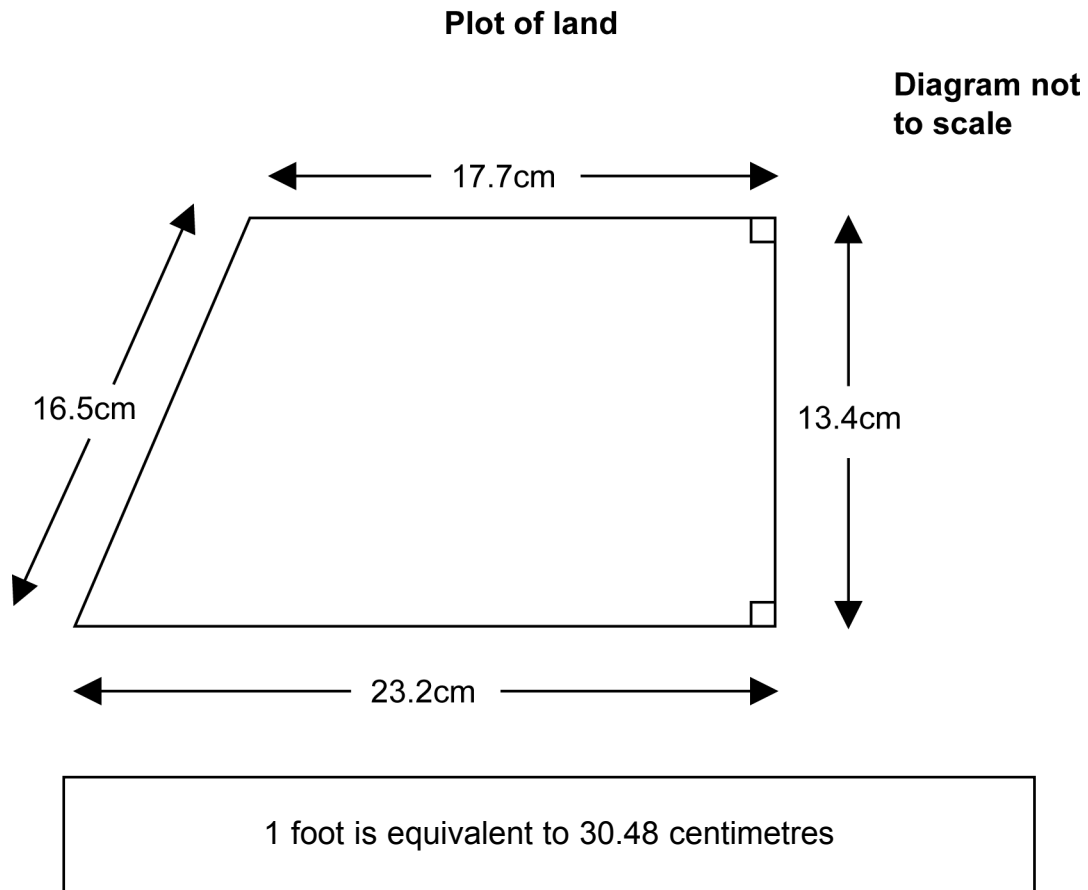
- d Is the astronomer's statement correct? Show calculations to support your answer.

**2 marks**

**Total 8 marks**

- 5 Storage warehouses are being built on sites across the country. They offer safe, secure storage to people and organisations for items such as furniture and equipment.

A man intends to buy a plot of land to use as a site for a storage warehouse. An estate agent shows him a plan of a plot of land that is for sale. The plan is drawn to a scale of 1 : 400. The following sketch shows the dimensions on the plan.



- a What is the area of the actual plot of land in square feet ( $\text{ft}^2$ )?

**3 marks**

The man thinks that the plot of land would be ideal as a site for a storage warehouse. He estimates that on this land a warehouse with a total storage space of  $25\,000\text{ft}^2$  could be occupied by a number of small units each with a storage space of  $50\text{ft}^2$  and a number of large units each with a storage space of  $150\text{ft}^2$ . He estimates that there would be a total of 320 units in the warehouse.

- b Use this information about storage space and the total number of units to write two equations about the number of small units and the number of large units he could have in his warehouse.

**1 mark**

- c Solve your equations to find how many small units and how many large units he could have in his warehouse.

2 marks

- d Show how to check your answers to part c.

1 mark

A storage warehouse at Bolton has a ground floor and an upper floor.  
The charge for  $75\text{ft}^2$  of storage on the ground floor is £22.72 **per week**.  
The charge for  $80\text{ft}^2$  of storage on the upper floor is £14.40 **per week**.

- e How much more is the charge per square foot ( $\text{ft}^2$ ) **per year** for storage on the ground floor than storage on the upper floor?

1 mark

To promote its services, a business puts on 3-week exhibitions 4 times a year. It uses a  $180\text{ft}^2$  unit in a warehouse in Birmingham to store its exhibition materials when they are not in use.  
The charge for this unit is

£52.80 per week plus VAT at 17.5%

The business insures the exhibition materials, valued at £28 000, during storage at a cost of

56 pence per £1 000 of the value insured per week (inclusive of VAT)

It uses this storage warehouse **for 3 years** but the costs **only apply** for the time when the exhibition materials are being stored.

- f What is the minimum charge to the business for storage of the exhibition materials and insurance over the 3-year period?

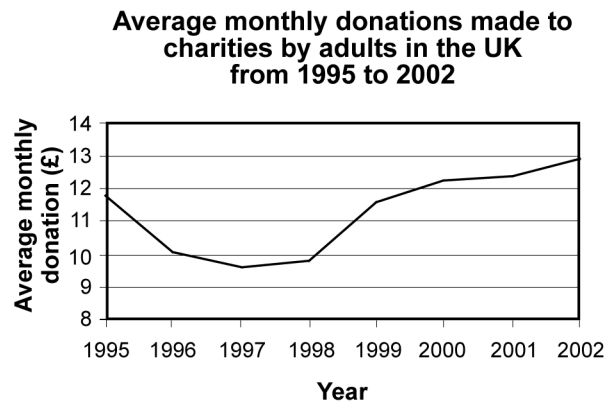
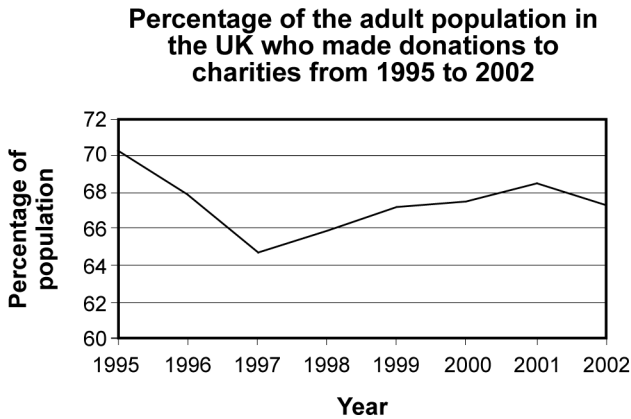
2 marks

**Total 10 marks**

**Part B - Extended-answer question**

- 6 The total amount of money given to charities mainly depends upon the number of the adult population who make donations to charities and the average amount donated.

The graphs below give information on how both these factors varied from 1995 to 2002.



- a Refer to the graphs above and write one statement describing how the percentage of the adult population who made donations to charities varied over the period of time between 1995 and 2002 and one statement about how the average monthly donations made to charities by adults varied from 1995 to 2002.

**2 marks**

In 2003 the number of adults aged 16- to 24-year-olds in the UK was  $6.79 \times 10^6$ . The average donation they made to charities in 2003 was £6.56 per month. The total of all the donations made to charities by adults in the UK was £7.1 billion in 2003.

1 billion is 1 000 000 000

- b What percentage of the total of all the donations made to charities by adults in the UK in 2003 was made by 16- to 24-year-olds?

**2 marks**

The table below gives the distribution of the monthly donations made to charities by adults in the UK in 2003.

**The distribution of the monthly donations made to charities by adults in the UK in 2003**

Monthly donation (£D) given to charity	Percentage of adult population	Cumulative frequency
0	42.1	42.1
$0 < D \leq 5$	23.9	66.0
$5 < D \leq 10$	10.6	76.6
$10 < D \leq 20$	9.6	86.2
$20 < D \leq 50$	9.1	95.3
$50 < D \leq 200$	4.7	100.0

- c Draw a cumulative frequency graph to show the distribution of the monthly donations made to charities by adults in the UK in 2003. **4 marks**
- d Refer to your graph and briefly explain what the distribution shows. **1 mark**
- e Use the data in the table to calculate an estimate of the mean monthly donation made to charities by adults in the UK in 2003. **3 marks**
- f Explain why your value for the mean, calculated in part e, is only an estimate. **1 mark**

The median monthly donation to charities by adults in the UK in 2003 is estimated to be £1.76.

- g Which of the two averages, the mean or the median, gives a better indication of the average monthly donation made to charities by adults in the UK in 2003. Give a reason for your answer.

**2 marks**  
**Total 15 marks**

**End of test**

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