



Unit Number

U3051246/KA3T

Key Skills

Application of Number

Level 3

Monday 12 May 2008

Total Marks: 50

No. of Questions: 6

Time: 1 hour 30 minutes

Materials required for examination

This test paper

An answer booklet

A pen with black or blue ink

A pencil and eraser

A ruler marked in mm and cm

2mm squared paper

A scientific calculator

You may use a bilingual dictionary

Instructions to Candidates

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

In the boxes on the answer book, write your centre number, registration number, surname and initials. The paper reference is shown above.

Write in black or blue ink only.

You have 15 minutes 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.

You will then have 1 hour 30 minutes to finish the test.

At the end of the test, hand the test paper, the Answer Booklet(s) and all notes to the supervisor.

Information for Candidates

There are two parts to this test.

Part A (total 34 marks) consists of 5 short-answer questions.

Part B (total 16 marks) consists of 1 extended-answer question.

Try to answer ALL the questions.

Advice to Candidates

Make sure that your writing is clear, and show all your working.

Read each question carefully.

If you need extra paper, use a second answer booklet. Make sure you put your personal details on the front of this booklet too.

Instructions to Centres

This paper must not be photocopied

Turn over

Part A - Short answer questions

- 1 The Government in the United Kingdom (UK) spends money on behalf of the public.

In 2005 the total public spending by the UK Government was £521 billion. The population of the UK in 2005 was 60.22 million.

1 billion is 1 000 000 000

- a On average, how much was public spending per member of the population in the UK in 2005?

1 mark

The table below gives information about public spending in the UK in 2005.

Public spending in the UK in 2005

Spending category	Amount spent (£billion)
Public Order and Safety	29.8
Debt Interest	25.0
Defence	28.8
Education	65.5
Transport	18.7
Health	84.7
Social Protection	167.0
Other Expenditure	101.5
Total	521.0

- b Approximately, what was the ratio of public spending on Social Protection in 2005 to public spending on Education in 2005? Give your answer in a simple form.

1 mark

- c In 2005, for every £100 spent on Health, how much was spent on Defence?

1 mark

- d Approximately, what fraction of total public spending in 2005 was spent on Debt Interest? Give your answer in a simple form.

1 mark

Total 4 marks

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- 2 UK water companies lose a substantial amount of water each day due to leaking pipes.

In 2004, one water company lost an average of 915 million litres of water per day due to leaking pipes. Its target for 2005 was to reduce leakage by 55 million litres of water per day.

In 2005, the company lost 894 million litres of water per day due to leaking pipes.

- a What percentage of its target reduction in leakage did the water company achieve in 2005?

1 mark

In order to meet future targets, the company must achieve an average decrease of 5% in leakage from its pipes each year after 2005.

- b If the company achieves an annual decrease in leakage of 5%, from 894 million litres in 2005, in which year will leakage decrease to fewer than 600 million litres per day?

2 marks

A newspaper claimed that the 3 609 million litres of water **per day** that leak away from pipes in the UK are enough to fill Lake Windermere to its average depth more than **four times every year**. Lake Windermere has a surface area of 15 square kilometres and an average depth of 21.3 metres.

<p>1 square kilometre is equal to 1 000 000 square metres 1 cubic metre is equal to 1 000 litres</p>
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- c Use this information to find how many litres of water there are in Lake Windermere. State whether the newspaper's claim is valid and show calculations to support your answer.

3 marks

Total 6 marks

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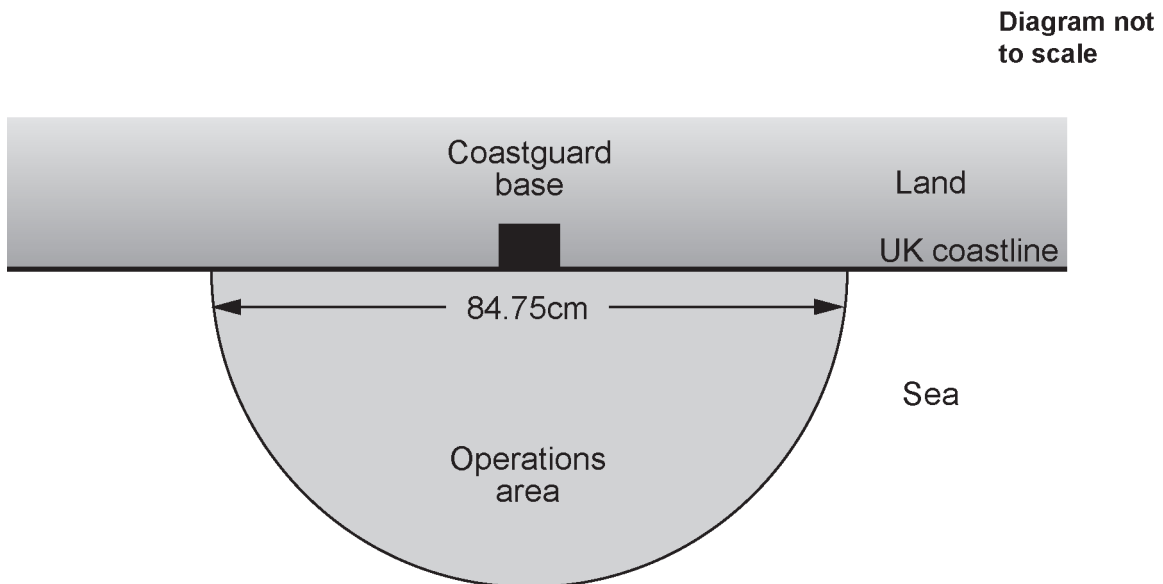
3 In 2005, a UK Coastguard helicopter flew the 10 000th rescue mission since Coastguard operations began on the same date, 22 years previously, in 1983.

a On average, how many rescue missions **per week** did UK Coastguard helicopters fly during this period?

1 mark

The sketch below shows the operations area of one UK Coastguard rescue helicopter. The operations area stretches out to sea from its base on the coast. On a map drawn to a scale of 1 : 190 000 the operations area is shown as a semi-circle with a diameter of 84.75 centimetres.

Sketch of the rescue helicopter's operations area with the scaled measurement of the diameter taken from the map

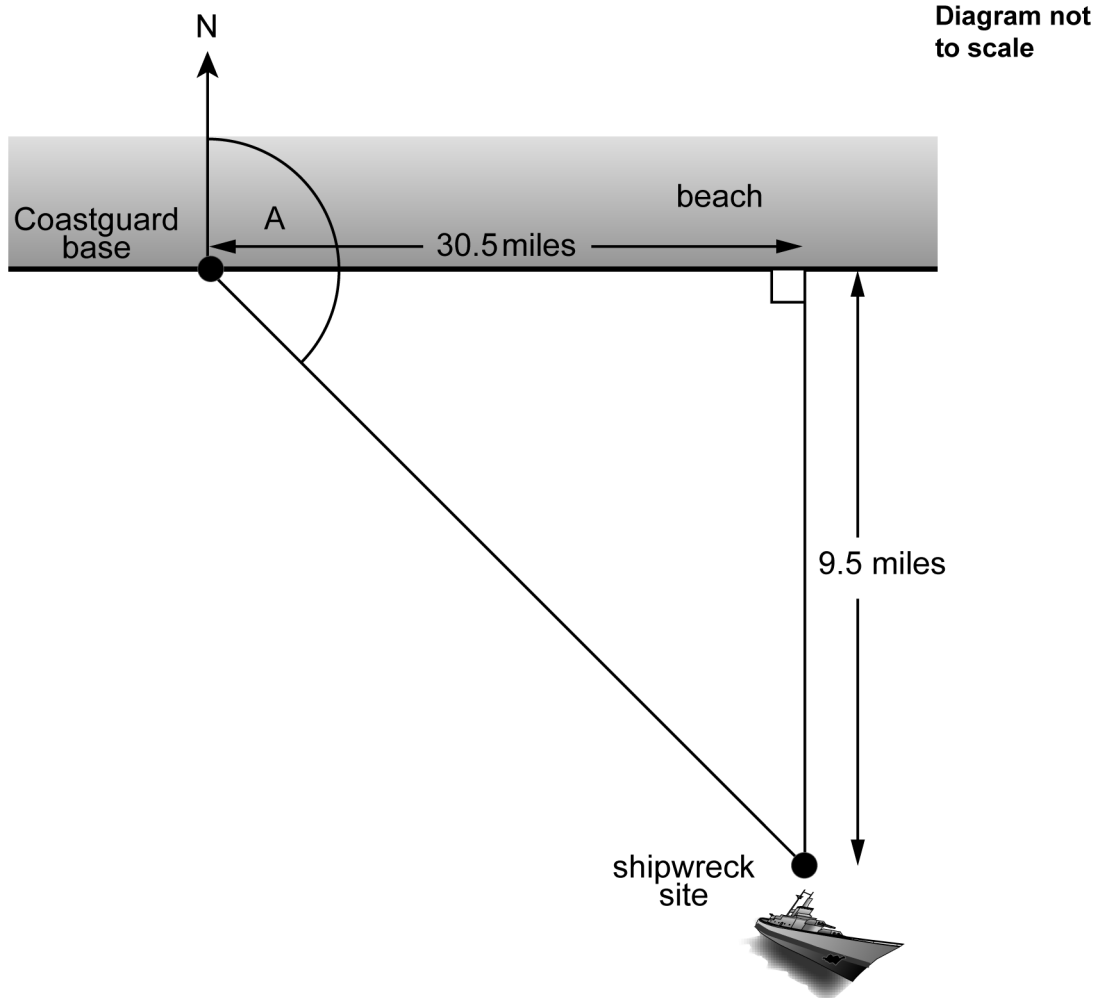


b What is the actual area of the UK Coastguard rescue helicopter's operations area?

3 marks

Two divers explore a shipwreck 9.5 miles due south of a beach. The beach is 30.5 miles due east of the coastguard base.

Simplified diagram showing the positions of the coastguard base, the shipwreck site and the beach



The divers fail to surface at their dive boat and a UK Coastguard rescue helicopter is called out from the coastguard base.

- c Calculate the bearing (angle A) of the shipwreck site from the coastguard base.

2 marks

- d Use a different method to check your answer to part c.

2 marks

Total 8 marks

4 Marathons are run over a distance of 26 miles 385 yards.

1 760 yards are equal to 1 mile

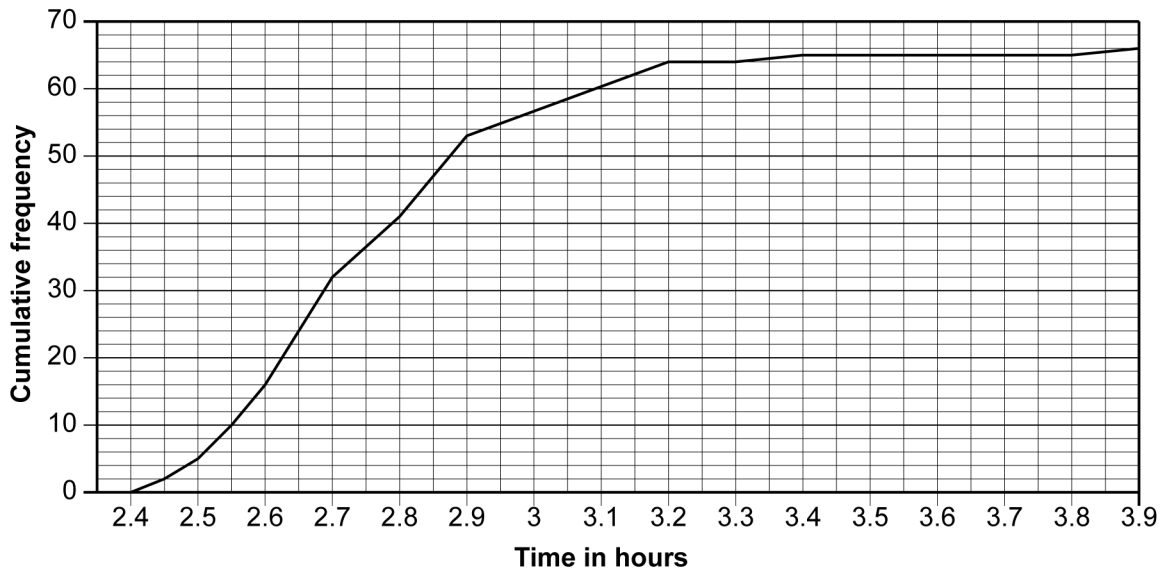
The 2004 Olympic Women's Marathon was won in a time of 2 hours 26 minutes 20 seconds.

a What was the average speed of the winning runner in the 2004 Olympic Women's Marathon in miles per hour?

3 marks

A total of 66 runners completed the 2004 Olympic Women's Marathon. The times of these runners are shown in the cumulative frequency graph below.

The finishing times of runners completing the 2004 Olympic Women's Marathon



b Use the graph to estimate the median finishing time in hours, minutes and seconds of the runners who completed the 2004 Olympic Women's Marathon.

2 marks

c Use the graph to estimate the interquartile range of the finishing times of the runners who completed the 2004 Olympic Women's Marathon.

2 marks

- d Briefly explain what your result for part c tells you.

1 mark

The table below gives the median and interquartile range of the finishing times of the runners who completed the 2004 Olympic Men's Marathon.

Median and interquartile range of finishing times in the 2004 Olympic Men's Marathon

Median	2 hours 21 minutes 01 seconds
Interquartile range	7 minutes 44 seconds

- e Make two statistical comparisons between the finishing times in the 2004 Olympic Women's Marathon and the 2004 Olympic Men's Marathon. Comment on your findings.

2 marks

Total 10 marks

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5 A company bought shares in a Premiership football club.

In September 2003 the company bought 7.94 million shares. This was equal to 3.2% of the total number of shares in the football club.

a What was the total number of shares in the football club?

1 mark

In September 2003 the shares were valued at $193\frac{1}{2}$ pence each.

b What was the total value of the 7.94 million shares bought by the company in September 2003?

1 mark

Between September 2003 and October 2004 the shares increased in value. In 2004 the same company bought an extra 3.68 million shares for a total cost of £9 572 200. Some of the extra shares were bought in June 2004 at a cost of 247 pence per share. The remainder of the extra shares were bought in October 2004 at a cost of 285 pence per share.

c Use this information to write two equations about the number of extra shares bought in June at 247 pence and the number of extra shares bought in October at 285 pence.

1 mark

d Use your equations to find the number of extra shares bought at 247 pence and the number of extra shares bought at 285 pence.

2 marks

e Show how to check your answer to part d.

1 marks

Total 6 marks

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Part B - Extended answer question

- 6 In mountainous areas air temperatures are lower and wind speeds usually higher, making it feel much colder than on lower ground.

Temperatures decrease by approximately 0.6°C for each 100 metres rise in height. The starting point of the mountain track up Ben Nevis is 98 feet above sea level. The summit of Ben Nevis is 4 406 feet above sea level.

1 foot is equivalent to 0.305 metres

- a Calculate the expected temperature at the summit of Ben Nevis when the temperature at the starting point of the mountain track up Ben Nevis is 5.4°C .

2 marks

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Wind chill is an estimate of how much cooler it feels when a wind is blowing. It depends on the actual air temperature and the wind speed. Wind chill temperatures at different wind speeds for actual air temperatures from 5°C to -10°C are shown in the table below.

Wind chill temperatures in °C for actual air temperatures from 5°C to -10°C

Wind speed in km per hour	Actual air temperature °C			
	5	0	-5	-10
0	5	0	-5	-10
5	4	-2	-7	-13
10	3	-3	-9	-15
15	2	-4	-11	-17
20	1	-5	-12	-18
25	1	-6	-12	-19
30	0	-6	-13	-20

An American website states that at an actual air temperature of 32°F (0°C) a wind speed of approximately 12.5 miles per hour gives the same wind chill temperature as an actual air temperature of 23°F with no wind.

The formula for converting °C to °F is given below.

$$F = \frac{9}{5} C + 32$$

where F is the temperature in degrees Fahrenheit
C is the temperature in degrees Celsius

1 mile is equivalent to 1.609 kilometres

- b Use the data in the table and the information above to decide if the website statement is correct. Clearly state your answer and show supporting calculations.

3 marks

The wind chill temperatures for various wind speeds at an actual air temperature of -20°C are shown in the table below.

**Wind chill temperatures for various wind speeds
at an actual air temperature of -20°C**

Wind speed (kilometres per hour)	0	5	10	15	20	25	30
Wind chill temperature ($^{\circ}\text{C}$)	-20	-24	-27	-29	-30	-32	-33

- c Use the data in the table to draw a line graph showing how the wind chill temperature varies with wind speed at an actual air temperature of -20°C .
6 marks
- d Refer to your graph and briefly explain how the wind chill temperature varies with wind speed.
1 mark

Severe wind chill temperatures can cause frostbite. When the wind chill temperature reaches -28°C , exposed skin can be damaged.

- e Use your graph to estimate the wind speed at an actual air temperature of -20°C that would cause exposed skin to be damaged.
1 mark

As part of a study of the climate in the Arctic, the actual air temperature was recorded every day in a town in northern Norway. The table below gives the daily temperatures for the 59 days in January and February.

Actual Air Temperatures in January and February

Actual air temperature (T) in °C	Number of days
$0 \leq T < -5$	11
$-5 \leq T < -10$	13
$-10 \leq T < -15$	18
$-15 \leq T < -20$	9
$-20 \leq T < -25$	3
$-25 \leq T < -30$	2
$-30 \leq T < -40$	3

- f Calculate an estimate of the mean actual air temperature in the town in northern Norway during January and February.

3 marks

Total 16 marks

End of test

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