



Unit Number

U3051246/KA3T

Key Skills

Application of Number

Level 3

Monday 14 November 2005

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 35 marks) consists of 5 short-answer questions.

Part B (total 15 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.

Turn over

Part A - Short Answer Questions

- 1 In response to a television programme in April 2004, the Royal Mail issued a press statement. This statement includes a reference to the number of letters that are delivered safely each year.

'21 billion letters are sent each year and 99.92% of these are delivered safely'

1 billion is 1 000 000 000

- a How many letters are **not** delivered safely each year?

1 mark

For most of the year 2004 the Royal Mail handled an average 82 million letters per working day but this number increased to an average 130 million letters per working day over the Christmas period.

- b What was the percentage increase in the number of letters handled per working day over the Christmas period?

1 mark

It could be assumed that the increase in the number of letters handled over the Christmas period was due to Christmas cards sent by 2nd class post at 21p per letter.

- c Based on this assumption, what was the increase in the Royal Mail's revenue, per day, from letters over the Christmas period?

1 mark

A Christmas card postmarked in Sydney, Australia at 6pm on December 4th 2003 arrived at its destination in Sheffield, England at 10am on December 7th 2003. Sydney is 10 500 miles away from Sheffield and the time in Sydney is 10 hours ahead of the time in Sheffield.

- d Taking into account the time difference, calculate an estimate of the average speed achieved for the card's journey.

3 marks

Total 6 marks

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2 Lavender is a herb that is grown for dried flowers and lavender oil.

A farmer uses 43 hectares of land to grow lavender and obtains a yield of 3.7 tonnes of lavender per hectare.

He uses one third of all the lavender he grows for dried flowers and makes lavender oil from the remainder. To extract the oil, the lavender is steamed in a $\frac{1}{4}$ -tonne batch. This extraction process takes 25 minutes for each batch. It is carried out continuously over a 12-hour working day.

- a What is the minimum number of whole working days needed to extract all the lavender oil?

3 marks

In an average year, the farm produces 53 gallons of lavender oil. Bottles of 10 millilitres of oil are sold at a retail price of £6.95. Oil is also sold at a wholesale price of £137.00 per litre bottle to the cosmetics industry. The ratio of the quantity of oil sold at retail price to the quantity of oil sold at wholesale price is 2 : 5

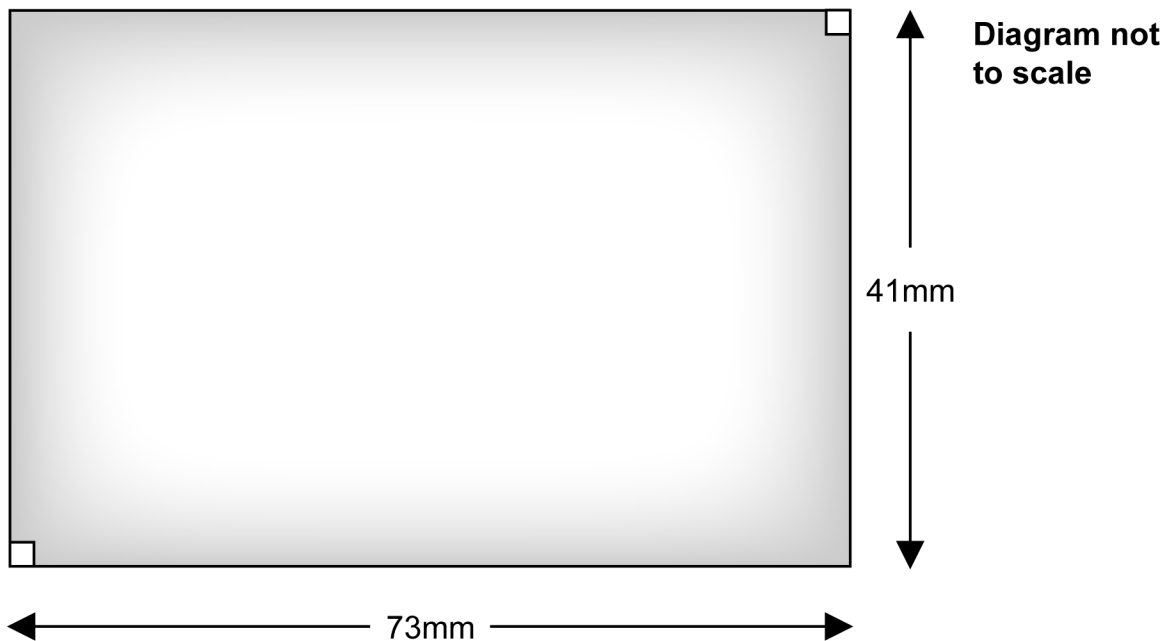
0.22 gallons are equivalent to 1 litre
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- b What is the farmer's income, in total, from sales of lavender oil in an average year?

3 marks

To increase his capacity for storing and drying lavender flowers the farmer plans a rectangular-shaped extension to a building. The simplified diagram below shows the dimensions taken from a diagram drawn to a scale of 1 : 125

New extension for storing and drying lavender




- c What is the actual area of the new extension planned for storing and drying lavender flowers?

2 marks
Total 8 marks

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- 3 The £2 coin was first issued by The Royal Mint in 1998. The coin is made of two different metal alloys so that it can be easily distinguished from other coins.

The table below gives the specifications of the standard £2 coin.

 <p>Diagram not to scale</p>	Diameter of coin	28.4 millimetres
	Diameter of inner ring	20.0 millimetres
	Thickness of the coin	2.5 millimetres
	Weight of the coin	12.0 grams
	Composition of inner ring	Cupro-nickel
	Composition of outer ring	Nickel-brass

The formula below can be used to calculate an estimate of the volume of nickel-brass used to make the outer ring of the £2 coin.

$$V = \pi t(R^2 - r^2)$$

where V is the volume of metal used for the outer ring of the coin in mm^3
 R is the radius of coin in mm
 r is the radius of the inner ring of the coin in mm
 t is the thickness of the coin in mm

- a Calculate an estimate of the volume of nickel-brass used to make the outer ring of the £2 coin.

2 marks

The Royal Mint produces a special commemorative £2 coin. This special coin has a total copper content of 9.0 grams and a total nickel content of 3.2 grams. The table below gives the prices of copper and nickel.

Metal	Price in US dollars per tonne
Copper	3240
Nickel	14820

£1 is equivalent to 1.828 US dollars

1 tonne is equal to 1 000 kilograms

A television report suggests that the value of the metal in the coin is less than 1% of its face value.

- b Is the suggestion in the television report true? Show calculations to support your answer.

3 marks

Total 5 marks

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- 4 A report on sales of bread in the United Kingdom (UK) states that 2 million tonnes of white bread were consumed in the year 2000. This was 69% of the total UK consumption of bread and bakery snacks.

The population of the UK in 2000 was 5.88×10^7

1 tonne is equal to 1 000 kilograms

- a What was the average consumption of bread and bakery snacks **per person per week** in the UK in the year 2000?

3 marks

A more recent report highlighted the fact that in 2004, annual sales of sandwiches in the UK rose by 8.1% over the year to reach £3.5 billion.

- b If this annual rate of growth remains constant, in which year will annual sales of sandwiches in the UK exceed £5 billion?

2 marks

Bread can be made at home using an electric breadmaker. The breadmaker uses 0.47 kilowatts of electricity on full power. To make a $1\frac{1}{2}$ -pound loaf of white bread, it runs at a quarter of full power for 2 hours and then at full power for 55 minutes.

The cost of running an appliance rated at one kilowatt for one hour is 6.41 pence.

- c What is the total cost of the electricity used to make a $1\frac{1}{2}$ -pound loaf of white bread in the breadmaker?

2 marks

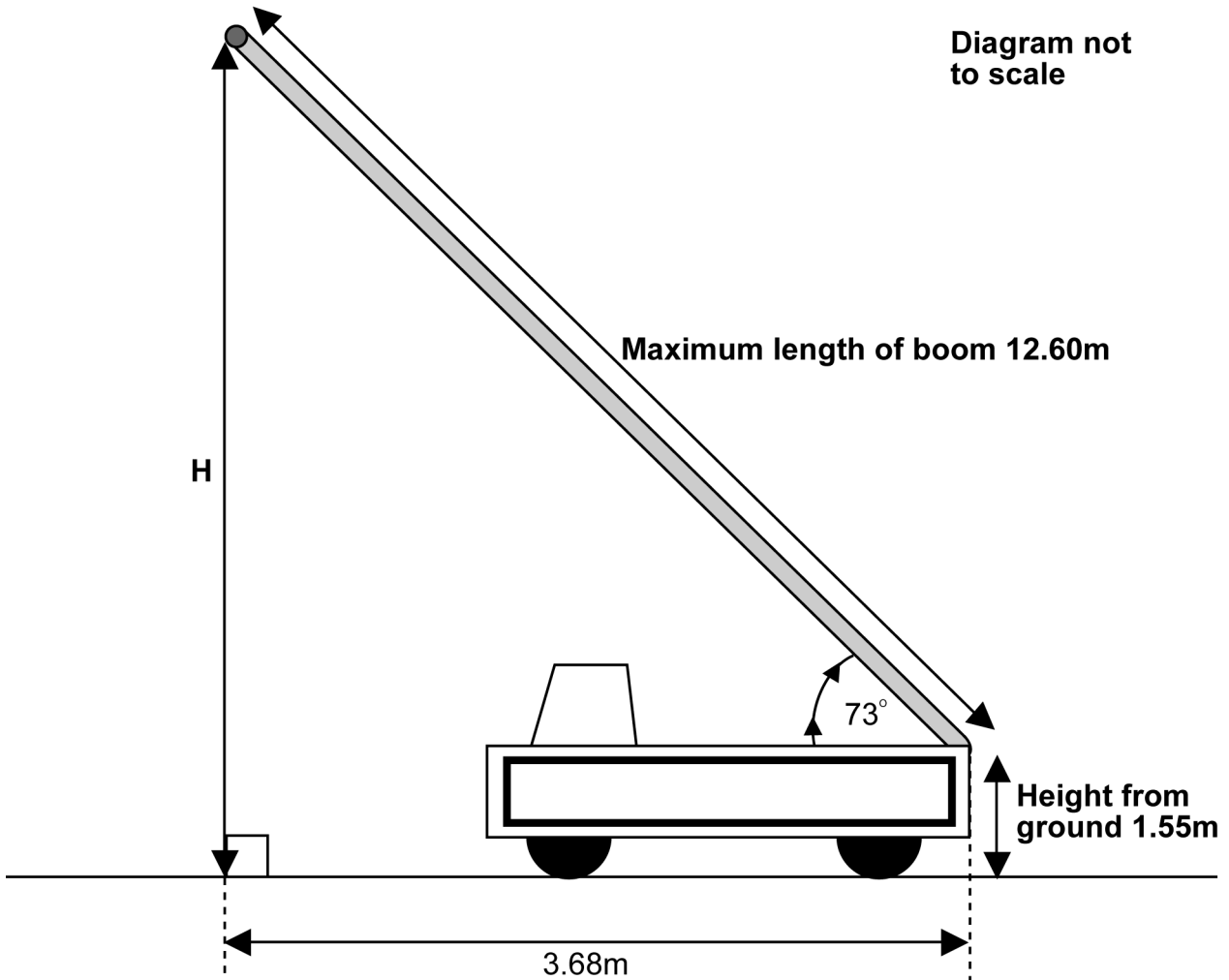
Total 7 marks

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5 A building contractor uses a crane to transport materials on a building site.

The crane has a boom that is 1.55 metres from the ground at its lower end. The boom extends to a maximum length of 12.60 metres at a maximum angle of 73° from the horizontal.

Simplified diagram of the crane to show the boom extended to its maximum length



a What is the maximum vertical height (H), from the ground to the top of the boom, when the boom is extended to its maximum length?

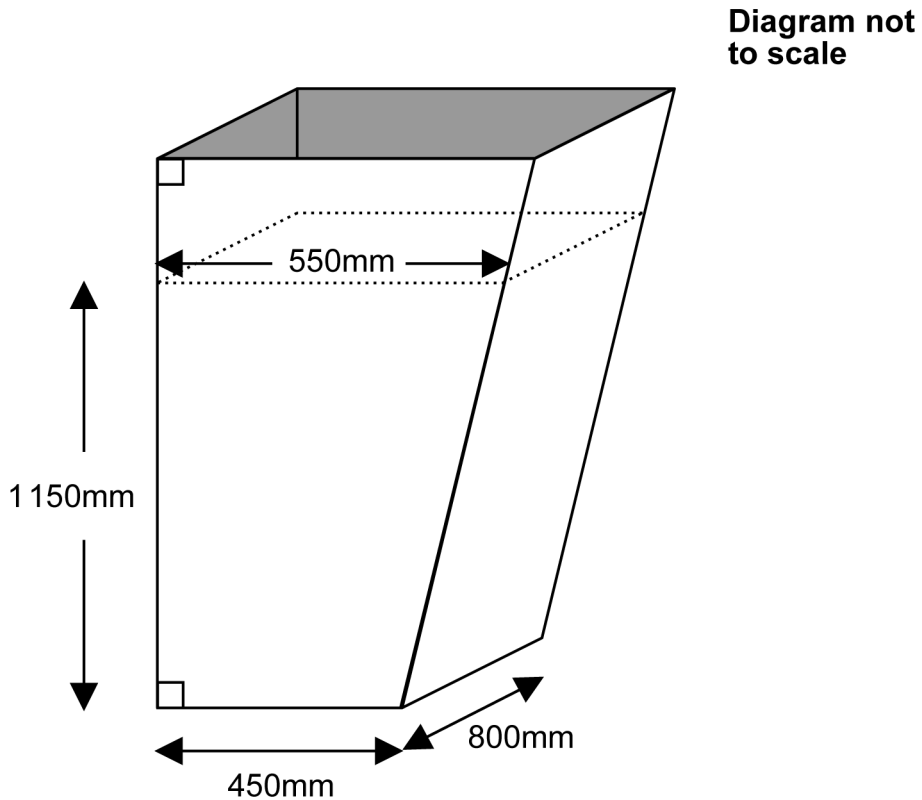
2 marks

b Show how to check your answer to part a using a different method.

1 mark

To lift concrete mix, the crane uses a bucket with a roughly uniform cross section as shown in the simplified diagram below.

Simplified diagram of the bucket used to lift concrete mix



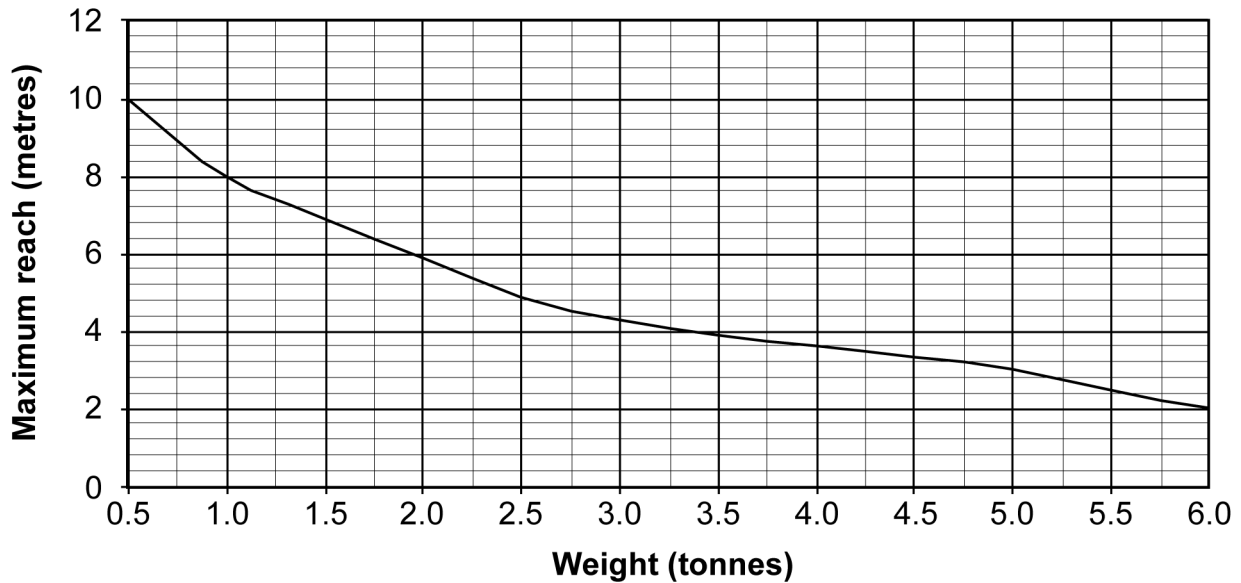
The maximum depth of concrete mix allowed in the bucket is 1150 millimetres.

- c What volume of concrete mix, in cubic metres, will the bucket hold when it is filled to its maximum depth of 1150 millimetres?

2 marks

The building contractor uses the graph below to find the maximum reach of the crane with a load of known weight.

Maximum reach of crane with given load



To lift a load of 1.25 cubic metres of concrete mix a bucket weighing 150 kilograms when empty is used. Concrete weighs 2.4 tonnes per cubic metre.

1 tonne is equal to 1 000 kilograms

- d Use the graph to find the maximum reach of the crane lifting the bucket with a load of 1.25 cubic metres of concrete mix.

2 marks

To lay a road on the building site, the contractor uses crushed stone as a base. Quotations are obtained from two suppliers of crushed stone.

- JB Aggregates charges £39.00 per tonne
 - Hardy Stone charges £59.50 per tonne for the first 10 tonnes, then £35.50 for each additional extra tonne to the first 10
- e What is the minimum number of tonnes of crushed stone the contractor needs to order for the quotation price from Hardy Stone to be the most economical?

2 marks

Total 9 marks

Part B - Extended Answer Question

6 The table gives data on eight Premiership football clubs for the 2002/2003 season.

Club	Income £000s	Total wages £000s	Average league attendance
Manchester United	174936	79517	67630
Liverpool	103981	54431	43243
Arsenal	103801	60569	38040
Newcastle United	96689	45195	51920
Chelsea	93027	54365	39799
Tottenham Hotspur	66506	38024	35899
Manchester City	49828	35371	34451
Southampton	48875	26666	30680

a Which club, Manchester United or Liverpool, spent a greater proportion of its income on wages? Show calculations to support your answer.

1 mark

The Football Association wants to investigate the possible link between the average league attendance and the income of the eight clubs in the table.

b Use the data from the table to draw a scatter graph to show the possible relationship between average league attendance and income at the eight clubs.

4 marks

c Use your graph to find if there is a link between average league attendance and income of the eight clubs. Briefly comment on your findings.

1 mark

The table below shows information on attendance at all the Premiership matches in the 2002/03 season.

Attendance at all the Premiership matches in the 2002/03 season

Attendance (a)	Number of matches
$10\,000 \leq a < 20\,000$	19
$20\,000 \leq a < 30\,000$	111
$30\,000 \leq a < 40\,000$	151
$40\,000 \leq a < 50\,000$	61
$50\,000 \leq a < 70\,000$	38

- d Calculate an estimate of the mean attendance at the Premiership matches in the 2002/03 season.

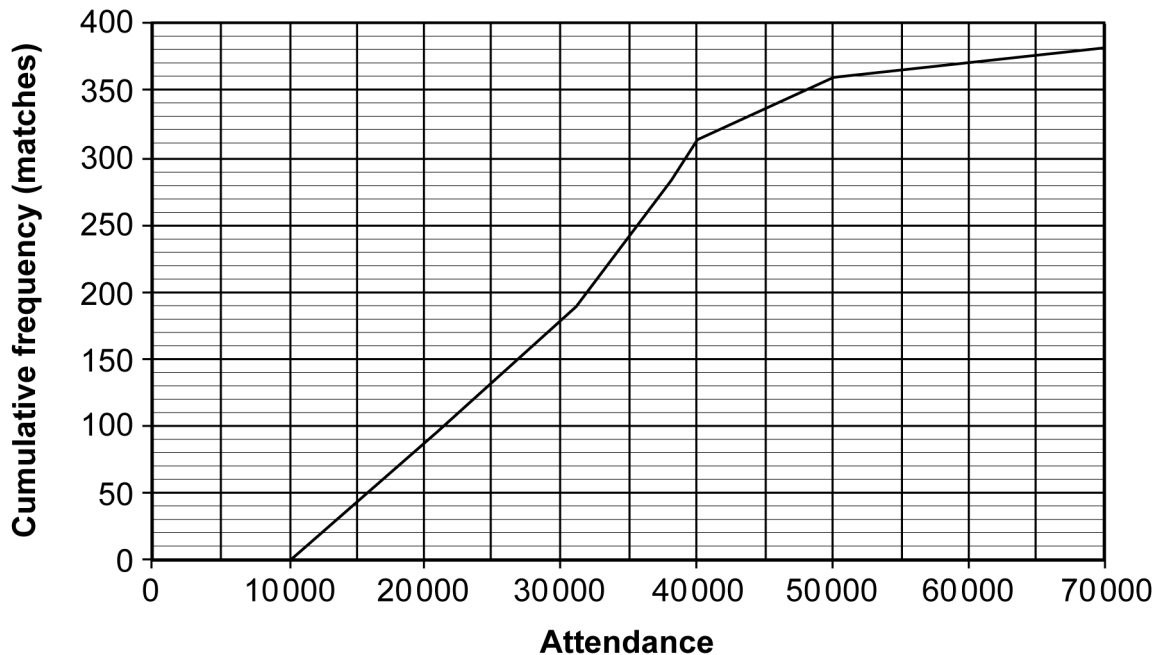
3 marks

- e Which is more representative of the data on attendance at the Premiership matches, the mean or the median? Write one sentence to justify your answer.

2 marks

The cumulative frequency graph below shows data on attendance at all the Premiership matches in the 1999/2000 season.

**Attendance at Premiership Matches,
1999/2000 season**



- f Use the cumulative frequency graph to estimate the median and interquartile range for the attendance at Premiership matches in the 1999/2000 season.

2 marks

For attendance at the Premiership matches in the 2002/03 season

- The median value was 33 974
- The interquartile range was 13 809

- g Make two comparisons between the attendance at Premiership matches in the 1999/2000 season and attendance at Premiership matches in the 2002/03 season. State the implication from each of your comparisons.

2 marks

Total 15 marks

End of test

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