



Unit Number

**U3051246/KA3T**

**Key Skills**

**Application of Number**

**Level 3**

**Monday 15 January 2007**

**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 33 marks) consists of 5 short-answer questions.

Part B (total 17 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.

## Part A - Short-answer questions

- 1 A farmer keeps chickens so that she can sell free-range eggs.

Free-range eggs must come from chickens that have access to an outdoor run. No more than 9 chickens are allowed to occupy each square metre of the run. The size of the farmer's outdoor chicken run is 0.125 hectares.

1 hectare is equal to 10 000 square metres

- a What is the maximum number of chickens the farmer can keep for producing free-range eggs in her outdoor chicken run?

1 mark

One year the farmer keeps 4 200 chickens. To supplement their diet, she feeds the chickens Layers Pellets. The recommended amount of this feed is one scoop of pellets for every 12 chickens each day. On average, one scoop contains 100 grams of pellets. The pellets cost £6.50 for 25 kilograms.

- b If she feeds her chickens the recommended amount, how much will it cost the farmer for Layers Pellets for this year?

2 marks

The chickens have two laying periods when they produce eggs.

- The 1st laying period extends from 20 weeks old to 65 weeks old.
- The 2nd laying period extends from 71 weeks old to 105 weeks old.

During each laying period, each chicken lays an average of one egg per day.

- c What is the total number of eggs the farmer can expect her 4 200 chickens to lay between the start of the first laying period and the end of the second laying period?

1 mark

The following year the farmer keeps fewer chickens. The total costs for these chickens for one year are

- £295.00 for housing
- £45.00 for feed

plus additional expenses estimated at 15% of the total cost for housing and feed.

During the year her chickens lay a total of 14 400 eggs which she packs into boxes of six.

- d Based on housing, feed and additional expenses, what is the estimated cost of producing six eggs in this year?

**2 marks**

**Total 6 marks**

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- 2 A man downloads music for five minutes to a file in MP3 format for his own use. During this five minutes, the music is sampled 44 100 times each second. The size of each of these samples is 16 bits. Before it is stored in MP3 format the file is compressed to make it smaller using a ratio of 12 : 1.

<p>8 bits are equal to 1 byte 1 Megabyte is equal to 1 048 576 bytes 1 Gigabyte is equal to 1 073 741 824 bytes 1 Gigabyte is equal to 1 024 Megabytes</p>
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- a What is the size in Megabytes of the MP3 file needed to store the downloaded music track?

2 marks

The man has a portable MP3 player with a memory of 5 Gigabytes.  
The size of the average MP3 album track is 3 Megabytes.

- b Calculate an estimate of the maximum number of album tracks he can store on his portable MP3 player.

1 mark

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

1 mark

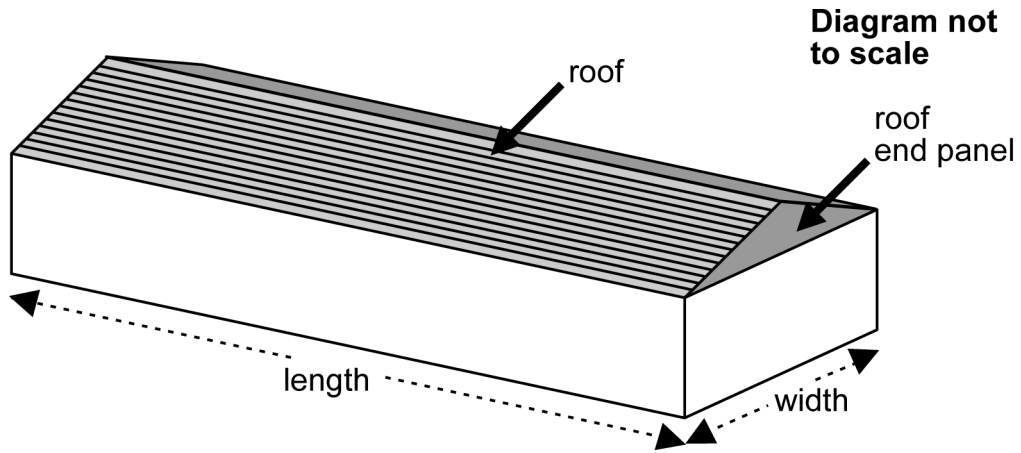
Total 4 marks

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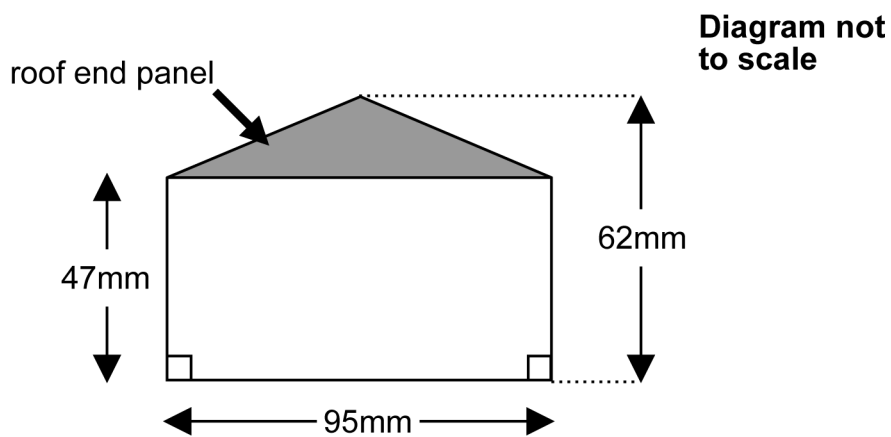
- 3 A pet food factory stores cartons of pet food in a warehouse.  
The roof end panels and the roof of this warehouse need replacing with metal sheeting.

**Simplified diagram of the warehouse**



To get an estimate for the cost of this work, the owner sends a contractor a simplified diagram with measurements taken from plans drawn to a scale of 1 : 100.

**Simplified diagram of the end of the warehouse**



- a What is the total area, in square metres, of the two roof end panels of the actual warehouse?

**2 marks**

The length of the warehouse measures 288 millimetres on the plans drawn to a scale of 1 : 100.

- b What is the total area, in square metres, of the roof of the actual warehouse?

**3 marks**

The owner asks the contractor for another estimate. He wants to know the price for replacing the roof of his office block with the same roofing material.

The contractor calculates that he will need 224 square metres of roofing material for the office block. His basic price is £16.92 per square metre to provide and install the roofing material plus 17.5% VAT calculated on the basic price.

- c What is the total price, including VAT, for the contractor to replace the roof of the office block with roofing material?

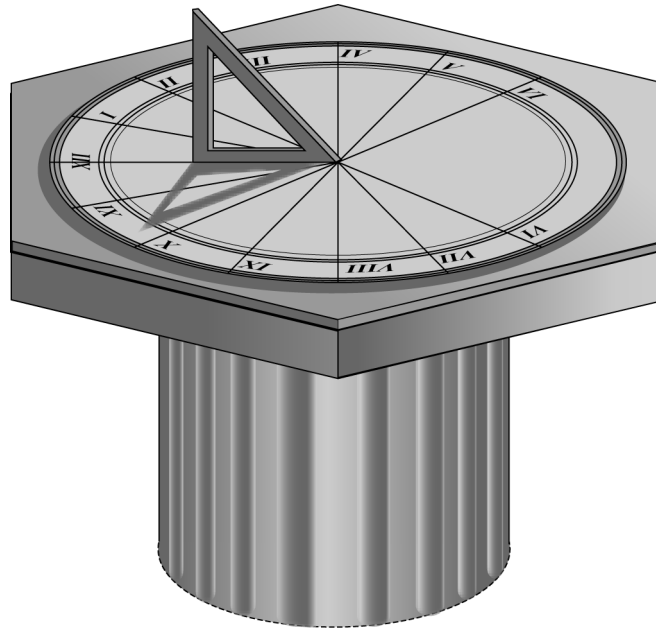
**2 marks**

**Total 7 marks**

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- 4 Sundials were originally used to estimate the time of day but garden designers now use them as special features.

A craftsman makes sundials like the one in the diagram below.



The angles of the sundial hour lines depend upon the degree of latitude at the place where the sundial is to be located.

The craftsman receives an order from a customer near Lincoln who lives at degree of latitude  $53.4^{\circ}\text{N}$ . He uses the formula below to calculate the angle measured from north for drawing each hour line on the sundial.

$$\tan A = \sin D \times \sin (15n)$$

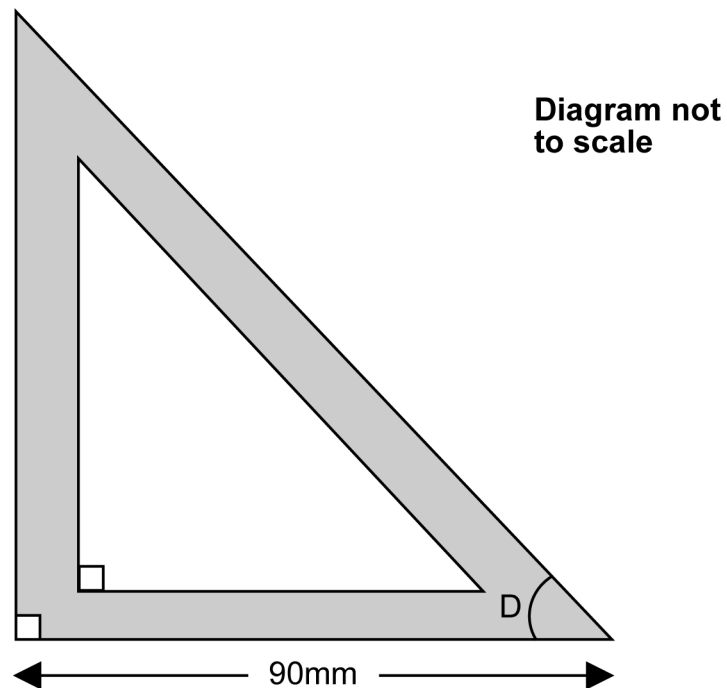
where **A** is the angle of an hour line measured from north in degrees  
**D** is the degree of latitude  
**n** is the number of hours after noon

- a Calculate the angle of the hour line measured from north representing 3 o'clock in the afternoon.

**2 marks**

In the simplified diagram of the sundial hand shown below, angle D must be equal to the degree of latitude at the location of the sundial.

**Simplified diagram of the sundial hand**



The craftsman makes the sundial hand from brass plate. The inner triangle is the same shape as the outer triangle. The lengths of the sides of the inner triangle measure three-quarters of the lengths of the sides of the outer triangle.

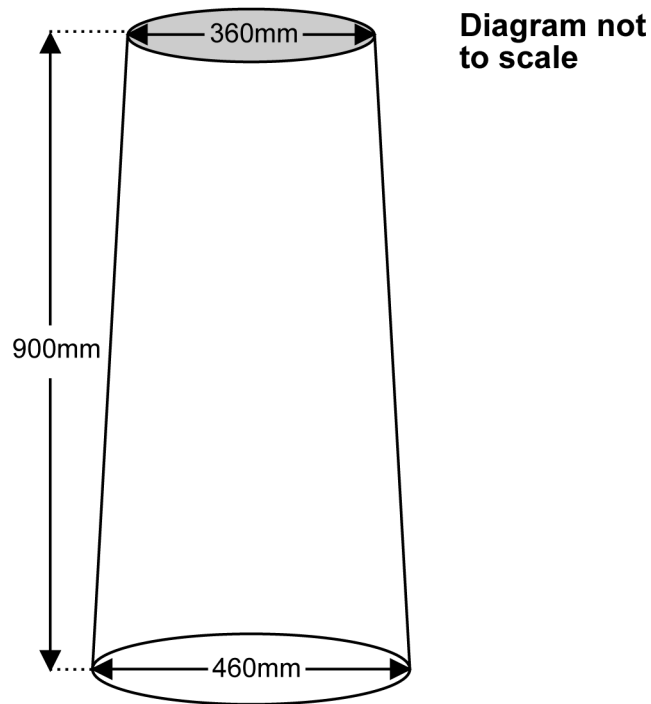
- b What is the area of brass plate in this sundial hand?

**3 marks**

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The craftsman makes a limestone base for the sundial.

**Simplified diagram of limestone base**



Before transporting the limestone base to the customer, the craftsman needs to find its volume in order to calculate its weight. The formula below gives the volume of the limestone base.

$$V = \frac{1}{3} \pi h (R^2 + Rr + r^2)$$

where **V** is the volume of the limestone base  
**h** is the height of the limestone base  
**R** is the lower radius  
**r** is the upper radius

The limestone weighs 2 611 kilograms per cubic metre.

c What is the weight of the limestone base?

**3 marks**

The craftsman uses a courier to transport his products to his customers. The courier's charges are shown in the table below.

Courier's charges	
Weight of package (kg)	Charge (£)
0 to 12kg	£37.00
Between 12kg and 30kg	Charge for 12kg plus an extra £1.55 per kg for each kg over 12kg
Over 30kg	Charge for 30kg plus an extra £1.45 per kg for each kg over 30kg

Another smaller sundial and base weigh 97 kilograms altogether.

- d How much will the courier charge to deliver this sundial and base to the customer?

2 marks

Total 10 marks

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5 A mobile phone company sells bundles of air time. One bundle offers customers 30 text messages and 20 minutes of voice calls for £5.30. Another bundle offers customers 200 text messages and 100 minutes of voice calls for £29.00. Assume the cost of a text message and the cost per minute of a voice call is the same in both bundles.

a Use this information to write two equations about the cost of text messages and the cost per minute of voice calls in the bundles of air time.  
1 mark

b Find the cost to send a text message and the cost per minute for a voice call in the bundles of air time.  
2 marks

c Show how to check your answers to part b.  
1 mark

In 2005 an article in The Times newspaper predicted that

*'By the end of 2005, 82% of the 12.6 million people in the UK aged between 5 and 24 years will own a mobile phone; this percentage will rise to 87% by the end of 2007.'*

The article also stated that the population of people in the UK aged between 15 and 24 years was growing at a rate of 0.4% a year.

d Use this information to predict how many more young people aged between 15 and 24 years will own a mobile phone by the end of 2007 than by the end of 2005.

2 marks

**Total 6 marks**

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## Part B - Extended-answer question

- 6 Statistics show that the amount of snack foods eaten in the United Kingdom (UK) is higher than in other countries in the rest of Europe.

On average, each person over the age of five years in the UK ate 3 standard packets of potato crisps per week in the year 2003.

There were 56 million people over the age of five years in the UK in 2003

A standard packet of potato crisps contains 34.5 grams of crisps.

- a What was the total weight of potato crisps eaten by all people over the age of five years in the UK during 2003?

2 marks

A European **report** stated that

*Potato crisps are the most popular savoury snack sold in the European Union. In 2003, in the UK, the total amount spent on potato crisps by people over the age of five years was 3865 million euros (€).*

In 2003 the average exchange rate in the UK was  $\text{£}0.65 = 1 \text{ euro (€)}$

- b What was the total amount, in pounds (£), spent **per day** on potato crisps by all people over the age of five years in the UK, in 2003?

1 mark

Italians over the age of five years spent an average of 11 euros (€) per person on potato crisps in 2003.

- c Approximately, what was the ratio of the average amount spent per person by Italians over the age of 5 years on potato crisps to the average amount spent per person by people in the UK over the age of 5 years on potato crisps, in 2003? Give your answer in a simple form.

2 marks

In 2004 a major potato crisp manufacturing company in the UK received 17 000 deliveries of potatoes. Each delivery consisted of 20 tonnes of potatoes. There were 4% more deliveries to this company in 2004 than in 2003.

A total of 4.3 tonnes of potatoes is required to produce 1 tonne of potato crisps.

- d How many tonnes of potato crisps did this company produce from its deliveries of potatoes in 2003?

**2 marks**

To produce bags for its current range of potato crisps, the company uses 952 000 square metres of foil costing a total of £399 840. It makes 24 bags from each square metre of foil.

The company intends to introduce a new flavour of crisps to its range using identical sized bags to those used in their current range.

- e How much will the foil for 600 000 bags of its new flavour crisps cost the company?

**1 mark**

In a multipack of six packets of crisps, each packet should contain at least 25 grams of crisps. An employee measures and records the actual weights of the contents of a sample of 50 packets of potato crisps.

**The distribution of the weights of the contents of a sample of 50 packets of crisps**

Weight (w) in grams	$23 \leq w < 25$	$25 \leq w < 27$	$27 \leq w < 29$	$29 \leq w < 33$	$33 \leq w < 39$
Number of packets	2	4	14	20	10

- f Draw a histogram to show the distribution of the weights of the contents of the 50 packets of potato crisps.

**4 marks**

- g Refer to your histogram to make one comment about the distribution of the weights.

**1 mark**

- h** Calculate an estimate of the mean weight of the contents of the packets of potato crisps.

**3 marks**

- i** Give one advantage of using the mean rather than the median for calculating the average weight of a packet of crisps in a multipack.

**1 mark**

**Total 17 marks**

**End of test**

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