



Unit Number

U3051246/KA3T

Key Skills

Application of Number

Level 3

Monday 11 June 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 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.

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Turn over

Part A - Short-answer questions

- 1 An article written by a newspaper journalist describes how spending has changed over the last 40 years.

The amount of money spent on clothing and footwear in the UK between 1964 and 2004 is given in the table below.

The amount of money spent on clothing and footwear in the UK from 1964 to 2004

Year	Amount of money spent in £millions
1964	1991
1974	4542
1984	13233
1994	26314
2004	42053

- a What was the percentage increase in the amount of money spent on clothing and footwear in the UK between **1994** and 2004?

1 mark

Between 2003 and 2004 the amount of money spent on clothing and footwear increased by 4.5%.

- b Assuming this increase continues at the same rate, in which year will the amount of money spent on clothing and footwear exceed £50 000 million?

2 marks

The ratio of the amount of money spent on clothing and footwear in the 1st, 2nd, 3rd and 4th quarters of the year 2004 was 7 : 8 : 8 : 11.
A total of £42 053 million was spent on clothing and footwear in 2004.

- c How much more money was spent on clothing and footwear in the 4th quarter of 2004 than was spent in the 1st quarter of that year?

1 mark

In 2004, a total of £42 053 million was spent on clothing and footwear. This represented approximately one eighth of the total spending of UK households. In the same year, the amount spent on recreation was approximately one sixth of the total spending of UK households. The newspaper article states that

'the amount of money spent on recreation in 2004 was nearly 60 times as much as the amount of money spent on recreation in 1964'

In 1964, a total of £964 million was spent on recreation.

- d Is this statement in the newspaper article correct? Show calculations to support your answer.

2 marks

Total 6 marks

Please go on to the next page

- 2 A sports club organises a fund-raising day.
Asking people to donate 2 pence coins is one activity.

In this activity members collect 2 pence coins and place them in a row as shown in the diagram below.

A row of 2p coins

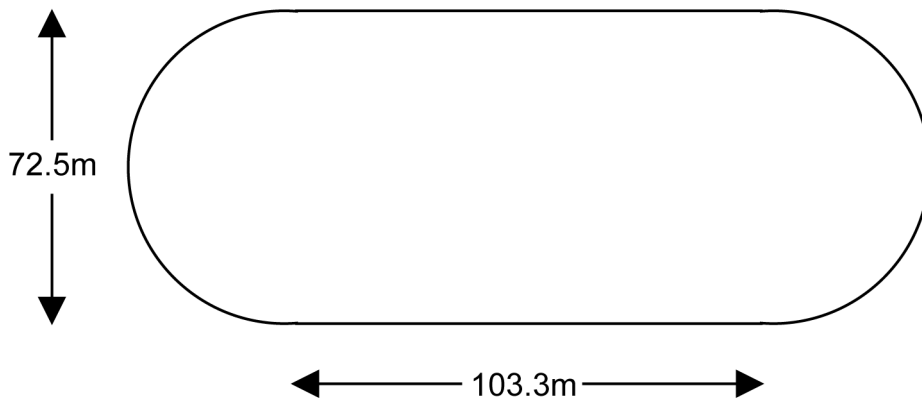
Diagram not to scale



They aim to collect enough 2p coins to make one complete circuit of the running track. The dimensions of the outside lane of the running track are shown in the simplified diagram below. It has two straight sections of track, each 103.3 metres long, joined by semicircular ends.

Simplified diagram of the outside lane of the running track

Diagram not to scale



The diameters of British coins are given in the table below.

Diameters of British Coins

Coin	Diameter in millimetres
£2	28.4
£1	22.5
50p	27.3
20p	21.4
10p	24.5
5p	18.0
2p	25.9
1p	20.3

- a** How much, **to the nearest pound**, will the sports club raise if the members collect enough 2p coins to make one complete circuit of the running track?
2 marks

On the previous year's fund-raising day, the club members raised a total of £1130. In one activity they collected enough 20p coins to place them in a row along a straight 100-metre lane of the running track.

- b** Approximately, what fraction of the total money raised on the previous year's fund-raising day was from the 20p coin activity? Give your answer in its simplest form.

2 marks

The members plan another fund-raising activity. They will charge each player 50p to take part in the activity and give prizes of £5. They estimate that 1 in every 20 players will win one of these £5 prizes.

- c** Write one equation about the amount of money that the members expect to raise from this activity and the number of players who take part. Use the symbol A to represent the amount of money they expect to raise and the symbol N for the number of players.

1 mark

- d** Use your equation to calculate an estimate of the number of players that need to take part in this activity in order to raise £100.

1 mark

- e** Show how to check your answer to part d by substituting your value for the number of players taking part in the activity into your equation from part c.

1 mark

Total 7 marks

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- 3 Households in the UK are being encouraged to replace traditional light bulbs with energy saving light bulbs that give similar light output but consume less energy.

The table below gives the energy consumption of a traditional light bulb and an energy saving light bulb with similar light output.

Energy consumption of light bulbs of similar light output

Type of light bulb	Energy consumption (per hour of use) in kilowatt hours
Traditional 100-watt light bulb	0.10
Energy saving light bulb	0.02

One kilowatt hour of electricity costs 8.06 pence.

In the average UK household, the amount of electricity used per day for lighting is equivalent to the use of one traditional 100-watt light bulb for 20 hours.

- a How much money could the average UK household save on electricity for lighting **per year** by using energy saving light bulbs instead of traditional light bulbs?

2 marks

A television programme claims that

'If 75% of UK households used energy saving light bulbs instead of traditional light bulbs, the amount of electricity saved per hour would be equivalent to the amount of electricity generated by a British Energy nuclear reactor in one hour.'

A British Energy nuclear reactor generates an average of 1.2×10^6 kilowatt hours of electricity in one hour.

The average saving in electricity per hour by a UK household using energy saving light bulbs instead of traditional light bulbs is 0.067 kilowatt hours.

There are approximately 2.4×10^7 households in the UK.

- b Is the claim in the television programme correct? Show calculations to support your answer.

2 marks

The amount of electricity used for lighting in UK households in 2004 was 1.77×10^{10} kilowatt hours. This was 15.3% of the total amount of electricity used for all purposes in UK households in 2004.

- c What was the total amount of electricity used for all purposes in UK households in 2004 in kilowatt hours?

1 mark

Total 5 marks

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4 A farmer grows wheat on her farm.

Last year, the farmer harvested an average of 7.5 tonnes of wheat per hectare. This year, due to improved farming methods, she expects to harvest 8% more wheat than last year from the same area of land.

One field of wheat has an area of 12.35 hectares.

a How many tonnes of wheat does the farmer expect to harvest from the field this year?

1 mark

The farmer needs to know whether she will have enough storage space for her harvested wheat.

1 tonne is equal to 1 000 kilograms 1 cubic metre of wheat weighs an average of 850 kilograms
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She expects to harvest a total of 600 tonnes of wheat this year.

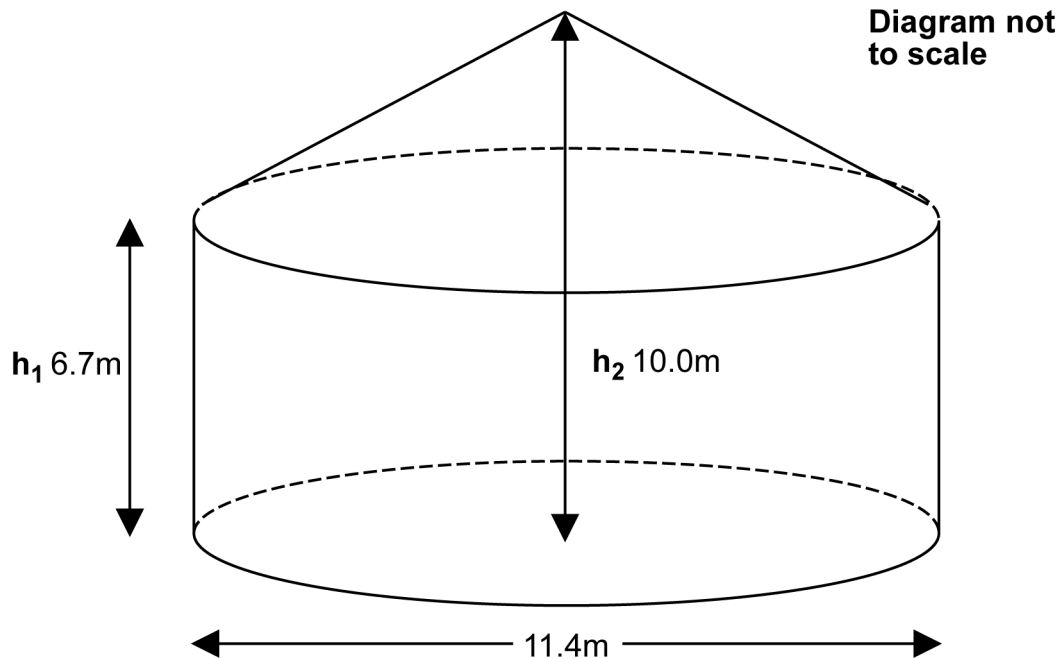
b How many cubic metres of wheat does the farmer expect to harvest in total this year?

1 mark

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The wheat will be stored in a silo. The silo has a circular base with a diameter of 11.4 metres.

Simplified diagram of the silo



The capacity of the silo is given by the formula below.

$$C = \frac{\pi r^2 (2h_1 + h_2)}{3}$$

where C is the capacity of the silo in cubic metres
 r is the radius of the silo in metres
 h_1 is the height of the silo at the eaves in metres
 h_2 is the height of the silo at the centre in metres

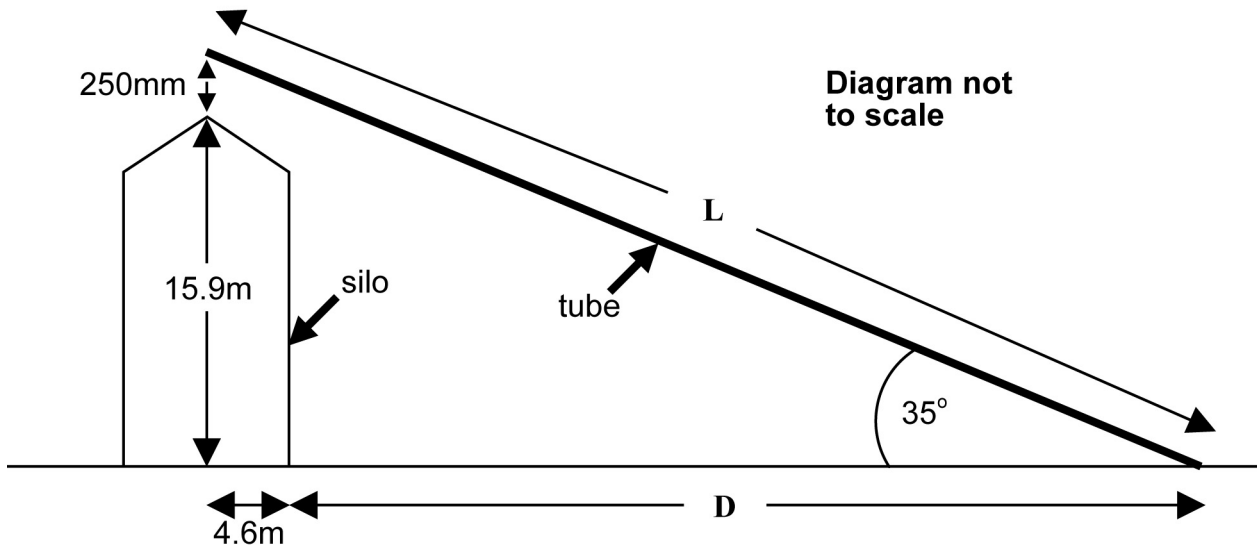
- c Calculate the capacity of the silo and state whether the silo is big enough to store all the farmer's wheat.

3 marks

The farmer also grows oats that need to be stored in a different silo. She buys a new silo with a diameter of 9.2 metres to store the oats.

The oats will be carried to the top of the new silo through a tube. The top of the silo is 15.9 metres above ground. To operate, the top end of the tube must be 250 millimetres higher than the top of the silo and positioned at an angle of 35° to the ground.

Simplified diagram of the new silo and the tube



- d What length of tube (L) does the farmer require for her new silo? 2 marks

The farmer needs to find a suitable site for the silo so that the tube can be positioned correctly.

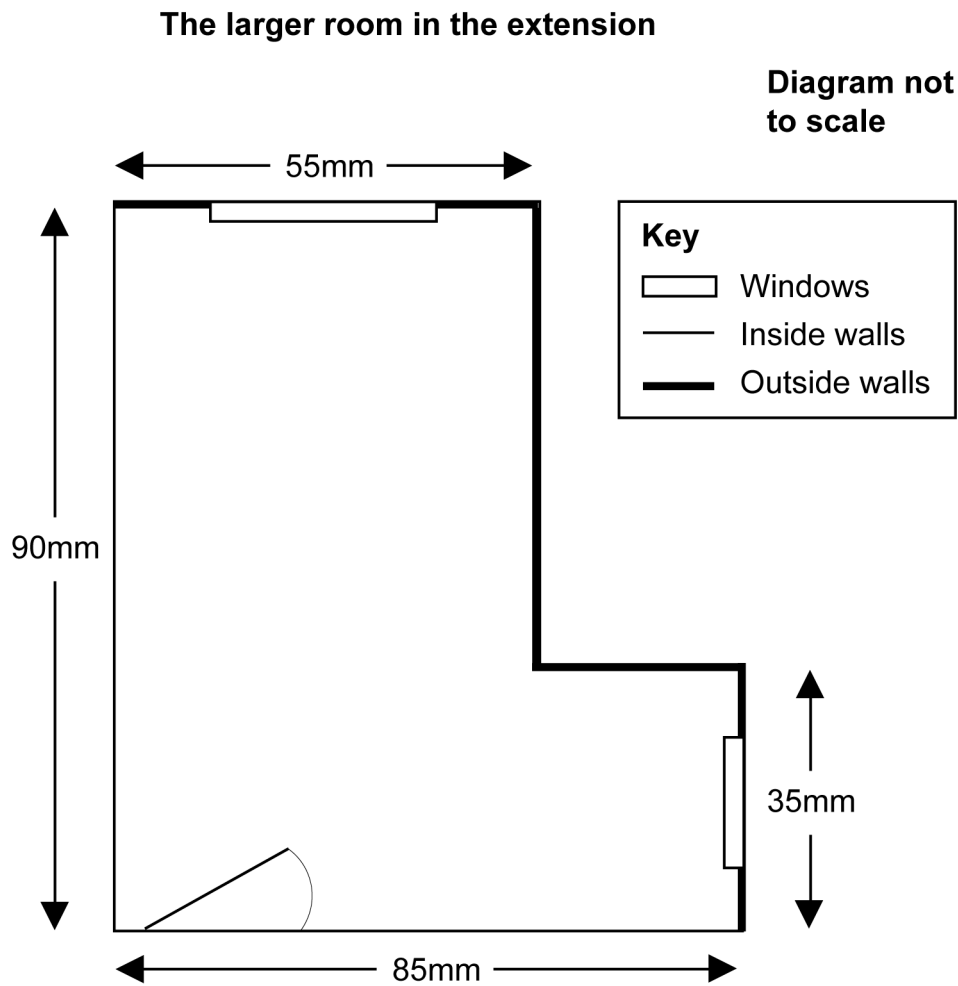
- e What is the correct distance (D) from the bottom of the tube to the base of the side of the silo for the tube to operate? 2 marks

- f Use an alternative method to check your answer to part e. 1 mark
- Total 10 marks**

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- 5 A builder is constructing a two-room extension to a house. He needs to know the floor area of each of the rooms to select the correct size of radiator.

The scaled dimensions of the larger room in the extension, taken from a plan drawn to a scale of 1 : 50, are shown in the diagram below.



- a What is the actual floor area of the larger room in the extension in square metres?

3 marks

The heat output required from a radiator depends upon the floor area of the room, the total length of the outside walls and the total area of the windows in the room.

The builder works out the minimum heat output required from a radiator for the smaller room in the extension, using the following formula.

$$W = 0.75 (57A_f + 33L + 48A_w)$$

where

- W** is the heat output required in watts
- A_f** is the floor area in square metres
- L** is the total length of outside walls in metres
- A_w** is the total area of the windows in square metres

The smaller room in the extension has

- a floor area of 10.50 square metres
- outside walls of total length 8.00 metres
- one window measuring 1.20 metres by 1.05 metres

The table below gives the sizes of radiators available to the builder, their heat outputs and prices.

Size, heat output and price of radiators

		Height of radiator in millimetres					
		400	500	600	750	900	
Length of radiator in millimetres	500	Heat output (W)	349	420	490	593	695
		Price (£)	46.82	52.44	61.26	78.13	95.25
	600	Heat output (W)	418	504	587	711	834
		Price (£)	55.64	62.07	72.63	92.70	112.91
	700	Heat output (W)	488	588	685	830	973
		Price (£)	63.95	71.70	84.94	108.49	130.43
800	Heat output (W)	558	672	783	948	1112	
	Price (£)	75.32	83.88	96.45	123.07	147.95	
900	Heat output (W)	627	759	881	1067	1251	
	Price (£)	84.01	93.64	107.56	145.68	165.09	
1000	Heat output (W)	697	840	979	1185	1390	
	Price (£)	96.70	103.55	118.79	160.66	183.00	

In order to fit below the window the height of the radiator must be less than 725 millimetres.

- b** What is the size of the cheapest radiator the builder can choose for the smaller room in the extension? The radiator must have the required minimum heat output and fit below the window. Show supporting calculations.

3 marks
Total 6 marks

Part B - Extended-answer question

- 6 There is concern in the UK about the amount of time that young people spend watching television.

The table below gives the number of hours per day that people aged 16 to 24 years spent watching television in the UK in 2003.

The number of hours per day spent watching television by people aged 16 to 24 in the UK in 2003

Number of hours (H)	Percentage of people aged 16 to 24	Cumulative frequency
$0 \leq H < 1$	4	4
$1 \leq H < 2$	17	21
$2 \leq H < 3$	25	46
$3 \leq H < 4$	19	65
$4 \leq H < 5$	14	79
$5 \leq H < 6$	8	87
$6 \leq H < 7$	3	90
$7 \leq H < 24$	10	100

- a Use the data in the table to draw a cumulative frequency graph to show the number of hours per day that people aged 16 to 24 years spent watching television in the UK in 2003. **5 marks**
- b Use your graph to estimate the median number of hours per day that people aged 16 to 24 years spent watching television in the UK in 2003. **1 mark**
- c Use your graph to find the interquartile range of the number of hours per day that people aged 16 to 24 years spent watching television in the UK in 2003. Show clearly how you obtained your answer. **2 marks**
- d Calculate an estimate of the mean number of hours per day that people aged 16 to 24 years spent watching television in the UK in 2003. **3 marks**

- e Is the mean or the median the most useful estimate of the average number of hours per day that people aged 16 to 24 years spent watching television in the UK in 2003? Explain briefly the reason for your choice.

1 mark

Similar data was collected on the number of hours per day people aged 65 years and over spent watching television. The results below were obtained from the data.

The number of hours per day people aged 65 years and over spent watching television in the UK in 2003

Median	3.1 hours
Interquartile range	3.2 hours

- f Compare the number of hours per day that people aged 16 to 24 years spent watching television and the number of hours per day that people aged 65 years and over spent watching television in the UK, in 2003. Write two sentences that compare your findings.

2 marks

Please go on to the next page

The table below gives the television channels that people aged 16 to 24 years and people aged 65 years and over preferred to watch in the UK in 2003.

Preferred television channels by people aged 16 to 24 and by people aged 65 and over in the UK in 2003

Television channel	Percentage of people aged 16 to 24	Percentage of people aged 65 and over
BBC1	26	47
BBC2	6	10
ITV1	20	25
Channel 4	12	5
Five	2	3
Other	34	10

In 2003, 11% of the UK population was aged 16 to 24 years and 16% was aged 65 years and over.

The population of the UK in 2003 was approximately 59.6 million

- g** Approximately, what is the ratio of the number of people aged 16 to 24 years who chose BBC1 as their preferred channel to the number of people aged 65 years and over who chose BBC1 as their preferred channel, in the UK in 2003? Show your working and give your answer in a simple form.

2 marks

Total 16 marks

End of test

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