



Key skills application of number Level 3

Monday 22 March 2004

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

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 32 marks) consists of 6 short-answer questions

Part B (total 18 marks) consists of 1 extended-answer question

Total marks available: 50

Try to answer ALL the questions

YOU HAVE 1 HOUR 30 MINUTES TO FINISH THE TEST

INSTRUCTIONS

- Make sure your personal details are entered correctly in the answer booklet
 - Read each question carefully
 - 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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Ref: AoN/L3/2.2/P7

Part A - Short-answer questions

1 In the year 2000:

- the UK television industry, which includes Sky TV and BBC Drama, spent £7 billion on programming
- Sky TV paid £366 million to broadcast 66 Premiership football matches
- BBC Drama cost £450 000 per hour to produce.

1 billion is 1 000 000 000

a What percentage of the total UK television industry spending in the year 2000 was spent by Sky TV on Premiership football?

1 mark

Each football match lasts for 90 minutes.

b What was the cost to Sky TV of one minute's football from one match in the year 2000?

2 marks

c How much did it cost BBC Drama to produce one minute of drama in the year 2000?

1 mark

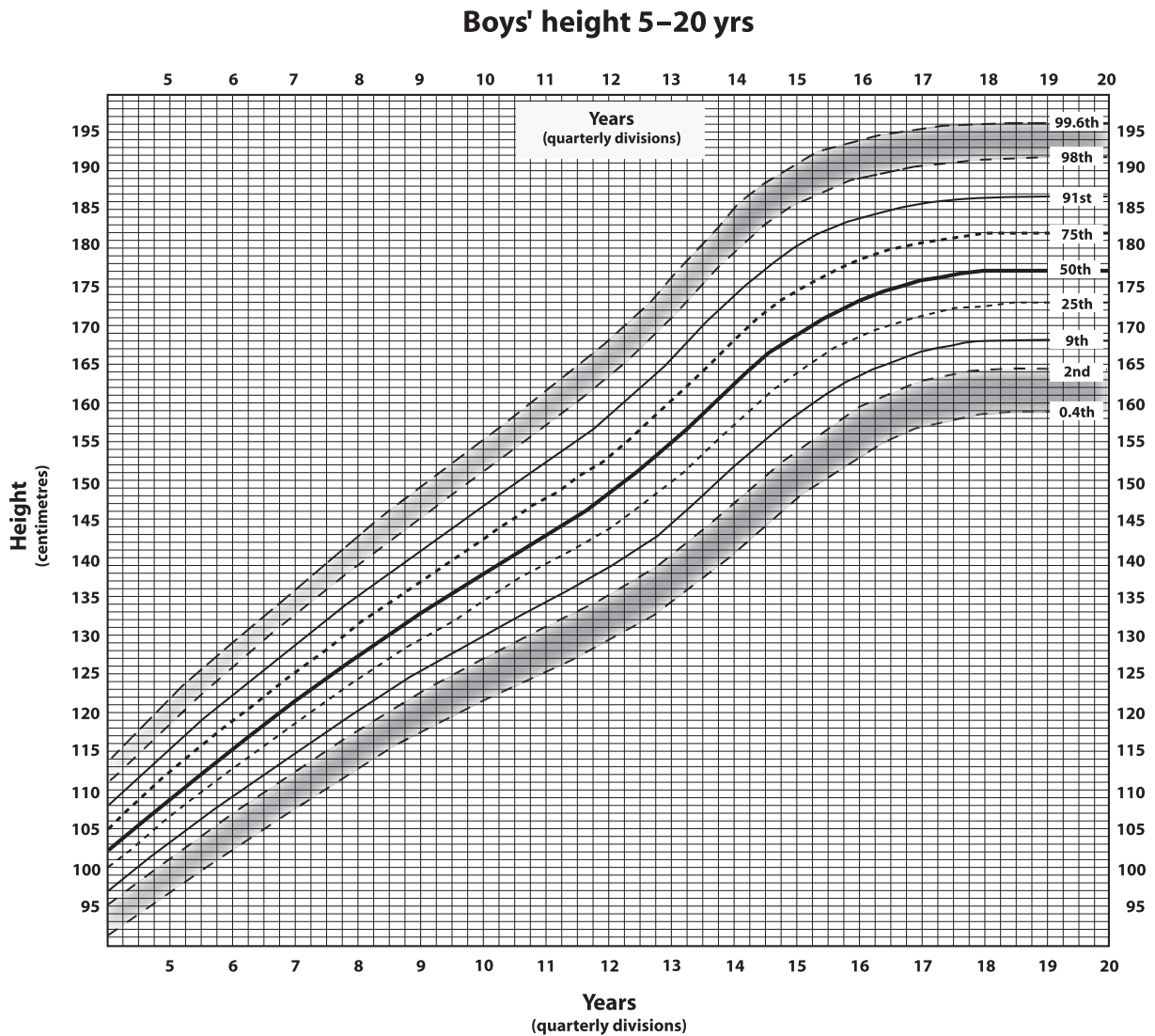
d What was the approximate ratio of the cost of one minute's BBC Drama to the cost of one minute's Premiership football on Sky TV? Write your answer in its simplest form.

1 mark

Total 5 marks

Please go on to the next page

- 2 The graph below can be used to predict the height of boys between the ages of 5 and 20 years.



A 5-year-old boy is 1.19 metres tall.

- a Use the graph to predict his height to the nearest centimetre when he is 12 years of age.

1 mark

Data on 16-year-old boys is collected to check the information on the graph.

Data on 16-year-old boys

Boys' height in centimetres	Frequency
160-164	25
165-169	56
170-174	92
175-179	59
180-184	38
185-189	22
190-194	8
Total	300

- b Compare the data in the table with the graph for boys of 16 years of age.

1 mark

The estimated mean height of this sample of 16-year-old boys is approximately 174cm.

- c Use this information and the graph to estimate the mean height of this sample of 300 boys when they were 11 years of age.

1 mark

Total 3 marks

- 3 A psychologist uses the formula below to assign a reading age to a piece of text.

$$R = 0.4(M + N) + 3$$

where

R = reading age in years

M = the mean number of words per sentence in the text

N = the number of words with 3 or more syllables per 100 words of text

She records the number of words per sentence in 20 sentences of text from a newspaper article.

Recorded data

Number of words per sentence	1-10	11-20	21-30	31-40
Number of sentences	2	6	9	3

- a Calculate an estimate of the mean number of words per sentence from the recorded data in the table.

3 marks

- b State one way in which the psychologist could have improved the accuracy of her data about sentence lengths.

1 mark

In the newspaper article there are 12 words with 3 or more syllables per 100 words of text.

- c Use the formula to calculate an estimate of the reading age for the newspaper article.

1 mark

The psychologist calculates that the reading age of a teenage magazine article is 13.4 years. In this article there are 9 words with 3 or more syllables per 100 words of text.

- d What is the mean number of words per sentence in this magazine article?

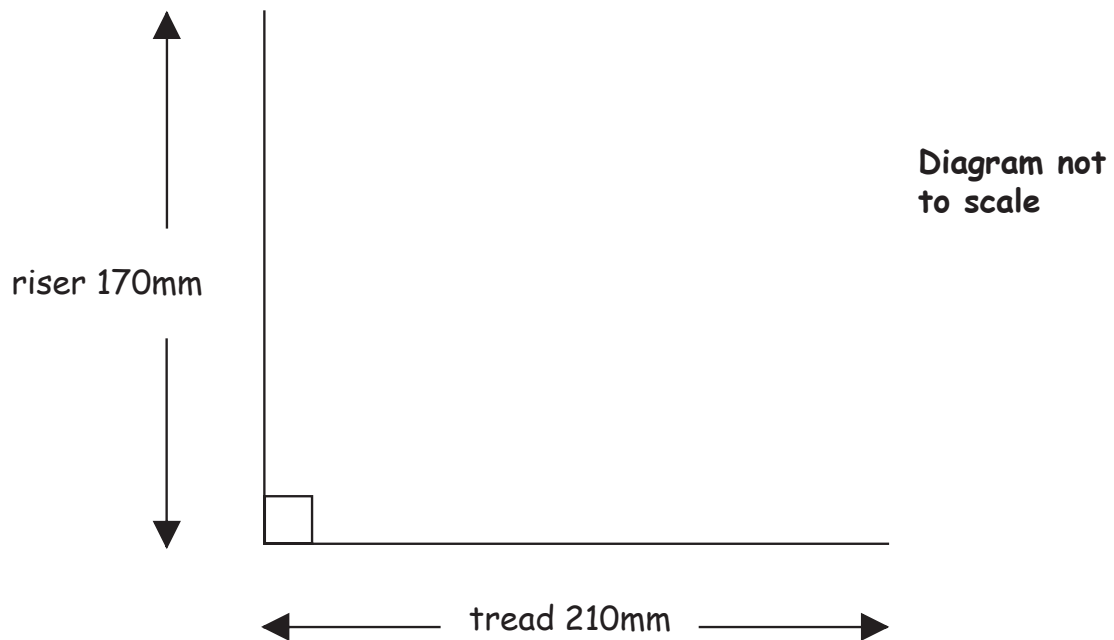
2 marks

Total 7 marks

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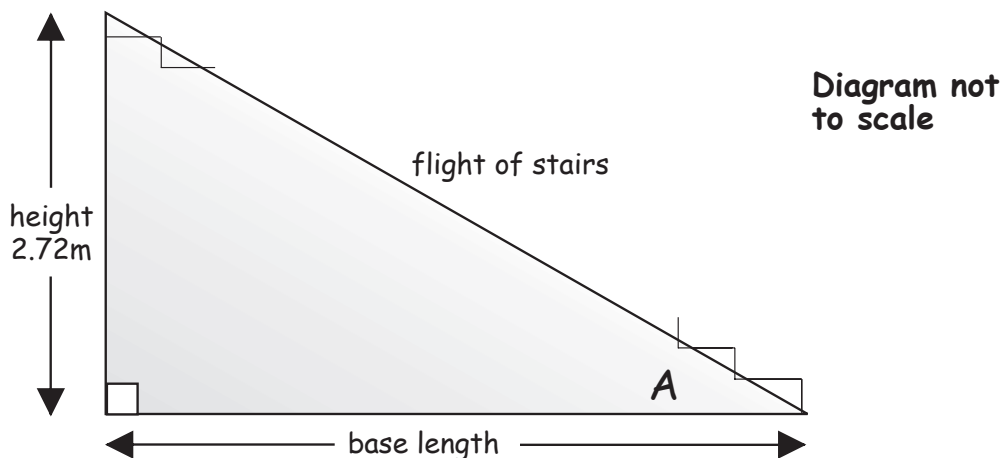
- 4 A small building company accepts a contract to renovate an old cottage.
 The company carpenter needs to construct a new flight of stairs. Each step consists of a tread and a riser.
 The vertical height of each riser in the flight of stairs is 170mm and the depth of each tread is 210mm.

Simplified diagram to show the cross-section of one step



The stairs must span a height of 2.72 metres as shown in the simplified diagram below.

Simplified diagram of the flight of stairs



One riser is positioned at the top and one riser is positioned at the bottom of the flight of stairs.

a How many **complete** steps are needed for the flight of stairs?

1 mark

b What is the base length of the flight of stairs, in metres?

1 mark

c Calculate the angle of elevation (A) of the flight of stairs.

2 marks

Total 4 marks

Please go on to the next page

- 5 The table below gives the number of notifiable offences recorded by the police in England and Wales between 1925 and 1998.

Number of notifiable offences recorded in England and Wales between 1925 and 1998

Year	1925	1950	1975	1981	1991	1998
Offences recorded (thousands)	114.0	479.4	2 105.6	2 794.2	5 075.3	5 109.1

(ref: National Statistics, www.statistics.gov.uk/)

- a Round the numbers of offences recorded to the nearest 10 000 and draw a line graph to display this data.
5 marks
- b Write one sentence about the changes in the numbers of notifiable offences recorded between 1925 and 1998.
1 mark
- c Use your graph to estimate the number of notifiable offences recorded in 1965.
1 mark

The police use the following formula to predict the number of notifiable offences recorded in any year since 1950.

$$C_n = C_0 \times \left(1 + \frac{6}{100}\right)^n$$

where

C_n = the number of notifiable offences recorded in the year

C_0 = the number of notifiable offences recorded in 1950

n = the number of years since 1950

- d Use this formula and the relevant data from the table to check that your answer for the number of notifiable offences recorded in 1965 in part c is correct. Show your working.

2 marks

Total 9 marks

6 In the year 2001 it was estimated that 125 million bananas were eaten each week in Great Britain. The population of Great Britain was estimated to be 60 000 000 in 2001.

- a Use the estimated data to calculate the number of bananas eaten per year per person in Great Britain in 2001.

1 mark

The consumption of bananas increased by 4.8% per year in each of the five years preceding 2001. In Great Britain in 2001, a total of 696 million kilograms of bananas were consumed.

- b How many complete years will it take for consumption to exceed 800 million kilograms per year, assuming that consumption of bananas continues to increase at the same rate in Great Britain?

2 marks

'Fairtrade' goods are so called because the workers who produce these goods are promised a fair deal. £14.6 million were spent on 'Fairtrade' bananas in Great Britain in 2001. This figure represents 2.7% of the total amount spent on bananas in that year.

- c What was the total amount spent on bananas in Great Britain in the year 2001?

1 mark

Total 4 marks

Part B - Extended-answer question

- 7 A nurseryman uses his greenhouses to grow exotic houseplants from seed. They take 16 weeks to germinate and grow before he sells them on.

The plants are grown in cylindrical hollows (plugs) in trays. Each plug has a diameter of 30mm and a depth of 30mm. There are 104 'plugs' in each tray and they are all filled to the brim with compost (soil) before the seeds are sown.

The nurseryman buys his compost in 80 litre bags.

- a How many complete trays of 'plugs' can be filled from one 80 litre bag of compost?

3 marks

The nurseryman pays £241.50 for 69 bags of compost each containing 80 litres. A greenhouse can hold a maximum of 250 trays.

- b What is the cost of the compost required for 250 trays?

1 mark

The nurseryman employs part-time workers to do seed planting. They are able to fill 1000 plugs per hour with seeds and compost. Earnings for this are £4.50 per hour.

- c How much does a part-time worker earn for filling 250 trays with seeds and compost?

2 marks

The data in the table below shows the costs and amounts of other items required for the 16-week cycle of growth for 250 trays of plants.

Cost and amounts of other items required for the 16-week cycle of growth

Item	Cost	Amount required
Seeds	£6.00 per packet of 80	1 seed per plug
Trays	25p each	250 per greenhouse
Feed	£25.00 per 10 kg carton	8g per tray
Fungicide	£5.20 per 500 ml bottle	25ml per tray

- d What is the total cost (for seed, trays, feed and fungicide) to grow 250 trays of plants? An unused portion of a pack of feed or fungicide can be kept to be used for the next 16-week cycle. Show your working clearly.

4 marks

At the beginning of one 16-week cycle, 24 000 seeds are sown in plugs in one greenhouse. The ratio of those seeds that fail to grow to those seeds that start to grow is 1 : 29. Of those that start to grow only $\frac{4}{5}$ grow into young plants.

- e How many young plants are there at the end of the 16-week cycle?

2 marks

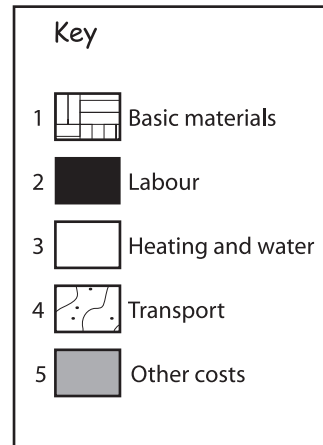
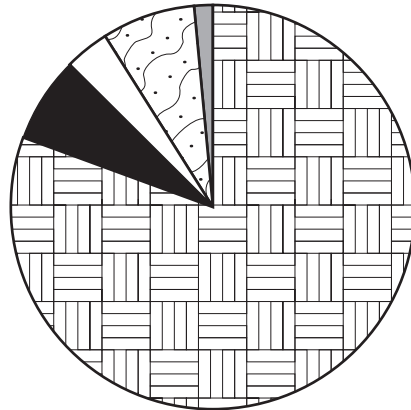
These young plants are sold on to customers for 45 pence each. The production of plants in this greenhouse costs £2 370 for the 16-week cycle.

- f How much profit is made on the young plants in this 16-week cycle?

1 mark

The nurseryman has 4 greenhouses. The pie chart below shows a breakdown of the total cost of £9 910 for production and marketing of plants for all 4 greenhouses for the 16-week cycle.

**Total plant production cost
for 16-week cycle**



The angle at the centre of the sector of the pie chart representing 'Heating and water' is 12°

g Calculate the cost for heating and water for the 4 greenhouses.

1 mark

The plants must be transported to customers around the country. The nurseryman receives quotes from two companies for transporting lorry loads of an identical size.

Quote from 'Carry-all'
£100 plus 14p per mile

Quote from 'Kwik-move'
70p per mile

The quotes are based on a single journey from the nursery to the customer. The nurseryman has customers in the following locations:

Location	Bath	Cambridge
Distance from the nursery in miles	240	50

- h Which transport company would be the most economical for the nurseryman to use for his customers in Bath? Show your working.

2 marks

- i Calculate the distance at which the costs of the two transport companies are the same.

2 marks

Total 18 marks

End of test