



Key skills application of number Level 3

Monday 24th May 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 33 marks) consists of 6 short-answer questions

Part B (total 17 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

First published in 2004.

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Ref: AoN/L3/3.1/P31

Part A - Short-answer questions

- 1 A part-time employee works for $7\frac{1}{2}$ hours a day on 3 days a week at a supermarket. His normal rate of pay is £5.16 per hour. Overtime is paid on Sundays at double the normal rate per hour.

In one week he works

- his usual 3 days
- an extra 6 hours on Wednesday
- 4 hours overtime on Sunday

Total deductions from his pay that week amount to £8.40.

The part-time employee puts aside £30 from his take-home pay that week towards a ticket for a music festival.

What is the approximate fraction of his take-home pay that he puts towards a ticket for a music festival? Give your answer in its lowest terms.

2 marks

Total 2 marks

Please go on to the next page

- 2 A family of six plan to go on a 7-day holiday to Cyprus. They see information on the baggage handling performance of several airlines in a newspaper.

Baggage lost by airlines

Airline	Number of passengers	Number of bags lost
KLM	1 466 983	53 985
Air France	3 530 209	128 450
British Airways	3 136 012	81 223
Cyprus Airways	112 003	2 845
Austrian Airlines	608 313	15 269
bmi British Midland	464 503	11 102
Alitalia	1 663 445	35 764
Lufthansa	3 648 274	75 884

Source: *Daily Telegraph* 19/03/03

- A** What is the approximate ratio of passengers on British Airways flights to passengers on Cyprus Airways flights?

1 mark

A travel agent offers the family a choice of two similar holidays with flights by British Airways or bmi British Midland.

- B** According to the data in the table, which of the two airlines, British Airways or bmi British Midland, is more likely to lose the family's bags? Show calculations to support your answer.

2 marks

For the family's choice of holiday, the travel agent quotes a total price of £1060 based on two adults and four children. However, the family consists of three adults and three children. The travel agent provides a new quote of £1140 based on three adults and three children.

C Use this information to construct two equations about the cost of this holiday for a family of two adults and four children and the cost of this holiday for a family of three adults and three children.

1 mark

D Calculate the cost of the holiday for each adult and the cost for each child.

2 marks

E Show how to check your answers for part d.

1 mark

Total 7 marks

Please go on to the next page

- 3** A sample of 50 people completed a questionnaire to investigate the number of hours people spend looking at television or computer monitors each day. The results are shown below.

Hours per day (to the nearest hour)	Number of people
0 – 2	7
3 – 5	17
6 – 8	15
9 – 11	10
12 – 14	1

- A** Identify the modal class for 'Hours per day' and the class containing the median value for 'Hours per day'. State your answers clearly.

2 marks

- B** Calculate an estimate of the mean time per day spent looking at television or computer monitors.

3 marks

- C** Which of the mode, median or the mean best represents the average time people spend looking at television or computer monitors? Justify your choice of average.

1 mark

The population of the United Kingdom is estimated to be 59 000 000.

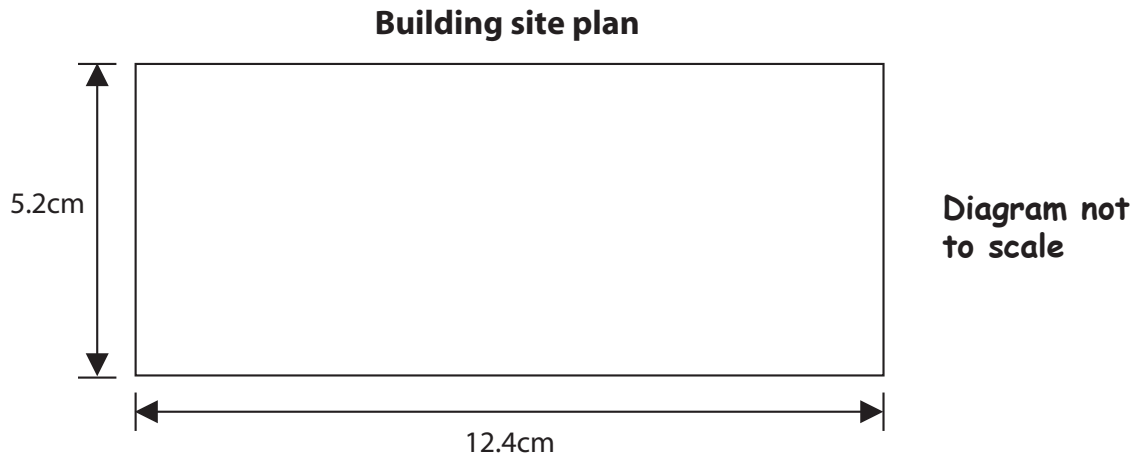
- D** Use the information in the table to predict the number of people in the United Kingdom who spend 9 hours or more per day looking at television or computer monitors.

1 mark

Total 7 marks

Please go on to the next page

- 4 A plan of a rectangular industrial building site is drawn to a scale of 1 : 350. On this plan the length of the site measures 12.4cm and the width of the site measures 5.2cm.



- A** What is the actual area of the site in square metres?

2 marks

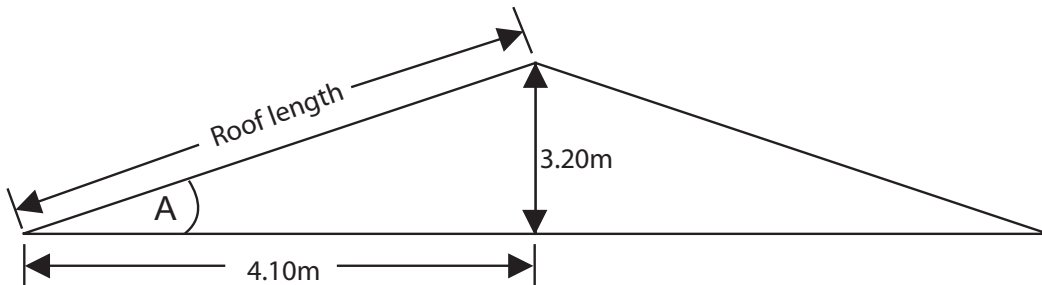
A building on the site is to be supported by reinforced concrete posts below ground level. Cylindrical holes are drilled into the ground and filled with concrete and reinforced with iron rods. In the reinforced concrete, the ratio of the space occupied by concrete to that occupied by the iron rods is 5 : 2. The holes for the posts are 3.0 metres deep and have a diameter of 400 millimetres.

- B** Calculate the number of cubic metres of concrete needed for 30 reinforced concrete posts. Write your answer to an appropriate degree of accuracy.

3 marks

The building will have a pitched roof. The diagram below shows a cross section through the symmetrically shaped roof.

Cross section through the symmetrically shaped roof



**Diagram
not to scale**

To check the pitch of the planned roof the builder needs to know the size of angle *A*.

C What is the size of this angle?

2 marks

The roofer needs to know the roof length in order to calculate the number of roofing tiles he requires.

D Calculate the roof length, on one side only.

1 mark

Total 8 marks

- 5 A car owner decides to keep a check on his car's petrol consumption over a 4-week period.

He fills up the petrol tank of his car at the end of each week and records the mileage.

At the start of the 4-week period, his mileage is 68 703 and his petrol tank is full.

End of week	Mileage	Litres of petrol to refill tank	Cost of petrol £
1	68947	39.5	29.98
2	69178	37.1	28.16
3	69483	47.2	36.30
4	69691	33.3	25.61

- A What is the average cost of petrol per mile for this car for the 4 weeks detailed in the table?

2 marks

- B Use the data in the table to calculate an estimate of the annual cost of petrol for this car assuming that petrol consumption and usage continue at a similar rate.

1 mark

The car is several years old. The handbook states that petrol consumption for this car should be 35 miles per gallon.

1 gallon is approximately equivalent to 4.5 litres

- C Calculate an estimate of the petrol consumption for this car in miles per gallon from the information in the table. Comment on how your result compares with the value for petrol consumption stated in the handbook.

2 marks

Total 5 marks

- 6 In January 2003 the Royal Society for the Protection of Birds (RSPB) launched the 2003 Big Garden Birdwatch. Volunteers counted a total of four and a half million birds.

Results show that blackbirds were recorded in 93% of the gardens in the survey. The mean number of blackbirds in those gardens was 2.7 and a total of 414 957 blackbirds were seen.

A How many gardens were surveyed in total?

2 marks

Starlings are the most common recorded species of birds seen in gardens but their numbers have declined on average by 4.5% per year since 1979. In the 2003 survey the total number of starlings seen was 744 518.

B Assuming the decline in numbers continues at the same rate, how many complete years will it take for the number of starlings to decrease to fewer than 500 000?

2 marks

Total 4 marks

Please go on to the next page

Part B - Extended-answer question

7 Anna plans to become slimmer and fitter.

Her basic metabolic rate (BMR) is the minimum daily calorie intake she requires to maintain vital functions such as breathing and heartbeat. She works out her BMR by multiplying her weight in pounds by 10. To lose weight at a steady pace she reduces her daily calorie intake according to the formula below.

$$\text{Reduced daily calorie intake} = 0.8 (\text{BMR} + 600)$$

1 kilogram is approximately equivalent to 2.2 pounds

Anna's weight is 73.8 kilograms.

A What is her reduced daily calorie intake?

2 marks

B Show how to check your answer to part **A**, by estimation, without using a calculator.

1 mark

She enrolls on a 100-day health and fitness programme. Her weight is recorded every 10 days. The table below gives her results.

Day	Weight (kg)
0	73.8
10	73.1
20	72.0
30	72.0
40	70.6
50	69.9
60	69.4
70	68.4

This data is used to predict Anna's weight after 100 days.

C Draw a suitable graph, using the data in the table, to show the trend in weight loss for Anna. Your scale for weight should start at 65kg. Draw, by inspection, the line of best fit.

5 marks

D Use your graph to predict her weight at the end of the 100-day programme.

1 mark

E What assumption did you make in predicting her weight at the end of the 100-day programme?

1 mark

Body mass index (BMI) can indicate whether a person has a healthy weight, is overweight or is obese.

Healthy weight	BMI of 19 to 24.9
Overweight	BMI of 25 to 29.9
Obese	BMI of 30 and above

The formula for calculating BMI is shown below.

$$\text{BMI} = \frac{\text{Body weight}}{\text{Height}^2}$$

where body weight is in kilograms
and height is in metres

Anna is 1.68 metres in height.

F In which category will her BMI lie at the end of the 100-day programme?
Show your working.

2 marks

On the 10th day of the programme and on the 40th day of the programme Anna took part in fitness tests and kept a record of her

- pulse rate before the test (P_r)
- pulse rate immediately after the test (P_0)
- pulse rate six minutes after the test (P_6)

The table below gives the results.

Day	P_r	P_0	P_6
10	71	136	82
40	68	129	74

A fitness rating (H) can be calculated from the following formula.

$$H = \frac{P_0 - P_6}{P_0 - P_r}$$

- G** Calculate Anna's fitness rating for each of the tests. What is the percentage increase in her fitness rating from the 10th to the 40th day of the programme?

3 marks

She intends to maintain her fitness and health by regularly working out on equipment at a fitness suite.

If she becomes a member of a sport and leisure club, at a cost of £90 a year, each session in the fitness suite will cost £2.25. One session in the same fitness suite costs a non-member £7.50

- H** Calculate the number of sessions per year in the fitness suite at which membership is the better deal.

2 marks

Total 17 marks

End of test