Key skills application of number Level 3

Monday 18th September 2006

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 30 marks) consists of 5 short-answer questions

Part B (total 20 marks) consists of 1 extended-answer question

Total marks available: 50

INSTRUCTIONS

You have 15 mins 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

Try to answer ALL the questions and:

- Make sure your personal details are entered correctly in the answer booklet
- 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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Part A - Short-answer questions

1 A report on the results of a survey about on-line sales via the internet by UK businesses in 2003 separated the total sales into

- on-line sales of **goods**
- on-line sales of **services**
- on-line sales of **digital products**

The report found that

The value of on-line sales of **goods** made by UK businesses was £26.6 billion.
The total value of all on-line sales made by UK businesses was £39.5 billion.

1 billion is 1 000 000 000

a For every £100 worth of on-line sales made by UK businesses in 2003, how much was spent on **goods**? Give your answer to the nearest £.

1 mark

The value of on-line sales of **services** made by UK businesses was £6 billion in 2002. In 2003, this value increased by 105%.

b What was the value of on-line sales of **services** made by UK businesses in 2003?

1 mark

Sales to households accounted for 28.9% of the total value of all on-line sales (£39.5 billion) made by UK businesses in 2003. The number of UK households with access to the internet in 2003 was estimated at 11.9 million.

c What was the average value of on-line sales to each UK household with access to the internet in 2003?

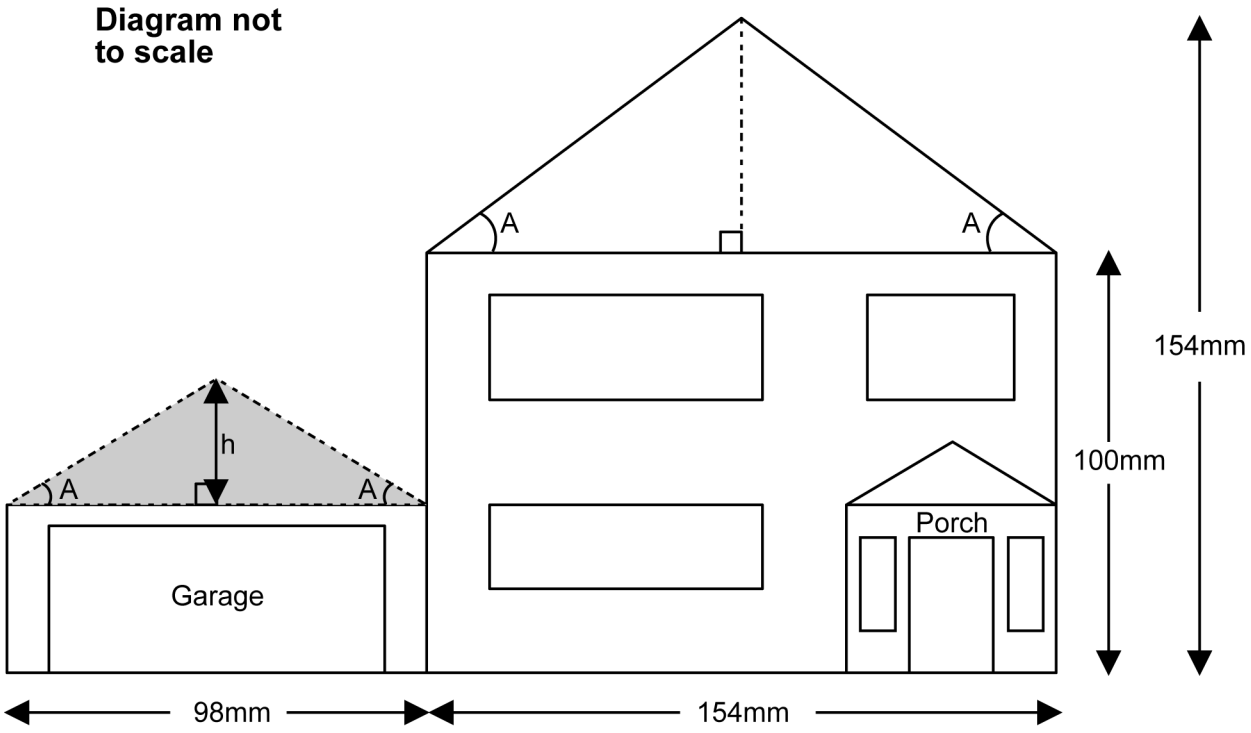
2 marks
Total 4 marks

Please go on to the next page

2 A householder wants to replace the leaking roof on his garage with a pitched roof. The local council's planning regulations require the new roof to have the same angle of pitch as the existing roofs on the house and porch.

The householder has plans of his house drawn to a scale of 1 : 50. He draws the simplified diagram below with some of the measurements taken from the scale plans.

Simplified diagram of the house showing new pitched roof on the garage



a Use the information in the diagram to calculate the angle of pitch (A) of the roof of the house.

2 marks

b Check your answer to part a and show your working.

1 mark

c What will be the **actual height** (h) **in metres** of the new pitched roof on the **garage** ?

2 marks

To build the gable end of the new pitched roof of the garage (the shaded area in the diagram) the builder will use 60 bricks for each square metre of gable end. He orders an extra 10% of bricks to allow for wastage.

d What is the total number of bricks the builder orders for the new garage gable end?

3 marks

Total 8 marks

Please go on to the next page

3 In 2003, the estimated total amount of money that adults gave to charities in the UK was £7.1 billion. The number of adults in the UK in 2003 was 4.78×10^7.

1 billion is 1 000 000 000

a What was the average amount **per month** that each adult in the UK gave to charities in 2003?

1 mark

In the UK, in 2003, 70.7% of women gave to charities compared with 60.1% of men.

There were 2.47×10^7 women in the UK in 2003 There were 2.31×10^7 men in the UK in 2003

b How many more women than men, in the UK, gave to charities in 2003?

2 marks

In the UK, in 2003, the average total monthly amount given to charities by women and men was £591.534 million. The average monthly amount that women gave to charities was approximately £84.258 million more than the average monthly amount given by men.

c Use this information to form two equations about the average monthly amount that women gave to charities and the average monthly amount that men gave to charities, in the UK in 2003.

1 mark

d What was the average monthly amount that women gave to charities and the average monthly amount that men gave to charities, in the UK in 2003?

2 marks

In 2003, there were 2.47×10^7 women and 2.31×10^7 men in the UK.

e Find how much per month each woman gave to charities and how much per month each man gave to charities, in the UK in 2003.

1 mark

Total 7 marks

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4 Ugandan coffee is the raw material used in many brands of instant coffee sold in UK supermarkets.

Between 1998 and 2003, the market price of Ugandan coffee decreased from 115.02 US cents per pound weight to 37.53 US cents per pound weight. Over the same period, the UK supermarket price of a 100-gram jar of instant coffee decreased from £1.95 to £1.79.

a Compare the percentage decrease in the market price of Ugandan coffee with the percentage decrease in the UK supermarket price of a 100-gram jar of instant coffee between 1998 and 2003. Comment on your findings.

2 marks

Fair-trade companies pay farmers in developing countries a fair price for their crops whatever the market conditions. The value of retail sales of coffee in the UK in 2003 is shown in the table below.

The value of retail sales of coffee in the UK in 2003

Type of coffee	Retail sales of all coffee in £million	Retail sales of Fair-trade coffee in £million
Ground and roasted	103.0	19.4
Instant	635.0	14.8
Total	738.0	34.2

b Use the data in the table to work out approximately what fraction of the retail sales of all **ground and roasted** coffee was Fair-trade coffee. Similarly, work out approximately what fraction of the retail sales of all **instant** coffee was Fair-trade coffee. Compare your answers and comment on your findings.

2 marks

The total value of retail sales of Fair-trade coffee in the UK increased by 48% from 2002 to reach £34.188 million in 2003.

c If this rate of increase continues, in which year will the value of the retail sales of Fair-trade coffee in the UK exceed £150 million?

2 marks

Total 6 marks

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5 Wind turbines erected offshore are seen as a future source of electricity for the UK.

It is estimated that over one year each offshore wind turbine will produce an average of 33% of its peak power output. The peak power output of each wind turbine is 2 megawatts.

1 megawatt is equal to 1×10^6 watts 1 gigawatt is equal to 1×10^9 watts

The total demand for electrical power in the UK in 2003 was 45.6 gigawatts.

a What percentage of the total demand for electrical power in the UK in 2003 would be generated by 5 000 wind turbines each producing an average of 33% of its peak power output?

2 marks

b Show, by estimation, how to check your answer to part a.

1 mark

Experts believe that the 5 000 offshore wind turbines, would generate enough electricity to produce hydrogen to fuel 4.32×10^6 small hydrogen-fuelled cars. Replacing petrol-fuelled cars with hydrogen-fuelled cars reduces carbon dioxide emissions because hydrogen-fuelled cars do not produce any carbon dioxide.

1 mile is equivalent to 1.609 kilometres 1 000 kilograms are equal to 1 tonne

On average, each small petrol-fuelled car travels 10 000 miles per year and the carbon dioxide emissions from this type of car are 149 grams per kilometre.

c What would be the reduction in carbon dioxide emissions per year if 4.32×10^6 small petrol-fuelled cars were replaced by hydrogen-fuelled cars? Give your answer to the nearest 1 000 tonnes.

2 marks

Total 5 marks

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Part B - Extended-answer question

6 Riders in the 2004 Tour de France cycle race started on 3rd July and finished on 25th July. This period of time included **2 rest days**. The race covered a total distance of 3 395 kilometres.

1 kilometre is equivalent to 0.621 miles

a To the nearest mile, what was the average distance covered by the riders on each race day in the 2004 Tour de France?

1 mark

One stage of the race, covering 64.5 kilometres, was won in a time of 1 hour 12 minutes 3 seconds.

b What was the average speed, in miles per hour, of the winning rider on this stage of the race.

2 marks

Stage 16, a mountain stage of the race, covers 15.5 kilometres. The start of this stage is 715 metres above sea level and the finish is 1 850 metres above sea level. The organisers use the formula below to calculate the average percentage gradient of the climb.

$$\mathbf{G = \frac{H}{D} \times 100}$$

where **G** is the average percentage gradient
H is the height climbed in metres
D is the distance travelled in metres

c Calculate the average percentage gradient on Stage 16 of the race.

1 mark

During the 3 395 kilometre race, there were a total of 31 climbs, each covering an average of 9.9 kilometres.

d Approximately, what is the ratio of the total distance covered during the climbs to the distance cycled over the remainder of the race? Show your working.

2 marks

The stage times for the 155 riders taking part in Stage 16 of the 2004 Tour de France are shown in the table below.

Stage times of the 155 riders taking part in Stage 16 of the 2004 Tour de France

Time in minutes (T)	Number of riders	Cumulative frequency
$39 \leq T < 41$	2	2
$41 \leq T < 43$	14	16
$43 \leq T < 45$	40	56
$45 \leq T < 47$	51	107
$47 \leq T < 49$	40	147
$49 \leq T < 51$	7	154
$51 \leq T < 53$	1	155

e Calculate an estimate of the mean stage time for the riders taking part in Stage 16 of the 2004 Tour de France.

3 marks

f Use the data in the table to draw a cumulative frequency graph for the times of the riders taking part in Stage 16 of the 2004 Tour de France.

5 marks

g From your graph estimate the median stage time for the 155 riders taking part in Stage 16 of the 2004 Tour de France.

1 mark

h Use your graph to estimate the interquartile range of the stage times for the 155 riders taking part in Stage 16 of the 2004 Tour de France.

2 marks

i Explain what your result for part h tells you about the times of the 155 riders taking part in Stage 16 of the 2004 Tour de France.

1 mark

The mean, the median and the interquartile range of the stage times for the riders on Stage 19 of the 2004 Tour de France are shown in the table below.

Results for the stage times for the riders on Stage 19 of the 2004 Tour de France

Mean	75.6 minutes
Median	75.8 minutes
Interquartile range	4.3 minutes

j Compare your results for the stage times for the riders on Stage 16 with your results for the stage times for the riders on Stage 19 of the 2004 Tour de France. Comment on your findings.

1 mark

k Why might the interquartile range be more useful than the range when comparing the stage times for the riders on Stage 16 and the stage times for the riders on Stage 19?

1 mark

Total 20 marks

End of test

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