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FOR WALES



Key skills application of number Level 3

Monday 13th March 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

REMEMBER: YOU HAVE 1 HOUR 30 MINUTES TO FINISH THE TEST

First published in 2005.

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Qualifications and Curriculum Authority, 83 Piccadilly, London W1J 8QA. www.qca.org.uk

Ref: AON-L3-S5_A-P44-v7.2-URN:388

Part A - Short Answer Questions

1 An article in a national newspaper dated September 2004 states

'Sweet Gale, a wild plant which grows on boggy land in the Scottish Highlands, could soon be worth £1.5 million a year to Scotland due to its medicinal properties.'

The article suggests that landowners could earn up to £750 per hectare each year for growing the plant.

- a If landowners earn £750 per hectare, how many hectares of land are required to grow Sweet Gale plants that provide an income of £1.5 million each year?

1 mark

A landowner has a rectangular strip of boggy land that measures 125 millimetres by 9 millimetres on a map with a scale of 1 : 5 000

1 hectare is equal to 10 000 square metres

- b Calculate the maximum annual income the landowner could earn from growing Sweet Gale on his rectangular strip of boggy land.

3 marks

Total 4 marks

2 A reference book identifies the world's largest living tree as 'General Sherman', a giant sequoia growing in California, USA. The book gives these details about the trunk of the 'General Sherman' tree

- diameter 8.2 metres
- volume 1 500 cubic metres

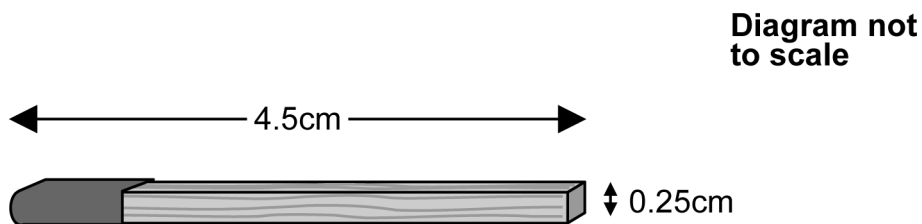
The trunk of the tree is approximately cylindrical in shape.

$$\text{Volume of a cylinder} = \pi r^2 h$$

a Use the reference book data to calculate an estimate of the height of the 'General Sherman' tree's trunk.

2 marks

The trunk of the 'General Sherman' tree is estimated to contain enough timber to make five billion matches. An average match is 4.5 centimetres long with a square cross-section of side length 0.25 centimetres.



$$1 \text{ billion is } 1000000000$$

b Show calculations to check that five billion matches is a reasonable estimate of the number of matches that could be made from the trunk of the 'General Sherman' tree.

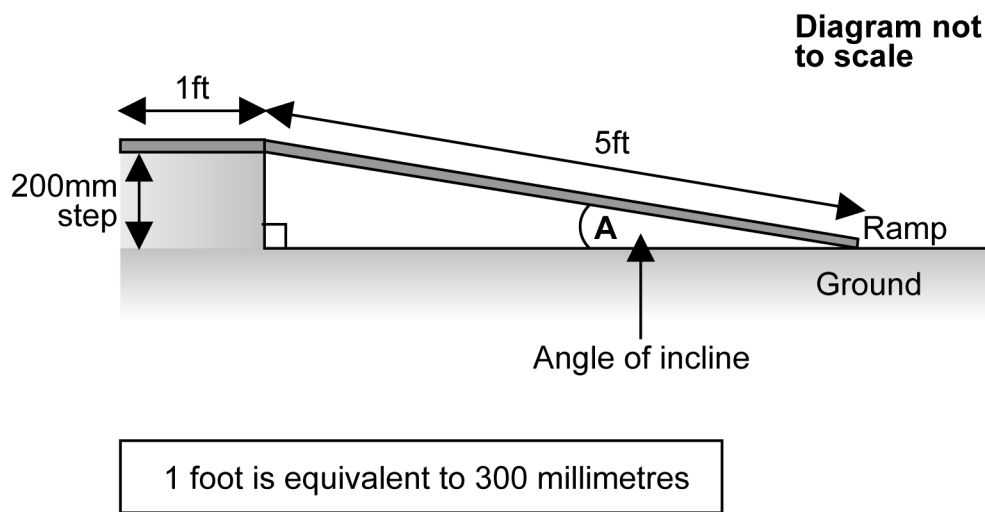
2 marks

Total 4 marks

- 3 All organisations that provide a service to the public must have wheelchair access.

The front entrance of a community hall has a step 200 millimetres high. The management committee of the hall decides to use a portable ramp to provide wheelchair access. The portable ramp is 6-feet (ft) long in total including a one-foot section of the ramp that rests on the top of the step.

Simplified diagram to show how the 6-foot long portable ramp will be used at the front entrance



Using portable ramps, the recommended maximum incline for wheelchair access is

Recommended maximum angle of incline	
Manual wheelchairs	Electric wheelchairs
7°	9.5°

- a Comment on how the angle of incline (A) provided by the 6-foot long portable ramp meets the recommended incline for wheelchair access using portable ramps. Show calculations to support your comment.

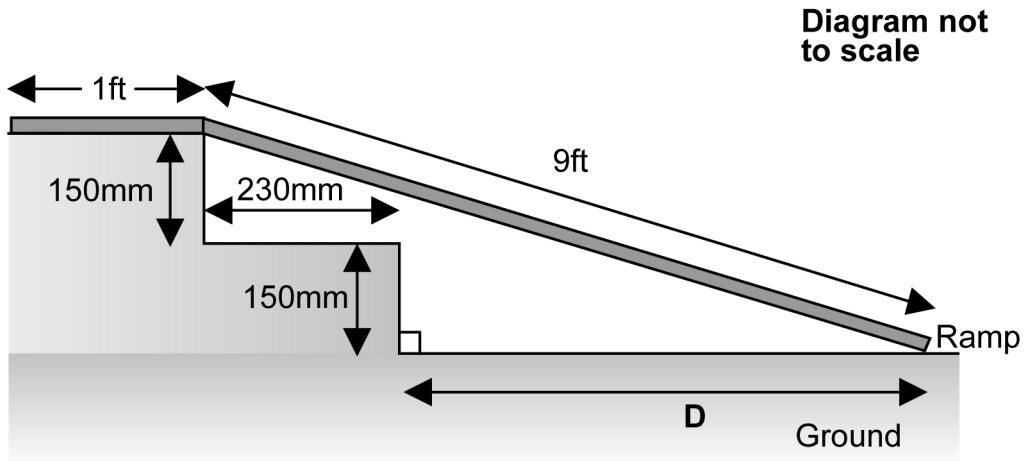
3 marks

- b Show how to check your calculations in part a.

1 mark

The side entrance to the community hall has two steps each 150 millimetres high. The depth of the lower step is 230 millimetres. For this entrance, the management committee buy a portable ramp with a total length of 10 feet including a one-foot section that rests on the top step.

Simplified diagram to show how the 10-foot long portable ramp will be used at the side entrance



- c Calculate the distance (**D**), in metres, that the 10-foot ramp will extend from the base of the bottom step to the base of the ramp.

2 marks
Total 6 marks

Please go on to the next page

- 4 In the year 2004 a charity in the United Kingdom held an appeal to raise funds for the restoration of an historic English church building in the Swiss Alps. The table shows the values of the first 205 donations to the appeal.

Value of donation (v) in £s	Number of donations
$0 \leq v < 20$	60
$20 \leq v < 50$	66
$50 \leq v < 100$	37
$100 \leq v < 500$	26
$500 \leq v < 5000$	12
$5000 \leq v < 50000$	4
Total	205

- a Explain why it was appropriate to use unequal class intervals when grouping the data in the table. 1 mark
- b Calculate the approximate fraction of the first 205 donations that were less than £100. Give your answer in its lowest terms. 1 mark
- c Calculate an estimate of the mean value of the first 205 donations received by the charity. 3 marks

The median donation to the appeal was £40

- d Which of the two averages, the mean or the median, gives the charity the best indication of a likely future individual donation for the appeal? Give a reason for your choice of average. 2 marks

To complete the project, the charity needs to raise 13 000 Swiss francs. It is thinking of running a campaign to ask people to sponsor building bricks for £10 each.

£1 is equivalent to 2.21 Swiss francs

- e How many sponsored bricks will be required to raise the remaining money to complete the project?

1 mark

Some of the donations were given under the Gift Aid scheme whereby the charity can claim back tax on the donations using the formula below

$$\text{Tax} = \frac{22}{78} \times \text{Donation}$$

The total tax reclaimed was £2 919.50

- f What was the total of the donations given under the Gift Aid scheme?

1 mark

Total 9 marks

- 5 There is concern about the increase of carbon dioxide (CO_2) emissions into the atmosphere which are thought to be the cause of global warming.

The table below gives the levels of CO_2 in the atmosphere, measured in parts per million (ppm) at ten year intervals from 1963 to 2003.

Year	1963	1973	1983	1993	2003
Level of CO_2 in the atmosphere (ppm)	319	330	343	357	376

- a What was the percentage increase in the level of CO_2 in the atmosphere between 1963 and 2003?

1 mark

One way of reducing CO_2 emissions is to reduce energy consumption.

The table below shows predicted energy consumption in the European Union (EU) from 2005 to 2020.

Year	2005	2010	2020
Energy consumption (Mtoe*)	1727	1788	1895

*million tonnes of oil equivalent

The World Wildlife Fund (WWF) is campaigning for a 1% reduction in energy consumption per year from 2005.

- b If the prediction for 2005 was correct, what value would WWF expect for energy consumption in 2020?

2 marks

It is suggested that switching off electrical devices such as televisions instead of leaving them on stand-by could reduce CO_2 emissions in the EU by up to 50 million tonnes between 2005 and 2020.

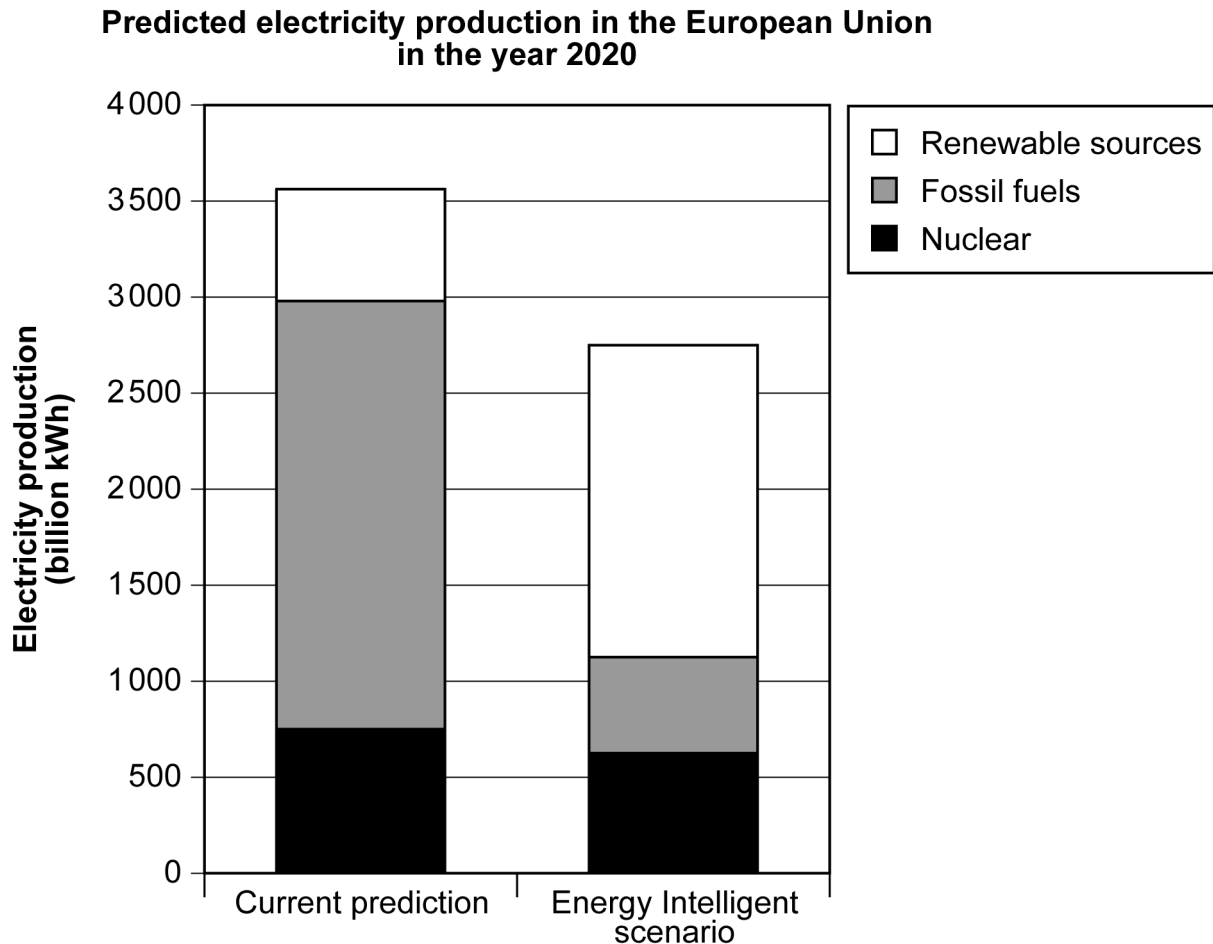
The population of the EU is approximately 450 million.

1 tonne is 1 000 kilograms

- c Calculate the average reduction in CO_2 emissions per day, (in grams), for each person in the EU, that would be achieved by this suggestion.

2 marks

The chart below compares the current prediction for electricity production in the EU in the year 2020 with the prediction from a study called 'Energy Intelligent' by the WWF.

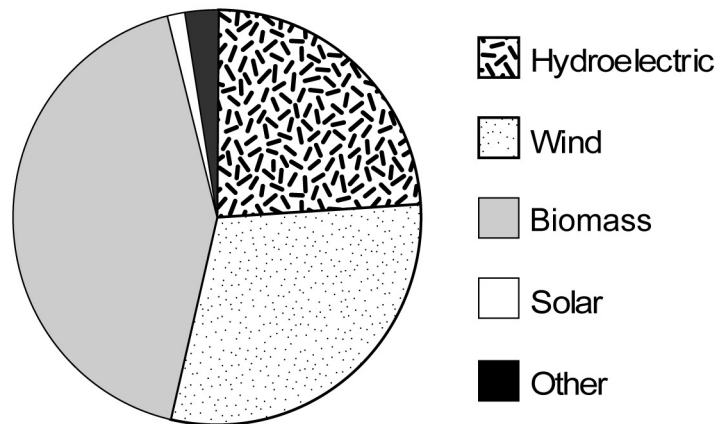


- d Compare the current prediction for electricity production in the EU in 2020 with that of the 'Energy Intelligent' prediction and make one relevant comment.

1 mark

The 'Energy Intelligent' study includes the pie chart below to show the proposed sources for producing the predicted 1 550 billion kilowatt hours (kWh) of electricity from renewable sources in 2020.

Proposed renewable sources for electricity production in the European Union in 2020.



The angle for biomass sources in the pie chart is 153° .

- e How much electricity (in billion kWh) could be produced from biomass sources in 2020, according to the 'Energy Intelligent' study?

1 mark

Total 7 marks

Please go on to the next page

Part B - Extended Answer Question

- 6 In England, all three- and four-year-old children have a right to pre-school education although not all actually receive it.

The demand for places in pre-school provision has increased since January 2000. The table below shows the number of three- and four-year-old children attending pre-school education in England each year between 2000 and 2004.

Year	2000	2001	2002	2003	2004
Number of three- and four year-olds in pre-school education (in 1000s)	365	386	380	429	445
Percentage of all three- and four-year-olds in pre-school education	30	32	32	37	39

- a Use the information in the table to calculate the total number of three- and four-year-old children in England in 2004.
1 mark
- b Use the data in the table on the number of three- and four-year-olds in pre-school education to plot the points for a line graph. Your graph must extend to the year 2006.
4 marks
- c Draw, by inspection, a line which best fits the points on your graph.
1 mark
- d Use your graph to predict the demand for pre-school education for three- and four-year-olds in 2006.
1 mark
- e What assumption did you make to predict the demand for pre-school education in 2006?
1 mark

A pre-school playgroup takes children between the ages of two- and four-years-old on five mornings each week.

Grants are not available for children younger than 3 years. The current grant paid to the playgroup for each three- or four-year-old child attending all five mornings each week is £415 per term. If a child attends on fewer than five mornings each week, the grant is reduced in direct proportion to the number of mornings attended.

**Pre-school playgroup attendance
three- or four-year-old children in the current 12-week term**

Number of mornings attended per week	Number of three- or four-year-old children
1	2
2	2
3	0
4	1
5	10

- f How much does the playgroup receive in grants for the current term for three- or four-year-old children?

1 mark

Grants are not available for two-year-old children so fees of £4.75 per morning are charged for each of the two-year-old children who attend the playgroup.

**Pre-school playgroup attendance
two-year-old children in the current 12-week term**

Day	Number of two-year-old children attending
Monday	4
Tuesday	6
Wednesday	5
Thursday	7
Friday	3

The local parish council also gives the playgroup a grant of £200 per term.

- g What is the playgroup's average income per morning from all sources (grants and fees) for the current 12-week term?

2 marks

Regulations state that the ratio of staff to children should be

- For two- year-olds, at least 1 member of staff to 5 children (1 : 5)
- For three- and four-year-olds, at least 1 member of staff to 8 children (1 : 8)

On Thursdays, 7 two-year-olds and 15 three- and four-year-olds attend.

- h** What is the minimum number of staff required on each Thursday of the current term?

1 mark

The table gives the rates of pay for the playgroup staff.

Playgroup leader (qualified)	£7.43 per hour
Playgroup assistants (qualified)	£6.37 per hour
Playgroup assistants (unqualified)	£5.78 per hour

The playgroup pays a rent of £18 per morning for the community hall (including lighting and heating) and insurance costs £110 per term. An allowance of 50p per child is made for the cost of materials each morning.

On Mondays, the playgroup leader, a qualified assistant and an unqualified assistant are each employed for $3\frac{1}{2}$ hours to supervise a total of 17 children.

- i** Is the average income you found in part g sufficient to cover the playgroup's total expenditure on wages, rent, insurance and materials on a Monday? Show calculations to support your answer.

2 marks

To help to raise funds for a new climbing frame the playgroup plan to sell children's T-shirts and sweatshirts bearing the playgroup logo. They order 20 of each from the manufacturer. The costs are shown below.

T-shirts	£2.45 each
Sweatshirts	£5.95 each
Postage and packing per order	£8.22 (including VAT)

They plan to sell the T-shirts for £3.99 each.

- j What is the lowest price they can sell each sweatshirt for in order to make at least £50 profit overall?

2 marks

The playgroup decides to sell the T-shirts for £3.99 each and sweatshirts for £7.99 each. At a promotional event they sell a total of 28 shirts. The total takings are £159.72

- k Use this information to form two equations about the T-shirts and the sweatshirts sold at the event.

1 mark

- l Use your equations to calculate the number of T-shirts sold and the number of sweatshirts sold at the event.

2 marks

- m Show how to check your answers to part l.

1 mark

Total 20 marks

End of test

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