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QUALIFICATIONS,
CURRICULUM &
ASSESSMENT AUTHORITY
FOR WALES



Edexcel
Success through qualifications

Key skills application of number Level 4

Monday 14 June 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 5 TASKS IN THIS TEST

Task 1: total 8 marks

Task 2: total 9 marks

Task 3: total 8 marks

Task 4: total 13 marks

Task 5: total 12 marks

Total marks available: 50

Try to complete ALL the tasks

YOU HAVE 2 HOURS 30 MINUTES TO FINISH THE TEST

INSTRUCTIONS

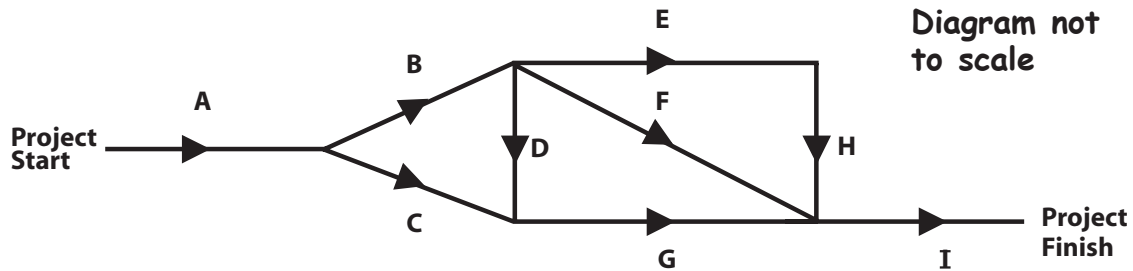
- Make sure your personal details are entered correctly in the answer booklet
- Read each question carefully
- Write in black or blue ink
- Make sure that your writing is clear, and show all your working
- If you need extra paper, use a second answer booklet. Make sure you put your personal details on 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

REMEMBER: YOU HAVE 2 HOURS 30 MINUTES TO FINISH THE TEST

- 1 Network diagrams are considered a key tool in project management, enabling the scheduling of activities to maximise efficiency.

The Project Manager of a small building programme has identified nine separate activities to be undertaken in order to complete the work.

The diagram below illustrates the relationships between these activities, eg Activity A must be completed before Activity B and C can be started.



Time required for each activity

Activity	Time required (days)
A	1
B	4
C	3
D	6
E	2
F	5
G	3
H	6
I	2

For this building programme each activity requires one worker.

- a Determine the minimum number of days to complete the project and the minimum number of workers with which this can be done. Draw up a schedule of activities for each of these workers to complete the project in this time. Using a suitable diagram, or otherwise, explain the answers. State any assumptions made.

4 marks

- b Evaluate the effect on the schedule if one fewer worker is available and justify the new schedule of activities.

2 marks

During Activity A it is discovered that two further activities will be required. They can be started after the completion of Activity C and are:

- Activity J, which will take 2 days and must be completed before Activity G can be started
 - Activity K, which will take 1 day and must be completed before Activities D, E and F can be started.
- c Sketch a revised network diagram showing these two additional activities, and assuming the same number of workers as in part b, explain what overall effect they will have on the time required to complete the project.

2 marks

Total 8 marks

- 2 The table below shows data for the year 2000 on the number of in-patients admitted to hospitals in Great Britain.

The columns entitled 'Total GB in-patients' give figures for the whole of Great Britain in 2000. The other columns relate to figures for an individual British hospital in the same period.

	Single hospital sample						Total GB in-patients (figures in thousands)		
	Average number of nights in hospital			Number of in-patients			Male	Female	Total
Age in years	Male	Female	All	Male	Female	Total			
0–4	7	4	6	53	37	90	146	106	252
5–15	3	3	3	67	38	105	189	109	298
16–44	6	4	5	145	382	527	501	1124	1625
45–64	11	9	10	185	173	358	548	481	1029
65–74	12	13	12	103	111	214	285	328	613
75 & over	16	16	16	97	133	230	261	409	670
All	10	8	9	650	874	1524	1930	2557	4487

Source: Office for National Statistics: Living in Britain 2000 General Household Survey (amended)

- a Use appropriate statistical analysis to compare and contrast the age distribution of male and female in-patients in the single hospital sample.

5 marks

- b Explain how you would evaluate whether or not the single hospital sample is representative of all GB in-patients.

1 mark

The *British Medical Journal* (1999) made the statement:

'Male children in Great Britain are twice as likely to be in-patients in hospital as are female children.'

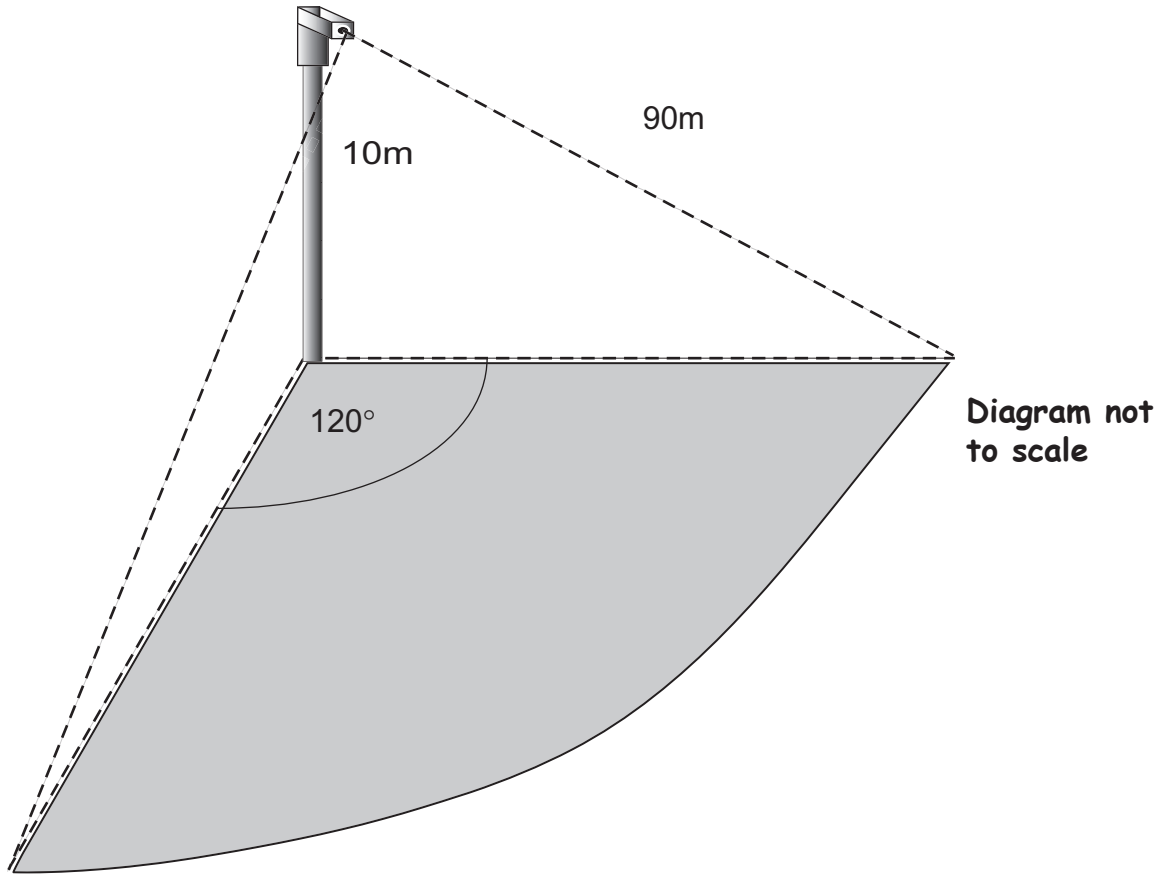
- c Investigate to what extent the statistics support this statement and make further comparisons about the hospitalisation of male and female children.

3 marks

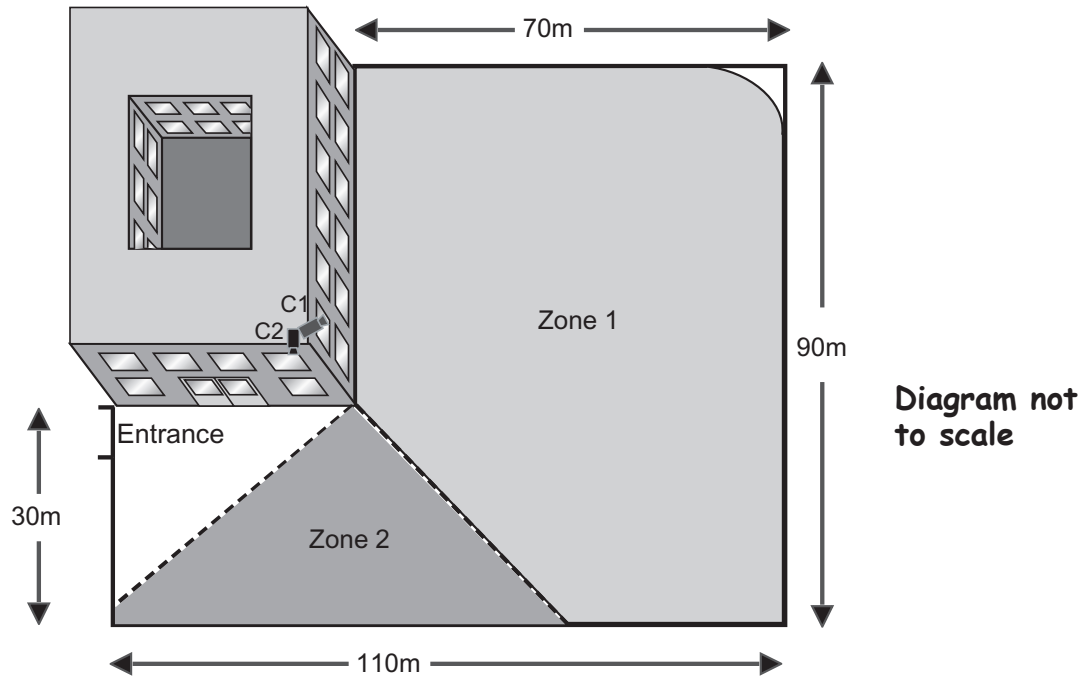
Total 9 marks

Please go on to the next page

- 3 The manager of a company is considering installing infra-red movement detection cameras to improve security in the office car park. Each camera has a range of 90 metres, and when positioned at a height of 10 metres gives a field of vision of 120° at ground level.



A diagram of the office building and L-shaped car park is shown below. One proposal is to install two fixed cameras C1 and C2 on the corner of the building at a height of 10 metres. The car park zones 1 and 2 that would be covered by these two cameras are shown by the shaded areas in the car park.



The manager wishes to know what percentage coverage of the total car park area this arrangement would give.

- a Find the percentage coverage given by the two cameras as shown in the diagram. Clearly show the method used and justify any approximations made.

4 marks

- b By considering alternative locations of 10 metre high fixed cameras around the perimeter of the car park, investigate whether it is possible to achieve 99% coverage without purchasing a third camera. Demonstrate, with the aid of a diagram, the improved positions for the cameras, justifying your decisions.

4 marks

Total 8 marks

- 4 'Although the housing market will slow appreciably over the next few months, residential property remains an excellent investment. Over the next decade, house prices will rise by an average annual figure of 5.2.'
'The annual rate of earning growth was 3.7 at the end of last year.'

Source: *Financial Times* 21 April 2003

A couple consider two options: buy a house straight away or save and buy in the future.

At the end of 2002 their situation is:

- they pay a rent of £280 per calendar month
- the cost of the type of house they want to buy is £124 000
- they have annual incomes for mortgage calculation purposes of £22 000 and £17 000, and
- a lump sum of £20 000, currently earning 2.5% interest per annum in a savings account.

According to a local building society, the amount that they can borrow to purchase a house is based upon:

$3.25 \times \text{annual income of applicant 1} + \text{annual income of applicant 2}$
or
 $2.5 \times \text{annual joint income}.$

- a Summarise how the couple's financial situation is likely to vary over the next 5 years by finding and illustrating graphically the:
- cost of the type of house that they wish to buy, and
 - the funds that are available to them from the end of 2002 to the end of 2007.

Contrast their ability to purchase the house at the beginning and end of the period.

5 marks

The couple consider saving to increase the funds available to them so that they can purchase an equivalent property at the end of 2007. They propose adding to their lump sum by saving a proportion of their combined salary.

- b Estimate the proportion of their total annual income they need to save to ensure that they have sufficient funds to take out a mortgage to buy such a property in 2007. Detail any assumptions made.

3 marks

After further research on the internet they find that it would be possible to take out a mortgage for the full £104 000 that they require at the end of 2002, and so wish to consider buying straight away. As first-time buyers they are offered four repayment mortgage deals over 25 years with a recommendation that they review their situation in 4 to 6 years' time.

The details of the mortgages are shown below. They have different conditions, rates of interest, charges and cashback amounts (cash gifts paid to the borrowers as inducements on taking out the mortgage). The variable rates of interest may increase or decrease in line with changes in the Bank of England base rate.

Mortgage deals available

Mortgage deal	Interest rate per annum	Set up charges	Cashback	Penalties for early redemption
A	1.89% fixed for 2 years then variable rate, currently 5.79%	£295	£250	for 6 years
B	Variable rate, currently 5.79%, discounted to 2.79% for 1st year, 3.79% for 2nd year, 4.79% for the 3rd year and 5.29% in the 4th year	NIL	£250	for 4 years
C	Lower variable rate, currently 5.25%	NIL	6% of loan value	for 6 years
D	4.49% fixed for 5 years then variable rate, currently 5.79%	£295	£300	for 5 years

Source: Alliance & Leicester plc

- c Choose two mortgage deals that the couple should consider. Give constructive reasons for your choices.

1 mark

They also find on the internet a formula which can be used to calculate approximate monthly repayments (**M**) on repayment mortgages.

$$M = P \left[\frac{R}{1 - (1 + R)^{-N}} \right]$$

where **P** = total amount of the loan

N = number of months over which the loan is agreed, and

R = monthly interest rate in decimal form, given by:

$$R = \frac{I}{12 \times 100}$$

where **I** = annual interest rate (%)

d Compare the effects of proceeding with each of the mortgage deals you chose in part c with:

- the couple's current financial situation, and
- with the option considered in part b.

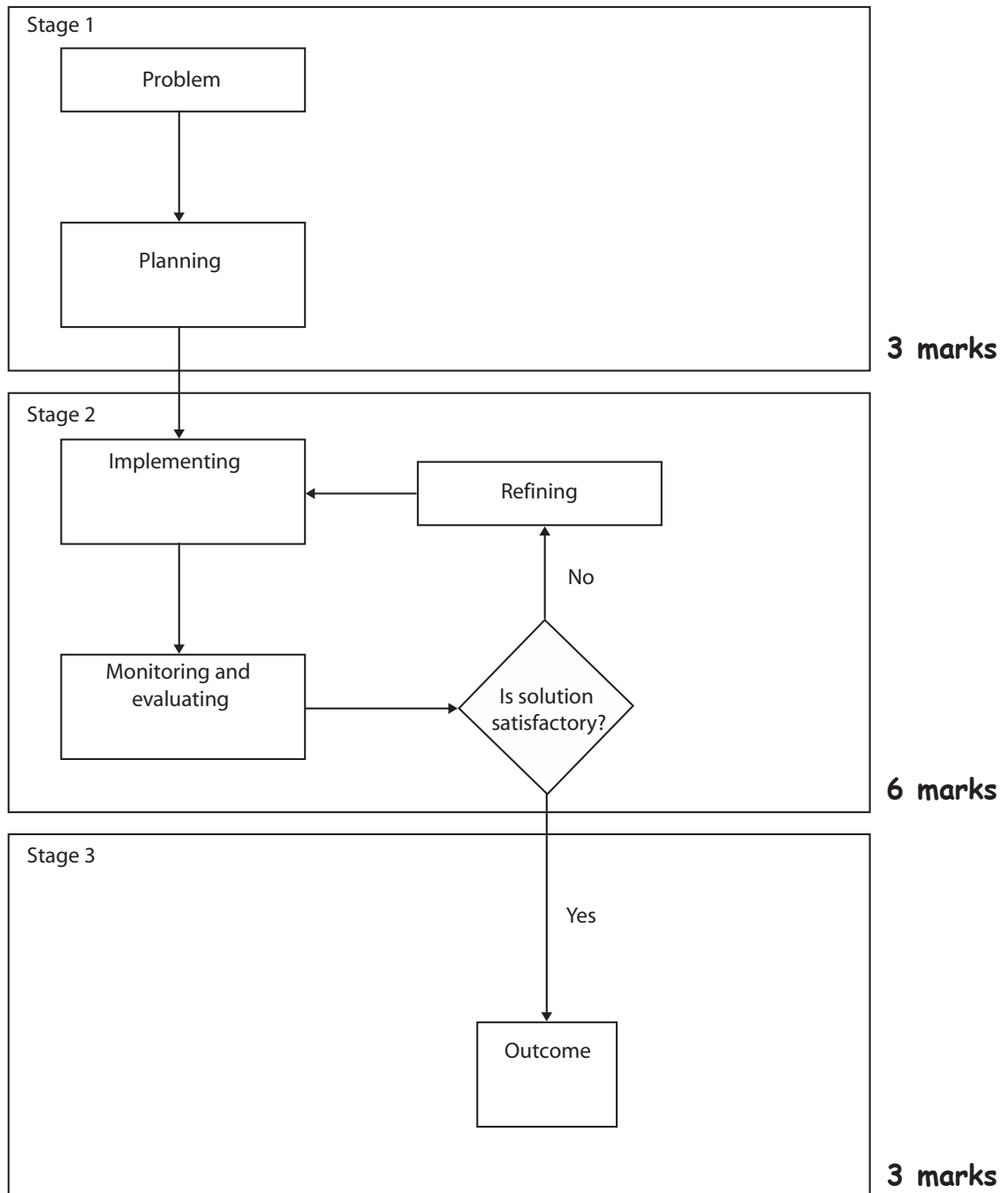
Recommend, with justification, the best way for the couple to proceed.

4 marks

Total 13 marks

- 5 This question requires you to supply from your own experience an example where you drew on a range of level 4 application of number skills to tackle a problem. The flow chart illustrates steps that are involved in developing a mathematical or statistical model when attempting to solve a problem.

Using the wording in each box as a heading, briefly state the problem and describe the skills and techniques you used at each stage to tackle the problem and to reach an outcome.



Total 12 marks

End of test