

Paper Reference(s)

6953/01

Edexcel GCE

Applied Information and Communication Technology

Unit 3: The Knowledge Worker

11–15 January 2010

Time: 2 hours 30 minutes

Materials required for examination

Short treasury tag
NCTW_exam.xls
Line_exam.txt
Student_exam.txt
Threshold_exam.txt
WWF_exam.txt

Items included with question papers

Cover sheet

Instructions to Candidates

Complete your candidate details on the cover sheet provided.

At the end of the examination use a treasury tag to attach your printouts to Page 2 of the cover sheet in the correct order.

Information for Candidates

There are **five** activities in this examination totalling **88** marks. **2** further marks are allocated to Standard Ways of Working giving a paper total of **90** marks.

The marks for parts of the activities are shown in round brackets: e.g. **(10)**.

There are suggested timings against each activity: e.g. **(15 minutes)**.

Advice to Candidates

Read the Scenario carefully as it contains additional information.

Work through the activities in order.

Attempt **ALL** activities.

Label your printouts clearly as instructed.

Printing must be undertaken within the examination time.

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Scenario

North Cyprus Turtle Watch

The 'Save the Planet' charity was formed in 1994 by a group of environmentalists who were worried about the number of marine creatures threatened by extinction. In those days its fundamental objective was to protect the Blue Whale whose numbers were dwindling at the time. As time went by the charity expanded its areas of interest and now has over 50 ventures being undertaken world wide.

One of these ventures is the 'North Cyprus Turtle Watch', which was set up to monitor the numbers of Green Belly Turtles. These have been under threat of extinction for about 50 years. Frodo James, a Lancashire born naturalist, is in charge of the project. He became famous through a TV programme called "The Dying World" in which several endangered species were investigated. Frodo became concerned about the Green Belly Turtle whilst filming one of his programmes and he successfully approached the charity for funding. He set up his base in Alagadi, North Cyprus. This is the only remaining nesting place of the Green Belly Turtle.

The North Cyprus Turtle Watch is currently running three projects. The first project involves the electronic tagging of male turtles so that they can be tracked. The female turtles will always return to the beach at Alagadi to lay their eggs but data about where the male turtles go is limited.

The second project is a captive breeding experiment. Turtle eggs are hatched and the baby turtles are kept in different sized tanks for the five years it takes for them to reach adulthood and consequently be able to breed. At this point they will be tagged and released back into the sea in the hope that they will boost numbers. The first batch is due for release in 2011.

The third project is an egg protection scheme and this is the project you will be working on. The gender of the hatched turtles depends on the average temperature of the nest during the incubation period. If the nest is covered by the sea for more than an hour a day then the average temperature tends to be lowered. This makes it more likely that the newly hatched turtles will be male.

It is possible to predict the highest point that the tide will reach on the beach each year, known as the **high water mark**. As this is known, it is possible to identify a line on the beach above which the newly hatched turtles will be female and below which male. This is known as the **threshold line**.

The female turtle will normally dig her nest in the first available space she comes to. Fewer nests are being dug above the threshold line because numbers of turtles have dwindled. This has led to a glut of male turtles while the female numbers have diminished. As these turtles only mate with one partner, the number of nests is determined by how many turtles there are of the gender with the fewer adults.

To combat this, the project is to implement a system by which student volunteers move a set number of nests from below the threshold line to above it. A small percentage of these nests are likely to be destroyed in this process. However, evening up the numbers of adult males and females will maximise the number of breeding pairs in five years' time.

You have been asked by Frodo to advise him on the number of nests to move in each of the next five years. To do this you have been supplied with a partially completed spreadsheet model and some data.

Note: the information contained in this scenario is fictitious. Much of the information has been adapted to provide a model of a suitable complexity.

Description of the model

The partially completed model will allow you to experiment with different values for the number of nests to be moved.

Worksheet	Description
Summary	<p>The summary worksheet is where most of the data required is to be displayed. Some of the formulae are missing. Amongst other things the worksheet will show estimates for the surviving turtles, in total and split into male and females. It will show the distance from the bottom of the nesting area to the predicted threshold line and calculate estimates of the number of nests which will be dug below and above it. There is an area where you can enter the number of nests you want to move in each of the years 2010 to 2015 and the worksheet will show how many nests are likely to be destroyed in the process.</p> <p>It is a well known fact that very few of the newly hatched turtles will live to adulthood and this worksheet will show the number of turtles it expects to survive.</p>
Threshold	The Threshold worksheet will contain the data used to predict the number of nests that will be dug below the threshold line.
Back Numbers	It is unclear how many turtles were born before the year 2010. However, in 2010 the baby turtles born in 2005, or at least those that survive, will be old enough to mate. These will need to be predicted in the model and this worksheet will contain those figures.

Some cells in the model are password protected. Should you wish to experiment with the model, the password is *edexcel*. Be aware that if you change the contents of any protected cell the model may not work.

Your Task

You have been asked by Frodo James of the North Cyprus Turtle Watch to complete a model that will enable you to suggest the number of nests to be moved from below the threshold line to above it during each of the next six years.

The Data

There are three sets of data needed by the model. The first set of data has been calculated by a student who surveyed the beach in the breeding season of 2007. He found the minimum distance between nests and the average area of beach a nest occupied. Based on the area and shape of the beach he calculated how many nests would be below the threshold line depending on how far up the beach the high water mark is. This data is in the text file `Threshold_exam.txt`.

The second set of data is an estimate of the number of new turtles that reached adulthood in the previous years. There are two possible data sources that could be used. During the 1990s the World Wildlife Fund did a survey of the number of newly hatched Green Belly Turtles which made it to the sea. They did this survey for six consecutive years. This data was logged and a projection formula was worked out which predicted the number of new turtles surviving to adulthood in future years. The results of this are in the text file `WWF_exam.txt`.

The alternative data source is based on the work of the student who collected the threshold data. Whilst he was measuring the nests he counted those below and above the threshold line. The same was done in 2008 and the estimated number of newly hatched turtles which made it into the sea in each case was calculated. This was in turn used to predict how many would reach adulthood and a formula was used to estimate the figures for 2005 to 2009. These figures are held in the file `Student_exam.txt`.

The third set of data are predictions of the high water marks for the next 15 years. These have been produced by the North Cyprus Shipping Office and have been worked out using their tidal model which is based on the weather and previous years' high water marks. This set of data is held in the file `Line_exam.txt`

All printouts MUST have a header and a footer. The header must contain the activity number. The footer must contain your name, candidate number and centre number.

Minimum font size of 10 should be used throughout.

All spreadsheet printouts should show gridlines and row and column headers.

For some of your spreadsheet printouts you may need to adjust column widths or set conditional formatting. To do this you will need to unprotect the worksheets. The password is *edexcel*.

Activity 1 – Understanding the situation (suggested time 15 minutes)

You should look at all the information available and make sure that you understand the situation.

On **one** sheet of A4 summarise the current situation by:

- listing key facts relevant to the problem you have to solve (8)
- outlining the decisions you have to make (2)
- describing what would make a good solution. (3)

Save and print.

Note: Bullet pointed answers are acceptable.

(Total 13 marks)

Activity 2 – Sources of information (suggested time 20 minutes)

On one sheet of A4:

Threshold_exam.txt contains data collected by a student.

- State what information this data supplies and why it is needed by the model. (2)
- Give **two** possible reasons why this data could lead to inaccuracies within the model. (2)

The files WWF_exam.txt and Student_exam.txt contain estimates of the new turtles for each of the previous five years.

- Identify which data file you are going to use and justify your decision. (4)
- State any external factors that could affect the accuracy and usefulness of the data. (3)

Line_exam.txt contains a prediction of where the high water mark will be in the next 15 years.

- Explain why it is needed by the model. (2)
- Give **two** possible reasons why this data could be inaccurate. (2)

Save and print.

(Total 15 marks)

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Activity 3 – Computer modelling (suggested time 50 minutes)

You should ensure that each printout is on **one** sheet of A4 only.

The model is stored as **NCTW_exam.xls**.

Open the spreadsheet model and familiarise yourself with it.

(a) **Importing Data**

- Insert a new worksheet, rename it 'Import Threshold' and import the file Threshold_exam.txt into it.
- Print off this worksheet showing the data. Remember to show gridlines and row and column headers.
- Insert a new worksheet, rename it 'Import Back Numbers' and import your choice of WWF_exam.txt or Student_exam.txt into it.
- Print off this worksheet showing the data. Remember to show gridlines and row and column headers.
- Insert a new worksheet, rename it 'Import Line' and import the file Line_exam.txt into it.
- Print off this worksheet showing the data and ensuring that it fits on one page of A4. Remember to show gridlines and row and column headers.

(6)

(b) **Threshold**

- Enter formulae into cells C2:Q3 of the 'Threshold' worksheet to read the data from your newly created 'Import Line' worksheet.
- Enter formulae into cells A6:B20 of the 'Threshold' worksheet to read the data from your newly created 'Import Threshold' worksheet.
- Print off columns A–E and rows 2–20 of the 'Threshold' worksheet showing **formulae**.

(5)

(c) **Back Numbers**

- Enter formulae into cells B2:F4 of the 'Back Numbers' worksheet to read the data from your newly created 'Import Back Numbers' worksheet.
- Print off columns A–C and rows 1–4 of the 'Back Numbers' worksheet showing **formulae**.

(3)

(d) **Summary**

- Enter a suitable formula into cell B5 of the ‘Summary’ worksheet to calculate the predicted total number of adult turtles in 2010.
- Replicate this formula to cell L5.
- Enter a formula into cell B6 which will calculate the number of female turtles laying eggs (Hint: this will be either the number of male turtles or the number of female turtles, whichever is the smaller).
- Replicate this formula to cell L6.
- In cell B8 enter a formula to read the correct high water mark measurement from the ‘Threshold’ worksheet.
- Replicate this formula to cell L8.
- If a nest is moved there is a 10% chance it will be destroyed. Enter a suitable formula into cell B12 to calculate the number of nests which would be destroyed.
- Replicate this formula to other similar cells.
- In cell C16 enter a formula to calculate the percentage **increase** in the number of surviving adult turtles from 2010 to 2011.
- Replicate this formula to cell L16.
- Unprotect the worksheet using the password edexcel.
- Set conditional formatting so that if this value is negative (ie shows a decrease) the cell is displayed with white writing on a red background.
- In cell A16 enter a suitable label for the row.
- Print off columns A–D and rows 2–16 of the ‘Summary’ worksheet showing formulae.

(20)

Using your model, experiment with moving nests to see which combination gives you the best projection for the turtles. With your best solution displayed:

- Print off columns A–G and rows 2–16 of the ‘Summary’ worksheet showing data
- Print off columns H–L and rows 2–16 of the ‘Summary’ worksheet showing data.

(5)

(Total 39 marks)

Activity 4 – Recommendations (suggested time 25 minutes)

Write a report for Frodo James of the North Cyprus Turtle Watch describing your recommendation.

The report should include:

- A suitable title.
- A brief introduction to the report.
- Your recommendation.
- A justification of your recommendation.
- Any other factors that may need to be taken into account.
- At least one chart or graph.
- A concluding statement. (11)
- Proof read your report. (3)

Save and print.

(Total 14 marks)

Activity 5 – Evaluation (suggested time 10 minutes)

Write an evaluation of the model considering:

- how well you thought it performed
- what else you would like it to do and why this would help.

Save and print.

(Total 7 marks)

(Standard Ways of Working: 2 marks)

TOTAL FOR PAPER: 90 MARKS

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