Level 3 Certificate in Using and Applying Mathematics
Written – sample assessment 1

Paper 2 Mathematical comprehension and Communicating with mathematics

DATE TBC
TIME TBC

Centre number						
Enrolment number						

You should have the following for this examination
- answer booklet
- pen with black ink
- pencil
- 30cm ruler
- calculator
- graph paper.

Surname	Other names

General instructions
- Please answer all of the questions.
- There are **60 marks** for this paper.
- You have 2 hours to complete Paper 2.
- There are **two** sections to this paper:
  Part 1: Mathematical comprehension
  Part 2: Communicating with mathematics.
- You are advised to divide your time equally between the two parts.
- Additional paper or inserts may be used but this must clearly show your name, your candidate number, your centre number and the question number.

You may use
- A scientific or graphical calculator.
- A PC installed with the following standard application office software:
  - word processor
  - spreadsheet
  - database
  - graphics and presentation packages.

You must not use
- internet
- e-mail
- mobile phones
- any pre-prepared files held on internal or external systems.

Marks available and weighting:

Paper 2	**Component**	**Maximum raw mark**	**Scaling Factor**	**Maximum scaled mark**
Part 1 a) 32 marks b) 28 marks	Mathematical comprehension	60	0.5	**30 marks**
Part 2 30 marks	Communicating with mathematics	30	1	**30 marks**

Paper 2: Part 1 – Mathematical comprehension
You should spend about one hour working on Part 1.

(a) Refer to *Speeding up* in the pre-release material.

1. The article states that the graph of Figure 1 "shows an interesting trend: although both men and women are improving their performance, women are improving at a faster rate than men."

   (a) How can you deduce this from features of the graphs of Figure 1?

   (2 marks)

   (b) What numerical values taken from Figure 1 support this statement and why?

   (4 marks)

   (c) Explain how the graph of Figure 2 confirms this.

   (2 marks)

   (d) What are the long term implications of the trends for men and women identified here?

   (2 marks)

2. Show in full the mathematical calculations to find the time men and women gold medalists would take running 100 metres in the same time as predicted by the lines of best fit to the data in Figure 1.

   (4 marks)

3. In 2012 Usain Bolt won a gold medal in the 100 metres in 9.63 seconds, and in the 200 metres in 19.32 seconds.

   (a) Calculate his average running speed for each event.

   (4 marks)

   (b) What can you deduce from these values and the times he took for the two races?

   (3 marks)

4. Write an explanation to someone of **the method** they should use to solve the simultaneous equations

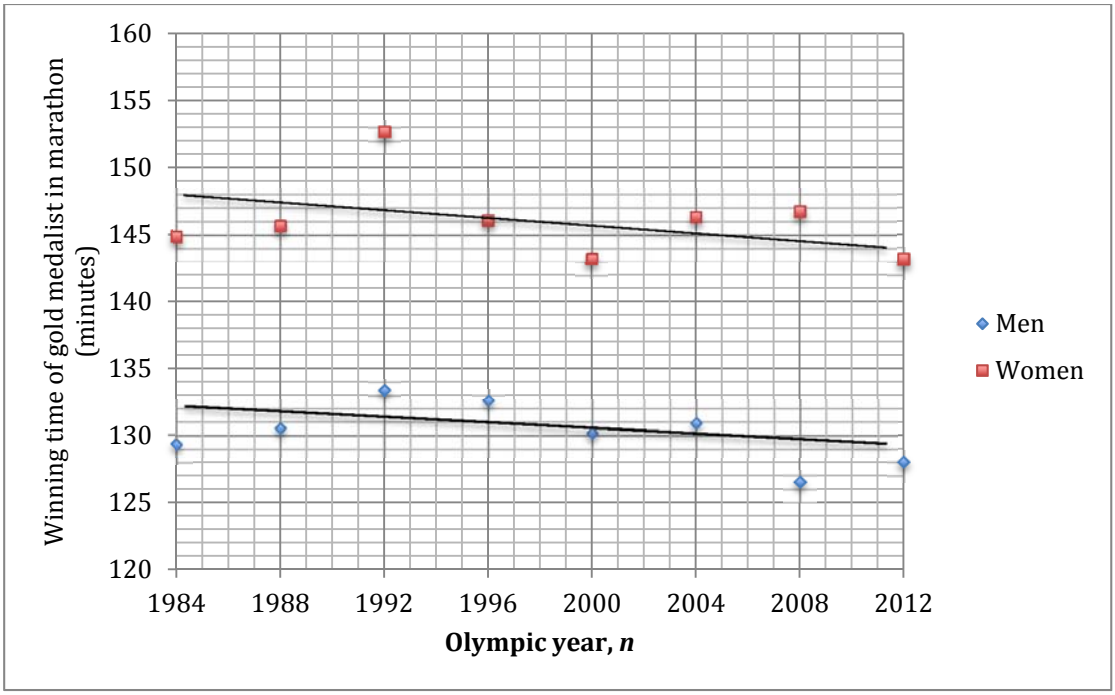
   $T_m = -0.0466n + 123.8$
   $T_w = -0.0199n + 67.16$

   to find the year in which it is predicted that men and women gold medalists in 10 000 metres will run the race in the same time.

   (4 marks)

5. The graph below shows the winning times for men and women in the Olympic Games for the marathon, since 1984.
Use values you find from the lines of best fit on the graph to find when they predict men and women will first run the marathon in the same time.

(7 marks)
(32 marks)



(b) Refer to *Making a quick buck* in the pre-release material.

6. For the model shown in Figure 4 calculate the total owed at the end of 15 periods of 90 days. Explain why it is this amount.

(4 marks)

7. To better match Ponzi's actual scheme a model assumes that each investor invests $1,000 rather than $100. If this was the only value altered in the model shown in Figure 4 what would be the effect on

   (a) the number of new investors required;

   (2 marks)

   (b) the total paid out

   (2 marks)

   at the end of each 90 day period?

8. Explain, in terms of the real situation, the significance of each of the terms of the formulae in cells

   (a) F4 (=E3)

   (2 marks)

   (b) G4 (=E3+F4)

   (2 marks)

   of the spreadsheet shown in Figure 5.

9. For the model represented in Figure 6 use spreadsheet notation to write down formulae that would calculate the values in cells

   (a) E4

   (2 marks)

   (b) F4

   (2 marks)

10. Consider another model in which everything is assumed to be the same as in the first model of the article except the interest rate, which is reduced to 10%. In this case,

    (a) calculate the number of new investors required after 90, 180 and 270 days.

    (4 marks)

    (b) what would be the total owed at the end of each of these periods?

    (4 marks)

11. Suggest **two** ways in which you might refine the model to more accurately represent what might happen in reality in the early stages of running a scheme like that set up by Ponzi.

(4 marks)

(28 marks)

Paper 2: Part 2 – Communicating with mathematics
You should spend about one hour working on Part 2.

Refer to *Crime data* in the pre-release material.

(a) Use the Crime Data to write a brief report aimed at a national audience. This should be no more than one side and should use diagrams and ideas of risk to make your case.
Bear in mind that the population of the UK can be taken to be approximately 65 million.

(b) Explain how you would adapt your report if you were to use the ideas it contains for a magazine circulated to a small village with a population of approximately 500.

(30 marks)

End of examination.