

3849-301 Level 3 Certificate in Using and Applying Mathematics

Paper 2: Mathematical Comprehension and Communicating with Mathematics

Sample assessment 3

Written

Date of exam TBC

You should have the following for this examination

- a clean copy of the pre-release material
 - normal distribution table
 - pen with black or blue ink
 - pencil
 - 30cm ruler
 - calculator
 - graph paper.
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General instructions

- There are **60 marks** for this paper.
- You have 2 hours to complete this paper.
- Answer all of the questions.
- Write all working out and answers in this booklet.
- There are **two** parts to this paper
Part 1: Mathematical comprehension
Part 2: Communicating with mathematics.
- You are advised to divide your time equally between the two parts.

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
- email
- internal or externally saved files
- mobile phones.

Marks available and weighting:

Paper 2	Component	Maximum raw mark	Scaling Factor	Maximum scaled mark
Part 1 a) 33 marks b) 27 marks	Mathematical comprehension	60	0.5	30 marks
Part 2 30 marks	Communicating with mathematics	30	1	30 marks

Part 1: Mathematical comprehension.

You should spend about one hour working on this part.

(a) Refer to *Supply and demand* in the pre-release material.

1. Explain the shape of the
 - (i) demand curve in **Figure 4** (2 marks)
 - (ii) supply curve in **Figure 5**. (2 marks)

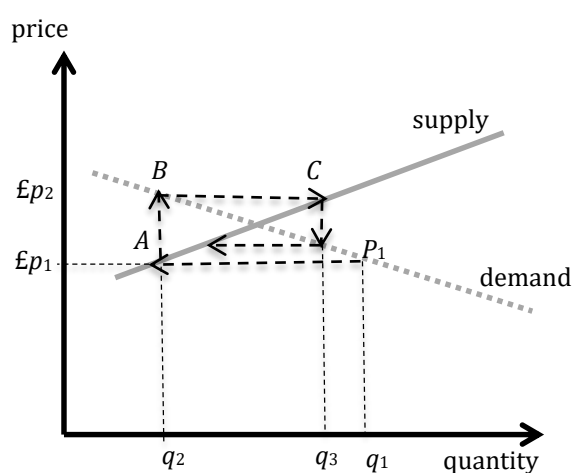
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2. **Figure 7** is repeated below with three points, *A*, *B* and *C* marked on it.



Explain what is happening at each of the points *A*, *B* and *C*.

(6 marks)

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3. According to **Figure 8**, if strawberries are initially priced at £1.25 what will be the demand and how many boxes of strawberries will the farmer supply in the next month?

(4 marks)

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4. According to the supply and demand curves in **Figure 8** at what price would the demand for strawberries hit zero?

(2 marks)

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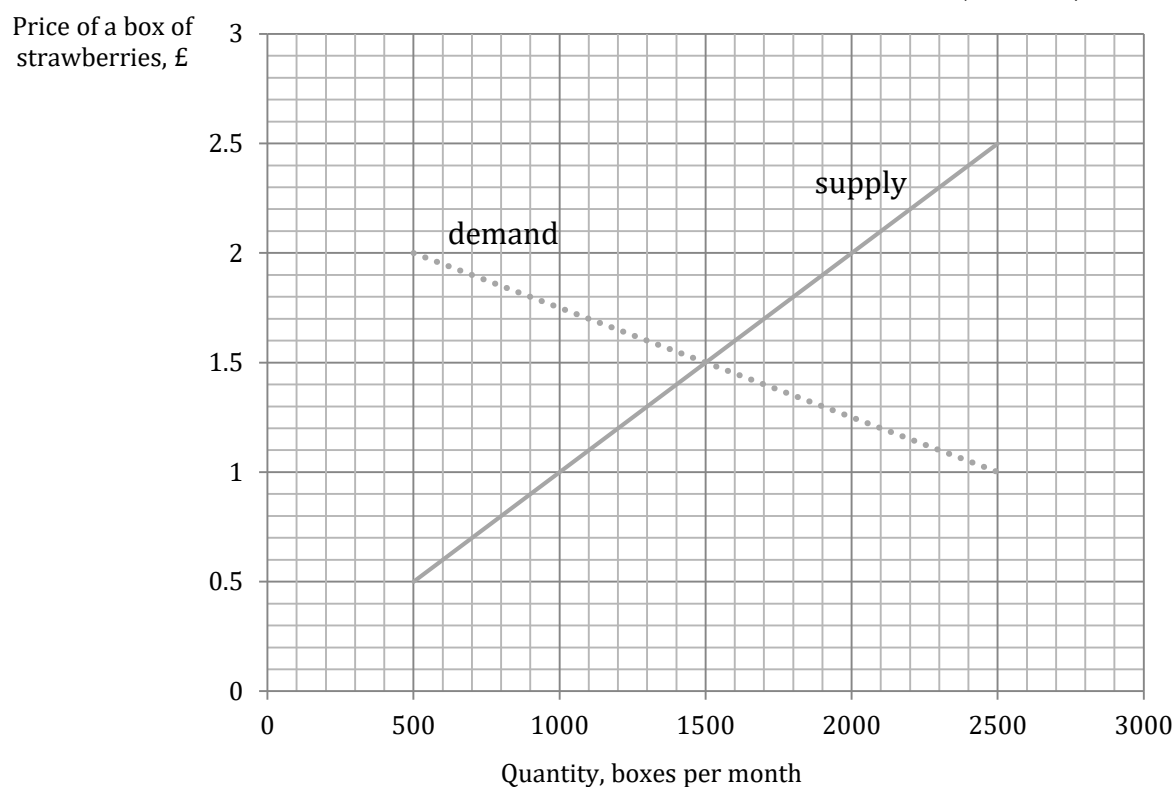
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5. **Figure 8** is repeated below.

- (a) On the graph below draw the 'cobwebbing' for the situation where the initial price for strawberries is £1 and the demand is, therefore, 2,500 boxes per month.

(3 marks)



- (b) In this case what would be the price of strawberries in the
- (i) second month (1 mark)
- (ii) third month? (1 mark)

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6. (a) For the supply and demand curves, modelled as straight lines in **Figure 8**, write down an equation for the
- (i) supply curve (2 marks)
 - (ii) demand curve (3 marks)
- where $\text{£}p$ is the price of strawberries per box and q is the quantity of boxes per month.

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- (b) Use the two equations to find the equilibrium point, where supply and demand intersects. (3 marks)

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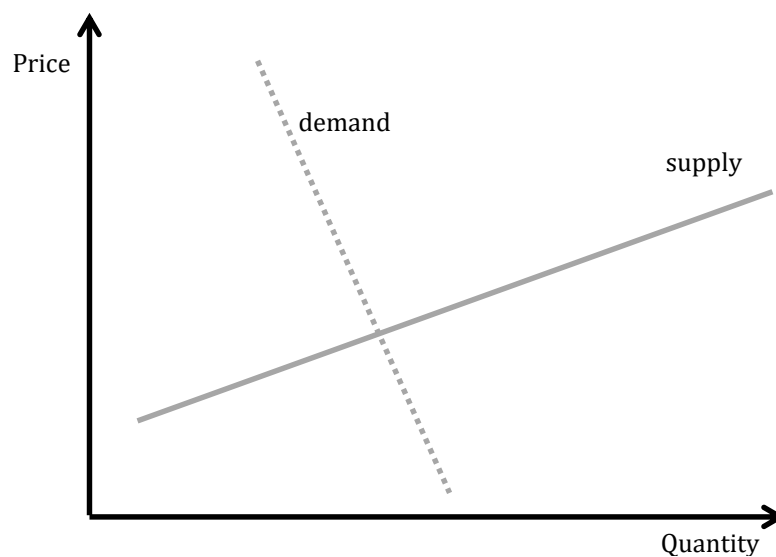
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7. Explain what would happen if the demand curve (modelled as a straight line) had a very steep negative gradient as in the sketch graph below.

(1 mark)

Draw a 'cobweb' on the sketch graph below to illustrate your explanation.

(3 marks)



(b) Refer to *Lottery numbers* in the pre-release material.

8. (a) Which numbered ball was drawn the most times in the first 2065 draws of the National lottery?

(1 mark)

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- (b) What is the range of the number of times each of the balls has appeared in the first 2065 draws of the National lottery?

(1 mark)

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9. If an additional lottery ball was to be added to the lottery draw of 59 balls so that to win you now need to select 6 balls from 60, what would be your chances of winning now?

(3 marks)

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10. (a) Draw a table like the one in **Figure 9** to show all of the different ways that two balls can be selected from 4 balls. (3 marks)

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- (b) How many different ways are there of drawing 2 balls from 4 balls, if the order in which the balls are drawn does not matter? (2 marks)

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11. The mean and standard deviation of the number of times each of the balls appeared in the first 2065 draws of the National lottery are different depending on whether you use either the raw or grouped frequency data.

Explain why.

(2 marks)

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12. Explain why the height of the first bar of the histogram in **Figure 12** is 0.3 rather than 3, which is the number of balls in this class according to the data in **Figure 9**.

(2 marks)

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13. The bars of the histogram in **Figure 12**, rather than having the ranges in the table of **Figure 11**, actually lie between values of 214.5, 224.5, 234.5, 244.5, 254.5, 264.5 and 274.5.

Explain why this is the case.

(2 marks)

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14. (a) What is the total area of the bars of the histogram in **Figure 12**?

Explain why this is the case.

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(2 marks)

- (b) Use the grouped frequency data (**Figure 11**) or histogram (**Figure 12**) to estimate the median number of times a ball has been drawn in the first 2065 draws of the National lottery.

(4 marks)

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15. Use the Normal distribution (**Figure 13**) as a probability model to find the probability that a ball was likely to be drawn more than 280 times in 2065 draws of the National lottery.

How many of the 49 balls in the first 2065 draws of the National lottery would you expect to have been drawn more than 280 times?

(5 marks)

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End of part 1.

Part 2: Communicating with mathematics.

You should spend about one hour working on this part.

Refer to *Counting calories* in the pre-release material.

Imagine that you work at a local health centre.

Use the information and data to write a publicity article that would encourage people to become healthier.

Your article should be around a single side of A4 including any diagrams.

(30 marks)

There is space on the following pages for your article and workings, or additional inserts/printouts can be used.

