Coimisiún na Scrúduithe Stáit
State Examinations Commission

Leaving Certificate Examination, 2012

Mathematics
(Project Maths – Phase 3)

Paper 1

Foundation Level

Friday 8 June Afternoon 2:00 – 4:30

300 marks

Examination number

Centre stamp

Running total	

For examiner	
Question	Mark
1	
2	
3	
4	
5	
6	
7	
8	
Total	

Grade

Instructions

There are **two** sections in this examination paper:

Section A	Concepts and Skills	150 marks	6 questions
Section B	Contexts and Applications	150 marks	2 questions

Answer all eight questions.

Write your answers in the spaces provided in this booklet. You will lose marks if you do not do so. There is space for extra work at the back of the booklet. You may also ask the superintendent for more paper. Label any extra work clearly with the question number and part.

The superintendent will give you a copy of the *Formulae and Tables* booklet. You must return it at the end of the examination. You are not allowed to bring your own copy into the examination.

Marks will be lost if all necessary work is not clearly shown.

Answers should include the appropriate units of measurement, where relevant.

Answers should be given in simplest form, where relevant.

Write the make and model of your calculator(s) here:

Section A — Concepts and Skills — 150 marks

Answer **all six** questions from this section.

Question 1 (25 marks)

For each of the following sequences of numbers, use the pattern to continue the sequence. In each case, explain your answer by describing the pattern.

(a) 12, 17·5, 23, 28·5, _____, _____.

(b) 64, 96, 144, 216, _____, _____.

(c) 1, 1, 2, 3, 5, 8, 13, 21, _____, _____.

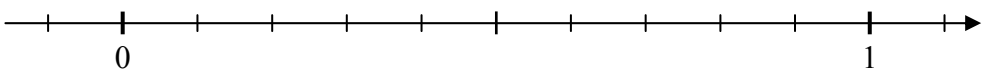
Question 2 **(25 marks)**

(a) **(i)** Let $a = 8640$. Express a as a product of prime factors.

(ii) Let $b = 2^{10} \times 3^5 \times 13^6$. Express ab as a product of prime factors, using powers appropriately.

(b) Place each of the following numbers in the correct position on the number line below.

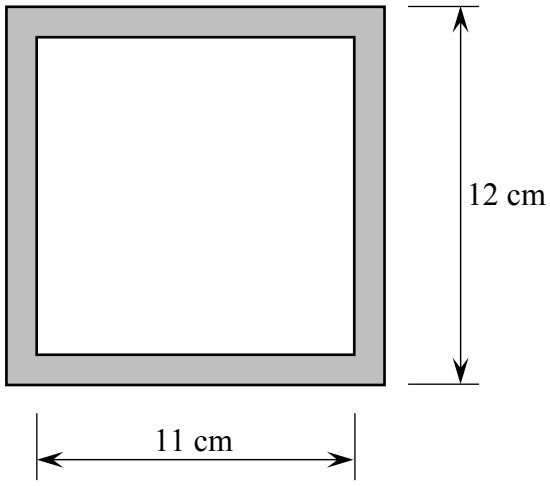
0·3, $\frac{3}{8}$, $\frac{5}{9}$, 60%, 0·12



Question 3 **(25 marks)**

(a) In the diagram, the inner square has side 11 cm and the outer square has side 12 cm.

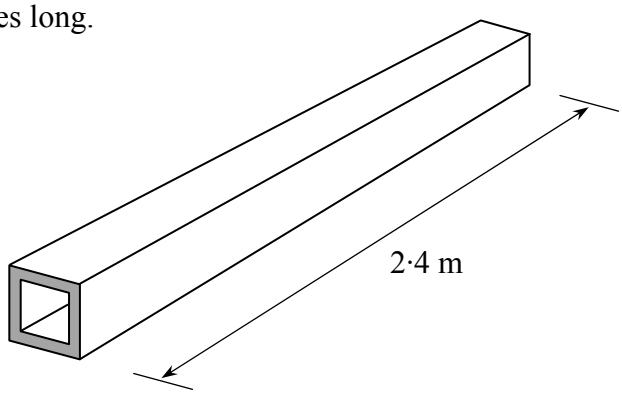
Find the area of the shaded region, which is the region between the two squares, in cm^2.



(b) The diagram shows a steel beam that is 2·4 metres long.

Its cross-section has the dimensions in part **(a)**.

Find the volume of steel in the beam, in cm^3.



(c) Each cm^3 of steel weighs 7·9 grams. How much does the steel beam weigh, in kilograms?

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Question 4 **(25 marks)**

(a) Solve the inequality $3x - 11 \leq 4$, for $x \in \mathbb{N}$.
List the elements of the solution set.

(b) Solve the simultaneous equations

$$a - 6b = 11$$
$$4a + 3b = 17$$

Question 5 **(25 marks)**

(a) Solve the equation $x^2 + 9x + 8 = 0$.

(b) Solve the equation $p^2 + 5p - 11 = 0$, giving your answers correct to two decimal places.

Question 6 **(25 marks)**

The graphs of two functions f and g are shown on the next page. The functions are:

$$f(x) = 8 + 3x - x^2$$
$$g(x) = 2x^2 - 5x - 2$$

Use the diagram to answer the questions below.
Show your work on the diagram.

(a) Find the value of $f(2{\cdot}6)$.

Answer: _____

(b) Find the maximum value of f.

Answer: _____

(c) Find the values of x for which $g(x) = 11$.

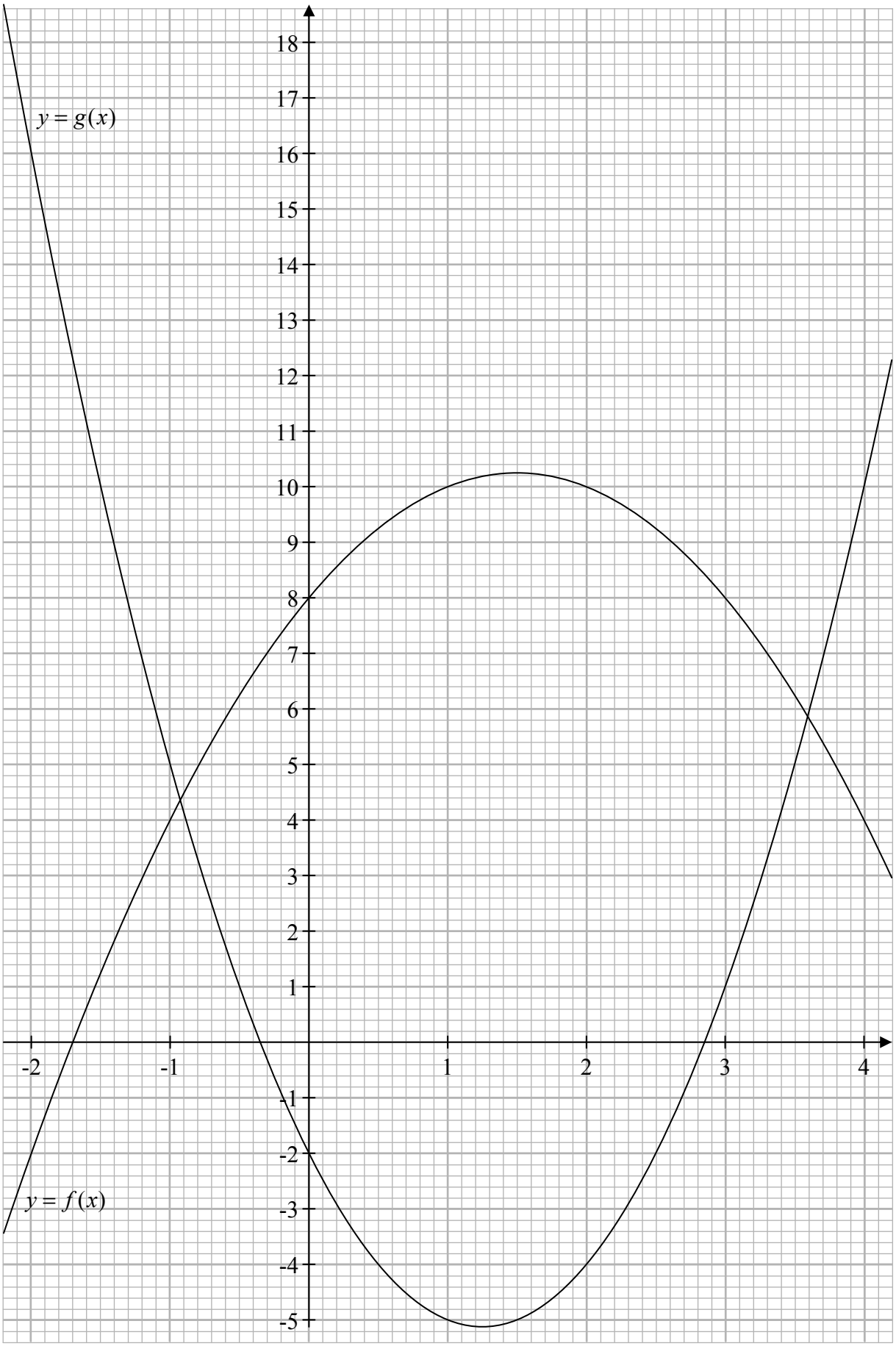
Answer: _____

(d) Find the range of values of x for which $g(x) \leq 0$.

Answer: _____

(e) Solve the equation $8 + 3x - x^2 = 2x^2 - 5x - 2$.

Answer: _____


y = g(x)
y = f(x)
18
17
16
15
14
13
12
11
10
9
8
7
6
5
4
3
2
1
-1
-2
-3
-4
-5
-2
-1
1
2
3
4

Section B	Contexts and Applications	150 marks

Answer **both** Question 7 **and** Question 8.

Question 7 **(75 marks)**

(a) Mary works in a shop. She has a time card for recording the hours she works every day, so that her pay for the week can be calculated. Her time card for one week is shown below. Some of the information is missing.

Time Card

Name: Mary McGowen **Department:** Floor **Work Number**: N523 **Week No:** 19

	Saturday	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday
Start	10:30	11:30	14:00	08:50	08:45	09:00	09:35
Finish	17:30	14:00	19:00	18:10	18:45	18:55	18:20
Lunch break	1hr	-	-	1hr	1hr	1hr	1hr
Daily Hrs	6·00	2·50		8·33		8·92	

SUMMARY

Total Sat/Sun hours		Total weekday hours (Monday to Friday)	

Weekday standard	37	hrs	Weekday overtime		hrs

(i) Calculate the number of hours Mary worked on Monday, Wednesday, and Friday, and insert these on the time card above.

(ii) Mary's standard working week is 37 hours. Complete the SUMMARY section of the time card to show the Saturday/Sunday hours, the total weekday hours, and the weekday overtime hours that Mary worked.

(iii) Mary is paid €9·80 per hour for standard weekday hours.
She is paid "time and a half" for weekday overtime.
She is paid "double time" for work on Saturdays and Sundays.
Calculate her gross pay for the week.

(iv) The following week, Mary had a gross pay of €680. The standard rate of income tax is 21% and the higher rate is 41%. Mary has weekly tax credits of €63 and a weekly standard-rate cut-off point of €630. Calculate the amount of tax Mary paid that week.

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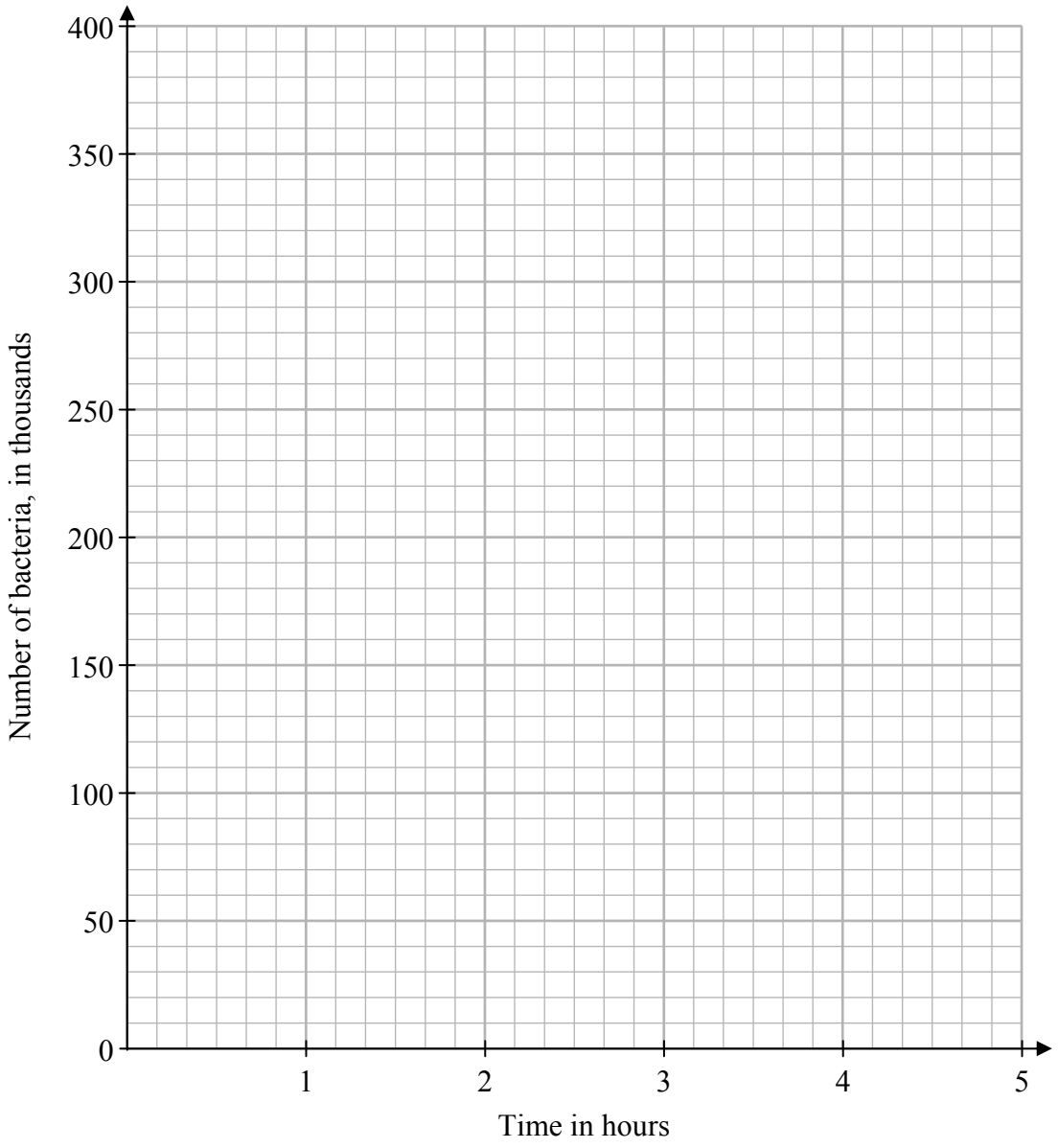
(b) A scientist is growing bacteria in a dish. The number of bacteria starts at 10 000 and doubles every hour.

(i) Complete the table below to show the number of bacteria over the next five hours.

Time in hours	0	1	2	3	4	5
Number of bacteria (in thousands)	10					

(ii) Draw a graph below to show the number of bacteria over the five hours.



(iii) Use your graph to estimate the number of bacteria in the dish after $2\frac{1}{2}$ hours.

Answer: _____

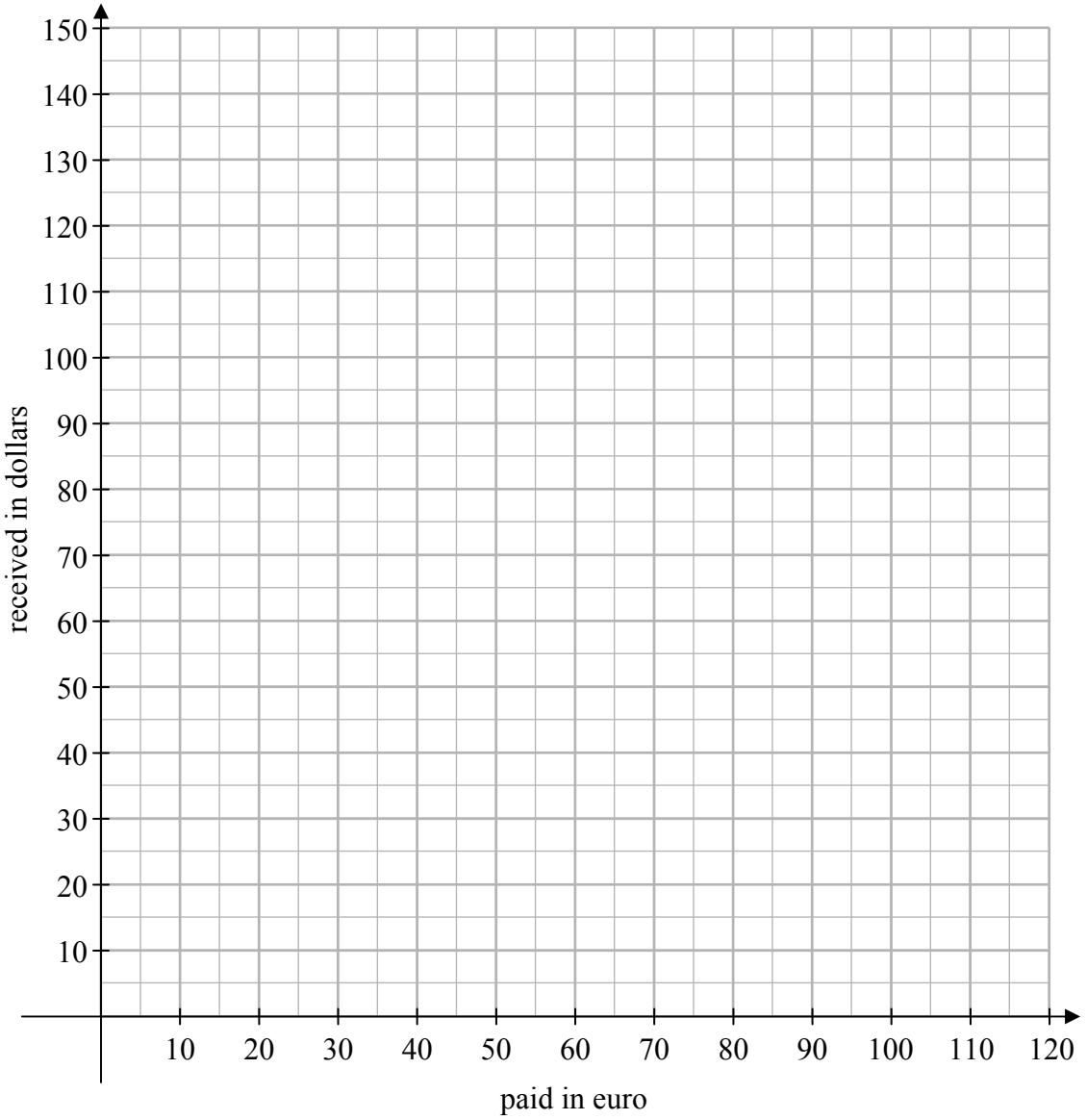
(iv) The scientist is growing the bacteria in order to do an experiment. She needs at least 250 000 bacteria in the dish to do the experiment. She started growing the bacteria at 10:00 in the morning. At what time is the dish of bacteria ready for the experiment?

Question 8 **(75 marks)**

Three friends were travelling to the USA together. They each went into the same bank on the same day to change some cash in euro into dollars. As well as applying an exchange rate, the bank charged a fee of a fixed amount. The total amounts that the friends paid and received were as follows:

- Deirdre paid 55 euro to get 65 US dollars
- Olga paid 85 euro to get 104 US dollars
- Frank paid 105 euro to get 130 US dollars.

(a) Use the information above to plot three points on the diagram below.



(b) On the diagram, draw a straight-line graph to show the amount you can get in dollars for any particular amount in euro (in that bank on that day).

(c) Use your graph to estimate how much you could get in dollars for €75.

Answer: _____

(d) Use your graph to estimate how much it would cost in euro to get 80 US dollars.

Answer: _____

(e) Find the slope of the graph and the point where it crosses the horizontal axis (the euro axis).

Slope = _____ Crosses axis at: (, 0)

(f) Use the pattern in the amounts the friends got, **or** the graph, to complete this sentence:

"For every extra €10 you spend, the amount you get in dollars goes _____

_____"

(g) Complete the following:

The exchange rate that the bank used that day was: 1 euro = _____ US dollars.

The fixed fee charged by the bank was € _____.

(h) Which of the three friends got the best value from the bank, in your opinion?
Give a reason for your answer.

(i) On the same day, another bank had the following exchange rate: 1 euro = 1·23 US dollars. This second bank did not charge any extra fixed fee.

Using tables **or** graphs **or** algebra **or** any other method, work out which of the friends, if any, would have been better off going to this second bank.

You may use this page for extra work.

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