UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
International General Certificate of Secondary Education

CANDIDATE NAME									
CENTRE NUMBER						CANDIDATE NUMBER			

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MATHEMATICS **0580/42**

Paper 4 (Extended) **October/November 2012**

2 hours 30 minutes

Candidates answer on the Question Paper.

Additional Materials: Electronic calculator
Mathematical tables (optional)
Geometrical instruments
Tracing paper (optional)

READ THESE INSTRUCTIONS FIRST

Write your Centre number, candidate number and name on all the work you hand in.
Write in dark blue or black pen.
You may use a pencil for any diagrams or graphs.
Do not use staples, paper clips, highlighters, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.
If working is needed for any question it must be shown below that question.
Electronic calculators should be used.
If the degree of accuracy is not specified in the question, and if the answer is not exact, give the answer to three significant figures. Give answers in degrees to one decimal place.
For π use either your calculator value or 3.142.

At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.
The total of the marks for this paper is 130.

This document consists of **20** printed pages.

For Examiner's Use

1 A factory produces bird food made with sunflower seed, millet and maize.

(a) The amounts of sunflower seed, millet and maize are in the ratio

sunflower seed : millet : maize = 5 : 3 : 1 .

(i) How much millet is there in 15 kg of bird food?

Answer(a)(i) ..... kg [2]

(ii) In a small bag of bird food there is 60 g of sunflower seed.

What is the mass of bird food in a small bag?

Answer(a)(ii) ..... g [2]

(b) Sunflower seeds cost \$204.50 for 30 kg from Jon's farm or €96.40 for 20 kg from Ann's farm.
The exchange rate is \$1 = €0.718.

Which farm has the cheapest price per kilogram?
You must show clearly all your working.

Answer(b) ..... [4]

For Examiner's Use

(c) Bags are filled with bird food at a rate of 420 grams per second.

How many 20 kg bags can be **completely** filled in 4 hours?

Answer(c) ..... [3]

(d) Brian buys bags of bird food from the factory and sells them in his shop for \$15.30 each. He makes 12.5% profit on each bag.

How much does Brian pay for each bag of bird food?

Answer(d) \$ ..... [3]

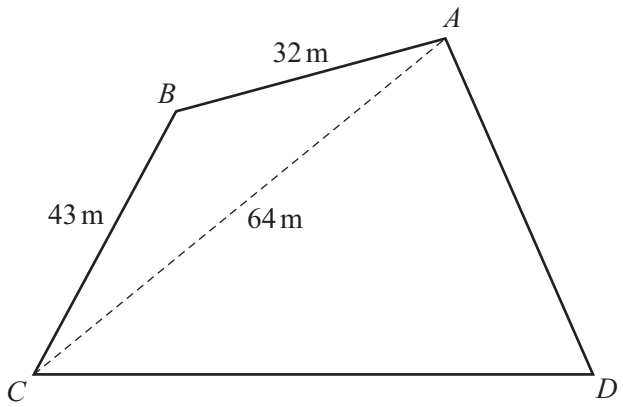
(e) Brian orders 600 bags of bird food.

The probability that a bag is damaged is $\frac{1}{50}$.

How many bags would Brian expect to be damaged?

Answer(e) ..... [1]

2



NOT TO SCALE

The diagram represents a field in the shape of a quadrilateral $ABCD$.
$AB = 32$ m, $BC = 43$ m and $AC = 64$ m.

(a) (i) Show clearly that angle $CAB = 37.0°$ correct to one decimal place.

Answer(a)(i)

[4]

(ii) Calculate the area of the triangle ABC.

Answer(a)(ii) ..... m^2 [2]

(b) $CD = 70$ m and angle $DAC = 55°$.

Calculate the perimeter of the whole field $ABCD$.

Answer(b) ..... m [6]

For Examiner's Use

3 **(a)** **(i)** Factorise completely the expression $4x^2 - 18x - 10$.

Answer(a)(i) ..... [3]

(ii) Solve $4x^2 - 18x - 10 = 0$.

Answer(a)(ii) $x =$ ..... or $x =$ ..... [1]

(b) Solve the equation $2x^2 - 7x - 10 = 0$.

Show all your working and give your answers correct to two decimal places.

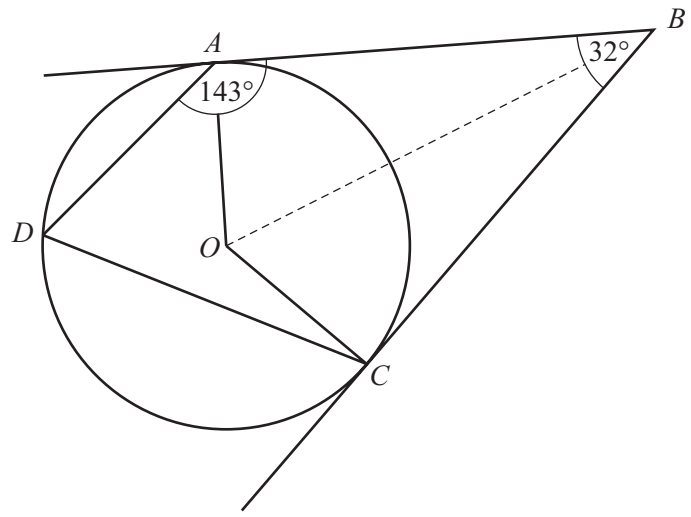
Answer(b) $x =$ ..... or $x =$ ..... [4]

(c) Write $\frac{6}{3x-1} - \frac{2}{x-2}$ as a single fraction in its simplest form.

Answer(c) ..... [3]

For Examiner's Use

4 (a)



NOT TO SCALE

Points A, C and D lie on a circle centre O.
BA and BC are tangents to the circle.
Angle $ABC = 32°$ and angle $DAB = 143°$.

(i) Calculate angle AOC in quadrilateral $AOCB$.

Answer(a)(i) Angle AOC = ... [2]

(ii) Calculate angle ADC.

Answer(a)(ii) Angle ADC = ... [1]

(iii) Calculate angle OCD.

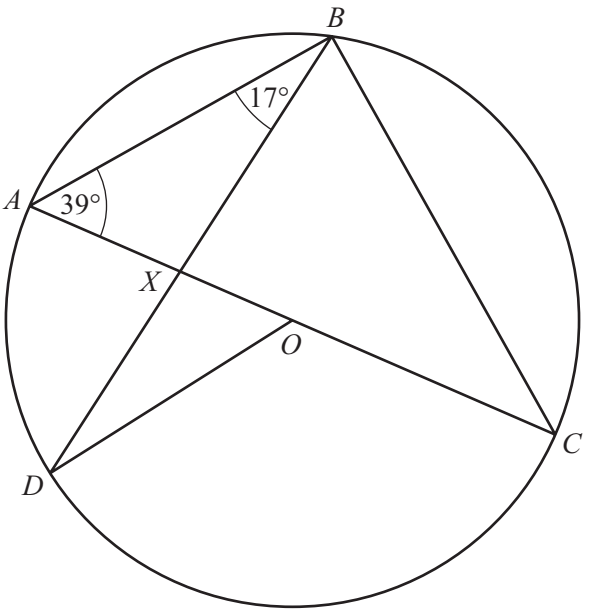
Answer(a)(iii) Angle OCD = ... [2]

(iv) $OA = 6$ cm.

Calculate the length of AB.

Answer(a)(iv) AB = ... cm [3]

(b)



NOT TO SCALE

A, *B*, *C* and *D* are on the circumference of the circle centre *O*.
AC is a diameter.
Angle *CAB* = 39° and angle *ABD* = 17°.

(i) Calculate angle *ACB*.

Answer(b)(i) Angle *ACB* = ... [2]

(ii) Calculate angle *BXC*.

Answer(b)(ii) Angle *BXC* = ... [2]

(iii) Give the reason why angle *DOA* is 34°.

Answer(b)(iii) ..... [1]

(iv) Calculate angle *BDO*.

Answer(b)(iv) Angle *BDO* = ... [1]

(v) The radius of the circle is 12 cm. Calculate the length of major arc *ABCD*.

Answer(b)(v) Arc *ABCD* = ... cm [3]

For Examiner's Use

For Examiner's Use

5 **(a)** A farmer takes a sample of 158 potatoes from his crop. He records the mass of each potato and the results are shown in the table.

Mass (m grams)	Frequency
$0 < m \leqslant 40$	6
$40 < m \leqslant 80$	10
$80 < m \leqslant 120$	28
$120 < m \leqslant 160$	76
$160 < m \leqslant 200$	22
$200 < m \leqslant 240$	16

Calculate an estimate of the mean mass.
Show all your working.

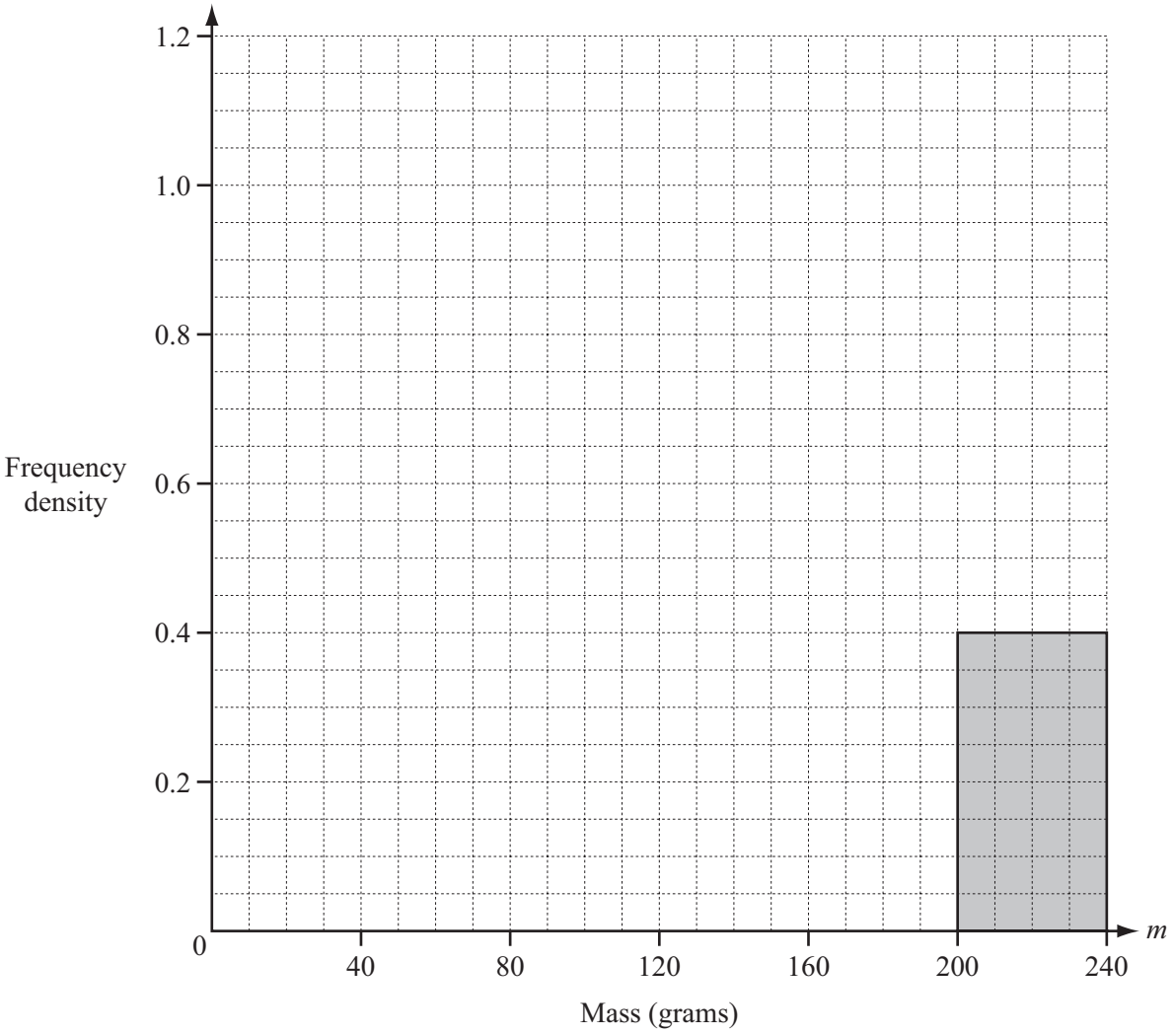
Answer(a) ..... g [4]

(b) A new frequency table is made from the results shown in the table in **part (a)**.

Mass (m grams)	Frequency
$0 < m \leqslant 80$	
$80 < m \leqslant 200$	
$200 < m \leqslant 240$	16

(i) Complete the table above. [2]

(ii) On the grid opposite, complete the histogram to show the information in this new table.



[3]

For Examiner's Use

(c) A bag contains 15 potatoes which have a mean mass of 136 g.
The farmer puts 3 potatoes which have a mean mass of 130 g into the bag.

Calculate the mean mass of all the potatoes in the bag.

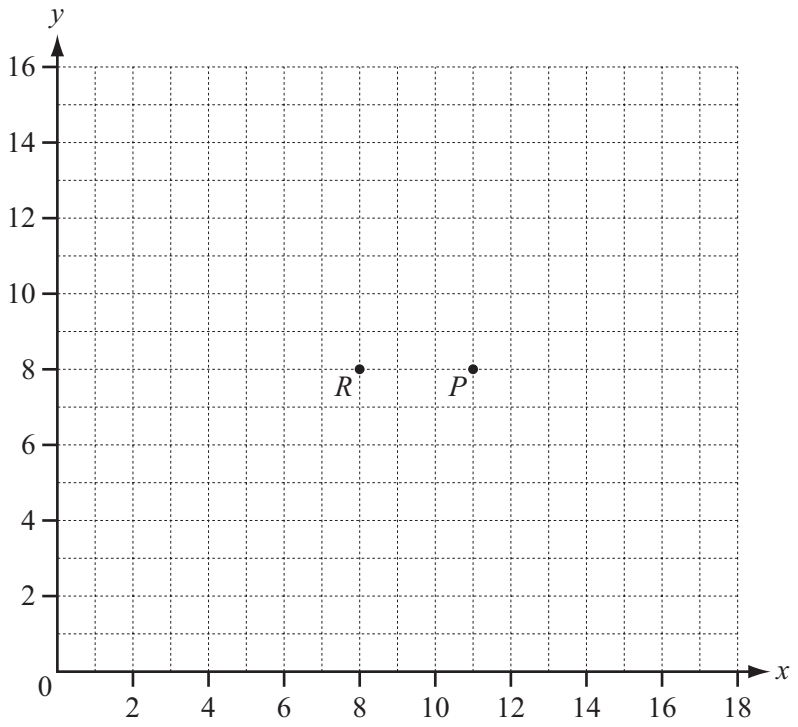
Answer(c) ..... g [3]

For Examiner's Use

6 **(a)** Calculate the magnitude of the vector $\begin{pmatrix} 3 \\ -5 \end{pmatrix}$.

Answer(a) ..... [2]

(b)



(i) The points P and R are marked on the grid above.

$\overrightarrow{PQ} = \begin{pmatrix} 3 \\ -5 \end{pmatrix}$. Draw the vector $\overrightarrow{PQ}$ on the grid above. [1]

(ii) Draw the image of vector $\overrightarrow{PQ}$ after rotation by 90° anticlockwise about R. [2]

(c) $\overrightarrow{DE} = 2\mathbf{a} + \mathbf{b}$ and $\overrightarrow{DC} = 3\mathbf{b} - \mathbf{a}$.

Find $\overrightarrow{CE}$ in terms of **a** and **b**. Write your answer in its simplest form.

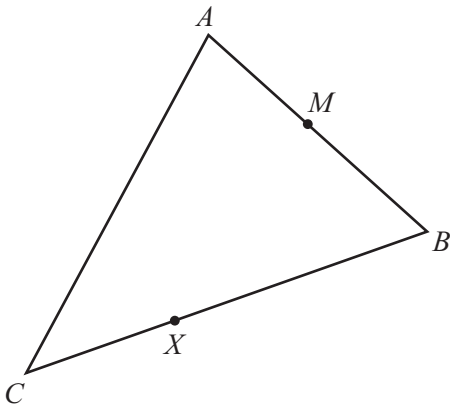
Answer(c) $\overrightarrow{CE} =$ ..... [2]

(d) $\overrightarrow{OT} = \begin{pmatrix} -2 \\ 5 \end{pmatrix}$ and $\overrightarrow{OV} = \begin{pmatrix} 5 \\ -1 \end{pmatrix}$.

Write $\overrightarrow{TV}$ as a column vector.

Answer(d) $\overrightarrow{TV} =$ $\begin{pmatrix} \\ \\ \end{pmatrix}$ [2]

(e)



NOT TO SCALE

$\overrightarrow{AB} = \mathbf{b}$ and $\overrightarrow{AC} = \mathbf{c}$.

(i) Find $\overrightarrow{CB}$ in terms of **b** and **c**.

Answer(e)(i) $\overrightarrow{CB} =$ ..... [1]

(ii) X divides CB in the ratio $1 : 3$.
M is the midpoint of AB.

Find $\overrightarrow{MX}$ in terms of **b** and **c**.
Show all your working and write your answer in its simplest form.

Answer(e)(ii) $\overrightarrow{MX} =$ ..... [4]

[Turn over

For Examiner's Use

7 Jay makes wooden boxes in two sizes. He makes x small boxes and y large boxes.
He makes at least 5 **small** boxes.
The greatest number of **large** boxes he can make is 8.
The greatest total number of boxes is 14.
The number of **large** boxes is at least half the number of **small** boxes.

(a) (i) Write down four inequalities in x and y to show this information.

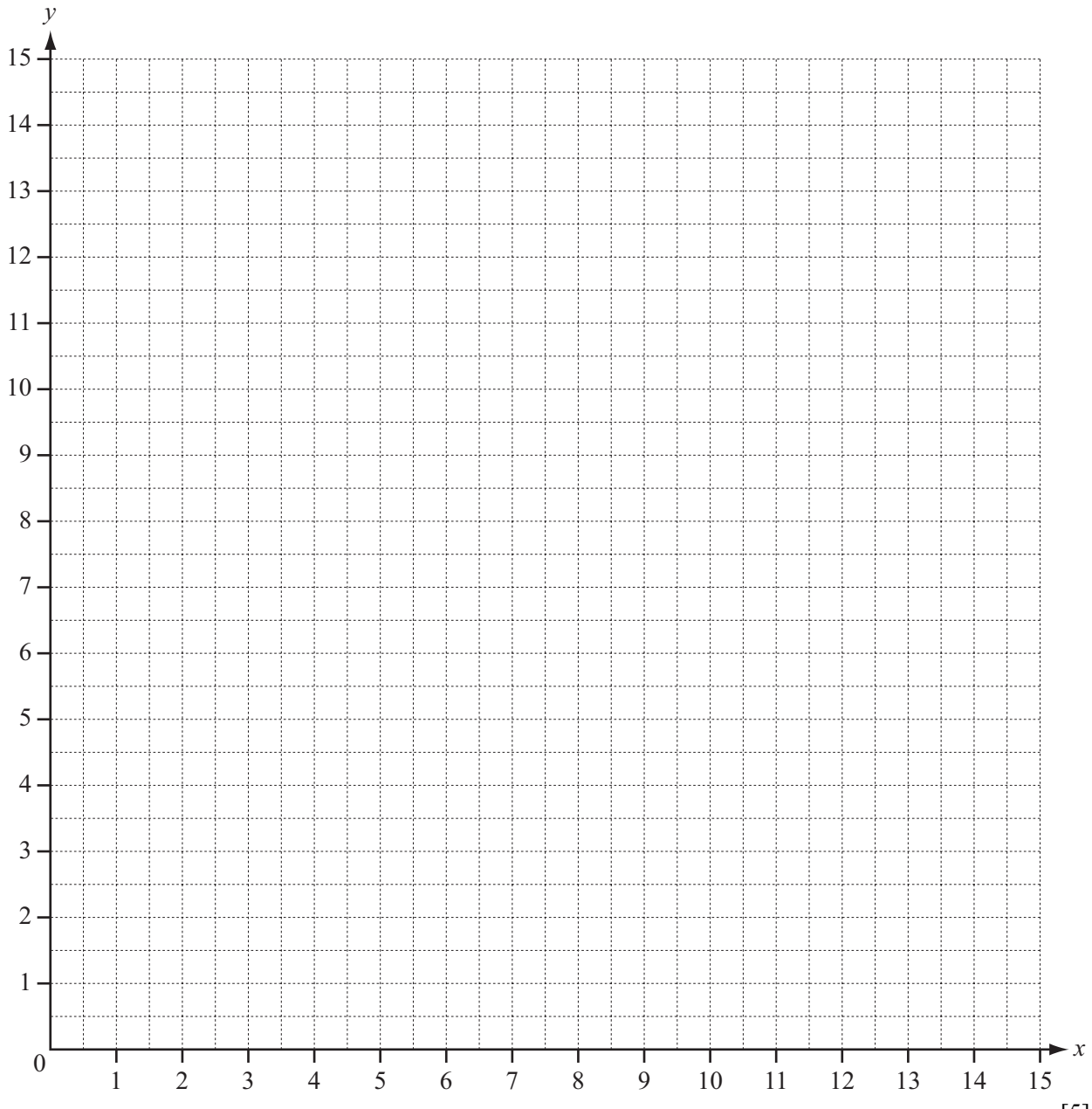
Answer(a)(i) .....

.....

.....

..... [4]

(ii) Draw four lines on the grid and write the letter R in the region which represents these inequalities.



[5]

For Examiner's Use

(b) The price of the small box is \$20 and the price of the large box is \$45.

(i) What is the greatest amount of money he receives when he sells all the boxes he has made?

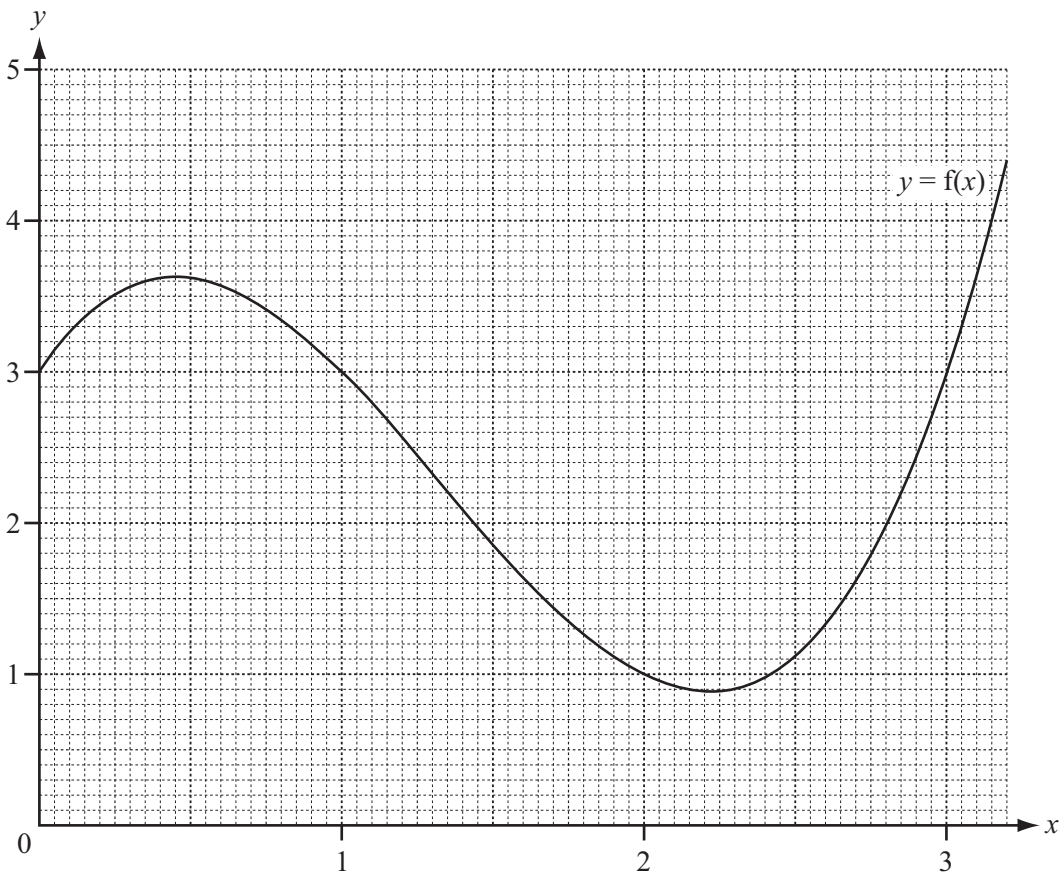
Answer(b)(i) \$ ..... [2]

(ii) For this amount of money, how many boxes of each size did he make?

Answer(b)(ii) ..... small boxes and ..... large boxes [1]

8 The graph of $y = f(x)$ is drawn on the grid for $0 \leqslant x \leqslant 3.2$.

For Examiner's Use



(a) (i) Draw the tangent to the curve $y = f(x)$ at $x = 2.5$. [1]

(ii) Use your tangent to estimate the gradient of the curve at $x = 2.5$.

Answer(a)(ii) ..... [2]

(b) Use the graph to solve $f(x) = 2$, for $0 \leqslant x \leqslant 3.2$.

Answer(b) $x =$ ..... or $x =$ ..... [2]

For Examiner's Use

(c) $g(x) = \frac{x}{2} + \frac{2}{x^2} \quad x \neq 0$.

(i) Complete the table for values of g(x), correct to 1 decimal place.

x	0.7	1	1.5	2	2.5	3
g(x)			1.6		1.6	1.7

[2]

(ii) On the grid opposite, draw the graph of $y = g(x)$ for $0.7 \leqslant x \leqslant 3$. [3]

(iii) Solve $f(x) = g(x)$ for $0.7 \leqslant x \leqslant 3$.

Answer(c) (iii) $x =$ ..... or $x =$ ..... or $x =$ ..... [3]

For Examiner's Use

9 **(a)** $\mathscr{E}$ = {25 students in a class}

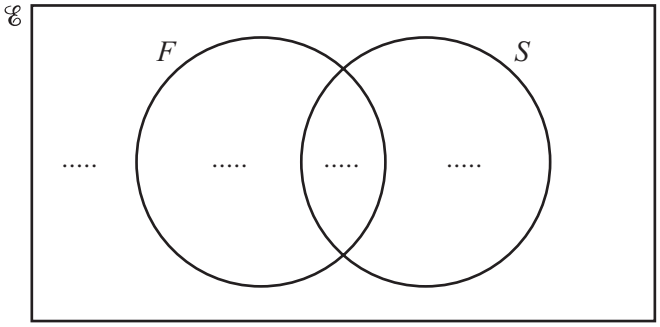
F = {students who study French}

S = {students who study Spanish}

16 students study French and 18 students study Spanish.

2 students study neither of these.

(i) Complete the Venn diagram to show this information.



[2]

(ii) Find n(F').

Answer(a)(ii) ..... [1]

(iii) Find n($F \cap S$)$'$.

Answer(a)(iii) ..... [1]

(iv) One student is chosen at random.

Find the probability that this student studies both French and Spanish.

Answer(a)(iv) ..... [1]

(v) Two students are chosen at random without replacement.

Find the probability that they both study only Spanish.

Answer(a)(v) ..... [2]

For Examiner's Use

(b) In another class the students all study at least one language from French, German and Spanish.

No student studies all three languages.

The set of students who study German is a proper subset of the set of students who study French.

4 students study both French and German.

12 students study Spanish but not French.

9 students study French but not Spanish.

A total of 16 students study French.

(i) Draw a Venn diagram to represent this information.

[4]

(ii) Find the total number of students in this class.

Answer(b)(ii) ..... [1]

For Examiner's Use

10 Consecutive integers are set out in rows in a grid.

(a) This grid has 5 columns.

1	2	3	4	5
6	7	8	9	10
11	12	13	14	15
16	17	18	19	20
21	22	23	24	25
26	27	28	29	30
31	32	33	34	35

a		*b*
	n	
c		*d*

The shape drawn encloses five numbers 7, 9, 13, 17 and 19. This is the $n = 13$ shape.

In this shape, $a = 7$, $b = 9$, $c = 17$ and $d = 19$.

(i) Calculate $bc - ad$ for the $n = 13$ shape.

Answer(a)(i) ..... [1]

(ii) For the 5 column grid, $a = n - 6$.

Write down b, c and d in terms of n for this grid.

Answer(a)(ii) $b =$ .....

$c =$ .....

$d =$ ..... [2]

(iii) Write down $bc - ad$ in terms of n.
Show clearly that it simplifies to 20.

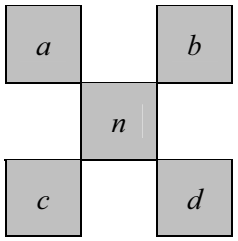
Answer(a)(iii)

[2]

For Examiner's Use

(b) This grid has 6 columns. The shape is drawn for $n = 10$.

1	2	3	4	5	6
7	8	9	10	11	12
13	14	15	16	17	18
19	20	21	22	23	24
25	26	27	28	29	30
31	32	33	34	35	36



(i) Calculate the value of $bc - ad$ for $n = 10$.

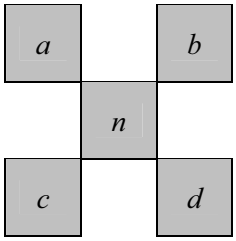
Answer(b)(i) ..... [1]

(ii) Without simplifying, write down $bc - ad$ in terms of n for this grid.

Answer(b)(ii) ..... [2]

(c) This grid has 7 columns.

1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30	31	32	33	34	35



Show clearly that $bc - ad = 28$ for $n = 17$.

Answer(c)

[1]

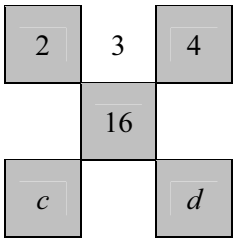
Question 10 continues on the next page.

(d) Write down the value of $bc - ad$ when there are t columns in the grid.

Answer(d) ..... [1]

For Examiner's Use

(e) Find the values of c, d and $bc - ad$ for this shape.



Answer (e) $c =$ .....

$d =$ .....

$bc - ad =$ ..... [2]