UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
International General Certificate of Secondary Education

CANDIDATE NAME

CENTRE NUMBER | | | | | |

CANDIDATE NUMBER | | | | |



**MATHEMATICS** **0580/41**

Paper 4 (Extended) **May/June 2011**

**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 $\pi$ 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 **16** printed pages.

*For Examiner's Use*

**1** A school has a sponsored swim in summer and a sponsored walk in winter.
In 2010, the school raised a total of \$1380.
The ratio of the money raised in summer : winter = 62 : 53.

**(a) (i)** Show clearly that \$744 was raised by the swim in **summer**.

*Answer (a)*(i)

[1]

**(ii)** Alesha's swim raised \$54.10. Write this as a percentage of \$744.

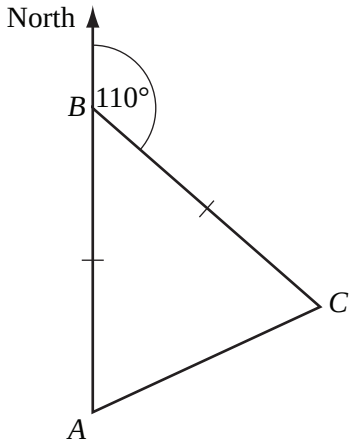
*Answer(a)*(ii) ..... %[1]

**(iii)** Bryan's swim raised \$31.50.
He received 75 cents for each length of the pool which he swam.

Calculate the number of lengths Bryan swam.

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

**(b)** The route for the **sponsored walk in winter** is triangular.



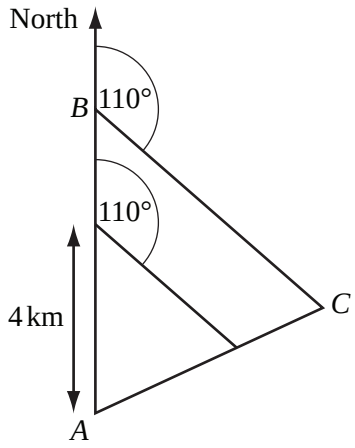

NOT TO SCALE

**(i)** Senior students start at *A*, walk North to *B*, then walk on a bearing 110° to *C*.
They then return to *A*.
*AB* = *BC*.

Calculate the bearing of *A* from *C*.

*Answer(b)*(i) ..... [3]

**(ii)**




NOT TO SCALE

$AB = BC = 6$ km.
Junior students follow a **similar** path but they only walk 4 km North from $A$, then 4 km on a bearing 110° before returning to $A$.

Senior students walk a total of 18.9 km.

Calculate the distance walked by junior students.

*Answer(b)*(ii) ..... km [3]

**(c)** The total amount, \$1380, raised in 2010 was 8% **less** than the total amount raised in 2009.

Calculate the total amount raised in 2009.

*Answer(c)* \$ ..... [3]





**[Turn over**

*For Examiner's Use*

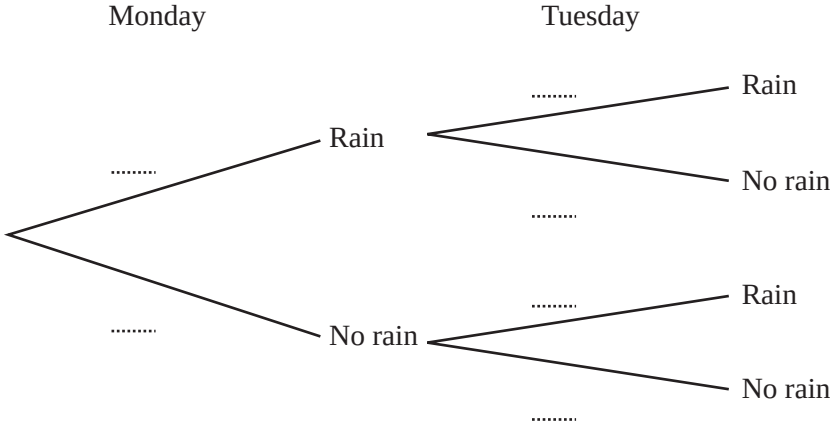
**2 In this question give all your answers as fractions.**

The probability that it rains on Monday is $\frac{3}{5}$.

If it rains on Monday, the probability that it rains on Tuesday is $\frac{4}{7}$.

If it does not rain on Monday, the probability that it rains on Tuesday is $\frac{5}{7}$.

**(a)** Complete the tree diagram.




[3]

**(b)** Find the probability that it rains

**(i)** on **both** days,

*Answer(b)*(i) ..... [2]

**(ii)** on Monday but not on Tuesday,

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

**(iii)** on **only one** of the two days.

*Answer(b)*(iii) ..... [2]

**(c)** If it does **not** rain on Monday and it does **not** rain on Tuesday, the probability that it does **not** rain on Wednesday is $\frac{1}{4}$.

Calculate the probability that it rains on **at least one** of the three days.

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

*For Examiner's Use*

**3** **(a)** $p$ varies **inversely** as $(m + 1)$.

When $p = 4$, $m = 8$.

Find the value of $p$ when $m = 11$.

*Answer(a)* $p =$ ..... [3]

**(b)** **(i)** Factorise $x^2 - 25$.

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

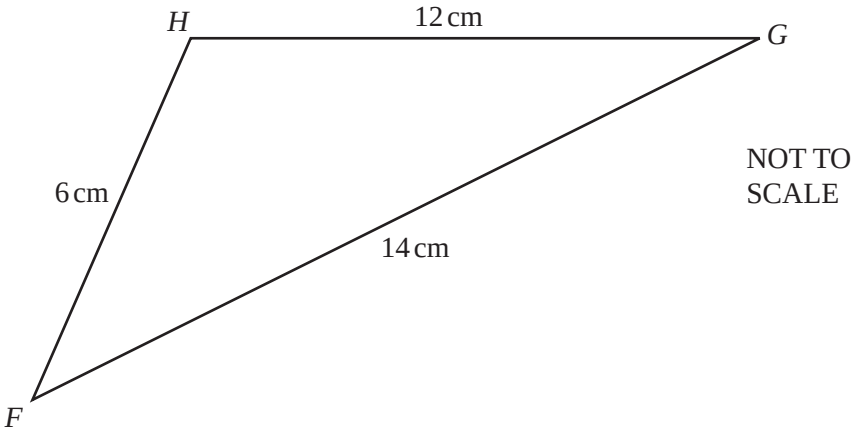
**(ii)** Simplify $\dfrac{2x^2 + 11x + 5}{x^2 \quad 25}$.

*Answer(b)*(ii) ..... [3]

**(c)** Solve the inequality $5(x - 4) < 3(12 - x)$.

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

**4 (a)**




The diagram shows triangle $FGH$, with $FG = 14$ cm, $GH = 12$ cm and $FH = 6$ cm.

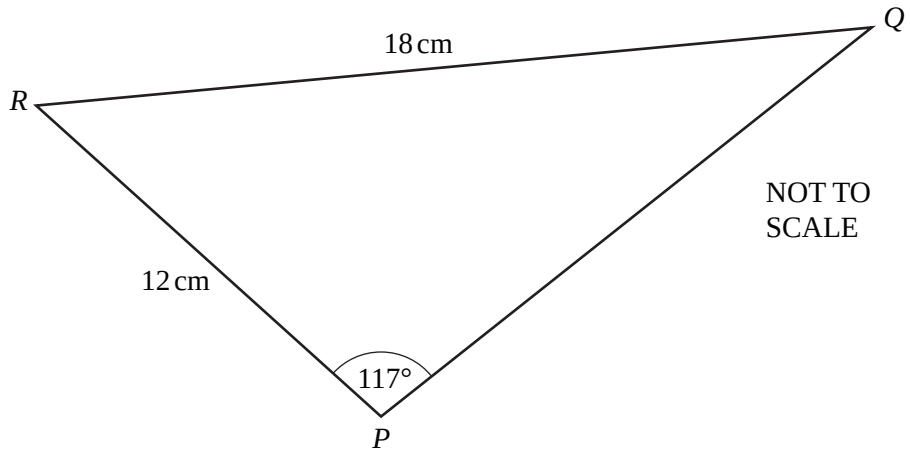
**(i)** Calculate the size of angle $HFG$.

*Answer(a)*(i) Angle $HFG$ = ..... [4]

**(ii)** Calculate the area of triangle $FGH$.

*Answer(a)*(ii) ..... $cm^2$ [2]

**(b)**




The diagram shows triangle $PQR$, with $RP = 12$ cm, $RQ = 18$ cm and angle $RPQ = 117°$.

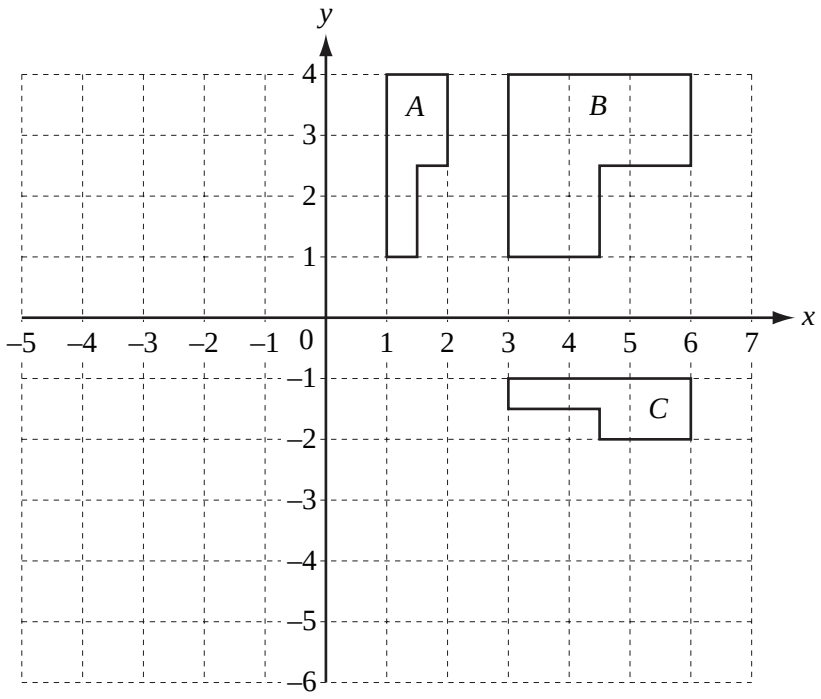
Calculate the size of angle $RQP$.

*Answer(b)* Angle $RQP$ = ..... [3]

*For Examiner's Use*

**5**






**(a)** On the grid above, draw the image of

**(i)** shape $A$ after translation by the vector $\begin{pmatrix} 3 \\ 2 \end{pmatrix}$, [2]

**(ii)** shape $A$ after reflection in the line $x = 1$. [2]

**(b)** Describe fully the **single** transformation which maps

**(i)** shape $A$ onto shape $B$,

*Answer(b)*(i) ..... [3]

**(ii)** shape $A$ onto shape $C$.

*Answer(b)*(ii) ..... [3]

**(c)** Find the matrix representing the transformation which maps shape $A$ onto shape $B$.

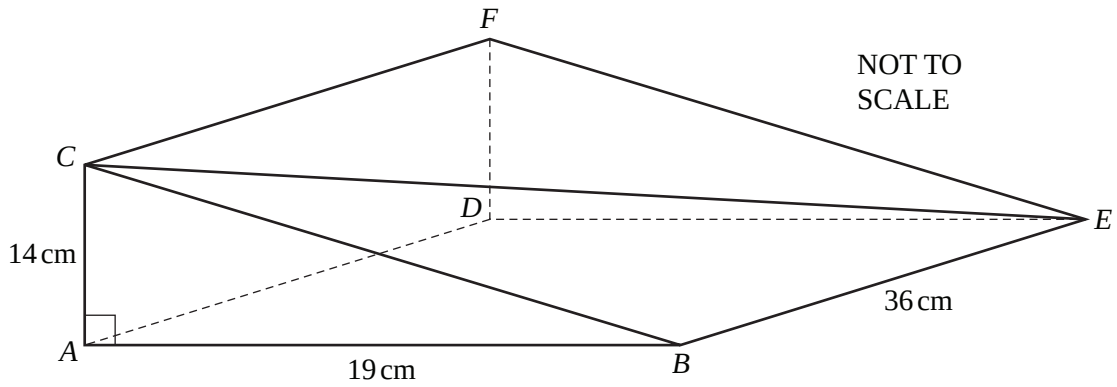
*Answer(c)* $\begin{pmatrix} & \\ & \end{pmatrix}$ [2]

**(d)** Describe fully the **single** transformation represented by the matrix $\begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix}$.

*Answer(d)* ..... [3]

**6**






In the diagram, *ABCDEF* is a prism of length 36 cm.
The cross-section *ABC* is a right-angled triangle.
*AB* = 19 cm and *AC* = 14 cm.

Calculate

**(a)** the length *BC*,

*Answer(a) BC =* ..... cm [2]

**(b)** the total surface area of the prism,

*Answer(b)* ..... $cm^2$ [4]

**(c)** the volume of the prism,

*Answer(c)* ..... $cm^3$ [2]

**(d)** the length *CE*,

*Answer(d) CE =* ..... cm [2]

**(e)** the angle between the line *CE* and the base *ABED*.

*Answer(e)* ..... [3]





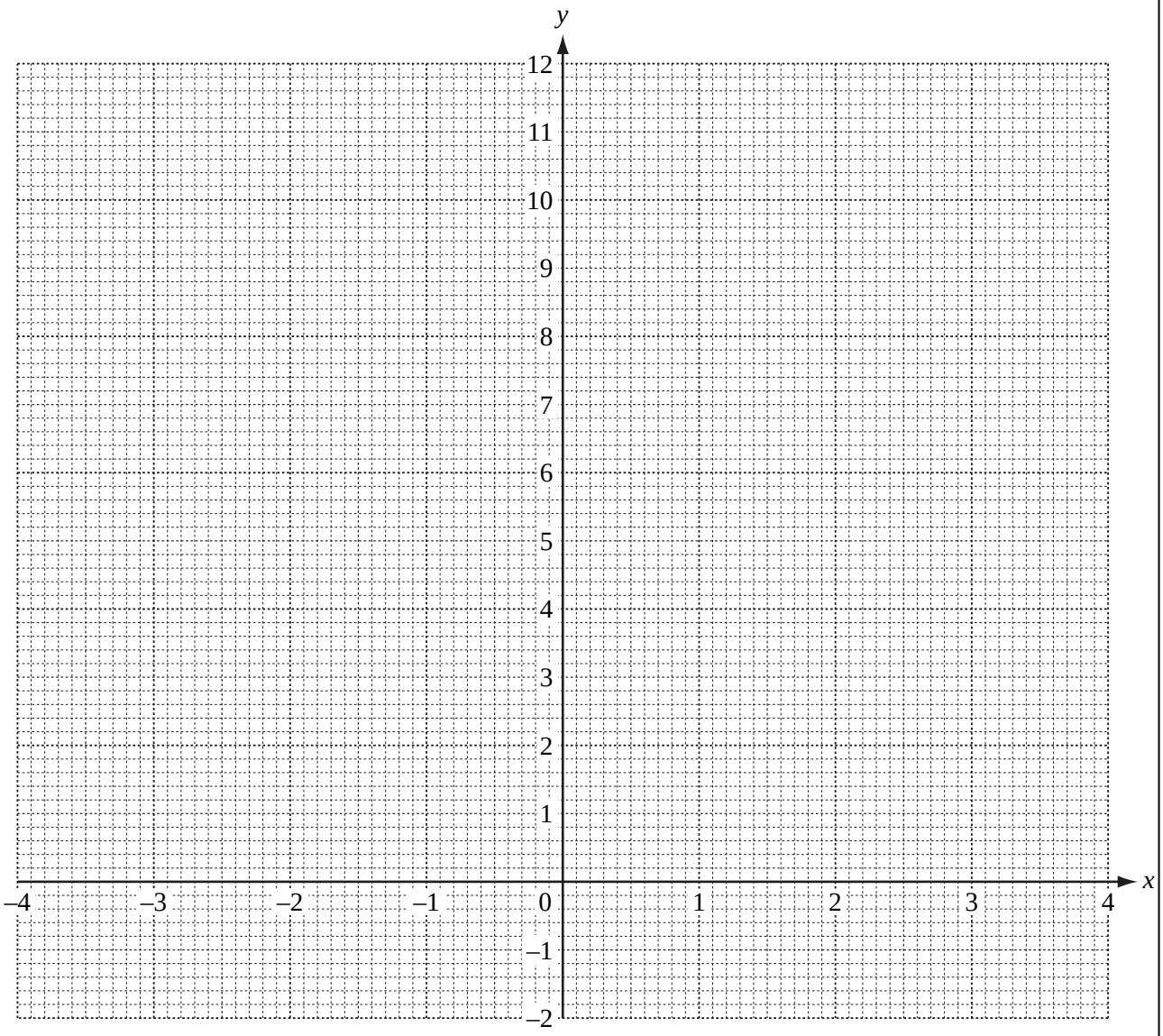
**[Turn over**

**7** **(a)** Complete the table of values for the equation $y = \frac{4}{x^2}$, $x \neq 0$.

| $x$ | $-4$ | $-3$ | $-2$ | $-1$ | $-0.6$ | | $0.6$ | $1$ | $2$ | $3$ | $4$ |
|---|---|---|---|---|---|---|---|---|---|---|---|
| $y$ | 0.25 | 0.44 | | | 11.11 | | | 4.00 | | 0.44 | |

[3]

**(b)** On the grid, draw the graph of $y = \frac{4}{x^2}$ for $-4 \leqslant x \leqslant -0.6$ and $0.6 \leqslant x \leqslant 4$.




[5]

**(c)** Use your graph to solve the equation $\frac{4}{x^2} = 6$ .

*Answer(c)*$x$ = ..... or $x$ = ..... [2]

**(d)** By drawing a suitable tangent, estimate the gradient of the graph where $x = 1.5$.

*Answer(d)* ..... [3]

**(e) (i)** The equation $\frac{4}{x^2} - x + 2 = 0$ can be solved by finding the intersection of the graph of $y = \frac{4}{x^2}$ and a straight line.

Write down the equation of this straight line.

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

**(ii)** On the grid, draw the straight line from your answer to **part (e)(i)**. [2]

**(iii)** Use your graphs to solve the equation $\frac{4}{x^2} - x + 2 = 0$.

*Answer(e)*(iii) $x$ = ..... [1]





**[Turn over**

*For Examiner's Use*

**8** The table below shows the marks scored by a group of students in a test.

| Mark | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 |
|---|---|---|---|---|---|---|---|---|
| Frequency | 10 | 8 | 16 | 11 | 7 | 8 | 6 | 9 |

**(a)** Find the mean, median and mode.

*Answer(a)* mean = .....

median = .....

mode = ..... [6]

**(b)** The table below shows the time ($t$ minutes) taken by the students to complete the test.

| Time ($t$) | $0 < t \leqslant 10$ | $10 < t \leqslant 20$ | $20 < t \leqslant 30$ | $30 < t \leqslant 40$ | $40 < t \leqslant 50$ | $50 < t \leqslant 60$ |
|---|---|---|---|---|---|---|
| Frequency | 2 | 19 | 16 | 14 | 15 | 9 |

**(i)** Cara rearranges this information into a new table.

Complete her table.

| Time ($t$) | $0 < t \leqslant 20$ | $20 < t \leqslant 40$ | $40 < t \leqslant 50$ | $50 < t \leqslant 60$ |
|---|---|---|---|---|
| Frequency | | | | 9 |

[2]

**(ii)** Cara wants to draw a histogram to show the information in **part (b)(i)**.

Complete the table below to show the interval widths and the frequency densities.

| | $0 < t \leqslant 20$ | $20 < t \leqslant 40$ | $40 < t \leqslant 50$ | $50 < t \leqslant 60$ |
|---|---|---|---|---|
| Interval width | | | | 10 |
| Frequency density | | | | 0.9 |

[3]

*For Examiner's Use*

**(c)** **Some** of the students were asked how much time they spent revising for the test.

10 students revised for 2.5 hours, 12 students revised for 3 hours and $n$ students revised for 4 hours.

The mean time that **these** students spent revising was 3.1 hours.

Find $n$.

**Show all your working**.

*Answer(c)* $n =$ ..... [4]

*For Examiner's Use*

**9** Peter wants to plant $x$ plum trees and $y$ apple trees.

He wants at least 3 plum trees and at least 2 apple trees.

**(a)** Write down one inequality in $x$ and one inequality in $y$ to represent these conditions.

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

**(b)** There is space on his land for no more than 9 trees.

Write down an inequality in $x$ and $y$ to represent this condition.

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

**(c)** Plum trees cost \$6 and apple trees cost \$14.

Peter wants to spend no more than \$84.

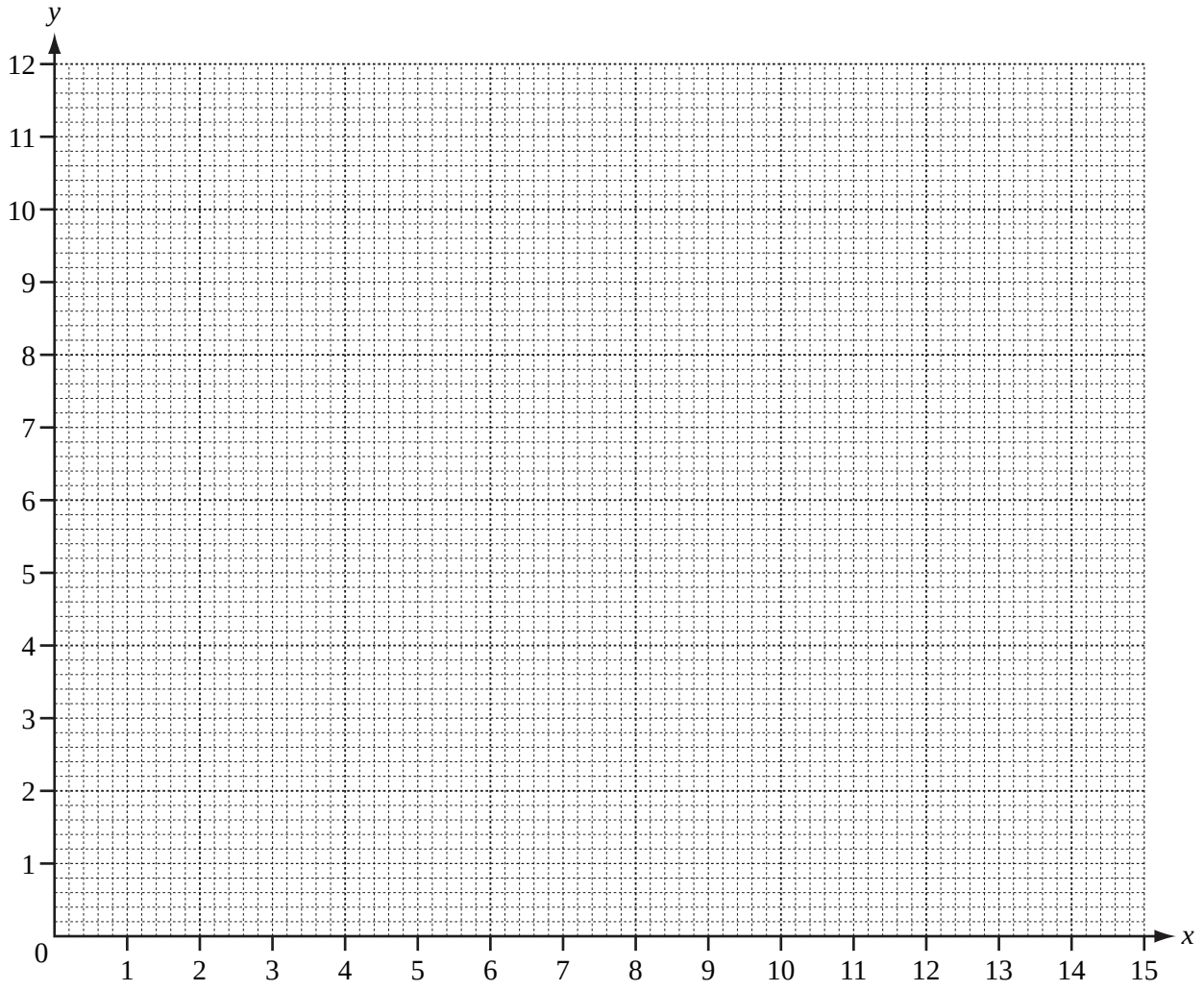
Write down an inequality in $x$ and $y$, and show that it simplifies to $3x + 7y \leqslant 42$.

*Answer(c)*

[1]

**(d)** On the grid, draw four lines to show the four inequalities and shade the **unwanted** regions.

*For Examiner's Use*




[7]

**(e)** Calculate the smallest cost when Peter buys a total of 9 trees.

*Answer(e)* $ ..... [2]

**Question 10 is printed on the next page.**

*For Examiner's Use*

**10** The first and the $n$th terms of sequences $A$, $B$ and $C$ are shown in the table below.

**(a)** Complete the table for each sequence.

| | 1st term | 2nd term | 3rd term | 4th term | 5th term | $n$th term |
|---|---|---|---|---|---|---|
| Sequence $A$ | 1 | | | | | $n^3$ |
| Sequence $B$ | 4 | | | | | $4n$ |
| Sequence $C$ | 4 | | | | | $(n + 1)^2$ |

[5]

**(b)** Find

**(i)** the 8th term of sequence $A$,

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

**(ii)** the 12th term of sequence $C$.

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

**(c)** **(i)** Which term in sequence $A$ is equal to 15 625?

*Answer(c)*(i) ..... [1]

**(ii)** Which term in sequence $C$ is equal to 10 000?

*Answer(c)*(ii) ..... [1]

**(d)** The first four terms of sequences $D$ and $E$ are shown in the table below.

Use the results from **part (a)** to find the 5th and the $n$th terms of the sequences $D$ and $E$.

| | 1st term | 2nd term | 3rd term | 4th term | 5th term | $n$th term |
|---|---|---|---|---|---|---|
| Sequence $D$ | 5 | 16 | 39 | 80 | | |
| Sequence $E$ | 0 | 1 | 4 | 9 | | |

[4]