Cambridge IGCSE™

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

MATHEMATICS **0580/43**

Paper 4 (Extended) **October/November 2022**

2 hours 30 minutes

You must answer on the question paper.

You will need: Geometrical instruments

INSTRUCTIONS
- Answer **all** questions.
- Use a black or dark blue pen. You may use an HB pencil for any diagrams or graphs.
- Write your name, centre number and candidate number in the boxes at the top of the page.
- Write your answer to each question in the space provided.
- Do **not** use an erasable pen or correction fluid.
- Do **not** write on any bar codes.
- You should use a calculator where appropriate.
- You may use tracing paper.
- You must show all necessary working clearly.
- Give non-exact numerical answers correct to 3 significant figures, or 1 decimal place for angles in degrees, unless a different level of accuracy is specified in the question.
- For π, use either your calculator value or 3.142.

INFORMATION
- The total mark for this paper is 130.
- The number of marks for each question or part question is shown in brackets [ ].

This document has **20** pages. Any blank pages are indicated.

[Turn over

1   (a) Here are the ingredients needed to make a pasta bake to serve 12 people.

> 250 g butter
>
> 600 g pasta
>
> 460 g mushrooms
>
> 280 g cheese
>
> 800 ml milk

(i) Find the mass of the cheese as a percentage of the mass of the mushrooms.

.... % [1]

(ii) Find the mass of butter needed to make a pasta bake to serve 18 people.

.... g [2]

(iii) Monica has 2.2 litres of milk and 1.5 kg of each other ingredient.

Calculate the greatest number of people she can serve with pasta bake.

.... [3]

(b) In 2019, a packet of pasta cost \$2.40.
This was an increase of 25% of the cost of a packet in 2018.

   (i) Work out the cost in 2018.
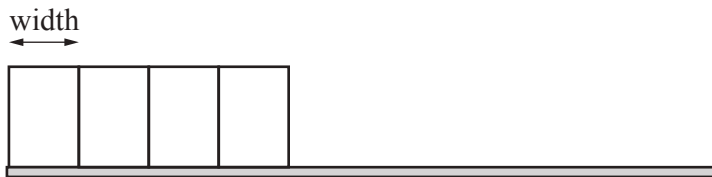
\$ .... [2]

   (ii) In 2020, the cost of a packet increased by 15% from the cost in 2019.

     Work out the total percentage increase in the cost of a packet from 2018 to 2020.

....% [3]

(c)

width

NOT TO SCALE

Pasta is sold in packets with width 11.5 cm, correct to the nearest 0.5 cm.
A shop places these packets in a single line on a shelf of length 2 m, correct to the nearest 0.1 m.

Find the maximum number of these packets that will fit along this shelf.
You must show all your working.

.... [3]

2 **(a)** Simplify fully.

(i) $p^3 \times p^{11}$

.... [1]

(ii) $\dfrac{18m^6}{3m^2}$

.... [2]

(iii) $\left(\dfrac{27x^9 y^{27}}{64}\right)^{-\frac{1}{3}}$

.... [3]

(b) A sequence has nth term $3n^2$.

Write down the first 3 terms of this sequence.

.... , ... , ... [2]

(c) Find the nth term for each of these sequences.

(i) 13, 16, 19, 22, 25, …

.... [2]

(ii) 3, 17, 55, 129, 251, …

.... [2]

(d) Solve.

$$\frac{3x - 22}{4} = 23$$

$x =$ .... [3]

(e) Use the quadratic formula to solve $3x^2 + 8x - 20 = 0$.
Show all your working and give your answers correct to 2 decimal places.

$x =$ .... , $x =$ .... [4]

3 The height, h cm, of each of 100 plants is recorded.
The table shows information about the heights of these plants.

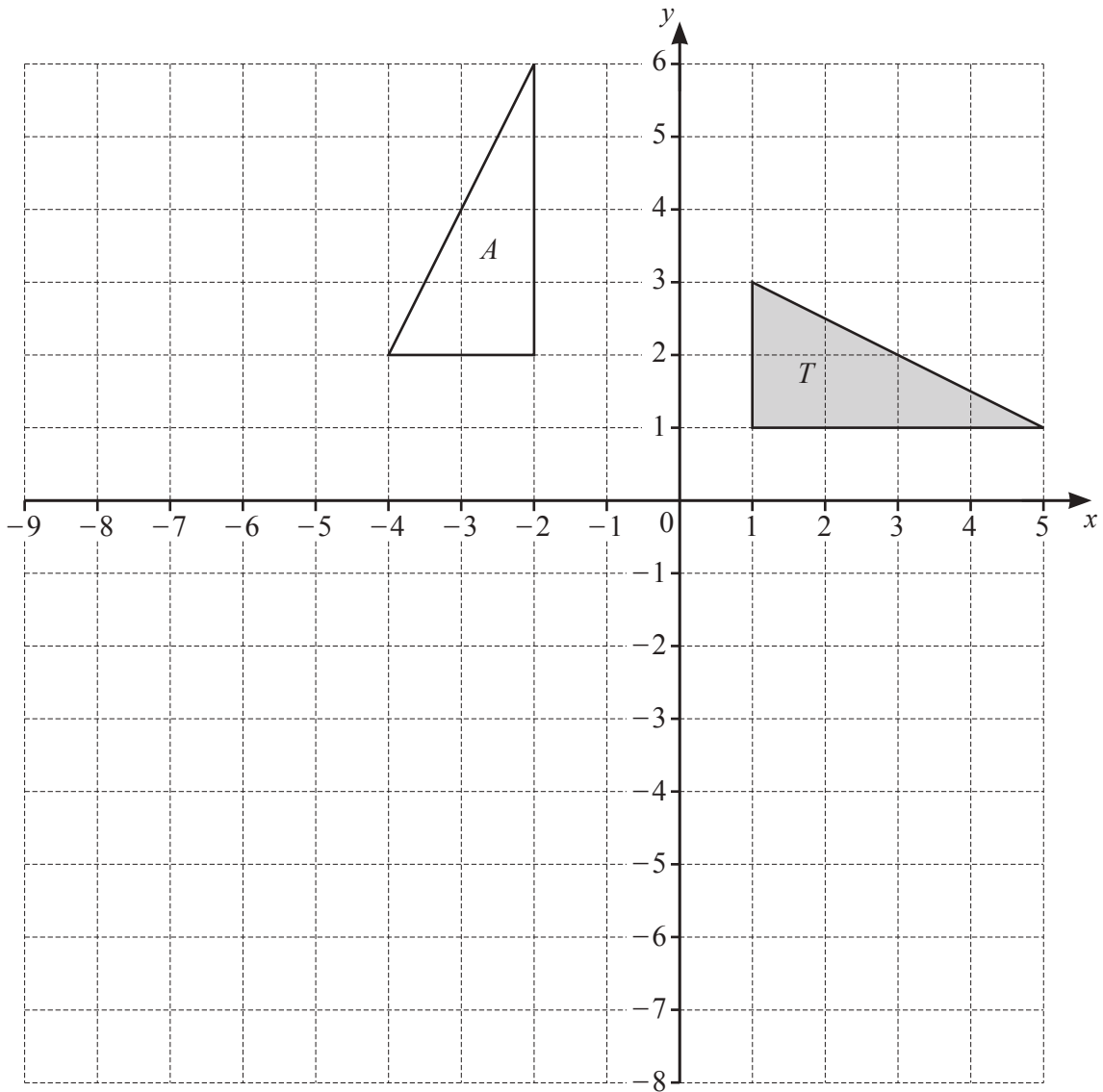| Height (h cm)	$10 < h \leqslant 15$	$15 < h \leqslant 25$	$25 < h \leqslant 40$	$40 < h \leqslant 60$	$60 < h \leqslant 70$
Frequency	8	18	28	33	13

(a) Complete the histogram to show this information.
The first two blocks have been drawn for you.
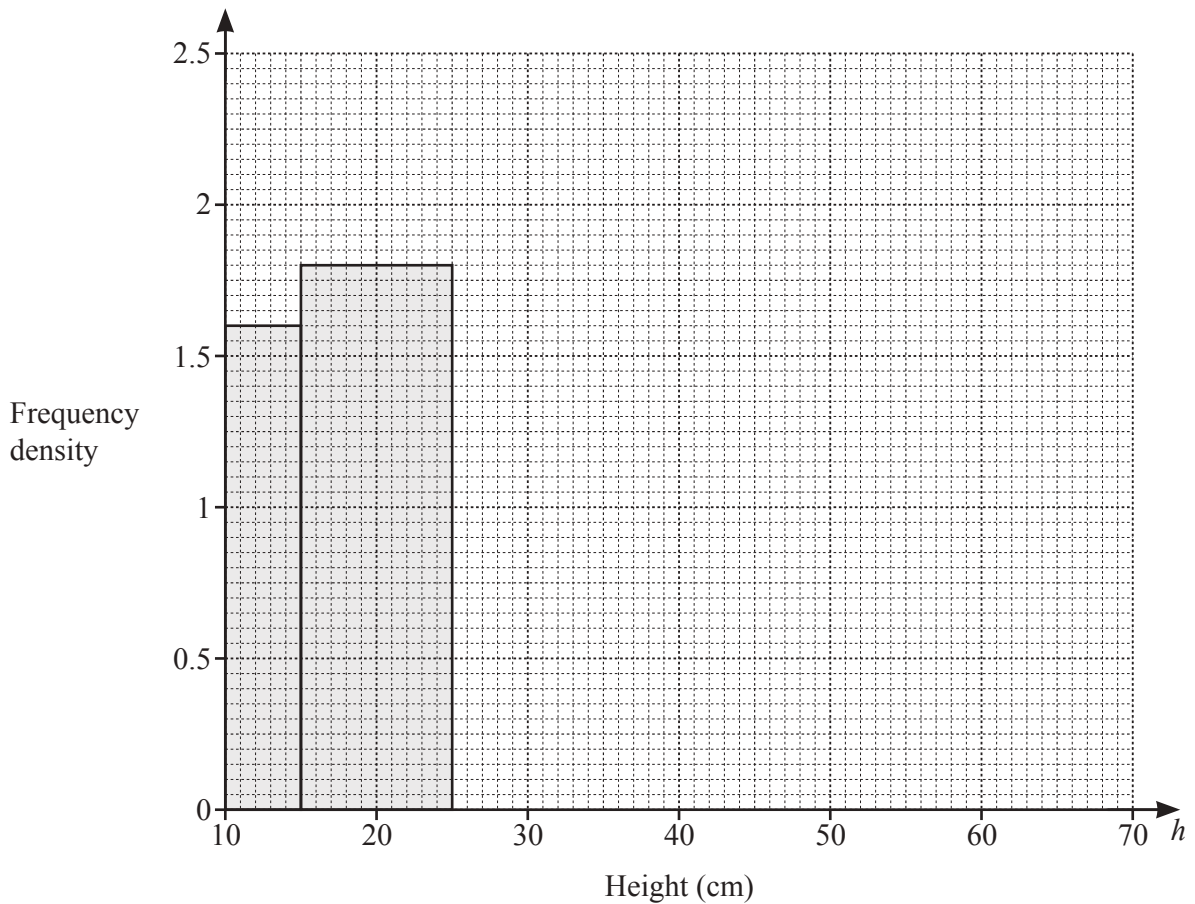
[3]
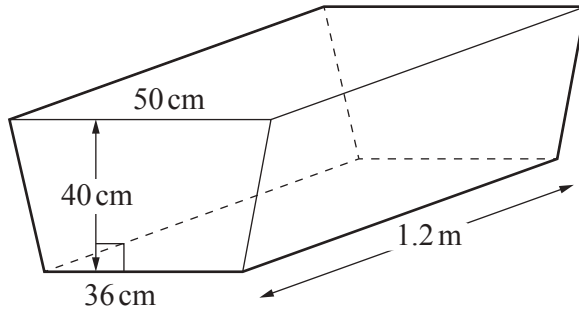
(b) Calculate an estimate of the mean height.

.... cm [4]

4

(a) Draw the reflection of triangle *T* in the line $y = -2$. [2]

(b) Draw the enlargement of triangle *T* with scale factor $\frac{1}{2}$ and centre of enlargement $(-5, -3)$. [2]

(c) Describe fully the **single** transformation that maps triangle *T* onto triangle *A*.

....

.... [3]

 [Turn over

5

NOT TO
SCALE

The diagram shows a water trough in the shape of a prism.
The prism has a cross-section in the shape of an isosceles trapezium.
The trough is completely filled with water.

(a) Show that the volume of water in the trough is 206.4 litres.

[3]

(b) The water from the trough is emptied at a rate of 600 ml per second.

Calculate the time taken, in minutes and seconds, for the trough to be emptied.

.... minutes .... seconds [3]

(c) All the water from the trough is emptied into a vertical cylindrical tank.
The depth of the water in the tank is 84 cm.
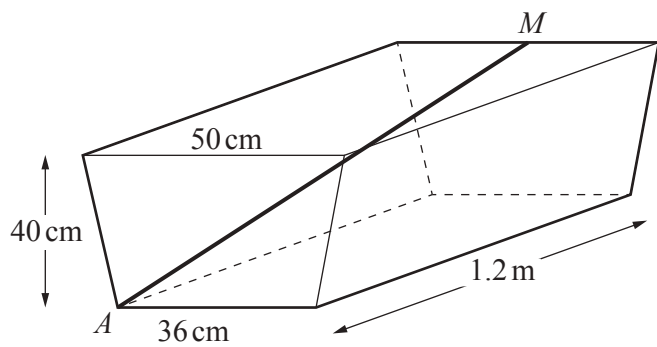
(i) Calculate the radius of the tank.

.... cm [3]

(ii) The tank is 60% full.

Calculate the height of the tank.

.... cm [2]

(d)

A steel rod *AM* is placed inside the empty water trough as shown in the diagram.
A is a vertex at the base of the isosceles trapezium and *M* is the midpoint of the top edge on the opposite face.

Calculate the length of the steel rod, *AM*.

AM = ... cm [4]

6 **(a)** $P = 5k^2 - 7$

    (i) Find the value of P when $k = 3$.

$$P = \text{...} \quad [2]$$

    (ii) Rearrange the formula to make k the subject.

$$k = \text{...} \quad [3]$$

(b) **(i)** Solve.
$$x - 3 \leqslant 5x + 7$$

$$\text{...} \quad [2]$$

    (ii) Show your answer to **part (b)(i)** on the number line.
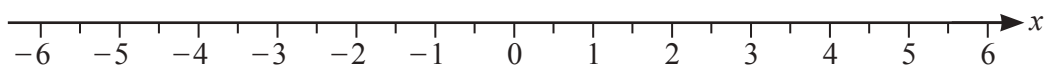
[1]

(c) The line $y = 16$ is drawn on the grid.
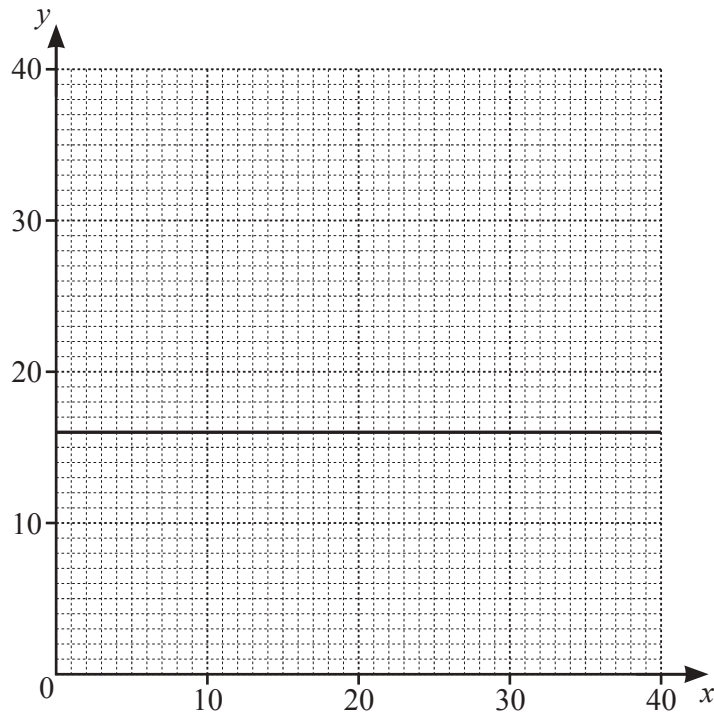
The region R satisfies the following inequalities.

$$y \geqslant 16 \qquad x > 2 \qquad 2x + 3y \geqslant 72 \qquad y \leqslant 32 - x$$

(i) By drawing three more lines and shading the region **not required**, find and label region R.

[6]

(ii) Find the integer coordinates (x, y) in the region R that give the maximum value of $2x + y$.

(..................... , ...) [2]

7   Regan is playing a game with these six number cards.

$$\boxed{-3} \quad \boxed{-2} \quad \boxed{2} \quad \boxed{3} \quad \boxed{5} \quad \boxed{7}$$

(a) She takes two cards at random, without replacement, and **multiplies** the two numbers to give a score.
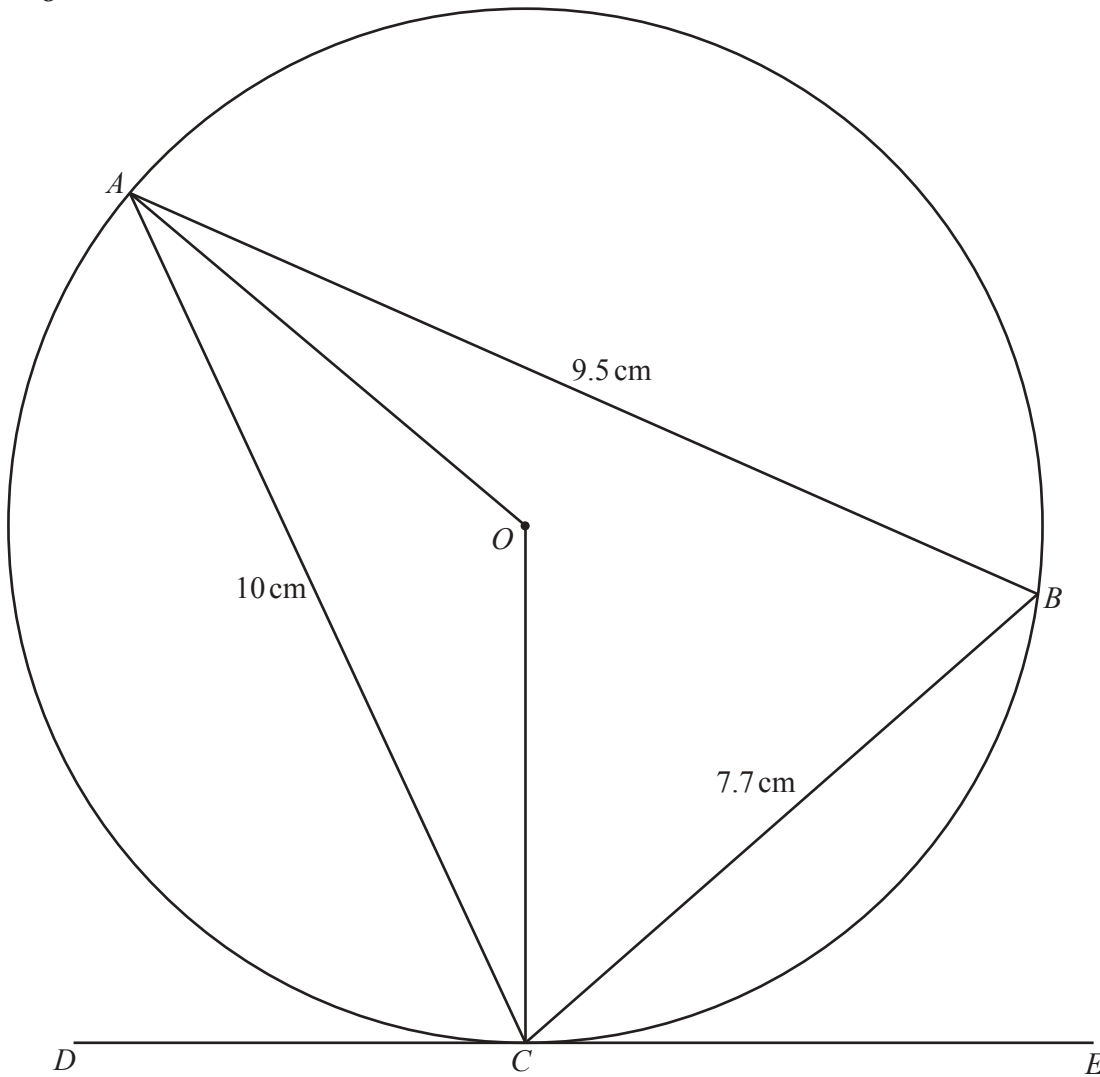
Find the probability that

(i) the score is 35

.... [3]

(ii) the score is a positive number.

.... [3]

(b) Regan now takes three cards at random from the six cards, without replacement, and **adds** the three numbers to give a total.

Find the probability that her total is 5.

.... [4]

8

A, *B* and *C* are points on the circle, centre *O*.
DE is a tangent to the circle at *C*.
AC = 10 cm, *AB* = 9.5 cm and *BC* = 7.7 cm.

(a) Show that angle *ABC* = 70.2°, correct to 1 decimal place.

[4]

(b) Find

    (i) angle *AOC*

                             Angle *AOC* = ... [1]

    (ii) angle *ACO*

                             Angle *ACO* = ... [1]

    (iii) angle *ACD*.

                             Angle *ACD* = ... [1]

(c) Calculate the radius, *OC*, of the circle.

                             OC = ... cm [3]

(d) Calculate the area of triangle *ABC* as a percentage of the area of the circle.

                                      ....% [4]
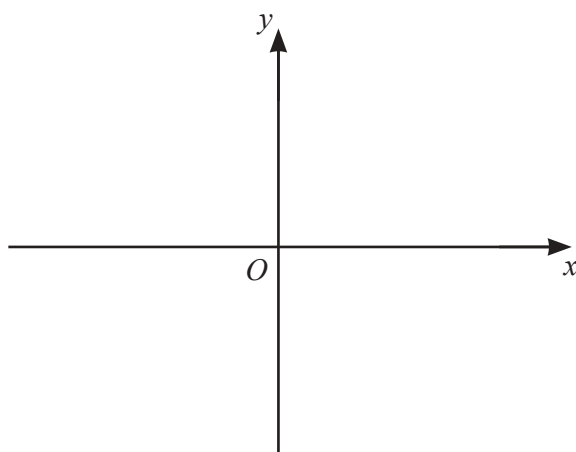
9 **(a)** Sketch the following graphs.
On each sketch, indicate any intercepts with the axes.
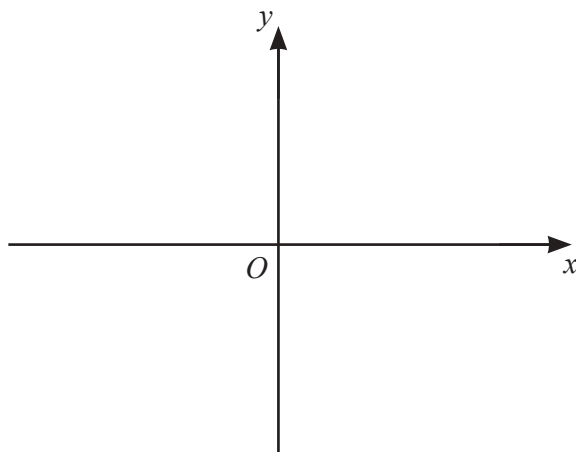
(i) $3x - 4y = 12$
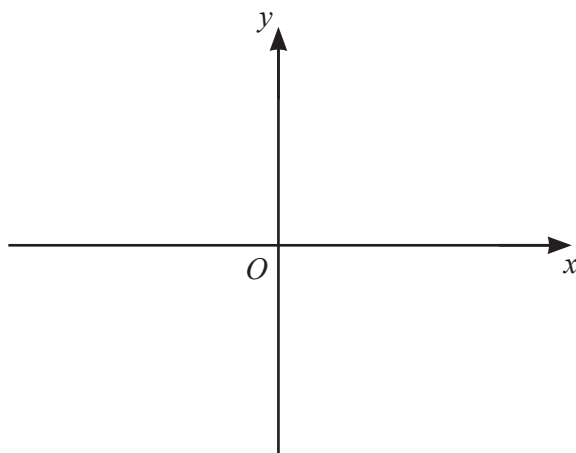
[2]

(ii) $y = x^2 - 3x - 4$

[4]

(iii) $y = 6^x$

[2]

(b) (i) Find the derivative, $\dfrac{dy}{dx}$, of $y = 5 + 8x - \dfrac{4}{3}x^3$.

.... [2]

(ii) Find the gradient of $y = 5 + 8x - \dfrac{4}{3}x^3$ at $x = -1$.

.... [2]

(iii) A tangent is drawn to the graph of $y = 5 + 8x - \dfrac{4}{3}x^3$.

The gradient of the tangent is -28.

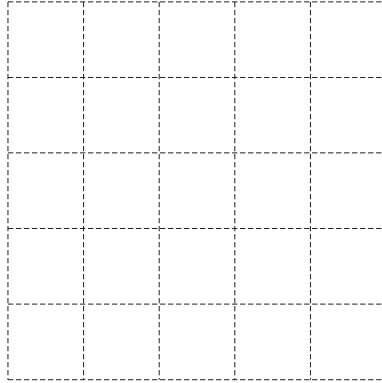Find the coordinates of the two possible points where this tangent meets the graph.
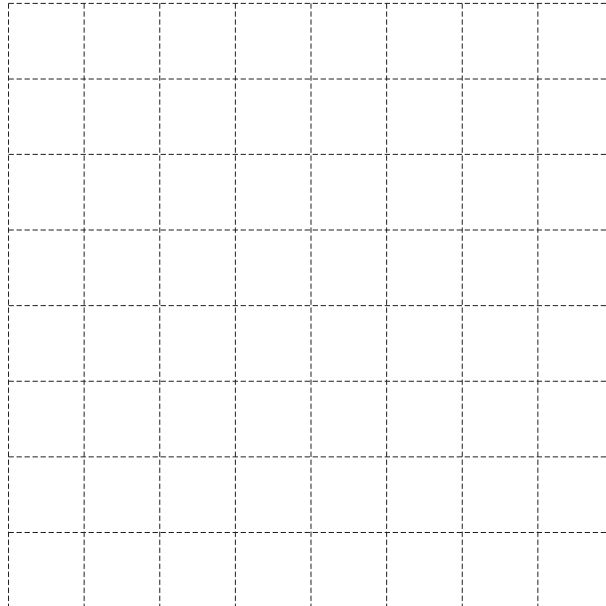
(..................... , ...)

(..................... , ...) [5]

10 (a)
$$\mathbf{a} = \begin{pmatrix} 1 \\ 2 \end{pmatrix} \qquad \mathbf{b} = \begin{pmatrix} -3 \\ 5 \end{pmatrix}$$

(i) On the grid, draw and label vector 2**a**.
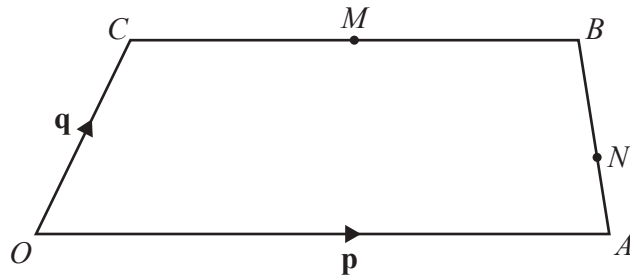
[1]

(ii) On the grid, draw and label vector (**a** − **b**).

[2]

(b)

OABC is a trapezium with *OA* parallel to *CB*.

M is the midpoint of *CB* and *N* is the point on *AB* such that $AN : NB = 1 : 2$.

O is the origin, $\overrightarrow{OA} = \mathbf{p}$, $\overrightarrow{OC} = \mathbf{q}$ and $\overrightarrow{CB} = \frac{3}{4}\mathbf{p}$.

(i) Find, in terms of **p** and/or **q**, in its simplest form

(a) $\overrightarrow{OB}$

$\overrightarrow{OB} =$ .... [1]

(b) $\overrightarrow{AB}$

$\overrightarrow{AB} =$ .... [2]

(c) $\overrightarrow{MN}$.

$\overrightarrow{MN} =$ .... [3]

(ii) *OA* and *MN* are extended to meet at *G*.

Find the position vector of *G* in terms of **p**.

.... [2]