



CANDIDATE
NAME

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CENTRE
NUMBER

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CANDIDATE
NUMBER

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0580/43

October/November 2022

2 hours 30 minutes

You must answer on the question paper.

You will need: Geometrical instruments

- 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.

- 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.

- 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
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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) $\frac{18m^6}{3m^2}$

..... [2]

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

..... [3]

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

Write down the first 3 terms of this sequence.

.....,, [2]

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

(i) 13, 16, 19, 22, 25, ...

..... [2]

(ii) 3, 17, 55, 129, 251, ...

..... [2]

(d) Solve.

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

$$x = \dots\dots\dots [3]$$

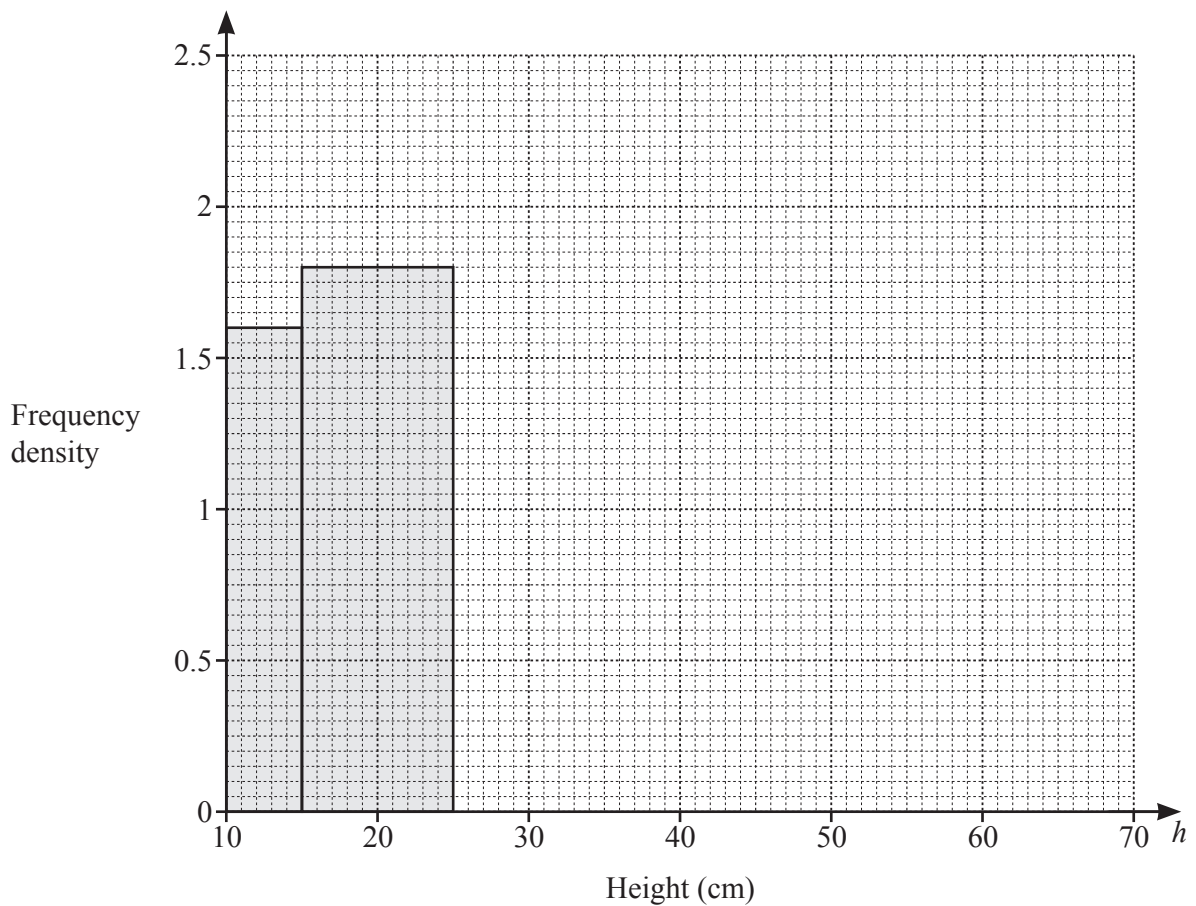
- (e) Use the quadratic formula to solve $3x^2 + 8x - 20 = 0$.
Show all your working and give your answers correct to 2 decimal places.

$$x = \dots\dots\dots, x = \dots\dots\dots [4]$$

- 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)	$10 < h \leq 15$	$15 < h \leq 25$	$25 < h \leq 40$	$40 < h \leq 60$	$60 < h \leq 70$
Frequency	8	18	28	33	13

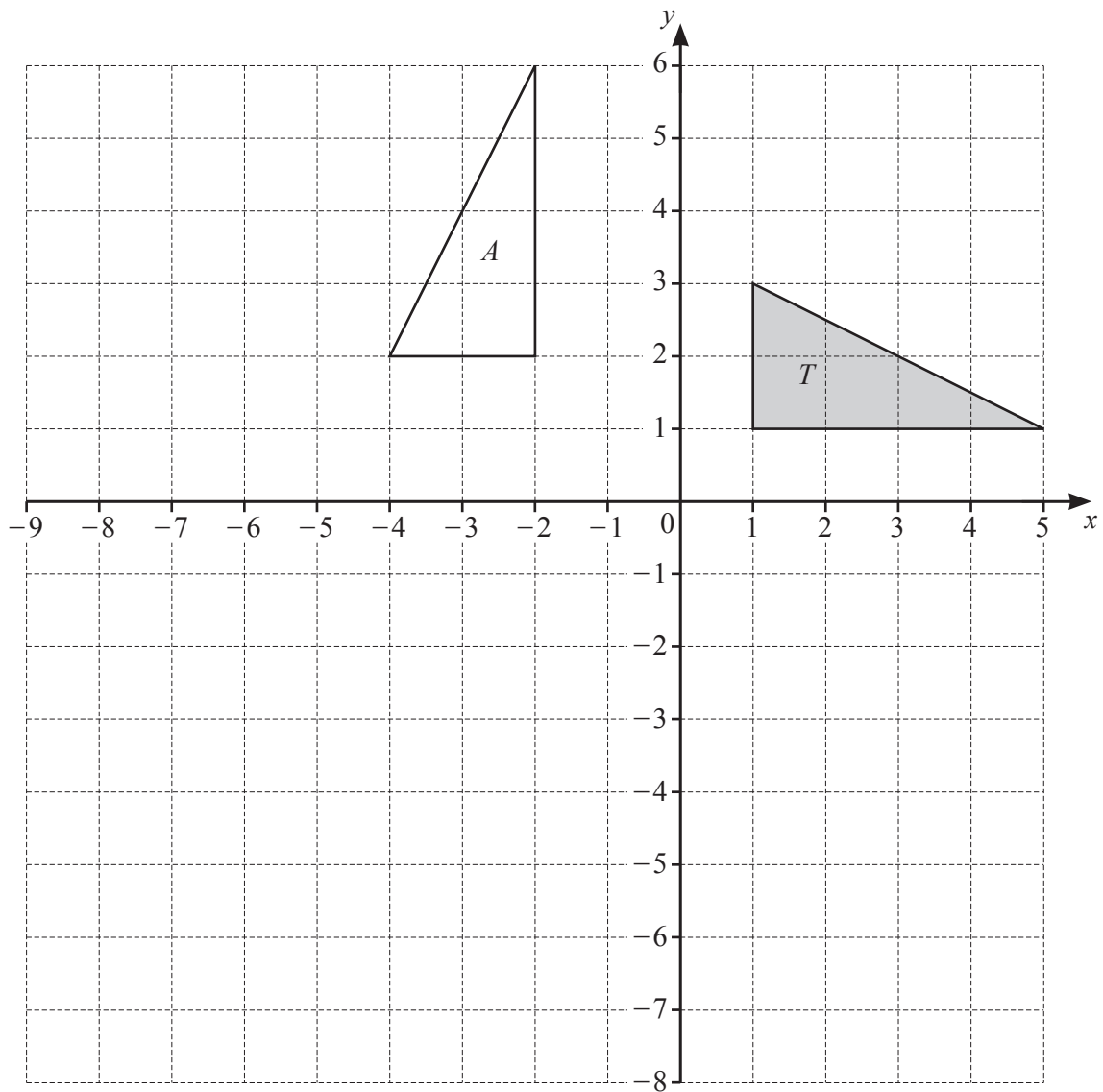
- (a) Complete the histogram to show this information.
The first two blocks have been drawn for you.



[3]

- (b) Calculate an estimate of the mean height.

..... cm [4]

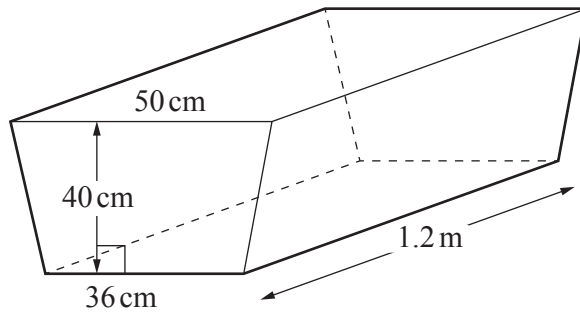


- (a) Draw the reflection of triangle T in the line $y = -2$. [2]
- (b) Draw the enlargement of triangle T with scale factor $\frac{1}{2}$ and centre of enlargement $(-5, -3)$. [2]
- (c) Describe fully the **single** transformation that maps triangle T onto triangle A .

.....

..... [3]

5

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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.

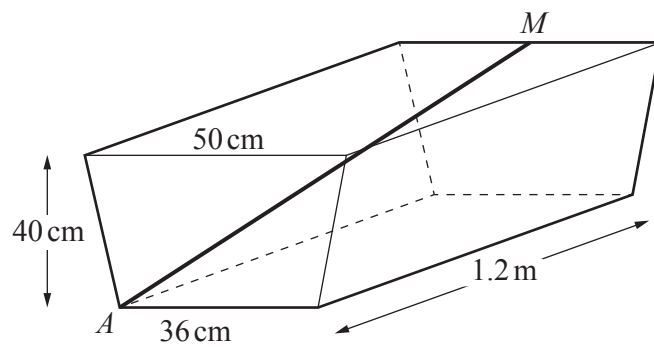
..... cm [3]

- (ii) The tank is 60% full.

Calculate the height of the tank.

..... cm [2]

- (d)



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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 $k = 3$.

$P = \dots\dots\dots$ [2]

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

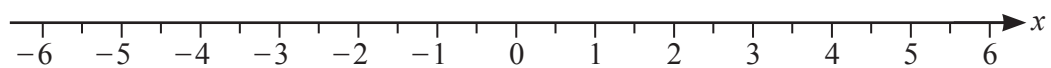
$k = \dots\dots\dots$ [3]

(b) (i) Solve.

$$x - 3 \leq 5x + 7$$

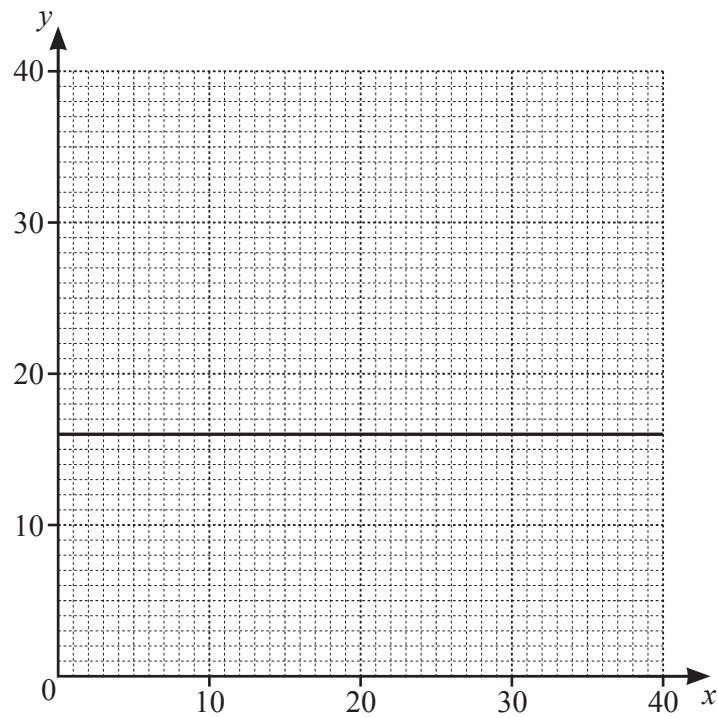
$\dots\dots\dots$ [2]

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



[1]

- (c) The line $y = 16$ is drawn on the grid.



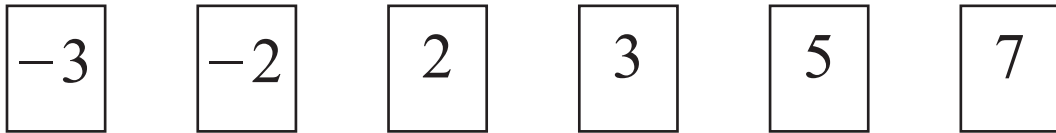
The region R satisfies the following inequalities.

$$y \geq 16 \quad x > 2 \quad 2x + 3y \geq 72 \quad y \leq 32 - x$$

- (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.



- (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]

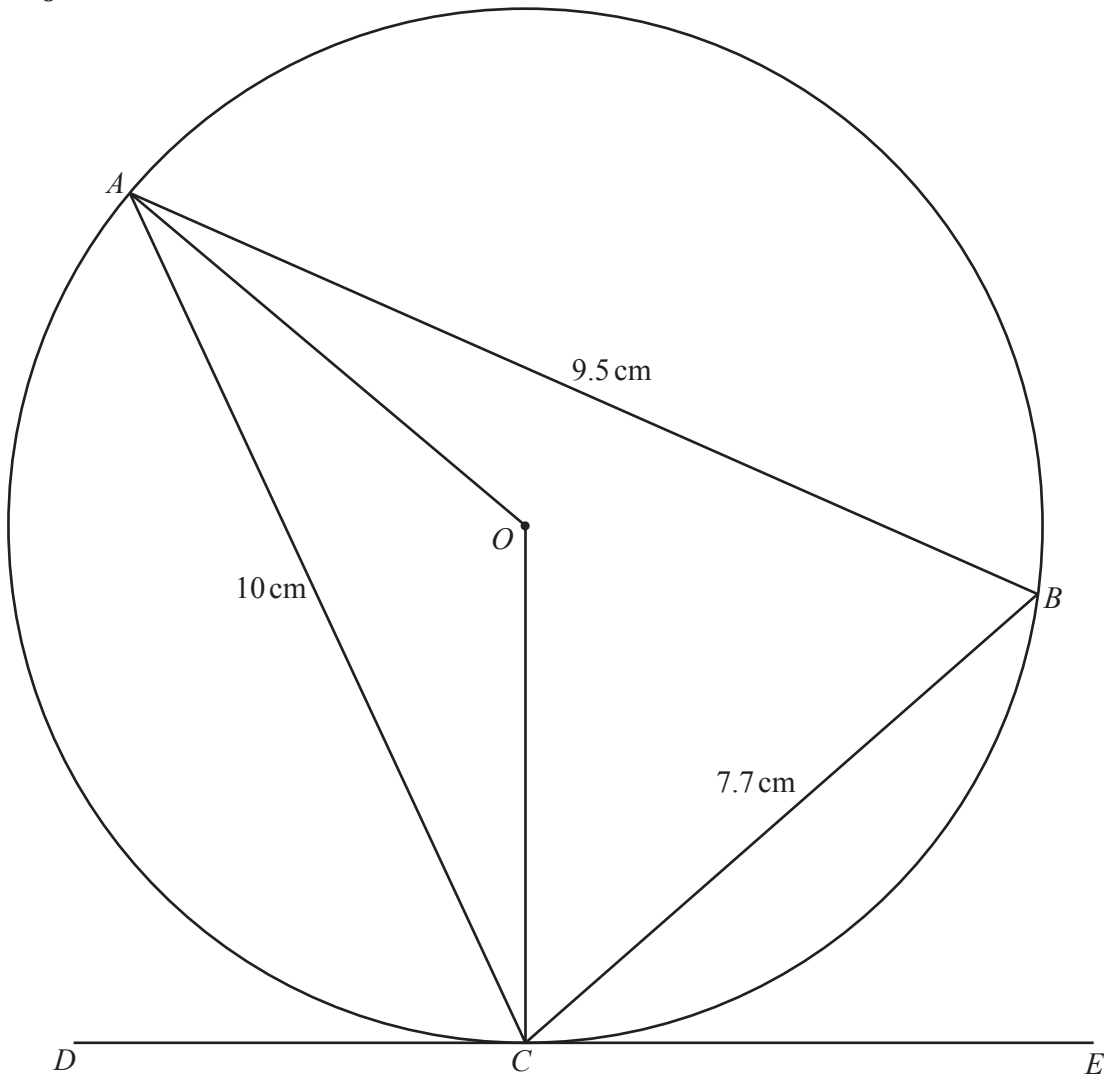
- (ii) the score is a positive number.

..... [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]



NOT TO
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A , B and C are points on the circle, centre O .
 DE is a tangent to the circle at C .
 $AC = 10\text{ cm}$, $AB = 9.5\text{ cm}$ and $BC = 7.7\text{ cm}$.

(a) Show that angle $ABC = 70.2^\circ$, correct to 1 decimal place.

[4]

(b) Find

(i) angle AOC

Angle $AOC = \dots\dots\dots$ [1]

(ii) angle ACO

Angle $ACO = \dots\dots\dots$ [1]

(iii) angle ACD .

Angle $ACD = \dots\dots\dots$ [1]

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

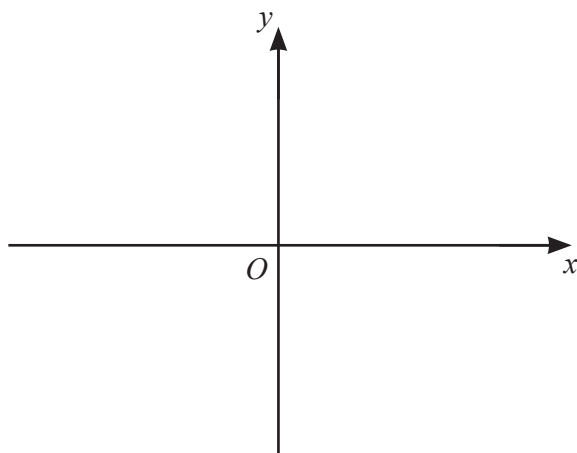
$OC = \dots\dots\dots$ cm [3]

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

$\dots\dots\dots$ % [4]

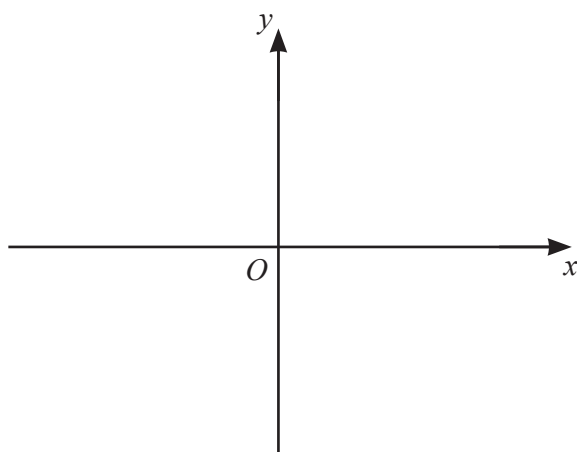
- 9 (a) Sketch the following graphs.
On each sketch, indicate any intercepts with the axes.

(i) $3x - 4y = 12$



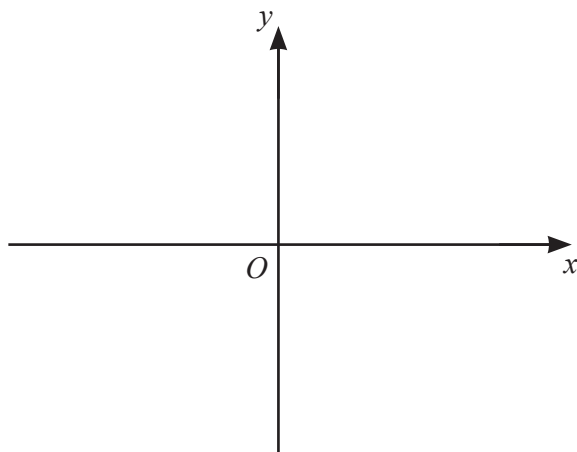
[2]

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



[4]

(iii) $y = 6^x$



[2]

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

..... [2]

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

..... [2]

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

The gradient of the tangent is -28 .

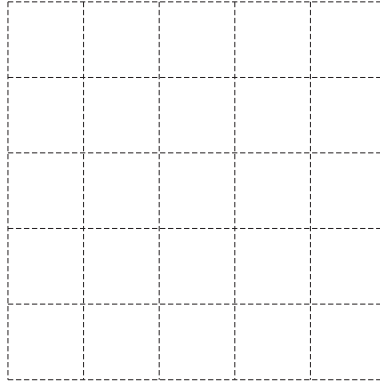
Find the coordinates of the two possible points where this tangent meets the graph.

(..... ,)

(..... ,) [5]

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

(i) On the grid, draw and label vector $2\mathbf{a}$.



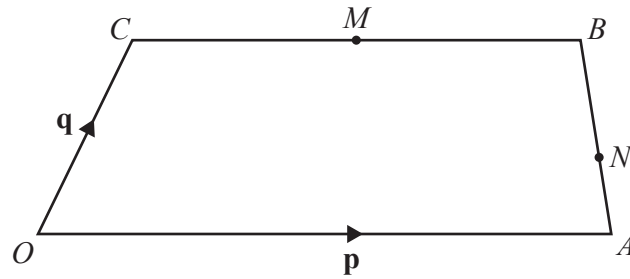
[1]

(ii) On the grid, draw and label vector $(\mathbf{a} - \mathbf{b})$.



[2]

(b)

NOT TO
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$OABC$ 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 $\mathbf{p}$ and/or $\mathbf{q}$, in its simplest form

(a) $\overrightarrow{OB}$

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

(b) $\overrightarrow{AB}$

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

(c) $\overrightarrow{MN}$.

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

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

Find the position vector of G in terms of $\mathbf{p}$.

$\dots\dots\dots$ [2]

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