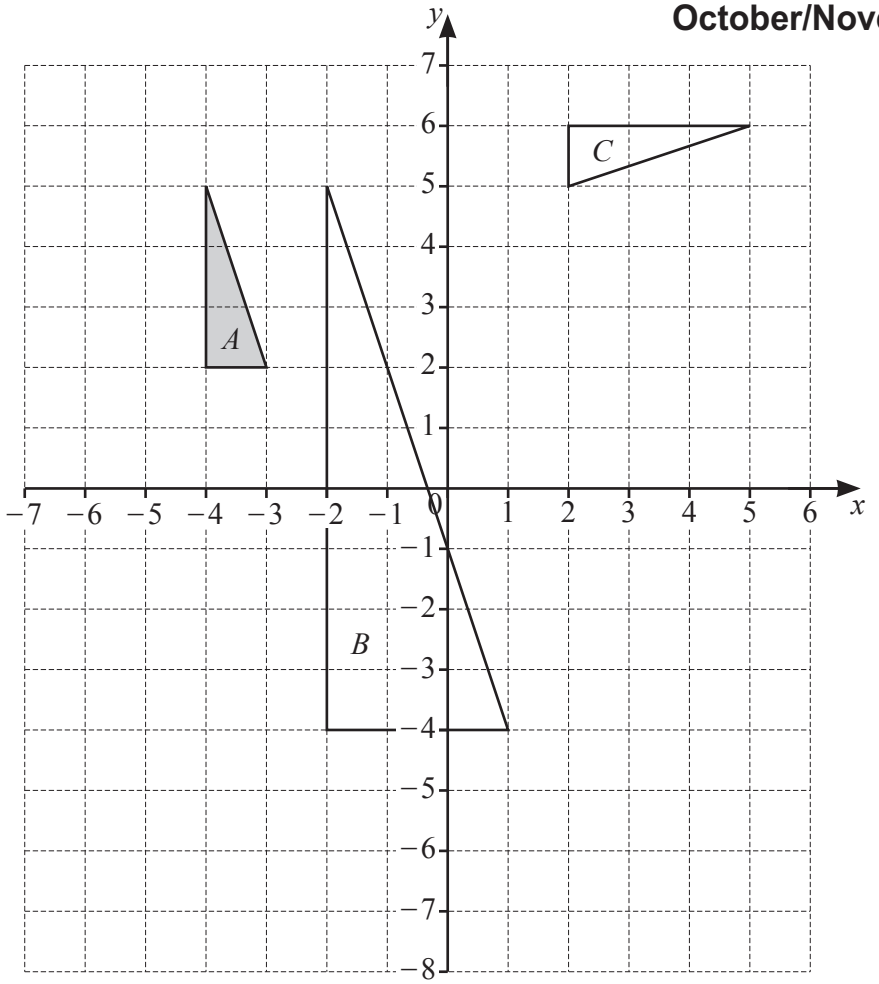
1



(a) Draw the image of shape A after a translation by the vector $\begin{pmatrix} 8 \\ -6 \end{pmatrix}$. [2]

(b) Draw the image of shape A after a reflection in the line $y = -1$. [2]

(c) Describe fully the **single** transformation that maps shape A onto shape B.

.....

..... [3]

(d) Describe fully the **single** transformation that maps shape A onto shape C.

.....

..... [3]

2 **(a)** A plane has 14 First Class seats, 70 Premium seats and 168 Economy seats.

Find the ratio First Class seats : Premium seats : Economy seats.
Give your answer in its simplest form.

..... : ..... : ..... [2]

(b) **(i)** For a morning flight, the costs of tickets are in the ratio

First Class : Premium : Economy = 14 : 6 : 5.

The cost of a Premium ticket is $114.

Calculate the cost of a First Class ticket and the cost of an Economy ticket.

First Class $ .....

Economy $ ..... [3]

(ii) For an afternoon flight, the cost of a Premium ticket is reduced from $114 to $96.90 .

Calculate the percentage reduction in the cost of a ticket.

..... % [2]

(c) When the local time in Athens is 09 00, the local time in Berlin is 08 00.
A plane leaves Athens at 13 15.
It arrives in Berlin at 15 05 local time.

(i) Find the flight time from Athens to Berlin.

..... h ..... min [1]

(ii) The distance the plane flies from Athens to Berlin is 1802 km.

Calculate the average speed of the plane.
Give your answer in kilometres per hour.

..... km/h [2]

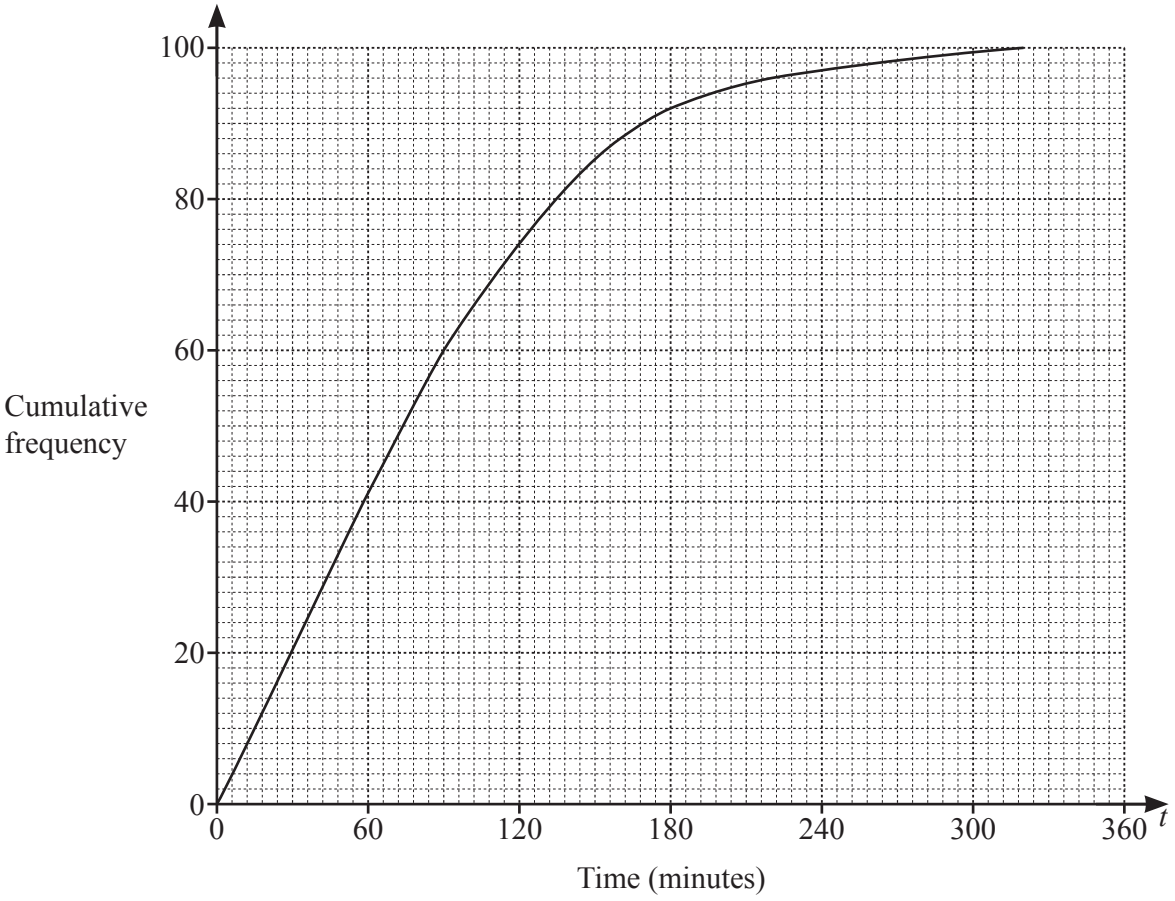
(b) The frequency table shows the times, t minutes, each of 100 children spent exercising in one week.

Time (t minutes)	$0 < t \leqslant 60$	$60 < t \leqslant 100$	$100 < t \leqslant 160$	$160 < t \leqslant 220$	$220 < t \leqslant 320$
Frequency	41	24	23	8	4

(i) Calculate an estimate of the mean time.

..... min [4]

(ii) The information in the frequency table is shown in this cumulative frequency diagram.



Use the cumulative frequency diagram to find an estimate of

(a) the 60th percentile,

..... min [1]

(b) the number of children who spent more than 3 hours exercising.

..... [2]

(iii) A histogram is drawn to show the information in the frequency table.
The height of the bar for the interval $60 < t \leqslant 100$ is 10.8 cm.

Calculate the height of the bar for the interval $160 < t \leqslant 220$.

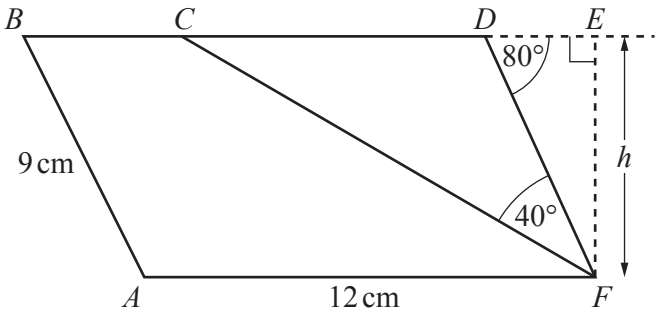
..... cm [2]

4 **(a)** A rectangle measures 8.5 cm by 10.7 cm, both correct to 1 decimal place.

Calculate the upper bound of the perimeter of the rectangle.

..... cm [3]

(b)



NOT TO SCALE

ABDF is a parallelogram and *BCDE* is a straight line.
AF = 12 cm, *AB* = 9 cm, angle *CFD* = 40° and angle *FDE* = 80°.

(i) Calculate the height, *h*, of the parallelogram.

h = ... cm [2]

(ii) Explain why triangle *CDF* is isosceles.

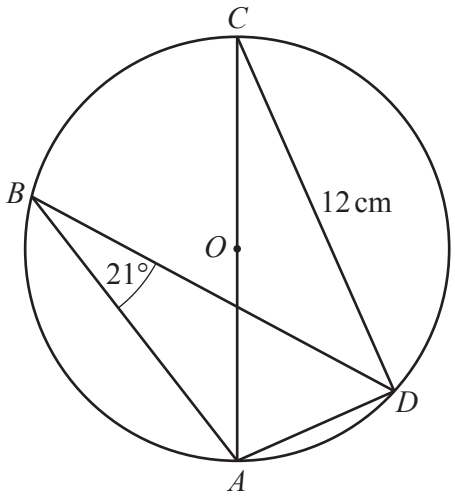
.....

..... [2]

(iii) Calculate the area of the **trapezium** *ABCF*.

..... cm^2 [3]

(c)



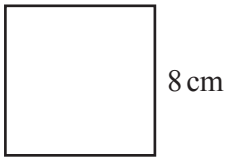
NOT TO SCALE

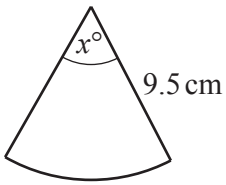
A, B, C and D are points on the circle, centre O.
Angle $ABD = 21°$ and $CD = 12$ cm.

Calculate the area of the circle.

..... cm^2 [5]

(d)





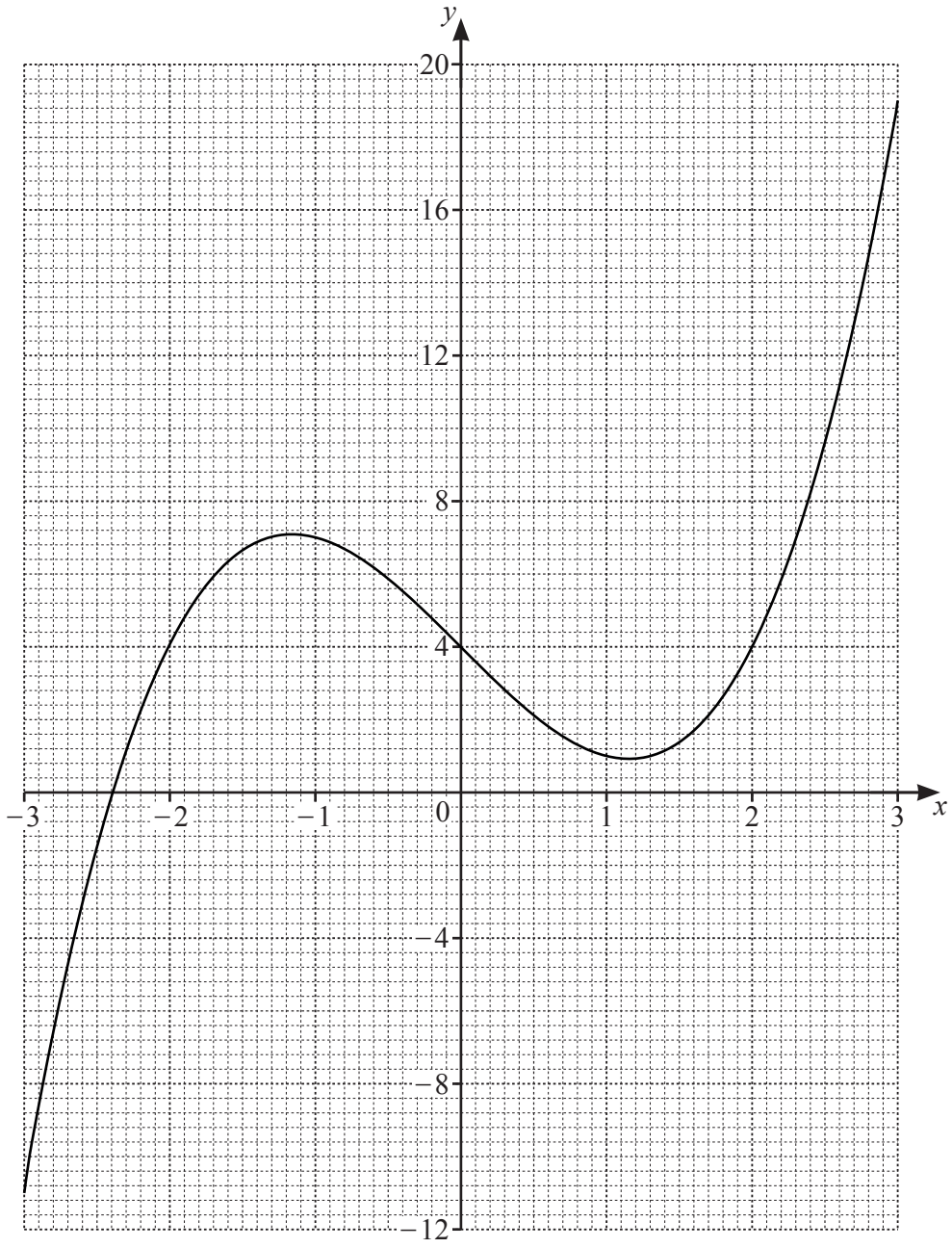
NOT TO SCALE

The diagram shows a square with side length 8 cm and a sector of a circle with radius 9.5 cm and sector angle $x°$.
The perimeter of the square is equal to the perimeter of the sector.

Calculate the value of x.

$x =$ ..... [3]

5 **(a)** The diagram shows the graph of $y = f(x)$ for $-3 \leqslant x \leqslant 3$.



(i) Solve $f(x) = 14$.

$x =$ ..... [1]

(ii) By drawing a suitable tangent, find an estimate of the gradient of the graph at the point $(-2, 4)$.

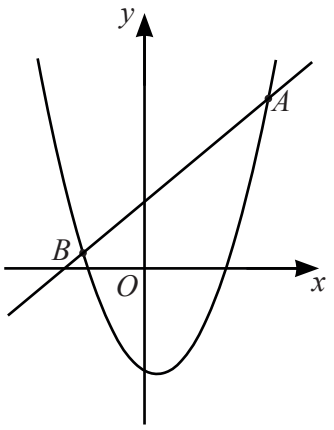
..... [3]

(iii) By drawing a suitable straight line on the grid, solve $f(x) = 2x - 2$ for $-3 \leqslant x \leqslant 3$.

.

$x =$ ..... [3]

(b)



NOT TO SCALE

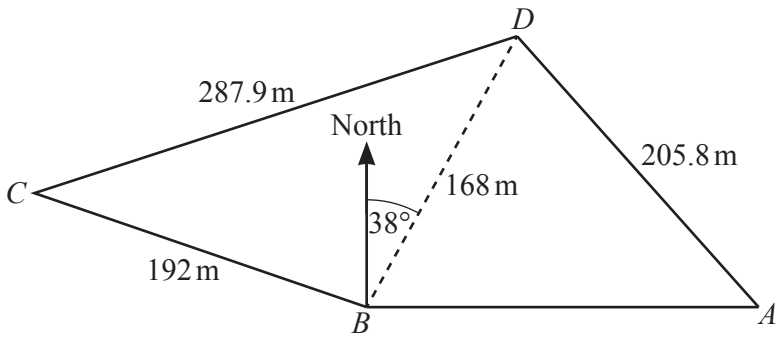
The diagram shows a curve with equation $y = 2x^2 - 2x - 7$.
The straight line with equation $y = 3x + 5$ intersects the curve at the points A and B.

Find the coordinates of the points A and B.

A (..... , ...)

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

6



NOT TO SCALE

The diagram shows a field, $ABCD$, on horizontal ground.
$BC = 192$ m, $CD = 287.9$ m, $BD = 168$ m and $AD = 205.8$ m.

(a) (i) Calculate angle CBD and show that it rounds to 106.0°, correct to 1 decimal place.

[4]

(ii) The bearing of D from B is 038°.

Find the bearing of C from B.

..... [1]

(iii) A is **due east** of B.

Calculate the bearing of D from A.

..... [5]

(b) (i) Calculate the area of triangle *BCD*.

..... m^2 [2]

(ii) Tomas buys the triangular part of the field, *BCD*.
The cost is \$35 750 per hectare.

Calculate the amount he pays.
Give your answer correct to the nearest \$100.
[1 hectare = 10 000 m^2]

\$ ..... [2]

7

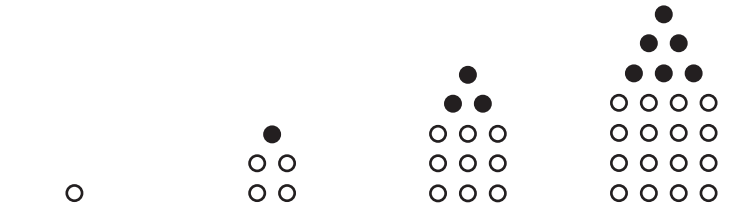


Diagram 1 Diagram 2 Diagram 3 Diagram 4

These are the first four diagrams of a sequence.
The diagrams are made from white dots and black dots.

(a) Complete the table for Diagram 5 and Diagram 6.

Diagram	1	2	3	4	5	6
Number of white dots	1	4	9	16		
Number of black dots	0	1	3	6		
Total number of dots	1	5	12	22		

[2]

(b) Write an expression, in terms of n, for the number of white dots in Diagram n.

..... [1]

(c) The expression for the total number of dots in Diagram n is $\frac{1}{2}(3n^2 - n)$.

(i) Find the total number of dots in Diagram 8.

..... [1]

(ii) Find an expression for the number of black dots in Diagram n.
Give your answer in its simplest form.

..... [2]

(d) T is the total number of dots used to make **all** of the first n diagrams.

$$T = an^3 + bn^2$$

Find the value of a and the value of b.
You must show all your working.

$a =$ .....

$b =$ ..... [5]

8 **(a)** Factorise completely.

$3a^2b - ab^2$

..... [2]

(b) Solve the inequality.

$3x + 12 < 5x - 3$

..... [2]

(c) Simplify.

$\left(3x^2y^4\right)^3$

..... [2]

(d) Solve.

$\frac{2}{x} = \frac{6}{2-x}$

$x =$ ..... [3]

(e) Expand and simplify.

$(x-2)(x+5)(2x-1)$

..... [3]

(f) Alan invests \$200 at a rate of r% per year compound interest.
After 2 years the value of his investment is \$206.46 .

(i) Show that $r^2 + 200r - 323 = 0$.

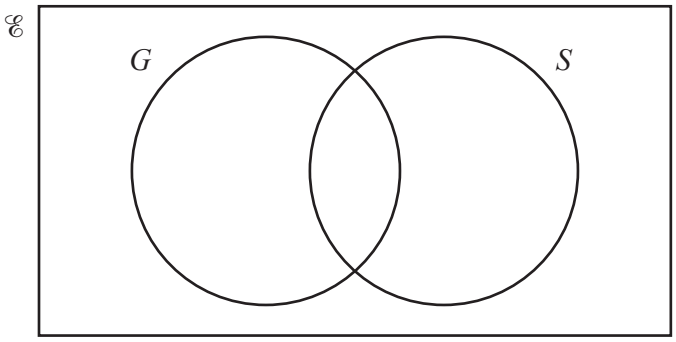
[3]

(ii) Solve the equation $r^2 + 200r - 323 = 0$ to find the rate of interest.
Show all your working and give your answer correct to 2 decimal places.

$r =$ ..... [3]

9 **(a)** There are 32 students in a class.

5 do not study any languages.
15 study German (G).
18 study Spanish (S).



(i) Complete the Venn diagram to show this information. [2]

(ii) A student is chosen at random.

Find the probability that the student studies Spanish but not German.

..... [1]

(iii) A student who studies German is chosen at random.

Find the probability that this student also studies Spanish.

..... [1]

(b) A bag contains 54 red marbles and some blue marbles.
36% of the marbles in the bag are red.

Find the number of blue marbles in the bag.

..... [2]

(c) Another bag contains 15 red beads and 10 yellow beads.
Ariana picks a bead at random, records its colour and replaces it in the bag.
She then picks another bead at random.

(i) Find the probability that she picks two red beads.

..... [2]

(ii) Find the probability that she does not pick two red beads.

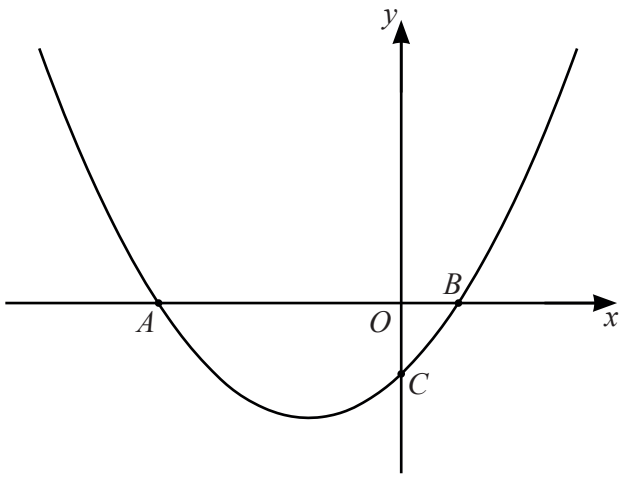
..... [1]

(d) A box contains 15 red pencils, 8 yellow pencils and 2 green pencils.
Two pencils are picked at random without replacement.

Find the probability that at least one pencil is red.

..... [3]

10 (a)



NOT TO SCALE

The diagram shows a sketch of the curve $y = x^2 + 3x - 4$.

(i) Find the coordinates of the points A, B and C.

A (..... , ...)

B (..... , ...)

C (..... , ...) [4]

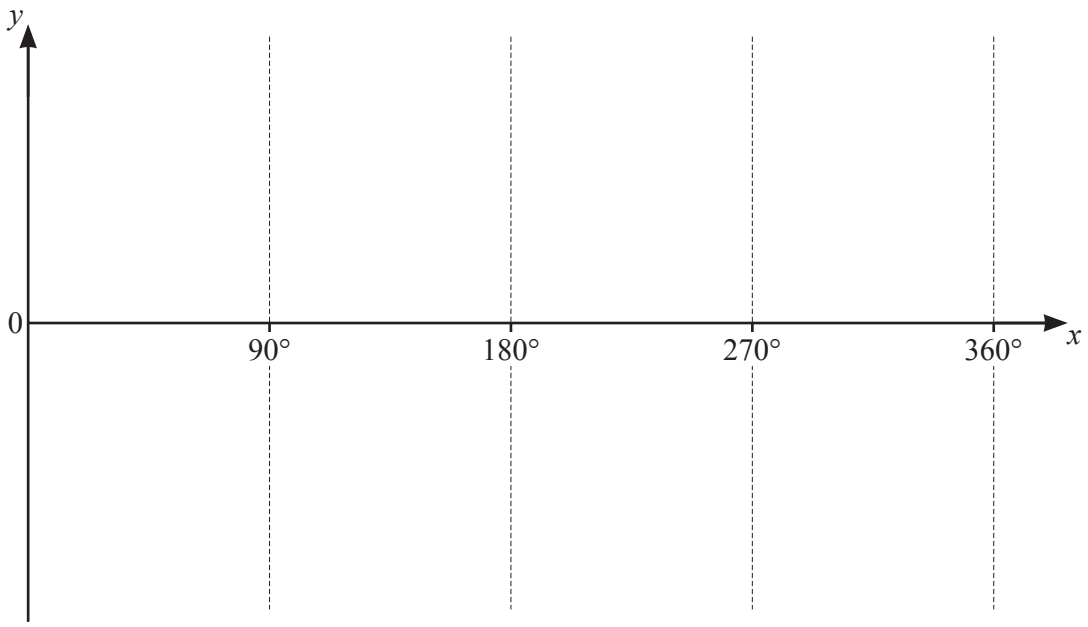
(ii) Differentiate $x^2 + 3x - 4$.

..... [2]

(iii) Find the equation of the tangent to the curve at the point (2, 6).

..... [3]

(b)



(i) On the diagram, sketch the graph of $y = \tan x$ for $0° \leqslant x \leqslant 360°$. [2]

(ii) Solve the equation $5\tan x = -7$ for $0° \leqslant x \leqslant 360°$.

$x =$ ..... or $x =$ ..... [3]