



1 David sells fruit at the market.

(a) In one week, David sells 120 kg of tomatoes and 80 kg of grapes.

(i) Write 80 kg as a fraction of the total mass of tomatoes and grapes.  
Give your answer in its lowest terms.

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

(ii) Write down the ratio mass of tomatoes : mass of grapes.  
Give your answer in its simplest form.

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

(b) (i) One day he sells 28 kg of oranges at \$1.56 per kilogram.  
He also sells 35 kg of apples.  
The total he receives from selling the oranges and the apples is \$86.38 .

Calculate the price of 1 kilogram of apples.

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

(ii) The price of 1 kilogram of oranges is \$1.56 .  
This is 20% more than the price two weeks ago.

Calculate the price two weeks ago.

Answer(b)(ii) \$ ..... [3]

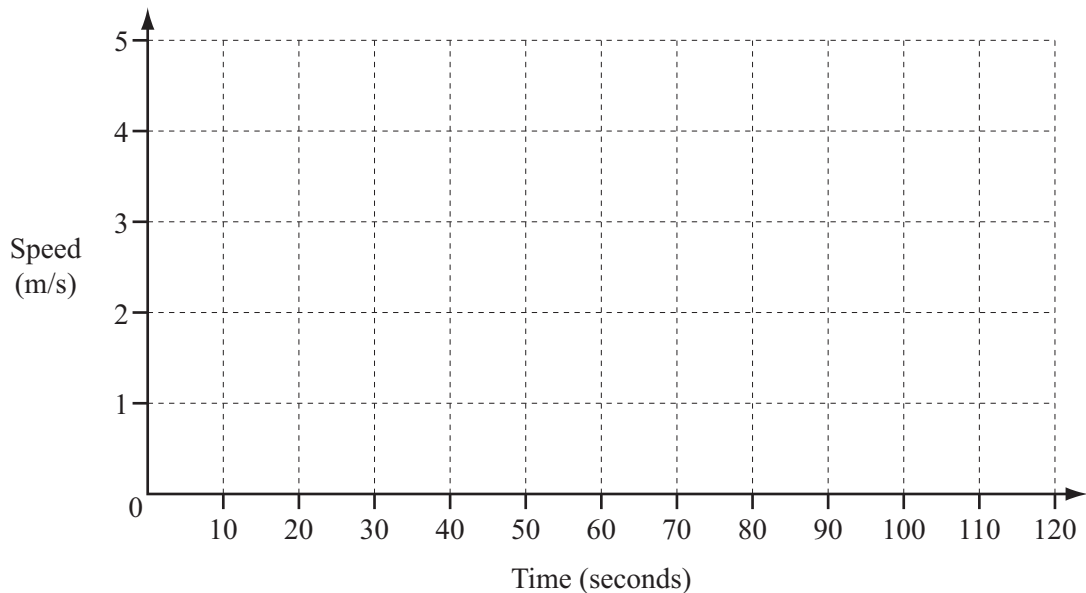
(c) On another day, David received a total of \$667 from all the fruit he sold.  
The cost of the fruit was \$314.20 .  
David worked for  $10\frac{1}{2}$  hours on this day.

Calculate David's rate of profit in dollars per hour.

Answer(c) ..... dollars/h [2]

- 2 Emily cycles along a path for 2 minutes.  
She starts from rest and accelerates at a constant rate until she reaches a speed of 5 m/s after 40 seconds.  
She continues cycling at 5 m/s for 60 seconds.  
She then decelerates at a constant rate until she stops after a further 20 seconds.

(a) On the grid, draw a speed-time graph to show Emily's journey.



[2]

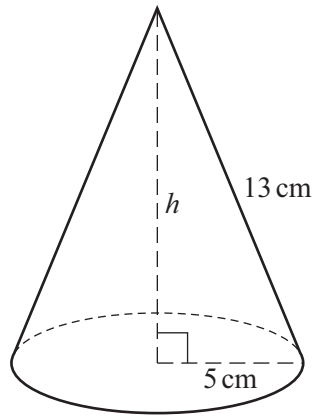
(b) Find Emily's acceleration.

Answer(b) ..... m/s<sup>2</sup> [1]

(c) Calculate Emily's average speed for the journey.

Answer(c) ..... m/s [4]

3

NOT TO  
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(a) The diagram shows a cone of radius 5 cm and slant height 13 cm.

(i) Calculate the curved surface area of the cone.

[The curved surface area,  $A$ , of a cone with radius  $r$  and slant height  $l$  is  $A = \pi rl$ .]

Answer(a)(i) ..... cm<sup>2</sup> [2]

(ii) Calculate the perpendicular height,  $h$ , of the cone.

Answer(a)(ii)  $h =$  ..... cm [3]

(iii) Calculate the volume of the cone.

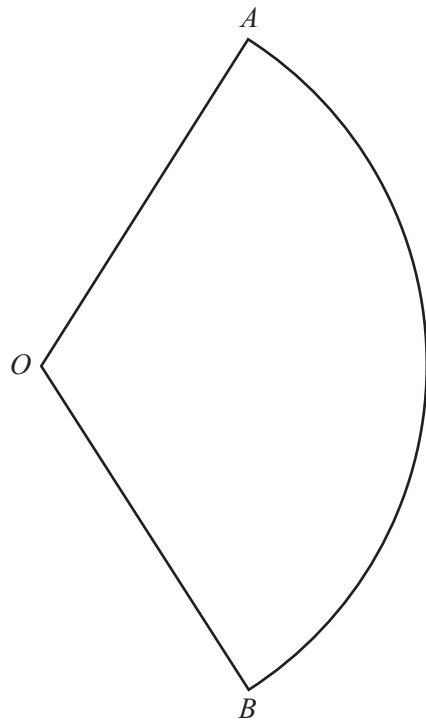
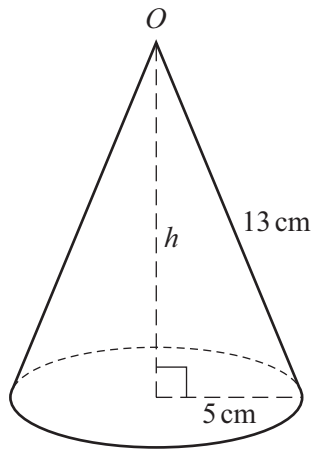
[The volume,  $V$ , of a cone with radius  $r$  and height  $h$  is  $V = \frac{1}{3}\pi r^2 h$ .]

Answer(a)(iii) ..... cm<sup>3</sup> [2]

(iv) Write your answer to **part (a)(iii)** in cubic metres.  
Give your answer in standard form.

Answer(a)(iv) ..... m<sup>3</sup> [2]

(b)

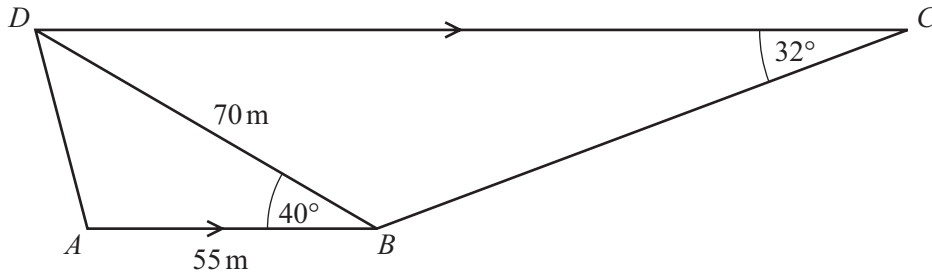
NOT TO  
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The cone is now cut along a slant height and it opens out to make the sector  $AOB$  of a circle.

Calculate angle  $AOB$ .

*Answer(b)* Angle  $AOB = \dots\dots\dots$  [4]

4

NOT TO  
SCALE

The diagram shows a school playground  $ABCD$ .

$ABCD$  is a trapezium.

$AB = 55$  m,  $BD = 70$  m, angle  $ABD = 40^\circ$  and angle  $BCD = 32^\circ$ .

(a) Calculate  $AD$ .

Answer(a)  $AD = \dots\dots\dots$  m [4]

(b) Calculate  $BC$ .

Answer(b)  $BC = \dots\dots\dots$  m [4]

(c) (i) Calculate the area of the playground  $ABCD$ .

Answer(c)(i) ..... m<sup>2</sup> [3]

(ii) An accurate plan of the school playground is to be drawn to a scale of 1:200 .

Calculate the area of the school playground on the plan.  
Give your answer in cm<sup>2</sup>.

Answer(c)(ii) ..... cm<sup>2</sup> [2]

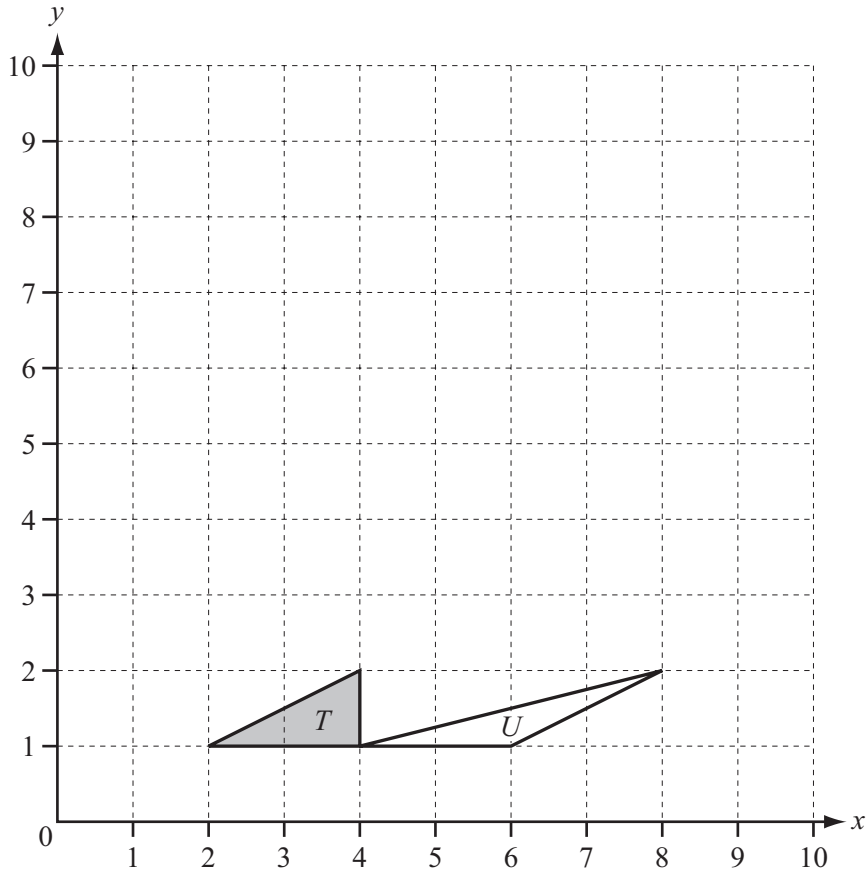
(d) A fence,  $BD$ , divides the playground into two areas.

Calculate the shortest distance from  $A$  to  $BD$ .

Answer(d) ..... m [2]

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5 (a)

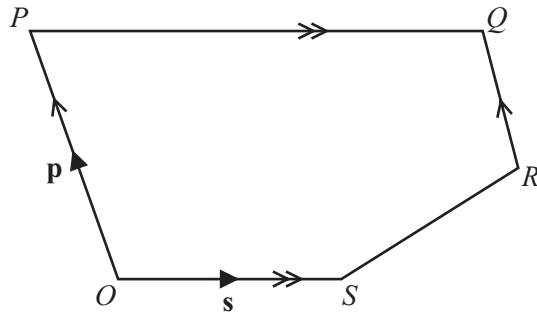


- (i) Draw the reflection of triangle  $T$  in the line  $y = 5$ . [2]
- (ii) Draw the rotation of triangle  $T$  about the point  $(4, 2)$  through  $180^\circ$ . [2]
- (iii) Describe fully the **single** transformation that maps triangle  $T$  onto triangle  $U$ .  
*Answer(a)(iii)* ..... [3]
- (iv) Find the  $2 \times 2$  matrix which represents the transformation in **part (a)(iii)**.

*Answer(a)(iv)*  $\left( \begin{array}{cc} & \\ & \end{array} \right)$  [2]



(b)



NOT TO  
SCALE

In the pentagon  $OPQRS$ ,  $OP$  is parallel to  $RQ$  and  $OS$  is parallel to  $PQ$ .  
 $PQ = 2OS$  and  $OP = 2RQ$ .  
 $O$  is the origin,  $\vec{OP} = \mathbf{p}$  and  $\vec{OS} = \mathbf{s}$ .

Find, in terms of  $\mathbf{p}$  and  $\mathbf{s}$ , in their simplest form,

(i) the position vector of  $Q$ ,

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

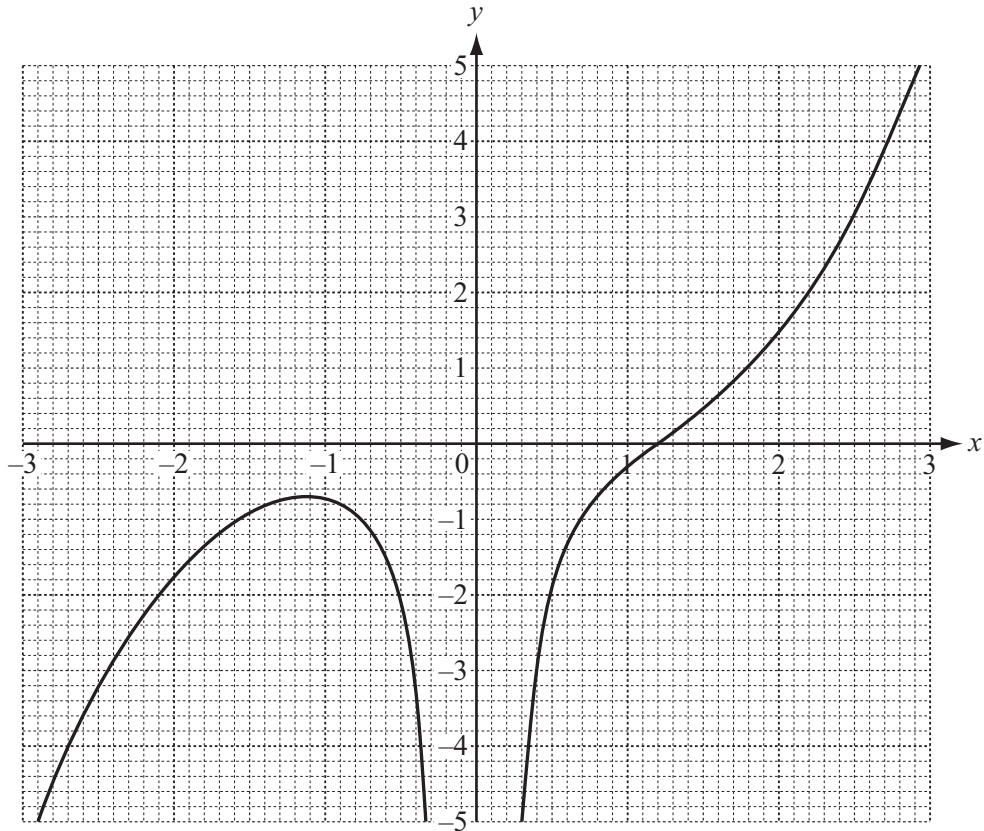
(ii)  $\vec{SR}$ .

Answer(b)(ii)  $\vec{SR} =$  ..... [2]

(c) Explain what your answers in **part (b)** tell you about the lines  $OQ$  and  $SR$ .

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

6 (a)



The diagram shows the graph of  $y = f(x)$  for  $-3 \leq x \leq 3$ .

(i) Find  $f(2)$ .

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

(ii) Solve the equation  $f(x) = 0$ .

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

(iii) Write down the value of the largest **integer**,  $k$ , for which the equation  $f(x) = k$  has 3 solutions.

Answer(a)(iii)  $k =$  ..... [1]

(iv) By drawing a suitable straight line, solve the equation  $f(x) = x$ .

Answer(a)(iv)  $x =$  ..... or  $x =$  ..... or  $x =$  ..... [3]

**(b)**  $g(x) = 1 - 2x$        $h(x) = x^2 - 1$

**(i)** Find  $gh(3)$ .

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

**(ii)** Find  $g^{-1}(x)$ .

*Answer(b)(ii)*  $g^{-1}(x) =$  ..... [2]

**(iii)** Solve the equation  $h(x) = 3$ .

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

**(iv)** Solve the equation  $g(3x) = 2x$ .

*Answer(b)(iv)*  $x =$  ..... [3]

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- 7 120 students are asked to answer a question.  
The time,  $t$  seconds, taken by each student to answer the question is measured.  
The frequency table shows the results.

Time	$0 < t \leq 10$	$10 < t \leq 20$	$20 < t \leq 30$	$30 < t \leq 40$	$40 < t \leq 50$	$50 < t \leq 60$
Frequency	6	44	40	14	10	6

- (a) Calculate an estimate of the mean time.

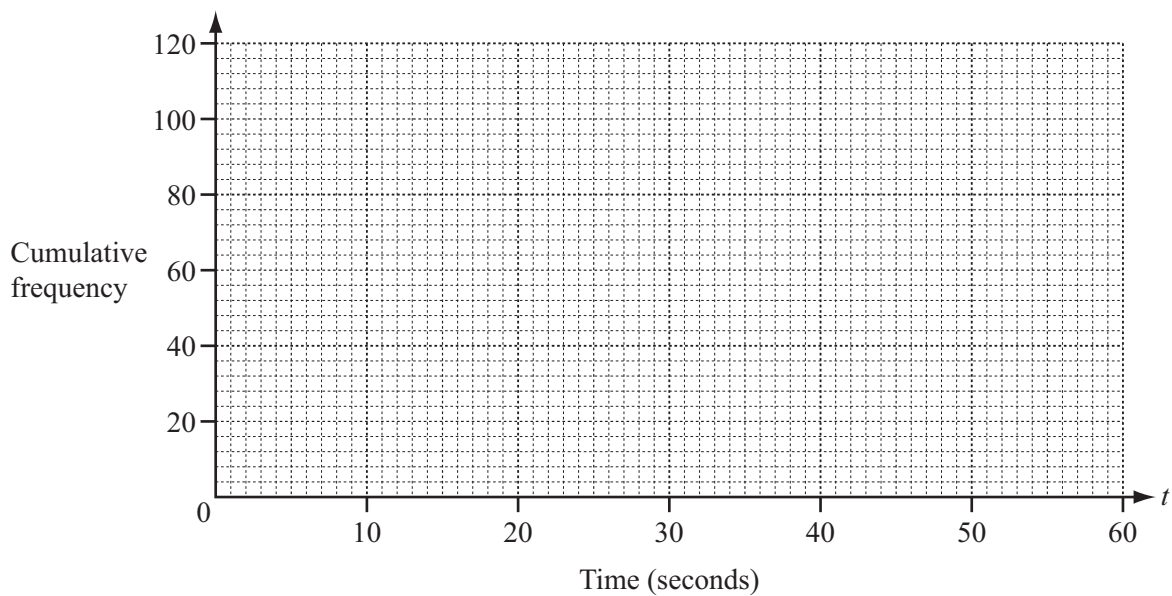
Answer(a) ..... s [4]

- (b) (i) Complete the cumulative frequency table.

Time	$t \leq 10$	$t \leq 20$	$t \leq 30$	$t \leq 40$	$t \leq 50$	$t \leq 60$
Cumulative frequency	6			104		120

[2]

- (ii) On the grid below, draw a cumulative frequency diagram to show this information.



[3]

- (iii) Use your cumulative frequency diagram to find the median, the lower quartile and the 60th percentile.

Answer(b)(iii)                      Median ..... s  
    Lower quartile ..... s  
    60th percentile ..... s [4]

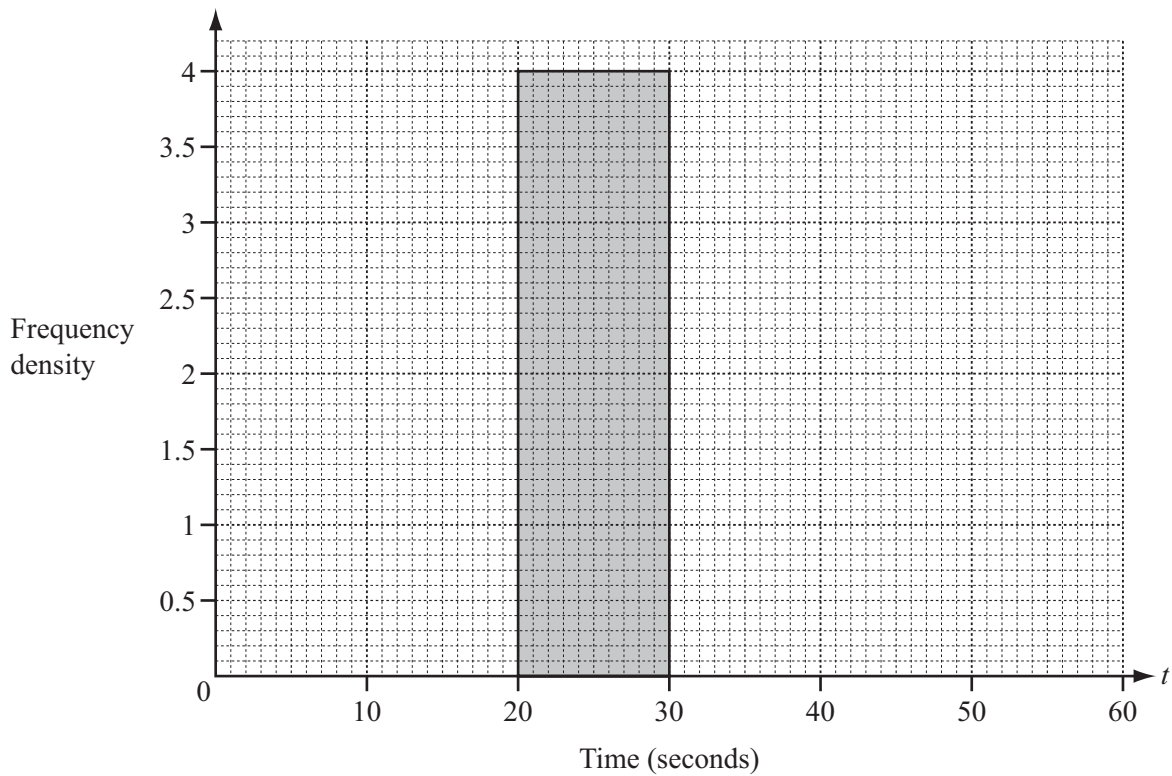
- (c) The intervals for the times taken are changed.

- (i) Use the information in the **frequency table** on the opposite page to complete this new table.

Time	$0 < t \leq 20$	$20 < t \leq 30$	$30 < t \leq 60$
Frequency		40	

[2]

- (ii) On the grid below, complete the histogram to show the information in the new table. One column has already been drawn for you.



[3]

- 8 (a) Solve the equation  $8x^2 - 11x - 11 = 0$ .  
Show all your working and give your answers correct to 2 decimal places.

*Answer(a)*  $x = \dots\dots\dots$  or  $x = \dots\dots\dots$  [4]

- (b)  $y$  varies directly as the square root of  $x$ .  
 $y = 18$  when  $x = 9$ .

Find  $y$  when  $x = 484$ .

*Answer(b)*  $y = \dots\dots\dots$  [3]

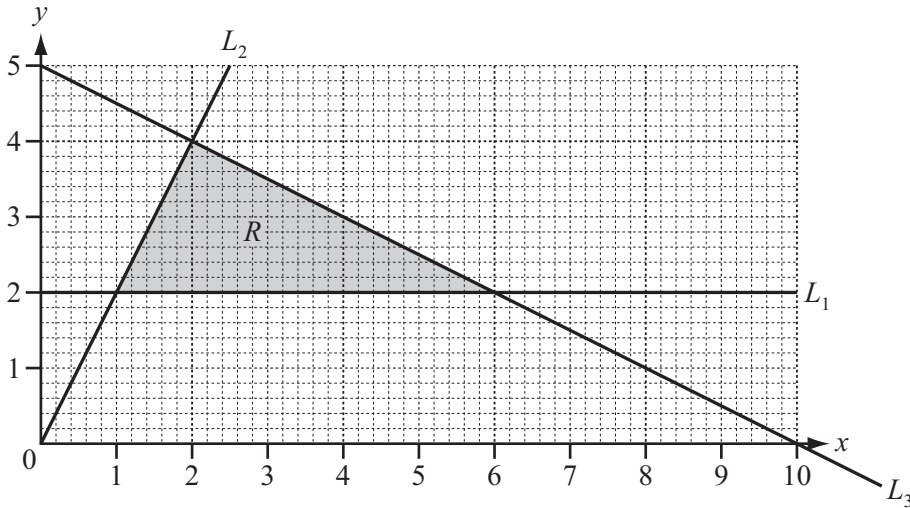
- (c) Sara spends  $\$x$  on pens which cost  $\$2.50$  each.  
She also spends  $\$(x - 14.50)$  on pencils which cost  $\$0.50$  each.  
The **total** of the number of pens and the number of pencils is 19.

Write down and solve an equation in  $x$ .

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*Answer(c)  $x =$  ..... [6]*

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(a) Find the equations of the lines  $L_1$ ,  $L_2$  and  $L_3$ .

Answer(a)  $L_1$  .....

$L_2$  .....

$L_3$  ..... [5]

(b) Write down the three inequalities that define the shaded region,  $R$ .

Answer(b) .....

.....

..... [3]



- (c) A gardener buys  $x$  bushes and  $y$  trees.  
The cost of a bush is \$30 and the cost of a tree is \$200.  
The shaded region  $R$  shows the only possible numbers of bushes and trees the gardener can buy.
- (i) Find the number of bushes and the number of trees when the total cost is \$720.

*Answer(c)(i)* ..... bushes  
..... trees [2]

- (ii) Find the number of bushes and the number of trees which give the greatest possible total cost.  
Write down this greatest possible total cost.

*Answer(c)(ii)* ..... bushes  
..... trees  
Greatest possible total cost = \$ ..... [3]

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<b>10 (a)</b>	1	= 1
	1 + 2	= 3
	1 + 2 + 3	= 6
	1 + 2 + 3 + 4	= 10

- (i) Write down the next line of this pattern.

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

- (ii) The sum of the first  $n$  integers is  $\frac{n}{k}(n + 1)$ .

Show that  $k = 2$ .

*Answer(a)(ii)*

[2]

- (iii) Find the sum of the first 60 integers.

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

- (iv) Find  $n$  when the sum of the first  $n$  integers is 465.

*Answer(a)(iv)*  $n =$  ..... [2]

- (v)  $1 + 2 + 3 + 4 + \dots + x = \frac{(n - 8)(n - 7)}{2}$

Write  $x$  in terms of  $n$ .

*Answer(a)(v)*  $x =$  ..... [1]

<b>(b)</b>	$1^3$	$= 1$
	$1^3 + 2^3$	$= 9$
	$1^3 + 2^3 + 3^3$	$= 36$
	$1^3 + 2^3 + 3^3 + 4^3$	$= 100$

**(i)** Complete the statement.

$$1^3 + 2^3 + 3^3 + 4^3 + 5^3 = \dots\dots\dots = (\dots\dots\dots)^2 \quad [2]$$

**(ii)** The sum of the first  $n$  integers is  $\frac{n}{2}(n + 1)$ .

Find an expression, in terms of  $n$ , for the sum of the first  $n$  cubes.

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

**(iii)** Find the sum of the first 19 cubes.

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

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