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0580/22

May/June 2018

1 hour 30 minutes

Additional Materials: Electronic calculator Geometrical instruments
Tracing paper (optional)

READ THESE INSTRUCTIONS FIRST

DO **NOT** WRITE IN ANY BARCODES.

For π , use either your calculator value or 3.142.

The total of the marks for this paper is 70.

This document consists of **15** printed pages and **1** blank page.

- 1 One morning, Marcia works from 08 20 to 11 15.

Find how long she works for.

Give your answer in hours and minutes.

..... h min [1]

- 2 Expand.

$$7(x - 8)$$

..... [1]

- 3 Here is a sequence.

a , 13, 9, 3, -5, -15, b , ...

Find the value of a and the value of b .

$a =$

$b =$ [2]

- 4 Complete these statements.

(a) When $w =$, $10w = 70$. [1]

(b) When $5x = 15$, $12x =$ [1]

- 5 22 17 25 41 39 4

Work out the difference between the two prime numbers in the list above.

..... [2]

- 6 Without using your calculator, work out $\frac{2}{3} - \frac{1}{12}$.

You must show all your working and give your answer as a fraction in its simplest form.

..... [2]

- 7 A and B are two towns on a map.
The bearing of A from B is 140° .

Work out the bearing of B from A .

..... [2]

- 8 Here are some numbers written in standard form.

$$3.4 \times 10^{-1} \quad 1.36 \times 10^6 \quad 7.9 \times 10^0 \quad 2.4 \times 10^5 \quad 5.21 \times 10^{-3} \quad 4.3 \times 10^{-2}$$

From these numbers, write down

- (a) the largest number,

..... [1]

- (b) the smallest number.

..... [1]

- 9 Using a straight edge and compasses only, construct the locus of points that are equidistant from A and B .

$A \bullet$

$\bullet B$

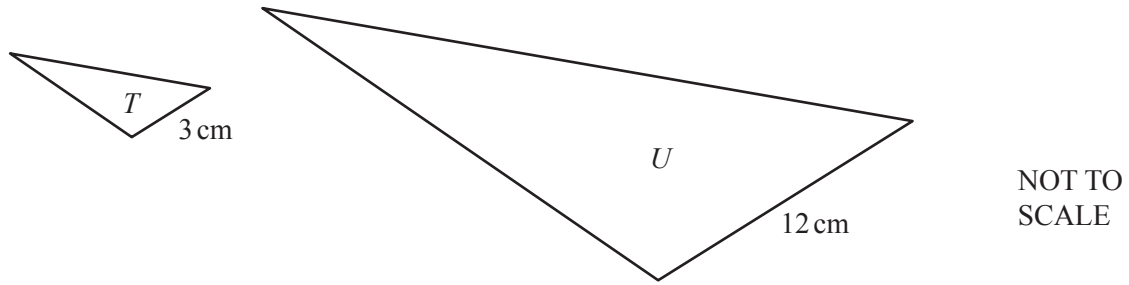
[2]

- 10 Factorise completely.

$$xy + 2y + 3x + 6$$

..... [2]

11



The diagram shows two mathematically similar triangles, T and U .
Two corresponding side lengths are 3 cm and 12 cm.
The area of triangle T is 5 cm^2 .

Find the area of triangle U .

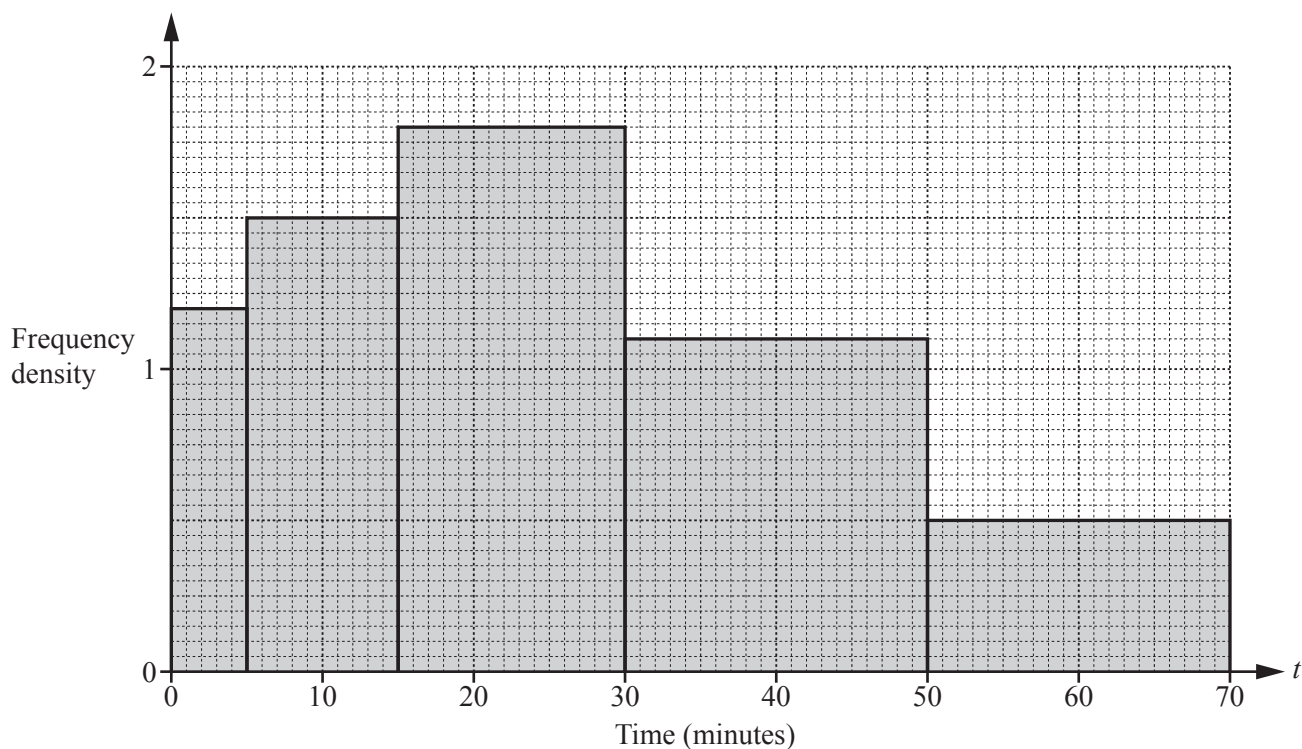
..... cm^2 [2]

- 12** Anna walks 31 km at a speed of 5 km/h.
Both values are correct to the nearest whole number.

Work out the upper bound of the time taken for Anna's walk.

..... hours [2]

- 13 The histogram shows information about the time, t minutes, spent in a shop by each of 80 people.

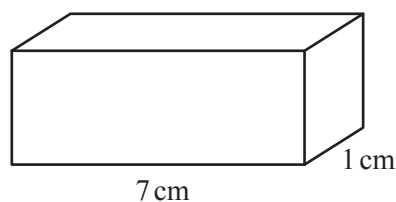


Complete the frequency table.

Time (t minutes)	$0 < t \leq 5$	$5 < t \leq 15$	$15 < t \leq 30$	$30 < t \leq 50$	$50 < t \leq 70$
Number of people	6		27		10

[2]

14



NOT TO
SCALE

The diagram shows a solid cuboid with base area 7 cm^2 .
The volume of this cuboid is 21 cm^3 .

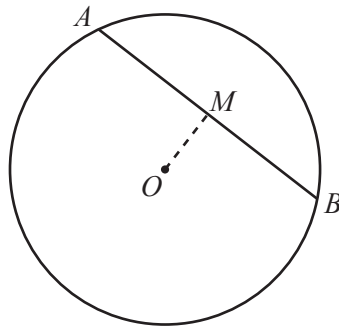
Work out the total surface area.

..... cm^2 [3]

- 15 Find the volume of a cylinder of radius 5 cm and height 8 cm.
Give the units of your answer.

..... [3]

16



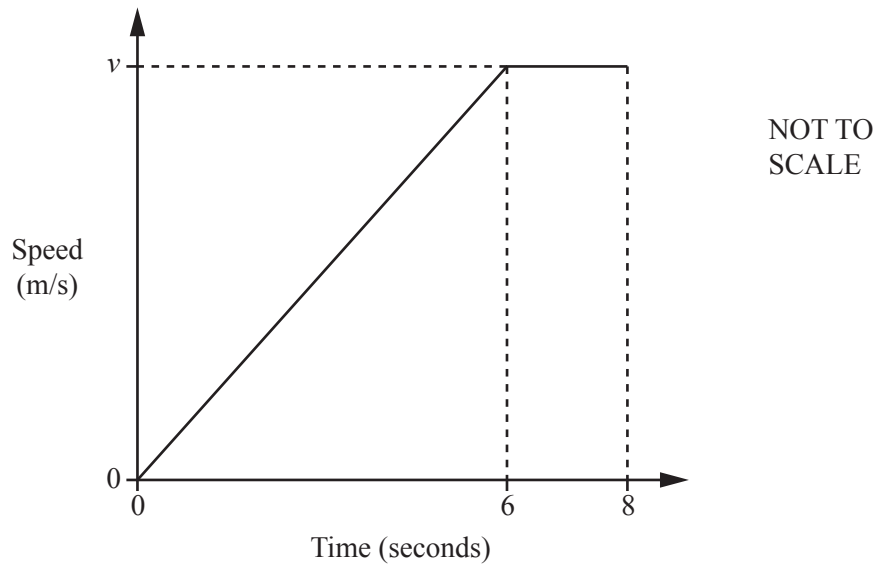
NOT TO
SCALE

The diagram shows a circle, centre O .
 AB is a chord of length 12 cm.
 M is the mid-point of AB and $OM = 4.5$ cm.

Calculate the radius of the circle.

..... cm [3]

- 17 The diagram shows information about the first 8 seconds of a car journey.



The car travels with constant acceleration reaching a speed of v m/s after 6 seconds.
The car then travels at a constant speed of v m/s for a further 2 seconds.
The car travels a total distance of 150 metres.

Work out the value of v .

$v = \dots\dots\dots$ [3]

- 18 A ball falls d metres in t seconds.
 d is directly proportional to the square of t .
 The ball falls 44.1 m in 3 seconds.

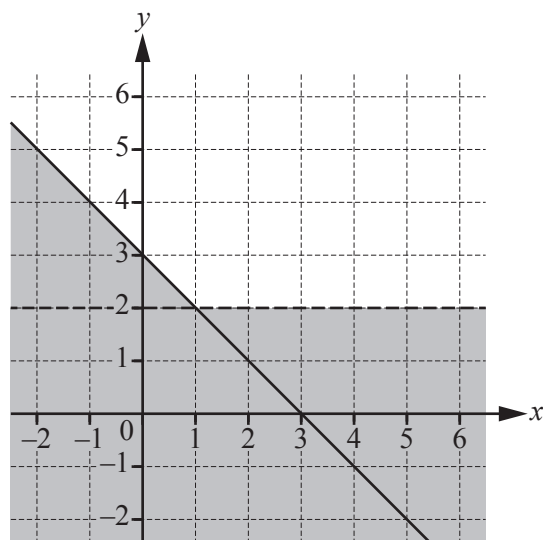
(a) Find a formula for d in terms of t .

$d = \dots\dots\dots$ [2]

(b) Calculate the distance the ball falls in 2 seconds.

$\dots\dots\dots$ m [1]

19



Find the two inequalities that define the region on the grid that is **not** shaded.

$\dots\dots\dots$
 $\dots\dots\dots$ [3]

20 $\mathbf{A} = \begin{pmatrix} 1 & 1 \\ 9 & 9 \end{pmatrix}$ $\mathbf{B} = \begin{pmatrix} 0 & 1 \\ 9 & 8 \end{pmatrix}$ $\mathbf{C} = \begin{pmatrix} 1 & 1 \\ 3 & 3 \end{pmatrix}$ $\mathbf{I} = \begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix}$

(a) Here are four matrix calculations.

$\mathbf{AI}$

$\mathbf{IA}$

$\mathbf{C}^2$

$\mathbf{B} + \mathbf{I}$

Work out which matrix calculation does **not** give the answer $\begin{pmatrix} 1 & 1 \\ 9 & 9 \end{pmatrix}$.

..... [2]

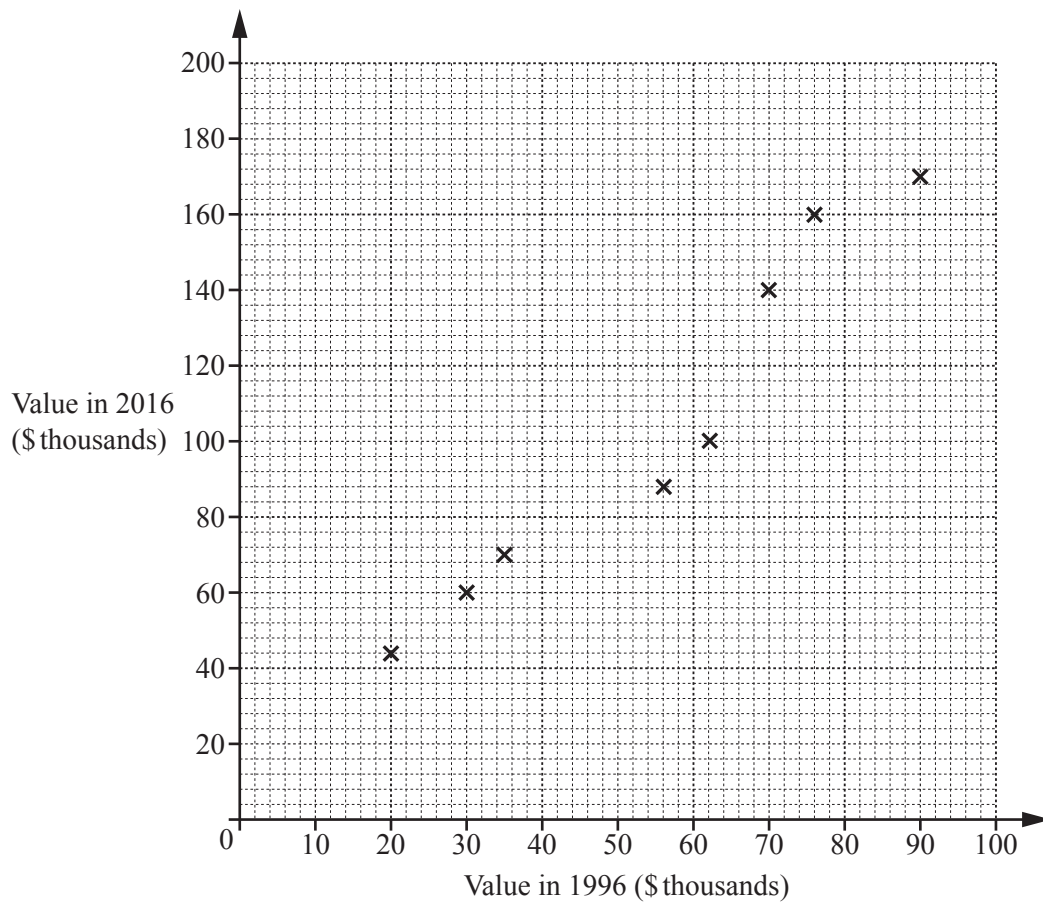
(b) Find $|\mathbf{B}|$.

..... [1]

(c) Explain why matrix $\mathbf{A}$ has no inverse.

..... [1]

- 21 The scatter diagram shows the value, in thousands of dollars, of eight houses in 1996 and the value of the same houses in 2016.



- (a) One of these eight houses had a value of \$70 000 in 1996.

Write down the value of this house in 2016.

\$ [1]

- (b) The values of two more houses are shown in the table.

Value in 1996 (\$ thousands)	40	80
Value in 2016 (\$ thousands)	80	150

On the scatter diagram, plot these values.

[1]

- (c) On the scatter diagram, draw a line of best fit.

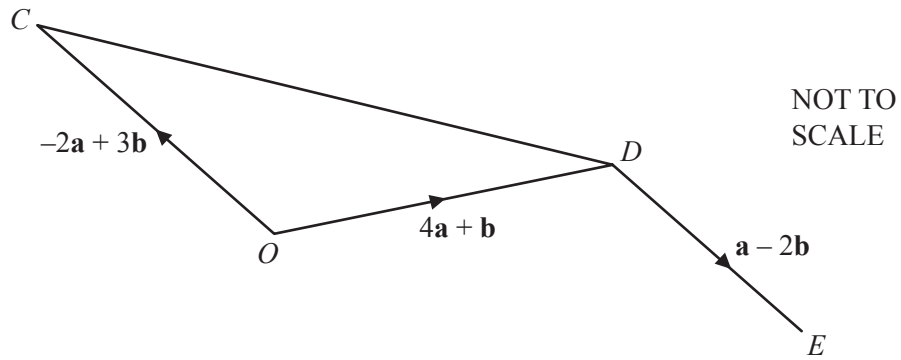
[1]

- (d) Another house had a value of \$50 000 in 1996.

Find an estimate of the value of this house in 2016.

\$ [1]

22



In the diagram, O is the origin, $\overrightarrow{OC} = -2\mathbf{a} + 3\mathbf{b}$ and $\overrightarrow{OD} = 4\mathbf{a} + \mathbf{b}$.

- (a) Find $\overrightarrow{CD}$, in terms of $\mathbf{a}$ and $\mathbf{b}$, in its simplest form.

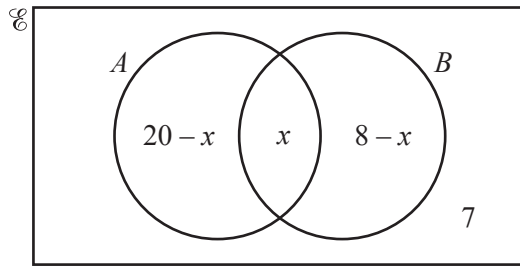
$$\overrightarrow{CD} = \dots\dots\dots [2]$$

- (b) $\overrightarrow{DE} = \mathbf{a} - 2\mathbf{b}$

Find the position vector of E , in terms of $\mathbf{a}$ and $\mathbf{b}$, in its simplest form.

$$\dots\dots\dots [2]$$

- 23 The Venn diagram shows information about the number of elements in sets A , B and $\mathcal{C}$.



- (a) $n(A \cup B) = 23$

Find the value of x .

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

- (b) An element is chosen at random from $\mathcal{C}$.

Find the probability that this element is in $(A \cup B)'$.

$\dots\dots\dots$ [2]

- 24** Box A and box B each contain blue and green pens only.
Raphael picks a pen at random from box A and Paulo picks a pen at random from box B .
The probability that Raphael picks a blue pen is $\frac{2}{3}$.
The probability that both Raphael and Paulo pick a blue pen is $\frac{8}{15}$.

(a) Find the probability that Paulo picks a blue pen.

..... [2]

(b) Find the probability that both Raphael and Paulo pick a green pen.

..... [3]

25 P is the point $(16, 9)$ and Q is the point $(22, 24)$.

- (a)** Find the equation of the line perpendicular to PQ that passes through the point $(5, 1)$.
Give your answer in the form $y = mx + c$.

$y = \dots\dots\dots$ [4]

- (b)** N is the point on PQ such that $PN = 2NQ$.

Find the co-ordinates of N .

$(\dots\dots\dots, \dots\dots\dots)$ [2]

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