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0580/21

May/June 2017

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 Simplify.
 $(x^2)^5$

..... [1]

- 2 The thickness of one sheet of paper is 8×10^{-3} cm.

Work out the thickness of 250 sheets of paper.

..... cm [1]

- 3 Write 23.4571 correct to

(a) 4 significant figures,

..... [1]

(b) the nearest 10.

..... [1]

- 4 The table shows the temperatures in five places at 10 am one day in January.

Place	Temperature ($^{\circ}\text{C}$)
Helsinki	-7
Chicago	-10
London	3
Moscow	-4
Bangkok	26

(a) Which place was the coldest?

..... [1]

(b) At 2 pm the temperature in Helsinki had increased by 4°C .

Write down the temperature in Helsinki at 2 pm.

..... $^{\circ}\text{C}$ [1]

- 5 Factorise completely.

$$12n^2 - 4mn$$

..... [2]

6 (a) $2^r = \frac{1}{16}$

Find the value of r .

$r =$ [1]

(b) $3^t = \sqrt[5]{3}$

Find the value of t .

$t =$ [1]

- 7 Without using a calculator, work out $1\frac{2}{3} + \frac{5}{7}$.

Write down all the steps of your working and give your answer as a mixed number in its simplest form.

..... [3]

- 8 Simon has two boxes of cards.
 In one box, each card has one shape drawn on it that is either a triangle or a square.
 In the other box, each card is coloured either red or blue.

Simon picks a card from each box at random.
 The probability of picking a triangle card is t .
 The probability of picking a red card is r .

Complete the table for the cards that Simon picks, writing each probability in terms of r and t .

Event	Probability
Triangle and red	
Square and red	$(1 - t)r$
Triangle and blue	
Square and blue	

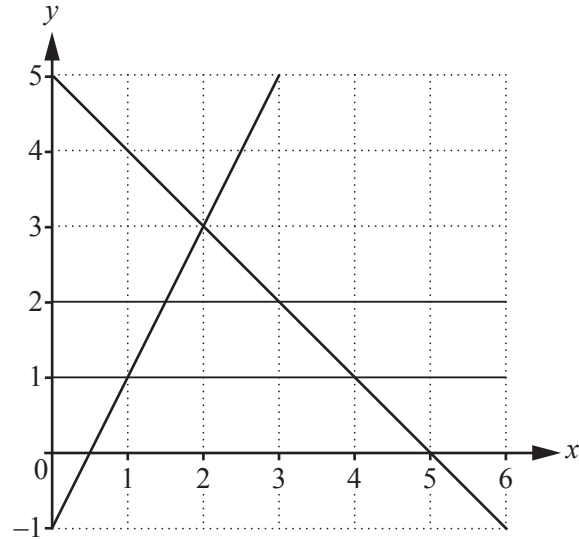
[3]

- 9 h is directly proportional to the square root of p .
 $h = 5.4$ when $p = 1.44$.

Find h when $p = 2.89$.

$h = \dots\dots\dots$ [3]

10



By shading the **unwanted** regions of the grid, find and label the region R that satisfies the following four inequalities.

$$y \leq 2$$

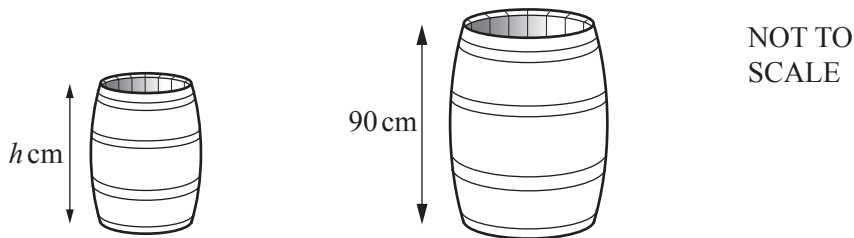
$$y \geq 1$$

$$y \leq 2x - 1$$

$$y \leq 5 - x$$

[3]

- 11 The two barrels in the diagram are mathematically similar.



The smaller barrel has a height of h cm and a capacity of 100 litres.
The larger barrel has a height of 90 cm and a capacity of 160 litres.

Work out the value of h .

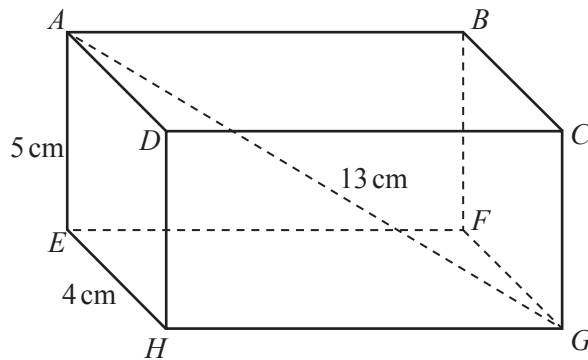
$h = \dots\dots\dots$ [3]

- 12 A line has gradient 5.
 M and N are two points on this line.
 M is the point $(x, 8)$ and N is the point $(k, 23)$.

Find an expression for x in terms of k .

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

13



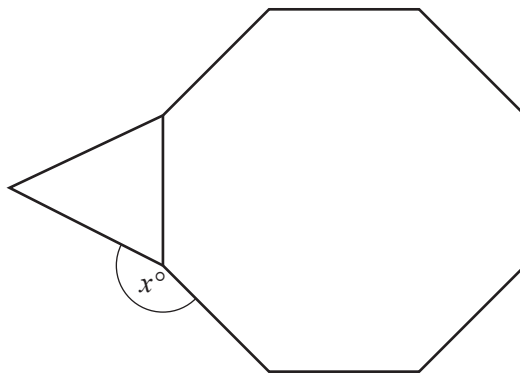
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The diagram shows a cuboid $ABCDEFGH$.
 $AE = 5$ cm, $EH = 4$ cm and $AG = 13$ cm.

Calculate the angle between the line AG and the base $EFGH$ of the cuboid.

$\dots\dots\dots$ [3]

- 14 The diagram shows a regular octagon joined to an equilateral triangle.

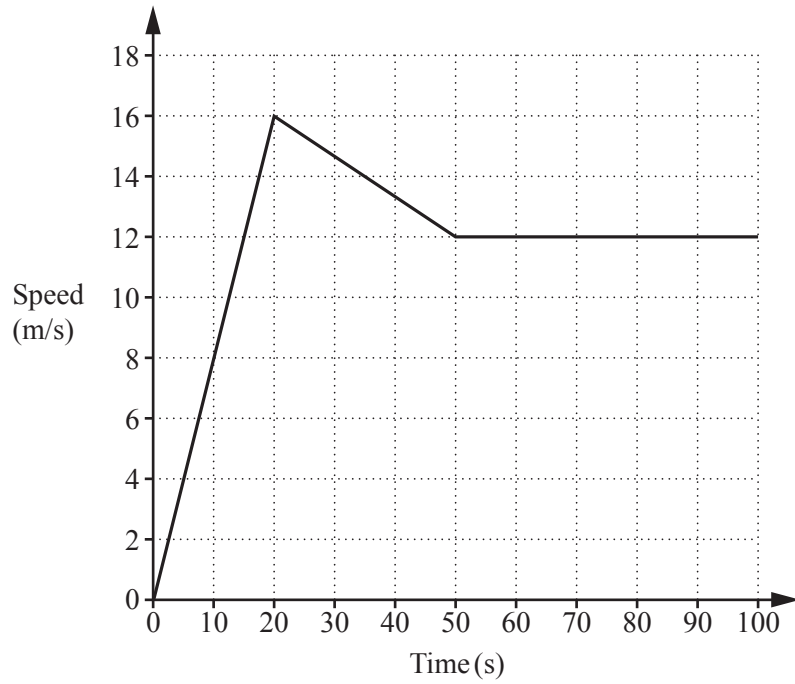


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Work out the value of x .

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

- 15 The diagram shows information about the first 100 seconds of a car journey.



- (a) Calculate the acceleration during the first 20 seconds of the journey.

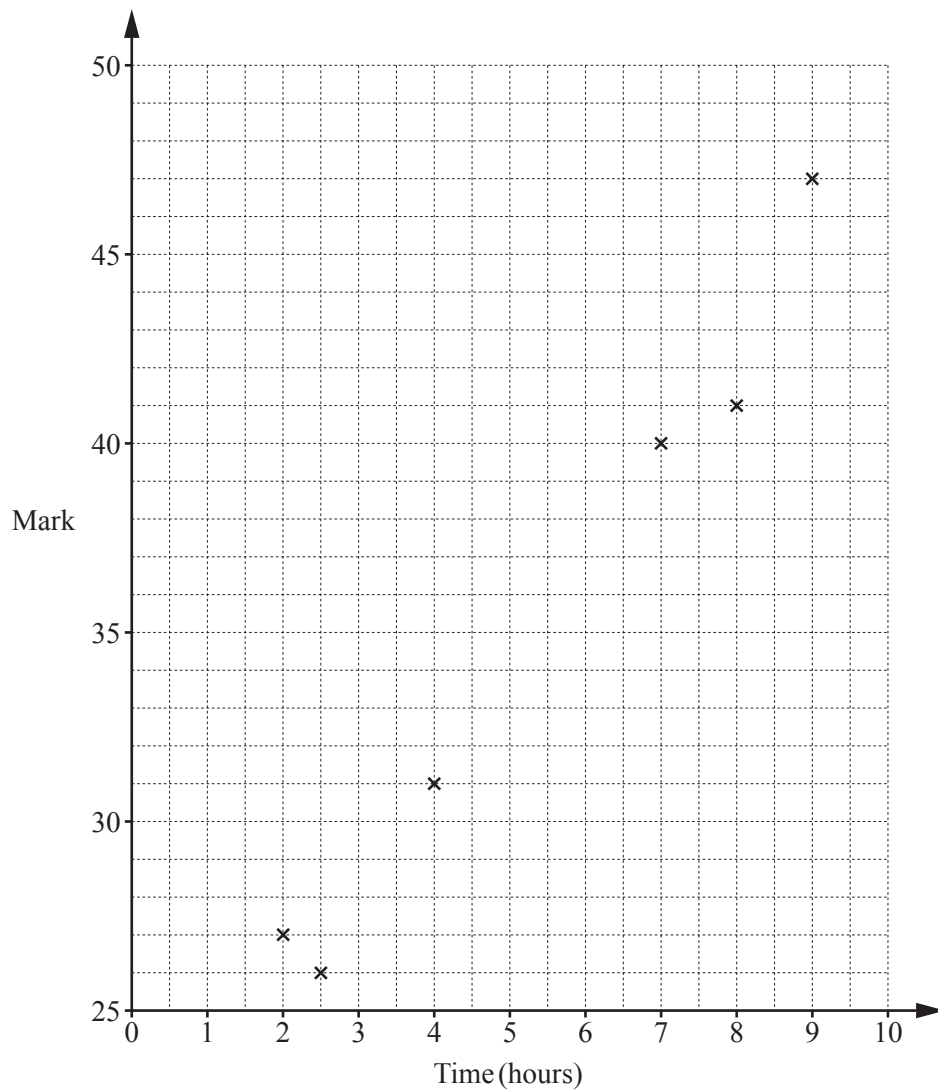
.....m/s² [1]

- (b) Work out the total distance travelled by the car in the 100 seconds.

.....m [3]

- 16 Six students revise for a test.

The scatter diagram shows the time, in hours, each student spent revising and their mark in the test.



- (a) The data for two more students is shown in the table.

Time (hours)	4.5	6.5
Mark	33	35

Plot these two points on the scatter diagram.

[1]

- (b) What type of correlation is shown on the scatter diagram?

..... [1]

- (c) Draw a line of best fit on the scatter diagram.

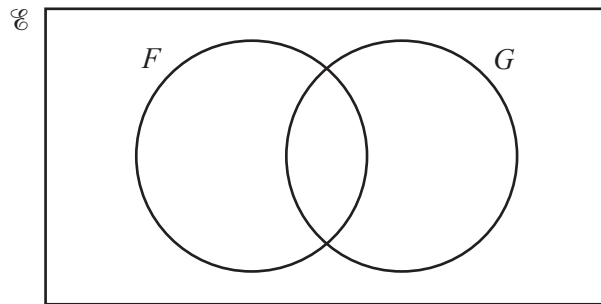
[1]

- (d) Another student spent 5.5 hours revising.

Estimate a mark for this student.

..... [1]

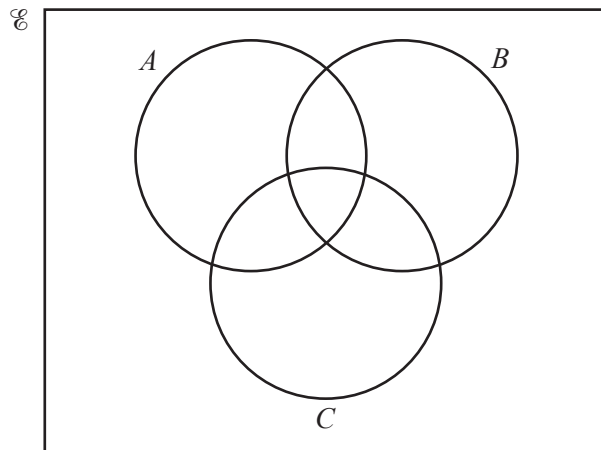
- 17 (a) In this Venn diagram, shade the region $F \cup G'$.



[1]

- (b) $E = \{1, 2, 3, 4, 5, 6, 7, 8, 9\}$
 $A = \{x: x \text{ is an odd number}\}$
 $B = \{x: x \text{ is a square number}\}$
 $C = \{x: x \text{ is a multiple of 3}\}$

- (i) Write all the elements of E in the Venn diagram below.



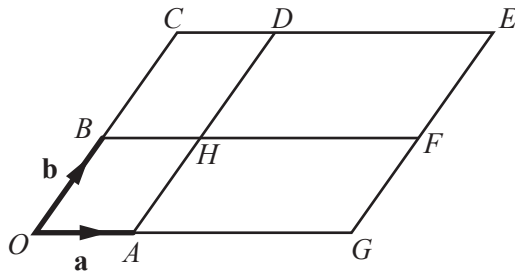
[2]

- (ii) Another number is included in the set E .
 This number is in the region $A' \cap B \cap C$.

Write down a possible value for this number.

..... [1]

- 18 The diagram shows a parallelogram $OCEG$.



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SCALE

O is the origin, $\overrightarrow{OA} = \mathbf{a}$ and $\overrightarrow{OB} = \mathbf{b}$.
 BHF and AHD are straight lines parallel to the sides of the parallelogram.
 $\overrightarrow{OG} = 3\overrightarrow{OA}$ and $\overrightarrow{OC} = 2\overrightarrow{OB}$.

- (a) Write the vector $\overrightarrow{HE}$ in terms of $\mathbf{a}$ and $\mathbf{b}$.

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

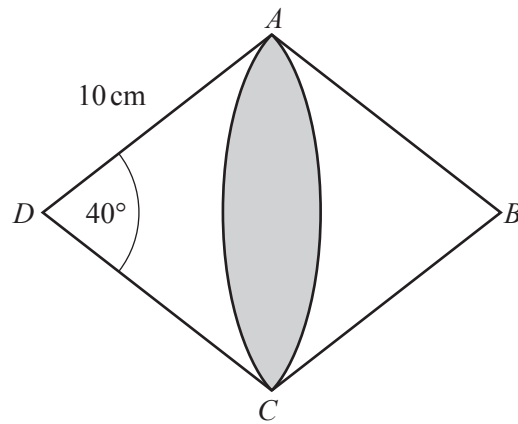
- (b) Complete this statement.

$\mathbf{a} + 2\mathbf{b}$ is the position vector of point [1]

- (c) Write down two vectors that can be written as $3\mathbf{a} - \mathbf{b}$.

..... and [2]

- 19 $ABCD$ is a rhombus with side length 10 cm.



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Angle $ADC = 40^\circ$.

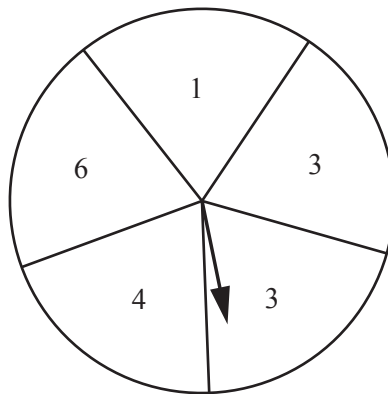
DAC is a sector of a circle with centre D .

BAC is a sector of a circle with centre B .

Calculate the shaded area.

..... cm^2 [4]

20 The diagram shows a fair spinner.



Anna spins it twice and adds the scores.

(a) Complete the table for the total scores.

		Score on first spin				
		1	3	3	4	6
Score on second spin	1	2	4	4	5	7
	3	4	6	6	7	9
	3	4	6	6	7	9
	4					
	6					

[1]

(b) Write down the most likely total score.

..... [1]

(c) Find the probability that Anna scores

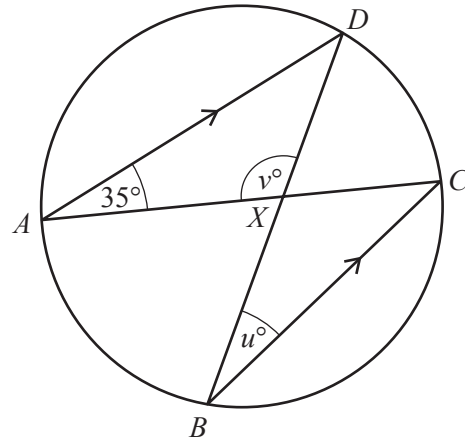
(i) a total less than 6,

..... [2]

(ii) a total of 3.

..... [1]

21 (a)

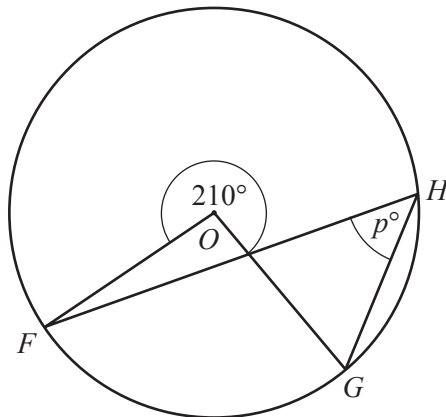
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A , B , C and D are points on the circle.
 AD is parallel to BC .
 The chords AC and BD intersect at X .

Find the value of u and the value of v .

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

(b)

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F , G and H are points on the circle, centre O .

Find the value of p .

 $p = \dots\dots\dots [2]$

22 Write as a single fraction in its simplest form.

(a) $\frac{x^2 - 3x}{x^2 - 9}$

..... [3]

(b) $\frac{3}{x-4} + \frac{2}{2x+5}$

..... [3]

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