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0580/42

May/June 2018

2 hours 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 130.

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

- 1 (a) Here is a list of ingredients to make 20 biscuits.

260g of butter
 500g of sugar
 650g of flour
 425g of rice

- (i) Find the mass of rice as a percentage of the mass of sugar.

..... % [1]

- (ii) Find the mass of butter needed to make 35 of these biscuits.

..... g [2]

- (iii) Michel has 2 kg of each ingredient.

Work out the greatest number of these biscuits that he can make.

..... [3]

- (b) A company makes these biscuits at a cost of \$1.35 per packet.
 These biscuits are sold for \$1.89 per packet.

- (i) Calculate the percentage profit the company makes on each packet.

..... % [3]

- (ii) The selling price of \$1.89 has increased by 8% from last year.

Calculate the selling price last year.

\$ [3]

- (c) Over a period of 3 years, the company's sales of biscuits increased from 15.6 million packets to 20.8 million packets.

The sales increased exponentially by the same percentage each year.

Calculate the percentage increase **each year**.

..... % [3]

- (d) The people who work for the company are in the following age groups.

Group A	Group B	Group C
Under 30 years	30 to 50 years	Over 50 years

The ratio of the number in group A to the number in group B is 7 : 10.

The ratio of the number in group B to the number in group C is 4 : 3.

- (i) Find the ratio of the number in group A to the number in group C.
Give your answer in its simplest form.

..... : [3]

- (ii) There are 45 people in group C.

Find the total number of people who work for the company.

..... [3]

- 2 The time taken for each of 120 students to complete a cooking challenge is shown in the table.

Time (t minutes)	$20 < t \leq 25$	$25 < t \leq 30$	$30 < t \leq 35$	$35 < t \leq 40$	$40 < t \leq 45$
Frequency	44	32	28	12	4

- (a) (i) Write down the modal time interval.

..... $< t \leq$ [1]

- (ii) Write down the interval containing the median time.

..... $< t \leq$ [1]

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

..... min [4]

- (iv) A student is chosen at random.

Find the probability that this student takes more than 40 minutes.

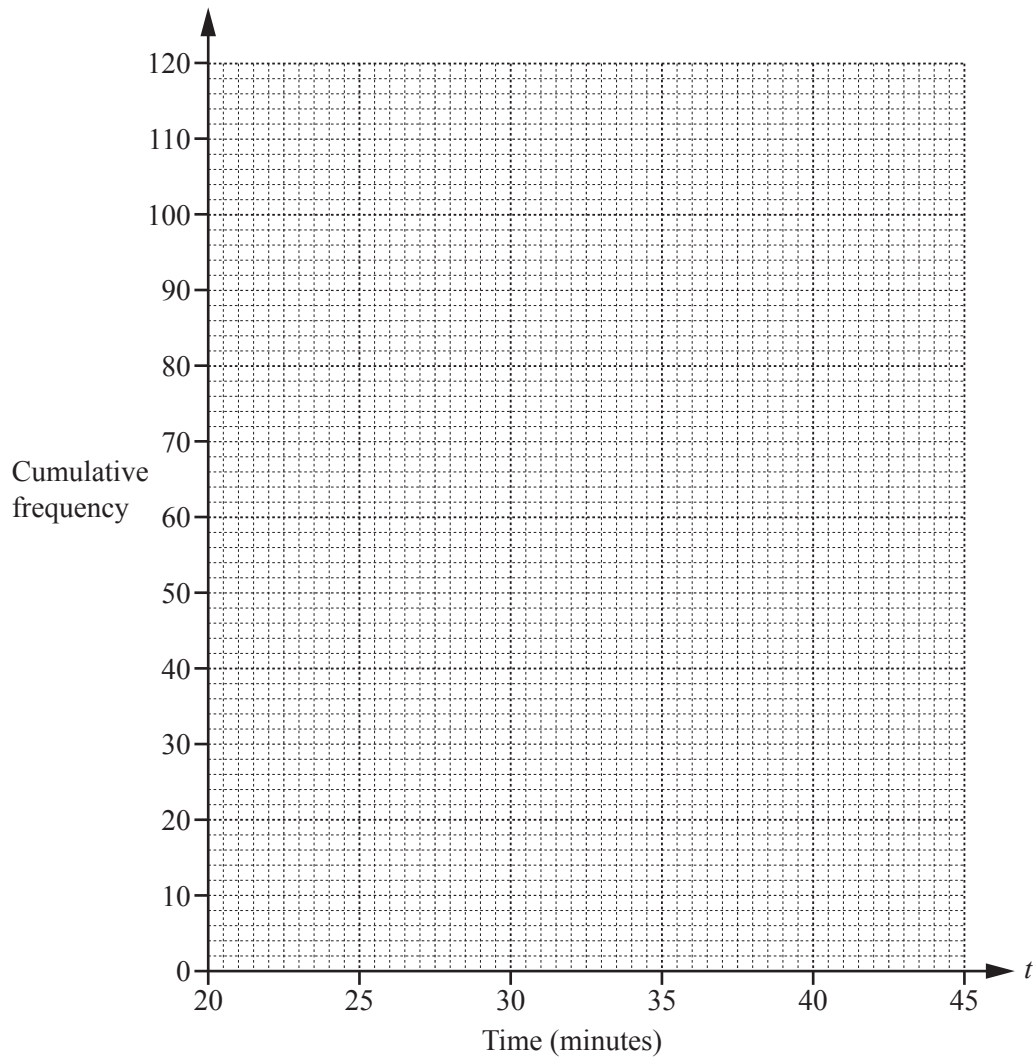
..... [1]

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

Time (t minutes)	$t \leq 20$	$t \leq 25$	$t \leq 30$	$t \leq 35$	$t \leq 40$	$t \leq 45$
Cumulative frequency	0	44				

[2]

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



[3]

- (iii) Find the median time.

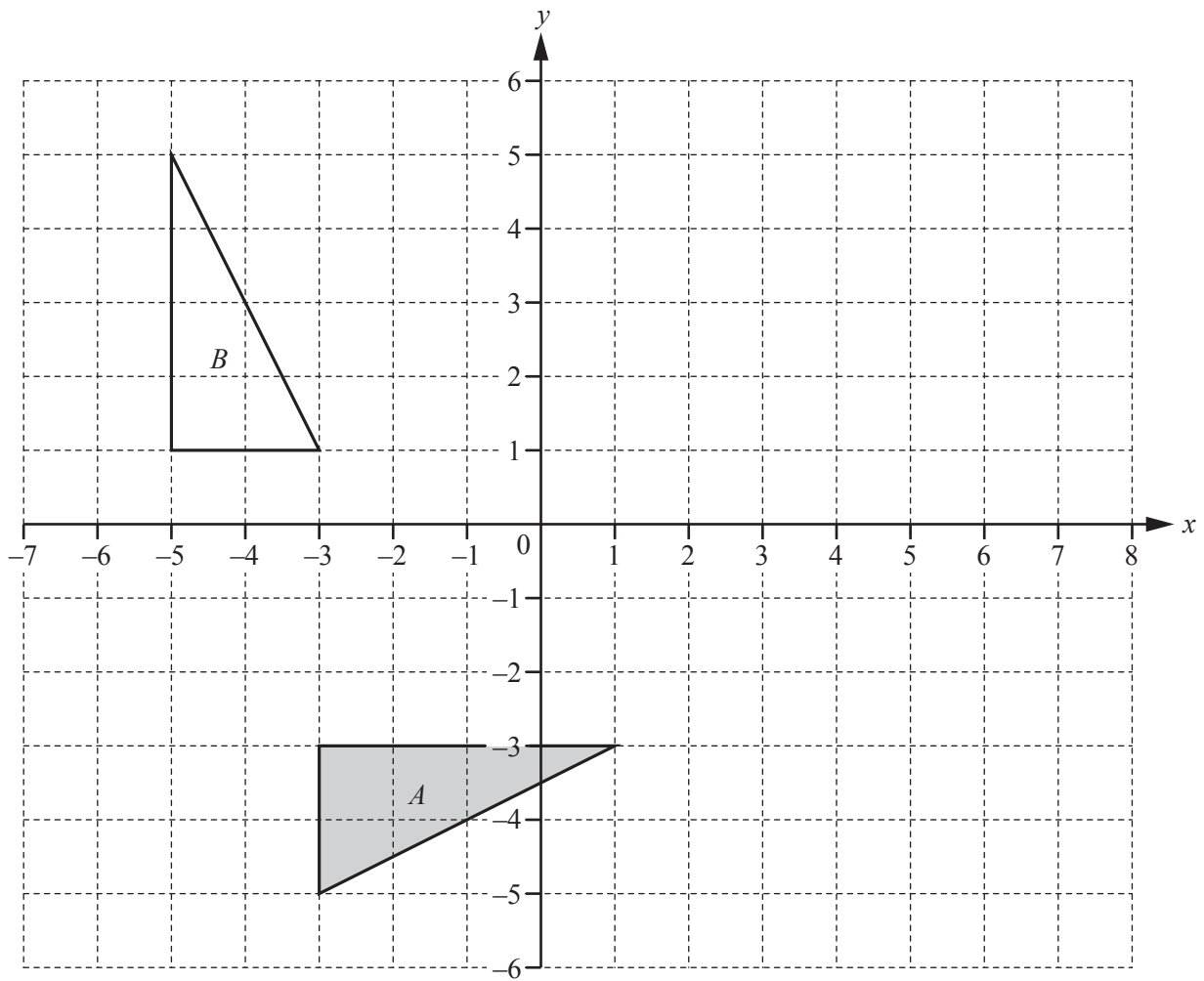
..... min [1]

- (iv) Find the interquartile range.

..... min [2]

- (v) Find the number of students who took more than 37 minutes to complete the cooking challenge.

..... [2]



(a) (i) Draw the image of triangle A after a reflection in the line $x = 2$. [2]

(ii) Draw the image of triangle A after a translation by the vector $\begin{pmatrix} -2 \\ 4 \end{pmatrix}$. [2]

(iii) Draw the image of triangle A after an enlargement by scale factor $-\frac{1}{2}$, centre $(3, 1)$. [3]

(b) Describe fully the **single** transformation that maps triangle A onto triangle B .

..... [3]

(c) Describe fully the **single** transformation represented by the matrix $\begin{pmatrix} 0 & -1 \\ -1 & 0 \end{pmatrix}$.

..... [2]

4 (a) Simplify.

(i) $(3p^2)^5$

..... [2]

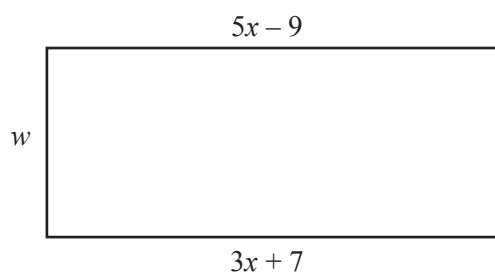
(ii) $18x^2y^6 \div 2xy^2$

..... [2]

(iii) $\left(\frac{5}{m}\right)^{-2}$

..... [1]

(b) In this part, all measurements are in metres.



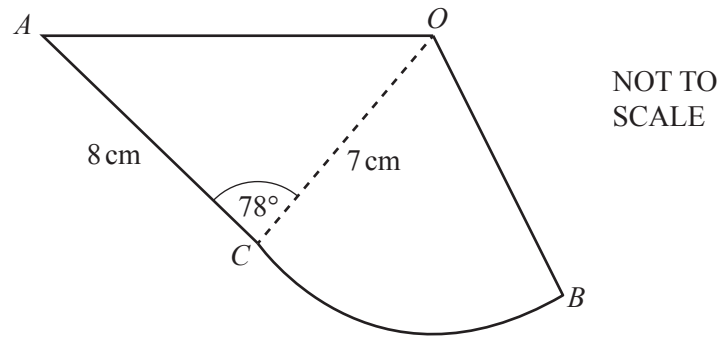
NOT TO
SCALE

The diagram shows a rectangle.
The area of the rectangle is 310 m^2 .

Work out the value of w .

$w =$ [4]

5



The diagram shows a design made from a triangle AOC joined to a sector OCB . $AC = 8\text{ cm}$, $OB = OC = 7\text{ cm}$ and angle $ACO = 78^\circ$.

- (a) Use the cosine rule to show that $OA = 9.47\text{ cm}$, correct to 2 decimal places.

[4]

- (b) Calculate angle OAC .

Angle $OAC = \dots\dots\dots$ [3]

- (c) The perimeter of the design is 29.5 cm.

Show that angle $COB = 41.2^\circ$, correct to 1 decimal place.

[5]

- (d) Calculate the total area of the design.

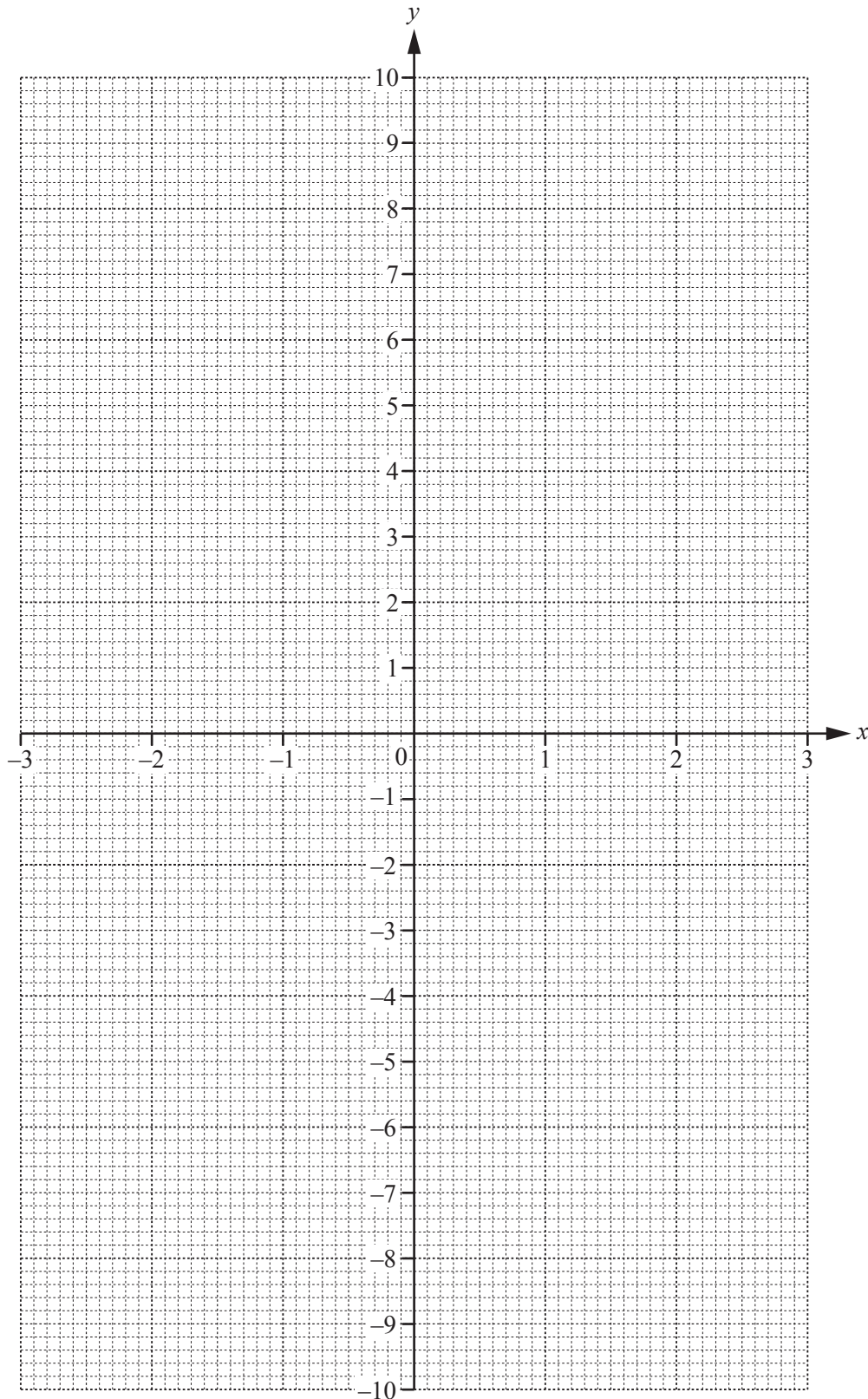
..... cm^2 [4]

- 6 (a) Complete the table of values for $y = \frac{x^3}{3} - \frac{1}{2x^2}$, $x \neq 0$.

x	-3	-2	-1	-0.5	-0.3		0.3	0.5	1	2	3
y	-9.1	-2.8	-0.8		-5.6		-5.5	-2.0			8.9

[3]

- (b) On the grid, draw the graph of $y = \frac{x^3}{3} - \frac{1}{2x^2}$ for $-3 \leq x \leq -0.3$ and $0.3 \leq x \leq 3$.



[5]

- (c) (i) By drawing a suitable tangent, find an estimate of the gradient of the curve at $x = -2$.

..... [3]

- (ii) Write down the equation of the tangent to the curve at $x = -2$.

Give your answer in the form $y = mx + c$.

$y =$ [2]

- (d) Use your graph to solve the equations.

(i) $\frac{x^3}{3} - \frac{1}{2x^2} = 0$

$x =$ [1]

(ii) $\frac{x^3}{3} - \frac{1}{2x^2} + 4 = 0$

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

- (e) The equation $\frac{x^3}{3} - \frac{1}{2x^2} + 4 = 0$ can be written in the form $ax^n + bx^{n-3} - 3 = 0$.

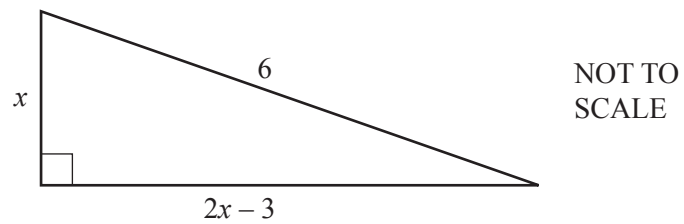
Find the value of a , the value of b and the value of n .

$a =$

$b =$

$n =$ [3]

- 7 In this question, all measurements are in metres.



The diagram shows a right-angled triangle.

- (a) Show that $5x^2 - 12x - 27 = 0$.

[3]

- (b) Solve $5x^2 - 12x - 27 = 0$.
Show all your working and give your answers correct to 2 decimal places.

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

- (c) Calculate the perimeter of the triangle.

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

- (d) Calculate the smallest angle of the triangle.

$\dots\dots\dots$ [2]

8 $f(x) = 8 - 3x$ $g(x) = \frac{10}{x+1}, x \neq -1$ $h(x) = 2^x$

(a) Find

(i) $hf\left(\frac{8}{3}\right),$

..... [2]

(ii) $gh(-2),$

..... [2]

(iii) $g^{-1}(x),$

$g^{-1}(x) =$ [3]

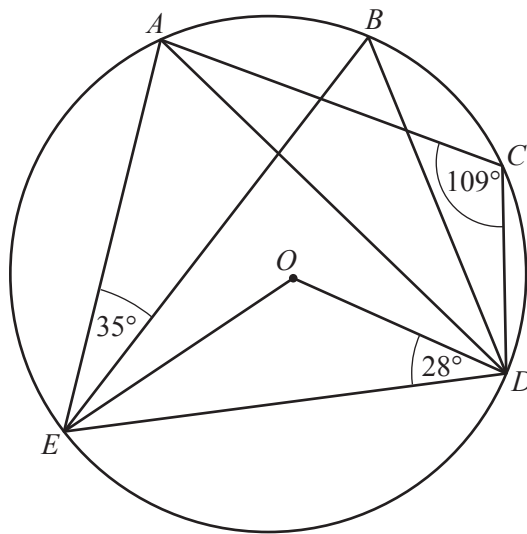
(iv) $f^{-1}f(5).$

..... [1]

(b) Write $f(x) + g(x)$ as a single fraction in its simplest form.

..... [3]

9 (a)

NOT TO
SCALE

A, B, C, D and E lie on the circle, centre O .

Angle $AEB = 35^\circ$, angle $ODE = 28^\circ$ and angle $ACD = 109^\circ$.

(i) Work out the following angles, giving reasons for your answers.

(a) Angle $EBD = \dots\dots\dots$ because $\dots\dots\dots$

$\dots\dots\dots$ [3]

(b) Angle $EAD = \dots\dots\dots$ because $\dots\dots\dots$

$\dots\dots\dots$ [2]

(ii) Work out angle BEO .

Angle $BEO = \dots\dots\dots$ [3]

(b) In a regular polygon, the interior angle is 11 times the exterior angle.

(i) Work out the number of sides of this polygon.

..... [3]

(ii) Find the sum of the interior angles of this polygon.

..... [2]

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