



Cambridge IGCSE[™]

| | CANDIDATE NAME | | | |
|-------------|-------------------|----------------------------|---------------------|--------------------|
| | CENTRE NUMBER | | CANDIDATE NUMBER | |
| * ω | MATHEMATIC | CS | | 1521/42 |
| 7 8 | Paper 4 (Exten | ded) | | May/June 2021 |
| N | | | | 2 hours 30 minutes |
| ω ο ο | You must answ | ver on the question paper. | | |
| 4 | You will need: | Geometrical instruments | | |

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INSTRUCTIONS

- Answer all questions. •
- Use a black or dark blue pen. You may use an HB pencil for any diagrams or graphs. •
- Write your name, centre number and candidate number in the boxes at the top of the page. •
- Write your answer to each question in the space provided.
- Do not use an erasable pen or correction fluid. •
- Do not write on any bar codes. •
- You should use a calculator where appropriate. •
- You may use tracing paper.
- You must show all necessary working clearly.
- Give non-exact numerical answers correct to 3 significant figures, or 1 decimal place for angles in • degrees, unless a different level of accuracy is specified in the question.
- For π , use either your calculator value or 3.142.

INFORMATION

- The total mark for this paper is 130.
- The number of marks for each question or part question is shown in brackets [].

This document has 20 pages. Any blank pages are indicated.



- **1** Fred is a gardener.
 - (a) Every week, he works 8 hours for Dr Shah, 8 hours for Mrs Tarek and the rest of his time for Mr Umbert.

2

(i) Fred works for a total of 20 hours every week. Mr Umbert pays him \$37 each week.

Work out how much Mr Umbert pays him for each hour.

(ii) Dr Shah pays him \$6 for each hour. Mrs Tarek pays him \$24 for the first 3 hours and then \$3 for each further hour.

Show that Fred is paid a total of \$124 each week.

[3]

(iii) Fred is saving this money to buy a mower costing \$800.

Calculate the number of weeks Fred must work before he can buy the mower.

(b) Fred uses compost in each of the gardens in the ratio Dr Shah : Mrs Tarek : Mr Umbert = 5 : 4 : 6. He uses a total of 345 litres of compost.

Find the number of litres of compost Fred uses in Mr Umbert's garden.

..... litres [2]

(c) Fred buys two different boxes of grass seed. One box of grass seed has a mass of 350 g and the other box of grass seed has a mass of 240 g, both correct to the nearest 10 grams.

Calculate the upper bound of the difference between the masses of the two boxes of grass seed.

..... g [2]



ABC is a straight line. *AB* = 18 cm, *MB* = 15 cm, *MC* = 31 cm and angle *MBC* = 104°.

Calculate

(a) angle *MCB*,

(b) *AM*,

(c) the area of triangle *MAC*.

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3 (a) A is the point (-1, 4) and B is the point (7, -8).

Find

(i) the coordinates of the midpoint of AB,

(.....) [2]

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(ii) the length of AB,

.....[3]

(iii) the equation of the line that is perpendicular to AB and passes through the point (9, 4).

......[4]



(b) Point *P* has position vector **s** and point *Q* has position vector **t**. *PQ* is extended to point *X* such that PX : QX = 7: 3.

Find the position vector of *X*.

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4 The table shows some values for $y = \frac{x}{2} - \frac{1}{x}, x \neq 0.$

| x | -2 | -1.5 | -1 | -0.5 | -0.2 | 0.2 | 0.5 | 1 | 1.5 | 2 |
|---|------|-------|----|------|------|-----|-------|---|------|-----|
| У | -0.5 | -0.08 | | 1.75 | | | -1.75 | | 0.08 | 0.5 |

(a) Complete the table.

(b) Draw the graph of
$$y = \frac{x}{2} - \frac{1}{x}$$
 for $-2 \le x \le -0.2$ and $0.2 \le x \le 2$.



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[3]

(c) Use your graph to solve the equation $\frac{x}{2} - \frac{1}{x} = -3.5$.

(d) (i) On the grid, draw the line 5x + 3y = 0.

(ii) Write down the *x*-coordinate of each point where the line 5x + 3y = 0 crosses the graph of $y = \frac{x}{2} - \frac{1}{x}$.

 $x = \dots$ and $x = \dots$ [2]

 $x = \dots [1]$

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[2]

(iii) Make y the subject of the equation 5x + 3y = 0.

y = [2]

(iv) The answers to **part** (d)(ii) are the solutions to $kx^2 = 6$, where k is integer.

Find the value of *k*, showing all of your working.

k = [3]



- 5 Abel and Benny ride their bicycles from school to the park.
 - (a) The speed-time graph below shows information about Abel's journey.



- (i) Find his acceleration during the first 8 seconds.
- (ii) Find the total distance that Abel cycles from school to the park.

..... m [3]

(b) The speed-time graph below shows information about Benny's journey along the same route from the school to the park.



Find the value of *v*.

- 6 (a) In Aytown the number of people without a computer is decreasing exponentially at a rate of 18% per year.
 Today, there are 25000 people in Aytown without a computer.
 - (i) Calculate the number of people without a computer in 11 years time.

.....[2]

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(ii) Find how many complete years from today it will be until there are fewer than 1000 people without a computer.

......[2]

(b) Johann and Katya each buy a computer. Johann pays 469 euros and Katya pays \$538.

Calculate the difference in price when the exchange rate is 1 = 0.9046 euros. Give your answer in dollars, correct to the nearest cent.

\$[3]

(c) In a sale, the price of another computer is reduced by 16% to \$273.

Calculate the price of this computer before the sale.

7 (a) 800 employees of a company were each asked how many hours it took them to travel to and from work in a week.The frequency table shows this information.

| Time (<i>t</i> hours) | $0 < t \le 1$ | $1 < t \le 3$ | $3 < t \leq 5$ | $5 < t \le 8$ | $8 < t \le 10$ |
|------------------------|---------------|---------------|----------------|---------------|----------------|
| Frequency | 75 | 130 | 166 | 291 | 138 |

(i) Calculate an estimate of the mean.

..... h [4]

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(ii) Complete the histogram to show the information in the table.



(b) The cumulative frequency diagram shows information about the amount (A) that each or ov people spend in a café.



(i) Use the cumulative frequency diagram to find an estimate of

| (a) | the median, | \$ | [1] |
|------------|---|---------------------------------|-----|
| (b) | the interquartile range, | | |
| | | \$ | [2] |
| (c) | the number of people who spend more than \$7. | | |
| | | | [2] |
| (a) | Use the information in the sumulative frequency | diagram in nant (b) to complete | tha |

(ii) (a) Use the information in the cumulative frequency diagram in **part** (b) to complete the frequency table.

| Amount (\$ <i>A</i>) | $0 < A \leqslant 1$ | $1 < A \leqslant 3$ | $3 < A \le 6$ | $6 < A \leqslant 8$ | $8 < A \le 10$ | |
|-----------------------|---------------------|---------------------|---------------|---------------------|----------------|---|
| Frequency | 5 | | | | | |
| | | | | | | Ī |

(b) Two people are chosen at random from those who spend more than \$1.

Find the probability that these people each spend more than \$6.

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ABC is an equilateral triangle. The sides of the triangle are tangents to the circle, centre *O*, at *M*, *N* and *P*. The radius of the circle is 5 cm.

(a) (i) Write down the reason why angle *OMA* is a right angle.

(ii) Find angle *OAM*.

Angle *OAM* = [1]

(b) Calculate AM.

AM = cm [3]

(c) Calculate the area of the shaded part of the diagram.

..... cm² [4]



(d) Calculate the perimeter of the shaded part of the diagram.



9 (a)



A, *B*, *C* and *D* are points on the circumference of a circle. *AC* and *BD* intersect at *X*.

(i) Write down the angle that is equal to angle *AXD*, giving a reason for your answer.

| | Angle because | [0] |
|-------|---|-----|
| (ii) | Write down the angle that is equal to angle <i>DAX</i> , giving a reason for your answer. | [2] |
| | Angle because | |
| | | [2] |
| (iii) | Complete the statement. | |
| | Triangle <i>BXC</i> is to triangle <i>AXD</i> . | [1] |
| (iv) | AX = 1.6 cm, DX = 4.6 cm and BX = 2.4 cm. | |

Calculate CX.

CX = cm [2]



(v) The area of triangle BXC is 7.2 cm^2 .

Calculate the area of triangle *AXD*.

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The two containers are mathematically similar. The volume of the smaller container is 189 cm^3 and its height is 12 cm. The volume of the larger container is 448 cm^3 .

Calculate the height of the larger container.

..... cm [3]

(b)



The diagram shows a rectangular channel that carries water to a storage tank. The width of the channel is 12 cm.

(a) In summer, the water in the channel is 3 cm deep and flows at a rate of 4 cm/s.

Show that 518400 cm³ of water flows into the storage tank in 1 hour.

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(b) In winter, the water in the channel is 5 cm deep and flows at a rate of 18 cm/s.

Calculate the percentage increase, from the summer to the winter, in the volume of water that flows into the storage tank in 1 hour.

(c) The storage tank is a vertical cylinder with radius r. When 518400 cm³ of water flows into the storage tank, the depth of the water increases by 4 mm.

Calculate the radius *r*. Give your answer in metres.

r = m [4]

- 11 A curve has equation $y = \frac{1}{4}x^4 3x^3 + 9x^2$.
 - (a) Find the coordinates of the three stationary points on this curve.

(.....) and (.....) [6]

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[4]

(b) Determine whether each of the stationary points is a maximum or a minimum. Give reasons for your answers.



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