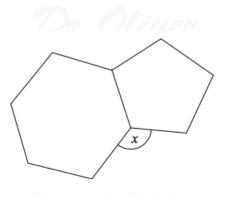# Dr Oliver Mathematics
# GCSE Mathematics
# 2022 June Paper 1H: Non-Calculator
# 1 hour 30 minutes

The total number of marks available is 80.
You must write down all the stages in your working.

1. Solve (2)
$$7x - 27 < 8.$$

2. Write 124 as a product of its prime factors. (2)

3. A delivery company has a total of 160 cars and vans. (5)

The number of cars : the number of vans = 3 : 7.

Each car and each van uses electricity or diesel or petrol.

- $\frac{1}{8}$ of the cars use electricity.
- 25% of the cars use diesel.
- The rest of the cars use petrol.

Work out the number of cars that use petrol.
You must show all your working.

4. (a) Write (1)
$$1.63 \times 10^{-3}$$
as an ordinary number.

(b) Write (1)
$$438\,000$$
in standard form.

(c) Work out (2)
$$(4 \times 10^3) \times (6 \times 10^{-5}).$$
Give your answer in standard form.

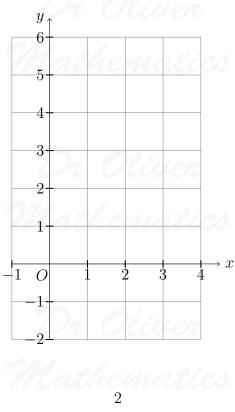5. Here is a regular hexagon and a regular pentagon. (3)

Work out the size of the angle marked $x$.
You must show all your working.

6.  (a) Complete the table of values for (2)

$$y = x^2 - 3x + 1.$$

| $x$ | $-1$ | $0$ | $1$ | $2$ | $3$ | $4$ |
|---|---|---|---|---|---|---|
| $y$ |  | $1$ |  | $-1$ |  |  |

(b) On the grid, draw the graph of (2)

$$y = x^2 - 3x + 1$$

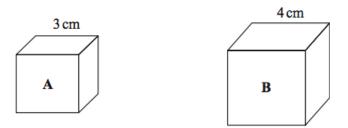for values of $x$ from $-1$ to $4$.

(c) Using your graph, find estimates for the solutions of the equation (2)
$$x^2 - 3x + 1 = 0.$$

7. Here are two cubes, **A** and **B**. (3)



3 cm

A

4 cm

B

Cube **A** has a mass of 81 g.

Cube **B** has a mass of 128 g.

Work out

the density of cube $A$ : the density of cube $B$.

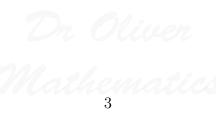Give your answer in the form $a : b$, where $a$ and $b$ are integers.

8. The table shows the amount of snow, in cm, that fell each day for 30 days. (3)

| Amount of snow ($s$ cm) | Frequency |
|---|---|
| $0 \leqslant s < 10$ | 8 |
| $10 \leqslant s < 20$ | 10 |
| $20 \leqslant s < 30$ | 7 |
| $30 \leqslant s < 40$ | 2 |
| $40 \leqslant s < 50$ | 3 |

Work out an estimate for the mean amount of snow per day.
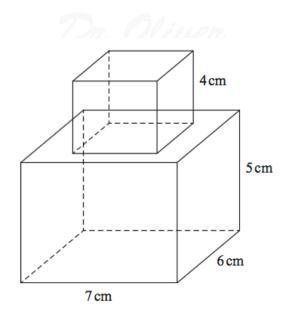
9. A cube is placed on top of a cuboid, as shown in the diagram, to form a solid. (3)

The cube has edges of length 4 cm.
The cuboid has dimensions 7 cm by 6 cm by 5 cm.

Work out the total surface area of the solid.

10. The table shows some information about the profit made each day at a cricket club on 100 days.

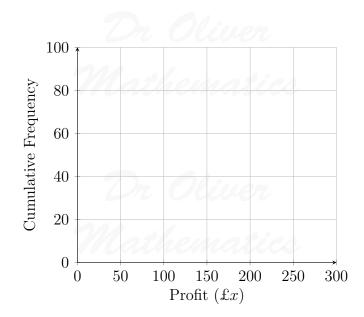| Profit (£x) | Frequency |
|---|---|
| $0 \leqslant x < 50$ | 10 |
| $50 \leqslant x < 100$ | 15 |
| $100 \leqslant x < 150$ | 25 |
| $150 \leqslant x < 200$ | 30 |
| $200 \leqslant x < 250$ | 5 |
| $250 \leqslant x < 300$ | 15 |

(a) Complete the cumulative frequency table. (1)

(b) On the grid, draw a cumulative frequency graph for this information (2)

(c) Use your graph to find an estimate for the number of days on which the profit was less than £125. (1)

(d) Use your graph to find an estimate for the interquartile range. (2)

11. Cormac has some sweets in a bag. (3)
    The sweets are lime flavoured or strawberry flavoured or orange flavoured.

    In the bag, the number of

    lime flavoured sweets : strawberry flavoured sweets : orange flavoured sweets $= 9 : 4 : x$.

    Cormac is going to take at random a sweet from the bag.

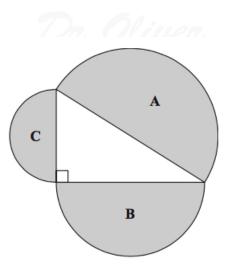    The probability that he takes a lime flavoured sweet is $\frac{3}{7}$.

    Work out the value of $x$.

12. Express (3)

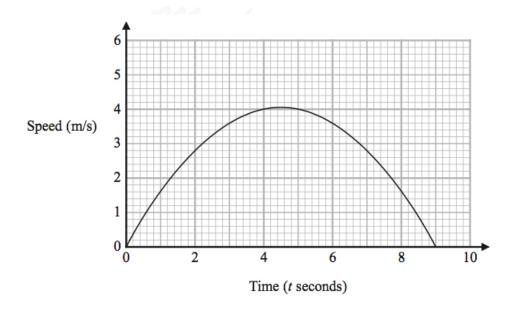    $$0.11\dot{7}$$

    as a fraction.

    You must show all your working.

13. A right-angled triangle is formed by the diameters of three semicircular regions, **A**, **B**, and **C** as shown in the diagram. (3)

5

Show that
$$\text{area of region } \mathbf{A} = \text{area of region } \mathbf{B} + \text{area of region } \mathbf{C}.$$

14. Here is a speed-time graph.



Time (*t* seconds)

(a) Work out an estimate of the gradient of the graph at $t = 2$. (3)

(b) What does the area under the graph represent? (1)

15. $A$, $B$, and $C$ are three points such that

- $\overrightarrow{AB} = 3\mathbf{a} + 4\mathbf{b}$ and
- $\overrightarrow{AC} = 15\mathbf{a} + 20\mathbf{b}$.

(a) Prove that $A$, $B$, and $C$ lie on a straight line. (2)

$D$, $E$, and $F$ are three points on a straight line such that

- $\overrightarrow{DE} = 3\mathbf{e} + 6\mathbf{f}$ and
- $\overrightarrow{EF} = -10.5\mathbf{e} - 21\mathbf{f}$.

(b) Find the ratio (3)
$$\text{length of } DF : \text{length of } DE.$$

16. A first aid test has two parts, a theory test and a practical test. (4)
The probability of passing the theory test is 0.75.
The probability of passing only one of the two parts is 0.36.

The two events are independent.

Work out the probability of passing the practical test.

17. $y$ is directly proportional to the square root of $t$. (4)
$y = 15$ when $t = 9$.

$t$ is inversely proportional to the cube of $x$.
$t = 8$ when $x = 2$,

Find a formula for $y$ in terms of $x$.
Give your answer in its simplest form.

18. Work out the value of (4)
$$\frac{\left(5\frac{4}{9}\right)^{-\frac{1}{2}} \times \left(4\frac{2}{3}\right)}{2^{-3}}.$$

You must show all your working.

19. Solve (4)
$$\frac{1}{2x-1} + \frac{3}{x-1} = 1.$$

Give your answer in the form
$$\frac{p \pm \sqrt{q}}{2},$$

where $p$ and $q$ are integers.

20. The centre of a circle is the point with coordinates $(-1, 3)$. (4)

The point $A$ with coordinates $(6, 8)$ lies on the circle.

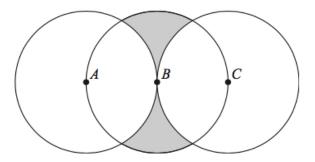Find an equation of the tangent to the circle at $A$.
Give your answer in the form

$$ax + by + c = 0,$$

where $a$, $b$, and $c$ are integers.

21. The diagram shows three circles, each of radius 4 cm. (5)

The centres of the circles are $A$, $B$, and $C$ such that $ABC$ is a straight line and

$$AB = BC = 4 \text{ cm.}$$

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Work out the total area of the two shaded regions.
Give your answer in terms of $\pi$.