Dr Oliver Mathematics
GCSE Mathematics
2023 November 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. Work out (3)

$$6.3 \times 2.4.$$

2. (a) (i) Write down the value of 5^0. (1)
   (ii) Write down the value of 5^{-2}. (1)
   (b) Write (2)

$$\frac{2^5 \times 2^4}{2^3}$$

   in the form 2^n where n is an integer.

3. (a) Write 156 as a product of its prime factors. (2)
   (b) Find the highest common factor (HCF) of 156 and 130. (2)

4. The mean length of 5 sticks is 4.2 cm.

   Nawal measured the length of one of the sticks as 7 cm.

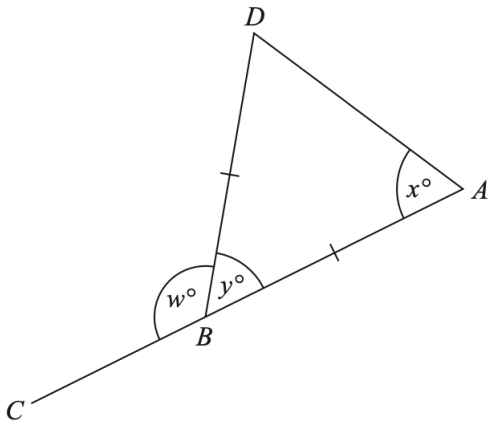
   (a) Work out the mean length of the other 4 sticks. (3)

   Nawal made a mistake.
   The stick was not 7 cm long.
   It was 17 cm long.

   (b) How does this affect your answer to part (a)? (1)

5. The point P lies on the line AB. (2)
   Use ruler and compasses to construct an angle of 90° at P.
   You must show all your construction lines.

6. The diagram shows an isosceles triangle ABD and the straight line ABC. (4)



- $BA = BD$.
- $x : y = 2 : 1$.

Work out the value of w.

7. Mano has three shelves of books. (5)

- There are x books on shelf A.
- There are $(3x + 1)$ books on shelf B.
- There are $(2x - 5)$ books on shelf C.

There is a total of 44 books on the three shelves.

All the books have the same mass.

The books on shelf B have a total mass of 7 500 g.

Work out the total mass of the books on shelf A.

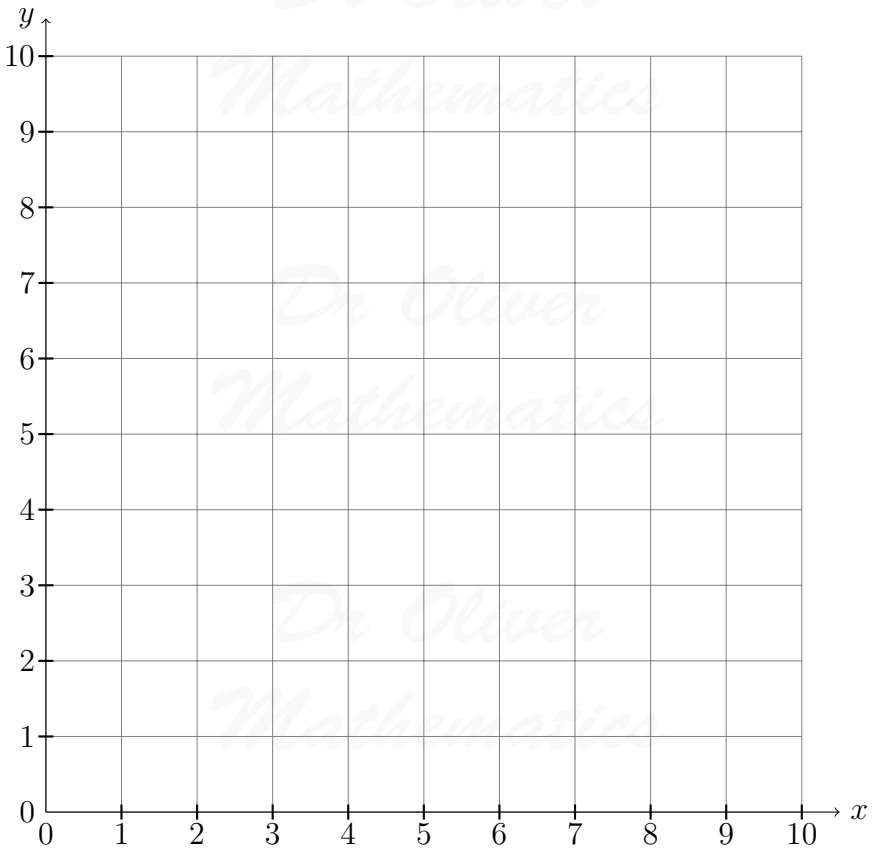
8. The normal price of a mattress is reduced by 40% in a sale. (2)
The price of the mattress in the sale is £660.

Work out the normal price of the mattress.

9. To cook rice,

the number of cups of rice (x) : the number of cups of water $(y) = 4 : 5$.

(a) Use this information to draw a graph to show the relationship between the number of cups of rice and the number of cups of water needed to cook rice. (2)



(b) (i) Find the gradient of the line drawn in part (a). (1)

(ii) Explain what this gradient represents. (1)

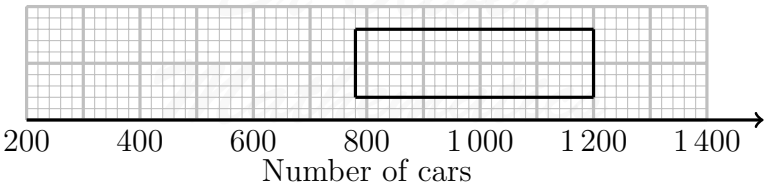
10. The circumference of a circle is 10 m. (3)

Work out the area of the circle.
Give your answer in terms of π.

11. Alice recorded the number of cars going into a village on each of 80 days.

The incomplete table and the incomplete box plot give information about her results.

	Number of cars
Least number	300
Lower quartile	
Median	900
Upper quartile	
Range quartile	1 000



(a) (i) Use the information in the table to complete the box plot. (3)

(ii) Use the information in the box plot to complete the table.

On some of these 80 days Alice saw fewer than 1 200 cars going into the village.

(b) Work out an estimate for the number of days Alice saw fewer than 1 200 cars going into the village. (2)

12. The straight line L has equation (3)

$$2y = 3x - 7.$$

Find an equation of the straight line perpendicular to L that passes through $(6, -5)$.

13. Solid A and solid B are similar. (3)

The ratio of the height of solid A to the height of solid B is $2 : 5$.

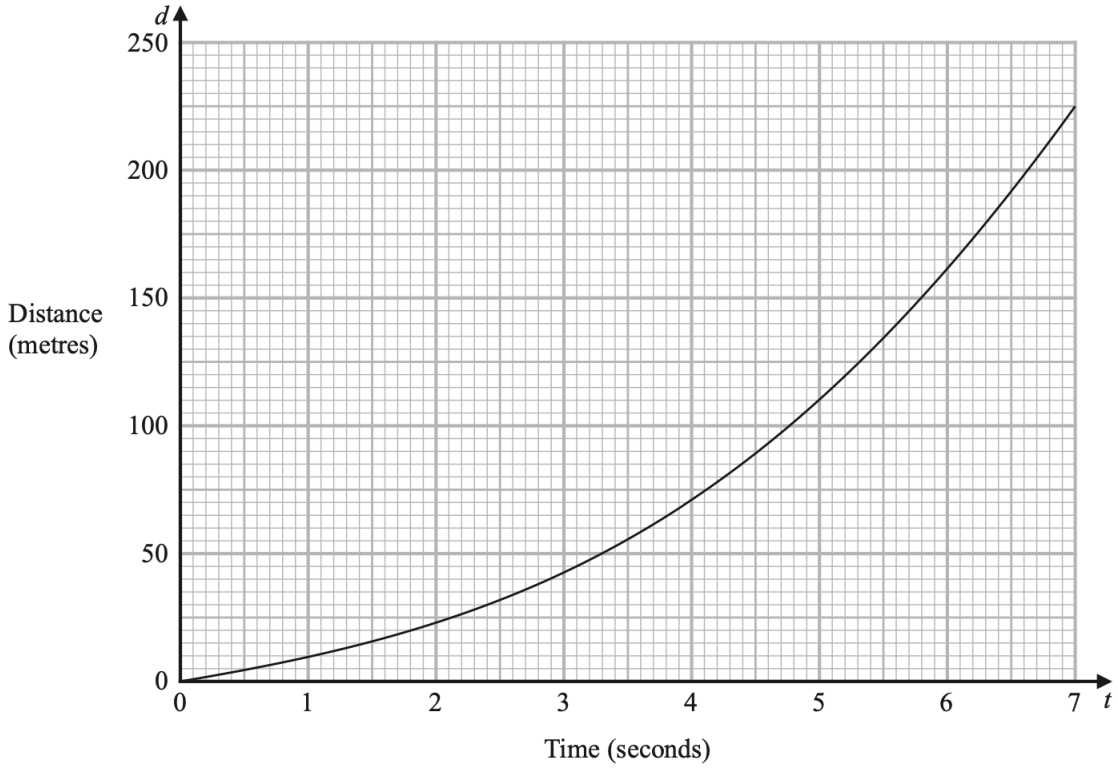
The volume of solid A is 12 cm^3.

Work out the volume of solid B.

14. Work out the value of (3)

$$27^{\frac{2}{3}} + \left(\tfrac{1}{2}\right)^{-3}.$$

15. Here is the distance-time graph for the distance (d metres) fallen by the object t seconds after it starts to fall. (3)



Work out an estimate for the gradient of the graph at $t = 3$.
You must show how you get your answer.

16. At the start of year n the population of a species is P_n.

At the start of the following year the population of the species is given by

$$P_{n+1} = kP_n,$$

where k is a positive constant.

- The population of the species at the start of Year 1 is 8 million.
- The population of the species at the start of Year 2 is 6 million.

(a) Work out the population of the species at the start of Year 3. (3)

At the start of Year 5 the value of k is increased by 0.3 to a new constant value.

Louise thinks that from the start of Year 5 the population of the species would increase year on year.

(b) Is Louise correct? (1)
You must give a reason for your answer.

17. (a) Factorise (2)

$$6x^2 - 5x - 4.$$

(b) Hence, or otherwise, solve (2)

$$6x^2 - 5x - 4 < 0.$$

18. Spinner A and spinner B are each spun once. (4)

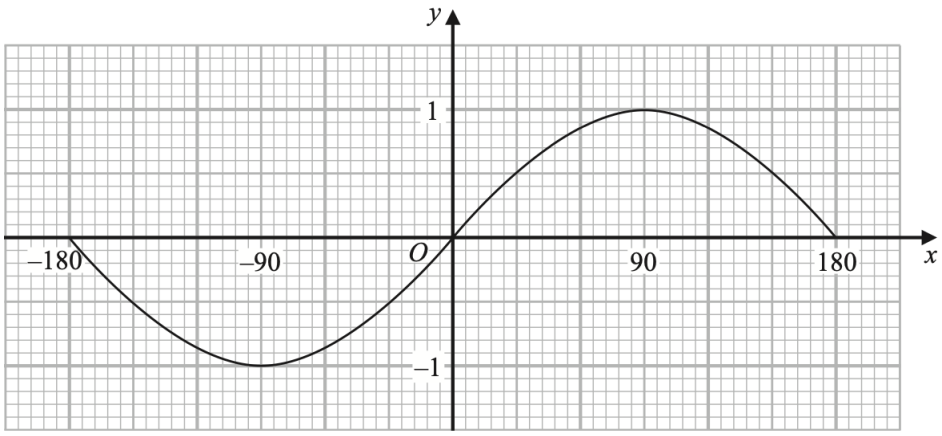
The probability that spinner A lands on red is $\frac{1}{4}$.

The probability that both spinner A and spinner B land on red is $\frac{1}{24}$.

Work out the probability that one spinner lands on red and the other spinner does **not** land on red.

19. Here is the graph of

$$y = \sin x^\circ \text{ for } -180 \leqslant x \leqslant 180.$$



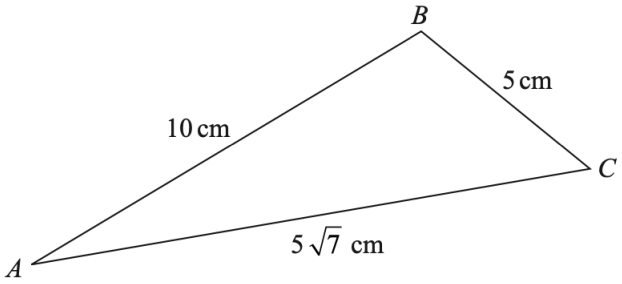
(a) Use the graph to find estimates for the solutions of (2)

$$\sin x^\circ = 0.3 \text{ for } -180 \leqslant x \leqslant 180.$$

(b) Write down a value of x such that (1)

$$\sin(x + 20)^\circ = 0 \text{ for } -180 \leqslant x \leqslant 180.$$

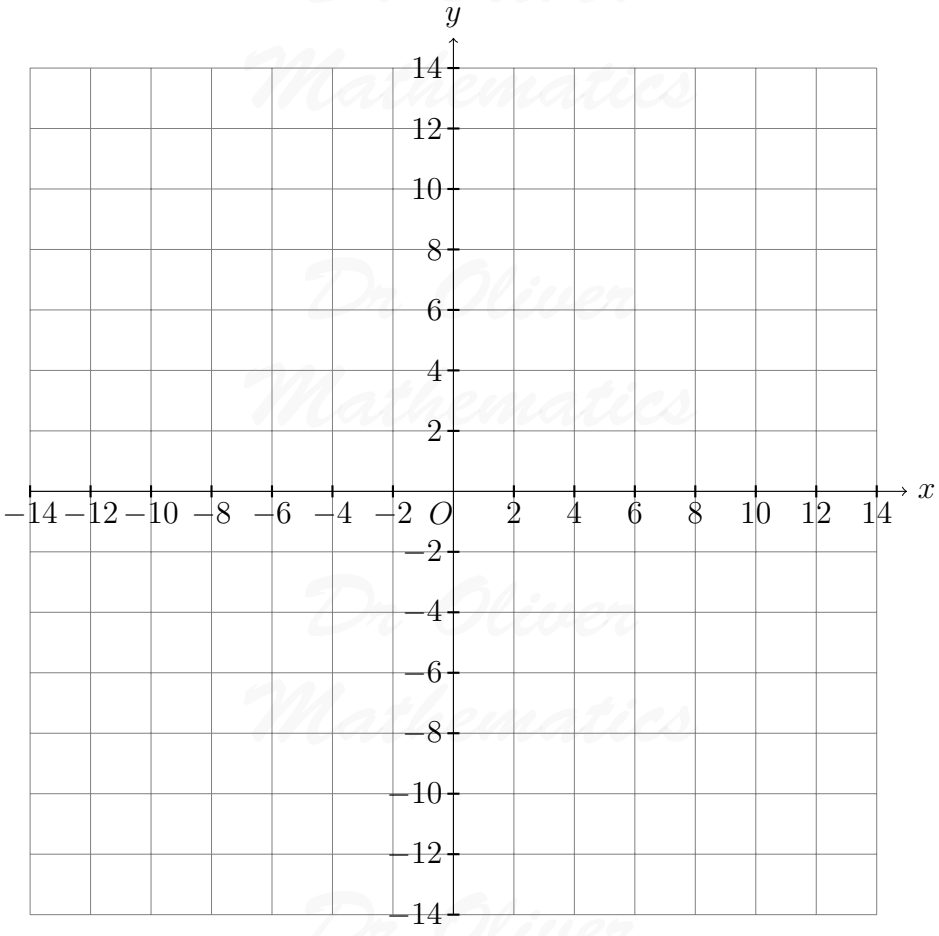
20. Here is triangle ABC. (4)



Find the size of angle ABC.
You must show all your working.

21. (a) On the grid, draw the graph of (2)

$$x^2 + y^2 = 169.$$



(b) Use your graph to find estimates for the solutions of the simultaneous equations (3)

$$x^2 + y^2 = 169$$
$$2y = 3x.$$

22. The 2nd term of a geometric sequence is $3 + 2\sqrt{2}$. (4)
The 3rd term of the sequence is $13 + 9\sqrt{2}$.

Find the value of the common ratio of the sequence.
Give your answer in the form $a + \sqrt{b}$, where a and b are integers.
You must show all your working.