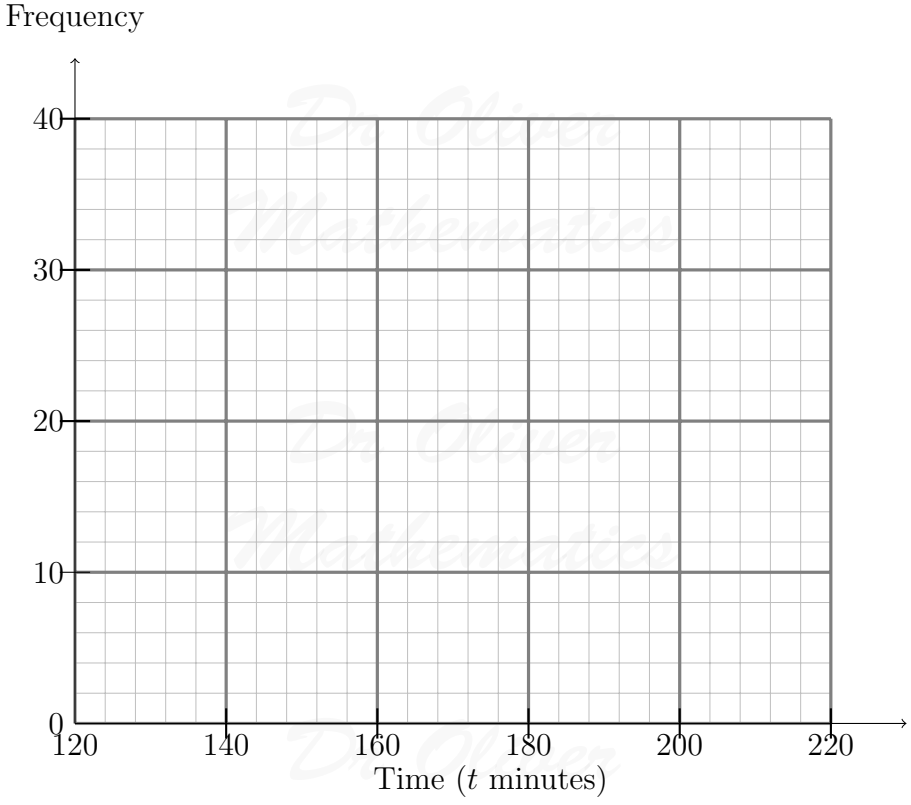
Dr Oliver Mathematics
GCSE Mathematics
2024 November Paper 3H: Calculator
1 hour 30 minutes

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

1. The table shows information about the times, in minutes, 100 people took to complete a bike race. (2)

Time (t minutes)	Frequency
$120 \leqslant t < 140$	12
$140 \leqslant t < 160$	28
$160 \leqslant t < 180$	30
$180 \leqslant t < 200$	22
$200 \leqslant t < 220$	8

On the grid below, draw a frequency polygon for this information.



2. (a) Write (1)

$$3.402 \times 10^5$$

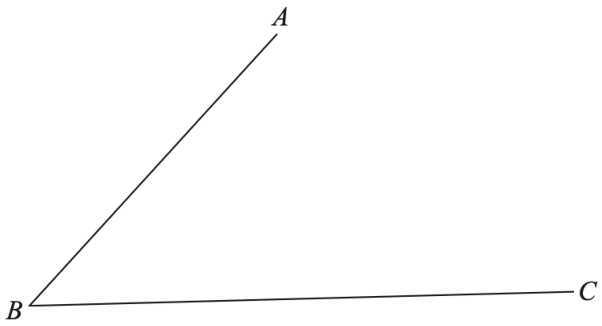
as an ordinary number.

(b) Write (1)

$$0.8026$$

in standard form.

3. Use ruler and compasses to construct the bisector of angle ABC. (2)
You must show your construction lines.

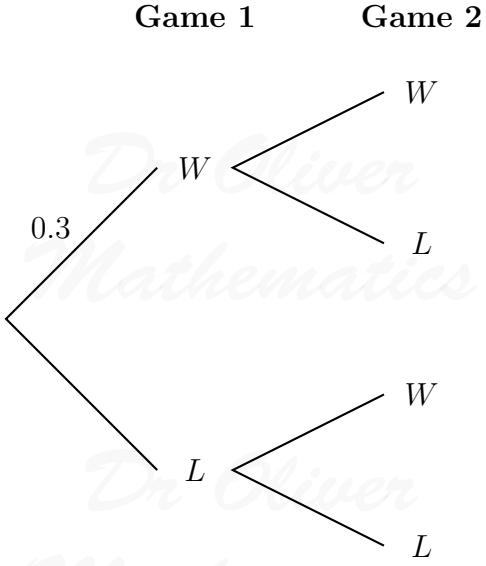


4. Dan is playing cards.

The probability that he will win a game of cards is 0.3.

Dan plays two games of cards.

(a) Complete the probability tree diagram. (2)



(b) Work out the probability that Dan does **not** win either game. (2)

5. Robyn buys a total of 240 pens and pencils, where (5)

$$\text{number of pens} : \text{number of pencils} = 3 : 5.$$

- Robyn pays 9 p for each pen.
- She sells each pen for 11 p.
- Robyn pays 6 p for each pencil.
- She sells each pencil for 10 p.

Robyn sells all of the pens and pencils.

Work out Robyn's percentage profit.
Give your answer correct to 1 decimal place.

6. The stem and leaf diagram shows the test scores of 23 students from School **A**. (4)

3	0							
4	1	2	4	4	5	7		
5	3	4	4	6	7	8	8	9
6	0	8	8	9	9			
7	1	3	9					

Key: 3|0 represents 30.

23 students from School **B** did the same test.

- Their median score was 56.
- The range of their scores was 47.

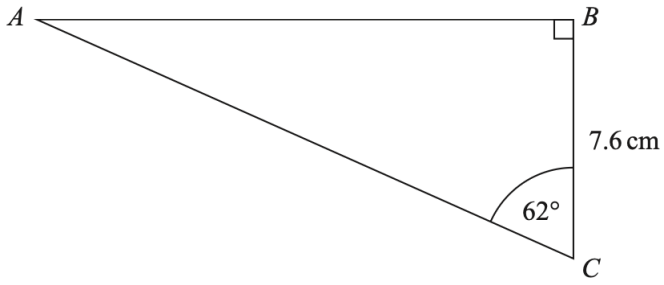
Compare the distribution of the test scores of the students from School **A** with the distribution of the test scores of the students from School **B**.

7. Jana used her calculator to find the value of a number t. (2)
The answer on her calculator began 10.2.

Complete the error interval for t.

$$\ldots\ldots\ldots \leqslant t < \ldots\ldots\ldots$$

8. ABC is a right-angled triangle. (2)



Calculate the length of AB.
Give your answer correct to 1 decimal place.

9. (a) Simplify fully (2)

$$2x^3y^5 \times 7x^2y.$$

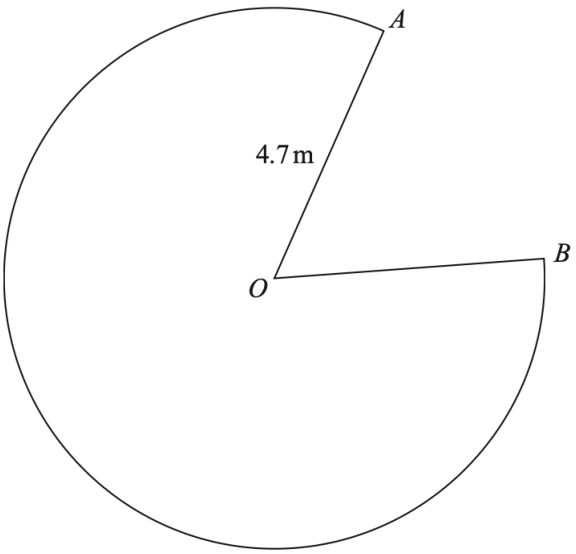
(b) Simplify (1)

$$(m^2)^{-3}.$$

10. In a sale, the normal prices are reduced by 15%. (2)
Amina buys a dress in the sale for £46.75.

Work out the normal price of the dress.

11. OAB is a sector of a circle with centre O and radius 4.7 m. (3)



The sector has a perimeter of 34.3 m.

Find the size of the reflex angle AOB.
Give your answer correct to the nearest degree.

12. Rudi invests £4 500 in a savings account.

He gets compound interest at a rate of

- 2.4% for the first year and
- 1.8% for each extra year.

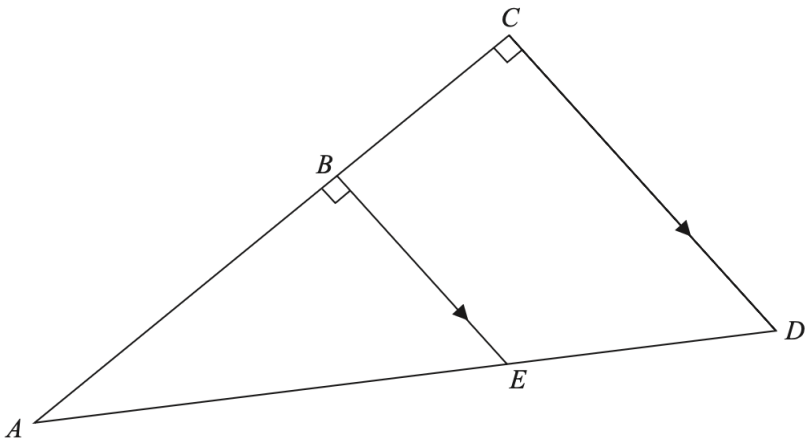
(a) Work out the value of Rudi's investment at the end of 3 years. (3)

Bruna buys a car for £7 500.

The value of the car depreciates by x% each year.
At the end of 2 years the value of the car is £4 107.

(b) Work out the value of x. (3)

13. ABC and AED are straight lines. (3)
BE and CD are parallel.



- $BE = 4.2$ cm.
- $CD = 6.3$ cm.
- $AC = 10.8$ cm.

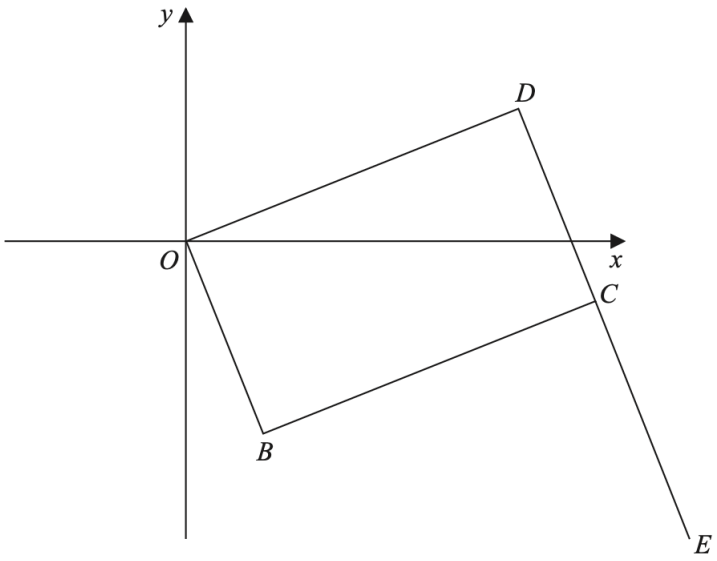
Work out the area of trapezium $BCDE$.

14. Prove algebraically that $0.4\dot{6}\dot{2}$ can be written as $\frac{229}{495}$. (3)

15. Make p the subject of the formula (4)

$$t = \frac{2(2p - 3)}{5 - 2p}.$$

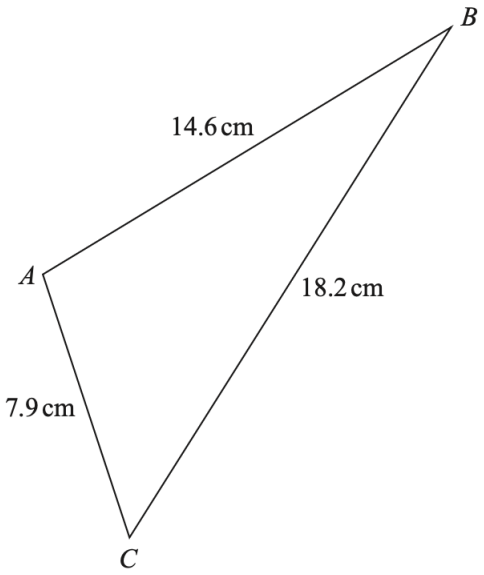
16. $OBCD$ is a rectangle. (5)
DCE is a straight line.



- B has coordinates $(2, -4)$.
- E has coordinates $(12, -6.5)$.

Work out the coordinates of D.
You must show all your working.

17. Here is triangle ABC. (4)



Work out the area of triangle ABC.
Give your answer correct to 3 significant figures.

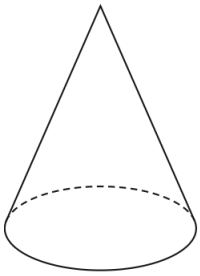
18. Maria wants to find an estimate for the number of frogs in a lake.

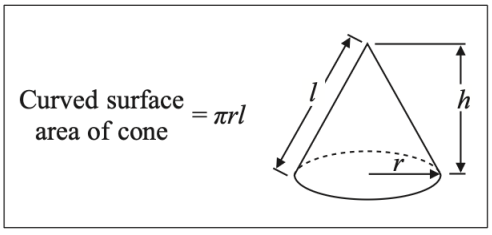
- On Saturday she catches 40 of the frogs.
- She puts a tag on each frog and releases them.
- On Monday she catches 55 of the frogs.
- 11 of the frogs have tags.

(a) Work out an estimate for the total number of frogs in the lake. (3)

(b) State one assumption you have made. (1)

19. The diagram shows a cone. (4)





- The radius of the base of the cone is $\frac{3}{4}$ of the height of the cone.
- The total surface area of the cone is 54π cm^2.

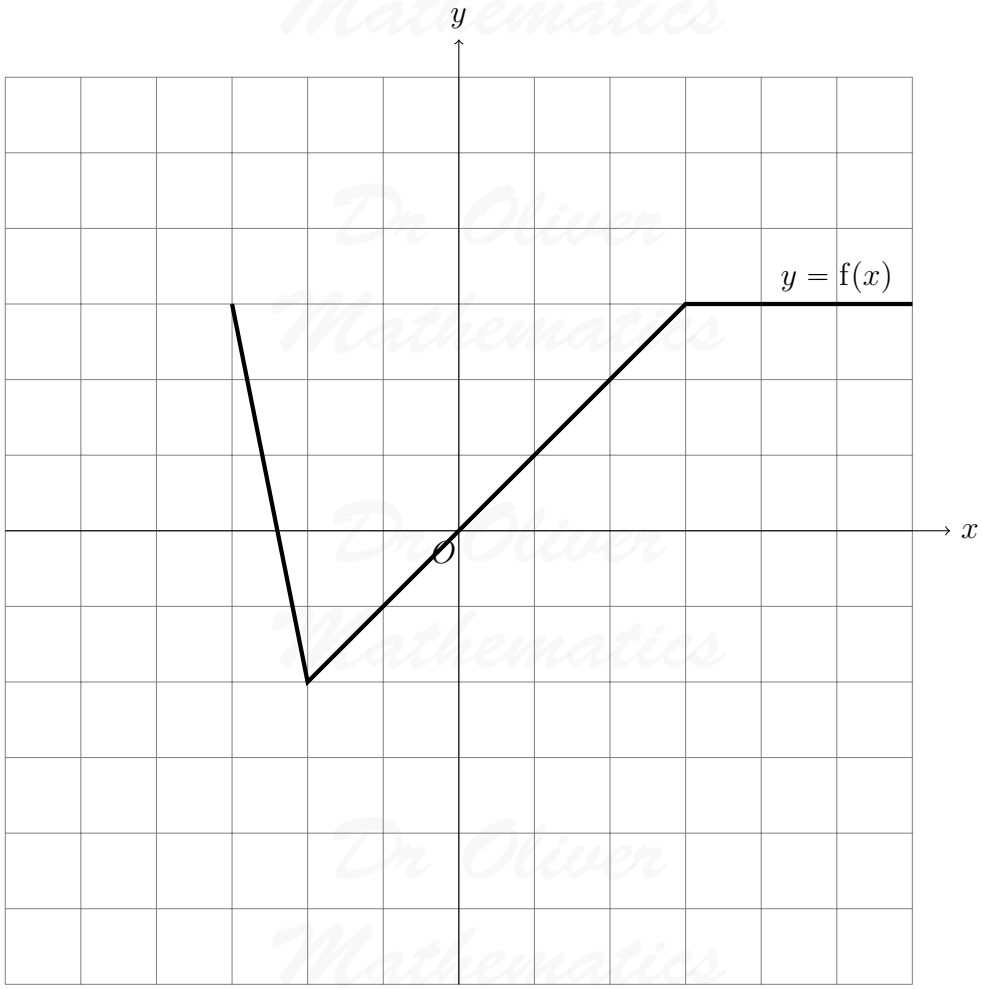
Work out the height of the cone.

20. Solve the simultaneous equations: (4)

$$y^2 = 3x^2 + 4$$
$$y + 2x = 7.$$

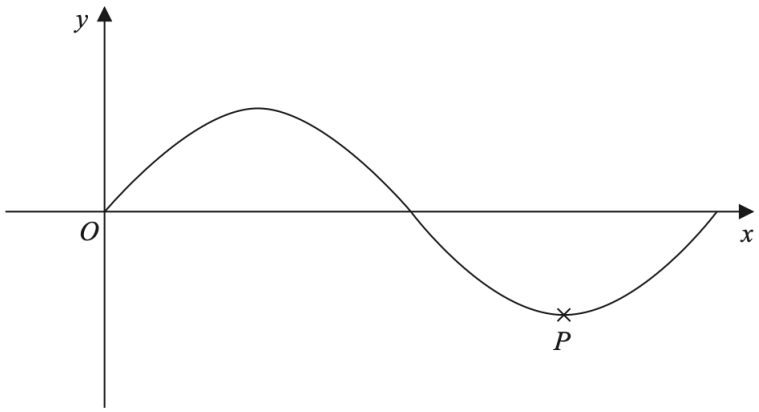
Give your solutions correct to 3 significant figures.

21. Here is the graph of $y = \mathrm{f}(x)$.



(a) On the grid, draw the graph of $y = -\mathrm{f}(x)$. (1)

Here is a sketch of the graph of $y = \sin x^\circ$.



The point marked P is a turning point on the graph.

The graph of

$$y = \sin x^\circ$$

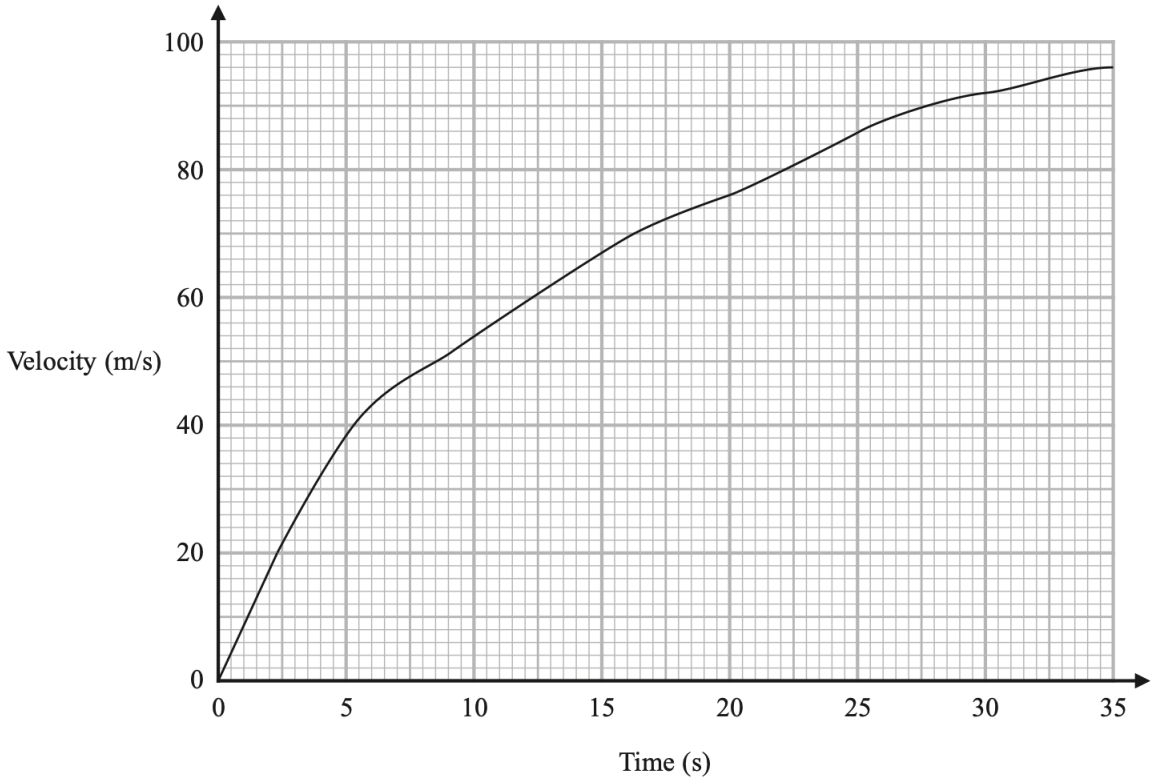
is translated to give the graph of

$$y = \sin(x + 180)^\circ + 4.$$

Following the translation the point P, shown on the graph above, moves to point R.

(b) Find the coordinates of R. (3)

22. Here is a velocity-time graph for an aeroplane. (3)



Work out an estimate for the distance the aeroplane travelled in the first 30 seconds.
Use 3 strips of equal width.

23. Sketch the graph of (5)

$$y = x^2 - 6px - 7, \text{ where } p > 0,$$

showing the coordinates of the turning point, in terms of p, and the coordinates of the intercept with the y-axis.

You must show all your working.