Dr Oliver Mathematics
AQA GCSE Mathematics
2019 June Paper 3: 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 £1.50 as a fraction of 60 p. (1)
   Circle your answer.

   $\frac{2}{5}$ $\frac{1}{4}$ $\frac{4}{1}$ $\frac{5}{2}$

2. For a biased dice, (1)

   $$P(6) = \frac{3}{5}.$$

   Circle the probability of two sixes when the dice is rolled twice.

   $\frac{6}{25}$ $\frac{6}{10}$ $\frac{9}{25}$ $\frac{9}{5}$

3. Circle the lowest common multiple (LCM) of 5, 15, and 25 (1)

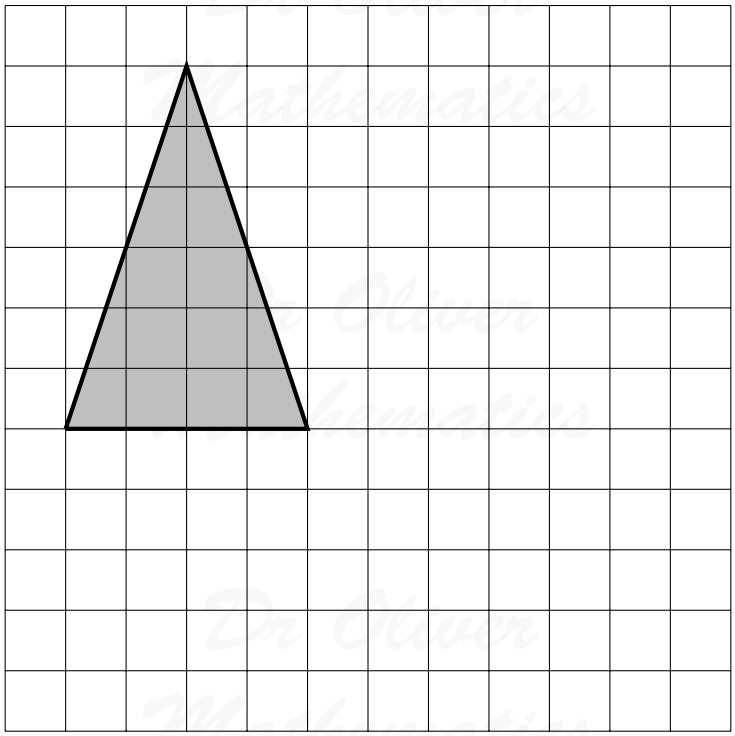
   5 45 75 150

4. Circle the two roots of (1)

   $$(x-5)(x+3) = 0$$

   -5 -3 3 5

5. On the grid, draw an enlargement of the triangle with scale factor $\frac{1}{2}$. (2)



6. To the nearest pound, Jon has £9. (3)

   To the nearest 50 p, Ellie has £6.50.

   Work out the maximum possible total amount of money.

7. Two solids, J and K, have the same density. (3)

	J	K
Mass	48 g	78 g
Volume	8 cm^3	
Density		

   Complete the table.
   Include units in your answers.

8. Rearrange (1)

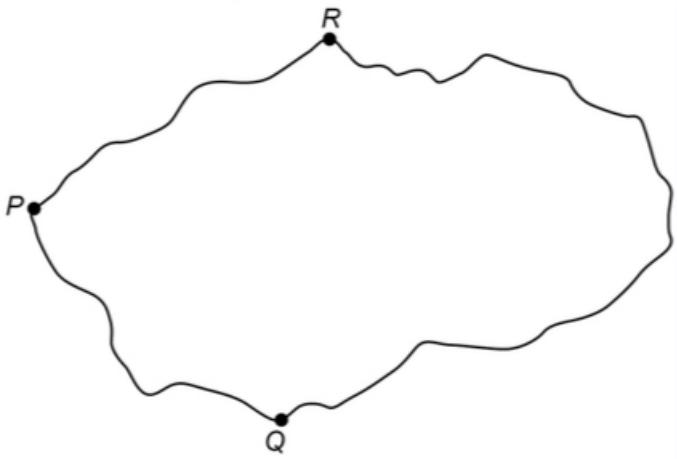
$$y = 3x - 2$$

   to make x the subject.
   Circle your answer.

$$x = \tfrac{1}{3}y - 2 \quad x = \frac{y+2}{3} \quad x = \frac{y-2}{3} \quad x = \tfrac{1}{3}y + 2$$

9. Towns P, Q, and R are connected by roads PQ, PR, and QR. (4)

- PR is 10 km longer than PQ.
- QR is twice as long as PR.
- The total length of the three roads is 170 km.



Not drawn accurately

Work out the length of PQ.

10. Mia wants to borrow £6 000 and repay it, with interest, after two years. (3)

She sees two offers for loans.

Offer 1	Offer 2
Compound interest	Compound interest
3% per year	First year 1%
	Second year 5%

Mia says, "I will pay back the same amount because the average of 1% and 5% is 3%."

Is she correct?
You **must** show your working.

11. Here are two sets of numbers, A and B. (4)

Set A	
200	160
104	100

Set B		
270	400	483
300	x	

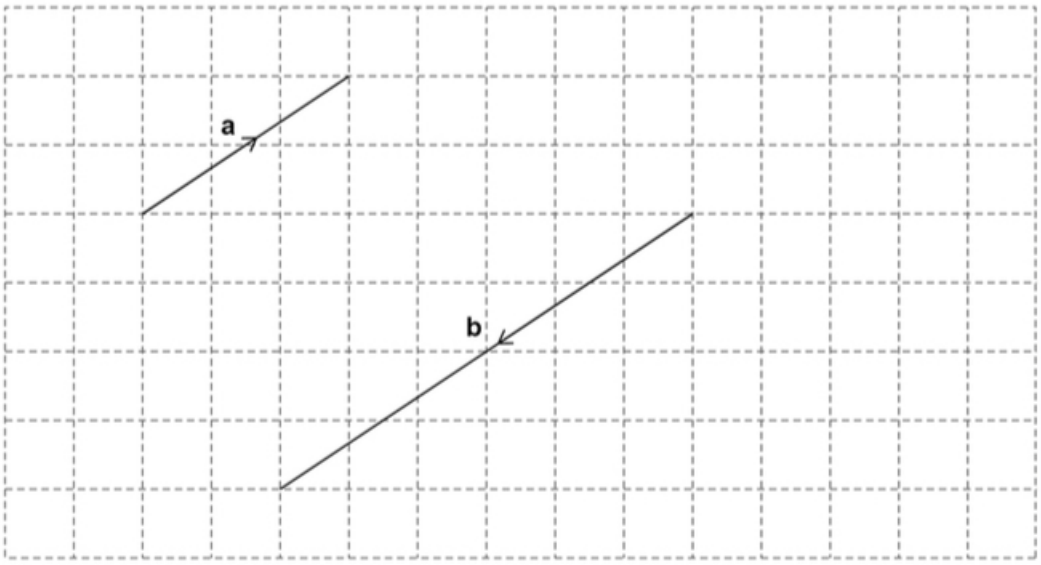
Mean of Set A : mean of Set $B = 3 : 8$.

Work out the value of x.

12. A straight line has gradient 4 and passes through the point $(5, 23)$. (3)

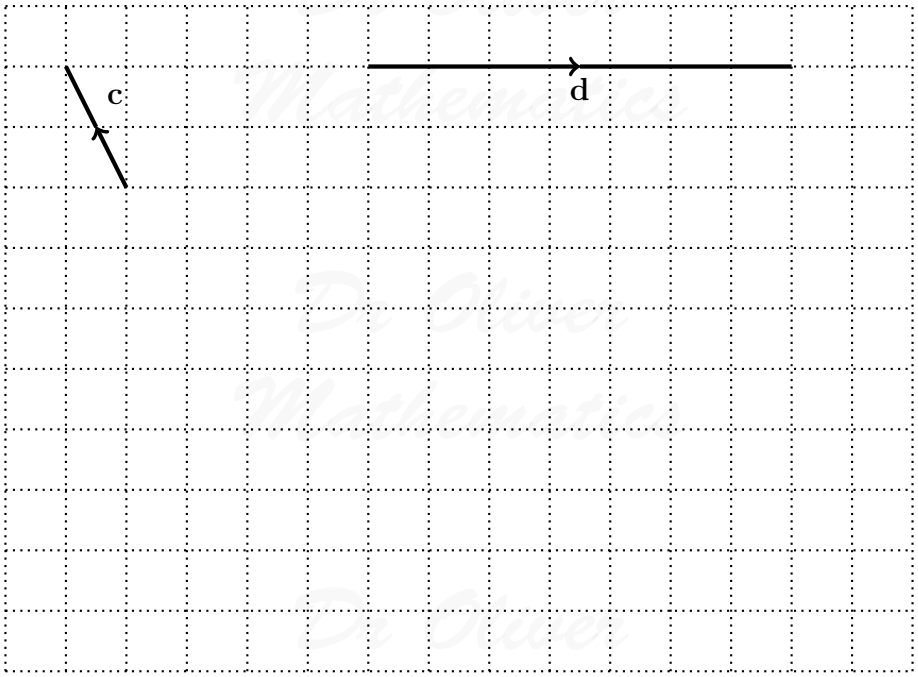
Work out the equation of the line.
Give your answer in the form $y = mx + c$.

13. (a) Vectors **a** and **b** are drawn on a grid. (1)



Write **b** in terms of **a**.

(b) Vectors **c** and **d** are drawn on a grid. (2)



On the grid above, draw a vector representing $\mathbf{c} - \mathbf{d}$.

14. For Class X, (1)

number of boys : number of girls = 7 : 8.

For Class Y,

number of boys : number of girls = 3 : 4.

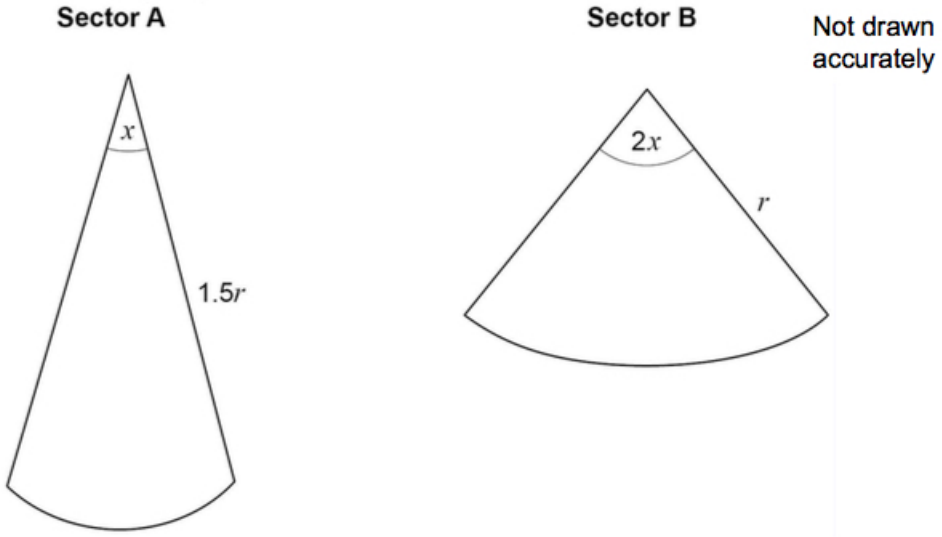
Which statement must be true?
Tick **one** box.

- ☐ Class X has more boys than class Y
- ☐ Class X has twice as many girls as class Y
- ☐ Class X has a greater proportion of boys than class Y
- ☐ Class X has the same proportion of boys as class Y

15. Simplify fully (3)

$$\frac{a^3b^2}{cd} \times \frac{c}{ab^5}.$$

16. Here are two sectors from different circles. (2)



Which sector has the bigger area?
Tick a box.

☐ Sector A ☐ Sector B

Show working to support your answer.

17. A factory makes kettles. (3)

- Four samples of kettles are tested for faults.
- Each sample has size 200.

Here are the relative frequencies of faulty kettles in the samples.

Sample	P	Q	R	S
Relative frequency	0.03	0.035	0.015	0.01

Work out the range of the number of faulty kettles in the four samples.

18. (a) Write (1)

$$x(3x - 9) = 4$$

in the form

$$ax^2 + bx + c = 0,$$

where a, b, and c are integers.

(b) Solve (2)

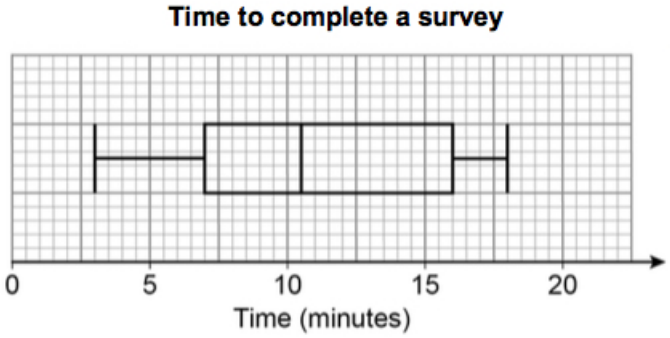
$$x(3x - 9) = 4.$$

Give your answers to 2 decimal places.

19. Here is some information about the times people took to complete a survey. (2)

Fastest time	3 minutes
Slowest time	18 minutes
Median	11 minutes
Lower quartile	7 minutes
Interquartile range	8 minutes

Ben draws this box plot to show the information.



Make **two** criticisms of his box plot.

20. d is directly proportional to the square of v.

$d = 6$ when $v = 20$.

(a) Work out an equation connecting d and v. (3)

(b) Work out the value of d when $v = 30$. (2)

21. Hanif makes green paint by mixing blue paint and yellow paint in the ratio (5)

blue : yellow = 7 : 3.

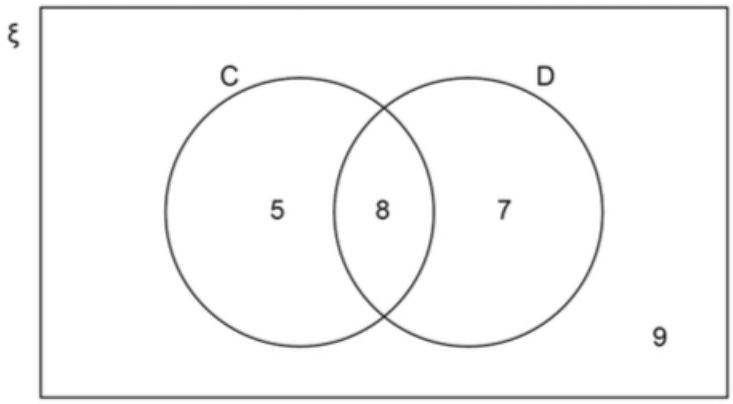
- He buys blue paint in 50-litre containers, each costing £225.
- He buys yellow paint in 20-litre containers, each costing £80.

He wants to

- sell the green paint in 5-litre tins and
- make 40% profit on each tin.

How much should he sell each tin for?

22.
- $\mathscr{E}$ = 29 students in a class.
- C = students who own a cat.
- D = students who own a dog.



(a) A student is chosen at random. (1)
Circle the probability that the student owns a cat or a dog but not both.

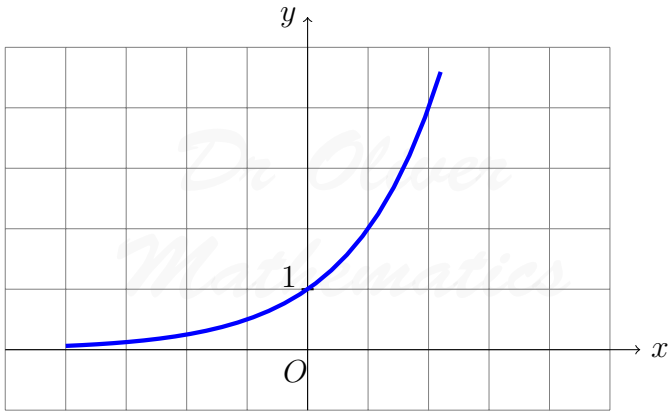
$\frac{12}{29}$ $\frac{13}{29}$ $\frac{15}{29}$ $\frac{20}{29}$

(b) A student who owns a dog is chosen at random. (1)
Circle the probability that the student also owns a cat.

$\frac{7}{15}$ $\frac{8}{15}$ $\frac{7}{29}$ $\frac{8}{29}$

23. Here is a sketch of the curve (2)

$$y = 2^x.$$



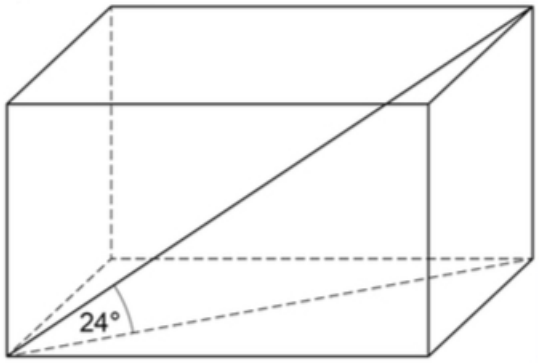
On the axes above, sketch the curve

$$y = 3^x.$$

24. The length of a diagonal of a cuboid is 20 cm. (3)

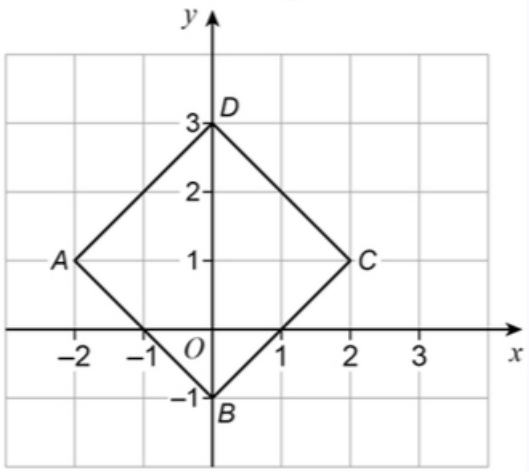
The diagonal makes an angle of 24° with the base.

The area of the base is 150 cm^2.



Work out the volume of the cuboid.

25. $ABCD$ is a square.
A is $(-2, 1)$. B is $(0, -1)$. C is $(2, 1)$. D is $(0, 3)$.



(a) A single transformation of $ABCD$ is such that (2)

- B is mapped to D,
- D is mapped to B, and
- A and C are invariant points.

Describe fully the transformation.

(b) A different **single** transformation of $ABCD$ is such that (3)

- B is mapped to D,
- D is mapped to B, and
- the only invariant point is $(0, 1)$.

Describe fully the transformation.

26. (3)

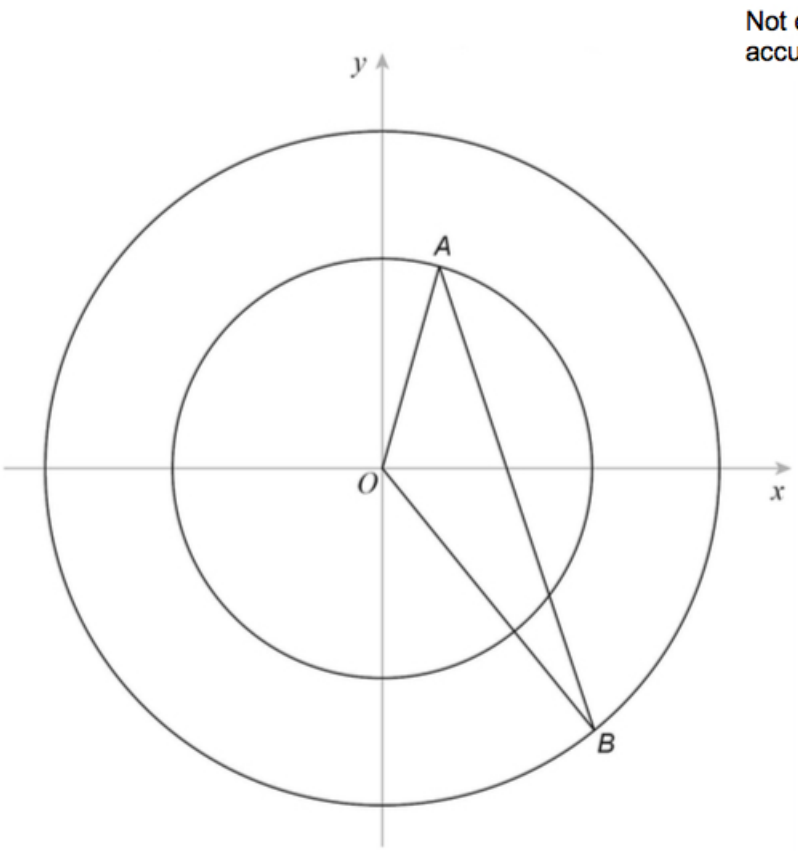
$$\mathrm{g}(x) = 16 - x \text{ and } \mathrm{h}(x) = x^3.$$

Solve

$$\mathrm{g}\,\mathrm{h}(x) = 24.$$

27. In this question, all lengths are in centimetres. (5)

- A is a point on a circle, centre O.
- B is a point on a different circle, centre O.
- $AB = 20$.



The equation of the larger circle is

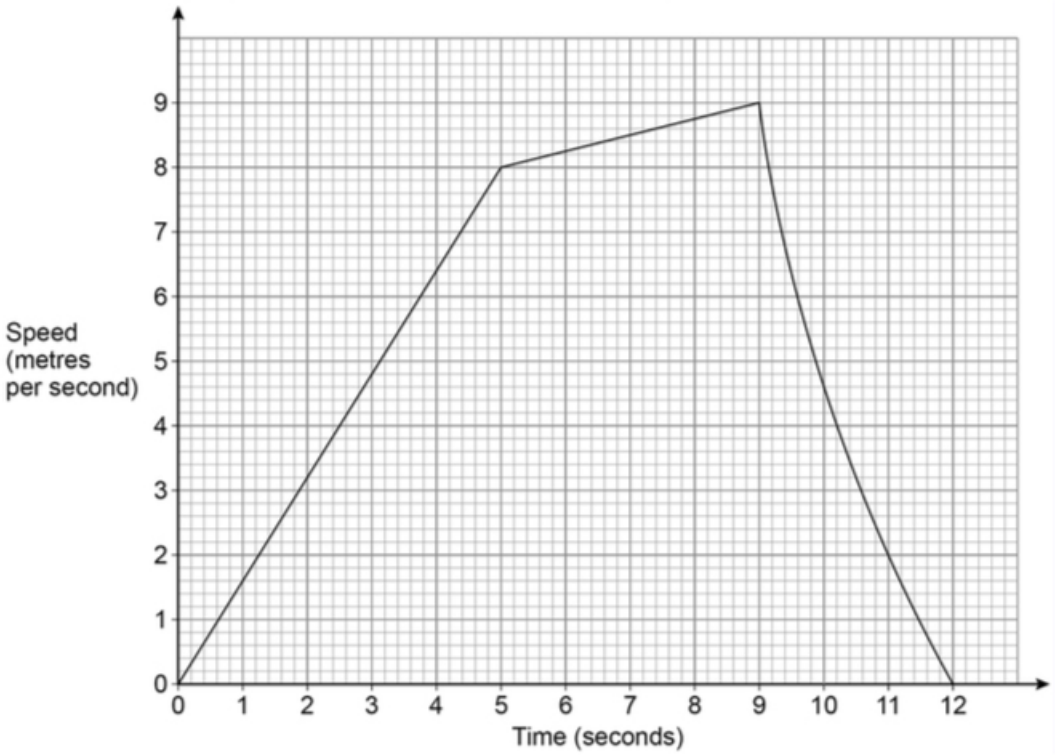
$$x^2 + y^2 = 144$$

and

radius of smaller circle : radius of larger circle = 4 : 5.

Work out the size of angle AOB.

28. Leo runs for 12 seconds.
The graph shows his speed.



(a) Show that the distance he runs is less than 67.5 metres. (4)

(b) Work out his average acceleration for the first 9 seconds. (2)
State the units of your answer.