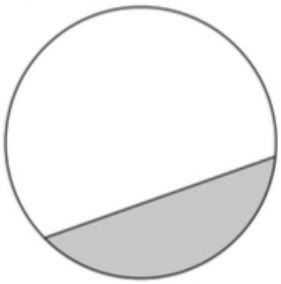
Dr Oliver Mathematics
AQA GCSE Mathematics
2018 June Paper 2: Calculator
1 hour 30 minutes

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

1. Here is a circle. (1)



Circle the word that describes the shaded part.

segment chord sector arc

2. Circle the number that is in standard form. (1)

0.25×10^4 6×10^7 38×10^{-3} $4 \times 10^{\frac{1}{2}}$

3. y is $1\frac{1}{2}$ times x. (1)

Circle the ratio that is equivalent to $y : x$.

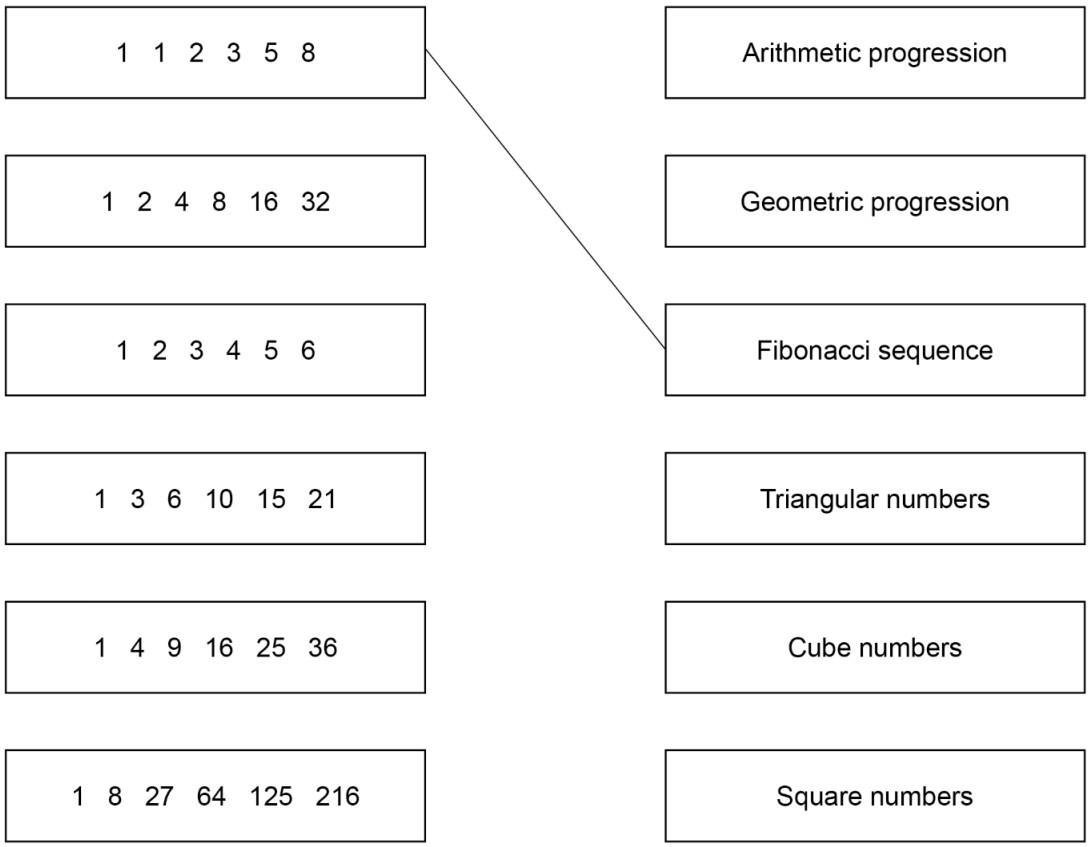
2 : 5 5 : 2 3 : 2 2 : 3

4. Work out 40 as a percentage of 10. (1)

Circle your answer.

4% 25% 300% 400%

5. Match each sequence to its description. (4)
One has been done for you.



6. The table shows information about the population of a city. (3)

Population in 2001	Population in 2011
420 000	480 000

Liam claims, "From 2011 to 2021, the population of the city will increase by the same percentage as from 2001 to 2011."

He works out,

$$\begin{aligned} \text{population increase from 2001 to 2011} &= 480\,000 - 420\,000 \\ &= 60\,000 \end{aligned}$$

$$\begin{aligned} \text{population in 2021} &= 480\,000 + 60\,000 \\ &= 540\,000. \end{aligned}$$

Does the population of 540 000 match his claim?
You must show your working.

7. On three days, Ali throws darts at a target.
Here are his results.

	Number of throws	Number of hits	Number of misses
Monday	20	15	5
Tuesday	30	22	8
Wednesday	40	17	23
Overall	90	54	36

(a) Work out **two** different estimates for the probability of Ali hitting the target. (2)

(b) Which of your two answers is the better estimate for the probability of Ali hitting the target? (1)
Give a reason for your answer.

8. Theo starts with savings of £18. (3)
James starts with no savings.

Each week from now, Theo will save £4.50 and James will save £4.

In how many weeks will Theo and James have savings in the ratio 15 : 8?

9. The length of each side of a regular pentagon is 8.4 cm to 1 decimal place.

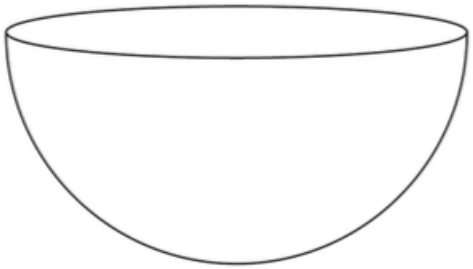
(a) Complete the error interval for the length of one side: (2)

..... cm $\leqslant$ length $<$ ..... cm.

(b) Complete the error interval for the perimeter: (1)

..... cm $\leqslant$ length $<$ ..... cm.

10. A container is a hemisphere of radius 30 cm. (3)



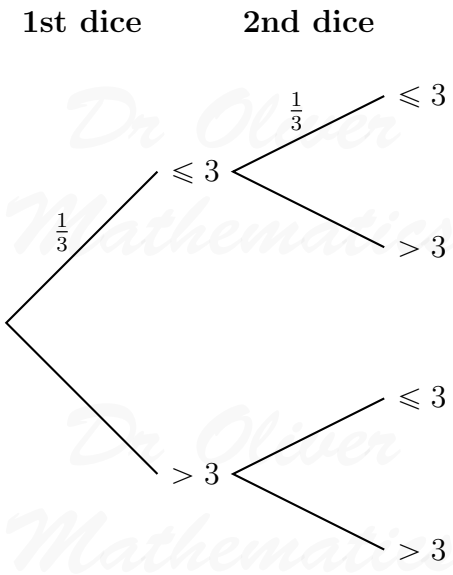
Sand fills the container at a rate of 4 000 cm^3 per minute.

Volume of a sphere = $\frac{4}{3}\pi r^3$ where r is the radius

Does it take **less than** a quarter of an hour to fill the container?
You **must** show your working.

11. Two ordinary fair dice are rolled.

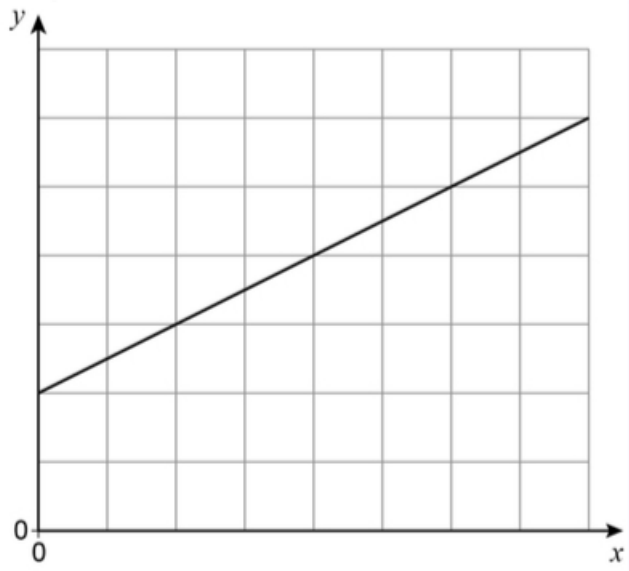
(a) Complete the tree diagram. (1)



(b) Work out the probability that **both** dice land on a number less than 3 (1)

(c) Work out the probability that **exactly one** of the dice lands on a number less than 3. (2)

12. A straight line is drawn on the centimetre grid.



Fay assumes that the scale is 1 cm represents 1 unit.

(a) Use her assumption to work out the gradient of the line. (1)

In fact, the scale is 1 cm represents 2 units.

(b) Which statement is correct? (1)
Tick **one** box.

☐ The answer to part (a) is too big

☐ The answer to part (a) stays the same

☐ The answer to part (a) is too small

13. Show that, for $x \neq -1$, (3)

$$\frac{8x^2 - 8}{4x + 4}$$

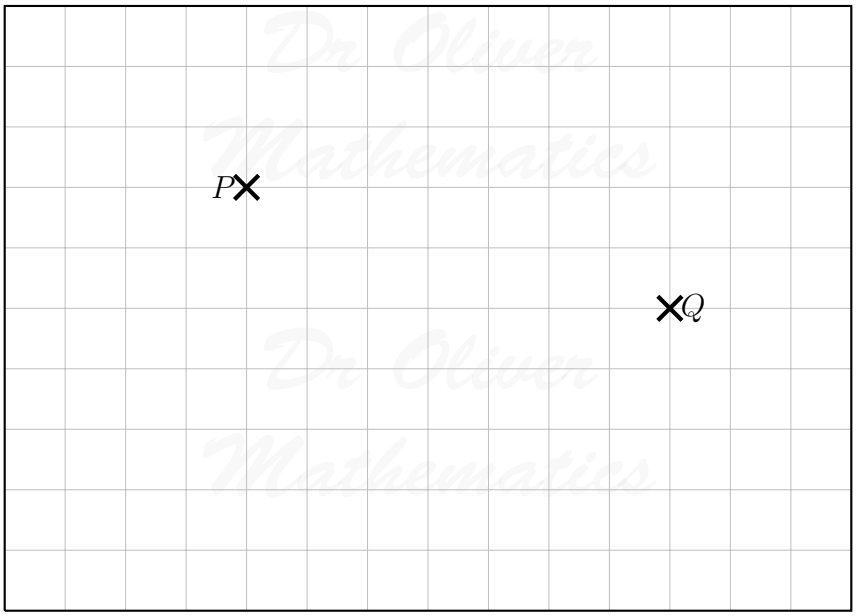
simplifies to the form

$$ax + b,$$

where a and b are integers.

14. The scale drawing represents a garden. (2)

- Water from a sprinkler at P reaches up to 20 metres from P.
- Water from a sprinkler at Q reaches up to 25 metres from Q.
- **Scale**: 1 cm represents 5 m.



Using a pair of compasses, show the region that water from **both** sprinklers reaches.

15. 100 men and 100 women took a test. (1)

	Median	Interquartile range	Range
Men	28	7.5	31
Women	30	9	37

Using this data, which statement **must** be true?
Tick **one** box.

☐ Men had a higher average score than women

☐ Men had more consistent scores than women

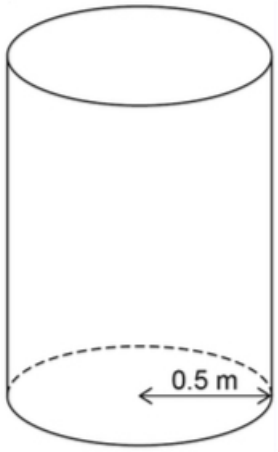
☐ A woman had the highest score

☐ A man had the lowest score

16. • Some concrete has volume 3.8 m^3.
    • The density of the concrete is 2400 kg/m^3.

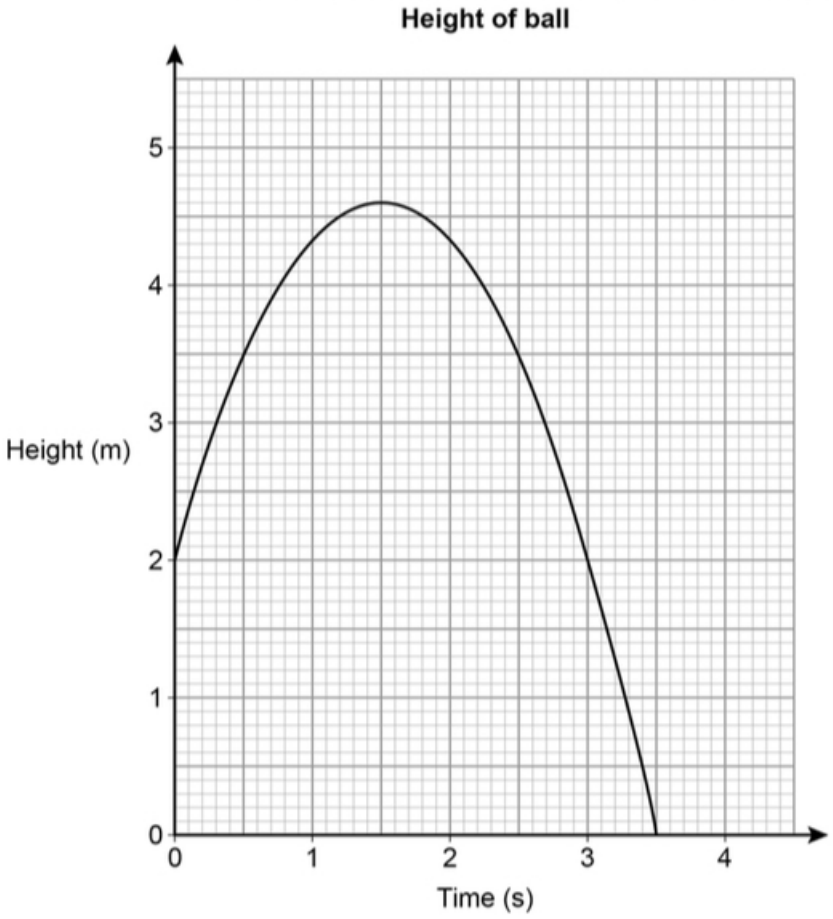
    (a) Work out the mass of the concrete. (2)

The 3.8 m^3 of concrete is made into the shape of a cylinder.
The base has radius 0.5 metres.



(b) Work out the height of the cylinder. (2)

17. A ball is thrown vertically upwards.
The graph shows the height of the ball above the ground after it is thrown.



(a) For how many seconds is the ball at a height of **more than** 2 metres? (1)

(b) After how many seconds is the ball at instantaneous rest when it is in the air? (1)

(c) Work out the average speed of the ball when it is moving downwards. (2)

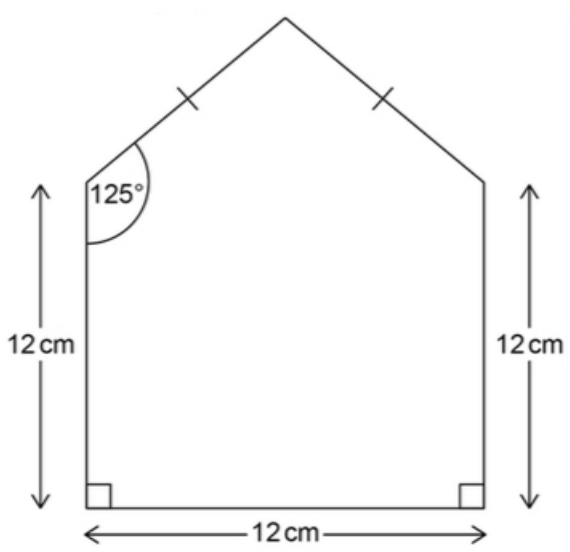
18. The solution of (1)

$$3^x = 300$$

lies between two consecutive integers.

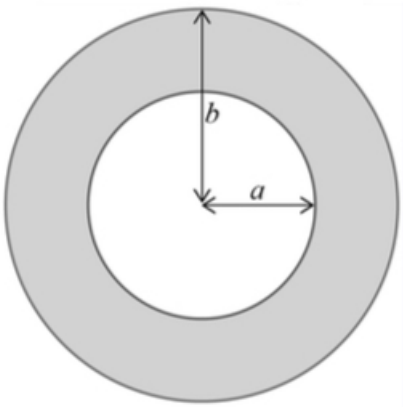
Work out the two integers.

19. A pentagon is made from a square and an isosceles triangle. (4)



Work out the perimeter of the pentagon.

20. Here is an inflated swimming ring with dimensions in centimetres. (3)

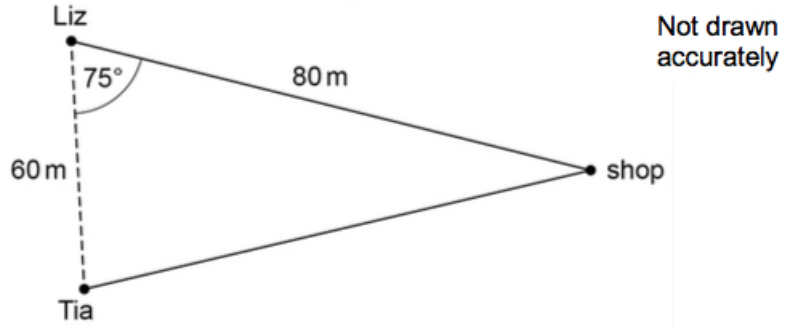


The volume of the ring, V cm^3, is given by

$$V = 0.25\,\pi^2(b-a)^2(b+a).$$

Work out the volume when $a = 20$ and $b = 30$.
Give your answer to 3 significant figures.

21. Liz and Tia are walking towards a shop along different straight paths.
The diagram shows their positions at 2 pm.



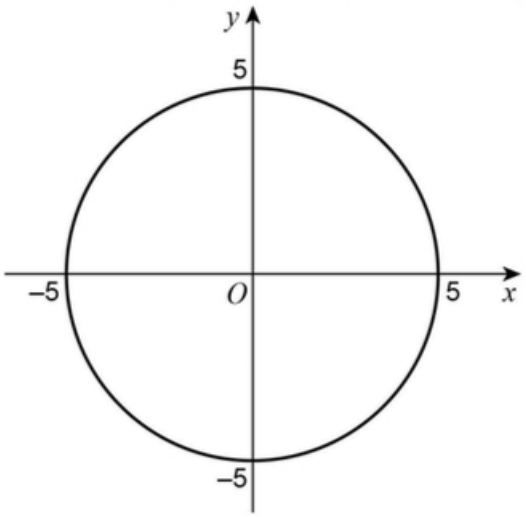
Assume they walk at the same speed.

(a) Who will arrive at the shop first? (3)
You **must** show your working.

In fact, Liz walks at a faster speed than Tia.

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

22. A circle, centre O, passes through $(5, 0)$. (1)



What is the equation of the circle?
Circle your answer.

$$x^2 + y^2 = 25 \quad x^2 + y^2 = 5 \quad x^2 + y^2 = 10 \quad x^2 + y^2 = 100$$

23. Solids X and Y are similar. (3)

- X has volume 64 cm^3.
- Y has volume 343 cm^3.

The surface area of X is 176 cm^2.

Work out the surface area of Y.

24. A tank is a cuboid measuring 50 cm by 35 cm by 20 cm. (4)
All lengths are to the **nearest centimetre**.

A container has a capacity of exactly 34 litres.
1 litre = 1 000 cm^3.

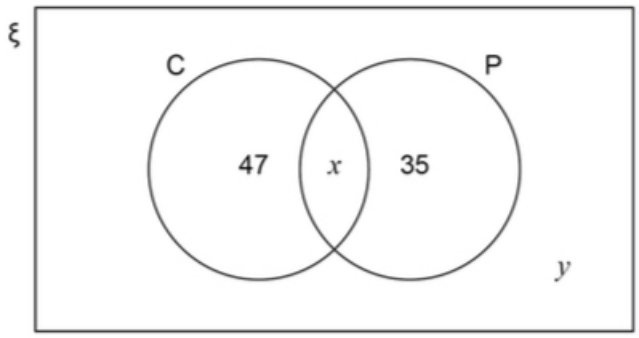
Which has the greater capacity?
Tick **one** box.

☐ Tank ☐ Container ☐ Cannot tell

Show working to support your answer.

25. The Venn diagram shows some information about 150 students. (4)

- $\mathscr{E}$ = 150 students.
- C = students who study Chemistry.
- P = students who study Physics.



The probability that a Physics student, chosen at random, also studies Chemistry is $\frac{5}{12}$.

One of the 150 students is chosen at random.

Work out the probability that the student does **not** study either Chemistry or Physics.

26. A curve has equation (4)

$$y = 4x^2 + 5x + 3.$$

A line has equation

$$y = x + 2.$$

Show that the curve and the line have **exactly** one point of intersection.
Do **not** use a graphical method.

27. Prove algebraically that (3)

$$2.7\dot{5}$$

converts to the fraction

$$\frac{124}{45}.$$

28.

$$\mathrm{f}(x) = 5 - x \text{ and } \mathrm{g}(x) = 3x + 7.$$

(a) Simplify (3)

$$\mathrm{f}(2x) + \mathrm{g}(x - 1).$$

(b) Solve (3)

$$\mathrm{g}^{-1}(x) = 2x.$$