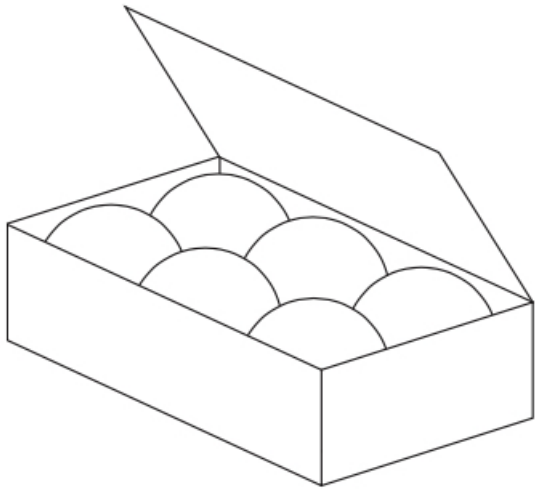
Dr Oliver Mathematics
AQA Mathematics
2016 June Paper 1: Calculator
1 hour 30 minutes

The total number of marks available is 70.
Give non-exact numerical answers correct to 3 significant figures, or 1 decimal place in the case of angles in degrees, unless a different level of accuracy is specified in the question.
You must write down all the stages in your working.

1. Increase £190 by 35%. (3)

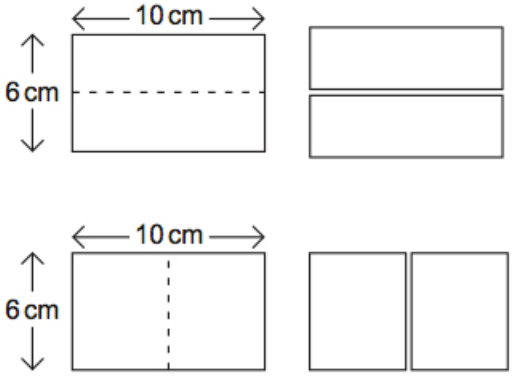
2. Six balls just fit inside a box as shown. (3)



- The balls each have a diameter of 5 cm.
- The box is a cuboid.

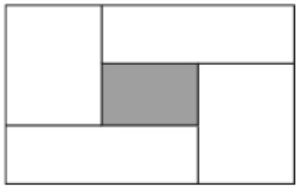
Work out the volume of the box.

3. Two 10 cm by 6 cm rectangles are cut in half as shown. (3)



Not drawn accurately

The four pieces are joined together, without overlap, as shown.



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Work out the perimeter of the shaded rectangle.

4. A bag has only red, white, blue, and yellow counters.
A counter is taken from the bag at random.

Here are some of the probabilities.

Colour	Red	White	Blue	Yellow
Probability	0.1		0.3	

(a) The probability of taking a white counter is twice the probability of taking a yellow counter. (2)

Complete the table.

(b) There are 500 counters in the bag altogether. (2)

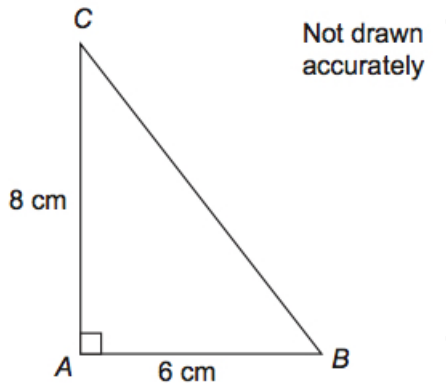
Complete the table.

Colour	Red	White	Blue	Yellow	Total
Counters in the bag	50				500

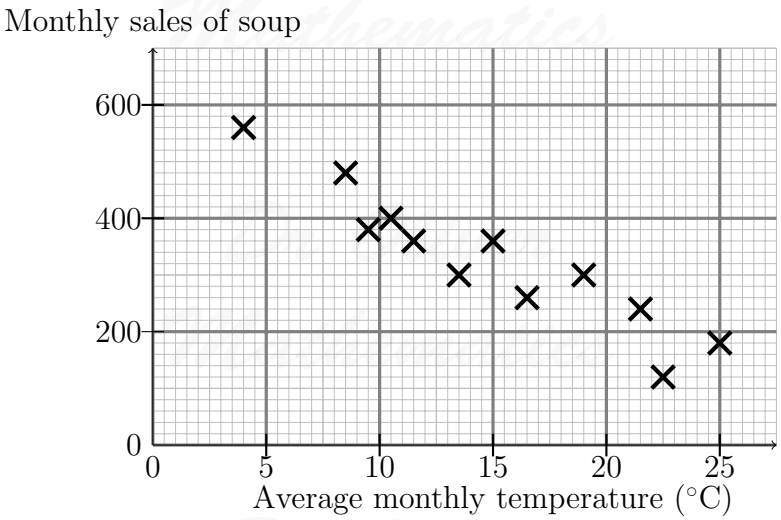
(c) All of the yellow counters are taken out of the bag. (2)

Work out the probability of taking a red counter at random from the bag now.

5. Work out length BC. (3)



6. A café owner records the average monthly temperature and the monthly sales of soup over a year.



(a) The scatter graph shows negative correlation. (1)

Write down the relationship between average monthly temperature and monthly sales of soup.

(b) The average monthly temperature for the next month is predicted to be 7°C. (2)

Use the graph to estimate the sales of soup that month.
You **must** show your working.

7. Dwayne Pipes uses this formula to work out the cost of a plumbing job in pounds. (4)

$$\boxed{\text{Cost of job} = 35 \times \text{number of hours} + 40}$$

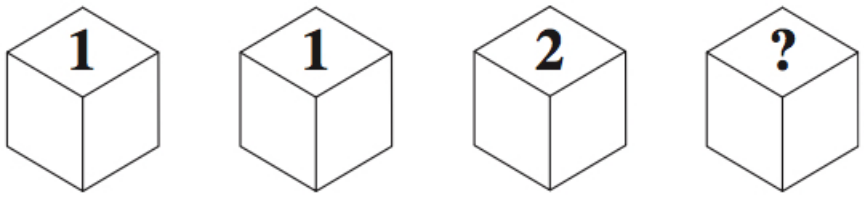
Ivor Wrench uses this formula to work out the cost of a plumbing job in pounds.

$$\boxed{\text{Cost of job} = 40 \times \text{number of hours} + 17.5}$$

A job of x hours costs the same with Dwayne and Ivor.

Set up and solve an equation to work out x.

8. (a) The scores on four ordinary, six-sided dice are put in order. (1)



The median of the **four** scores is 0.5 **less** than the mean of the four scores.

Circle the value of the fourth score.

2 3 4 5 6

(b) The dice are rolled again. (2)
The median of the scores is 0.5 **less** than the range.

Work out a possible set of scores.

9. (a) Simplify fully (1)

$$\frac{w^3 \times w^4}{w^2}.$$

(b) Simplify fully (2)

$$2x^2y^3 \times 4xy^2.$$

(c) Simplify fully (2)

$$12a^4b^5 \div 2a^2b.$$

10. (a) Work out (2)

$$(3 \times 10^5) \times (6 \times 10^{-2}).$$

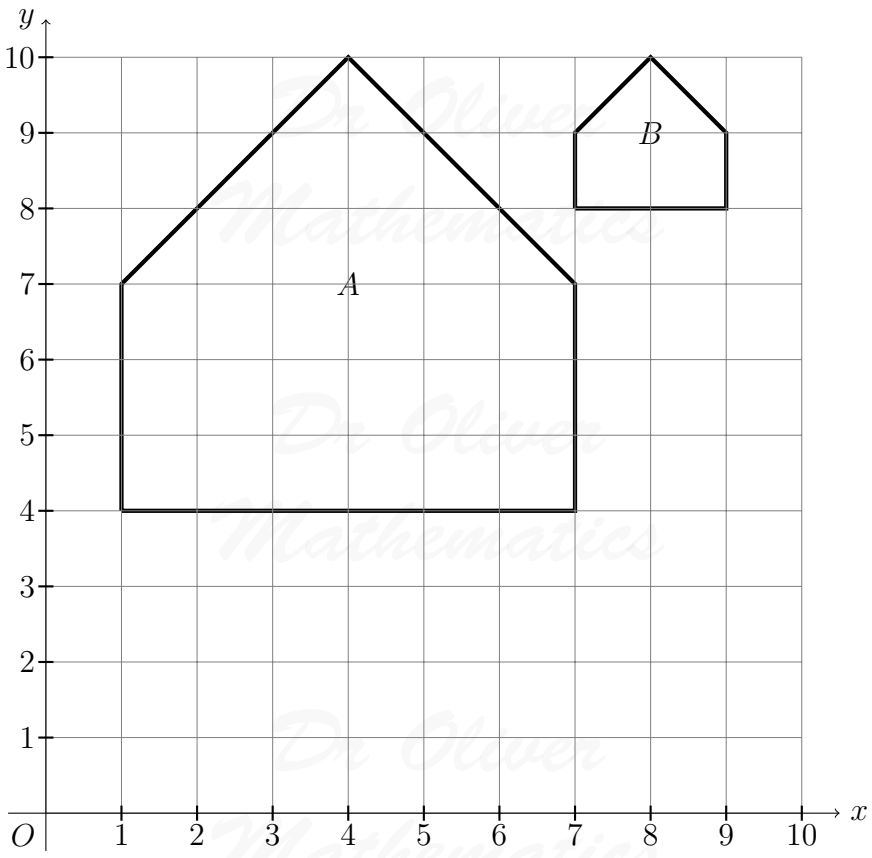
Write your answer in standard form.

(b) Work out (2)

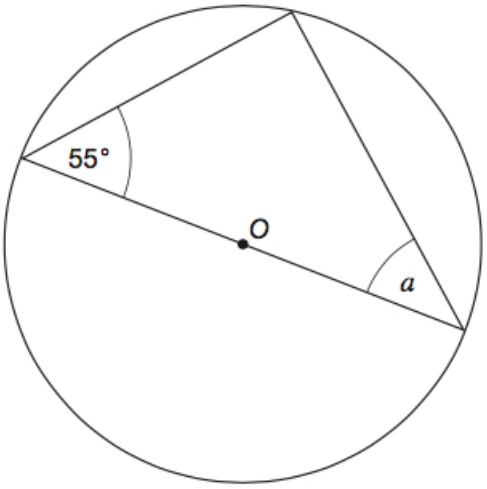
$$(8 \times 10^4 + 4 \times 10^4) \div 24.$$

Write your answer in standard form.

11. Describe fully the **single** transformation that maps shape A to shape B. (3)



12. (a) O is the centre of the circle. (1)



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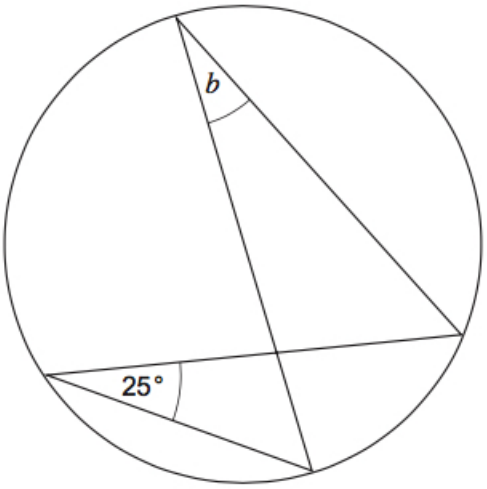
Work out the size of angle a.

(b) Work out the size of angle b. (1)



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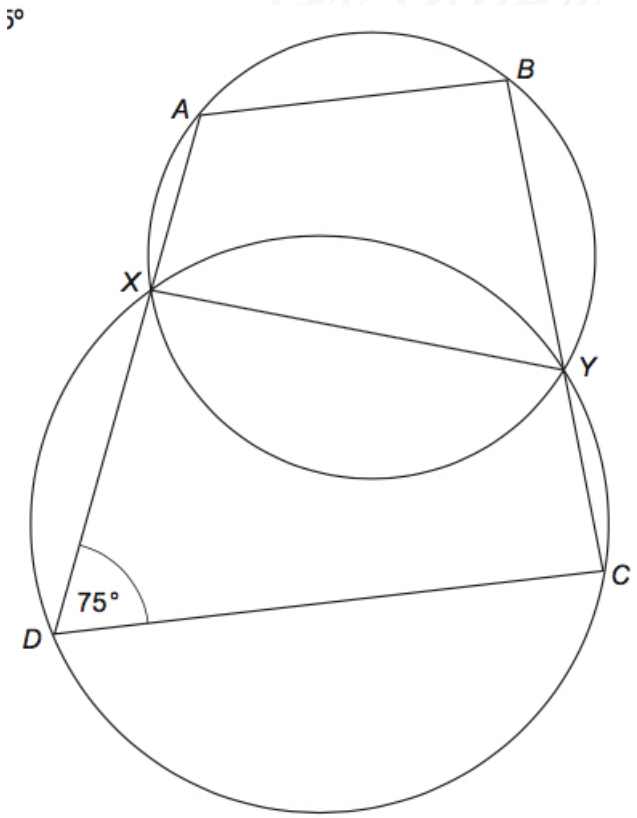
(c) Two circles, with different radii, intersect at X and Y. (3)



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- A and B are points on the smaller circle.
- C and D are points on the larger circle.
- AXD and BYC are straight lines.
- Angle $XDC = 75°$.

Show that AB is parallel to DC.

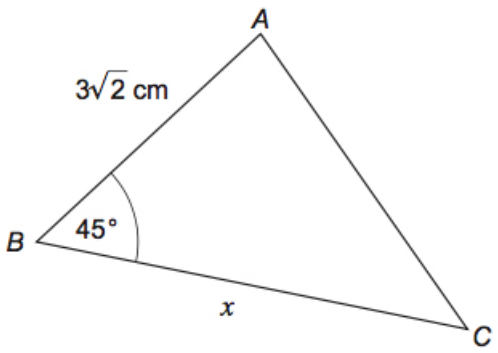
13. (a) Expand and simplify (2)

$$(6x - 1)(2x + 3).$$

(b) Solve (3)

$$4x^2 + x - 3 = 0.$$

14. ABC is a triangle. (2)



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- $AB = 3\sqrt{2}$ cm.
- Angle $ABC = 45°$.
- The area of ABC is 12 cm^2.
- You are given that $\sin 45° = \frac{1}{\sqrt{2}}$.

Work out the length x.

15. Rearrange (3)

$$y = \frac{3x + 5}{x}$$

to make x the subject.
You **must** show your working.

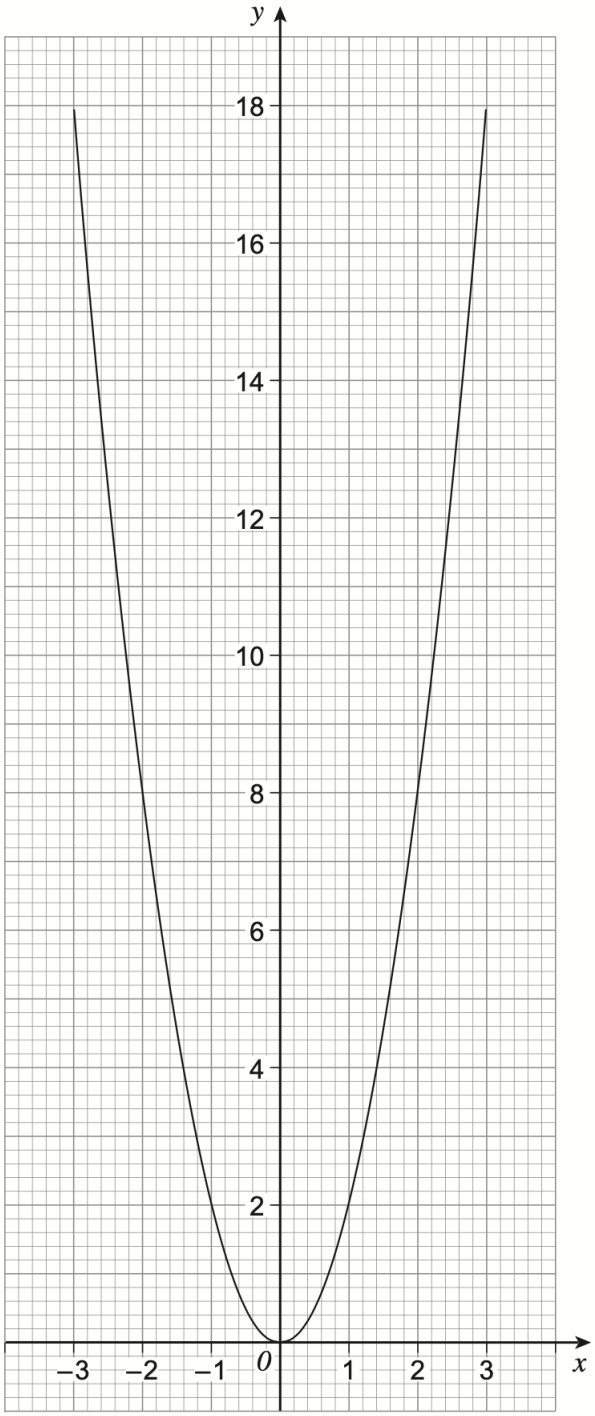
16. Solve (3)

$$\tfrac{1}{2}(3x - 1) < \tfrac{3}{8}(x + 1).$$

17. Here is the graph of

$$y = 2x^2$$

for values of x from -3 to 3.



(a) Use the graph to estimate the solutions to (2)

$$2x^2 = 15.$$

Show clearly how you obtained your answer.

(b) Use the graph to estimate the value of $\sqrt{5}$. (2)
Show clearly how you obtained your answer.

18. Simplify fully (3)

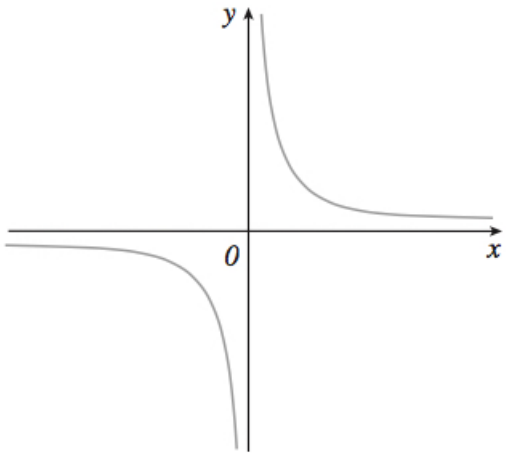
$$\frac{(5-\sqrt{3})(3-\sqrt{3})}{2}.$$

Give your answer in the form

$$a+b\sqrt{3},$$

where a and b are integers.

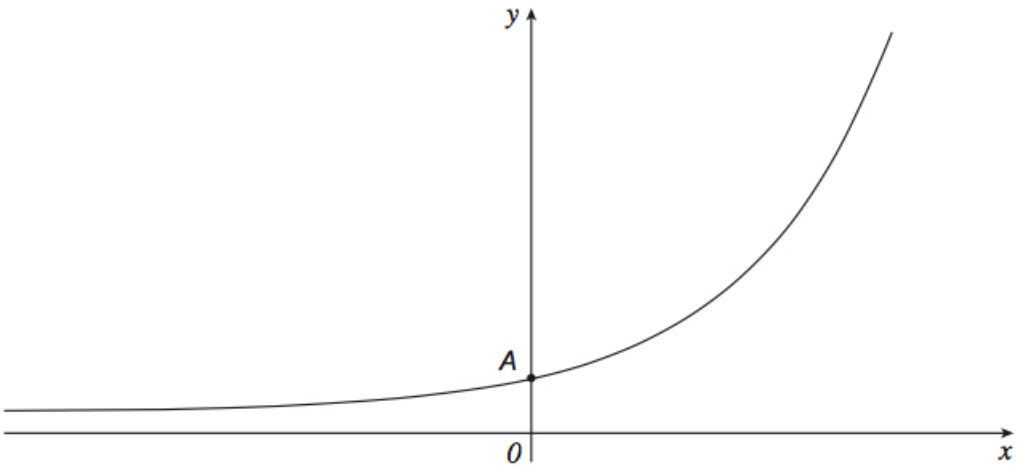
19. (a) Circle a possible equation for the graph shown below. (1)



$y = x^3$ $y = \frac{1}{x}$ $y = \cos x$ $y = \sin x$

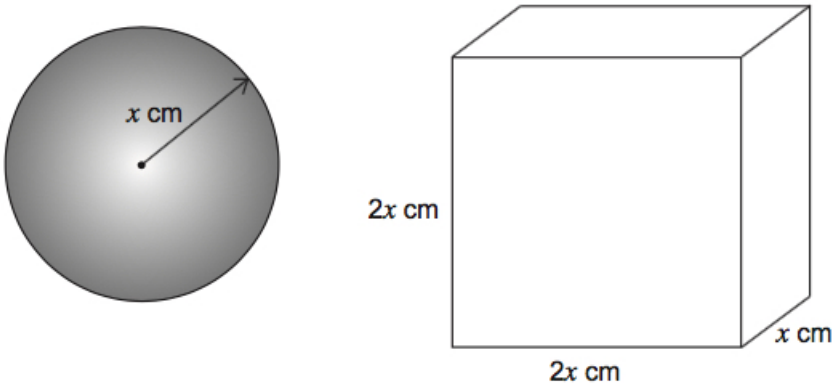
(b) This is the graph of (1)

$$y = 2^x.$$



Write down the coordinates of A.

20. A sphere has a radius of x cm. (3)
A cuboid has edges of length x cm, width $2x$ cm, and height $2x$ cm.



Show clearly that the sphere has the larger volume.