Dr Oliver Mathematics
GCSE Mathematics
2009 November Paper 3H: Non-Calculator
1 hour 45 minutes

The total number of marks available is 100.
You must write down all the stages in your working.

1. Using the information that

$$74 \times 234 = 17\,316,$$

write down the value of

(a) 740×234, (1)

(b) 74×2.34. (1)

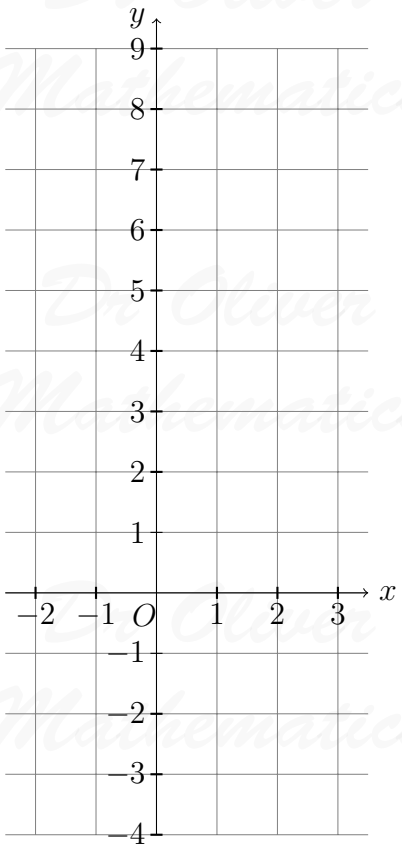
2. Work out an estimate for the value of (3)

$$\frac{31 \times 4.92}{0.21}.$$

3. (a) Complete the table of values for $y = 2x + 2$. (2)

x	-2	-1	0	1	2	3
y			0	2		

(b) On the grid, draw the graph of $y = 2x + 2$. (2)



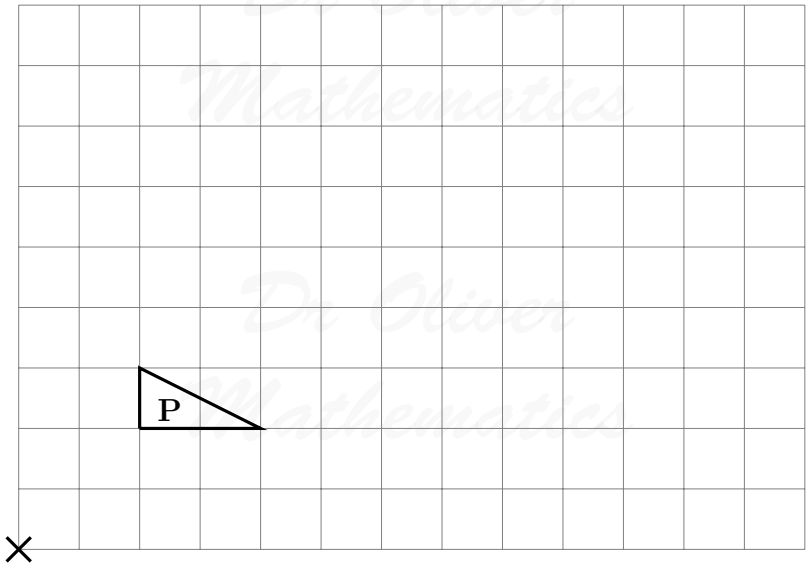
(c) Use your graph to find (2)

(i) the value of y when $x = -1.5$,

(ii) the value of x when $y = 7$.

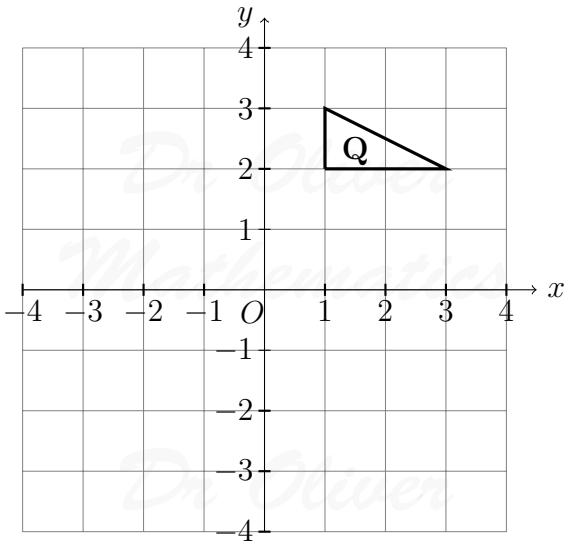
4. Triangle **P** has been drawn on a grid.

(a) On the grid, draw an enlargement of the triangle **P** with scale factor 3. (2)



Triangle **Q** has been drawn on a grid.

(b) On the grid, rotate triangle **Q** 90° clockwise, centre O. (3)



5. Here are the weights in grams, to the nearest gram, of 15 eggs.

33	46	41	54	51
38	60	44	55	51
62	55	52	37	63

(a) Complete the ordered stem and leaf diagram to show this information. (3)
You must include a key.

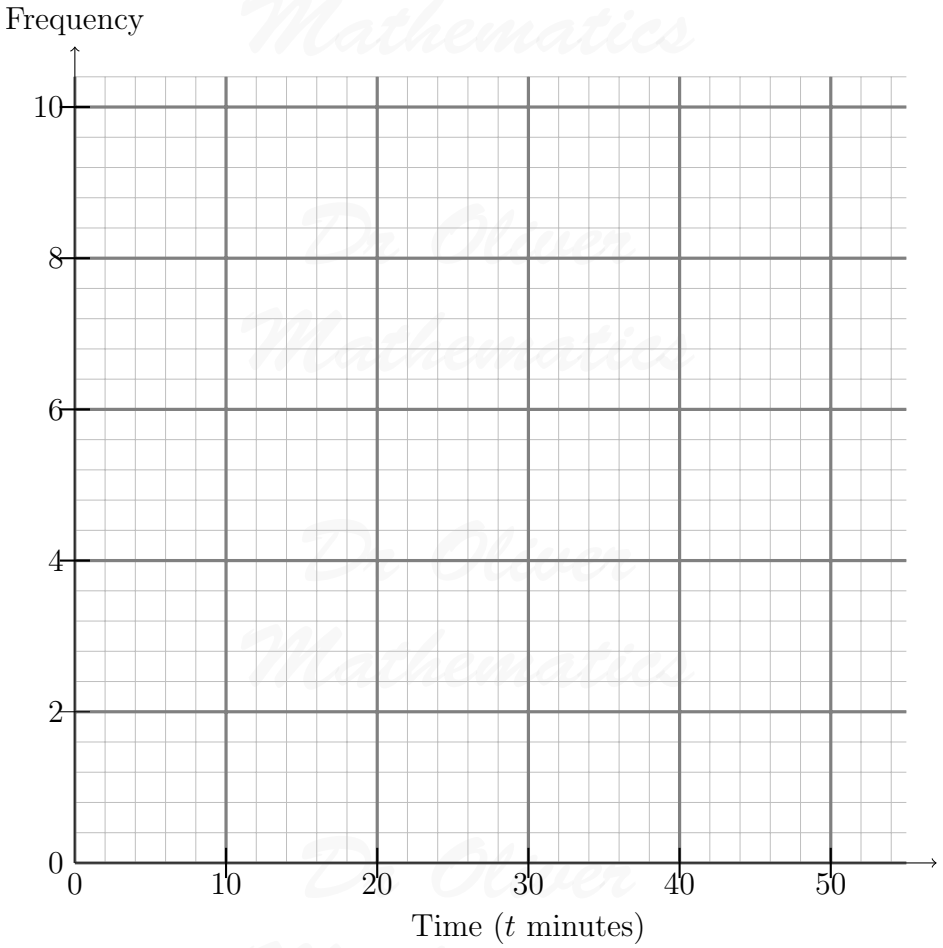
Meg is going to pick at random one of the eggs.

(b) Work out the probability that this egg will have a weight of more than 45 grams. (2)

6. 30 students took a test.
The table shows information about how long it took them to complete the test.

Time (t minutes)	Frequency
$0 < t \leqslant 10$	5
$10 < t \leqslant 20$	7
$20 < t \leqslant 30$	8
$30 < t \leqslant 40$	6
$40 < t \leqslant 50$	4

(a) On the grid, draw a frequency polygon for this information. (2)



(b) Write down the modal class interval. (1)

7. (a) Work out (2)

$$\frac{3}{8} + \frac{1}{4}.$$

Give your answer in its simplest form.

(b) Work out (2)

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

(c) Work out (3)

$$423 \times 12.$$

You **must** show **all** your working.

8. Simon wants to find out how much people spend using their mobile phone.
He uses this question on a questionnaire.

How much do you spend using your mobile phone?

☐ £1–£5 ☐ £5–£10 ☐ £10–£15

(a) Write down **two** things that are wrong with this question. (2)

(b) Design a better question for his questionnaire to find out how much people spend using their mobile phone. (2)
You should include some response boxes.

9. (a) A solid cube has sides of length 5 cm. (4)

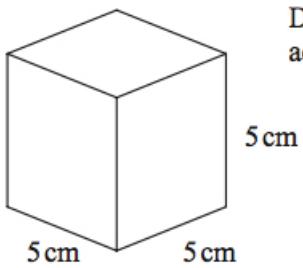


Diagram **NOT** accurately drawn

Work out the total surface area of the cube.
State the units of your answer.

The volume of the cube is 125 cm^3.

(b) Change 125 cm^3 into mm^3. (2)

The weight of the cube is 87 grams, correct to the nearest gram.

(c) (i) What is the minimum the weight could be? (2)

(ii) What is the maximum the weight could be?

10. (a) Simplify (2)

$$3a + 4c - a + 3c.$$

(b) Expand (1)

$$y(2y - 3).$$

(c) Factorise (2)

$$x^2 - 4x.$$

(d) Expand and simplify (2)

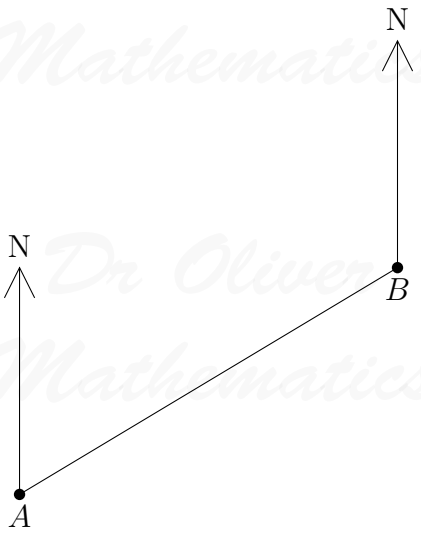
$$2(x + 3) + 3(2x - 1).$$

(e) Solve (2)

$$3(x + 2) = 8.$$

11. The diagram shows the positions of two telephone masts, A and B, on a map.

(a) Measure the bearing of B from A. (1)



Another mast C is on a bearing of 160° from B.
On the map, C is 4 cm from B.

(b) Mark the position of C with a cross (×) and label it C. (2)

12. Batteries are sold in packets and boxes. (3)
Each packet contains 4 batteries.
Each box contains 20 batteries.
Bill buys p packets of batteries and b boxes of batteries.
Bill buys a total of N batteries.
Write down a formula for N in terms of p and b.

13. (a) Write in standard form 213 000. (1)

(b) Write in standard form 0.001 23. (1)

14. (a) Write down the value of 5^0. (1)

(b) Write down the value of 2^{-1}. (1)

15. k is an integer such that $-1 \leqslant k < 3$.

(a) List all the possible values of k. (2)

(b) Solve the inequality (2)

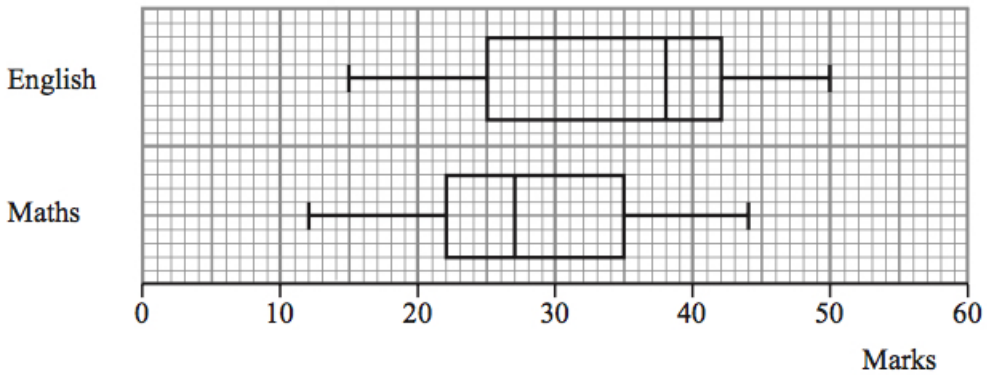
$$6y \geqslant y + 10.$$

16. Make q the subject of the formula (3)

$$5(q + p) = 4 + 8p.$$

Give your answer in its simplest form.

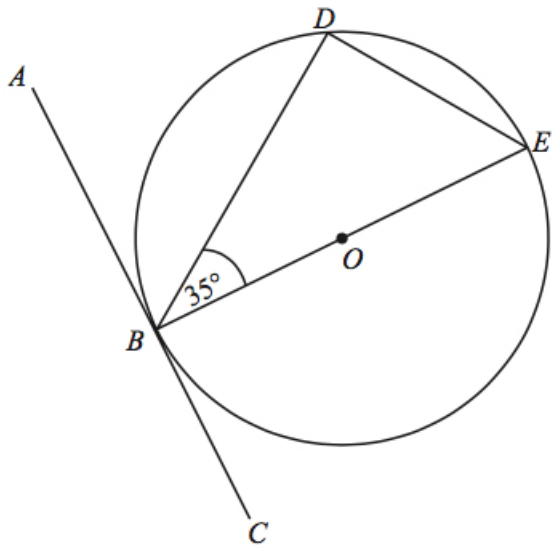
17. The box plots show the distribution of marks in an English test and in a Maths test for a group of students.



(a) What is the highest mark in the English test? (1)

(b) Compare the distributions of the marks in the English test and marks in the Maths test. (2)

18. B, D, and E are points on a circle centre O.



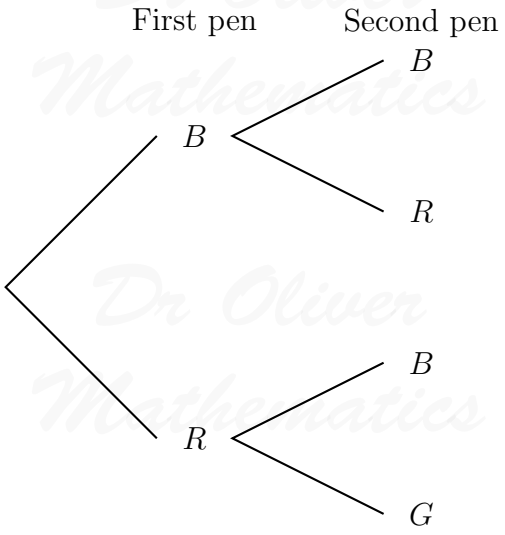
ABC is a tangent to the circle.
BE is a diameter of the circle.
Angle $DBE = 35°$.

(a) Find the size of angle ABD. (2)
Give a reason for your answer.

(b) Find the size of angle DEB. (2)
Give a reason for your answer.

19. Emma has 7 pens in a box.
5 of the pens are blue.
2 of the pens are red.
Emma takes at random a pen from the box and writes down its colour.
Emma puts the pen back in the box.
Then Emma takes at random a second pen from the box, and writes down its colour.

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



(b) Work out the probability that Emma takes exactly one pen of each colour from the box. (3)

20. Solve the simultaneous equations: (3)

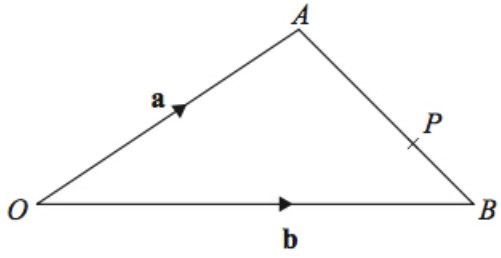
$$4x + y = -1$$
$$4x - 3y = 7.$$

21. Work out (2)

$$(2 + \sqrt{3})(2 - \sqrt{3}).$$

Give your answer in its simplest form.

22. OAB is a triangle.



$\overrightarrow{OA} = \mathbf{a}$.
$\overrightarrow{OB} = \mathbf{b}$.

(a) Find the vector $\overrightarrow{AB}$ in terms of $\mathbf{a}$ and $\mathbf{b}$. (1)

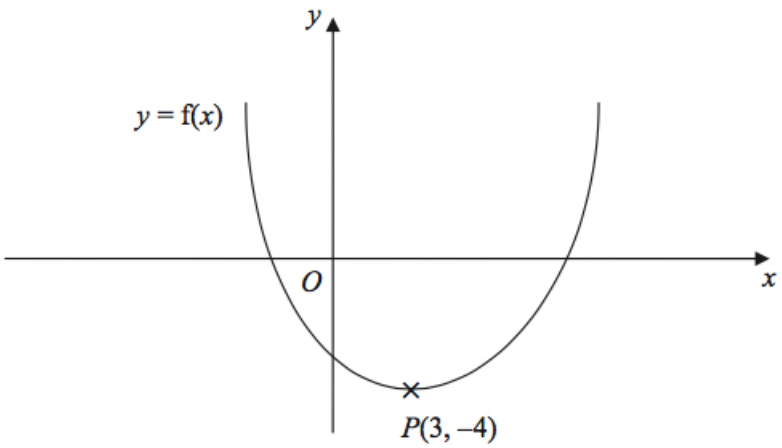
P is the point on AB so that $AP : PB = 2 : 1$.

(b) Find the vector $\overrightarrow{OP}$ in terms of **a** and **b**. (3)
Give your answer in its simplest form.

23. Prove that the recurring decimal (3)

$$0.\dot{3}\dot{6} = \tfrac{4}{11}.$$

24. This is a sketch of the curve with the equation $y = \mathrm{f}(x)$.



The only minimum point of the curve is at $P(3, -4)$.

(a) Write down the coordinates of the minimum point of the curve with the equation $y = \mathrm{f}(x - 2)$. (2)

(b) Write down the coordinates of the minimum point of the curve with the equation $y = \mathrm{f}(x + 5) + 6$. (2)

25. Prove, using algebra, that the sum of two consecutive whole numbers is always an odd number. (3)