Dr Oliver Mathematics
GCSE Mathematics
2015 Paper 2H: Calculator
1 hour 45 minutes

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

1. Uditi has a bag of chocolate sweets.
   There are 30 sweets in the bag.
   This table shows the types of sweets in the bag.

	Strawberry	Caramel	Nut
Dark chocolate	3	1	6
Milk chocolate	4	5	2
White chocolate	1	4	4

   Uditi takes at random a sweet from the bag.

   (a) Write down the probability that the sweet is a dark chocolate caramel. (1)

   (b) Work out the probability that the sweet is a white chocolate. (2)

   There are some dark chocolates, some milk chocolates, and some white chocolates in a box.
   The table below shows the probabilities that a chocolate taken at random from the box is a dark chocolate or is a milk chocolate.

	Dark chocolate	Milk chocolate	White chocolate
Probability	0.35	0.17	

   A chocolate is taken at random from the box.

   (c) Work out the probability that the chocolate is a white chocolate. (2)

2. The equation (4)
$$x^3 - x^2 = 30$$

   has a solution between 3 and 4.
   Use a trial and improvement method to find this solution.
   Give your answer correct to one decimal place.
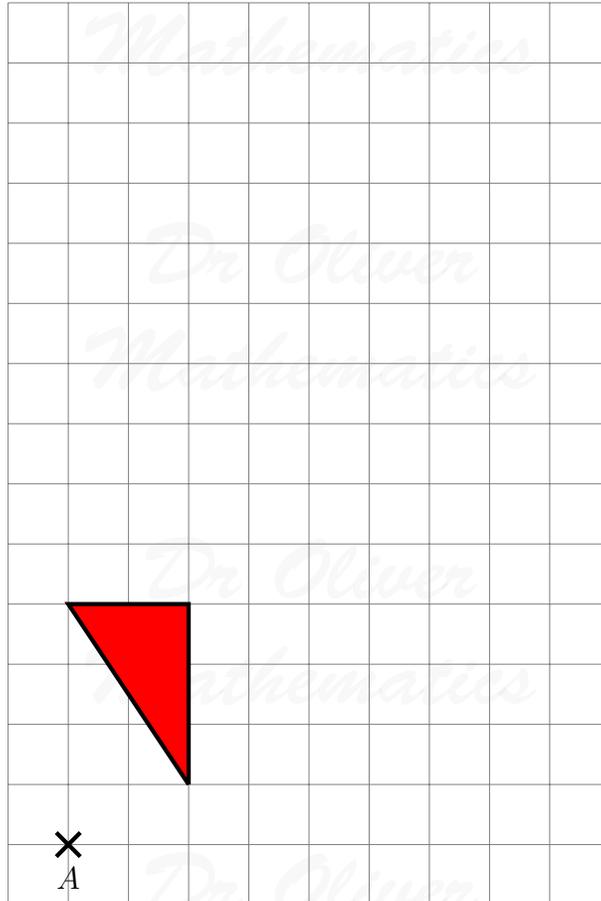   You must show all your working.

3. Use your calculator to work out
$$\frac{\sqrt{70.25}}{4.2 - 2.37}.$$

   (a) Write down all the figures on your calculator display.   (2)
       You must give your answer as a decimal.

   (b) Write your answer to part (a) correct to 4 decimal places.   (1)

4. A shaded shape is shown on the grid.   (2)

5. Redlands School sent x students to a revision day.   (5)
   St Samuel's School sent twice as many students as Redlands School.
   Francis Long School sent 7 fewer students than Redlands School.
   Each student paid £15 for the revision day.
   The students paid a total of £1155.
   Work out how many students were sent by each school to the revision day.
   You must show all your working.

6. Coffee sachets are sold in three different sizes of box. (4)

A small box has 12 coffee sachets and costs £5.65.
A medium box has 20 coffee sachets and costs £9.20.
A large box has 35 coffee sachets and costs £15.75.
Work out which size of box gives the best value for money.
You must show all your working.

7. (a) Expand $7(x + 5)$. (1)

   (b) Expand $3y(4y - 3)$. (1)

   (c) Expand and simplify $(t + 2)(t + 4)$. (2)

8. Sandra has a piece of string 153 cm long. (3)
   She cuts the string into three lengths in the ratio $4 : 2 : 3$.
   Work out the length, in centimetres, of each piece of string.

9. The frequency table gives information about the numbers of emails sent by 51 teachers on Monday.

Number of emails sent (m)	Frequency
$0 < m \leqslant 10$	5
$10 < m \leqslant 20$	17
$20 < m \leqslant 30$	14
$30 < m \leqslant 40$	9
$40 < m \leqslant 50$	6

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

Frequency

20

15

10

5

O 10 20 30 40 50 Number of emails sent (m)
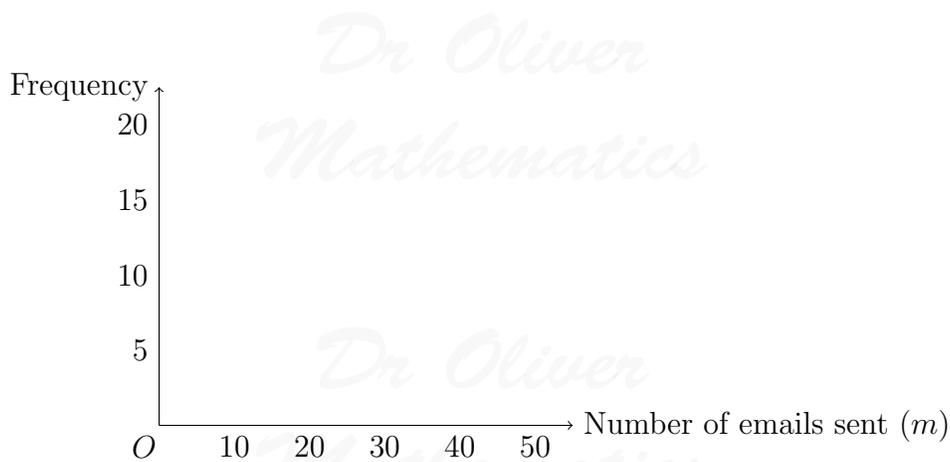
(b) Nalini says that at least a quarter of these teachers sent more than 30 emails. (2)
Is Nalini correct?
You must explain your answer.

10. Here is a scale drawing of an office. (3)
The scale is 1 cm to 2 metres.

A D

B C

A photocopier is going to be put in the office.
The photocopier has to be closer to B than it is to A.
The photocopier also has to be less than 8 metres from C.
Show, by shading, the region where the photocopier can be put.

11. The diagram shows the top of Levi's birthday cake. (4)

4
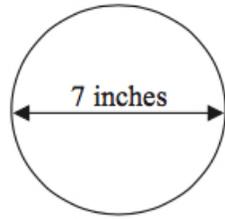
Diagram **NOT**
accurately drawn

7 inches

The top of the cake is in the shape of a circle.
The diameter of the circle is 7 inches.
A ribbon is going to be put around the side of the cake.
Ribbons are sold in 50 cm lengths.
1 inch is 2.54 cm.
Work out if one length of ribbon is long enough to go all the way around the cake.
You must show your working.

12. The points A, B, and C lie in order on a straight line. (3)
    The coordinates of A are $(2, 5)$.
    The coordinates of B are $(4, p)$.
    The coordinates of C are $(q, 17)$.
    Given that $AC = 4AB$, find the values of p and q.

13. Martin and Janet are in an orienteering race. (2)
    Martin runs from checkpoint A to checkpoint B, on a bearing of $065°$.
    Janet is going to run from checkpoint B to checkpoint A.
    Work out the bearing of A from B.

14. Sumeet records the times, in minutes, for 40 runners to finish a half marathon. (4)
    Information about these times is shown in the table.

| Time (t minutes)	Frequency
$60 < t \leqslant 90$	10
$90 < t \leqslant 120$	14
$120 < t \leqslant 150$	9
$150 < t \leqslant 180$	5
$180 < m \leqslant 50$	2

Calculate an estimate for the mean time.

15. (a) Work out the value of 25^{-3}. (1)

    (b) Work out the value of 350^3. (2)
        Give your answer in standard form.

16. Liquid A has a density of 0.7 g/cm³. (4)
Liquid B has a density of 1.6 g/cm³.
140 g of liquid A and 128 g of liquid B are mixed to make liquid C.
Work out the density of liquid C.

17. The line **N** is drawn below. (3)
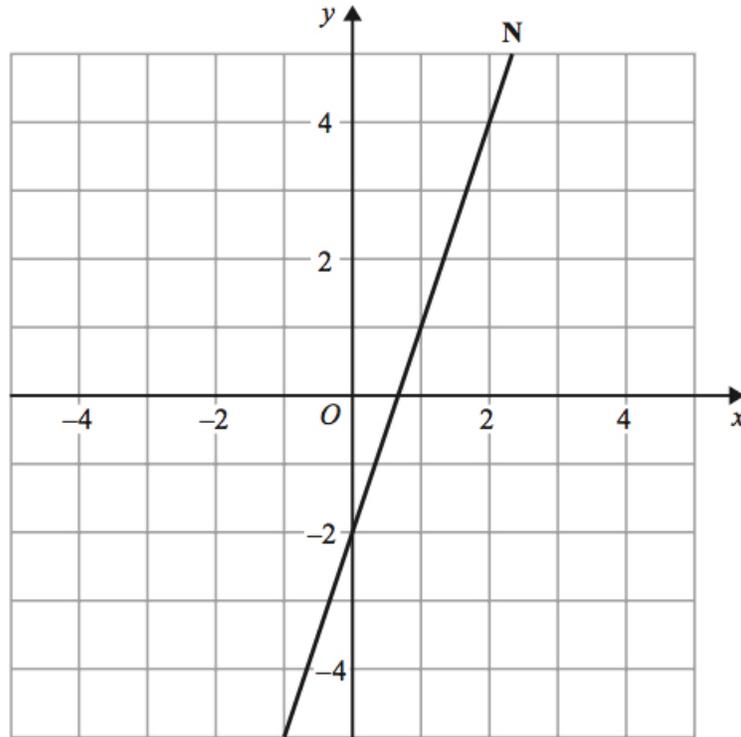
Find an equation of the line perpendicular to line **N** that passes through the point $(0, 1)$.

18. The owners of a car park recorded the number of cars parked at 12 noon each day.
The table shows information about the number of cars parked in the car park at 12 noon each day in July and in December.

	July	December
Least number of cars	75	100
Lower quartile	90	115
Median	95	130
Upper quartile	150	150
Greatest number of cars	178	180

(a) What type of diagram could you draw to represent the information for each month? (1)

(b) Compare the distribution of the number of cars recorded in July with the distribution of the number of cars recorded in December. (2)

19. $ABCD$ is a rectangle. (4)

Diagram **NOT** accurately drawn
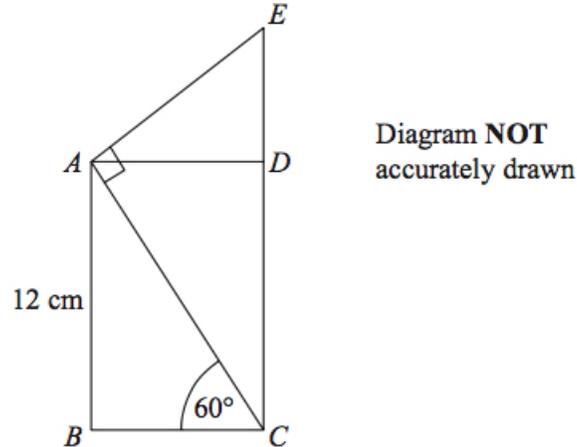
CDE is a straight line.
$AB = 12$ cm.
Angle $ACB = 60°$.
Angle $EAC = 90°$.
Calculate the length of CE.
You must show all your working.

20. Show that (3)
$$(n + 3)^2 - (n - 3)^2$$
is an even number for all positive integer values of n.

21. Fred is making two rectangular flower beds. (2)
The dimensions of the larger rectangle will be three times the dimensions of the smaller rectangle.
There is going to be the same depth of soil in each flower bed.
Fred needs 180 kg of soil for the smaller flower bed.
Work out how much soil Fred needs for the larger flower bed.

22. Claire is making a loaf of bread. (3)
A loaf of bread loses 12% of its weight when it is baked.
Claire wants the baked loaf of bread to weigh 1.1 kg.
Work out the weight of the loaf of bread before it is baked.
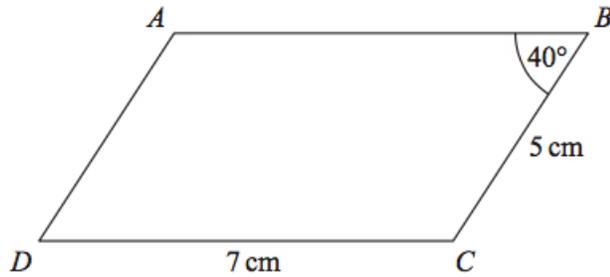
23. Here is a parallelogram. (3)

Diagram **NOT**
accurately drawn

$DC = 7$ cm.
$CB = 5$ cm.
Angle ABC is $40°$.
Work out the area of the parallelogram.
Give your answer correct to 1 decimal place.

24. Steve travelled from Ashton to Barnfield. (4)
    He travelled 235 miles, correct to the nearest 5 miles.
    The journey took him 200 minutes, correct to the nearest 5 minutes.
    Calculate the lower bound for the average speed of the journey.
    Give your answer in miles per hour, correct to 3 significant figures.
    You must show all your working.

25. Solve the equation (3)
    $$3x^2 + 4x - 12 = 0.$$

    Give your solutions correct to 2 decimal places.

26. The histogram shows some information about the salaries of a sample of people.

Frequency density
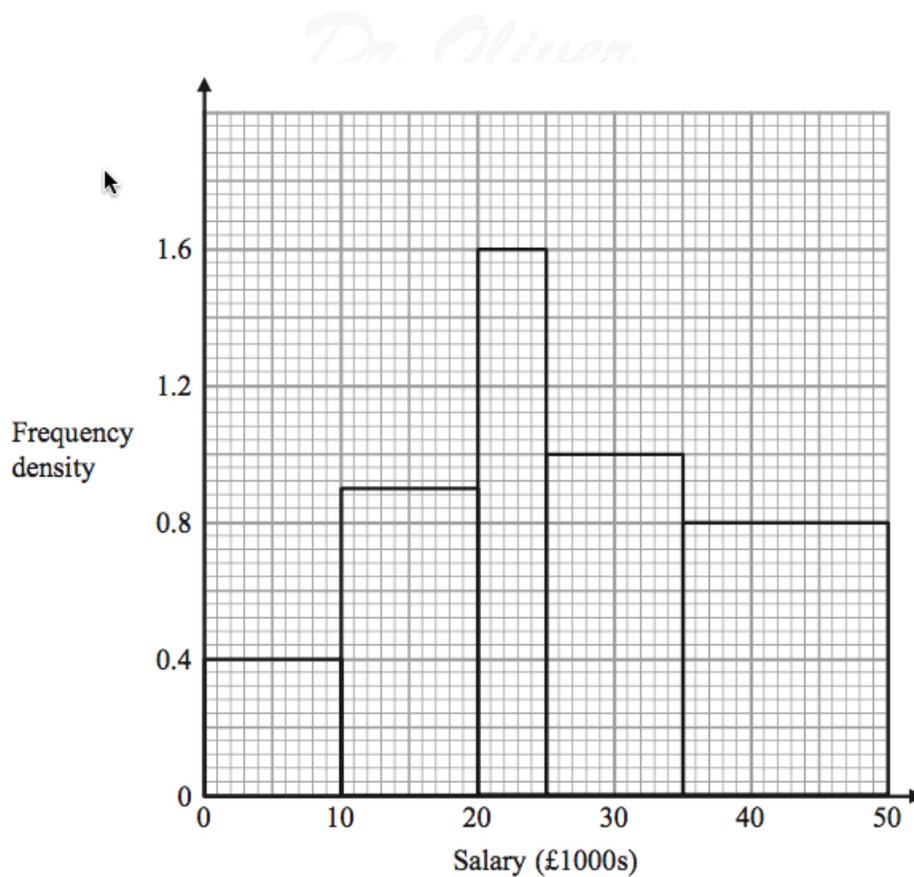
Salary (£1000s)

(a) Use the histogram to complete the frequency table. (2)

Salary (p) in £1000s	Frequency
$0 < p \leqslant 10$	4
$10 < p \leqslant 20$	
$20 < p \leqslant 25$	
$25 < p \leqslant 35$	
$35 < p \leqslant 50$	

(b) Work out the proportion of people in the sample who have a salary greater than £40 000. (2)

(c) Find an estimate for the median salary. (2)
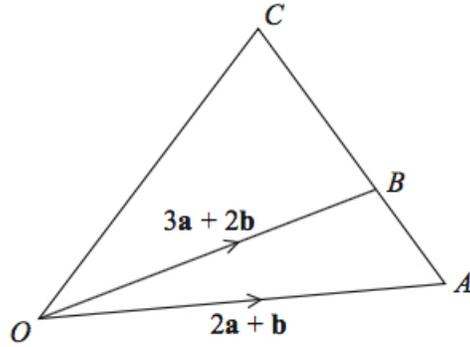
27. ABC is a straight line. (4)

Diagram **NOT** accurately drawn

$AB : BC = 2 : 5.$
$\overrightarrow{OA} = 2\mathbf{a} + \mathbf{b}.$
$\overrightarrow{OB} = 3\mathbf{a} + 2\mathbf{b}.$
Express $\overrightarrow{OC}$ in terms of $\mathbf{a}$ and $\mathbf{b}$.
Give your answer in its simplest form

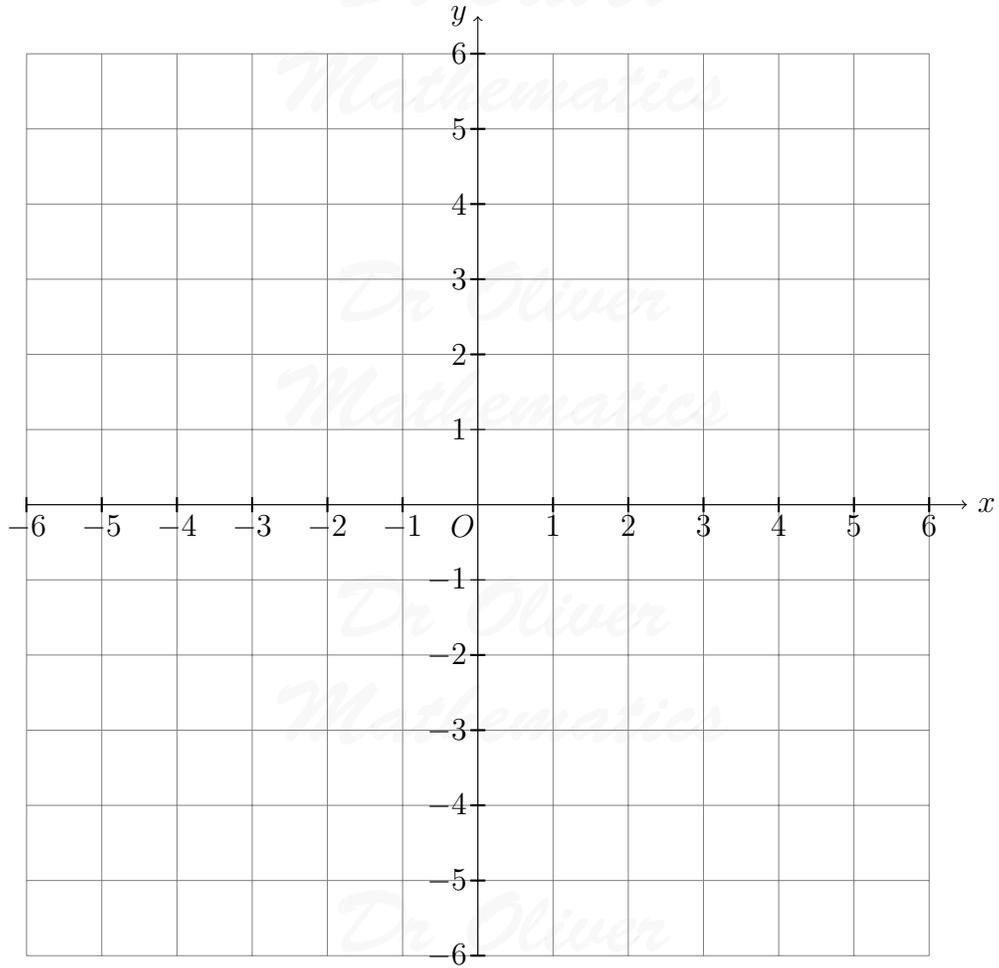28. (a) On the grid, construct the graph of $x^2 + y^2 = 16$. (2)

(b) Find estimates for the solutions of the simultaneous equations (3)

$$x^2 + y^2 = 16$$
$$y = 2x + 1.$$