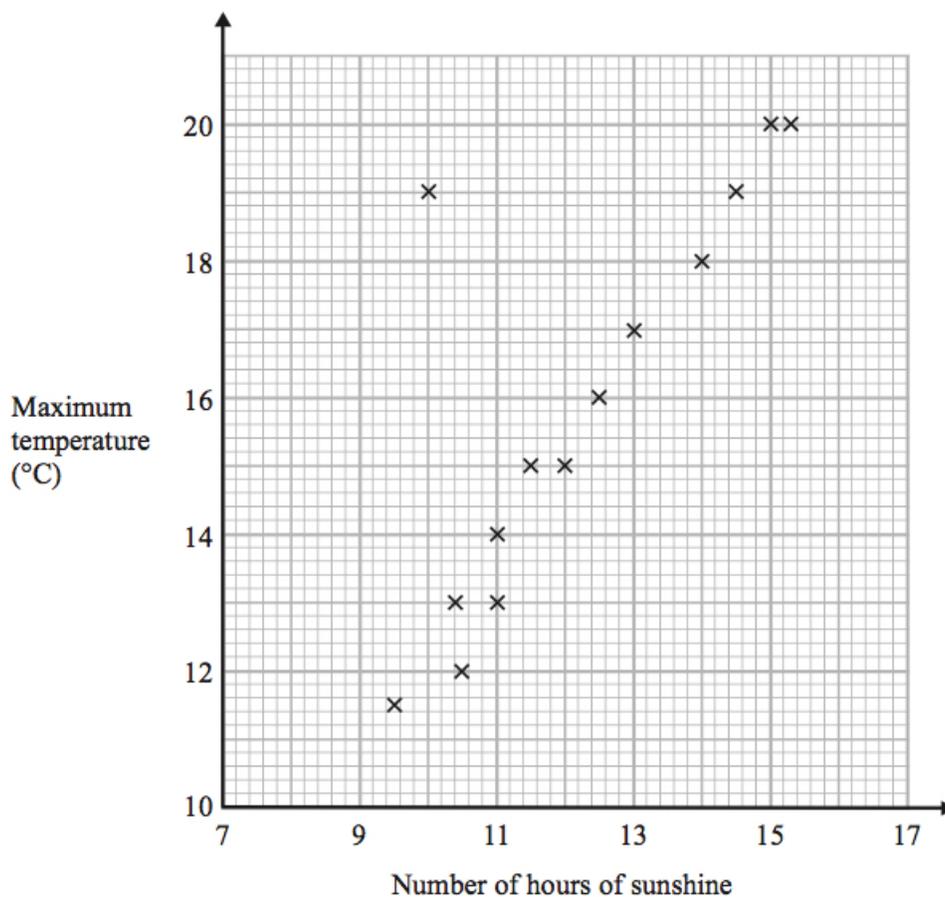


**Dr Oliver Mathematics**  
**GCSE Mathematics**  
**2017 Paper 1H: Non-Calculator**  
**1 hour 30 minutes**

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

1. The scatter graph shows the maximum temperature and the number of hours of sunshine in fourteen British towns on one day.



One of the points is an outlier.

- (a) Write down the coordinates of this point. (1)
- (b) For all the other points write down the type of correlation. (1)

On the same day, in another British town, the maximum temperature was  $16.4^{\circ}\text{C}$ .

(c) Estimate the number of hours of sunshine in this town. (2)

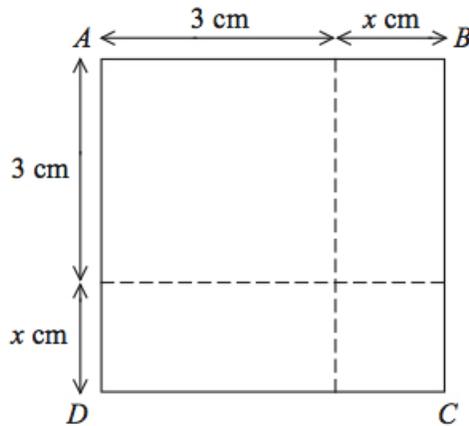
A weatherman says, "Temperatures are higher on days when there is more sunshine."

(d) Does the scatter graph support what the weatherman says? (1)  
Give a reason for your answer.

2. Express 56 as the product of its prime factors. (2)

3. Work out  $54.6 \times 4.3$  (3)

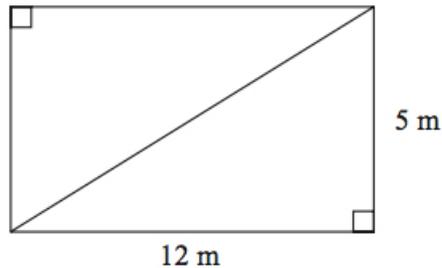
4. The area of square  $ABCD$  is  $10 \text{ cm}^2$ . (3)



Show that

$$x^2 + 6x = 1.$$

5. This rectangular frame is made from 5 straight pieces of metal. (5)



The weight of the metal is  $1.5 \text{ kg}$  per metre.

Work out the total weight of the metal in the frame.

6. The equation of the line  $L_1$  is  $y = 3x - 2$ . (2)  
The equation of the line  $L_2$  is  $3y - 9x + 5 = 0$ .

Show that these two lines are parallel.

7. There are 10 boys and 20 girls in a class. (3)  
The class has a test.

The mean mark for all the class is 60.  
The mean mark for the girls is 54.

Work out the mean mark for the boys.

8. (a) Write  $7.97 \times 10^{-6}$  as an ordinary number. (1)  
(b) Work out the value of  $(2.52 \times 10^5) \div (4 \times 10^{-3})$ . (2)  
Give your answer in standard form.

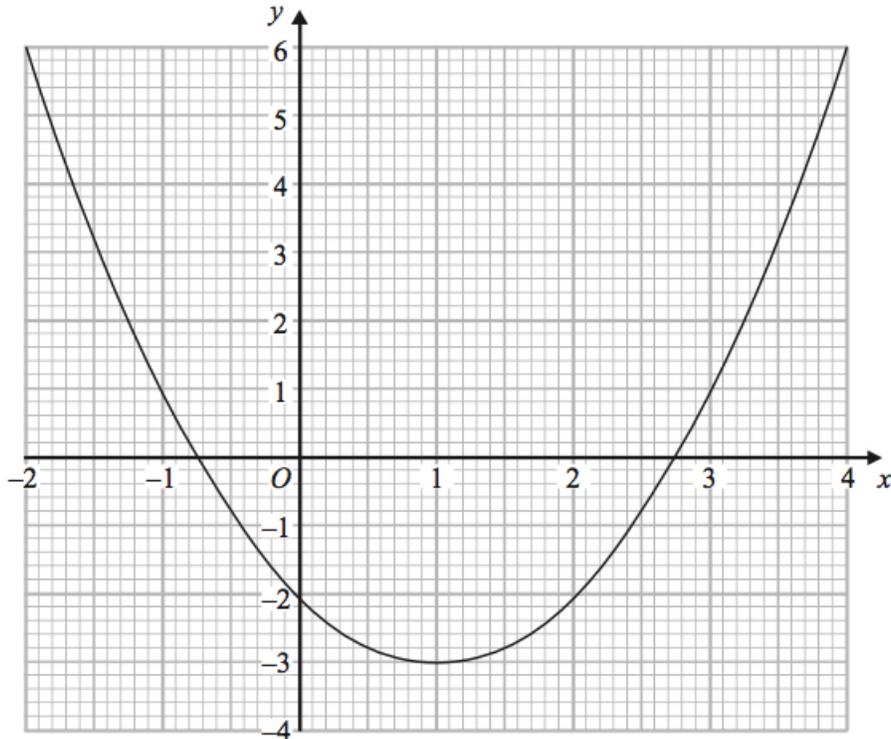
9. Jules buys a washing machine. (2)

20% VAT is added to the price of the washing machine.  
Jules then has to pay a total of £600.

What is the price of the washing machine with **no** VAT added?

10. Show that  $(x + 1)(x + 2)(x + 3)$  can be written in the form  $ax^3 + bx^2 + cx + d$  where  $a$ , (3)  
 $b$ ,  $c$ , and  $d$  are positive integers.

11. The graph of  $y = f(x)$  is drawn on the grid.



- (a) Write down the coordinates of the turning point of the graph. (1)
- (b) Write down estimates for the roots of  $f(x) = 0$ . (1)
- (c) Use the graph to find an estimate for  $f(1.5)$ . (1)
12. (a) Find the value of  $81^{-\frac{1}{2}}$ . (2)
- (b) Find the value of  $\left(\frac{64}{125}\right)^{\frac{2}{3}}$ . (2)
13. The table shows a set of values for  $x$  and  $y$ .

$x$	1	2	3	4
$y$	9	$2\frac{1}{4}$	1	$\frac{9}{16}$

- $y$  is inversely proportional to the square of  $x$ .
- (a) Find an equation for  $y$  in terms of  $x$ . (2)
- (b) Find the positive value of  $x$  when  $y = 16$ . (2)
14. White shapes and black shapes are used in a game. (4)  
Some of the shapes are circles.

All the other shapes are squares.

The ratio of the number of white shapes to the number of black shapes is 3 : 7.  
The ratio of the number of white circles to the number of white squares is 4 : 5.  
The ratio of the number of black circles to the number of black squares is 2 : 5.

Work out what fraction of all the shapes are circles.

15. A cone has a volume of  $98 \text{ cm}^3$ .  
The radius of the cone is 5.13 cm.  
(a) Work out an estimate for the height of the cone. (3)

John uses a calculator to work out the height of the cone to 2 decimal places.

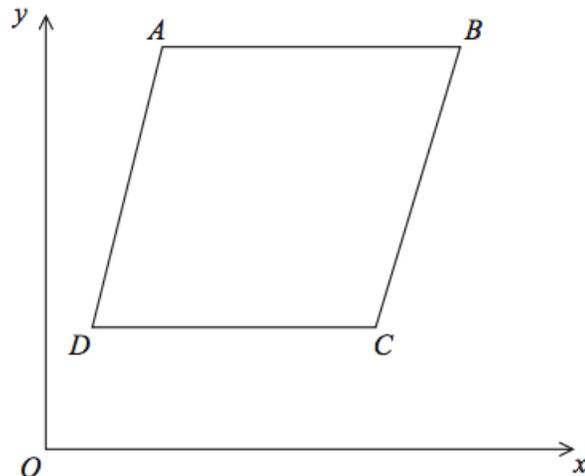
- (b) Will your estimate be more than John's answer or less than John's answer? (1)  
Give reasons for your answer.
16.  $n$  is an integer greater than 1. (4)  
Prove algebraically that

$$n^2 - 2 - (n - 2)^2$$

is always an even number.

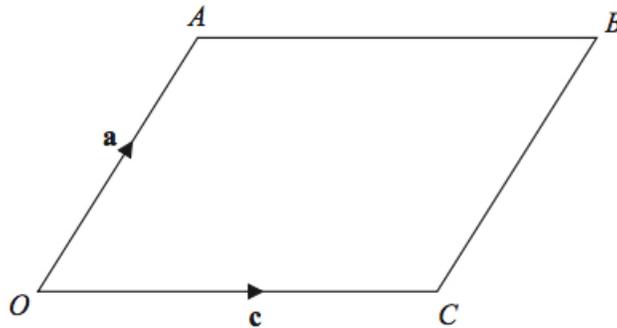
17. There are 9 counters in a bag. (4)  
7 of the counters are green.  
2 of the counters are blue.  
Ria takes at random two counters from the bag.  
Work out the probability that Ria takes one counter of each colour.  
You must show your working.

18.  $ABCD$  is a rhombus. (4)



The coordinates of  $A$  are  $(5, 11)$ .  
 The equation of the diagonal  $DB$  is  $y = \frac{1}{2}x + 6$ .  
 Find an equation of the diagonal  $AC$ .

19.  $OABC$  is a parallelogram. (4)

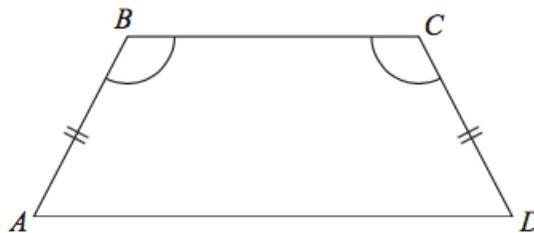


$\vec{OA} = \mathbf{a}$  and  $\vec{OC} = \mathbf{c}$ .  
 $X$  is the midpoint of the line  $AC$ .  
 $OCD$  is a straight line so that  $OC : CD = k : 1$ .  
 Given that  $\vec{XD} = 3\mathbf{c} - \frac{1}{2}\mathbf{a}$ , find the value of  $k$ .

20. Solve algebraically the simultaneous equations (5)

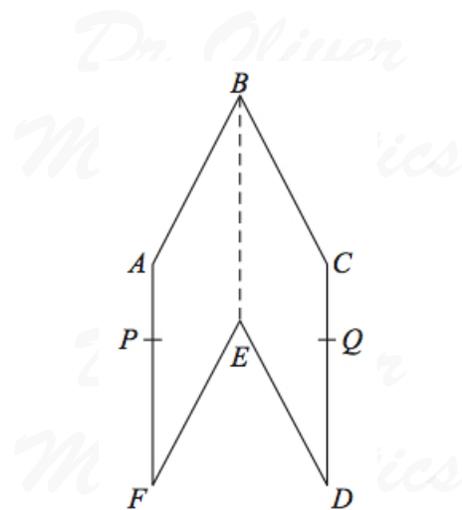
$$\begin{aligned} x^2 + y^2 &= 25 \\ y - 3x &= 13. \end{aligned}$$

21.  $ABCD$  is a quadrilateral. (4)



$AB = CD$ .  
 Angle  $ABC =$  angle  $BCD$ .  
 Prove that  $AC = BD$ .

22. The diagram shows a hexagon  $ABCDEF$ . (5)



$ABEF$  and  $CBED$  are congruent parallelograms where  $AB = BC = x$  cm.  
 $P$  is the point on  $AF$  and  $Q$  is the point on  $CD$  such that  $BP = BQ = 10$  cm.  
 Given that angle  $ABC = 30^\circ$ , prove that

$$\cos PBQ = 1 - \frac{(2 - \sqrt{3})x^2}{200}.$$

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