Dr Oliver Mathematics
GCSE Mathematics
2018 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. (a) Work out (2)
$$2\tfrac{1}{7} + 1\tfrac{1}{4}.$$

   (b) Work out (2)
$$1\tfrac{1}{5} \div \tfrac{3}{4}.$$

   Give your answer as a mixed number in its simplest form.

2. In a village, the number of houses and the number of flats are in the ratio $7 : 4$ and the (3)
number of flats and the number of bungalows are in the ratio $8 : 5$.
There are 50 bungalows in the village.
How many houses are there in the village?

3. Renee buys 5 kg of sweets to sell. (4)
She pays £10 for the sweets.
Renee puts all the sweets into bags.
She puts 250 g of sweets into each bag.
She sells each bag of sweets for 65 p.
Renee sells all the bags of sweets.
Work out her percentage profit.

4. A cycle race across America is 3 069.25 miles in length.
Juan knows his average speed for his previous races is 15.12 miles per hour.
For the next race across America he will cycle for 8 hours per day.

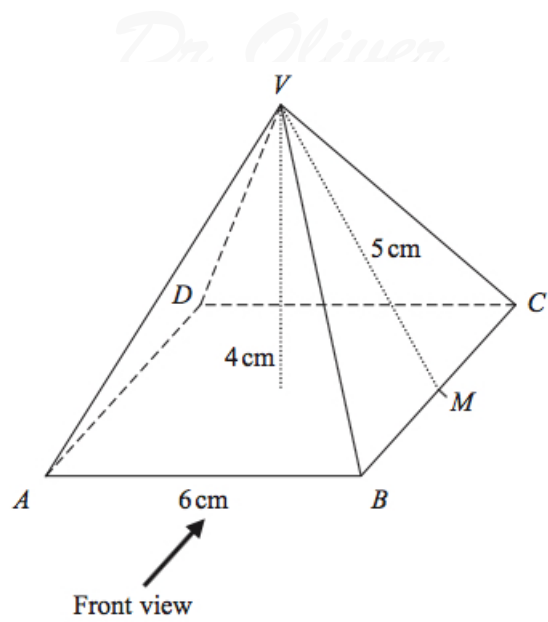   (a) Estimate how many days Juan will take to complete the race. (3)

   Juan trains for the race.
   The average speed he can cycle at increases.
   It is now 16.27 miles per hour.

   (b) How does this affect your answer to part (a)? (1)
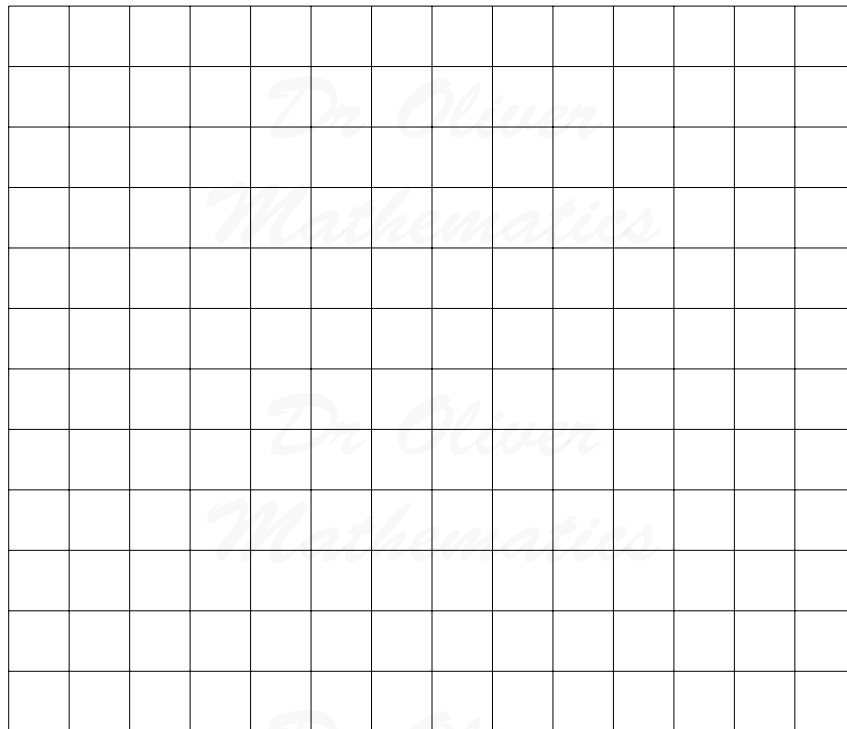
5. Here is a solid square-based pyramid, $VABCD$.

The base of the pyramid is a square of side 6 cm.
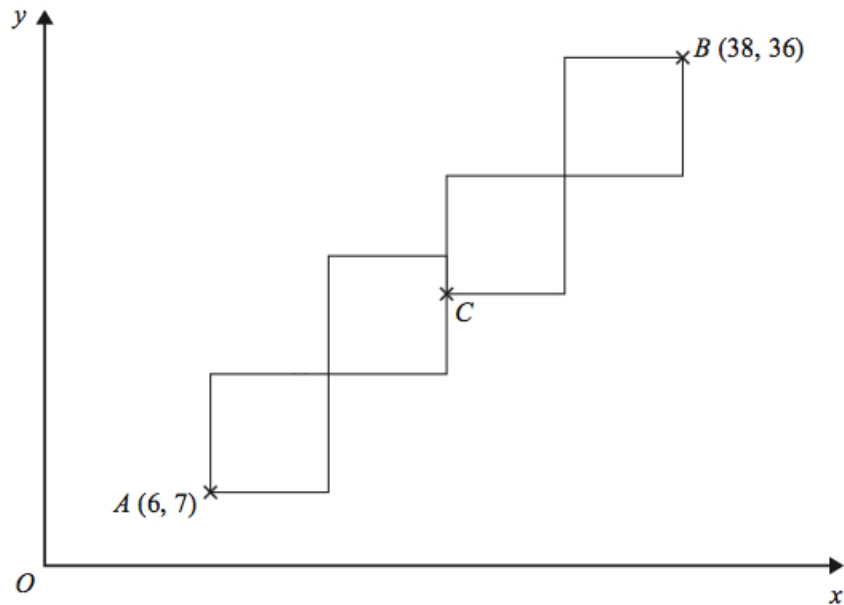The height of the pyramid is 4 cm.
M is the midpoint of BC and $VM = 5$ cm.

(a) Draw an accurate front elevation of the pyramid from the direction of the arrow. (2)
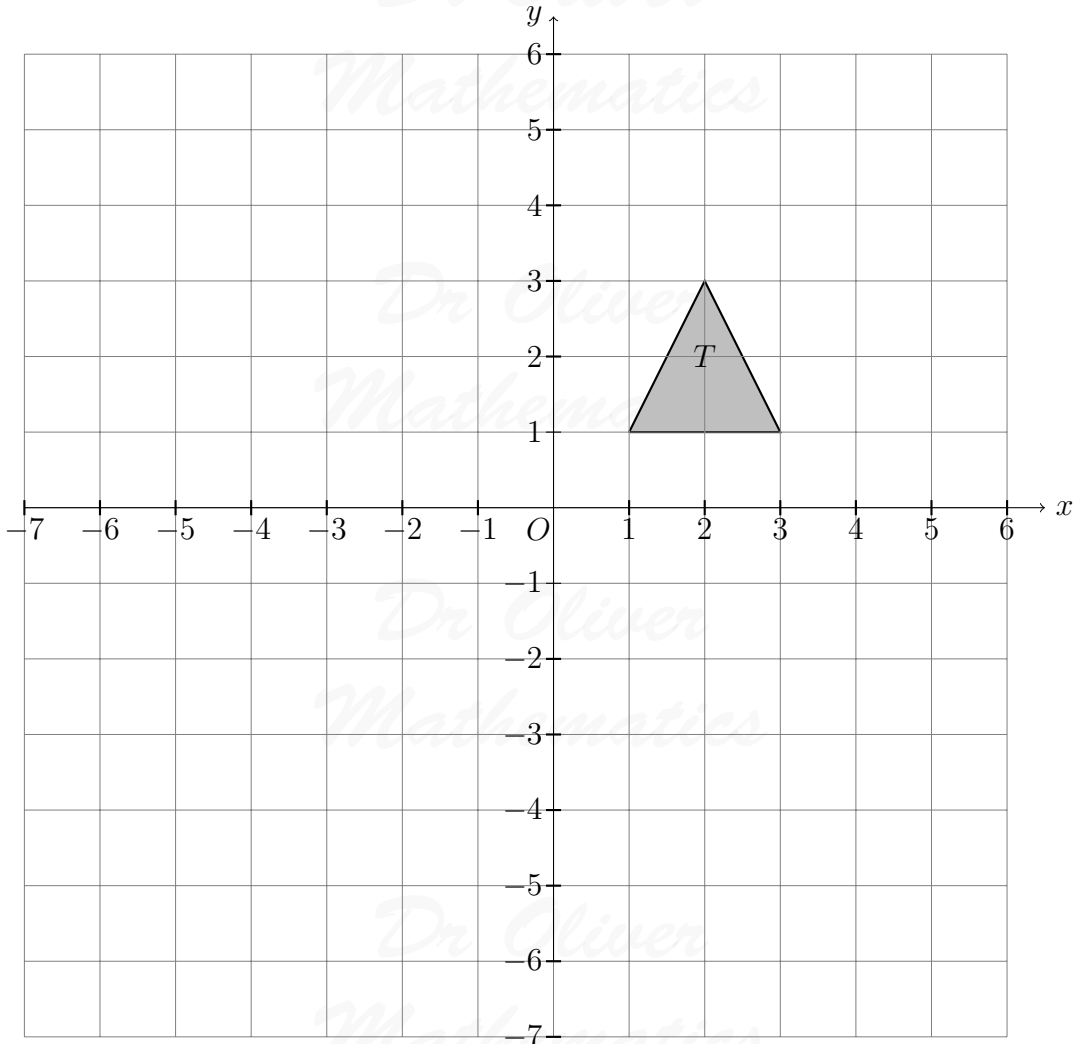

(b) Work out the total surface area of the pyramid. (4)

6. A pattern is made from four identical squares. (5)
   The sides of the squares are parallel to the axes.

Point A has coordinates $(6, 7)$.
Point B has coordinates $(38, 36)$.
Point C is marked on the diagram.

Work out the coordinates of C.

7. Shape **T** is reflected in the line $x = -1$ to give shape **R**. (2)
   Shape **R** is reflected in the line $y = -2$ to give shape **S**.

Describe the **single** transformation that will map shape **T** to shape **S**.

8. The perimeter of a right-angled triangle is 72 cm.   (4)
   The lengths of its sides are in the ratio $3 : 4 : 5$.

   Work out the area of the triangle.

9. (a) Write down the value of $36^{\frac{1}{2}}$.   (1)

    (b) Write down the value of 23^0.   (1)

    (c) Work out the value of $27^{-\frac{2}{3}}$.   (2)

10. The table gives some information about the heights of 80 girls.

Least height	133 cm
Greatest height	170 cm
Lower quartile	145 cm
Upper quartile	157 cm
Median	151 cm

(a) Draw a box plot to represent this information. (3)

120   130   140   150   160   170   180
Height (cm)
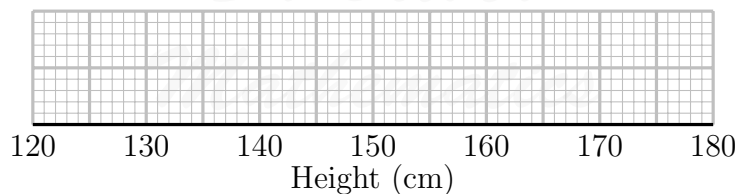
(b) Work out an estimate for the number of these girls with a height between 133 cm and 157 cm. (2)

11. A and B are points on a circle, centre O. (5)
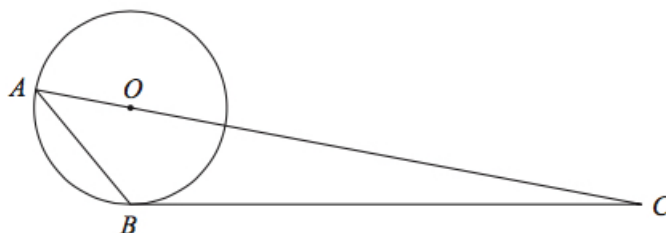
BC is a tangent to the circle.
AOC is a straight line.
Angle $ABO = x°$.
Find the size of angle ACB, in terms of x.
Give your answer in its simplest form.
Give reasons for each stage of your working.

12. Prove that the square of an odd number is always 1 more than a multiple of 4 (4)

13. (3)

$$\sqrt{5}(\sqrt{8} + \sqrt{18})$$

can be written in the form $a\sqrt{10}$ where a is an integer.

Find the value of a.

5

14. y is inversely proportional to d^2. (5)
    When $d = 10$, $y = 4$.

    d is directly proportional to x^2.
    When $x = 2$, $d = 24$.

    Find a formula for y in terms of x.
    Give your answer in its simplest form.

15. (a) Factorise (1)
$$a^2 - b^2.$$

   (b) Hence, or otherwise, simplify fully (3)
$$(x^2 + 4)^2 - (x^2 - 2)^2.$$

16. There are only red counters, blue counters and purple counters in a bag. (3)
    The ratio of the number of red counters to the number of blue counters is $3 : 17$.

    Sam takes at random a counter from the bag.
    The probability that the counter is purple is 0.2.

    Work out the probability that Sam takes a red counter.

17. Simplify fully (3)
$$\frac{3x^2 - 8x - 3}{2x^2 - 6x}.$$

18. Here is the graph of $y = \sin x°$ for $-180 \leqslant x \leqslant 180$. (2)
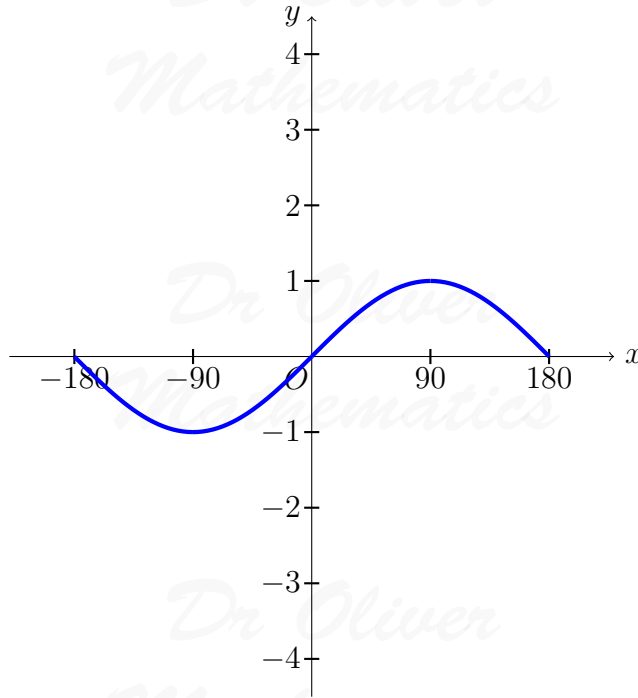
On the grid, sketch the graph of $y = \sin x° - 2$ for $-180 \leqslant x \leqslant 180$.

19. The point P has coordinates $(3, 4)$. (5)
The point Q has coordinates (a, b).

A line perpendicular to PQ is given by the equation $3x + 2y = 7$.

Find an expression for b in terms of a.

20. n is an integer such that (5)
$$3n + 2 \leqslant 14 \text{ and } \frac{6n}{n^2 + 5} > 1.$$

Find all the possible values of n.