Dr Oliver Mathematics
AQA GCSE Mathematics
2018 Jun Paper 3: Calculator
1 hour 30 minutes

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

1. Circle the decimal that is closest in value to (1)

$$\frac{11}{20}.$$

0.56 0.6 0.525 0.5

2. Circle the list of all the integers that satisfy (1)

$$-2 < x \leqslant 4.$$

$-2, -1, 0, 1, 2, 3$ $-1, 0, 1, 2, 3$ $-2, -1, 0, 1, 2, 3, 4$ $-1, 0, 1, 2, 3, 4$

3. Circle the largest number. (1)

$3.2\dot{7}$ 3.27 3.277 $3.20\dot{7}$

4. What is the size of an exterior angle of a regular decagon? (1)
Circle your answer.

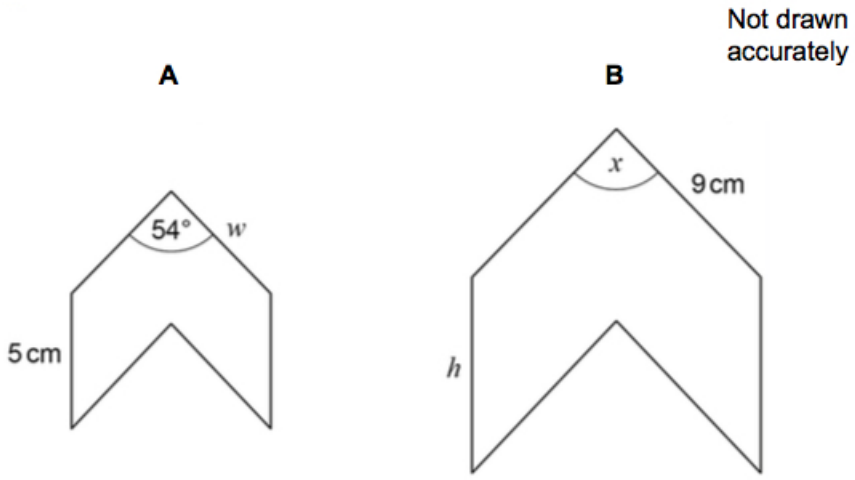
18° 36° 144° 162°

5. a is a common factor of 72 and 120. (4)
b is a common multiple of 6 and 9.

Work out the highest possible value of

$$\frac{a}{b}.$$

6. **A** and **B** are similar shapes. (3)
B is an enlargement of **A** with scale factor 1.5.



Work out the values of x, h, and w.

7. (4)

Investment A : Save £150 per month for 2 years
2.5% interest is added to the total amount saved

Investment B : Invest £3 500
Compound interest is added at 3% per year

After 2 years, how much **more** is investment B worth than investment A?

8. (a) Show that the lines (3)

$$y = 3x + 7 \text{ and } 2y - 6x = 8$$

are parallel.
Do **not** use a graphical method.

(b) Is the point $(-5, -6)$ above, below or on the line $y = 3x + 7$? (2)
Tick **one** box.

☐ Above ☐ Below ☐ On the line

You **must** show your working.
Do **not** use a graphical method.

9. The cost of a ticket increases by 10% to £19.25. (3)

Work out the original cost.

10. The nth term of a sequence is (3)

$$12n - 5.$$

Work out the numbers in the sequence that

have two digits and are **not** prime.

11.

$$\mathbf{a} = \begin{pmatrix} 6 \\ -10 \end{pmatrix}, \mathbf{b} = \begin{pmatrix} -1 \\ 2 \end{pmatrix}, \text{ and } \mathbf{c} = \begin{pmatrix} -4 \\ 7 \end{pmatrix}.$$

(a) Work out (2)

$$\mathbf{a} + \mathbf{b} + \mathbf{c}.$$

(b) Show that (2)

$$\mathbf{a} + 2\mathbf{c}$$

is parallel to is $\mathbf{b}$.

12. A force of 40 Newtons is applied to an area of 3.2 square metres. (2)

$$\text{pressure} = \frac{\text{force}}{\text{area}}$$

Work out the pressure.
Give the units of your answer.

13. Tick **all** the statements that are true for any rhombus. (1)

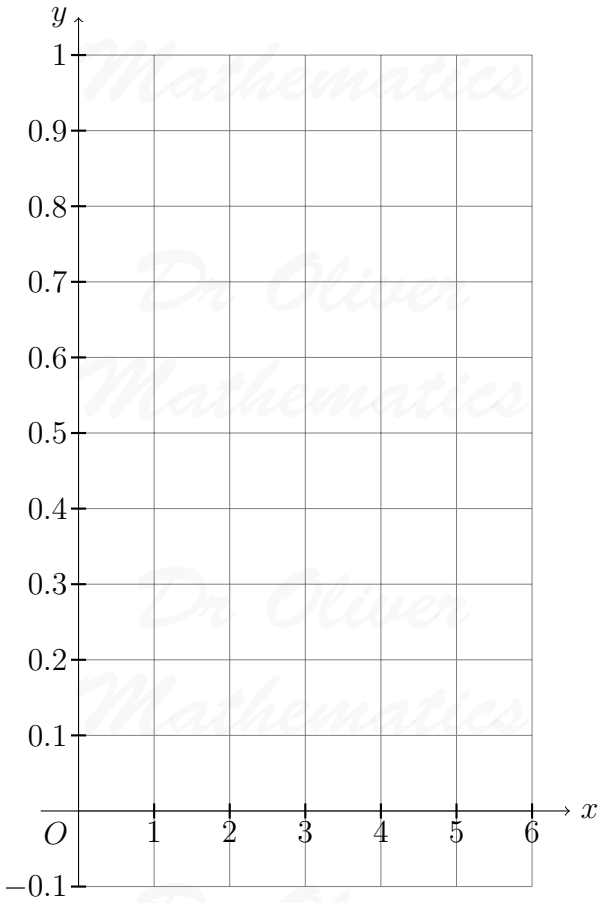
- ☐ The diagonals are lines of symmetry
- ☐ The diagonals bisect each other
- ☐ The diagonals are perpendicular
- ☐ The diagonals are equal in length

14. Draw the graph of (3)

$$y = 0.8^x$$

for values of x from 0 to 6.

x	0	1	2	3	4	5	6
y							



15. Amy has x beads. (1)

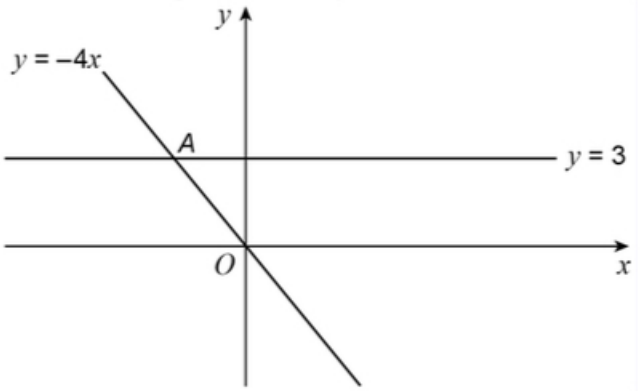
Billy has three more beads than Amy.

Carly has four times as many beads as Billy.

Circle the expression for the number of beads that Carly has.

$4x + 3$ $3x + 4$ $4(x + 3)$ $x + 12$

16. Two straight lines intersect at point A. (1)



Circle the coordinates of A.

$$\left(-\tfrac{3}{4}, 3\right) \quad (-4, 3) \quad (-12, 3) \quad \left(-\tfrac{4}{3}, 3\right)$$

17. Here are two methods to make a 4-digit code. (3)
Codes can have repeated digits.

Method A

For the first two digits use an odd number between 30 and 100

For the last two digits use a multiple of 11

Method B

Use four digits in the order even odd even odd

Do **not** use the digit zero

Which method gives the **greater** number of possible codes?
You **must** show your working.

18. Show that, for $x \neq 0$, (3)

$$\frac{x+4}{3x} - \frac{5}{2x}$$

can be written in the form

$$\frac{ax+b}{cx},$$

where a, b, and c are integers.

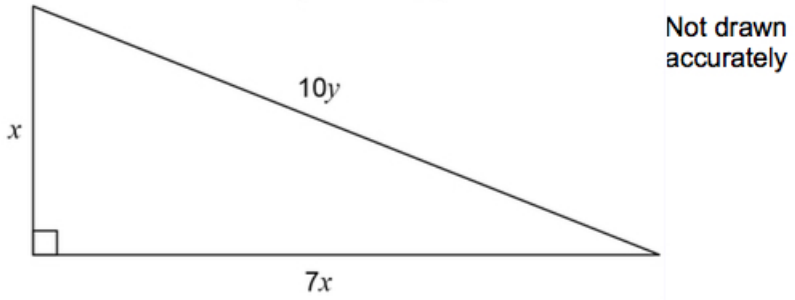
19. The equation of a straight line is (1)

$$3x + 2y = 24.$$

Circle the point where the line crosses the x-axis.

$(0, 8)$ $(12, 0)$ $(0, 12)$ $(8, 0)$

20. All dimensions are in centimetres. (3)



Use Pythagoras' theorem to work out the exact value of

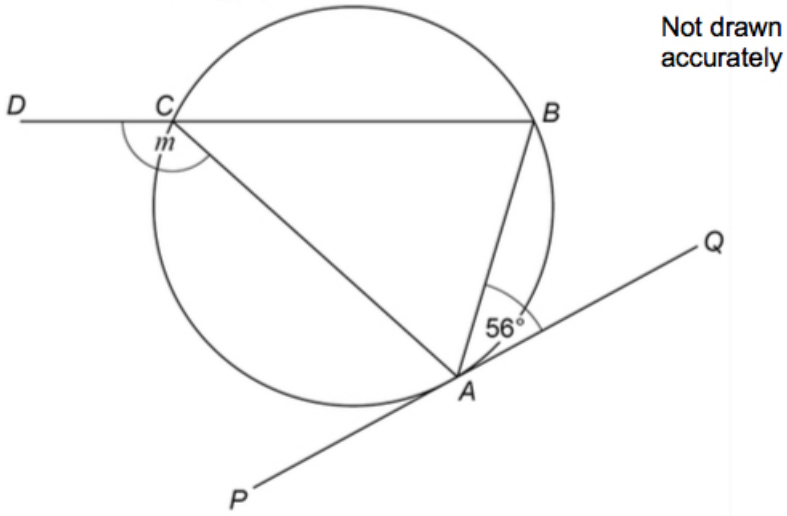
$$\frac{x}{y}.$$

21. The mass of an ornament is m grams.
The height of the ornament is h centimetres.
m is directly proportional to the cube of h.
$m = 1\,600$ when $h = 8$.

(a) Work out an equation connecting m and h. (3)

(b) Work out the mass of an ornament of height 12 centimetres. (2)

22. A, B, and C are points on a circle. (1)
DCB is a straight line.
PAQ is a tangent to the circle.



Sam is trying to work out the size of angle m.
Here is his working.

angle $ACB = 56°$	angles in the same segment are equal
$m = 180° - 56°$	angles at a point on a straight line add up to 180°
$m = 124°$	

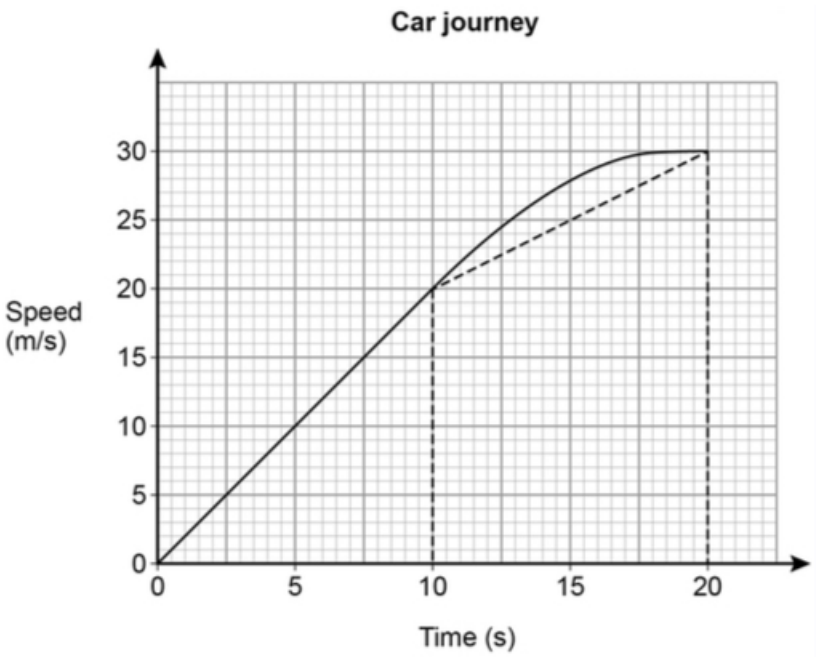
Make a criticism of his working.

23. A sequence of numbers is formed by the iterative process (2)

$$u_{n+1} = \frac{3}{u_n + 1}, \; u_1 = 4.$$

Work out the values of u_2 and u_3.

24. The speed-time graph shows 20 seconds of a car journey.
Harry wants to estimate the distance the car travels in this time.



He uses a triangle and a trapezium, as shown, to estimate the area under the graph.

(a) Complete Harry's method to estimate the distance the car travels. (3)

(b) For this journey, which of these is true for Harry's method? (1)
Tick **one** box.

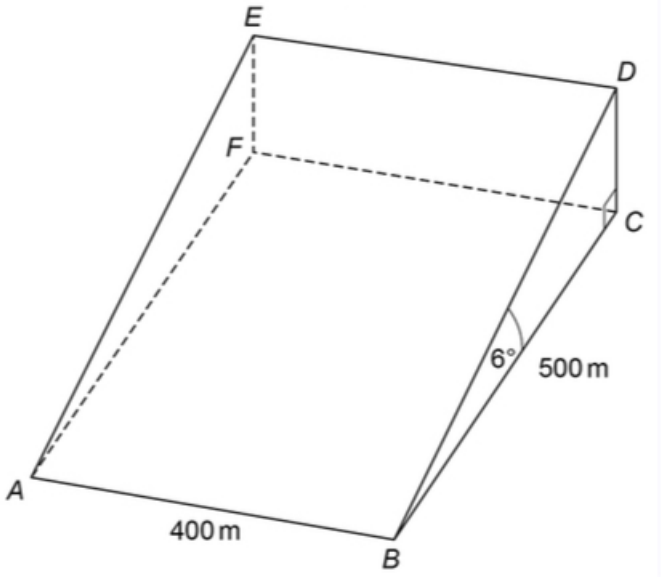
☐ It works out an overestimate of the distance

☐ It works out an underestimate of the distance

☐ It could work out an overestimate or an underestimate of the distance

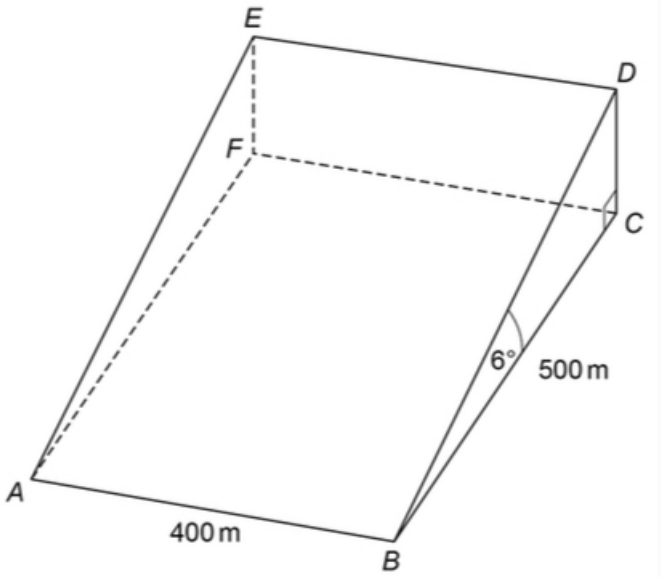
25. $ABCDEF$ is a triangular prism which represents part of a hill.

- $ABCF$ is the horizontal rectangular base.
- D is vertically above C.



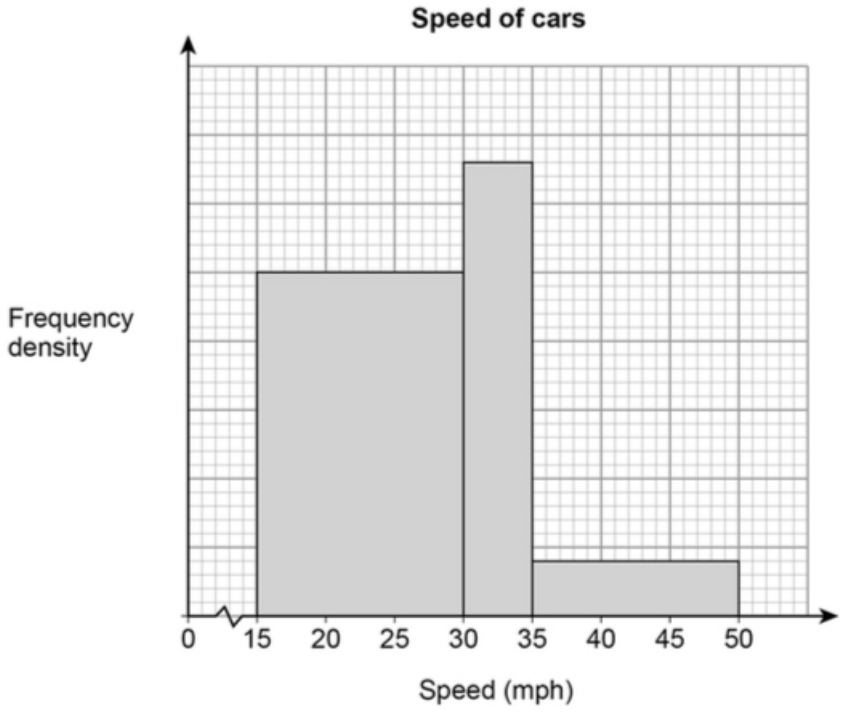
(a) Work out the height CD. (2)

Jamil walks in a straight line from A to D.



(b) Work out the size of angle DAC. (4)
You **must** show your working.

26. The histogram shows information about the speed of cars as they pass a checkpoint.
The scale on the frequency density axis is missing.



The histogram shows information about 480 cars.

(a) How many cars does the first bar represent? (4)

Cars with a speed greater than 40 mph are over the speed limit.

(b) Use the histogram to estimate the number of cars that are over the speed limit. (2)

27. A bag contains 30 discs. (3)
10 are red and 20 are blue.

- One disc is taken out at random and replaced by **two** of the other colour.
- Another disc is then taken out at random and replaced by **two** of the other colour.
- Another disc is then taken out at random.

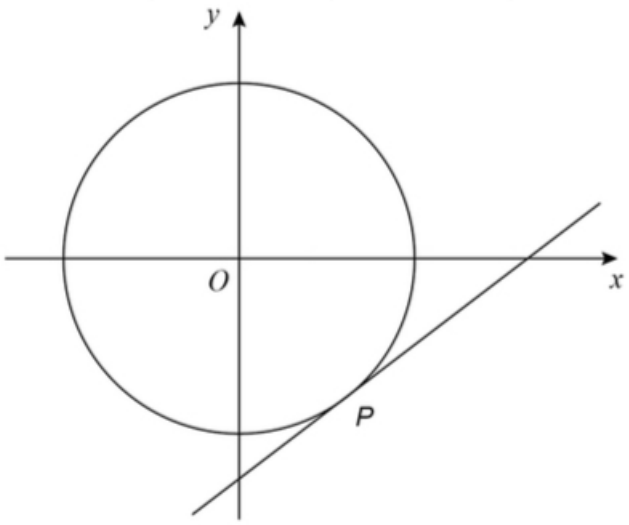
Work out the probability that all three discs taken out are red.

28. P is a point on the circle with equation (5)

$$x^2 + y^2 = 80.$$

P has x-coordinate 4 and is below the x-axis.

Not drawn accurately



Work out the equation of the tangent to the circle at P.