

Dr Oliver Mathematics
GCSE Mathematics
2022 November 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. Write 500 as a product of powers of its prime factors. (3)

2. (a) Work out (2)

$$1\frac{3}{5} + 2\frac{1}{4}.$$

Give your answer as a mixed number.

- (b) Show that (2)

$$2\frac{2}{3} \div 6 = \frac{4}{9}.$$

3. Simplify (2)

$$(2^{-5} \times 2^8)^2.$$

Give your answer as a power of 2

4. Work out (2)

$$0.004 \times 0.32.$$

5. A car factory is going to make four different car models **A**, **B**, **C**, and **D**. (2)

80 people are asked which of the four models they would be most likely to buy.

The table shows information about the results.

Car model	Number of people
A	23
B	15
C	30
D	12

The factory is going to make 40 000 cars next year.

Work out how many model **B** cars the factory should make next year.

6. Rizwan writes down three numbers a , b , and c :

$$a : b = 1 : 3$$

$$b : c = 6 : 5.$$

(a) (i) Find

$$a : b : c.$$

(2)

(ii) Express a as a fraction of the total of the three numbers a , b , and c .

(2)

Emma writes down three numbers m , n , and p :

$$n = 2m$$

$$p = 5n.$$

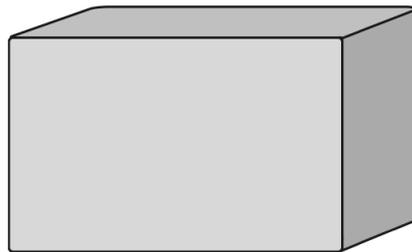
(b) Find

$$m : p.$$

(2)

7. A storage tank exerts a force of 10 000 newtons on the ground.

(2)



$\text{pressure} = \frac{\text{force}}{\text{area}}$
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The base of the tank in contact with the ground is a 4 m by 2 m rectangle.

Work out the pressure on the ground due to the tank.

8. Two numbers m and n are such that

(2)

- m is a multiple of 5,
- n is an even number, and
- the highest common factor (HCF) of m and n is 7.

Write down a possible value for m and a possible value for n .

9. (a) Complete the table of values for

(2)

$$y = 6x - x^3.$$

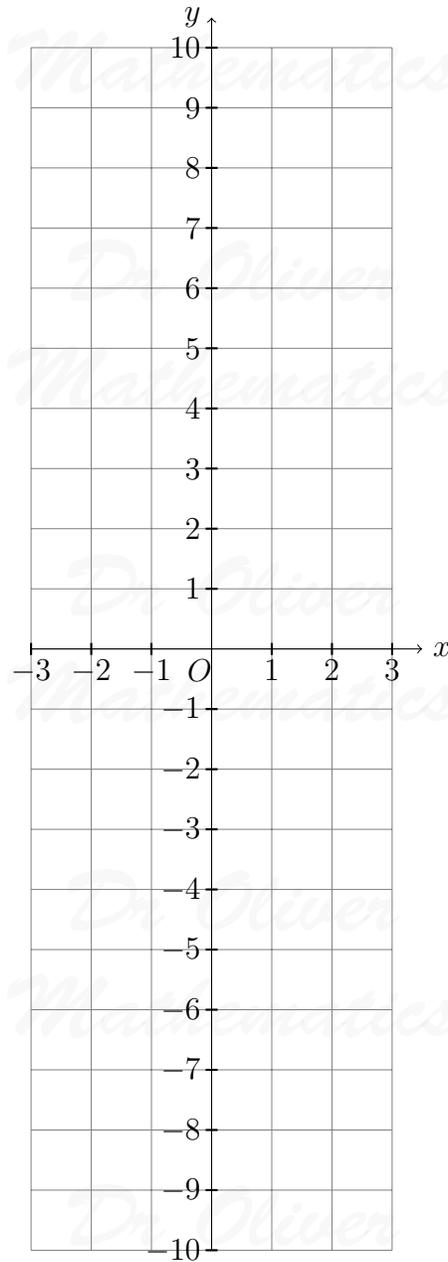
x	-3	-2	-1	0	1	2	3
y	9					4	-9

(b) On the grid, draw the graph of

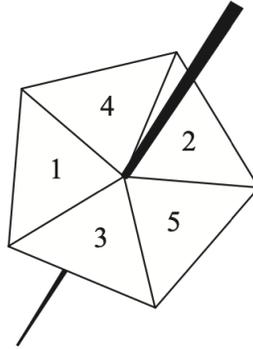
(2)

$$y = 6x - x^3$$

for values of x from -3 to 3 .



10. Lina spins a biased 5-sided spinner 40 times.



Here are her results.

Score	1	2	3	4	5
Frequency	6	8	9	7	10

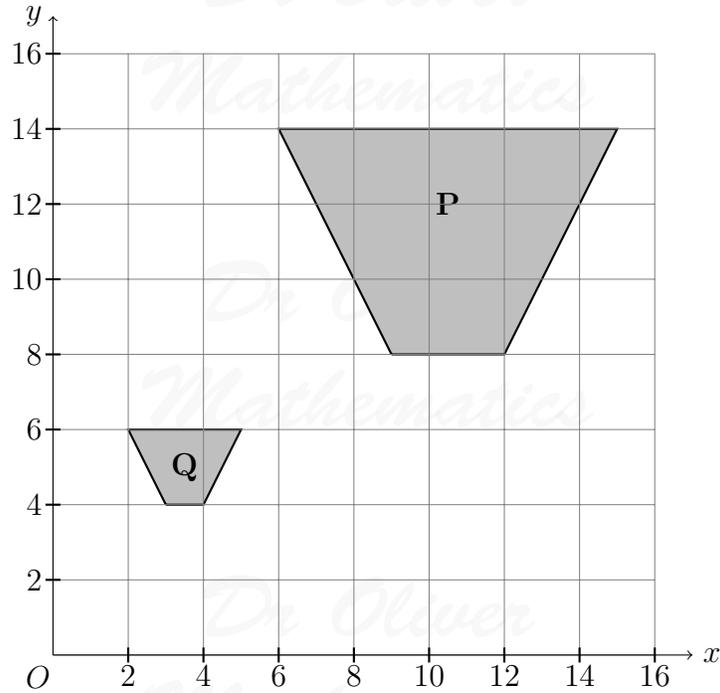
Lina is now going to spin the spinner another two times.

- (a) Work out an estimate for the probability that she gets a score of 5 both times. (2)

Derek is going to spin the spinner a large number of times.

- (b) Work out an estimate for the percentage of times Derek can expect to get a score of 1. (2)

11. Describe fully the single transformation that maps shape **P** onto shape **Q**. (2)



12. Solve the simultaneous equations (4)

$$5x + 2y = 11$$

$$4x + 3y = 6.$$

13. p is inversely proportional to t . (3)

Complete the table of values.

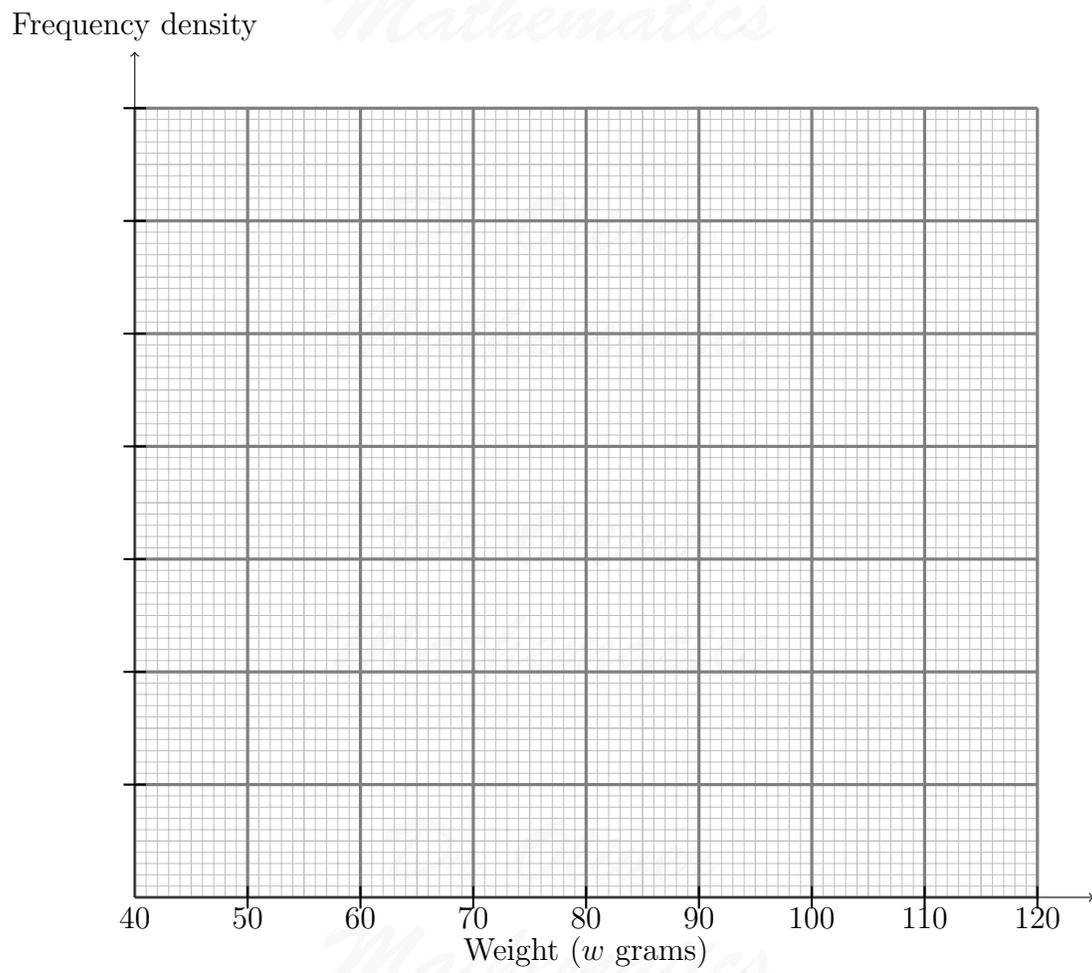
t	100	25	2
p	1	5	

14. The table shows information about the weights, in grams, of some potatoes. (3)

Weight (w grams)	Number of potatoes
$50 < w \leq 70$	20
$70 < w \leq 80$	50
$80 < w \leq 90$	60
$90 < w \leq 110$	30

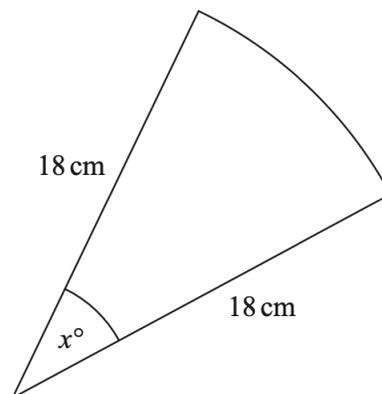
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On the grid, draw a histogram for this information.



15. The diagram shows a sector of a circle of radius 18 cm.

(3)



The length of the arc is 4π cm.

Work out the value of x .

16. (a) Prove that

$$(2m + 1)^2 - (2n - 1)^2 = 4(m + n)(m - n + 1).$$

(3)

Sophia says that the result in part (a) shows that the difference of the squares of any two odd numbers must be a multiple of 4.

(b) Is Sophia correct?

You must give reasons for your answer.

(1)

17. Work out the value of

$$\left(\frac{8}{27}\right)^{\frac{4}{3}}.$$

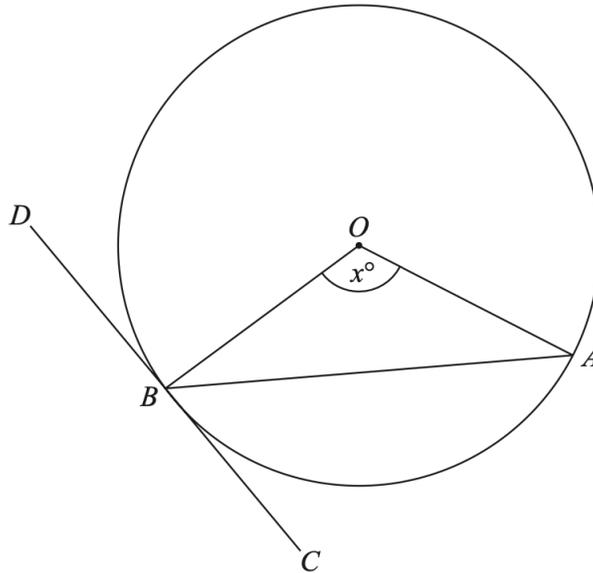
(2)

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

DBC is the tangent to the circle at B .

Angle $AOB = x^\circ$.

(3)



Show that

$$\text{angle } ABC = \frac{1}{2}x^\circ.$$

You must give a reason for each stage of your working.

19. Solve

(5)

$$\frac{1}{x} - \frac{1}{x+1} = 4.$$

Give your answer in the form $a \pm b\sqrt{2}$, where a and b are fractions.

20. Alfie has 11 cards.

(3)

He has

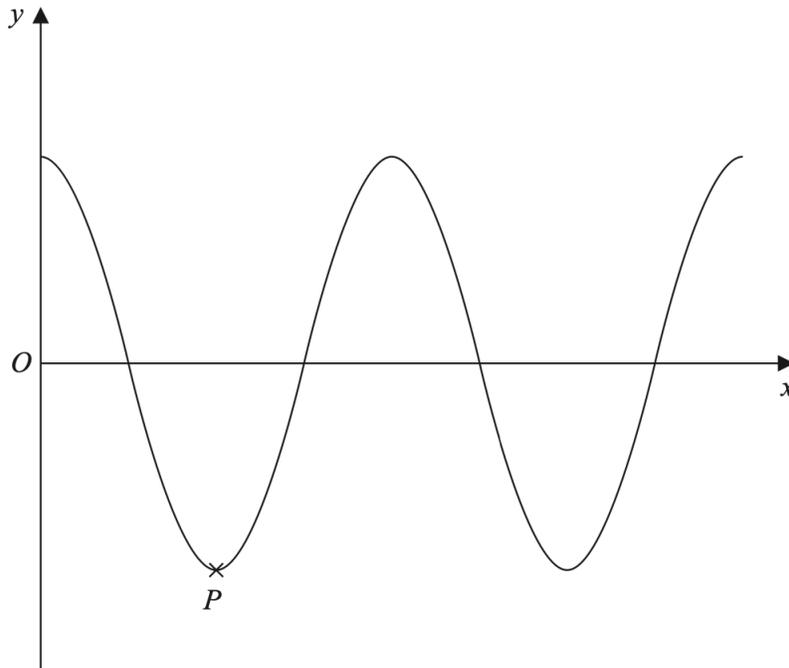
- 3 blue cards
- 7 green cards and
- 1 white card.

Alfie takes at random 2 of these cards.

Work out the probability that he takes cards of different colours.

21. The diagram shows a sketch of part of the curve with equation $y = \cos x^\circ$.
 P is a minimum point on the curve.

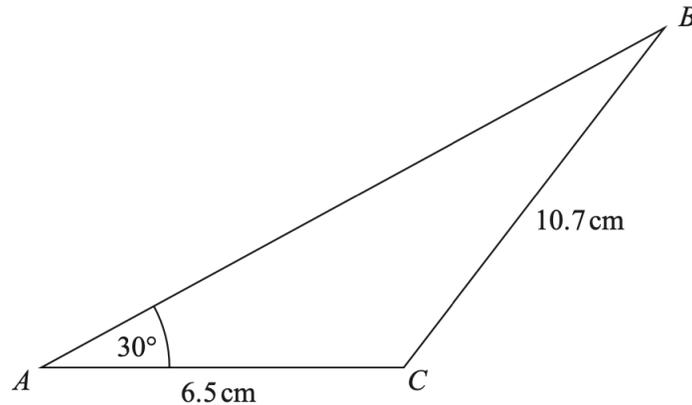
(2)



Write down the coordinates of P .

22. Here is a triangle ABC .

(4)



Work out the value of $\sin ABC$.

Give your answer in the form $\frac{m}{n}$ where m and n are integers.

23. Here are the first five terms of a geometric sequence.

$$\sqrt{5} \quad 10 \quad 20\sqrt{5} \quad 200 \quad 400\sqrt{5}.$$

(a) Work out the next term of the sequence.

(2)

The 4th term of a different geometric sequence is $\frac{5\sqrt{2}}{4}$.

The 6th term of this sequence is $\frac{5\sqrt{2}}{8}$.

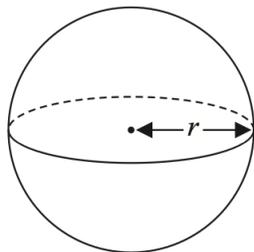
Given that the terms of this sequence are all positive,

(b) work out the first term of this sequence.

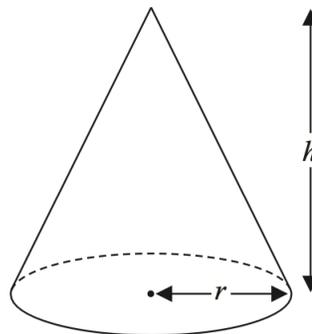
You must show all your working.

(3)

24. Here is a solid sphere and a solid cone.



$$\text{Volume of sphere} = \frac{4}{3} \pi r^3$$



$$\text{Volume of cone} = \frac{1}{3} \pi r^2 h$$

All measurements are in cm.

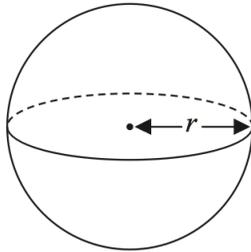
The volume of the sphere is equal to the volume of the cone.

(a) Find $r : h$.

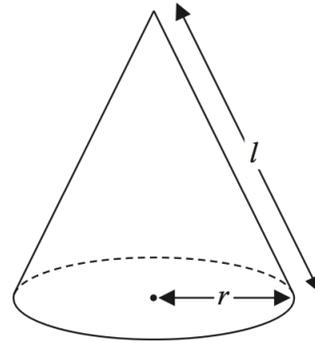
Give your answer in its simplest form.

(2)

Here is a different solid sphere and a different solid cone.



Surface area of sphere = $4\pi r^2$



Curved area of cone = $\pi r l$

All measurements are in cm.

The surface area of the sphere is equal to the **total** surface area of the cone.

(b) Find $r : h$.

Give your answer in the form $1 : \sqrt{n}$, where n is an integer.

(4)