

Dr Oliver Mathematics
GCSE Mathematics
2004 November Paper 5H: Non-Calculator
2 hours

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

1. Rosa prepares the ingredients for pizzas. (3)
She uses cheese, topping, and dough in the ratio 2 : 3 : 5.
Rosa uses 70 grams of dough.
Work out the number of grams of cheese and the number of grams of topping Rosa uses.

2. Work out (3)
 $12\frac{1}{2} \div \frac{5}{8}$.

3. (a) Expand the brackets (1)
 $p(q - p^2)$.

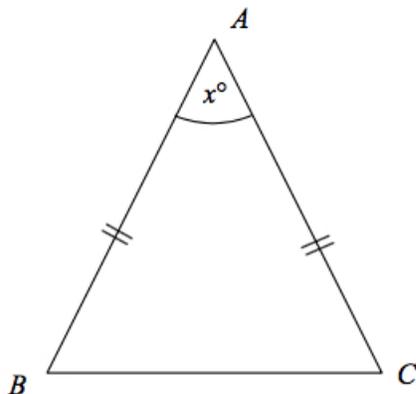
- (b) Expand and simplify (2)
 $5(3p + 2) - 2(5p - 3)$.

4. (a) (i) Write 40 000 000 in standard form. (2)
(ii) Write 3×10^{-5} as an ordinary number

- (b) Work out the value of (2)
 $3 \times 10^{-5} \times 40\,000\,000$.

Give your answer in standard form.

5. ABC is an isosceles triangle.



**Diagram NOT
accurately drawn**

$AB = AC.$

Angle $A = x^\circ.$

(a) Find an expression, in terms of x , for the size of angle $B.$ (2)

(b) Solve the simultaneous equations (3)

$$3p + q = 11$$

$$p + q = 3.$$

6. Calculate the size of the exterior angle of a regular hexagon. (2)

7. Use ruler and compasses to **construct** an angle of 45° at $A.$ (3)
You must show **all** construction lines.

A

8. Calculate the volume of the triangular prism. (4)

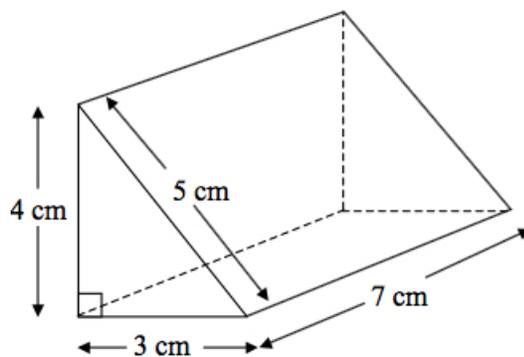


Diagram **NOT** accurately drawn

9. (a) Simplify (2)

(i) $\frac{x^6}{x^2}$,

(ii) $(y^4)^3$.

(b) Expand and simplify (2)

$$(t + 4)(t - 2).$$

(c) Write down the integer values of x that satisfy the inequality (2)

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

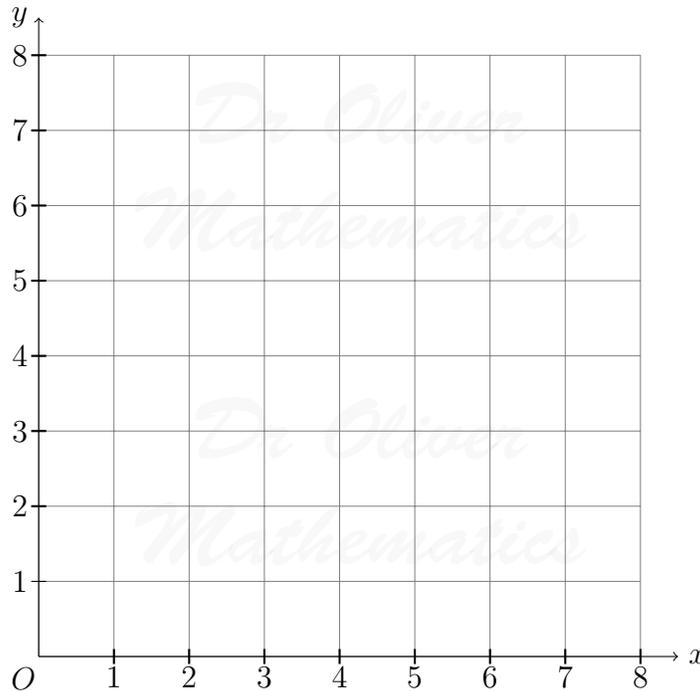
(d) Find the value of (2)

(i) $36^{-\frac{1}{2}}$,

(ii) $27^{\frac{2}{3}}$.

10. (a) On the grid below, draw straight lines and use shading to show the region **R** that satisfies the inequalities: (3)

$$x \geq 2, y \geq x, \text{ and } x + y \leq 6.$$



The point P with coordinates (x, y) lies inside the region **R**.
 x and y are **integers**.

(b) Write down the coordinates of **all** points of **R** whose coordinates are both integers. (2)

11. Make u the subject of the formula (2)

$$D = ut + kt^2.$$

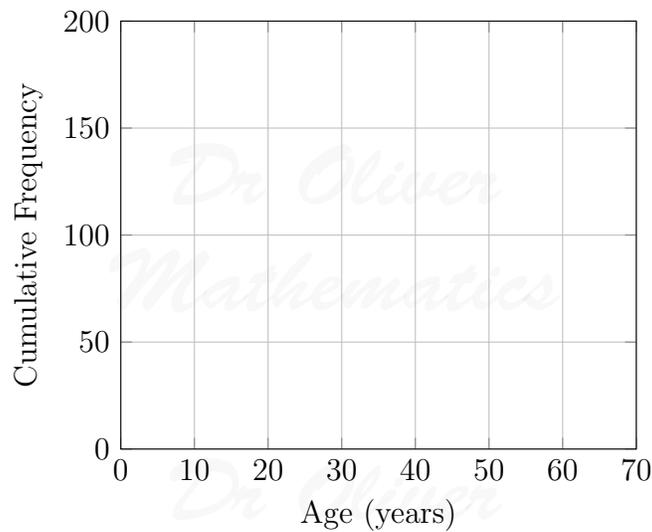
12. The table gives information about the ages of 160 employees of an IT company.

Age (A) in years	Frequency
$15 < A \leq 25$	44
$25 < A \leq 35$	56
$35 < A \leq 45$	34
$45 < A \leq 55$	19
$55 < A \leq 65$	7

(a) Complete the cumulative frequency table. (1)

Age (A) in years	Cumulative Frequency
$15 < A \leq 25$	
$25 < A \leq 35$	
$35 < A \leq 45$	
$45 < A \leq 55$	
$55 < A \leq 65$	

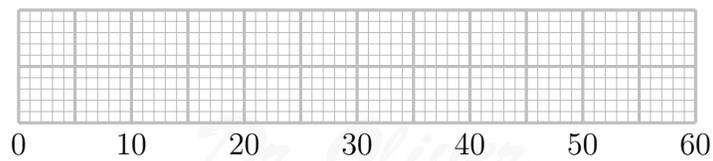
(b) Draw a cumulative frequency graph for your table. (2)



- (c) Use your graph to find an estimate for (3)
- (i) the median age of the employees,
 - (ii) the interquartile range of the ages of the employees.

Another IT company has 80 employees.
 The age of the youngest employee is 24 years.
 The age of the oldest employee is 54 years.
 The median age is 38 years.
 The lower quartile is 30 years.
 The lower quartile is 44 years.

- (d) Draw a box plot to show information about the ages of the employees. (2)



13. The diagram shows a circle, centre O .

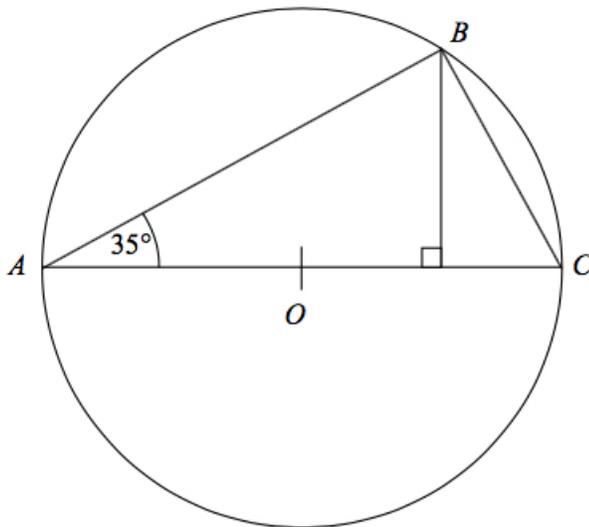


Diagram **NOT**
accurately drawn

AC is a diameter.
 Angle $BAC = 35^\circ$.
 D is the point on AC such that angle BDA is a right angle.

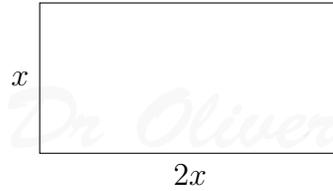
- (a) Work out the size of angle BCA . (2)
Give reasons for your answer.
- (b) Calculate the size of angle DBC . (1)

(c) Calculate the size of angle BOA .

(2)

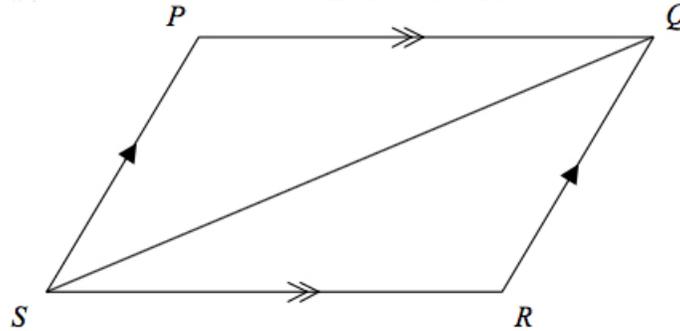
14. The length of a rectangle is twice the width of the rectangle.
The length of a diagonal of the rectangle is 25 cm.

(3)



Work out the area of the rectangle.
Give your answer as an integer.

15. $PQRS$ is a quadrilateral.



PQ is parallel to SR .
 SP is parallel to RQ .

- (a) Prove that triangle PQS is congruent to triangle RSQ .

(3)

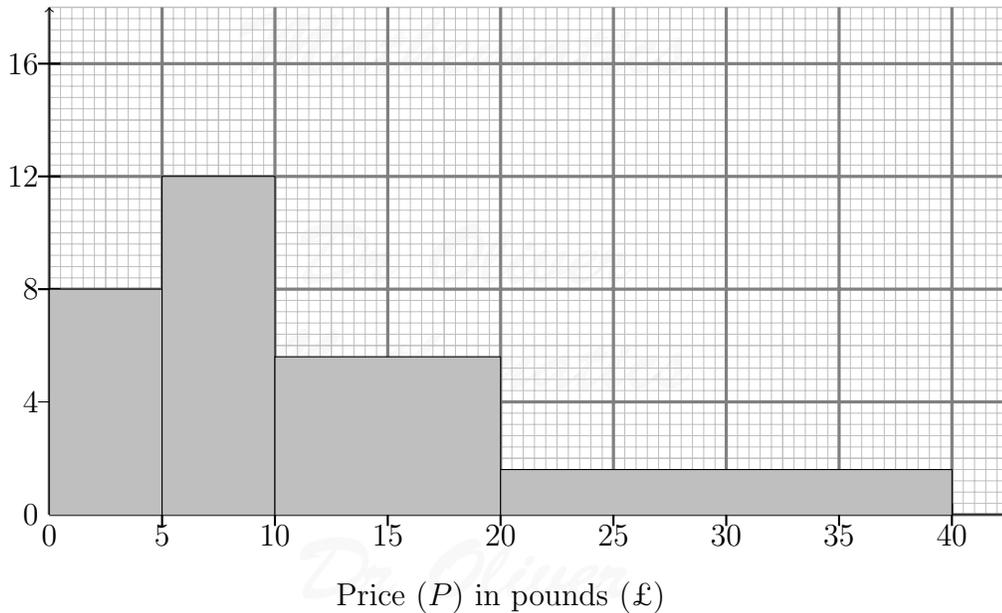
- (b) In quadrilateral $PQRS$, angle SPQ is obtuse.

(2)

Explain why $PQRS$ cannot be a cyclic quadrilateral.

16. This histogram gives information about the books sold in a bookshop one Saturday.

Frequency density



(a) Use the histogram to complete the table.

(2)

Price (P) in pounds (£)	Frequency
$0 < P \leq 5$	
$5 < P \leq 10$	
$10 < P \leq 20$	
$20 < P \leq 40$	

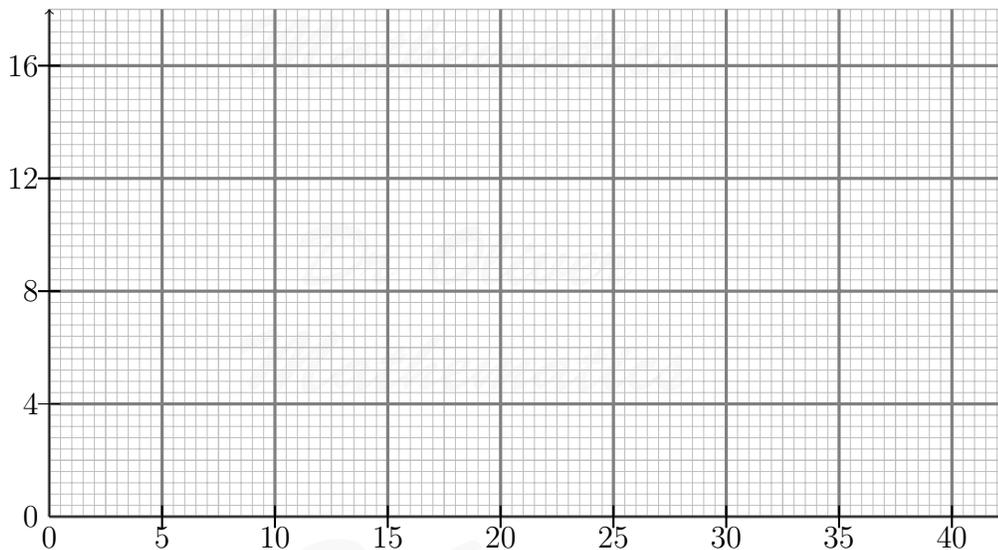
The frequency table below gives information about the books sold in a second bookshop on the same Saturday.

Price (P) in pounds (£)	Frequency
$0 < P \leq 5$	80
$5 < P \leq 10$	20
$10 < P \leq 20$	24
$20 < P \leq 40$	96

(b) Draw a histogram to represent the information about the books sold in the second bookshop.

(3)

Frequency density



Price (P) in pounds (£)

17. (a) Express

$$\frac{6}{\sqrt{2}}$$

(2)

in the form $a\sqrt{b}$, where a and b are positive integers.

The diagram shows a right-angled isosceles triangle.

The length of each of its equal sides is $\frac{6}{\sqrt{2}}$ cm.

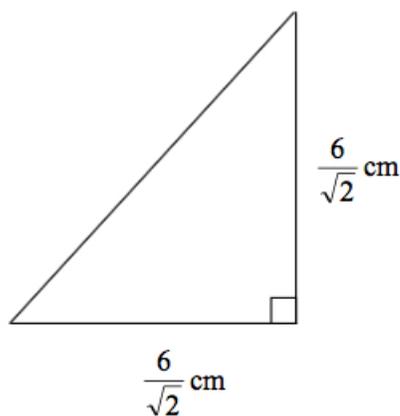


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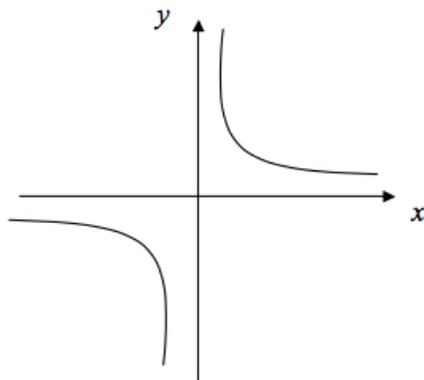
(b) Find the area of the triangle.

Give your answer as an integer.

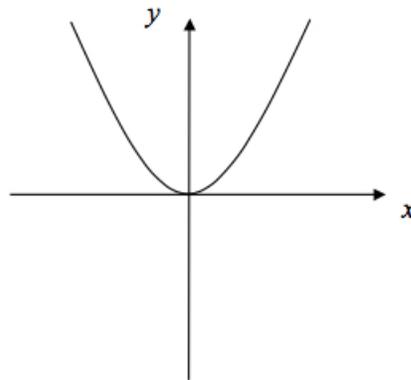
(2)

18. The graphs of y against x represent four different types of proportionality.

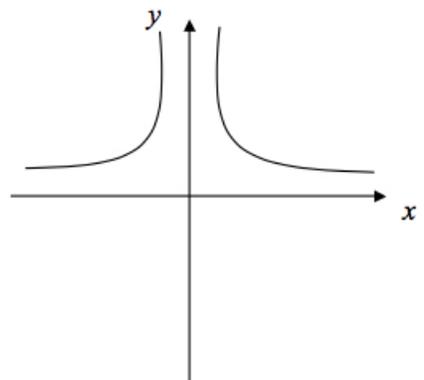
(2)



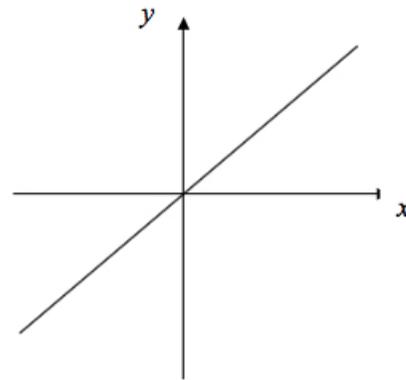
Graph A



Graph B



Graph C



Graph D

Write down the letter of the graph which represents the type of proportionality.

Type of proportionality	Graph letter
y is directly proportional to x	
y is inversely proportional to x	
y is proportional to the square of x	
y is inversely proportional to the square of x	

19. (a) Write down an expression, in terms of n , for the n th multiple of 5.

(1)

(b) Hence, or otherwise,

(5)

(i) prove that the sum of two consecutive multiples of 5 is always an odd number,

- (ii) prove that the product of two consecutive multiples of 5 is always an even number.

20. The diagram shows part of two graphs.

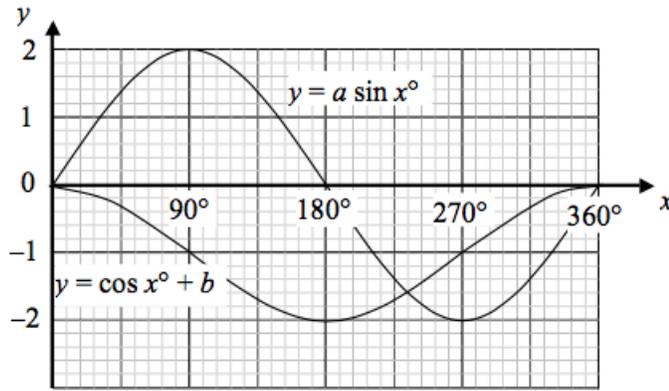


Diagram NOT accurately drawn

The equation of one graph is $y = a \sin x^\circ$.

The equation of the other graph is $y = \cos x^\circ + b$.

- (a) Find the value of a and find the value of b . (2)
- (b) Use the graphs to find the values of x in the range $0 \leq x \leq 720^\circ$ when (2)

$$a \sin x^\circ = \cos x^\circ + b.$$

- (c) Use the graphs to find the value of (2)

$$a \sin x^\circ - (\cos x^\circ + b)$$

when $x = 450^\circ$.

21. OPQ is a triangle. (5)

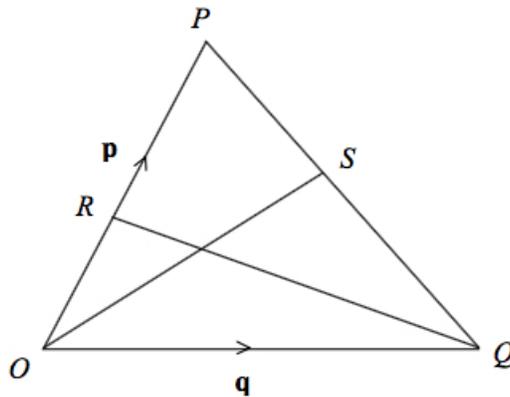


Diagram NOT accurately drawn

R is the midpoint of OP .

S is the midpoint of PQ .

$\overrightarrow{OP} = \mathbf{p}$ and $\overrightarrow{OQ} = \mathbf{q}$,

- (a) Find \overrightarrow{OS} in terms of \mathbf{p} and \mathbf{q} .
- (b) Show that RS is parallel to OQ .

22. Solve

$$\frac{2}{x+1} + \frac{3}{x-1} = \frac{5}{x^2-1}.$$

(4)

23. The diagram shows a sector of a circle with a radius of x cm and centre O .

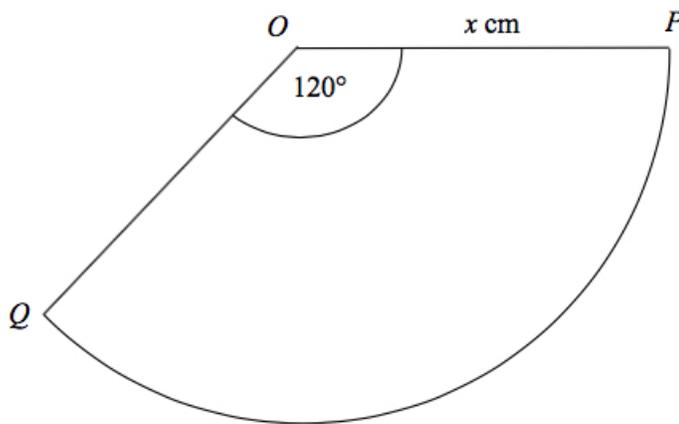


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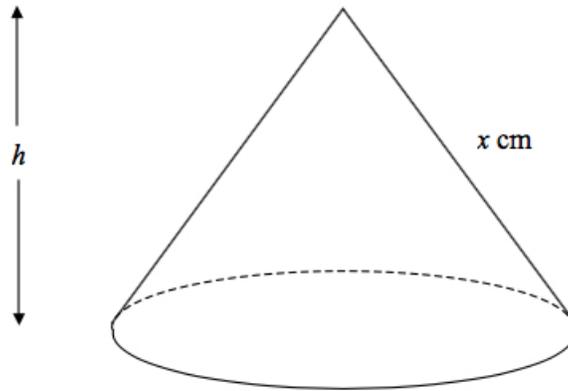
PQ is an arc of the circle.

Angle $POQ = 120^\circ$.

- (a) Write down an expression in terms of π and x for
 - (i) the area of this sector,
 - (ii) the arc length of this sector.

(2)

The sector is the net of the curved surface of this cone.
Arc PQ forms the circumference of the circle that makes the base of the cone.



The curved surface area of the cone is $A \text{ cm}^2$.
The volume of the cone is $V \text{ cm}^3$.
The height of the cone is $h \text{ cm}$.
Given that $V = 3A$,

(b) find the value of h .

(3)

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