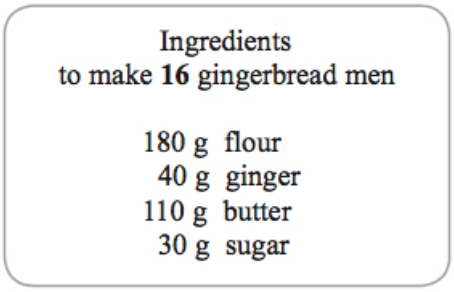
Dr Oliver Mathematics
GCSE Mathematics
2012 November Paper 1H: Non-Calculator
1 hour 45 minutes

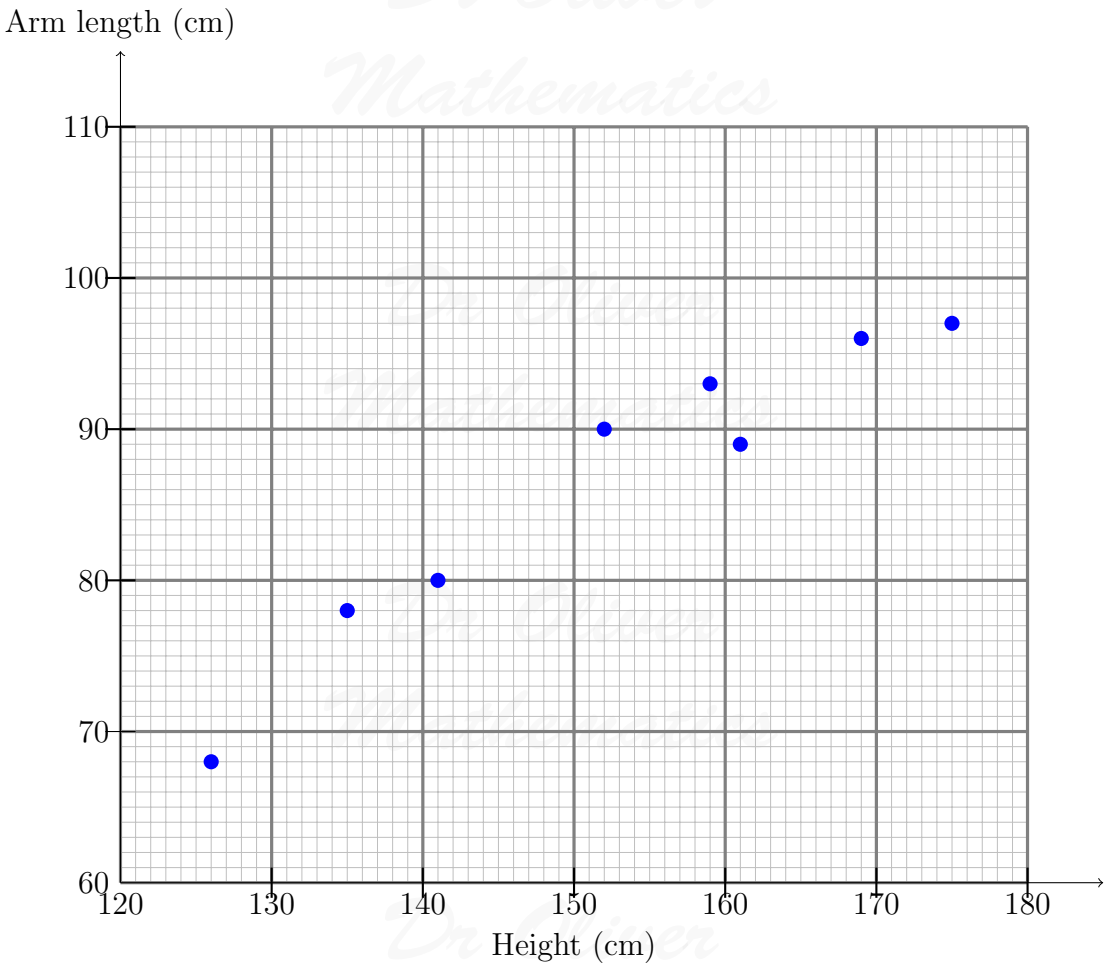
The total number of marks available is 100.
You must write down all the stages in your working.

1. Here are the ingredients needed to make 16 gingerbread men. (3)



Hamish wants to make 24 gingerbread men.
Work out how much of each of the ingredients he needs.

2. The scatter graph shows information about the height and the arm length of each of 8 students in Year 11.



(a) What type of correlation does this scatter graph show? (1)

A different student in Year 11 has a height of 148 cm.

(b) Estimate the arm length of this student. (2)

3. Here is part of Gary's electricity bill. (4)

Electricity bill

New reading	7155 units
Old reading	7095 units

Price per unit 15p

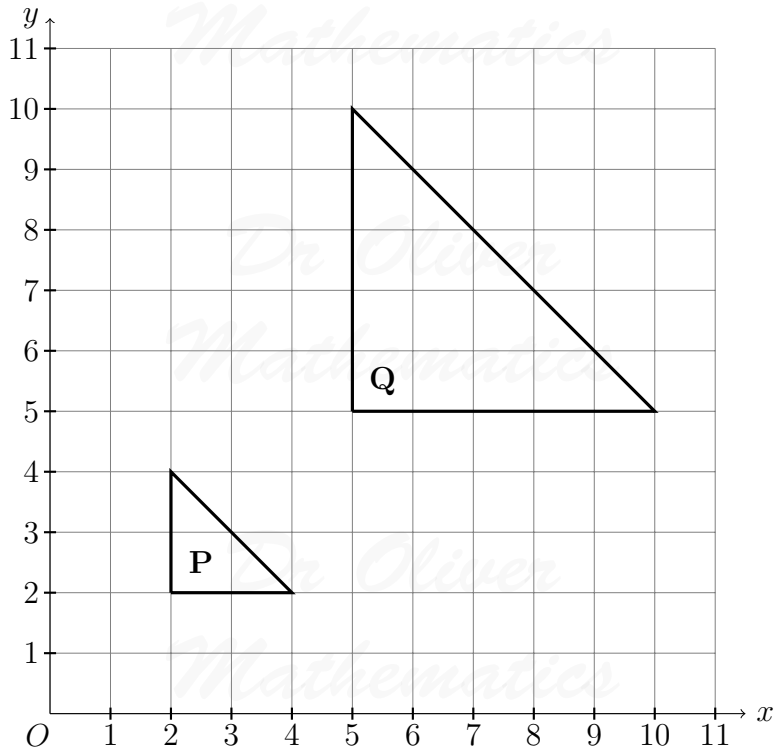
Work out how much Gary has to pay for the units of electricity he used.

4. Alison wants to find out how much time people spend reading books. (2)
She is going to use a questionnaire.
Design a suitable question for Alison to use in her questionnaire.

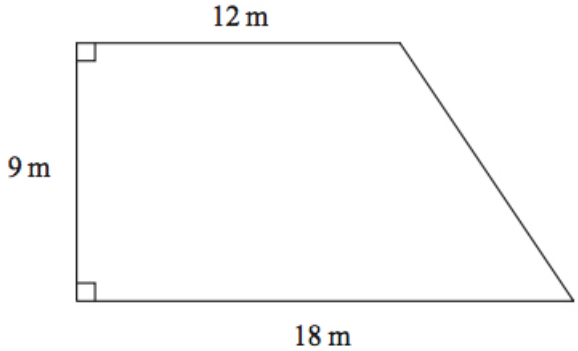
5. Work out an estimate for (3)

$$\frac{31 \times 9.87}{0.509}.$$

6. Describe fully the single transformation that maps shape **P** onto shape **Q**. (3)



7. Here is a diagram of Jim's garden. (4)



Jim wants to cover his garden with grass seed to make a lawn.
Grass seed is sold in bags.
There is enough grass seed in each bag to cover 20 m^2 of garden.
Each bag of grass seed costs £4.99.
Work out the least cost of putting grass seed on Jim's garden.

8. There are only red counters, blue counters, white counters, and black counters in a bag.
The table shows the probability that a counter taken at random from the bag will be red or blue.

Colour	Red	Blue	White	Black
Probability	0.2	0.5		

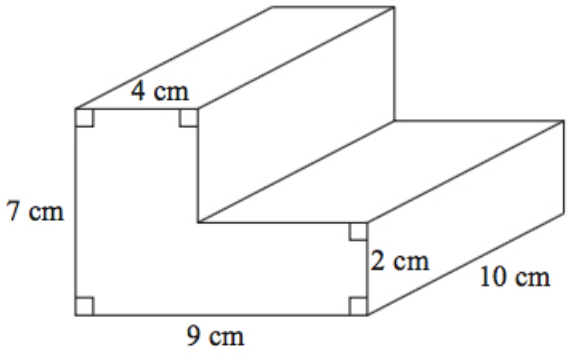
The number of white counters in the bag is the same as the number of black counters in the bag.
Tania takes at random a counter from the bag.

(a) Work out the probability that Tania takes a white counter. (2)

There are 240 counters in the bag.

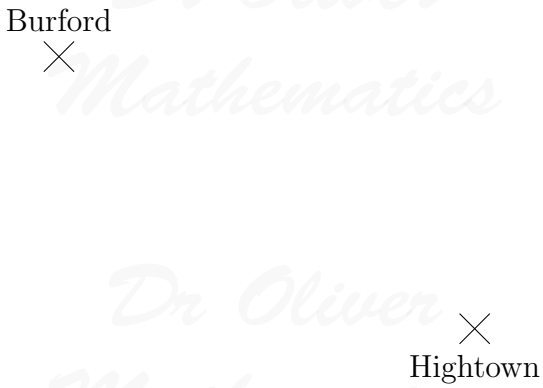
(b) Work out the number of red counters in the bag. (2)

9. The diagram shows a prism. (3)



Work out the volume of the prism.

10. Here is a map. (3)
The map shows two towns, Burford and Hightown.



A company is going to build a warehouse.
The warehouse will be less than 30 km from Burford and less than 50 km from Hightown.
Shade the region on the map where the company can build the warehouse.

11. (a) Expand $4(3x + 5)$. (1)

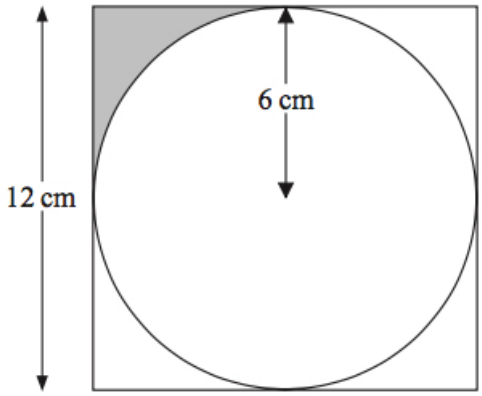
(b) Expand and simplify (2)

$$2(x - 4) + 3(x + 5).$$

(c) Expand and simplify (2)

$$(x + 4)(x + 6).$$

12. The diagram shows a circle drawn inside a square. (3)



The circle has a radius of 6 cm.
The square has a side of length 12 cm.
Work out the shaded area.
Give your answer in terms of π.

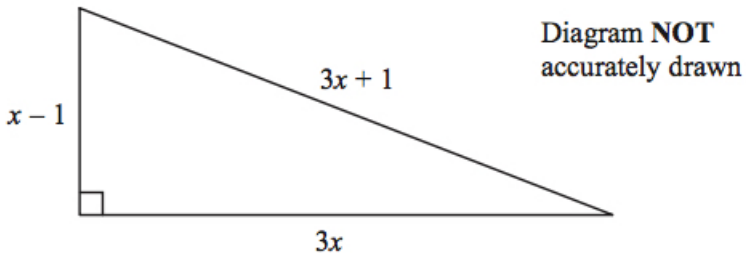
13. Talil is going to make some concrete mix. (4)
He needs to mix cement, sand and gravel in the ratio 1 : 3 : 5 by weight.
Talil wants to make 180 kg of concrete mix.
Talil has 15 kg of cement, 85 kg of sand, and 100 kg of gravel.
Does Talil have enough cement, sand, and gravel to make the concrete mix?

14. The bearing of a ship from a lighthouse is 050°. (2)
Work out the bearing of the lighthouse from the ship.

15. (a) Simplify $m^5 \div m^3$. (1)

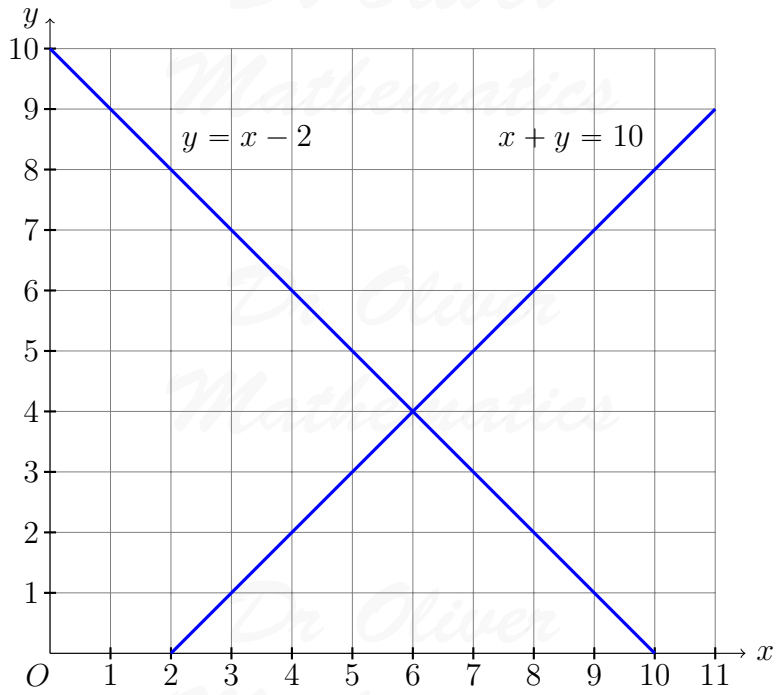
(b) Simplify $5x^4y^3 \times x^2y$. (2)

16. The diagram shows a triangle. (4)



In the diagram, all the measurements are in metres.
The perimeter of the triangle is 56 m.
The area of the triangle is A m^2.
Work out the value of A.

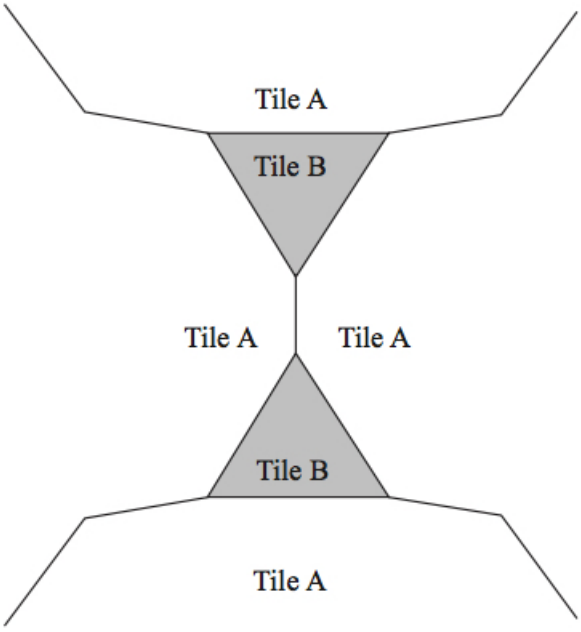
17. The lines $y = x - 2$ and $x + y = 10$ are drawn on the grid. (3)



On the grid, mark with a cross (×) each of the points with integer coordinates that are in the region defined by

$$y > x - 2$$
$$x + y < 10$$
$$x > 3.$$

18. The diagram shows part of a pattern made from tiles. (4)

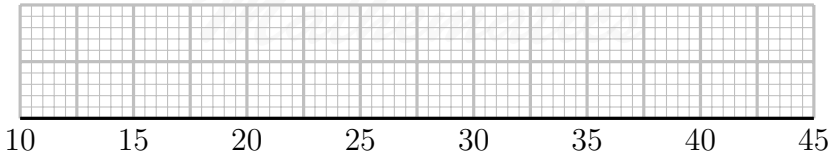


The pattern is made from two types of tiles, tile A and tile B.
Both tile A and tile B are regular polygons.
Work out the number of sides tile A has.

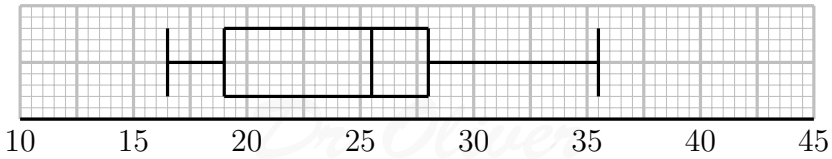
19. Sameena recorded the times, in minutes, some girls took to do a jigsaw puzzle.
Sameena used her results to work out the information in this table.

	Minutes
Shortest time	18
Lower quartile	25
Median	29
Upper quartile	33
Longest time	44

(a) On the grid, draw a box plot to show the information in the table. (2)



The box plot below shows information about the times, in minutes, some boys took to do the same jigsaw puzzle.



(b) Compare the distributions of the girls' times and the boys' times. (2)

20. Write the following numbers in order of size. (2)
Start with the smallest number.

$$0.038 \times 10^2 \qquad 3\,800 \times 10^{-4} \qquad 380 \qquad 0.38 \times 10^{-1}$$

21. The table shows information about the speeds of 100 lorries.

Speed (s) in km/h	Frequency
$0 < s \leqslant 20$	2
$20 < s \leqslant 40$	9
$40 < s \leqslant 60$	23
$60 < s \leqslant 80$	31
$80 < s \leqslant 100$	27
$100 < s \leqslant 120$	8

(a) Complete the cumulative frequency table for this information. (1)

Speed (s) in km/h	Cumulative Frequency
$0 < s \leqslant 20$	2
$0 < s \leqslant 40$	
$0 < s \leqslant 60$	
$0 < s \leqslant 80$	
$0 < s \leqslant 100$	
$0 < s \leqslant 120$	

(b) On the grid, draw a cumulative frequency graph for your table. (2)

(c) Find an estimate for the number of lorries with a speed of more than 90 km/h. (2)

22. Solve the simultaneous equations (4)

$$3x + 2y = 4$$
$$4x + 5y = 17.$$

23. $ABCD$ is a square. (4)

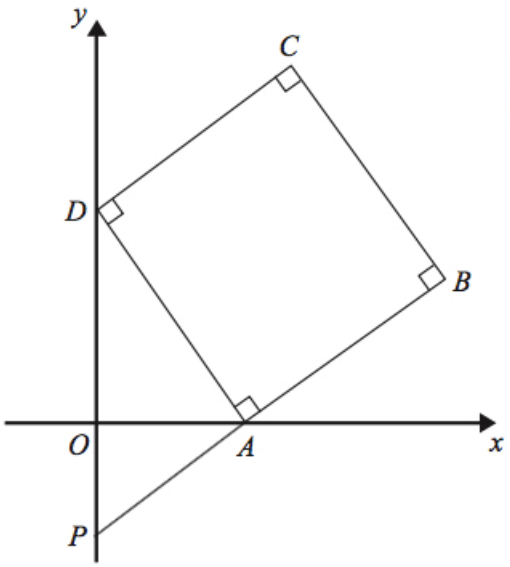


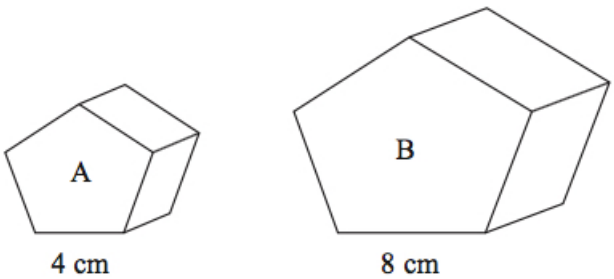
Diagram **NOT** accurately drawn

P and D are points on the y-axis.
A is a point on the x-axis.
PAB is a straight line.
The equation of the line that passes through the points A and D is $y = -2x + 6$.
Find the length of PD.

24. Make t the subject of the formula (4)

$$p = \frac{3 - 2t}{4 + t}.$$

25. The diagram shows two similar solids, A and B.



Solid A has a volume of 80 cm^3.

(a) Work out the volume of solid B. (2)

Solid B has a total surface area of 160 cm^2.

(b) Work out the total surface area of solid A. (2)

26. (a) Rationalise the denominator of (2)

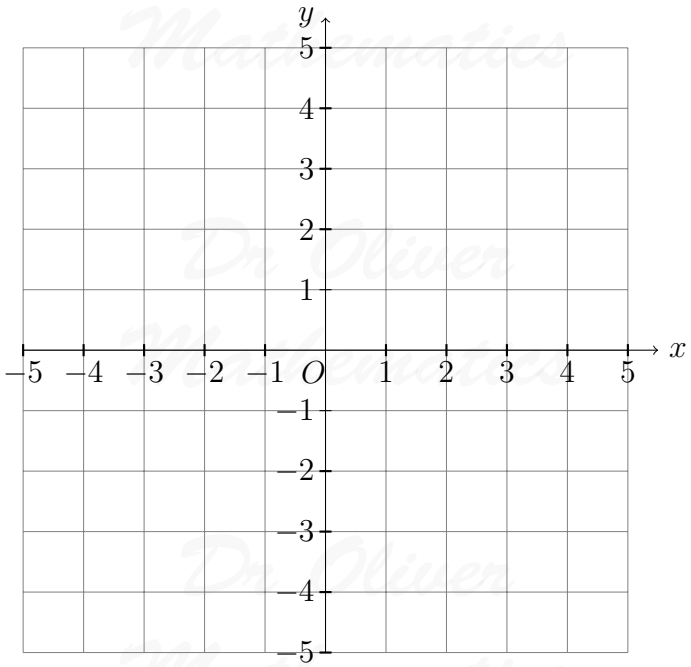
$$\frac{5}{\sqrt{2}}.$$

(b) Expand and simplify (2)

$$(2+\sqrt{3})^2-(2-\sqrt{3})^2.$$

27. (a) On the grid, draw the graph of (2)

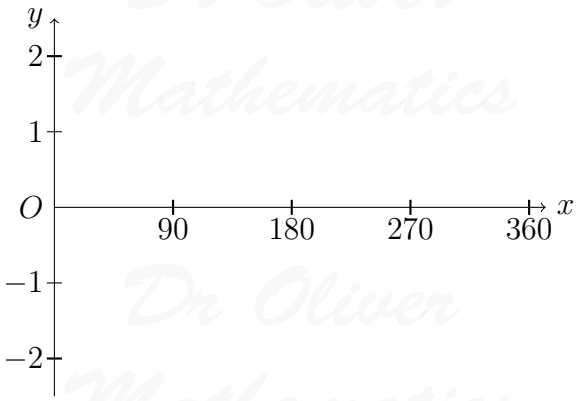
$$x^2+y^2=4.$$



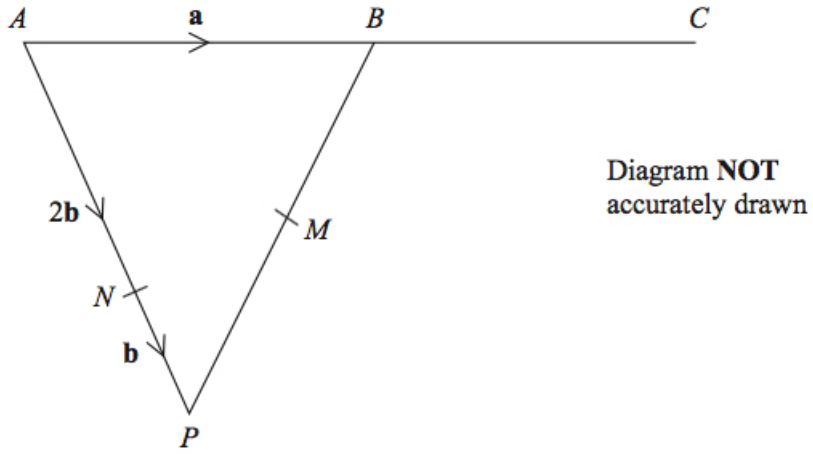
(b) On the grid, sketch the graph of (2)

$$y=\cos x$$

for $0^\circ \leqslant x \leqslant 360^\circ$.



28. APB is a triangle.



N is a point on AP.
$\overrightarrow{AB} = \mathbf{a}$.
$\overrightarrow{AN} = 2\mathbf{b}$.
$\overrightarrow{NP} = \mathbf{b}$.

(a) Find the vector $\overrightarrow{PB}$, in terms of $\mathbf{a}$ and $\mathbf{b}$. (1)

B is the midpoint of AC.
M is the midpoint of PB.

(b) Show that NMC is a straight line. (4)