

Thursday 17 January 2013 – Morning

GCSE MATHEMATICS A

A503/02 Unit C (Higher Tier)

Candidates answer on the Question Paper.

OCR supplied materials:

None

Other materials required:

- Scientific or graphical calculator
- Geometrical instruments
- Tracing paper (optional)

Duration: 2 hours



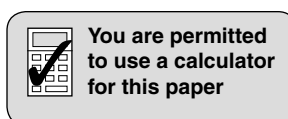
Candidate forename		Candidate surname	
Centre number		Candidate number	

INSTRUCTIONS TO CANDIDATES

- Write your name, centre number and candidate number in the boxes above. Please write clearly and in capital letters.
- Use black ink. HB pencil may be used for graphs and diagrams only.
- Answer **all** the questions.
- Read each question carefully. Make sure you know what you have to do before starting your answer.
- Your answers should be supported with appropriate working. Marks may be given for a correct method even if the answer is incorrect.
- Write your answer to each question in the space provided. Additional paper may be used if necessary but you must clearly show your candidate number, centre number and question number(s).
- Do **not** write in the bar codes.

INFORMATION FOR CANDIDATES

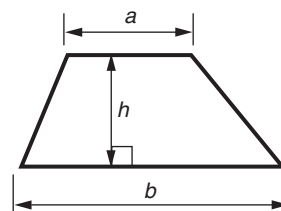
- The number of marks is given in brackets [] at the end of each question or part question.
- Your Quality of Written Communication is assessed in questions marked with an asterisk (*).
- Use the π button on your calculator or take π to be 3.142 unless the question says otherwise.
- The total number of marks for this paper is **100**.
- This document consists of **24** pages. Any blank pages are indicated.



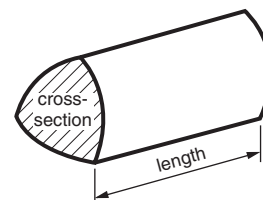
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Formulae Sheet: Higher Tier

Area of trapezium $= \frac{1}{2} (a + b)h$



Volume of prism $= (\text{area of cross-section}) \times \text{length}$

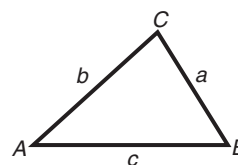


In any triangle ABC

Sine rule $\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$

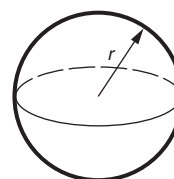
Cosine rule $a^2 = b^2 + c^2 - 2bc \cos A$

Area of triangle $= \frac{1}{2} ab \sin C$



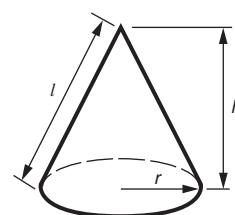
Volume of sphere $= \frac{4}{3} \pi r^3$

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



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

Curved surface area of cone $= \pi r l$



The Quadratic Equation

The solutions of $ax^2 + bx + c = 0$,
where $a \neq 0$, are given by

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

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1 Janet and Phil go to a summer fair.

(a) Three cakes are left for sale on the cake stall.

Fruit cake (F)	Chocolate cake (C)	Sponge cake (S)
-------------------	-----------------------	--------------------

Janet buys one of these cakes at random and then Phil buys one of the remaining cakes at random.

(i) List all the possible ways they could do this.
The first one has been done for you.

Janet	Phil
F	C

[2]

(ii) What is the probability that either Janet or Phil buys the chocolate cake?

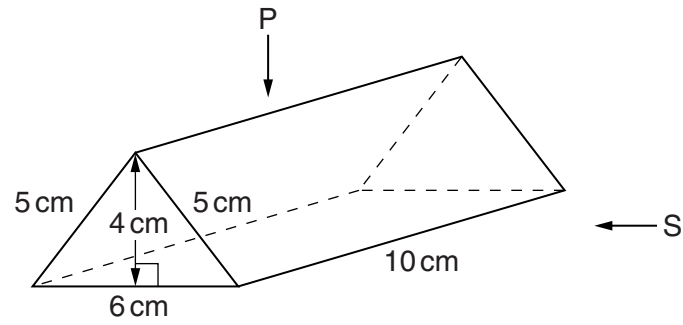
(a)(ii) _____ [2]

(b) On one of the stalls there is the chance to win a car.
Phil has to throw five sixes with five fair, ordinary six-sided dice to win.
He throws the five dice.

What is the probability that Phil will win the car?

(b) _____ [3]

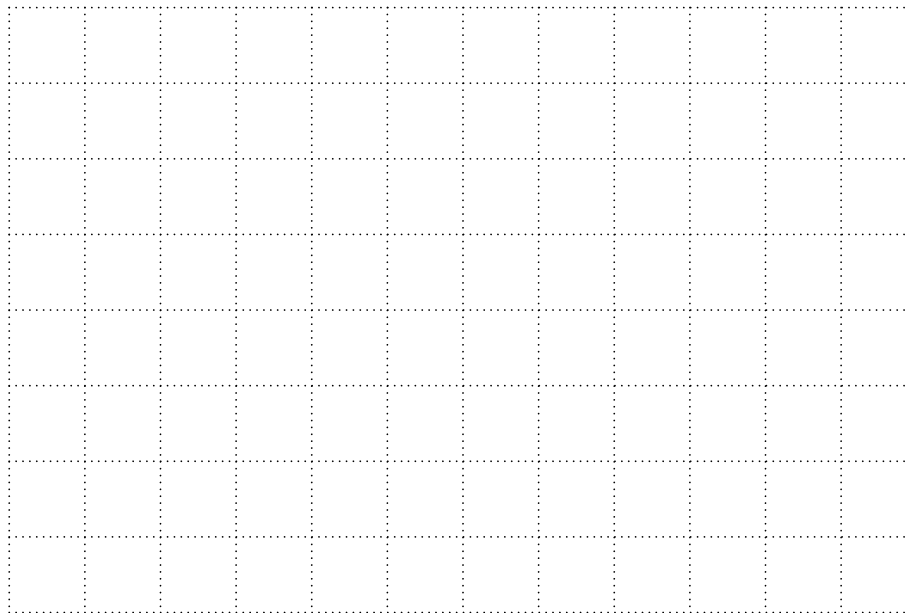
- 2 A chocolate bar is contained in a closed box which is a triangular prism.



(a) Make an accurate, full-size drawing of

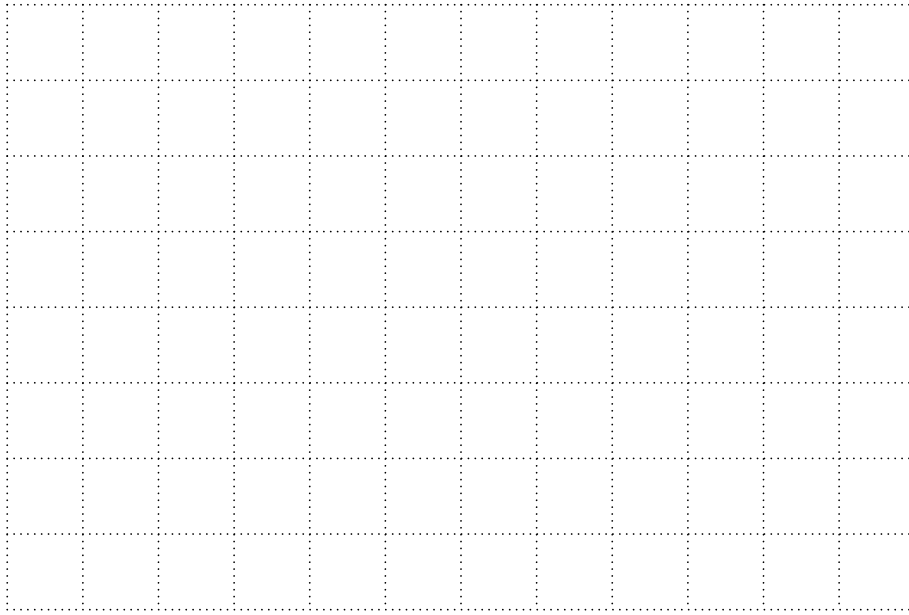
- (i) the plan (from P) and
- (ii) the side elevation (from S) of the prism.

(i) Plan



[2]

(ii) Side elevation



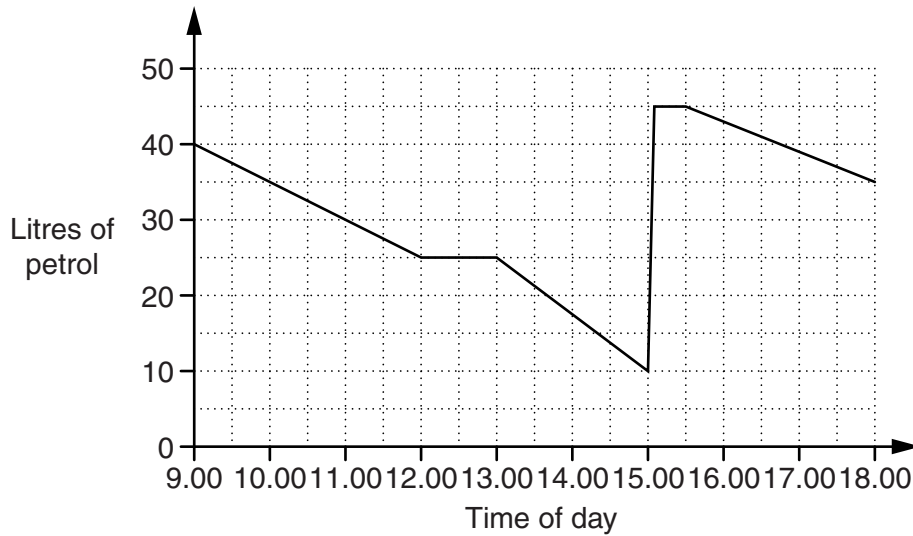
[2]

(b) The box is made from card.

What is the total area of card needed to make the box?

(b) _____ cm^2 [4]

- 3** Nisha goes on holiday in her car.
The graph shows how many litres of petrol are in the tank of her car during the journey.



- (a)** Work out the rate at which the car was using petrol during the first 3 hours of the journey.
State the units of your answer.

(a) _____ [3]

- (b)** Between which times was the car using petrol at the greatest rate?

(b) _____ and _____ [1]

- (c)** What could have happened

- (i)** between 12.00 and 13.00,

_____ [1]

- (ii)** at 15.00?

_____ [1]

- 4 The table shows the probabilities of how a randomly selected adult in a particular town would vote in an election.

Party	Conservative	Liberal Democrat	Labour	Other
Probability	0.4	0.17	0.35	

(a) Complete the table. [2]

(b) Work out the probability that a randomly selected adult would vote Conservative or Liberal Democrat.

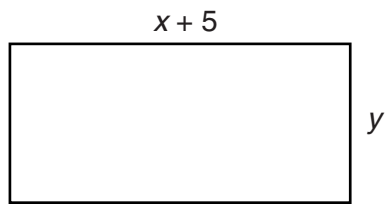
(b) _____ [2]

(c) There are 2500 adults in the town.

How many of these adults might you expect to vote Labour?

(c) _____ [2]

5* **Three** of these rectangles are joined together to form a different rectangle.



Find an expression for the perimeter of each possible rectangle.
Give any answer in the form $ax + by + c$.

[5]

- 6 Frances invests £30 000 at 6% per year **compound** interest.

How much will the investment be worth after 3 years?

£ _____ [4]

- 7 Use your calculator to work these out.

(a) $2\frac{3}{4} \times 1\frac{2}{3}$

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

(a) _____ [1]

(b) 0.2^{-5}

(b) _____ [1]

8 (a) Factorise.

$$6x + 8$$

(a) _____ [1]

(b) Work out the value of $x^2 - 9$ when

(i) $x = 5$,

(b)(i) _____ [1]

(ii) $x = -4$.

(ii) _____ [1]

(c) Factorise.

$$x^2 - 9$$

(c) _____ [1]

- 9** Emma and Rebecca are going on holiday.
They are each allowed 21 kg of luggage on the flight.

- (a)** After packing her suitcase, Rebecca weighs it on her bathroom scales.
The scales show a weight of 42 lb (pounds).

Is the suitcase within the allowed weight limit?

Show clearly how you decide.

[2]

- (b)** Emma's suitcase weighs 40 lb, correct to the nearest pound.

Write down the upper and lower bound of this weight.

(b) Upper bound _____ lb

Lower bound _____ lb **[2]**

- (c)** At the airport, 17 suitcases are each weighed as 21 kg, correct to the nearest kg.

What is the largest possible total weight of these 17 suitcases?

(c) _____ kg **[2]**

- 10** Ketchup is sold in two sizes of bottle, 'Standard' and 'Large'.
The 'Large' bottle and the 'Standard' bottle are similar shapes.
Their labels are also similar shapes.

- (a)** The width of the label on the 'Large' bottle is 1.1 times the width of the label on the 'Standard' bottle.
The perimeter of the label on the 'Large' bottle is 28 cm.

Work out the perimeter of the label on the 'Standard' bottle.

(a) _____ cm [2]

- (b)** The height of the 'Large' bottle is 1.1 times the height of the 'Standard' bottle.
The volume of the 'Standard' bottle is 300 ml.

Work out the volume of the 'Large' bottle of ketchup.
Give your answer to an appropriate degree of accuracy.

(b) _____ ml [3]

11 (a) Multiply out.

$$x(x^2 - 3x + 1)$$

(a) _____ [3]

(b) Multiply out and simplify.

$$3(4x + 1) - 2(5x + 6)$$

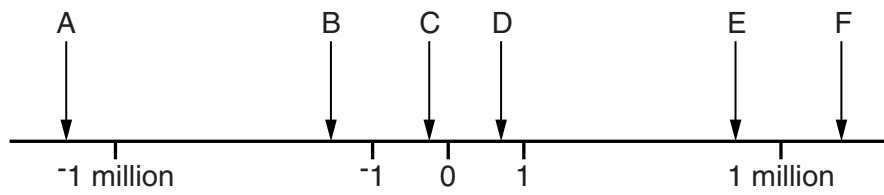
(b) _____ [3]

(c) Multiply out and simplify.

$$(x - 10)(x + 2)$$

(c) _____ [2]

12 This number line is **not** to scale.



The arrows show roughly the position of some standard form numbers.

Which arrow represents

(a) 8×10^5 ,

(a) Arrow _____ [1]

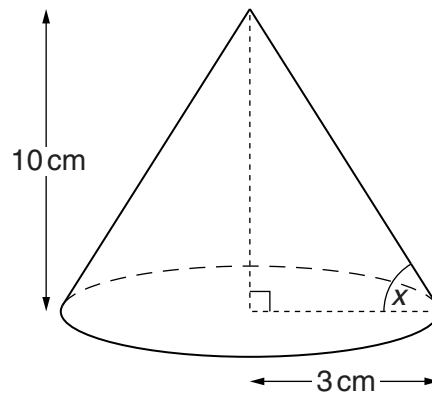
(b) 7×10^{-6} ,

(b) Arrow _____ [1]

(c) 3×10^{-2} ?

(c) Arrow _____ [1]

13 Here is a cone.



(a) Work out the volume of the cone.

(a) _____ cm^3 [2]

(b) Work out angle x , the angle between the slant height of the cone and the base.

(b) _____ $^\circ$ [3]

```

graph LR
    Root(( )) ---|0.6| Lift1[Lift]
    Root --- NoLift1[No lift]
    Lift1 --- Lift2[Lift]
    Lift1 --- NoLift2[No lift]
    NoLift1 --- Lift3[Lift]
    NoLift1 --- NoLift4[No lift]
    
```

(b) Work out the probability that Pat gets a lift on just one of the two days.

(b) _____ [3]

15 You are given that

$$y \propto \frac{1}{x}.$$

(a) Given also that $y = 7$ when $x = 3$, find a formula connecting y and x .

(a) _____ [2]

(b) Find y when $x = 10$.

(b) _____ [1]

(c) Find x when $y = 10$.

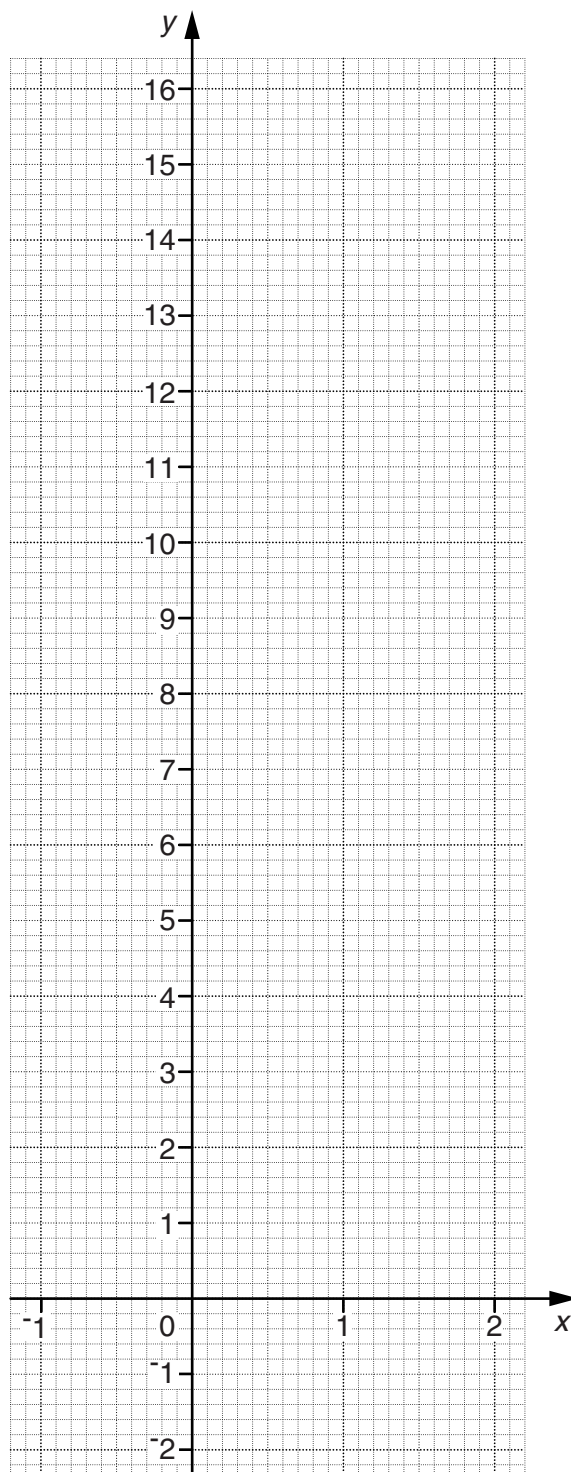
(c) _____ [1]

16 (a) Complete the table for $y = 4^x$.

x	-1	-0.5	0	0.5	1	1.5	2
y		0.5			4		16

[2]

(b) Draw the graph of $y = 4^x$.



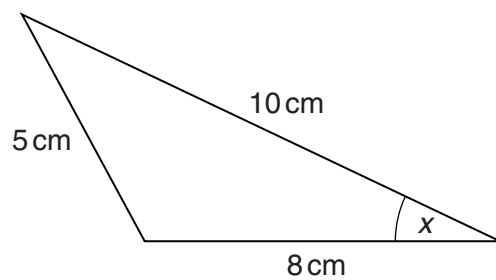
[2]

(c) Use your graph to solve this equation.

$$4^x = 12$$

(c) _____ [1]

17 Here is a triangle.



**Not to
scale**

(a) Show that $x = 29.7^\circ$, correct to one decimal place.

[3]

(b) Work out the area of the triangle.

(b) _____ cm^2 [2]

- 18 (a)** Write this expression in completed square form, $(x + a)^2 - b$.

$$x^2 + 6x + 1$$

(a) _____ [2]

- (b)** Use your answer to part **(a)** to solve this equation.

$$x^2 + 6x + 1 = 0$$

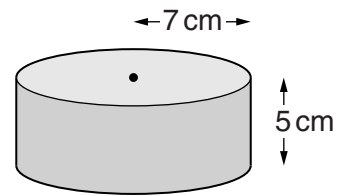
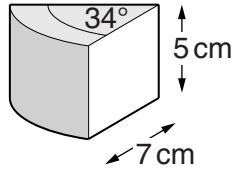
Give your answers correct to 2 decimal places.
Show your working clearly.

(b) _____ [4]

- 19** A cheese is a cylinder of radius 7 cm and depth 5 cm.

The cheese is totally covered with a thin coating of wax.

A slice of the cheese is cut so that the top is the sector of a circle of angle 34° .



Work out the area of the wax coating on this slice of cheese.

_____ cm^2 [6]

END OF QUESTION PAPER

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