

**Thursday 9 June 2016 – 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	
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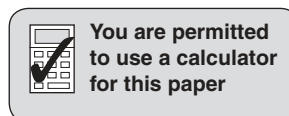
Centre number						Candidate number				
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### INSTRUCTIONS TO CANDIDATES

- 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

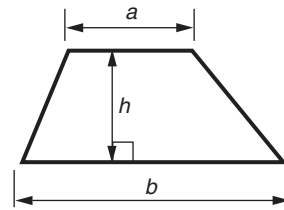
- The number of marks is given in brackets [ ] at the end of each question or part question.
- Your quality of written communication is assessed in questions marked with an asterisk (\*).
- Use the  $\pi$  button on your calculator or take  $\pi$  to be 3.142 unless the question says otherwise.
- The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



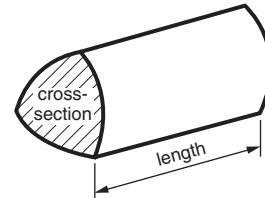
You are permitted  
to use a calculator  
for this paper

## Formulae Sheet: Higher Tier

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



**Volume of prism** = (area of cross-section)  $\times$  length

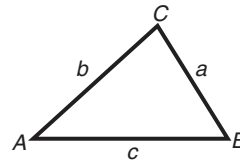


**In any triangle ABC**

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

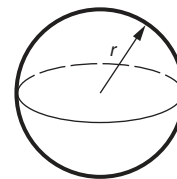
**Cosine rule**  $a^2 = b^2 + c^2 - 2bc \cos A$

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



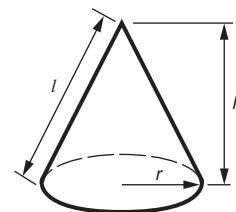
**Volume of sphere** =  $\frac{4}{3}\pi r^3$

**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

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

**PLEASE DO NOT WRITE ON THIS PAGE**

Answer **all** the questions.

- 1 Terri travels to and from school by bus.  
Here are the bus fares for different types of ticket.

Ticket type	Fare
1-way	£1.35
Return	£2.16
All week	£9.80

- (a) One week, Terri travels to school and back by bus on 5 days.

How much cheaper is it to buy an 'All week' ticket rather than '1-way' tickets?

(a) £ ..... [1]

- (b) Express the ratio

cost of **two** '1-way' tickets : cost of **one** 'Return' ticket

in its simplest form.

(b) ..... : ..... [2]

2 (a) (i) Louise has these numbers of different types of teeth.

- 8 incisors
- 4 canine
- 8 premolars
- 12 molars

What fraction of Louise's teeth are molars?  
Give your answer in its simplest form.

(a)(i) ..... [2]

(ii) Finn has 27 teeth.  
About 18% of his teeth have fillings.

How many of Finn's teeth have fillings?

(ii) ..... [3]

(iii) Kirsten has 30 teeth.  
 $\frac{2}{5}$  of her teeth have fillings.

How many of Kirsten's teeth have fillings?

(iii) ..... [2]

(b) A dentist has this information about her patients.

Number of fillings	0	1 or 2	3 or 4	More than 4
Probability	0.25	0.17		0.4

(i) Complete the table.

[2]

(ii) One of the patients is chosen at random.

What is the probability that this person has 2 fillings or fewer?

(b)(ii) ..... [2]

(iii) Two of the patients are chosen at random.

Calculate the probability that they both have more than 4 fillings.

(iii) ..... [2]

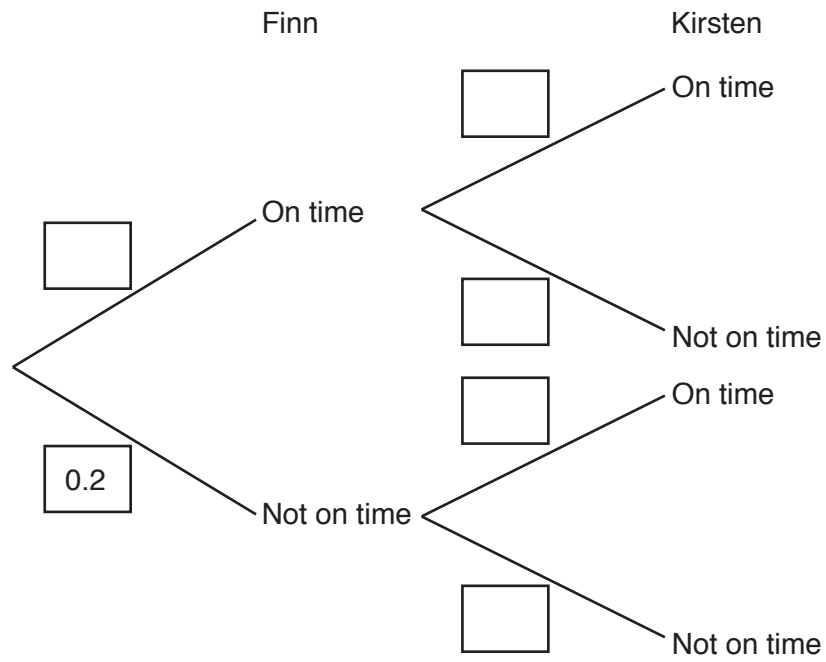
(iv) The dentist has 1500 patients altogether.

How many of these patients have 1 or 2 fillings?

(iv) ..... [2]

(c) Finn and Kirsten both visit the dentist.  
 The probability that the dentist **does not** see any patient on time is 0.2.

(i) Complete the tree diagram.

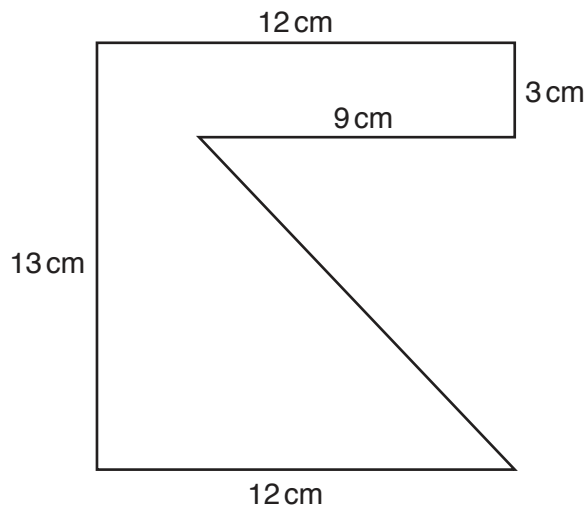


[2]

(ii) Calculate the probability that just one of Finn and Kirsten is not seen on time.

(c)(ii) ..... [3]

- 3 A right-angled triangle is cut from a rectangular piece of paper.



**Not to scale**

- (a) Calculate the area of the paper remaining.

(a) .....  $\text{cm}^2$  [3]

- (b) Change your answer to part (a) into  $\text{mm}^2$ .

(b) .....  $\text{mm}^2$  [1]

4 (a) Simplify fully.

$$\frac{16y^4}{2y^2}$$

(a) ..... [2]

(b) Multiply out the brackets.

$$4x^2(x - 6)$$

(b) ..... [2]

(c) Multiply out the brackets and simplify fully.

$$3(x - 7) + 5(2x + 1)$$

(c) ..... [3]



- 5 A four-sided spinner is numbered 1 to 4.  
 The spinner is spun many times and, each time, the number it lands on is recorded.  
 The table shows the results.

Number	1	2	3	4
Frequency	132	117	128	123

- (a) Explain why it is reasonable to use this information to work out an estimate of the probability of getting a 4 with this spinner.

.....  
 ..... [1]

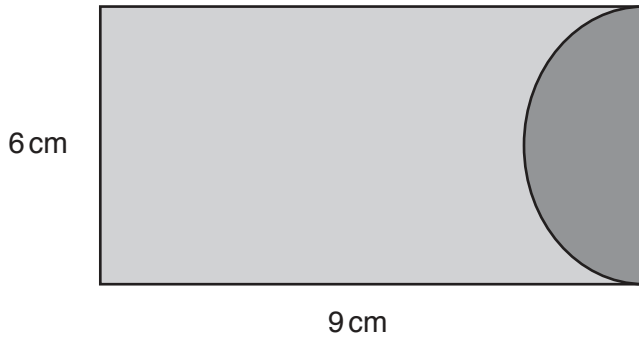
- (b) Use the values in the table to work out an estimate of the probability of getting a 4 with this spinner.

(b) ..... [2]

- (c) Is the spinner fair or biased?  
 Explain clearly how you decide.

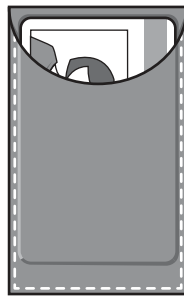
.....  
 ..... [2]

6\* The case shown below is used to store a travel card.



Not to scale

The case is two rectangles of leather joined together. One of the rectangles has a semicircle cut away.



Work out the total area of leather in the case.

..... [6]

- 7 (a) Factorise fully.

$$4xy - 10xw$$

(a) ..... [2]

- (b) Solve.

$$x^2 = 49$$

(b) ..... [2]

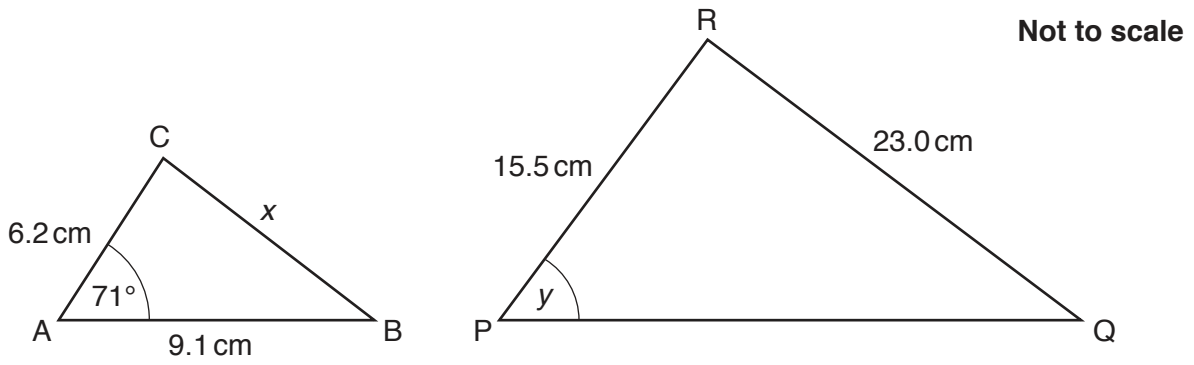
- (c) Use the quadratic formula to solve this equation.

$$3x^2 - 2x - 7 = 0$$

Give your answers correct to 2 decimal places.

(c) ..... [4]

8 Triangles ABC and PQR are mathematically similar.



(a) Calculate length  $x$ .

(a) ..... cm [3]

(b) What is the size of angle  $y$ ?

(b) ..... ° [1]

(c) Show that the area of triangle ABC is  $26.7 \text{ cm}^2$ , correct to 1 decimal place.

[2]

(d) Work out the area of triangle PQR.

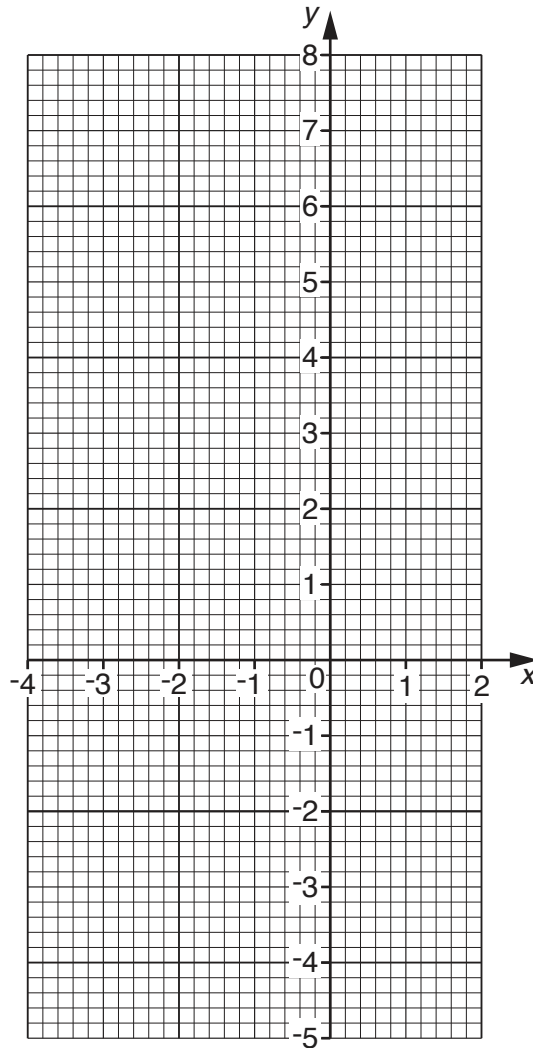
(d) .....  $\text{cm}^2$  [2]

9 (a) Complete the table for  $y = x^2 + 3x - 2$ .

x	-4	-3	-2	-1	0	1	2
y	2	-2					8

[2]

(b) On the grid, draw the graph of  $y = x^2 + 3x - 2$  for  $-4 \leq x \leq 2$ .



[2]

(c) Use your graph to solve the equation  $x^2 + 3x - 2 = 0$ .

(c) ..... [2]

- 10 (a) Mehdi invests £4000 at a rate of 2% compound interest each year.  
Calculate how much the investment is worth after 3 years.

(a) £ ..... [3]

- (b) Alec earned £8164 in one year.  
This was an increase of 4% on his earnings for the previous year.

Calculate Alec's earnings for the previous year.

(b) £ ..... [3]

11 (a) Write these in order, smallest first.

$7.1 \times 10^5$

$7.01 \times 10^{-5}$

$7.1 \times 10^{-5}$

$7.01 \times 10^{-6}$

..... [3]  
*smallest*

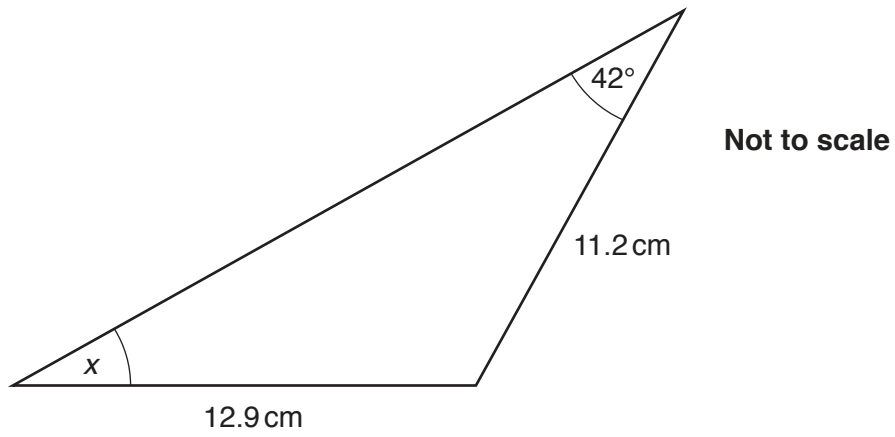
(b) The distance of the Sun from the Earth is 150 000 000 kilometres.  
 The speed of light is  $3.0 \times 10^8$  metres per second.

Calculate the time, in seconds, it takes for light to travel from the Sun to the Earth.

(b) ..... seconds [3]



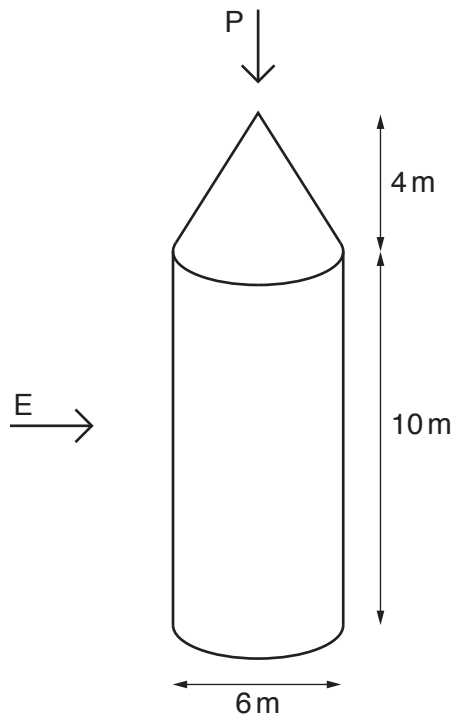
12 Here is a triangle.



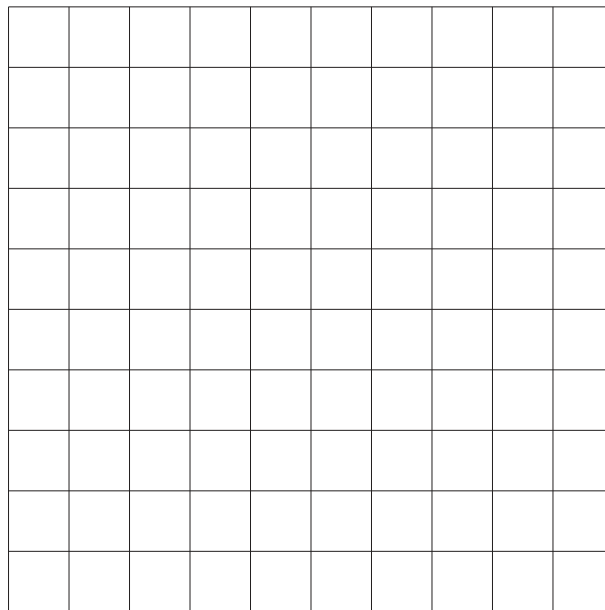
Work out the size of angle  $x$ .

.....° [3]

13 The tower of a castle is a cylinder topped with a cone.



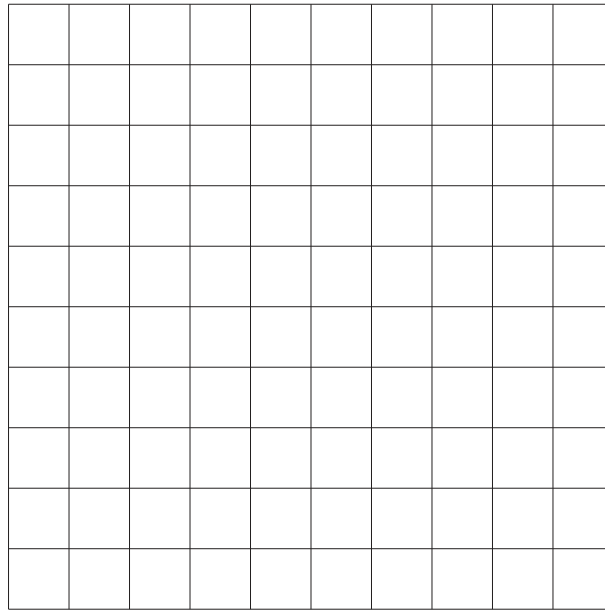
(a) Draw the side elevation (view from E) of the tower.  
Use a scale of 1 square to 2 m.



Side elevation

[2]

- (b) Draw the plan (view from P) of the tower.  
Use a scale of 1 square to 1 m.



Plan

[2]

- (c) Work out the volume of the tower.  
Give your answer in terms of  $\pi$ , in its simplest form.

(c) ..... cm<sup>3</sup> [4]

14 (a) Simplify fully.

$$\frac{x^2 - 5x + 4}{x^2 - 2x - 8}$$

(a) ..... [4]

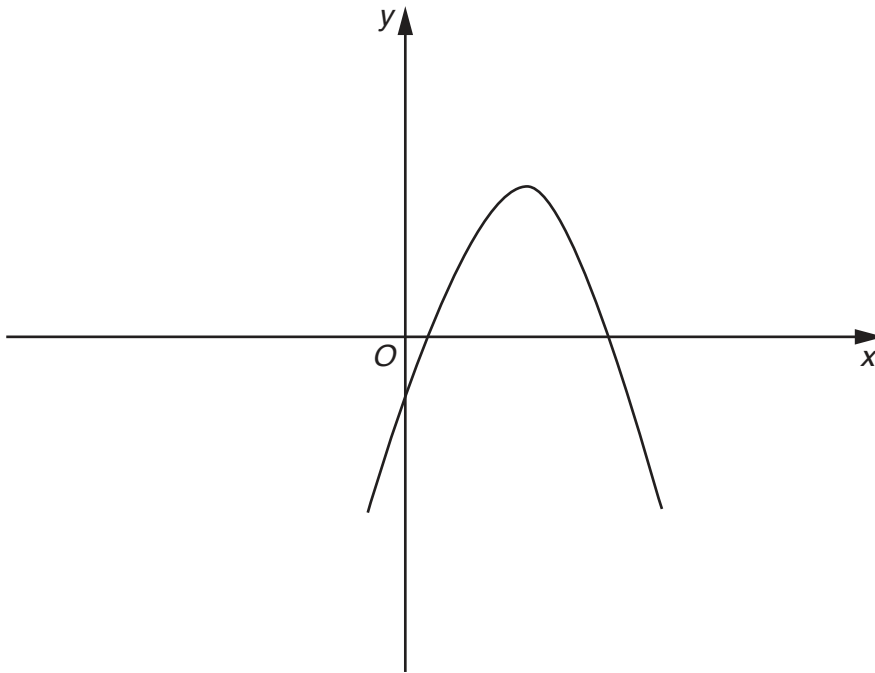
(b) Work out the value of  $a$  and the value of  $b$  in this identity.

$$x^2 - 8x + b \equiv (x + a)^2 + 2$$

(b)  $a =$  .....

$b =$  ..... [3]

15 (a) Here is a sketch graph of  $y = f(x)$ .

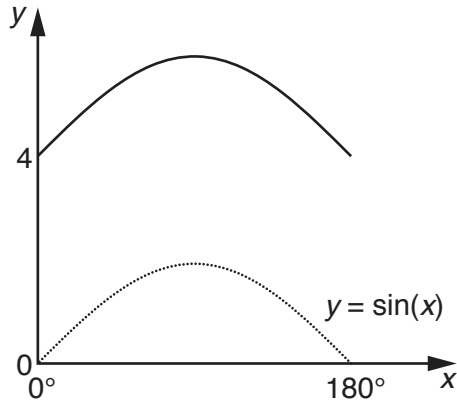


On the same diagram, sketch the graph of  $y = f(x - 2)$ .

[1]

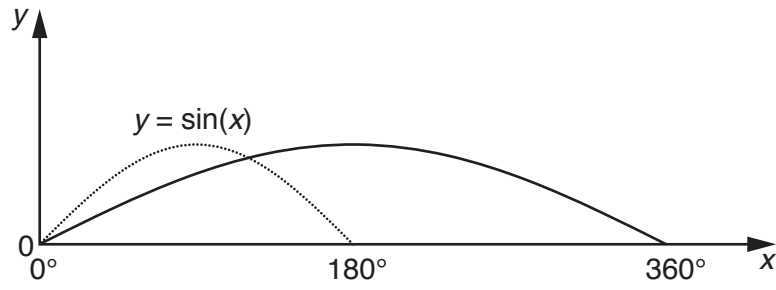
(b) In each part, write down the equation of the transformed graph.

(i)



(b)(i) ..... [1]

(ii)



(ii) ..... [1]

END OF QUESTION PAPER

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