

Write your name here

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**Pearson Edexcel
International GCSE**

Centre Number

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Candidate Number

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Mathematics A

Paper 4HR



Higher Tier

Monday 12 January 2015 – Afternoon

Time: 2 hours

Paper Reference

4MA0/4HR

You must have:

Ruler graduated in centimetres and millimetres, protractor, compasses, pen, HB pencil, eraser, calculator. Tracing paper may be used.

Total Marks

Instructions

- Use **black** ink or ball-point pen.
- **Fill in the boxes** at the top of this page with your name, centre number and candidate number.
- Answer **all** questions.
- Without sufficient working, correct answers may be awarded no marks.
- Answer the questions in the spaces provided
– *there may be more space than you need.*
- **Calculators may be used.**
- You must **NOT** write anything on the formulae page.
Anything you write on the formulae page will gain NO credit.

Information

- The total mark for this paper is 100.
- The marks for **each** question are shown in brackets
– *use this as a guide as to how much time to spend on each question.*

Advice

- Read each question carefully before you start to answer it.
- Check your answers if you have time at the end.

Turn over ►

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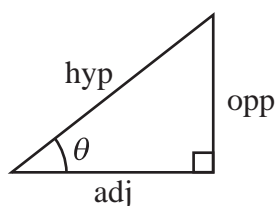
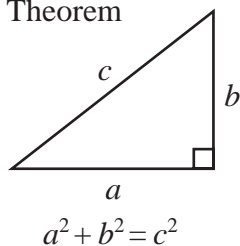
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PEARSON

**International GCSE MATHEMATICS
FORMULAE SHEET – HIGHER TIER**

Pythagoras' Theorem

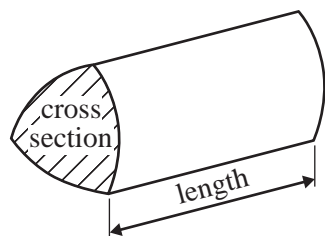


$$\begin{aligned} \text{adj} &= \text{hyp} \times \cos \theta \\ \text{opp} &= \text{hyp} \times \sin \theta \\ \text{opp} &= \text{adj} \times \tan \theta \end{aligned}$$

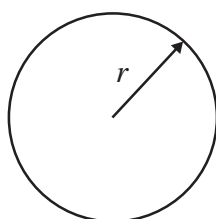
$$\text{or } \sin \theta = \frac{\text{opp}}{\text{hyp}}$$

$$\cos \theta = \frac{\text{adj}}{\text{hyp}}$$

$$\tan \theta = \frac{\text{opp}}{\text{adj}}$$

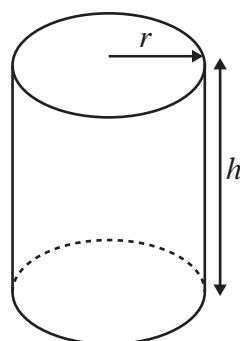


Volume of prism = area of cross section \times length



Circumference of circle = $2\pi r$

Area of circle = πr^2

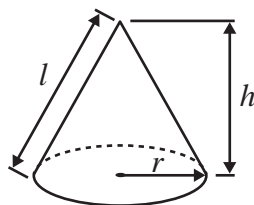


Volume of cylinder = $\pi r^2 h$

Curved surface area of cylinder = $2\pi r h$

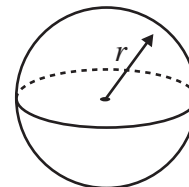
Volume of cone = $\frac{1}{3} \pi r^2 h$

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

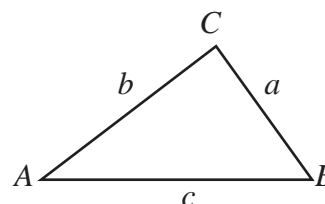


Volume of sphere = $\frac{4}{3} \pi r^3$

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



In any triangle ABC

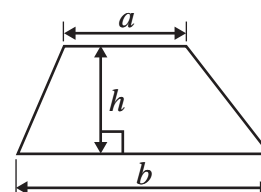


Sine rule: $\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$

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

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

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



The Quadratic Equation

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

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



Answer ALL TWENTY questions.

Write your answers in the spaces provided.

You must write down all stages in your working.

1 Eric travels from the UK to India every year.

In 2010, the exchange rate was $\text{£}1 = 67.1$ rupees.

In 2012, the exchange rate was $\text{£}1 = 82.5$ rupees.

In 2010 Eric changed $\text{£}600$ into rupees.

How many pounds (£) did Eric have to change to rupees in 2012 to get the same number of rupees as he did in 2010?

£

(Total for Question 1 is 3 marks)

Do NOT write in this space.



2 The wheel of the Singapore Flyer is a circle with a diameter of 150 metres.

- (a) Calculate the circumference of the wheel.
Give your answer correct to the nearest metre.



..... metres
(2)

The wheel takes 30 minutes to rotate once.

- (b) Work out the average speed of a point on the circumference of the wheel as it rotates once.
Give your answer in metres per second correct to 3 significant figures.

..... metres per second
(3)



The diagram shows a giant wheel above horizontal ground.

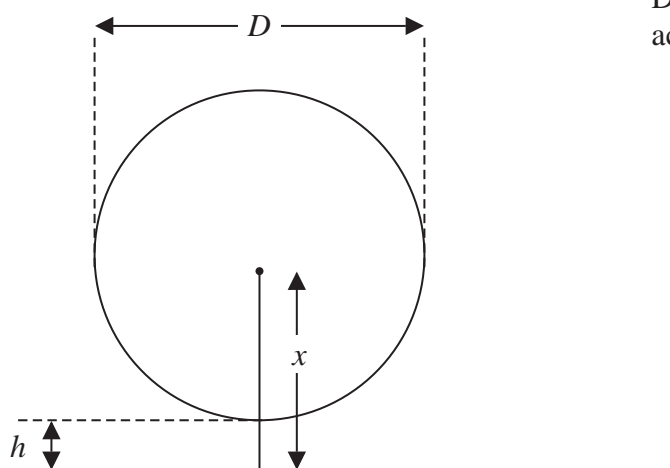


Diagram **NOT**
accurately drawn

The wheel is a circle of diameter D metres.

The lowest point of the wheel is h metres above the ground.

The centre of the wheel is x metres above the ground.

(c) Express h in terms of D and x

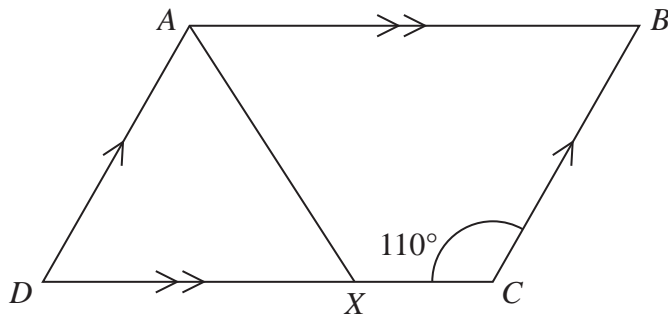
.....
(2)

(Total for Question 2 is 7 marks)

Do NOT write in this space.



3

Diagram **NOT**
accurately drawn

$ABCD$ is a parallelogram.

Angle $DCB = 110^\circ$

X is the point on DC such that AX bisects the angle DAB .

Calculate the size of angle AXC .

.....^o

(Total for Question 3 is 4 marks)

Do **NOT** write in this space.

6



4 Solve $x + 2y = 3$
 $x - y = 6$

Show clear algebraic working.

$$x = \dots\dots\dots$$

$$y = \dots\dots\dots$$

(Total for Question 4 is 3 marks)

Do NOT write in this space.



5 Here are some rows of a number pattern.

| Row number | Column 1 | Column 2 | Column 3 |
|------------|------------------|----------|----------|
| 1 | $1 \times 3 + 1$ | 4 | 2^2 |
| 2 | $2 \times 4 + 1$ | 9 | 3^2 |
| 3 | $3 \times 5 + 1$ | 16 | 4^2 |
| ⋮ | | | |
| | | 676 | |
| ⋮ | | | |
| n | | | |

(a) Write down the Row number of the row that has 676 in Column 2

.....
(1)

(b) For Row number n ,

(i) write down an expression, in terms of n , that should go in Column 1

.....
(ii) write down an expression, in terms of n , that should go in Column 3

.....
(2)

(Total for Question 5 is 3 marks)



- 6 The table gives information about the number of vehicles passing a point on a road in each of 70 intervals of equal length.

| Number of vehicles | Frequency |
|--------------------|-----------|
| 1 to 5 | 8 |
| 6 to 10 | 10 |
| 11 to 15 | 18 |
| 16 to 20 | 20 |
| 21 to 25 | 10 |
| 26 to 30 | 4 |

- (a) Write down the modal class interval.

.....
(1)

- (b) Calculate an estimate for the mean.

.....
(4)

(Total for Question 6 is 5 marks)

Do NOT write in this space.



7 Here is a trapezium $ABCD$.

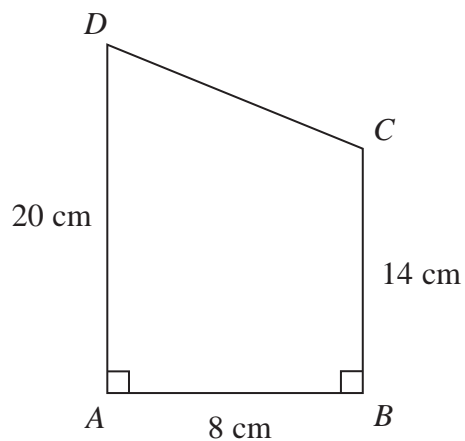


Diagram **NOT**
accurately drawn

Angle $DAB = \text{angle } ABC = 90^\circ$

$AD = 20 \text{ cm}$

$AB = 8 \text{ cm}$

$BC = 14 \text{ cm}$

(a) Calculate the area of the trapezium $ABCD$.

..... cm^2
(2)

(b) Calculate the length of CD .

..... cm
(4)

(Total for Question 7 is 6 marks)



- 8 (a) Write 224 as a product of powers of its prime factors.
Show your working clearly.

.....
(3)

- (b) Write down 3 **different** factors of 224 with a sum between 99 and 110

.....
(2)

(Total for Question 8 is 5 marks)

Do NOT write in this space.



9 $\mathcal{E} = \{1, 2, 3, 4, 5, 6, 7, 8, 9, 10\}$

$A = \{\text{even numbers}\}$

$B = \{\text{multiples of 3}\}$

(a) List the members of set B .

.....
(1)

(b) Find $A \cup B$

.....
(1)

(c) Find $A \cap B$

.....
(1)

x is a member of \mathcal{E}

$x \in B$

$x \notin A$

(d) What are the possible values of x ?

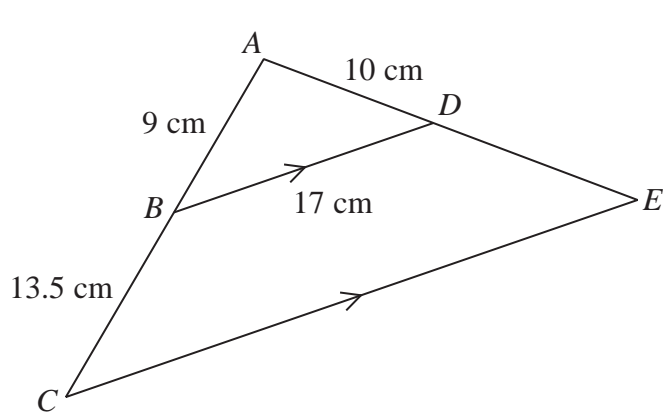
.....
(2)

(Total for Question 9 is 5 marks)

Do NOT write in this space.



10

Diagram NOT
accurately drawn

In the diagram ABC and ADE are straight lines.
 BD is parallel to CE .

$AB = 9$ cm, $BC = 13.5$ cm, $AD = 10$ cm, $BD = 17$ cm

(a) Calculate the length of CE .

..... cm
(2)

(b) Calculate the length of DE .

..... cm
(2)

The area of triangle ABD is 36 cm²

(c) Calculate the area of quadrilateral $BDEC$.

..... cm²
(3)

(Total for Question 10 is 7 marks)



P 4 4 6 2 0 A 0 1 3 2 4

11 $t^n = \frac{1}{t^3}$

(a) Write down the value of n .

$$n = \dots\dots\dots (1)$$

(b) Simplify $\frac{6xy^5}{3xy^2}$

$$\dots\dots\dots (2)$$

(c) Expand and simplify $(3x - 2y)(x + 2y)$

$$\dots\dots\dots (2)$$

(d) Factorise $4x^2 - 7x - 2$

$$\dots\dots\dots (2)$$

(Total for Question 11 is 7 marks)

Do NOT write in this space.



12 $I = kT^4$

$$k = 5.67 \times 10^{-8}$$

$$T = 5800$$

- (a) Work out the value of I .
Give your answer in standard form correct to 3 significant figures.

$$I = \dots\dots\dots (2)$$

- (b) Rearrange the formula $I = kT^4$ to make T the subject.

$$\dots\dots\dots (2)$$

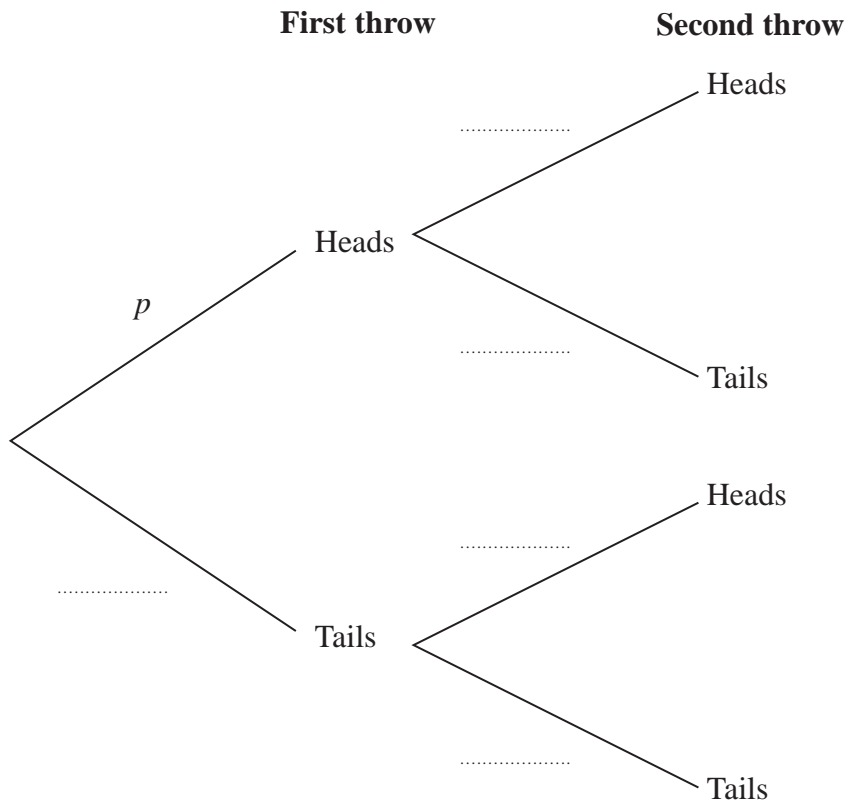
(Total for Question 12 is 4 marks)

Do NOT write in this space.



13 Jim has a biased coin.
 The probability that Jim will throw Heads on any throw is p .
 Jim throws the coin twice.

- (a) Complete the probability tree diagram.
 Give your probabilities in terms of p .



(2)

- (b) Find an expression, in terms of p , for the probability that Jim will throw two Heads.

.....

(1)

Given that $p = 0.8$,

- (c) work out the probability that Jim will throw exactly one Head.

.....

(3)

(Total for Question 13 is 6 marks)



14 (a) Solve $x^2 - 4x - 1 = 0$

Show your working clearly.

Give your solutions correct to 3 significant figures.

.....
(3)

Hence, or otherwise,

(b) solve $(x + 3)^2 - 4(x + 3) - 1 = 0$

giving your solutions correct to 3 significant figures.

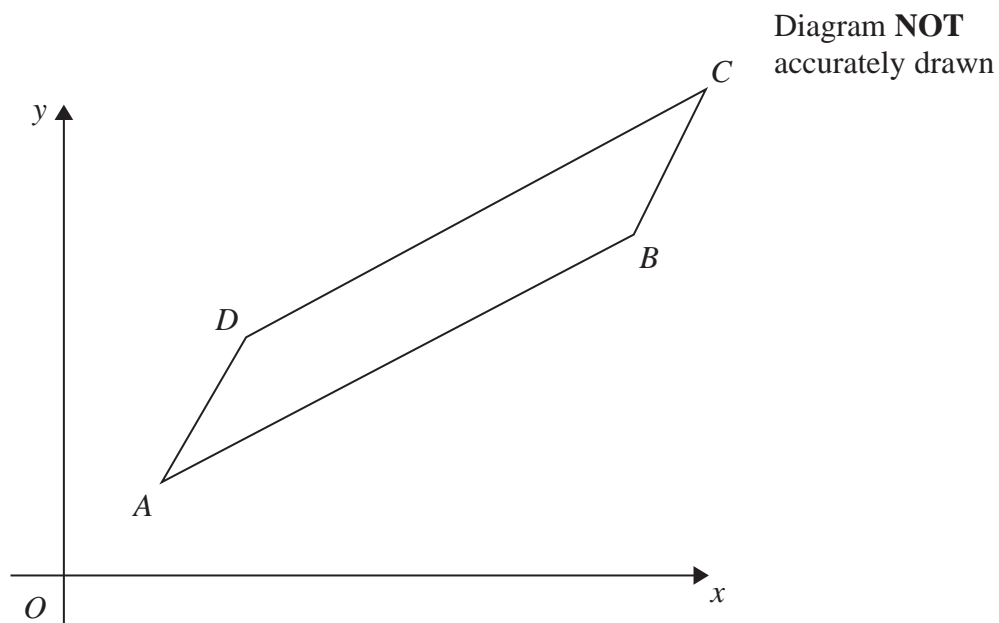
.....
(1)

(Total for Question 14 is 4 marks)

Do NOT write in this space.



15 Here is the parallelogram $ABCD$.



$$\vec{AD} = \begin{pmatrix} 1 \\ 2 \end{pmatrix}, \vec{AB} = \begin{pmatrix} 5 \\ 3 \end{pmatrix}$$

(a) Find the magnitude of \vec{AD} .

Give your answer correct to 3 significant figures.

.....
(2)

The point A has coordinates $(4, 2)$

(b) Work out the coordinates of the point C .

.....
(3)



The diagonals of the parallelogram $ABCD$ cross at the point E .

(c) Find as a column vector, \vec{OE} .

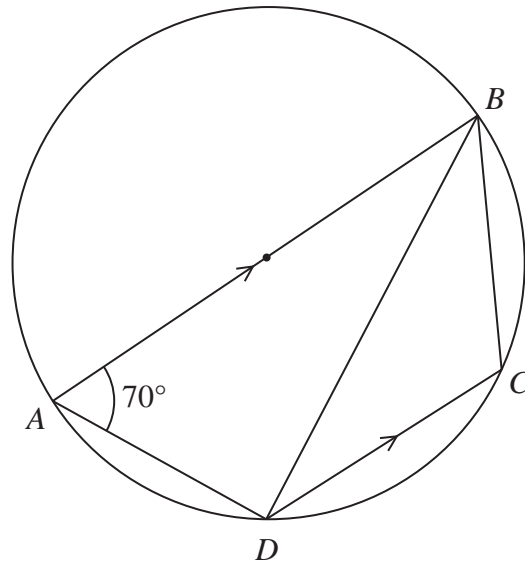
.....
(3)

(Total for Question 15 is 8 marks)

Do NOT write in this space.



16

Diagram NOT
accurately drawn

A , B , C and D are points on a circle.
 AB is a diameter of the circle.
 DC is parallel to AB .
 Angle $BAD = 70^\circ$

(a) Calculate the size of angle BDC .

.....
 (2)

The tangent to the circle at D meets the line BC extended at T .

(b) Calculate the size of angle $BT D$.

.....
 (3)

(Total for Question 16 is 5 marks)



17 (a) Show that $(3 + 2\sqrt{2})(4 - \sqrt{2}) = 8 + 5\sqrt{2}$

Show your working clearly.

(2)

(b) Rationalise the denominator and simplify fully $\frac{10 + 3\sqrt{2}}{\sqrt{2}}$

Show your working clearly.

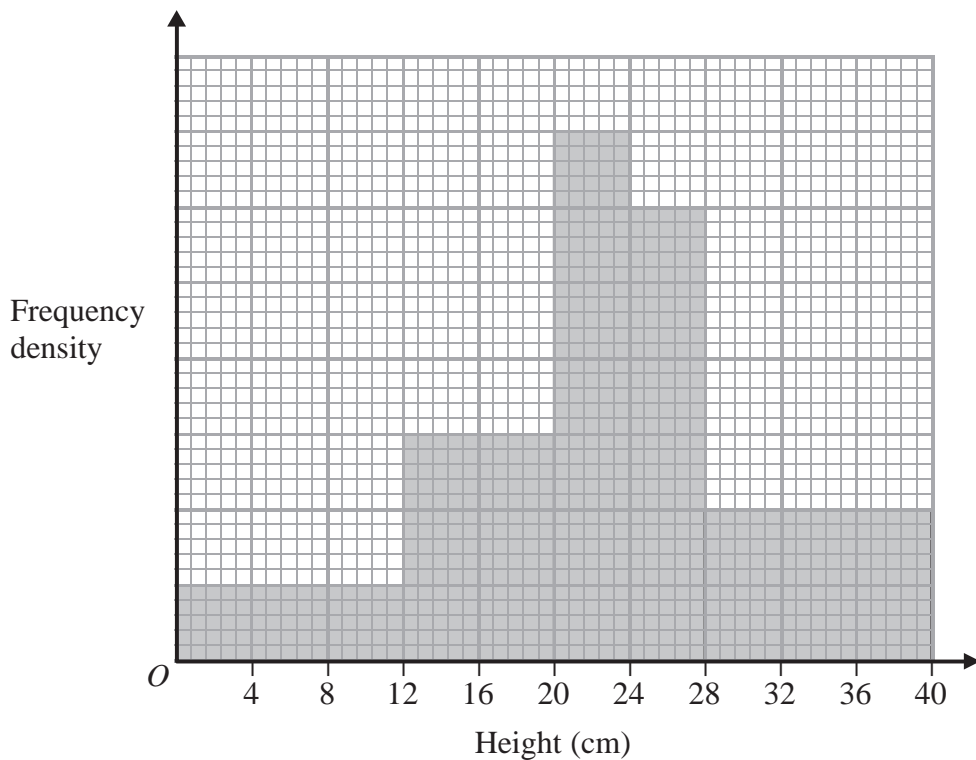
.....
(2)

(Total for Question 17 is 4 marks)

Do NOT write in this space.



18



The histogram gives information about the heights of some plants.

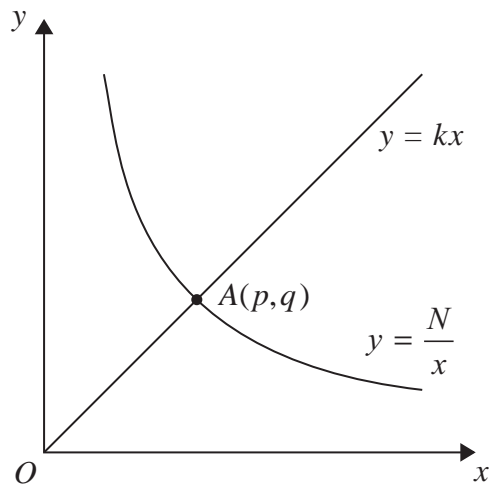
There are 360 plants with a height of 20 cm or less.

Work out the number of plants with a height of more than 20 cm.

(Total for Question 18 is 3 marks)



19



The diagram shows the straight line with equation $y = kx$ intersecting the curve with equation $y = \frac{N}{x}$ at the point $A(p, q)$.

(a) Find p and find q .

Give each answer in its simplest form, in terms of k and N .

$$p = \dots\dots\dots$$

$$q = \dots\dots\dots$$

(3)

Given that $p = 2q$

(b) find the value of k .

$$k = \dots\dots\dots$$

(2)

(Total for Question 19 is 5 marks)



20 (a) Factorise $4x^2 - 1$

.....
(2)

(b) Solve $\frac{4}{2x+1} + \frac{1}{4x^2-1} = 3$

Show clear algebraic working.

.....
(4)

(Total for Question 20 is 6 marks)

TOTAL FOR PAPER IS 100 MARKS

