

Write your name here

Surname

Other names

**Pearson Edexcel  
International GCSE**

Centre Number

--	--	--	--	--	--

Candidate Number

--	--	--	--	--

# Mathematics A

## Paper 3HR

**Higher Tier**Thursday 26 May 2016 – Morning  
**Time: 2 hours**

Paper Reference

**4MA0/3HR****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 ►

P45864A

©2016 Pearson Education Ltd.

1/1/1/

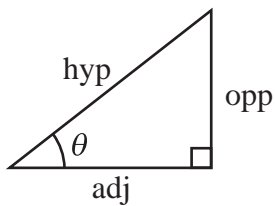
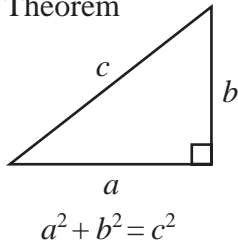


P 4 5 8 6 4 A 0 1 2 0

**PEARSON**

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

Pythagoras' Theorem



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

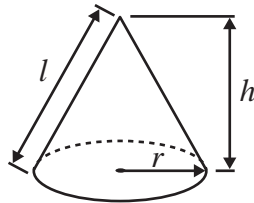
$$\text{or } \sin \theta = \frac{\text{opp}}{\text{hyp}}$$

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

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

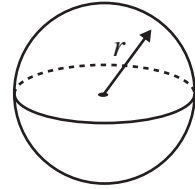
$$\text{Volume of cone} = \frac{1}{3} \pi r^2 h$$

$$\text{Curved surface area of cone} = \pi r l$$

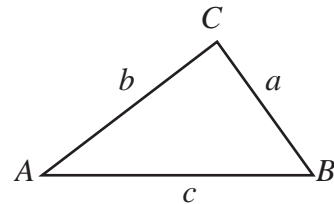


$$\text{Volume of sphere} = \frac{4}{3} \pi r^3$$

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



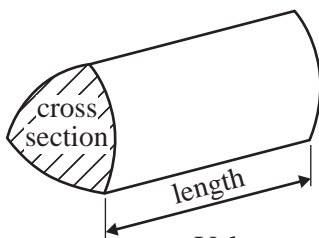
In any triangle ABC



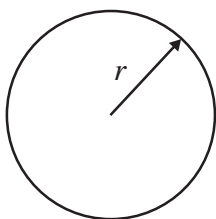
$$\text{Sine rule: } \frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

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

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



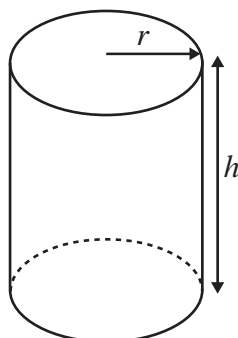
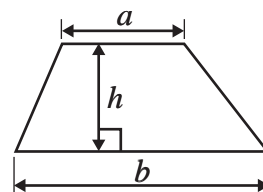
$$\text{Volume of prism} = \text{area of cross section} \times \text{length}$$



$$\text{Circumference of circle} = 2\pi r$$

$$\text{Area of circle} = \pi r^2$$

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



$$\text{Volume of cylinder} = \pi r^2 h$$

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

The Quadratic Equation

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

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

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA



**Answer ALL TWENTY TWO questions.**

**Write your answers in the spaces provided.**

**You must write down all the stages in your working.**

- 1** Rafael and Roger played tennis against each other 30 times.  
Each of the times they played, either Rafael won or Roger won.  
The ratio of the number of times Rafael won to the number of times Roger won is 7 : 3
- (a) Work out the number of times Rafael won.

.....  
(2)

In a school, there are 75 girls in the tennis squad.  
The ratio of the number of boys in the tennis squad to the number of girls in the tennis squad is 4 : 3

- (b) Work out the number of boys in the tennis squad.

.....  
(2)

**(Total for Question 1 is 4 marks)**

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA



2 (a) Factorise fully  $2x^2 - 4x$

.....  
(2)

$$A = 2p + 3q$$

(b) Work out the value of  $p$  when  $A = 32$  and  $q = 7$

$p =$  .....  
(3)

**(Total for Question 2 is 5 marks)**

3 There are 50 marbles in a bag.  
35 of the marbles are brown.

Otti takes at random a marble from the bag.  
He records the colour of the marble and puts the marble back in the bag.

He does this 300 times.

Work out an estimate for the number of brown marbles he takes.

.....  
**(Total for Question 3 is 2 marks)**

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA



DO NOT WRITE IN THIS AREA

- 4 Work out the size of an exterior angle of a regular polygon with 8 sides.

.....<sup>o</sup>

**(Total for Question 4 is 2 marks)**

DO NOT WRITE IN THIS AREA

- 5 In a sale, normal prices are reduced by 8%

- (a) The normal price of a jacket is £28

Work out the price of the jacket in the sale.

£ .....  
(3)

- (b) In the sale, the price of a shirt decreases by £3

Work out the normal price of the shirt.

£ .....  
(3)

**(Total for Question 5 is 6 marks)**

DO NOT WRITE IN THIS AREA



6 (a) Solve the inequalities  $-4 < 3x + 5 \leq 11$

.....  
(3)

(b) Write down the integer values of  $x$  which satisfy  $-4 < 3x + 5 \leq 11$

.....  
(2)

**(Total for Question 6 is 5 marks)**

7 Write 792 as a product of its prime factors.  
Show your working clearly.

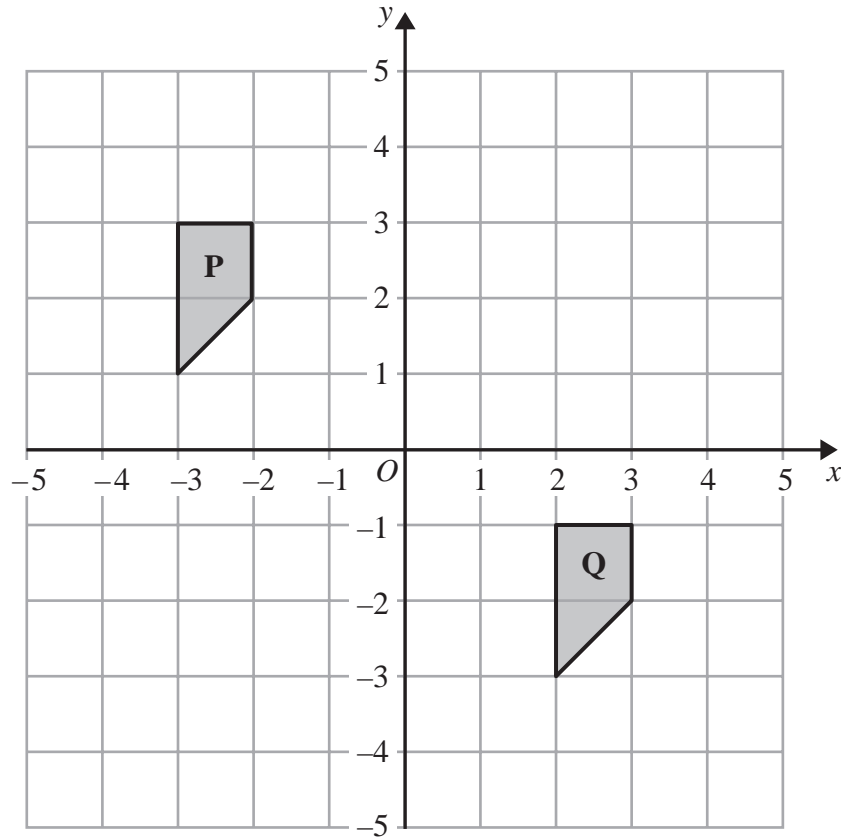
.....  
**(Total for Question 7 is 3 marks)**

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

8



- (a) Describe fully the single transformation that maps shape **P** onto shape **Q**.

(2)

- (b) Rotate shape **Q**  $90^\circ$  clockwise about  $(1,0)$   
Label the new shape **R**.

(2)

(Total for Question 8 is 4 marks)



9 Li throws a 6-sided biased dice once.

The table shows the probability that the dice will land on 1, 2, 3, 5 or 6

<b>Number</b>	1	2	3	4	5	6
<b>Probability</b>	0.15	0.1	0.05		0.2	0.15

(a) Work out the probability that the dice will land on 4

.....  
(2)

(b) Work out the probability that the dice will land on an odd number.

.....  
(2)

**(Total for Question 9 is 4 marks)**

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA



- 10** Julie asked 50 children how many exercise sessions they each took part in last month. The table shows information about her results.

Number of exercise sessions	Frequency
0 to 6	13
7 to 13	10
14 to 20	16
21 to 27	7
28 to 34	4

Calculate an estimate for the total number of exercise sessions the children took part in last month.

.....

**(Total for Question 10 is 3 marks)**

- 11** The line **L** passes through the point (3, 1) and is parallel to the line with equation  $y = \frac{7}{2} - 2x$ . Find an equation for the line **L**.

.....

**(Total for Question 11 is 3 marks)**



12 (a) Simplify fully  $\frac{a^{11}}{a^2 \times a^5}$

.....  
(2)

(b) Make  $p$  the subject of  $p + 4q = 3p + 5$

.....  
(2)

(c) Expand and simplify  $(2y + 3)(4y - 1)$

.....  
(2)

(d) Simplify  $(8a^6b^3)^{\frac{1}{3}}$

.....  
(2)

**(Total for Question 12 is 8 marks)**

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA



13 Here is the quadrilateral  $ABCD$ .

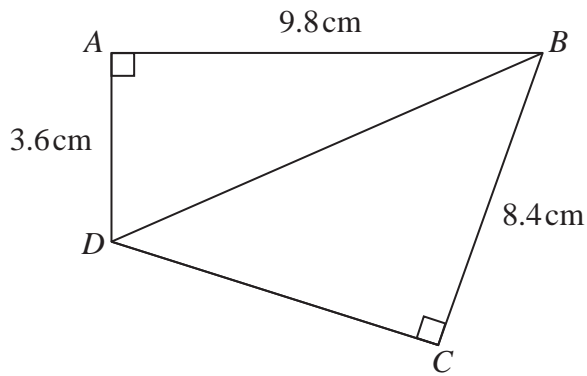


Diagram **NOT**  
accurately drawn

Angle  $BAD = 90^\circ$  and angle  $BCD = 90^\circ$

$AB = 9.8\text{ cm}$

$AD = 3.6\text{ cm}$

$BC = 8.4\text{ cm}$

Calculate the length of  $DC$ .

..... cm

(Total for Question 13 is 4 marks)

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA





15  $y = x^3 - \frac{9}{2}x^2 - 54x + 10$

(a) Find  $\frac{dy}{dx}$

.....  
(2)

The curve with equation  $y = x^3 - \frac{9}{2}x^2 - 54x + 10$  has two turning points.

(b) Find the  $x$  coordinate of each of these two points.

.....  
(3)

(Total for Question 15 is 5 marks)

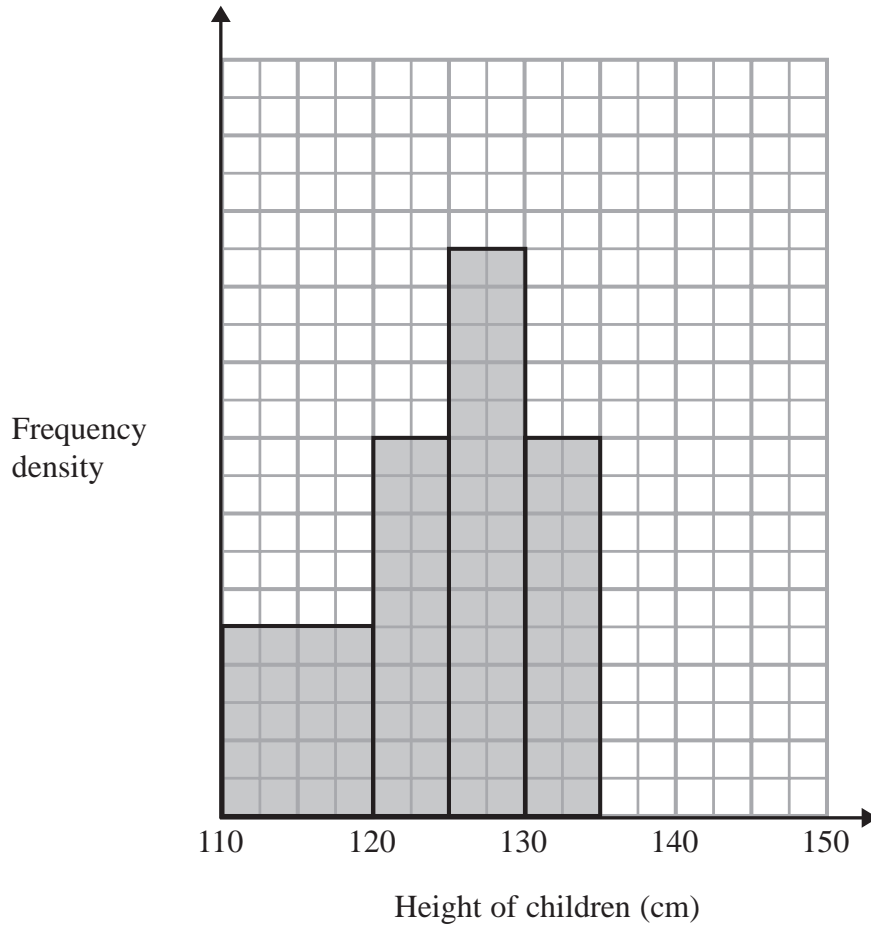
DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA



16 The incomplete histogram shows information about the heights of a group of children.



There were 10 children with heights between 130cm and 135 cm.

(a) How many children had heights between 110cm and 130cm?

.....  
(3)

There were 6 children with heights between 135 cm and 145 cm.

(b) Show this information on the histogram.

(1)

(Total for Question 16 is 4 marks)

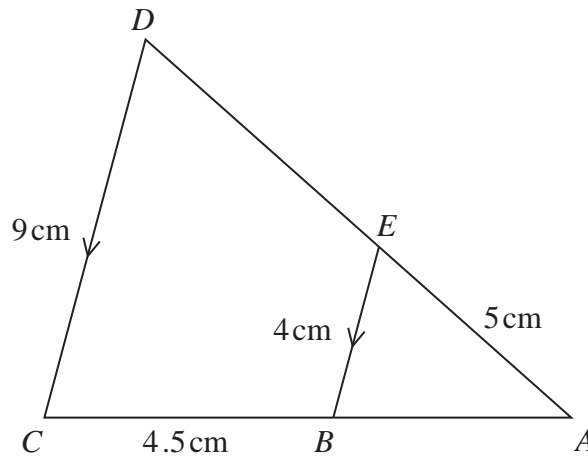
DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA



17

Diagram **NOT**  
accurately drawn

Triangle  $ABE$  is similar to triangle  $ACD$ .  
 $AED$  and  $ABC$  are straight lines.  
 $EB$  and  $DC$  are parallel.  
 $AE = 5$  cm,  $BC = 4.5$  cm,  $BE = 4$  cm,  $CD = 9$  cm

(a) Calculate the length of  $AD$ .

..... cm  
 (2)

(b) Calculate the length of  $AB$ .

..... cm  
 (2)

The area of quadrilateral  $BCDE$  is  $x$  cm<sup>2</sup>

The area of triangle  $ABE$  is  $y$  cm<sup>2</sup>

(c) Find an expression for  $y$  in terms of  $x$ .  
 Give your answer as simply as possible.

$y =$  .....  
 (3)

(Total for Question 17 is 7 marks)



18  $f$  is the function such that

$$f(x) = \frac{x}{3x + 1}$$

(a) Find  $f(0.5)$

.....  
(1)

(b) Find  $ff(-1)$

.....  
(2)

(c) Find the value of  $x$  that cannot be included in any domain of  $f$

.....  
(1)

(d) Express the inverse function  $f^{-1}$  in the form  $f^{-1}(x) = \dots$   
Show clear algebraic working.

$f^{-1}(x) = \dots$   
(3)

**(Total for Question 18 is 7 marks)**

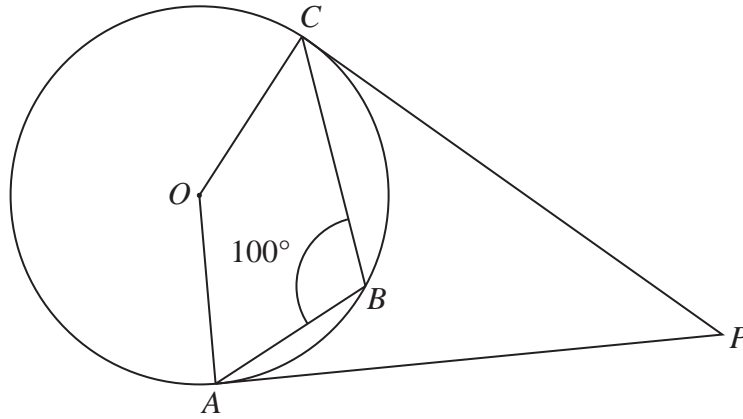
DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA



19

Diagram **NOT**  
accurately drawn

$A$ ,  $B$  and  $C$  are points on a circle, centre  $O$ .  
 $PA$  and  $PC$  are tangents to the circle.  
 Angle  $ABC = 100^\circ$

Calculate the size of angle  $APC$ .

.....  
 (Total for Question 19 is 3 marks)



20 (a) Simplify fully  $\frac{50x^2 - 8}{10x - 4}$

Show clear algebraic working.

.....  
(3)

(b) Given that  $a$  is a positive integer, show that

$$\sqrt{3a}(\sqrt{12a} + a\sqrt{3a})$$

is always a multiple of 3

(3)

(Total for Question 20 is 6 marks)

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA



- 21 Solve  $3 \times 4^{2k+8} = 24$   
Show your working clearly.

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

(Total for Question 21 is 4 marks)

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA



22

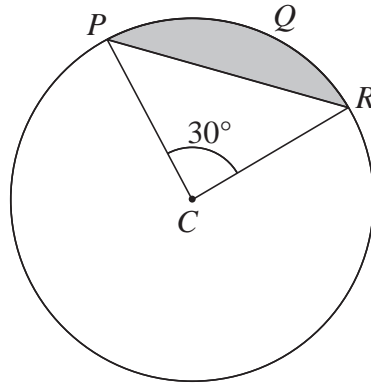


Diagram **NOT**  
accurately drawn

The diagram shows a circle, centre  $C$ .  
 $PR$  is a chord of the circle.  
 The area of the shaded region is  $100 \text{ cm}^2$   
 Angle  $PCR = 30^\circ$

Calculate the length of the arc  $PQR$ .  
 Give your answer correct to 3 significant figures.

..... cm

(Total for Question 22 is 6 marks)

**TOTAL FOR PAPER IS 100 MARKS**

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

