

Paper Reference AAL30/01  
Pearson Edexcel Award

Total Marks
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Algebra  
Level 3  
Calculator NOT allowed

Time: 2 hours plus your additional time allowance

In the boxes below, write your name, centre number and candidate number.

Surname					
Other names					
Centre Number					
Candidate Number					

**YOU MUST HAVE**

**Ruler, writing and drawing equipment,  
compasses.**

**YOU WILL BE GIVEN**

**Diagram Booklet**

**INSTRUCTIONS**

**Answer ALL questions.**

**Answer the questions in the spaces  
provided in this Question Paper or on the  
separate diagrams – there may be more  
space than you need.**

**CALCULATORS ARE NOT ALLOWED.**

**Turn over**

## **INFORMATION**

**The total mark for this paper is 90**

**The marks for EACH question are shown in brackets – use this as a guide as to how much time to spend on each question.**

**There may be spare copies of some diagrams in case you need them.**

## **ADVICE**

**Read each question carefully before you start to answer it.**

**Try to answer every question.**

**Check your answers if you have time at the end.**

**Answer ALL questions.**

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

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

**You must NOT use a calculator.**

1. (a) Expand and simplify  
 $(2c - 3d)(2c + 3d)$   
(2 marks)
- 

(continued on the next page)

**1. continued.**

**(b) Simplify**

$$(y^{-\frac{1}{2}})^{-6}$$

**(1 mark)**

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**(continued on the next page)**

**Turn over**

**1. continued.**

**(c) Simplify**

$$(4p^2 + 5p^2)^{\frac{3}{2}}$$

**(2 marks)**

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**(continued on the next page)**

**Turn over**

**1. continued.**

**(d) Express**

$$\frac{x}{x+2} - \frac{x^2}{(x+2)^2}$$

**as a single fraction in its simplest form.**

**(3 marks)**

**Answer space continues on the next page.**

**Turn over**



**1. (d) continued.**

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**(Total for Question 1 is 8 marks)**

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- 2. Look at the diagram for Question 2 in the Diagram Booklet.**

**It shows a grid.**

**On the grid, construct the graph of**

$$y^2 = 25 - x^2$$

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

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**3. (a) Factorise**

$$2wt + 6w - 5t - 15$$

**(2 marks)**

---

**(continued on the next page)**

**Turn over**

**3. continued.**

**(b) Factorise**

$$8gh^3 - 6g^3h^2$$

**(2 marks)**

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**(Total for Question 3 is 4 marks)**

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**Turn over**

4. Look at the diagram for Question 4 in the Diagram Booklet.

It shows a grid.

On the grid, show the region that satisfies all the inequalities below.

$$x > -1$$

$$y > 2$$

$$y > x - 3$$

$$x + 2y > 4$$

Label the region R

(Total for Question 4 is 5 marks)

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Turn over

**5. Solve**

$$\frac{2x}{x-4} = \frac{x}{x+2}$$

**(3 marks)**

**Answer space continues on the next page.**

**Turn over**

**5. continued.**

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**(Total for Question 5 is 3 marks)**

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**Turn over**

6. A straight line passes through the points with coordinates  $(3, 1)$  and  $(-2, 5)$

- (a) Find the gradient of this line.  
(2 marks)

Answer space continues on the next page.



**6. (a) continued.**

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**(continued on the next page)**

**Turn over**

**6. continued.**

**(b) Find an equation for this line.**

**Give your answer in the form**

$$**y = mx + c**$$

**(3 marks)**

**Answer space continues on the  
next page.**

**6. (b) continued.**

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

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**Turn over**

**7. Look at the diagram for Question 7 in the Diagram Booklet.**

**It shows part of a speed–time graph for a walker.**

- (a) Write down the acceleration of the walker for values of  $t$  between  $t = 0$  and  $t = 20$**   
**(1 mark)**
- 

**(continued on the next page)**

**7. continued.**

**(b) Find the distance walked  
between  $t = 0$  and  $t = 20$   
(2 marks)**

\_\_\_\_\_ **km**

**(continued on the next page)**

**Turn over**

**7. continued.**

**(c) Look at the diagram for  
Question 7(c) in the  
Diagram Booklet.**

**It shows a grid.**

**On the grid, draw a  
distance–time graph for the  
walker for values of  $t$  between  
 $t = 0$  and  $t = 20$   
(2 marks)**

**(Total for Question 7 is 5 marks)**

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8. (a) Find the sum and the product of the roots of the equation

$$\frac{1}{2}x^2 + x + 1 = 0$$

(2 marks)

Answer space continues on the next page.

8. (a) continued.

sum = \_\_\_\_\_

product = \_\_\_\_\_

(continued on the next page)

Turn over



**8. continued.**

**Here is a different quadratic equation.**

$$x^2 + \frac{1}{2}x + c = 0$$

**This equation has two equal roots.**

**(b) Find the value of  $c$**

**(2 marks)**

**Answer space continues on the  
next page.**

**8. (b) continued.**

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**(Total for Question 8 is 4 marks)**

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**Turn over**

9.  **$f$  is inversely proportional to  $d$**   
 **$f = 20$  when  $d = 0.25$**

**(a) Find a formula for  $f$  in terms of  $d$**

**(3 marks)**

**Answer space continues on the next page.**

9. (a) continued.

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(continued on the next page)

Turn over

**9. continued.**

$$w = \frac{3}{(2-u)^2}$$

**(b) Make  $u$  the subject of the formula.**

**(3 marks)**

**Answer space continues on the next page.**

**Turn over**

9. (b) continued.

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(Total for Question 9 is 6 marks)

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Turn over

**10. Solve**

$$6k^2 + 5k - 6 < 0$$

**(3 marks)**

**Answer space continues on the next page.**

**10. continued.**

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

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**Turn over**



**11. Below are the first five terms of an arithmetic series.**

**$-2$       $-6$       $-10$       $-14$       $-18$**

**(a) Find the 51st term of this series.  
(2 marks)**

**Answer space continues on the  
next page.**

**11. (a) continued.**

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**(continued on the next page)**

**11. continued.**

**Remember:**

**Below are the first five terms of an arithmetic series.**

**$-2$       $-6$       $-10$       $-14$       $-18$**

**(b) Find the sum of the first 51 terms of this series.**

**(3 marks)**

**Answer space continues on the next page.**

**Turn over**

**11. (b) continued.**

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**(Total for Question 11 is 5 marks)**

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**Turn over**

12. (a) Complete the table of values below for

$$y = \left( \frac{2-x}{2} \right)^3$$

There are five spaces to fill.

(2 marks)

Space for working is on the next page

x	y
-2	
-1	3.375
0	
1	
2	
3	
4	-1

Turn over

**12. (a) continued.**

**(continued on the next page)**

**Turn over**

**12. continued.**

**(b) Look at the diagram for  
Question 12(b) in the  
Diagram Booklet.**

**It shows a grid.**

**On the grid, draw the graph of**

$$y = \left( \frac{2 - x}{2} \right)^3 \text{ for values of } x$$

**from  $-2$  to  $4$**

**(3 marks)**

**(continued on the next page)**

**12. continued.**

**(c) (i) Use your graph to find an estimate for the solution of**

$$\left(\frac{2-x}{2}\right)^3 = 2$$

**(1 mark)**

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**(continued on the next page)**

**Turn over**



**12. (c) continued.**

**(ii) Use your graph to find an estimate for the solution of**

$$(2 - x)^3 = 48$$

**(2 marks)**

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

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**Turn over**

13. The straight line **L** has equation  
 $y = 4x + 1$

**L** is the tangent to a curve at the point **P** with coordinates (1, 5)

Find an equation of the normal to this curve at **P**

Give your answer in the form  
 $ax + by + c = 0$  where **a**, **b** and **c**  
are integers.

(4 marks)

Answer space is on the next  
two pages.

**13. continued.**

**Turn over**

**13. continued.**

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**(Total for Question 13 is 4 marks)**

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**Turn over**

**14. Look at the table for Question 14 in the Diagram Booklet.**

**It shows a table of values for**

$$y = 4^x$$

**Use the trapezium rule to find an estimate for the area of the region under the curve  $y = 4^x$ , between  $x = 0$  and  $x = 2$  and above  $y = 0$**

**Use 4 strips of equal width.**

**(2 marks)**

**Answer space continues on the next two pages.**

**14. continued.**

**Turn over**

**14. continued.**

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**(Total for Question 14 is 2 marks)**

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**Turn over**

15. (a) (i) Write the equation

$$\frac{(x-5)^2}{2} = x \text{ in the form}$$

$$ax^2 + bx + c = 0 \text{ where}$$

**a, b and c are integers.**

**(2 marks)**

**Answer space continues on  
the next page.**



**15. (a) (i) continued.**

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**(continued on the next page)**

**Turn over**

**15. (a) continued.**

**(ii) Hence solve the equation**

$$\frac{(x-5)^2}{2} = x$$

**Give your answer in the form  
 $p \pm \sqrt{q}$  where  $p$  and  $q$  are  
integers.**

**(3 marks)**

**Answer space continues on  
the next page.**

**15. (a) (ii) continued.**

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**(continued on the next page)**

**Turn over**

**15. continued.**

**(b) (i) Write**

**$x^2 - 6x - 16$  in the form**

**$(x + m)^2 + n$  where  $m$  and**

**$n$  are integers.**

**(2 marks)**

**Answer space continues on  
the next page.**

**15. (b) (i) continued.**

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**(continued on the next page)**

**Turn over**

**15. (b) continued.**

**(ii) Hence, using your answer to part (b)(i), solve the equation**

$$\mathbf{x^2 - 6x - 16 = 0}$$

**(2 marks)**

**Answer space continues on the next page.**

**15. (b) (ii) continued.**

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**(Total for Question 15 is 9 marks)**

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**Turn over**

**16. Solve, algebraically, the simultaneous equations**

$$x^2 - y^2 = 1$$

$$x = 3y$$

**Give each solution in the form**

**$\frac{a}{\sqrt{b}}$  where  $a$  and  $b$  are integers.**

**(4 marks)**

**Answer space continues on the next three pages.**

**Turn over**



**16. continued.**

**Turn over**

**16. continued.**

**Turn over**

**16. continued.**

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**(Total for Question 16 is 4 marks)**

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**Turn over**

**17. (a) Simplify**

$$\left(\sqrt{3}\right) + \left(\sqrt{3}\right)^2 + \left(\sqrt{3}\right)^3 + \left(\sqrt{3}\right)^4$$

**(2 marks)**

**Answer space continues on the  
next page.**

**Turn over**

**17. (a) continued.**

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**(continued on the next page)**

**Turn over**

**17. continued.**

**(b) Simplify**

$$\frac{1}{2 - \sqrt{5}} + \frac{1}{2 + \sqrt{5}}$$

**(3 marks)**

**Answer space continues on the  
next page.**

**17. (b) continued.**

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**(Total for Question 17 is 5 marks)**

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**Turn over**

**18. Look at the diagram for Question 18(a) in the Diagram Booklet.**

**It shows the graph of**  
 **$y = h(x)$**

**(a) On the grid in the Diagram Booklet, draw the graph of**

$$y = \frac{1}{2}h(x)$$

**(2 marks)**

**(continued on the next page)**



**18. continued.**

**Look at the diagram for Question 18(b)  
in the Diagram Booklet.**

**It shows the graph of**

$$y = h(x)$$

**(b) On the grid in the Diagram  
Booklet, draw the graph of**

$$y = h(x + 2)$$

**(2 marks)**

**(Total for Question 18 is 4 marks)**

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**19. Look at the diagram for Question 19 in the Diagram Booklet.**

**It shows a set of axes.**

**Using the axes, sketch the graph of**

$$y = \frac{1}{x} - 3$$

**Show clearly any asymptotes and the coordinates of any points of intersection of the graph with the axes.**

**(Total for Question 19 is 4 marks)**

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**TOTAL FOR PAPER IS 90 MARKS**

**END OF PAPER**

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