

Please check the examination details below before entering your candidate information

Candidate surname

Other names

**Pearson Edexcel  
Level 3 GCE**

Centre Number

|  |  |  |  |  |
|--|--|--|--|--|
|  |  |  |  |  |
|--|--|--|--|--|

Candidate Number

|  |  |  |  |  |
|--|--|--|--|--|
|  |  |  |  |  |
|--|--|--|--|--|

**Wednesday 7 October 2020**

Afternoon (Time: 2 hours)

Paper Reference **9MA0/01**

**Mathematics**

**Advanced**

**Paper 1: Pure Mathematics 1**

**You must have:**

Mathematical Formulae and Statistical Tables (Green), calculator

Total Marks

**Candidates may use any calculator allowed by Pearson regulations.  
Calculators must not have the facility for symbolic algebra manipulation,  
differentiation and integration, or have retrievable mathematical formulae  
stored in them.**

### Instructions

- Use **black** ink or ball-point pen.
- If pencil is used for diagrams/sketches/graphs it must be dark (HB or B).
- **Fill in the boxes** at the top of this page with your name, centre number and candidate number.
- Answer **all** questions and ensure that your answers to parts of questions are clearly labelled.
- Answer the questions in the spaces provided  
– *there may be more space than you need.*
- You should show sufficient working to make your methods clear.  
Answers without working may not gain full credit.
- Inexact answers should be given to three significant figures unless otherwise stated.

### Information

- A booklet 'Mathematical Formulae and Statistical Tables' is provided.
- There are 16 questions in this question paper. 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.
- Try to answer every question.
- Check your answers if you have time at the end.

Turn over ►

P66785A

©2020 Pearson Education Ltd.

1/1/1/1/



Pearson

1. (a) Find the first four terms, in ascending powers of  $x$ , of the binomial expansion of

$$(1 + 8x)^{\frac{1}{2}}$$

giving each term in simplest form.

(3)

(b) Explain how you could use  $x = \frac{1}{32}$  in the expansion to find an approximation for  $\sqrt{5}$

There is no need to carry out the calculation.

(2)

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA





2. By taking logarithms of both sides, solve the equation

$$4^{3p-1} = 5^{210}$$

giving the value of  $p$  to one decimal place.

(3)

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA









4. The function  $f$  is defined by

$$f(x) = \frac{3x - 7}{x - 2} \quad x \in \mathbb{R}, x \neq 2$$

(a) Find  $f^{-1}(7)$

(2)

(b) Show that  $ff(x) = \frac{ax + b}{x - 3}$  where  $a$  and  $b$  are integers to be found.

(3)

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---







5. A car has six forward gears.

The fastest speed of the car

- in 1<sup>st</sup> gear is  $28 \text{ km h}^{-1}$
- in 6<sup>th</sup> gear is  $115 \text{ km h}^{-1}$

Given that the fastest speed of the car in successive gears is modelled by an **arithmetic sequence**,

(a) find the fastest speed of the car in 3<sup>rd</sup> gear.

(3)

Given that the fastest speed of the car in successive gears is modelled by a **geometric sequence**,

(b) find the fastest speed of the car in 5<sup>th</sup> gear.

(3)

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---





6. (a) Express  $\sin x + 2 \cos x$  in the form  $R \sin(x + \alpha)$  where  $R$  and  $\alpha$  are constants,  $R > 0$  and  $0 < \alpha < \frac{\pi}{2}$
- Give the exact value of  $R$  and give the value of  $\alpha$  in radians to 3 decimal places. (3)

The temperature,  $\theta^\circ\text{C}$ , inside a room on a given day is modelled by the equation

$$\theta = 5 + \sin\left(\frac{\pi t}{12} - 3\right) + 2 \cos\left(\frac{\pi t}{12} - 3\right) \quad 0 \leq t < 24$$

where  $t$  is the number of hours after midnight.

Using the equation of the model and your answer to part (a),

- (b) deduce the maximum temperature of the room during this day, (1)
- (c) find the time of day when the maximum temperature occurs, giving your answer to the nearest minute. (3)

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---



### Question 6 continued

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

Lined area for student response.





DO NOT WRITE IN THIS AREA

Question 6 continued

Blank writing area with horizontal lines.

(Total for Question 6 is 7 marks)



7.

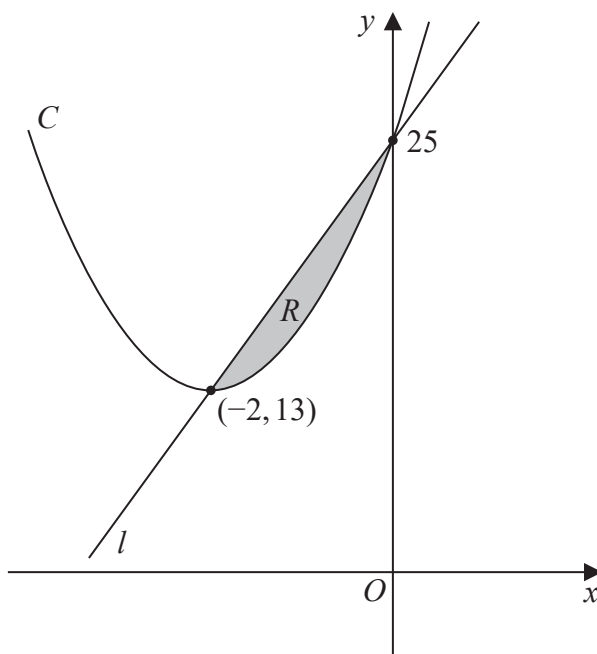
**Figure 1**

Figure 1 shows a sketch of a curve  $C$  with equation  $y = f(x)$  and a straight line  $l$ .

The curve  $C$  meets  $l$  at the points  $(-2, 13)$  and  $(0, 25)$  as shown.

The shaded region  $R$  is bounded by  $C$  and  $l$  as shown in Figure 1.

Given that

- $f(x)$  is a quadratic function in  $x$
- $(-2, 13)$  is the minimum turning point of  $y = f(x)$

use inequalities to define  $R$ .

(5)















9.

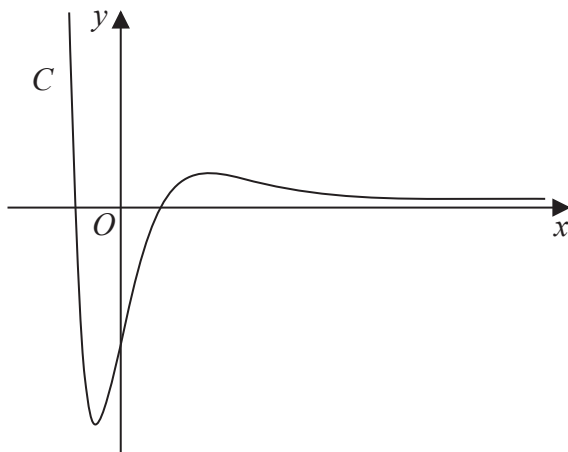


Figure 2

Figure 2 shows a sketch of the curve  $C$  with equation  $y = f(x)$  where

$$f(x) = 4(x^2 - 2)e^{-2x} \quad x \in \mathbb{R}$$

- (a) Show that  $f'(x) = 8(2 + x - x^2)e^{-2x}$  (3)
- (b) Hence find, in simplest form, the exact coordinates of the stationary points of  $C$ . (3)

The function  $g$  and the function  $h$  are defined by

$$g(x) = 2f(x) \quad x \in \mathbb{R}$$

$$h(x) = 2f(x) - 3 \quad x \geq 0$$

- (c) Find (i) the range of  $g$   
(ii) the range of  $h$  (3)











10. (a) Use the substitution  $x = u^2 + 1$  to show that

$$\int_5^{10} \frac{3 \, dx}{(x-1)(3+2\sqrt{x-1})} = \int_p^q \frac{6 \, du}{u(3+2u)}$$

where  $p$  and  $q$  are positive constants to be found.

(4)

(b) Hence, using algebraic integration, show that

$$\int_5^{10} \frac{3 \, dx}{(x-1)(3+2\sqrt{x-1})} = \ln a$$

where  $a$  is a rational constant to be found.

(6)























































16. Prove by contradiction that there are no positive integers  $p$  and  $q$  such that

$$4p^2 - q^2 = 25$$

(4)

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA





