



**Coimisiún na Scrúduithe Stáit
State Examinations Commission**

LEAVING CERTIFICATE EXAMINATION, 2007

MATHEMATICS – ORDINARY LEVEL

PAPER 1 (300 marks)

THURSDAY, 7 JUNE – MORNING, 9:30 to 12:00

Attempt **SIX QUESTIONS** (50 marks each).

WARNING: Marks will be lost if all necessary work is not clearly shown.

**Answers should include the appropriate units of measurement,
where relevant.**

1. (a) Convert 164 miles to kilometres, taking 5 miles to be equal to 8 kilometres.
- (b) €8500 was invested for 2 years at compound interest.
- (i) The rate of interest for the first year was 4%.
Find the amount of the investment at the end of the first year.
- (ii) The amount of the investment at the end of the second year was €9237·80.
Find the rate of interest for the second year.
- (c) The table shows the hours Alan worked over four days.

Day	Thursday	Friday	Saturday	Sunday
Hours worked	9	9	9·5	h

Alan's basic rate of pay is €15·60 per hour.
He is paid one and a half times the basic rate for work on Saturday and Sunday.

- (i) Calculate Alan's total pay for Thursday, Friday and Saturday.
- (ii) Alan was paid a total of €702 for the four days' work.
Find h , the number of hours Alan worked on Sunday.
2. (a) Find the solution set of $4x - 15 < 1$, $x \in \mathbf{N}$.
- (b) (i) Find the value of $\frac{x + 3y + 5}{2x + 2y}$ when $x = \frac{5}{2}$ and $y = \frac{1}{3}$.
- (ii) Find the value of x for which $2^{x+3} = 4^x$.
- (c) (i) Solve the equation $x - \frac{1}{x} = 2$ and write your solutions in the form $a \pm \sqrt{b}$, where $a, b \in \mathbf{N}$.
- (ii) Verify **one** of your solutions.

3. (a) Solve $2x = 3(5 - x)$.

(b) Solve the simultaneous equations

$$\frac{x}{4} - \frac{y}{3} = \frac{5}{6}$$
$$2x - 6 = 3y.$$

(c) Let $f(x) = 2x^3 + 11x^2 + 4x - 5$.

(i) Verify that $f(-1) = 0$.

(ii) Solve the equation

$$2x^3 + 11x^2 + 4x - 5 = 0.$$

4. (a) Given that $i^2 = -1$, simplify

$$3(2 - 4i) + i(5 - 6i)$$

and write your answer in the form $x + yi$, where $x, y \in \mathbf{R}$.

(b) Let $z = 5 - 3i$.

(i) Plot z and $-z$ on an Argand diagram.

(ii) Calculate $|z - 1|$.

(iii) Find the value of the real number k such that $ki + 4z = 20$.

(c) Let $u = 3 + 2i$.

(i) Find the value of $u^2 + \bar{u}^2$, where \bar{u} is the complex conjugate of u .

(ii) Investigate whether $\frac{13}{u} = \bar{u}$.

5. (a) The n th term of a sequence is given by $T_n = 1 - n$.
- (i) Find T_5 , the fifth term.
 - (ii) Find $T_5 - T_{10}$ where T_{10} is the tenth term.
- (b) The first term of an arithmetic series is 3 and the common difference is 4.
- (i) Find, in terms of n , an expression for T_n , the n th term.
 - (ii) How many terms of the series are less than 200?
 - (iii) Find the sum of these terms.
- (c) The first two terms of a geometric series are $\frac{1}{3} + \frac{1}{9} + \dots$
- (i) Find r , the common ratio.
 - (ii) Find an expression for S_n , the sum of the first n terms.
Write your answer in the form $\frac{1}{k} \left(1 - \frac{1}{3^n} \right)$ where $k \in \mathbf{N}$.
 - (iii) The sum of the first n terms of the geometric series $\frac{p}{3} + \frac{p}{9} + \dots$ is $1 - \frac{1}{3^n}$.
Find the value of p .

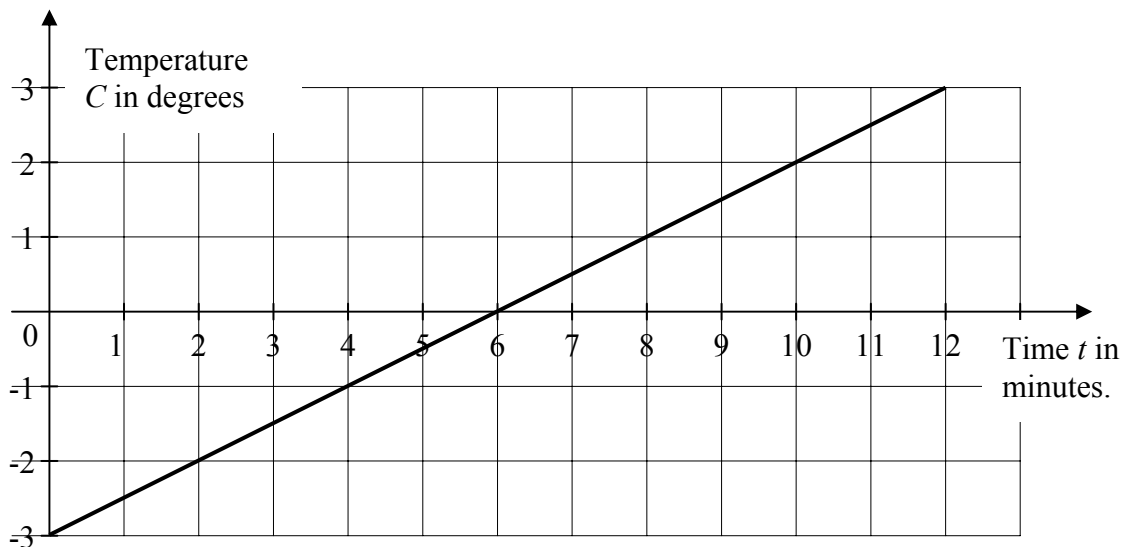
6. (a) Let $g(x) = x^2 - 6x$, $x \in \mathbf{R}$.

(i) Write down $g'(x)$, the derivative of $g(x)$.

(ii) For what value of x is $g'(x) = 0$?

(b) A cold object is placed in a warm room.

Its temperature C degrees after time t minutes is shown in the following graph.



(i) After what time interval is the temperature of the object 0 degrees?

(ii) What is the rise in temperature of the object in the first 10 minutes?

(iii) The relationship between the temperature C and the time t is given by

$$C = \frac{1}{2}(t + k).$$

Find the value of k .

(c) Let $f(x) = (5x - 2)^4$ for $x \in \mathbf{R}$.

(i) Find $f'(x)$, the derivative of $f(x)$.

(ii) Find the co-ordinates of the point on the curve $y = f(x)$ at which the slope of the tangent is 20.

7. (a) Differentiate $6x^4 - 3x^2 + 7x$ with respect to x .
- (b) (i) Differentiate $(x^2 + 9)(4x^3 + 5)$ with respect to x .

(ii) Given that $y = \frac{3x}{2x+3}$, find $\frac{dy}{dx}$.

Write your answer in the form $\frac{k}{(2x+3)^n}$, where $k, n \in \mathbf{N}$.

- (c) A car starts from rest at the point a .



The distance of the car from a , after t seconds, is given by

$$s = 2t^2 + 2t$$

where s is in metres.

- (i) Find the speed of the car after 2 seconds.
- (ii) Find the acceleration of the car.
- (iii) The distance from a to the point b is 24 metres. After how many seconds does the car reach the point b ?

8. (a) Let $f(x) = \frac{1}{4}(6 - 2x)$ for $x \in \mathbf{R}$. Evaluate $f(5)$.

- (b) Differentiate $x^2 - 3x$ with respect to x from first principles.

(c) Let $f(x) = \frac{1}{x+7}$, $x \in \mathbf{R}$, $x \neq -7$.

- (i) Given that $f(k) = 1$, find k .
- (ii) Find $f'(x)$, the derivative of $f(x)$.
- (iii) Show that the curve $y = f(x)$ has no turning points.

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