

# **LONGDEAN SCHOOL A LEVEL MATHEMATICS**

## **A Level Mathematics**

**Type of course: GCE A level**

**Level: 3**

**Board: OCR**

**Syllabus Title: Mathematics**

**Code: H240 (2 year A level)**

## **Welcome to A Level Mathematics at Longdean!**

The aim of the course is to develop mathematical thinking and problem solving, building on the techniques learnt in Higher GCSE. You will study a mixture of Pure and Applied modules but the course is linear over 2 years which means all topics are examined at the end of the second year.

You are expected to work through the following topics and complete all of the questions that follow to the best of your ability which means you will be expected to revise any topic you're unsure of. Completed work should be handed in at your first Maths lesson in September.

Good luck!

### **REQUIRED TOPIC LIST:**

- A) Finding the equation of a straight line**
- B) Factorising quadratic expressions**
- C) Solving quadratic equations**
- D) Completing the square**
- E) Simultaneous equations**
- F) Index notation**
- G) Simplifying surds, rationalising the denominator**

## A) Finding the equation of a straight line

1 Find the gradient of the line segment joining each pair of points.

- a (3, 1) and (5, 5)    b (4, 7) and (10, 9)    c (6, 1) and (2, 5)    d (-2, 2) and (2, 8)  
e (1, 3) and (7, -1)    f (4, 5) and (-5, -7)    g (-2, 0) and (0, -8)    h (8, 6) and (-7, -2)

2 Write down the gradient and  $y$ -intercept of each line.

- a  $y = 4x - 1$     b  $y = \frac{1}{3}x + 3$     c  $y = 6 - x$     d  $y = -2x - \frac{3}{5}$

3 Find the gradient and  $y$ -intercept of each line.

- a  $x + y + 3 = 0$     b  $x - 2y - 6 = 0$     c  $3x + 3y - 2 = 0$     d  $4x - 5y + 1 = 0$

## B) Factorising quadratic expressions

1 Factorise

- a  $x^2 + 4x + 3$     b  $x^2 + 7x + 10$     c  $y^2 - 3y + 2$     d  $x^2 - 6x + 9$   
e  $y^2 - y - 2$     f  $a^2 + 2a - 8$     g  $x^2 - 1$     h  $p^2 + 9p + 14$

2 Factorise

- a  $2x^2 + 3x + 1$     b  $2 + 7p + 3p^2$     c  $2y^2 - 5y + 3$     d  $2 - m - m^2$   
e  $3r^2 - 2r - 1$     f  $5 - 19y - 4y^2$     g  $4 - 13a + 3a^2$     h  $5x^2 - 8x - 4$

## C) Solving quadratic equations

1 Using factorisation, solve each equation.

- a  $x^2 - 4x + 3 = 0$     b  $x^2 + 6x + 8 = 0$     c  $x^2 + 4x - 5 = 0$     d  $x^2 - 7x = 8$   
e  $x^2 - 25 = 0$     f  $x(x - 1) = 42$     g  $x^2 = 3x$     h  $27 + 12x + x^2 = 0$

## D) Completing the square

1 Express in the form  $(x + a)^2 + b$

- a  $x^2 + 2x + 4$     b  $x^2 - 2x + 4$     c  $x^2 - 4x + 1$     d  $x^2 + 6x$   
e  $x^2 + 4x + 8$     f  $x^2 - 8x - 5$     g  $x^2 + 12x + 30$     h  $x^2 - 10x + 25$

## E) Simultaneous equations

1 Solve each pair of simultaneous equations.

a  $x^2 - y + 3 = 0$

$x - y + 5 = 0$

b  $2x^2 - y - 8x = 0$

$x + y + 3 = 0$

c  $x^2 + y^2 = 25$

$2x - y = 5$

d  $x^2 + 2xy + 15 = 0$

$2x - y + 10 = 0$

e  $x^2 - 2xy - y^2 = 7$

$x + y = 1$

f  $3x^2 - x - y^2 = 0$

$x + y - 1 = 0$

## F) Index notation

1 Simplify

a  $2p^2 \times 4p^5$

b  $x^2 \times x^3 \times x^5$

c  $12n^7 \div 2n^2$

d  $(y^3)^4$

e  $(2b)^3 \div 4b^2$

f  $p^3q \times pq^2$

g  $x^4y^3 \div xy^2$

h  $2r^2s \times 3s^2$

2 Evaluate

a  $4^{\frac{3}{2}}$

b  $27^{\frac{2}{3}}$

c  $16^{\frac{3}{4}}$

d  $(-125)^{\frac{2}{3}}$

e  $9^{\frac{5}{2}}$

f  $8^{-\frac{2}{3}}$

g  $36^{-\frac{3}{2}}$

h  $(\frac{1}{8})^{\frac{4}{3}}$

i  $(\frac{4}{9})^{\frac{3}{2}}$

j  $(\frac{1}{216})^{-\frac{2}{3}}$

k  $(\frac{9}{16})^{-\frac{3}{2}}$

l  $(-\frac{27}{64})^{\frac{4}{3}}$

## G) Simplifying surds, rationalising the denominator

1 Simplify

a  $\sqrt{12}$

b  $\sqrt{28}$

c  $\sqrt{80}$

d  $\sqrt{27}$

e  $\sqrt{24}$

f  $\sqrt{128}$

g  $\sqrt{45}$

h  $\sqrt{40}$

i  $\sqrt{75}$

j  $\sqrt{112}$

k  $\sqrt{99}$

l  $\sqrt{147}$

2 Express each of the following as simply as possible with a rational denominator.

a  $\frac{1}{\sqrt{5}}$

b  $\frac{2}{\sqrt{3}}$

c  $\frac{1}{\sqrt{8}}$

d  $\frac{14}{\sqrt{7}}$

e  $\frac{3\sqrt{2}}{\sqrt{3}}$

f  $\frac{\sqrt{5}}{\sqrt{15}}$

