

Lesson 11

Additional Mathematics
A-Level Pure Mathematics : Year 1
Topics in Algebra

11.1 Test

*Any solution based entirely on graphical
or numerical methods is not acceptable*

Marks Available : 60

Question 1

GCSE Examination Question from June 2021, Paper 1H, Q7 (Edexcel)

(a) Write down all possible values of y if

$$-4 \leq 2y < 6 \text{ and } y \text{ is an integer}$$

[2 marks]

(b) Solve the inequality, $7t - 3 \leq 2t + 31$

[2 marks]

Question 2

GCSE Examination Question from June 2021, Paper 1H, Q9 (Edexcel)

(a) Factorise fully, $25a^4c^7d + 45a^9c^3h$

[2 marks]

(b) Solve $(2x + 5)^2 = (2x + 3)(2x - 1)$

[3 marks]

Question 3

A-Level Examination question from May 2014, Paper C1, Q3 (Edexcel)

Find the set of values of x for which

(a) $3x - 7 > 3 - x$

[2 marks]

(b) $x^2 - 9x \leq 36$

[3 marks]

(c) both $3x - 7 > 3 - x$ and $x^2 - 9x \leq 36$

[1 mark]

Question 4

Use the method of completing the square to solve the equation $x^2 + 4 = 6x$

Give your solutions in surd form.

[2 marks]

Question 5

A-Level Examination Question from June 2019, Paper PM1, Q5(a)(b) (Edexcel)

$$f(x) = 2x^2 + 4x + 9$$

- (a) Write $f(x)$ in the form $a(x + b)^2 + c$
where a , b and c are integers to be found.

[3 marks]

- (b) Sketch the curve with equation $y = f(x)$
Show any points of intersection with the coordinate axes and the coordinates of any turning point.

[3 marks]

Question 6

GCSE Examination Question from January 2020, Paper 2HR, Q23, (Edexcel)

Express $7 - 12x - 2x^2$ in the form $a + b(x + c)^2$ where a , b and c are integers.

[3 marks]

Question 7

A-Level Examination Question from January 2011, Paper C1, Q8 (Edexcel)

The equation

$$x^2 + (k - 3)x + (3 - 2k) = 0$$

where k is a constant, has two distinct real roots.

(a) Show that k satisfies $k^2 + 2k - 3 > 0$

[3 marks]

(b) Find the set of possible values of k

[4 marks]

Question 8

A-Level Examination Question from May 2007, Paper C1, Q6 (Edexcel)

(a) By eliminating y from the equations

$$y = x - 4$$

$$2x^2 - xy = 8$$

show that

$$x^2 + 4x - 8 = 0$$

[2 marks]

(b) Hence, or otherwise, solve the simultaneous equations

$$y = x - 4$$

$$2x^2 - xy = 8$$

giving your answers in the form $a \pm b\sqrt{3}$, where a and b are integers.

[5 marks]

Question 9

Additional Mathematics Examination Question from June 2019, Paper 1, Q10 (OCR)

You are given that the line $y = 2x + k$ cuts the circle $x^2 + y^2 = 5$ in two points, A and B .

(a) Show that the x coordinates of A and B satisfy the equation

$$5x^2 + 4kx + (k^2 - 5) = 0$$

[2 marks]

(b) Hence find the values of k for which the line is a tangent to the circle.

[2 marks]

Question 10

A-Level Examination Question from May 2002, Paper C1, Q4 (Edexcel)

(a) By completing the square, find in terms of k the roots of the equation

$$x^2 + 2kx - 7 = 0$$

[4 marks]

(b) Prove that, for all real values of k , the roots of $x^2 + 2kx - 7 = 0$ are real and different.

[2 marks]

(c) Given that $k = \sqrt{2}$ find the exact roots of the equation.

[2 marks]

Question 11

The width of a rectangular sports pitch is x metres, $x > 0$.

The length of the pitch is 20 metres more than its width.

The perimeter of the pitch must be less than 300 metres.

(a) Form a linear inequality in x

[2 marks]

Given that the area of the pitch must be greater than 4800 m^2 ;

(b) Form a quadratic inequality in x

[2 marks]

(c) By solving your inequalities, find the set of possible values of x

[4 marks]

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Teachers may obtain detailed worked solutions to the exercises by email from MHHShrewsbury@Gmail.com