FUNCTIONS: MODULUS FUNCTIONS

A2 Unit 3: Pure Mathematics B

WJEC past paper questions: 2010 – 2017

Total marks available 57 (approximately 1 hour 10 minutes)

1. 
   (a) Solve the inequality $|3x + 1| \leq 5$. 
   (b) The function $f$ is defined by $f(x) = |x|$. 
      (i) Sketch the graph of $y = f(x)$. 
      (ii) On a separate set of axes, sketch the graph of $y = f(x - 3) + 2$. On your sketch, indicate the coordinates of the point on the graph where the value of the $y$-coordinate is least and the coordinates of the point where the graph crosses the $y$-axis. 

(Summer 10)

2. 
   Solve the following. 
   (a) $5|x| + 1 = 7 - 3|x|$ 
   (b) $|3x - 1| > 5$ 

(January 11)

3. 
   (a) Show, by counter-example, that the statement $|a + b| = |a| + |b|$ is false. 
   (b) Solve the equation $|2x + 1| = |3x - 4|$ 

(Summer 11)
4. Solve the following.
   (a) \(|4x - 5| \geq 3\), \quad [3]
   (b) \((3|x| + 1)^{\frac{1}{3}} = 4\).
      \quad [2]

(January 12)

5. Solve the following.
   (a) \(4|x - 3| + 2 = 8 - 5|x - 3|\) \quad [3]
   (b) \(|5x - 2| \leq 3\) \quad [3]

(Summer 12)

6. (a) Solve the inequality \(|3x - 4| > 5\). \quad [3]
   (b) (i) Sketch the graph of \(y = |x|\).
       (ii) The diagram below shows a sketch of the graph of \(y = a|x + b|\), where \(a\) and \(b\) are constants. The graph meets the \(x\)-axis at the point \((4, 0)\) and the \(y\)-axis at the point \((0, -8)\).

Find the value of \(a\) and the value of \(b\). \quad [3]

(January 13)
7. 
(a) Show, by counter-example, that the statement

\[ |a + 1| = |b + 1|, \text{ then } a = b \]

is false. \[2\]

(b) Solve the inequality

\[ |x^2 - 10| \leq 6. \]

(Summer 13) \[4\]

8.

Solve the equation

\[ |3x + 4| = 2|x - 3|. \]

(January 14) \[3\]

9. 
(a) Show, by counter-example, that the statement

\[ |2a + 3b| = 2|a| + 3|b| \]

is false. \[2\]

(b) Solve the equation

\[ |3x - 2| = 7|x|. \]

(Summer 14) \[3\]

10. 
(a) Find all values of \(x\) satisfying the inequality \( |3x - 5| \leq 1. \) \[3\]

(b) Use your answer to part (a) to find all values of \(y\) satisfying the inequality \( \left| \frac{3}{y} - 5 \right| \leq 1. \) \[2\]

(Summer 15)

11. 
Solve the equation

\[ |5x + 4| = -7x. \]

(Summer 16) \[4\]