ALGEBRA: EXPRESSIONS, EQUATIONS AND INEQUALITIES

CHECKLIST
Make sure you……

- Can solve quadratic equations by:
  - Factorising
  - Using the quadratic formula
  - Using the K-substitution
- Can analyse the nature of the roots of a quadratic equation.
- Revise the surds and the laws of exponents
- Are able to solve inequalities
- Can solve simultaneous equations

Mind Map: Quadratic Equations

\[ ax^2 + bx + c = 0 \]

- Factorise
- Simultaneous equations
- Inequalities
- Quadratic formula: \[ x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} \]
- Determine nature of roots: \[ \Delta = b^2 - 4ac \]
Exam Questions

Question 1
Solve for x:
1.1 \((x -3)(x +5) = 9\)
1.2 \((x^2-2x)^2 -8 = 7(x^2-2x)\)
1.3 \(9.2^{x-1} = 2.3^x\)

Question 2
(Adapted from Feb 2010, Paper 1, Question 1)
Solve the following inequality for x:
\[2x^2 - 2 \leq 3x\]

Question 3
Solve simultaneously for x and y
\[2 + y = -2x\]
\[-2x^2 + 8xy + 42 = y\]

Question 4
Solve simultaneously for x and y
\[3^{x-10} = 3^x\]
\[y^2 + x = 20\]

Question 5
(Adapted from Nov 2012, Paper 1, Question 1)
The solutions of a quadratic equation are given by \(x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}\)
For which value(s) of p will this equation have:
5.1. Two equal solutions
5.2 No real solutions

Question 6
(Adapted from Nov 2012, Paper 1, Question 1)
If \(\frac{14}{\sqrt{15} - \sqrt{17}} = a\sqrt{b}\) determine, without using a calculator, the values of a and b if a and b are integers.
Test Yourself

Question 1
The solution to the equation $x^2 - 6x = 0$ is
A 0, only
B 6, only
C 0 or 6
D $\pm \sqrt{6}$

Question 2
What is the solution set of $\frac{x + 2}{x - 2} = \frac{-3}{x}$?
A {-2, 3}
B {-3, -2}
C {-1, 6}
D {-6, 1}

Question 3
Solve the quadratic equation $x^2 + 4x + 1 = 0$.
A $-4 \pm \sqrt{5}$
B $-2 \pm \sqrt{3}$
C $\frac{4 \pm \sqrt{6}}{2}$
D 1 and -1

Question 4
Which statement best explains why there is no real solution to the quadratic equation $2x^2 + x + 7 = 0$?
A The value of $1^2 - 4 \cdot 2 \cdot 7$ is positive.
B The value of $1^2 - 4 \cdot 2 \cdot 7$ is equal to 0.
C The value of $1^2 - 4 \cdot 2 \cdot 7$ is negative.
D The value of $1^2 - 4 \cdot 2 \cdot 7$ is not a perfect square.

Question 5
Solve the quadratic inequality $x^2 - 4x - 21 \leq 0$. Write the solution set in interval notation.
A $[7, \infty)$
B $(-\infty, -3])$
C $(-\infty, -3] \cup [7, \infty)$
D $[-3, 7]$