Algebraic Expressions – Test A (30 mins)

✓ Fundamentals Challenge Expert

Subtopics: Index laws, expanding brackets, factorising, negative and fractional indices, surds, rationalising denominators

1. **Expand** the brackets and **simplify** where necessary:

   a) $2(x+3)$ b) $2x(5-9x)$ c) $(x+1)(x+2)$

   d) $(3+y)(4-y)$ e) $(x+3)(x^2+5x-2)$ f) $(x+1)(x+2)(x+3)$ **[11]**

2. **Factorise** fully:

   a) $3x+6$ b) $12x-x^2$ c) $x^2+7x+10$

   d) x^2-4 e) $2x^2-x-1$ f) x^3+4x^2+3x **[9]**

3. **Simplify** the following expressions:

   a) $x^2 \times x^3$ b) x^0 c) $\left(x^2\right)^{\frac{5}{2}}$

   d) $3x^7 \div x^3$ e) $y^5 \times y^{-3}$ f) $\dfrac{15y^6}{5y^3}$ **[6]**

4. **Simplify** as fully as possible:

   a) $\sqrt{16}$ b) $\sqrt{75}$ c) $3\sqrt{24}$

   d) $\sqrt{12}+\sqrt{27}$ e) $\dfrac{\sqrt{32}}{\sqrt{2}}$ f) $\sqrt{2} \times \sqrt{32}$ **[10]**

5. Simplify:

   a) $\left(\sqrt{x}\right)^2$ b) $\sqrt{y^2} \times \sqrt{y^3}$ c) $\left(3\sqrt{y}\right)^2$ **[5]**

6. Write the following as **fractions** or **integers**:

   a) 22^{-1} b) $27^{\frac{1}{3}}$ c) $9^{\frac{3}{2}}$ **[4]**

7. **Rationalise** the denominator of the following fractions:

   a) $\dfrac{1}{\sqrt{5}}$ b) $\dfrac{3}{\sqrt{2}}$ c) $\dfrac{1}{2+\sqrt{3}}$ **[5]**

TOTAL 50 MARKS

Simultaneous Equations and Inequalities – Test A (25 mins) ✓Fundamentals Challenge Expert

Subtopics: Linear simultaneous equations, quadratic simultaneous equations, simultaneous equations on graphs, linear inequalities, quadratic inequalities, inequalities on graphs, regions

1. Solve the following simultaneous equations by **elimination:**

$$3x + y = 5$$
$$2x + y = 4$$

[3]

2. Solve the following simultaneous equations by **substitution:**

$$x - y = 4$$
$$3x + y = 16$$

[3]

3. Solve the simultaneous equations:

$$2x + 3y = 7$$
$$3x + y = 7$$

[4]

4. Solve the simultaneous equations:

$$x - y = 5$$
$$x^2 + x + y = -2$$

[5]

5. Solve the following inequalities:
   a) $2x - 3 > 0$ **[1]**
   b) $(x-2)(x+3) \geq 0$ **[3]**
   c) $x^2 - 4x - 5 \leq 0$ **[4]**
   d) $x^2 + 5x - 1 < 2x - 3$ **[4]**

6. a) On **three separate diagrams**, sketch the graphs that represent the boundaries of the following inequalities, labelling **all** points where each graph crosses the **axes:**
      i) $y \geq x$ **[3]**
      ii) $y > (x-2)(x+2)$ **[3]**
      iii) $y \leq x^2 - 5x + 6$ **[4]**
   b) For each graph, shade the region that satisfies the inequality and label it **R**. **[3]**

TOTAL 40 MARKS

Straight Line Graphs – Test A (30 mins)

✓ Fundamentals Challenge Expert

Subtopics: Equations of straight lines, parallel and perpendicular lines, length and area, modelling

1. Write down the **gradient** and ***y*-intercept** of these lines:
   a) $y=-4x+11$ b) $y+2x+3=0$ c) $6x-2y+4=0$ **[6]**

2. Work out the **gradient** of the lines joining these pairs of points:
   a) $(-1,-1),(1,1)$ b) $(-1,2),(5,4)$ c) $(-1,-1),(3,1)$
   d) $(8,4),(6,3)$ e) $(0,3c),(6c,0), c\neq 0$ f) $\left(\frac{1}{3},\frac{1}{2}\right),\left(\frac{1}{4},1\right)$ **[12]**

3. Write these lines in the form $ax+by+c=0$, where a, b, and c are **integers** and $a\geq 0$:
   a) $y=2x+1$ b) $y=\frac{4}{5}x$ c) $y=-3x+\frac{5}{8}$ **[3]**

4. Find the equation of the line with **gradient** 3 that passes through the point (2, 1).
   Give your answer in the form $y=mx+c$. **[2]**

5. Find the equation of the line that passes through the points $(3,2)$ and $(5,6)$.
   Give your answer in the form $ax+by+c=0$, where a, b, and c are **integers** and $a\geq 0$. **[4]**

6. Work out whether the following pairs of lines are **parallel**:
   a) $y=2x-1$, $y+2x+4=0$ b) $y=4x+2$, $8x-2y+5=0$ c) $2x-3y+8=0$, $3x-2y+8=0$ **[9]**

7. Work out whether the following pairs of lines are **perpendicular**:
   a) $y=3x+2$, $y=-\frac{1}{3}x+2$ b) $y=2x+4$, $y+2x=4$ c) $4x-2y-2=0$, $2x+4y-6=0$ **[9]**

8. Find the **distance** between the following pairs of points. *Leave your answer in simplified surd form.*
   a) $(0,4),(2,6)$ b) $(-1,3),(2,9)$ c) $(-2,-5),(4,1)$ **[6]**

TOTAL 51 MARKS