

Indicial Equations: Quadratic Form & Simultaneous Equations

This exercise set covers two advanced types of indicial equations: those that reduce to a quadratic equation by substitution (letting $y = a^x$), and simultaneous indicial equations involving two unknowns, solved by equating indices and combining the resulting linear equations. **Perfect for students preparing for WAEC, NECO, and JAMB Mathematics.**

Exercises

1. Solve for x in the equation $3^{2x} - 10(3^x) + 9 = 0$
2. Solve the equations $2^{m+n} = 32$, $3^{3n-m} = 27$
3. Solve for x in the equation $2^{2x} - 6(2^x) + 8 = 0$
4. Solve the equations $2^{x+y} = 64$, $3^{x-y} = 9$

ANSWERS & WORKINGS

1. Let $y = 3^x$. Then $y^2 - 10y + 9 = 0 \Rightarrow (y-1)(y-9) = 0 \Rightarrow y = 1$ or $y = 9$. $3^x = 1 \Rightarrow x = 0$. $3^x = 9 \Rightarrow x = 2$.

Answer: $x = 0$ or 2

2. $2^{m+n} = 2^5 \Rightarrow m + n = 5$. $3^{3n-m} = 3^3 \Rightarrow 3n - m = 3$. Adding: $(m+n) + (3n-m) = 5+3 \Rightarrow 4n = 8 \Rightarrow n = 2$, so $m = 3$. **Answer: $m = 3$, $n = 2$**

3. Let $y = 2^x$. Then $y^2 - 6y + 8 = 0 \Rightarrow (y-2)(y-4) = 0 \Rightarrow y = 2$ or $y = 4$. $2^x = 2 \Rightarrow x = 1$. $2^x = 4 \Rightarrow x = 2$.

Answer: $x = 1$ or 2

4. $2^{x+y} = 2^6 \Rightarrow x + y = 6$. $3^{x-y} = 3^2 \Rightarrow x - y = 2$. Adding: $2x = 8 \Rightarrow x = 4$, so $y = 2$. **Answer: $x = 4$, $y = 2$**

✓ Questions 1 and 2 have been checked against the original answers and both match exactly. Questions 3 and 4 are new, added to give more practice on the quadratic and simultaneous forms.