

Indicial Equations

This exercise set covers solving indicial (exponential) equations — equations in which the unknown appears as a power. You will practise expressing both sides with the same base, then equating the indices to solve for the unknown, including equations with square roots, fractional and negative indices, and equations involving two unknowns. **Perfect for students preparing for WAEC, NECO, and JAMB Mathematics.**

Exercises

1. Solve: $2^{\sqrt{2x+1}} = 32$
2. Solve for n: $4^{n-1} \times 5^{2n-2} \times 10^n = 1$
3. Solve for m: $9^{2m+1} = 81^{m+2} \div 3^m$
4. Solve for x: $5(2^{x-3}) = 160$
5. Find n if $9^{1+n} \times 3 = 27^{-n}$
6. Solve for x: $27^{x/2} = 3^{3/4} \times 9^{-1/4}$
7. If $(2/3)^{a-1} = 27/8$, find the value of a.
8. If $(3/4)^x (2/3)^y = 32/27$, find the values of x and y respectively.
9. Solve for x: $5^{x-1} = 25$
10. Solve for y: $3^{2y} = 27$

ANSWERS & WORKINGS

1. $2^{\sqrt{2x+1}} = 2^5 \Rightarrow \sqrt{2x+1} = 5 \Rightarrow 2x+1 = 25 \Rightarrow x = 12$. **Answer: x = 12**
2. $4^{n-1} = 2^{2n-2}$; $10^n = 2^n 5^n$. Combining: $2^{3n-2} 5^{3n-2} = 10^{3n-2} = 10^0 \Rightarrow 3n-2 = 0 \Rightarrow n = 2/3$. **Answer: n = 2/3**
3. $9^{2m+1} = 3^{4m+2}$; $81^{m+2}/3^m = 3^{4m+8}/3^m = 3^{3m+8}$. So $4m+2 = 3m+8 \Rightarrow m = 6$. **Answer: m = 6**
4. $2^{x-3} = 160/5 = 32 = 2^5 \Rightarrow x-3 = 5 \Rightarrow x = 8$. **Answer: x = 8**
5. $9^{1+n} \times 3 = 3^{2+2n} \times 3^1 = 3^{3+2n}$; $27^{-n} = 3^{-3n}$. So $3+2n = -3n \Rightarrow 5n = -3 \Rightarrow n = -3/5$. **Answer: n = -3/5**
6. $27^{x/2} = 3^{3x/2}$; RHS = $3^{3/4} \times 3^{-1/2} = 3^{1/4}$. So $3x/2 = 1/4 \Rightarrow x = 1/6$. **Answer: x = 1/6**
7. $27/8 = (3/2)^3 = (2/3)^{-3}$. So $a-1 = -3 \Rightarrow a = -2$. **Answer: a = -2**
8. By inspection/trial: $(3/4)^{-2} \times (2/3)^1 = (16/9) \times (2/3) = 32/27$, which checks out. **Answer: x = -2, y = 1**

9. $5^{x-1} = 5^2 \Rightarrow x - 1 = 2 \Rightarrow x = 3$. **Answer: $x = 3$**

10. $3^{2y} = 3^3 \Rightarrow 2y = 3 \Rightarrow y = 3/2$. **Answer: $y = 3/2$**

✓ Questions 1–8 have been checked against the original answers and all match exactly. Questions 9 and 10 are new, added to round the set out to 10 simple indicial equations.

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