

LESSON **Challenge**
2-5 *Have a Good Reason*

Mathematical induction is a type of proof that uses deductive reasoning to prove statements about positive integers. To prove that $13^n + 11$ is divisible by 12, for example, you assume that there is a whole number r such that $13^k + 11 = 12r$. It is important to be able to justify each step of these types of proofs.

1. Write a justification for each step of the mathematical induction proof.

$13^k + 11 = 12r$	Inductive hypothesis
$13^k = 12r - 11$	a. _____
$13(13^k) = 13(12r - 11)$	b. _____
$13^{k+1} = 13(12r - 11)$	c. _____
$13^{k+1} = 156r - 143$	d. _____
$13^{k+1} + 11 = 156r - 132$	e. _____
$13^{k+1} + 11 = 12(13r - 11)$	f. _____

2. Write a justification for each step of the mathematical induction proof, which proves that $10^n - 1$ is divisible by 9.

$10^k - 1 = 9r$	Inductive hypothesis
$10^k = 9r + 1$	a. _____
$10(10^k) = 10(9r + 1)$	b. _____
$10^{k+1} = 10(9r + 1)$	c. _____
$10^{k+1} = 90r + 10$	d. _____
$10^{k+1} - 1 = 90r + 9$	e. _____
$10^{k+1} - 1 = 9(10r + 1)$	f. _____

3. In the figure, $\angle 1 \cong \angle 3$, $\angle 3 \cong \angle 2$, and $m\angle 1 = 65^\circ$. Find $m\angle ABC$. Justify each step.

