For positive integer *n*:

$1^2+2^2+3^2+\ldots+n^2 = n(n+1)(2n+1)/6$

1. What is the n = 1?
2. What is n = 2?
3. Hypothesis? P(n) =
4. Basis step? P(1) =
5. Inductive step? P(k) =
6. Must show? P(k+1) =

Add what to both sides of P(k)=.

Prove, using induction, that the sum of the first *n* even positive integers is:

$2+4+6+\ldots+2n = n(n+1)$

7. What is the sum for n=1?

8. Hypothesis? P(n) =

9. Basis step? P(1) =

10. Inductive step? P(k) =

11. Must show? P(k+1) =

12. Proof

Hint: Add 2(k+1) to both sides of P(k)=

Prove that 2 divides n^2+n for positive integers:

13. Hypothesis? P(n)

14. Basis step? P(1)

15. Inductive step? P(k)

16. Must show? P(k+1)

17. Proof

Prove, using induction, for *n* positive integer:

$1^2+2^2+3^2+\ldots+n^2 = n(n+1)(2n+1)/6$

1. What is the n = 1? 1
2. What is n = 2? 5
3. Hypothesis? $P(n) = n(n+1)(2n+1)/6$
4. Basis step? $P(1) = 1$
5. Inductive step? $P(k) = k(k+1)(2k+1)/6$
6. Must show? $P(k+1) = (k+1)(k+1+1)(2(k+1)+1)/6$

Hint: Add $(k+1)^2$ to both sides of P(k)=

Prove, using induction, that the sum of the first *n* even positive integers is:

$2+4+6+\ldots+2n = n(n+1)$

7. What is the sum for n=1. $2 = 1(1+1) = 2$

8. Hypothesis? $P(n) = 2+4+6+\ldots+2n = n(n+1)$

9. Basis step? $P(1) = 1(1+1) = 2$

10. Inductive step? $P(k)=(2+4+6+\ldots+2k)=k(k+1)$

11. Show? $P(k+1)=(2+4+6+\ldots+2k)+2(k+1)$
$= (k+1)((k+1)+1) = (k+1)(k+2)$

12. Proof

$P(k)=2+4+6+\ldots+2k$	$= k(k+1)$	Inductive Hypothesis
$P(k+1) =$ $(2+4+6+\ldots+2k)+2(k+1)$	$= k(k+1)+2(k+1)$	Add $2(k+1)$ to both sides of $P(k)$
	$= k^2+k+2k+2$	Multiply
	$= k^2+3k+2$	Add
	$=(k+1)(k+2)$	Factor

Prove that 2 divides n^2+n for positive integers:

13. Hypothesis? P(n) 2 divides n^2+n

14. Basis step? P(1) 2 divides $1^2+1 = 2$

15. Inductive step? P(k) 2 divides k^2+k

16. Must show? P(k+1) 2 divides $(k+1)^2+(k+1)$

17. Proof

$$
\begin{aligned}
(k+1)^2+(k+1) &= k^2 + 2k + 1 + k+1 \\
&= k^2 + k + 2(k+1)
\end{aligned}
$$

P(k) 2 divides k^2+k

2 divides $2(k+1)$