

Quiz on Induction

Question 0. Everyone gets this correct!

- A) I like college life.
- B) I wish I was on Mars without a space suit.

Question 1

Let $P(n)$ be the statement that

$$1^2+2^2+\dots+n^2 = n(n+1)(2n+1)/6 \text{ for } n > 0.$$

What is the statement $P(1)$?

- A) $1^2+2^2+\dots+n^2 = n(n+1)(2n+1)/6$
- B) $n=1$
- C) $0^2 = 0(0+1)(0+1)/6$
- D) It doesn't exist.
- E) $1^2 = 1(1+1)(2+1)/6$

Correct answers are circled in red.

Question 2

Let $P(n)$ be the statement that

$$1^2+2^2+\dots+n^2 = n(n+1)(2n+1)/6 \text{ for } n > 0.$$

What do you use during the inductive proof to go from the first line below to the second line?

$$1^2+2^2+\dots+k^2+(k+1)^2 = (k+1)((k+1)+1)(2(k+1)+1)/6$$

$$k(k+1)(2k+1)/6+(k+1)^2 = (k+1)((k+1)+1)(2(k+1)+1)/6$$

- A) Algebra
- B) Base case
- C) Inductive Hypothesis
- D) all of the above

Question 3

Let $P(n)$ be the statement that

$$1^2+2^2+\dots+n^2 = n(n+1)(2n+1)/6 \text{ for } n > 0.$$

If you can't prove the base case, for which values of n can you prove that $P(n)$ is true using mathematical induction?

- A) none
- B) all $n > 0$
- C) just $n = 1$
- D) all $n > k$

Question 4

Let $P(n)$ be the statement that

$$1^2+2^2+\dots+n^2 = n(n+1)(2n+1)/6 \text{ for } n > 0.$$

What do you need to prove the inductive step?

- A) the Inductive Hypothesis
- B) nothing
- C) the base case
- D) the base case and the Inductive Hypothesis

Question 5

Let $P(n)$ be the statement that

$$\sum_{j=1}^n j^3 = n(n+1)(2n+1)(3n^2+3n-1)/30 \text{ for } n > 0.$$

What is the base case (basis step) ?

- A) $\sum_{j=1}^1 j^3 = 1(1+1)(2+1)(3+3-1)/30$
- B) $\sum_{j=1}^n j^3 = 1(1+1)(2+1)(3+3-1)/30$, for $j = 1$ to n
- C) none of the above

Question 6

When proving the Inductive Step, how many times is the Inductive Hypothesis used?

- A) Only once.
- B) More than once.
- C) Sometimes it is not needed.
- D) Once, but only if it is first proved to be true.

Question 7

What was wrong with the inductive proof discussed in class about the color of horses?

- A) The Inductive Hypothesis was missing.
- B) They were unicorns.
- C) One of the base cases was missing
- D) All of the base cases were missing.
- E) The Inductive Step had an error.