

Tracy's CHRISTMAS QUESTION



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The Adams children were very excited for Christmas. The whole house was decorated and they were anxiously awaiting the arrival of Santa.



Tracy's dad told her not to worry because Santa has a rule that if he gives one child a present, the next youngest child will get a present.





Lucky for Tracy, her dad knows the induction principle!



Her dad explains that as long as baby Noah gets a present from Santa, everyone will. And baby Noah has been good this year!

If baby Noah gets a present, Santa's rule says Tracy will also get one!



And if Tracy gets a present... her older brother Liam will get one!

And if Liam gets one... her older sister Lauren will get a gift!



And if Lauren gets a present... Mom will too!

If Mom gets a present... Dad must also!



So everyone will get a present from Santa!

Now Tracy was happy knowing everyone would have presents from Santa and couldn't wait until Christmas morning!



Notes

The **Induction Principle** that Tracy's dad understands is the reason he can ensure Tracy that everyone in her family will receive a gift from Santa. The principle states that if $P(0)$ is true, that the youngest family member receives a gift from Santa, which we know since baby Noah was good this year and will therefore get a present, and $P(n)$ implies $P(n+1)$, which is true because of Santa's rule, then by induction $P(n)$ is true for all n , so everyone in the family will get a present from Santa on Christmas. For all sizes of n , no matter how large the family is, everyone will get a present.