Assume that CricketBowlingFigures is context free. For any context-free language, the non empty words in that language can be generated by a grammar in Chomsky Normal Form. Let G be the Chomsky Normal Form version of CricketBowlingFigures. The words produced by CricketBowlingFigures is in the form (O,M,R,W).

G will have k non-terminal symbols. Let w be any word generated by G with length greater than 2k-1. By the Pumping Lemma for Context Free Grammar’s, there exists u,v,y and z such that w = uvxyz, v and y are not both empty, |vxy| 2k and for all i 0, uvixyiz is generated by G if CricketBowlingFigures is context free.

. There are 6 cases for what v and y can be and this proof will show that in each of the 6 cases, uvixyiz is not produced by G for all i 0.

Case 1: v and/or y include a comma or the left bracket or right bracket.

Case 2: v and/or y would include some amount of 1s that represent O and uxy represents some amount or the whole amount of O. This will be the 1s before the first comma.

Case 3: v and/or y have some of the 1s that represent M and uxy represents some amount or the whole amount of M.

Case 4: v represents some amount of 1s in O, x represents the comma between O and M and can also represent some amount of 1s in O and/or M, and y represents some amount of 1s in M.

Case 5: v and/or y have some of the 1s in W and uxy represents some amount or the whole amount of W.

Case 6: v represents some amount of 1s in M and y represents some amount of 1s in W.

Disproving Case 1

Let i = 2 so the word would become uv2xy2z. Based on the definition of this case, the new word would either include 2 left brackets or 2 right brackets or 4 commas. G only accepts words with 1 left bracket at the start and 1 right bracket at the end of the word so multiple left or right brackets would not be accepted. G only accepts words with 3 commas so it would reject words with 4 comma. As G does not accept the new word produced for all i 0, this case for v and y has been disproven.

Disproving Case 2

Let i = 0 so the word would become uxz. As v and y have been removed, that means some amount of 1s have been removed from the O part of the word. Therefore O would be less then M which breaks the rule of CricketBowlingFigures where M is less than or equal to O. This new word would not be produced by G.

Disproving Case 3

Let i = 3 so that xyz would increase the amount of 1s in the M part of the word to be greater than while the O part would remain at . This would not be accepted by CricketBowlingFigures as the M in the word must be less than or equal to the O. Therefore, this new word would not be produced by G.

Disproving Case 4

Let i = 0 so that both O and M would lose some amount of 1s depending on the definition of v and y. W was originally defined in such a way that wickets was equal to 6 times the number of O. By removing some amount of 1s from O and keeping the same amount of W, W is now greater than 6 times the number of O and the new word would not be produced by G as it is not in CricketBowlingFigures.

Disproving Case 5

Let i =2 so that the number of W would increase while the amount of O would stay the same. W was defined in w such that it was equal to 6 times the number of O. By adding more W but keeping the same amount of O, now W is greater than 6 times the number of O and therefore the new word would not be produced by G as it is not in CricketBowlingFigures.

Disproving Case 6

Let i = 2 so that the number of M and W have increased. w was defined so that O is equal to M. In the new word, M has increased but O has not changed so now M is greater than O. This would not be produced by G as M must be less than or equal to O.

In every case for what v and y could be, uvixyiz was not produced by G for all i 0. This is a contradiction as the pumping lemma for Context Free Grammars requires that there must be a way for uvxyz to be selected such that the language accepts all words produced by uvixyiz for all i 0. Due to this contradiction, G must not be a context free language and therefore CricketBowlingFigures must not be a context free language.