

Impossibility Result

Through the method applied it is impossible to get anything below 15. But in order to achieve anything above 15 we are dependent on the question which means it's only possible to achieve marks above 15 when all 3 bits of the selected bits are either all true or all false. If any of the bits are different, it will affect 1 mark per 3 bits. And since we are making a group of 5 then the maximum number of incorrect answers we are bound to get is 5.

So the question is can we guarantee at least 16 marks in each case here?

According to the method we are using above, if we wish to obtain the max result we need to reduce the number of groupings.

A 3-to-1 mapping(groupings) has a worst-case accuracy of 67.66%. And a 5-to-1 mapping has worst-case accuracy of 60% so it's preferable to choose 3:1 over 5:1. And it reduces significantly as we increase the number of elements in a group.

Now let's assume we want to reduce the number of incorrect answers to 4.

For this

We can group our question array as 4 groups of 3's (total 12 bits) + 8 bits spare.

Which needs 12 bits to transmit.

Alternatively, we group it as 2 groups of 3's and 1 group of 5's(total 11 bits) + 9 bits spare.

Which again needs 12 bits to transfer the best solution.

Hence, 15 is the lowest possible mark guaranteed to score in any case.