

IMAT5119\_2021\_501 Fuzzy Logic:

***Runner Fuzzy Inference System***

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**Introduction:**

Running, or Jogging, is a popular hobby and from of exercise throughout the world. It’s a great method of both keeping fit and is a great chance to embrace the outdoors. The term ‘*jogging*’ is a very broad, umbrella term that encompasses a lot of different styles of running at different paces and distances. ‘*Running*’, on the other hand, whilst originally only used to describe much faster paced versions of the exercise, when referenced in respect to the hobby covers both actual running and slower paced jogging further increasing the scope of the term.

Indeed within the entire scope of all, to refer to it in a more abstract manner, ‘*terrestrial locomotion*’ done by humans on foot, there is an incredible scope for multiple different defined types of on foot movement. Depending on the speed, or *pace* to use the official term, of an observed individual they could either be *walking*, *power walking*, *running*, *sprinting* or perhaps if they were moving at a particularly slow pace, even *crawling*.

When also considering the ultimate distance travelled during the course of the movement, a number of other types of movement come into consideration. *Short*, *Medium* and *Marathon* length distances each vary hugely in the amount of space a person must cover to complete them however, each of these terms, even the *crisply* defined term *Marathon* traditionally meaning a distance of exactly *42.195 kilometres*, over time have been used colloquially to describe a variety of distances, often depending largely on the overall athleticism of the describing individual. A distance of *5* or *10 kilometres* wouldn’t be particularly daunting for a seasoned runner such as *Eliud Kipchoge* for example, the current world-record holder in the marathon with a time of *2 hours, 1 minute and 18 seconds*, however, someone who is perhaps particularly elderly or otherwise infirm could easily struggle to just complete such a distance, let alone complete it in the time it would take *Kipchoge* to.

As well as the actual length of the route being completed it’s also important to consider the overall slope of the terrain along the route. Running uphill is considerably harder than downhill of course, however the overall steepness of a route is also similarly a difficult observation to express linguistically. Professional athletes often use a *Running Track* when training and competing, which officially must be consistently level throughout, while cross-country runners use natural, *open-air* terrain which often contains both inclines and slopes, affecting the maximum speed the runners will be able to achieve.

Being an avid runner myself, for this first piece of coursework for my Fuzzy Logic module I had originally wanted to capitalise on my own interest in the hobby by using my knowledge to create a *Fuzzy Inference System* which could consider the above three factors to determine an exact type of exercise being completed by the observed individual. This original idea was quickly scrapped however, after it became apparent that as there are so many different *nominal* types of *terrestrial locomotion* that they could not be properly represented upon the single axis scale output of a *FIS*. In order to format the output in the desired manner, it was instead chosen to use the output to describe the *minimum athleticism* of the observed individual on a *0* to *100* scale. The *speed*, *distance* and *average cumulative elevation gain per KM* are each an input into the system, along with the newly added *mean heart rate (BPM)* of the induvial, which was included after the decision to measure athleticism as a person’s heart rate is a good way of observing how hard their body is working. More athletic people won’t need to work their bodies as hard as less athletic people when completing similar journeys.

Within this report I will be detailing the development process of my *Runner Fuzzy Inference System* s including presenting and explaining the logic behind each decision it makes and explaining the impact of each input on the overall athleticism output.

**System Overview:**

**General System Overview:**

As previously mentioned, the *Jogger FIS* will consider a total of four different input factors when determining how the minimum athleticism of the observed individual. These are:

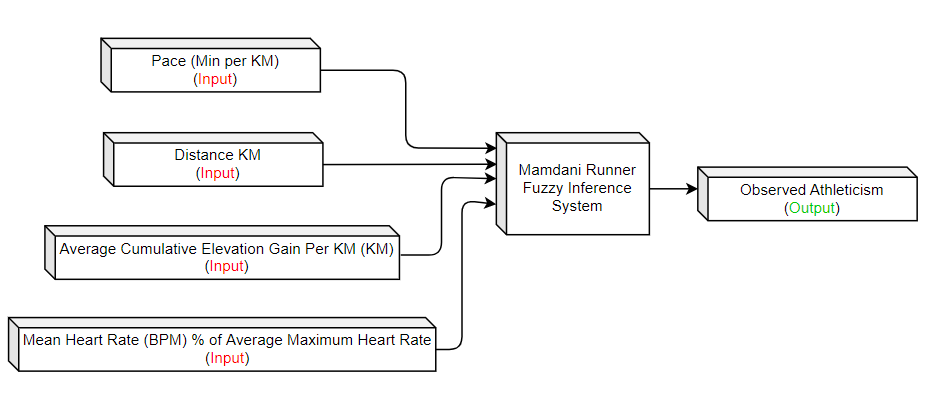
1. **Their Pace (Min per KM)**: This is given by the total time from start to finish of their journey divided by the distance in *kilometres* they travelled and results in the average amount of time it would take them to complete a single *kilometre* based on the observed journey. The *Runner FIS* measure this on the range between *0* and *18* minutes and encompasses the speeds, *crawling*, *slow walking*, *walking*, *fast walking*, *jogging* and *sprinting*.
2. **The Distance (KM)**: The total distance travelled by the individual during the journey. The *FIS* measures this on the range between *0* and *42.5* *kilometres* and encompasses the distances, *very short*, *short*, *medium*, *long*, *very long* and *marathon*.
3. **Average Cumulative Elevation Gain Per KM (KM)**: The average increase in the individual’s elevation in *kilometres* per *kilometre*. This is measured on a range from *0* to *1* kilometres gained in elevation per kilometre, with *0* indicating that there was no gain at all and *1* indicating a complete vertical incline. The inclines encompassed in this range are *level*, *nearly level*, *very gentle*, *gentle*, *moderate*, *strong*, *very strong*, *extreme*, *steep* and *very steep*.
4. **Mean Heart Rate (BPM) % of Average Maximum Heart Rate**: The average beats per minute of the observed individual’s heart throughout their journey as a percentage of their maximum heart rate. The average maximum heart rate of the individual’s age group can be calculated by subtracting their age from *220* and then the percentage by diving the average heart rate by that number and multiply it by *100*. The range of values measured by the *FIS* for this input is from *0* to *100*% and covers the heart rate ranges, *low*, *target* and *high*.

The completed *Fuzzy Inference System* takes in these four input parameters and using defuzzification, gives a resultant *crisp* output of the observed individuals minimum athleticism.

**Design Considerations:**

One of the main considerations made of the systems design, was to ensure that the resultant output of the individual’s athleticism is always referred to as the *observed* athleticism of the individual, as the observed journey might not have necessarily been an actual form of exercise by the individual and therefore could not be reliably used as a representative of their maximum athletic ability. We can however determine that the individual is athletic enough to complete the journey and therefore that the actual output athleticism is less than or equal to the individual’s actual athleticism.

**System Diagram:**

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**Figure 1:** Diagram of the *Runner Fuzzy Inference System’s* inputs and outputs

**System Inputs Overview**

**Pace (Min per KM):**

The first input into the system is the speed of the induvial observed journey. The faster the person is able to complete the journey, the more athletic they must be. The input of the speed into the system is given as time over distance instead of the traditional distance over time and is the resultant average time it took/would take the individual to travel a single *kilometre* based on the observed journey. The input of the individual’s observed speed from their journey is given as a *pace*, time over distance, as opposed to the traditional definition of speed, distance over time, as *pace* is commonly used within the context of athletes and other runners measuring how fast they were as they prefer to get an immediate “*immediate sense for how long it takes to cover distances*” (SportTracks 2020, Understanding Pace in Running).

The given value for this variable is negatively correlated with the resultant value for the individuals observed athleticism, as we can reasonably assert that the longer it takes for the individual to complete their journey the less athletically straining it must have been. When making this assertion however, we must ensure that we are referring to the individuals speed, or *pace* in this instance, which is irrespective of the overall distance travelled and not just the overall length of the journey, which would be respective of, and hugely affected by, how long the actual journey itself was and could therefore not be reasonably compared against that of another journey.

Whilst the individual’s calculated *pace* value is irrespective of the length of the overall journey, it is still affected by it. This is because the observed individual’s pace is likely to drop over time as they become more worn out and are unable to maintain the same speed they were at the start. An average jogging *pace* is more commendable over a longer journey than shorter one of course. We could potentially use this change in the individual’s *pace* over time as another factor in measuring the athleticism of the observed individual, the less it drops off the more athletic they must be, however, this metric would only be useful for particularly exerting journeys completed either at a fast *pace* or over a long distance, since individuals who were only completing a journey at a moderate pace or over a shorter distance would easily be able to maintain a consistent pace for much longer.

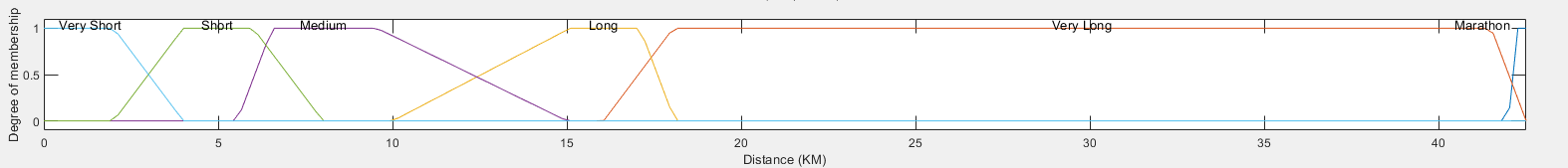


**Figure 2:** A ‘Degree of Membership’ diagram for the range of possible ‘Pace (Min per KM)’ values. Refer to Appendix A1 for a full-size version.

**Distance (KM):**

The second input into the system is the distance, or length, of the individual’s observed journey; specifically the distance which they covered and not the distance between the start and end points of the journey.

The distance travelled in the observed journey is positively correlated with the observed athleticism of the individual. It is of course simply common sense, to assert that the larger the overall distance travelled, the more athletic they must be however, in order for us to be able to infer the actual value of their athleticism, we would need to consider both the distance and the *pace* input. This is because their average *pace* throughout their journey is negatively impacted by its length: an average *pace* of *7:00 min/km* over a *10*-mile journey shows considerably more athleticism than one with a similar *pace* over only 1 mile. A value for either which initially appears to indicate a high level of athleticism can be quickly turned on its head following a less impressive value for the other.



**Figure 3:** A ‘Degree of Membership’ diagram for the range of possible ‘Distance (KM)’ values. Refer to Appendix A1 for a full-size version.

**Average Cumulative Elevation Gain Per KM (KM):**

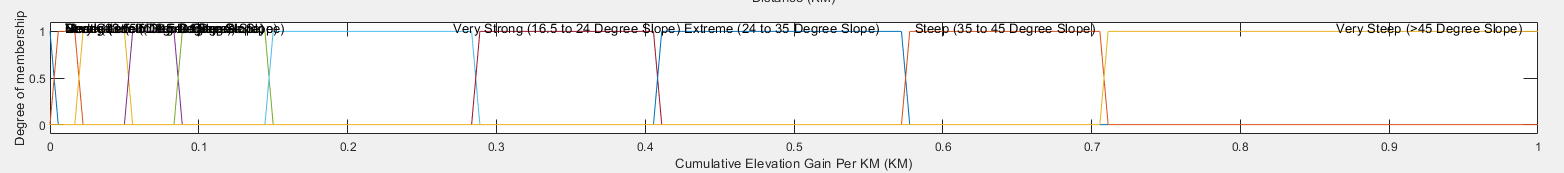
|  |  |
| --- | --- |
| **Degree of Incline** | **Category** |
| 0 | Level |
| 0.3 - 1.1 | Nearly level |
| 1.1 - 3 | Very gentle slope |
| 3 - 5 | Gentle slope |
| 5 - 8.5 | Moderate slope |
| 8.5 - 16.5 | Strong slope |
| 16.5 - 24 | Very strong slope |
| 24 - 35 | Extreme slope |
| 35 - 45 | Steep slope |
| > 45 | Very steep slope |

**Figure 3:** The standard slope descriptors table. Viewable at <https://geographyfieldwork.com/SlopeSteepnessIndex.htm>

The *FIS’s* third input is the average cumulative gain in elevation in *kilometres* per *kilometre*. This value is used to describe the overall incline throughout the route, measured in average total gain in *kilometres* per *kilometre* travelled during the journey.

As we are measuring only the cumulative gain in per *kilometre* travelled by the individual, we can easily determine that the range of acceptable values for this input must be from *0* *kilometre*, representing no gain in elevation at all, to *1* *kilometre*, representing the steepest possible incline of a completely vertical journey. Initially the *FIS* was only going to consider gains of between *0* and *0.8* *kilometres* as it would of course be impossible for anyone to walk or run straight upwards however, it was eventually changed to include this incline to account for the possibility that the individual is climbing up a surface. Indoor wall or free climbing for example.

There are *10* different *crisp* sets being used to categorise the overall elevation gain: *Level (0 to .3 Degree Slope)*, *Nearly Level (.3 to 1.1 Degree Slope)*, *Very Gentle (1.1 to 3 Degree Slope)*, *Gentle (3 to 5 Degree Slope)*, *Moderate (5 to 8.5 Degree Slope)*, *Strong (8.5 to 16.5 Degree Slope)*, *Very Strong (16.5 to 24 Degree Slope)*, *Extreme (24 to 35 Degree Slope)*, *Steep (35 to 45 Degree Slope)* and *Very Steep (>45 Degree Slope)*. The reason that we are able to use crisp sets here is because there is actually exists a list of standard slope descriptors, that are used to categorise the steepness of a slope based on the degree of the incline. Using basic trigonometry, I was able to calculate from the specified degree of incline boundaries for the categories, the amount of elevation that would be gained travelling up such a slope. Using these resultant elevation gains, I was able to define the crisp *membership function* for each set.

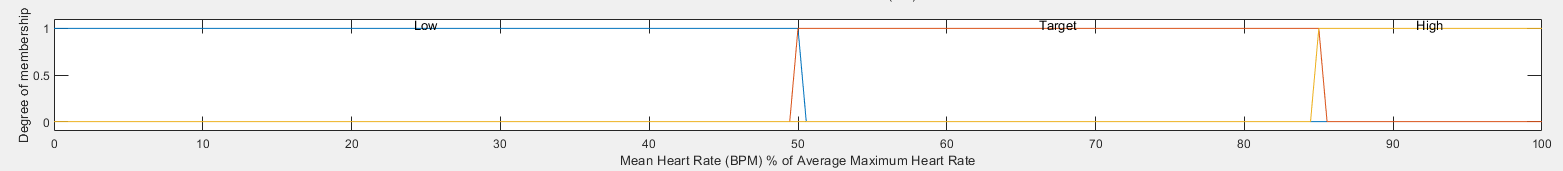


**Figure 5:** A ‘Degree of Membership’ diagram for the range of possible ‘Average Cumulative Elevation Gain Per KM (KM)’ values. Refer to Appendix A1 for a full-size version.

**Mean Heart Rate (BPM) % of Average Maximum Heart Rate:**

The fourth and final *FIS* input is the individual’s mean heart rate, in *beats per minute*, as a *percentage* of their *maximum heart rate*. There are three different possible sets for the heart rate, *low*, *target* and *high*. The *target* set defines the range of acceptable relative *beats per minute* an individual’s heart rate should be within when exercising as advised by the *American Heart Association*: *50%* to *85%*. The *low* and *high* sets define the values outside of this acceptable range.

This input is less obviously associated with the output athleticism than the previous three. The distance, incline and *pace* of the individual throughout the journey all correlate exactly with the output. The longer the distance, the steeper the incline and the quicker the *pace* the more athletic the individual must be. While it’s easy to assume that the individual’s heart rate during the journey is also similarly correlated, as the quicker their heart beats the harder their body must be working, it in fact has a more complex relationship than initially presumed. The *target* set of values for heart rate during exercise, as advised by the *American Heart Association*, is not in fact a goal to be achieved during exercise but instead the acceptable range of possible heart rates a mostly healthy individual would reside in. If an individual’s heart rate is categorised as *low* it doesn’t indicate that they are not exercising very hard, but instead that their heart is not working efficiently and they should consider consulting a doctor. Similarly, a heart rate considered *high* could be achieved during particularly rigorous exercise however, this would not be so much of an achievement for completing such exercise as it would be an alarming indicator that the individuals putting themselves at danger and could potentially be about to collapse. A heart rate within either set is in fact an indicator of particularly low overall athleticism and will negatively impact the final output, while an input of a *target* level heart rate is actually the most common set and has no impact on the output. The purpose of this input is to ensure that those with abnormal heart rates are labelled as having low athleticism.

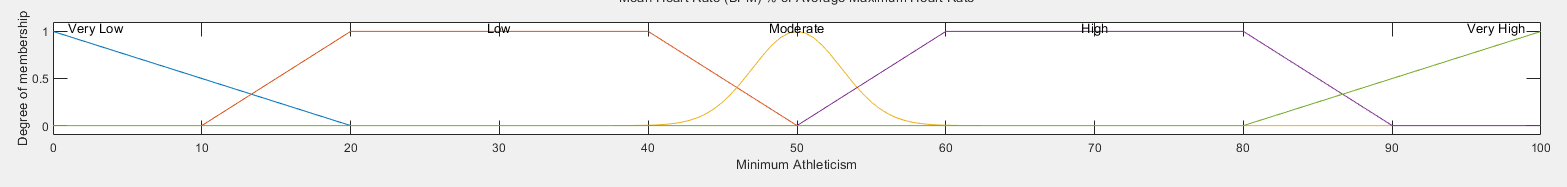


**Figure 6:** A ‘Degree of Membership’ diagram for the range of possible ‘Mean Heart Rate (BPM) % of Average Maximum Heart Rate’ values. Refer to Appendix A1 for a full-size version.

**System Output Overview:**

After considering the input journey *pace*, distance, elevation and the individual’s heart rate, the *FIS* is then able to decide the individuals observed athleticism from the completed journey. As there is no traditionally used scale of athleticism, the system outputs a rating on a scale of *0* to *100*; *0* being the lowest possible level of athleticism and *100* being the highest. Similarly to an IQ test, this athleticism result is intended to maintain a consistent median raw score, *50* in this case, when tested against the population of a norming sample and could therefore be used as a reference point to compare a person’s athleticism against the rest of the world. The completed *FIS* could then be used as a nationally standard method of ranking an individual’s athleticism and have considerable applications in the medical and athletic fields.

As the individual’s final athleticism ranking is presented a completely newly defined scale there are no official definitions or measurements that can be used to categorise the system’s final output. To that end, the scale has been split into five simple descriptor categories that describe the person’s athleticism based on its relative position in the scale. These are *very low*, *low*, *moderate*, *high* and *very high*.



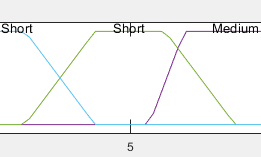
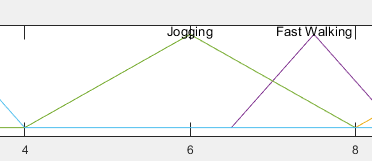
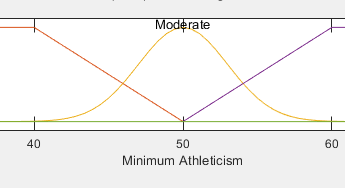
**Figure 7:** A ‘Degree of Membership’ diagram for the range of possible ‘Mean Heart Rate (BPM) % of Average Maximum Heart Rate’ values. Refer to Appendix A1 for a full-size version.

**Design, Testing and Evaluation of Fuzzy-Inference System:**

**Initial System Design:**

The system was entirely developed and tested using the MATLAB R202b software package, a computing-environment with fuzzy logic capabilities. Using MATLAB I was easily able to define both the *fuzzy-inference system* and the various *membership functions* for each of it’s four inputs and overall output using their collective suite of *fuzzy-inference* command line functions. As a more visual alternative to these functions, MATLAB also has *fuzzy logic designer* graphical user interface, that can also be used to create a *FIS* without having to write any code. Due to my own programming background however, I knew that writing the code wouldn’t be a problem and would also allow me to have more direct and intricate control over the system than could be provided by the *GUI*.

The three membership functions used to in the *FIS* are the trapezoidal membership function; used to show a range of values with full membership to a set with sloping edges on either side to show the gradual decline in membership for values outside this range as they move further away from the values with full membership, the triangular membership function; which similarly presents the gradual decline in degree of membership for values moving away from those with full membership however, there is only a single value with full membership and the gaussian membership function which shows the membership degree increasing as the input approaches the full membership value however, instead the membership fluctuates in the shape of a normally distributed *bell-curve* with the change in the degree of membership increasing as the input approaches the full membership value.

**Figure 8a, 8b and 8c:** The trapezoidal, triangular and gaussian membership functions respectively.

**Observations on Rules:**

In order for the *Runner Fuzzy-Inference System* to correctly infer the athleticism of the individual from the provided inputs, it needs a set of clearly defined rules that define the resultant output of the system based on the given series of inputs. There’s a possible *1,080* different combinations of input set combinations to account for: *6* possible *paces*, *6* possible distances, *10* possible cumulative elevation gains and *3* heart rate categories. Fortunately, there doesn’t need to be a unique rule for each of these combinations, as we also have the option to develop generic rules, which don’t consider the value of every input and can therefore handle multiple combinations of inputs. These rules are particularly useful as they reduce the total number of rules within the overall rule base and therefore enable the system to compute the output faster, as there’s less rules to process. A full, linguistic interpretation of the systems rule base is available in Appendix D1.

The first two of these generic rules state that when the individual’s *heart rate* is *high* or *low* their overall athleticism must be *low*. As mentioned earlier, if their heart rate has left the *target* set and entered into either the *high* or *low* sets then this is an indication of abnormality and not a good indicator of how hard they’re working. These are the highest priority rules in the system and therefore cannot be ‘overruled’ by any other combination of inputs that the system might indicate good overall athleticism. No matter the values of the other three inputs, if the heart rate is *high* or *low*, the *FIS* will categorise athletics as *low*.

The other two generic rules state have the second highest priority and state that the distance input is *marathon* the athleticism must be *very high* and when the distance is *very long* the athleticism must be *high*. These rules are used to ensure that athleticism is a high value whenever the individual has travelled a noticeably long distance. Marathon runner often train for between twelve and twenty weeks to complete a marathon and even if they do not manage to jog, or even fast walk, the entire way being able to complete such a distance is always impressive and deserving of a high athleticism rating. Similarly, *very long* distances, while not on the same level as a *marathon*, are also worthy of note and a high athletic rating.

**System Testing Description:**

In order to determine that the created system give the desired outputs when given a list of test inputs. Each test will have a unique combination of inputs and a desired output. The combination of inputs will be fed into the system and the desired output compared against that of the system. If any errors are found, then the *FIS’s* code will be reviewed and continue to be tested until the system works as intended. The table of the input test data is available in Appendix C1.

In order to implement this testing process in as efficient a manner as possible, a spreadsheet file called ‘*FISTestData*’ was created, containing a table of the four input values for each test and the desired output. Each test row in the table also includes another two columns, one for the *FIS* to record the output athleticism of each tested input combination and another that uses an IF statement to compare the desired and resultant outputs and state whether the test was a success or failure. Another table counts the number of errors that have occurred and outputs the final percentage accuracy of the *FIS*.

When first testing the system using the described method, there was a persistent error with the given output data. No matter what the input values were given, it would always output an exact moderate athleticism for the individual of *50*. Fortunately, it became apparent during research into the problem over the internet that arrays in MATLAB begin at an index of *1* not *0* like most other programming languages. The *FIS* was being incorrectly fed the test indexes within the table as an input as it was using the first four values in the row as the inputs and not the four values after the test index. Once the *FIS* code had been altered to fix this problem, the testing process ran properly.

**Tests:**

The first series of tests discovered *18* errors in *FIS* output. When reviewing the instances where these errors occurred in the system, they were all discovered to have an input heart rate within the *target* set. Upon checking the system’s rules it became apparent that the two highest priority rules for setting the athleticism to *low* if either the *heart rate* was *high* or *low* had accidentally been set to set the athleticism to *low* if the *heart rate* was in the actual *target* set. Once the problem had been determined and the rules changed the next set of tests were carried out and the system correctly output every single value.

**Defuzzification Method Testing:**

The above tests and expected tests results were carried out using the *middle of maximum* defuzzification method to find a representative value on the athleticism scale for the chosen output set. This defuzzification method choses the average of the range of values with full membership, membership degree of *1*, to the output set. When first developing the system I chose to use this method as I believed this was the simplest method and most understandable method and after having tested some of the other potential methods, this notion only became further reinforced in my mind, which is why I opted to eventually continue to use it in the completed *FIS*.

The first other defuzzification method tested was *bisector*, a method that picks the value on the scale at which the chosen set can be split into two sections of equal area. This method produced similar results to those when using *mom* as the majority of the sets are symmetrical. This method was decided against as when the non-symmetrical sets were defuzzied, the values became skewed too much away from the middle to the extent that they were no longer fully representative of the set.

The next method tested was *centroid*, which choses the *centre of gravity* of the set. This often-produced similar results to *bisector*, and I again chose not to use it as I believed it skewed the representation of the set too much. It was this realisation of not wanting to skew the overall representation of the set, which motivated me to not pick *smallest* or *largest of maximum* either, methods that chose the smallest and largest values with full membership to the set and decided that the best method was *mom*, the one I’d originally implemented.

**Critical Reflection:**

Having reviewed my completed system I believe that the developed *FIS* can be used to accurately determine the athleticism of a person based on an observed journey they’ve made. Fixing errors in the code turned out to be relatively easy to do as the logic used by the system was evident and understandable throughout, and the only mistakes made were transcription errors when defining some of the rules.

If I was given more time to go back over and improve on the *FIS* I would want to include even more inputs into the system to improve the accuracy of the final output. One input I as a runner had originally wanted to include but, never really decided on how best to represent it was the type of terrain throughout the journey. Running on softer surfaces such as grass use more effort to push off from during the stride of a run and are therefore tougher to complete than similar runs carried out on concrete or track. There are also multiple other small factors that can impact the individual throughout the journey such as the type of shoes their wearing, the temperature, their hydration and even if they might be fatigued still from another previous exercise and not able to push themselves as hard as they potentially could.

As previously mentioned, I believe that a system such as this could easily find use out in the world. Medical practitioners could use it as a given standardized test to determine a person’s athleticism and therefore if they are at risk of certain viruses or heart conditions. Athletes could also use it to rate and compare themselves against their previous runs if their training sessions varied in distance and elevation.

**End Conclusion:**

Overall, developing this system was definitely an enjoyable and interesting learning experience as I was able to apply my own knowledge in fuzzy logic systems to a favourite hobby of mine and gain a deeper understanding of both. I now also have a system that I can use to rate my own runs and compare my overall progression and hopeful increase in overall fitness. The system doesn’t use as many inputs as I perhaps would have liked it to however, I believe that the four it does are the most important factors on the overall athletic ability needed to complete such a journey and limiting the number of inputs to what I did has definitely helped to reduce the overall complexity of the system.

**Bibliography:**

* *SportTracks 2020, Understanding Pace in Running, SportTracks, viewed 28th December 2020,* https://sporttracks.mobi/blog/understanding-pace-in-running

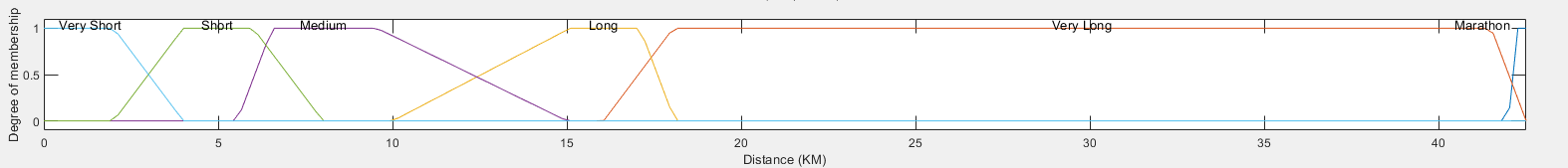
**Appendices:**

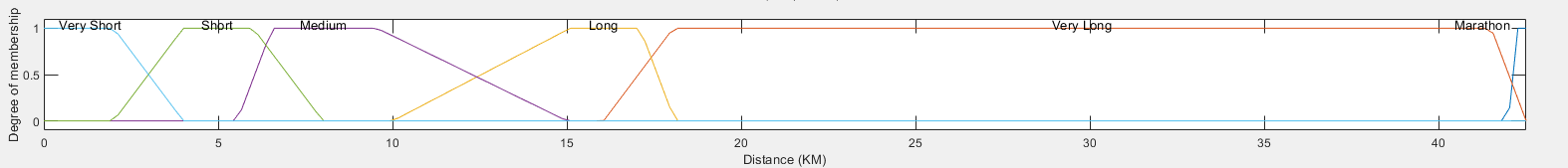
**A1)** Full Size System Input Membership Degree Diagrams:



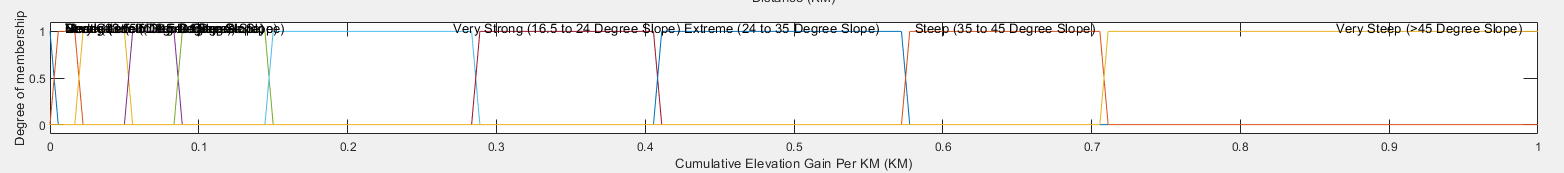
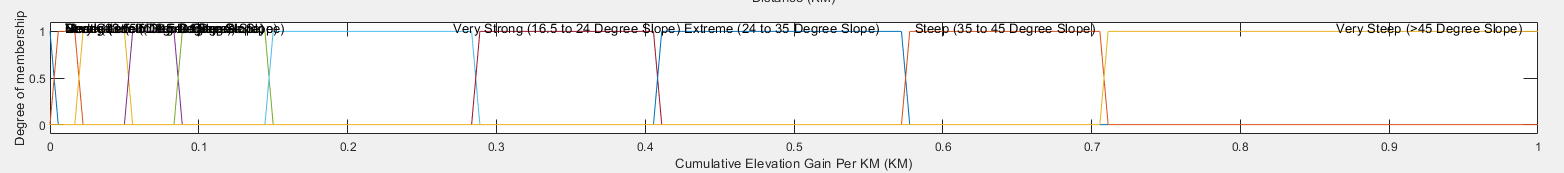


**Figure 2:** A ‘Degree of Membership’ diagram for the range of possible ‘Pace (Min/KM)’ values. The mapped fuzzy speed sets are: *Sprinting*, *Jogging*, *Fast Walking*, *Slow Walking*, *Walking* and *Crawling*.

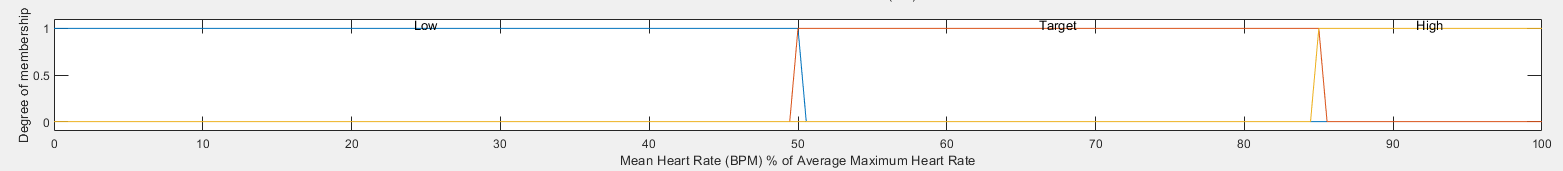


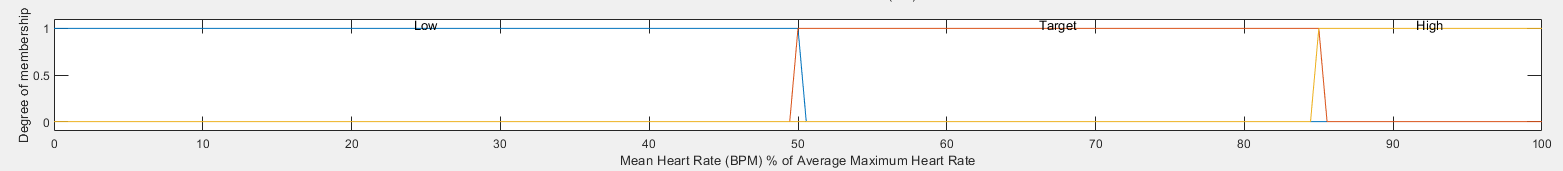


**Figure 3:** A ‘Degree of Membership’ diagram for the range of possible ‘Distance (KM)’ values. The mapped fuzzy distance sets are: *Very Short*, *Short*, *Medium*, *Long*, *Very Long* and *Marathon*.



**Figure 5:** A ‘Degree of Membership’ diagram for the range of possible ‘Cumulative Elevation Gain Per KM (KM)’ values. The mapped fuzzy elevation gain sets are: *Level* *(0 to .3 Degree Slope)*, *Nearly Level (.3 to 1.1 Degree Slope)*, *Very Gentle (1.1 to 3 Degree Slope)*, *Gentle (3 to 5 Degree Slope)*, *Moderate (5 to 8.5 Degree Slope)*, *Strong (8.5 to 16.5 Degree Slope)*, *Very Strong (16.5 to 24 Degree Slope)*, *Extreme (24 to 35 Degree Slope)*, *Steep (35 to 45 Degree Slope)* and *Very Steep* *(>45 Degree Slope)*. The first six set’s title overlap in the above diagram due to how closely together and comparatively small they are compared to the last five sets.





**Figure 6:** A ‘Degree of Membership’ diagram for the range of possible ‘Mean Heart Rate (BPM) % of Average Maximum Heart Rate’ values. The mapped fuzzy Heart Rate sets are: *Low*, *Target* and *High*.

**B1)** Full Code Listing:

% Clear the Command Window

clc

% Get Input Values From Spreadsheet

InputSpreadsheet = ('FISTestData.xlsx');

TestInputs = xlsread(InputSpreadsheet);

% Define a Fuzzy Inference System, Called 'Jog Rater'

JogRaterFIS = newfis('Jog Rater');

% Define the inputs for the Jog Rater FIS: 'Pace (Min per KM)', 'Distance (KM)', 'Cumulative Elevation Gain Per KM (KM)' and 'Mean Heart Rate (BPM) % of Average Maximum Heart Rate'

JogRaterFIS = addvar(JogRaterFIS, 'input', 'Pace (Min per KM)', [0 18]);

JogRaterFIS = addvar(JogRaterFIS, 'input', 'Distance (KM)', [0 42.5]);

JogRaterFIS = addvar(JogRaterFIS, 'input', 'Cumulative Elevation Gain Per KM (KM)', [0 1]);

JogRaterFIS = addvar(JogRaterFIS, 'input', 'Mean Heart Rate (BPM) % of Average Maximum Heart Rate', [0 100]);

% Define the Output (Athleticism)

JogRaterFIS = addvar(JogRaterFIS, 'output', 'Minimum Athleticism', [0 100]);

% Define Membership Functions for the 'Pace (Min per KM)' Input

JogRaterFIS = addmf(JogRaterFIS, 'input', 1, 'Crawling', 'trapmf', [14.6 15.6 17.6 18.6]);

JogRaterFIS = addmf(JogRaterFIS, 'input', 1, 'Slow Walking', 'trapmf', [9 10 12 13]);

JogRaterFIS = addmf(JogRaterFIS, 'input', 1, 'Walking', 'trapmf', [8 10 14 16]);

JogRaterFIS = addmf(JogRaterFIS, 'input', 1, 'Fast Walking', 'trimf', [6.5 7.5 8.5]);

JogRaterFIS = addmf(JogRaterFIS, 'input', 1, 'Jogging', 'trimf', [4 6 8]);

JogRaterFIS = addmf(JogRaterFIS, 'input', 1, 'Sprinting', 'trapmf', [0 0 3 4]);

% Define Membership Functions for the 'Distance (KM)' Input

JogRaterFIS = addmf(JogRaterFIS, 'input', 2, 'Marathon', 'trapmf', [42 42.195 42.5 42.5]);

JogRaterFIS = addmf(JogRaterFIS, 'input', 2, 'Very Long', 'trapmf', [16.047 18.047 41.5 42.5]);

JogRaterFIS = addmf(JogRaterFIS, 'input', 2, 'Long', 'trapmf', [10 15.094 17.094 18.094]);

JogRaterFIS = addmf(JogRaterFIS, 'input', 2, 'Medium', 'trapmf', [5.547 6.547 9.547 15]);

JogRaterFIS = addmf(JogRaterFIS, 'input', 2, 'Short', 'trapmf', [2 4 6 8]);

JogRaterFIS = addmf(JogRaterFIS, 'input', 2, 'Very Short', 'trapmf', [0 0 2 4]);

% Define Membership Functions for the 'Average Cumulative Elevation Gain Per KM (KM)' Input

JogRaterFIS = addmf(JogRaterFIS, 'input', 3, 'Level (0 to .3 Degree Slope)', 'trapmf', [0 0 0.00523596383141958 0.00523596383141958]);

JogRaterFIS = addmf(JogRaterFIS, 'input', 3, 'Nearly Level (.3 to 1.1 Degree Slope)', 'trapmf', [0.00523596383141958 0.00523596383141958 0.01919744239968967 0.01919744239968967]);

JogRaterFIS = addmf(JogRaterFIS, 'input', 3, 'Very Gentle (1.1 to 3 Degree Slope)', 'trapmf', [0.01919744239968967 0.01919744239968967 0.052335956242943835 0.052335956242943835]);

JogRaterFIS = addmf(JogRaterFIS, 'input', 3, 'Gentle (3 to 5 Degree Slope)', 'trapmf', [0.052335956242943835 0.052335956242943835 0.08715574274765817 0.08715574274765817]);

JogRaterFIS = addmf(JogRaterFIS, 'input', 3, 'Moderate (5 to 8.5 Degree Slope)', 'trapmf', [0.08715574274765817 0.08715574274765817 0.14780941112961063 0.14780941112961063]);

JogRaterFIS = addmf(JogRaterFIS, 'input', 3, 'Strong (8.5 to 16.5 Degree Slope)', 'trapmf', [0.14780941112961063 0.14780941112961063 0.28401534470392265 0.28401534470392265]);

JogRaterFIS = addmf(JogRaterFIS, 'input', 3, 'Very Strong (16.5 to 24 Degree Slope)', 'trapmf', [0.28401534470392265 0.28401534470392265 0.4067366430758002 0.4067366430758002]);

JogRaterFIS = addmf(JogRaterFIS, 'input', 3, 'Extreme (24 to 35 Degree Slope)', 'trapmf', [0.4067366430758002 0.4067366430758002 0.573576436351046 0.573576436351046]);

JogRaterFIS = addmf(JogRaterFIS, 'input', 3, 'Steep (35 to 45 Degree Slope)', 'trapmf', [0.573576436351046 0.573576436351046 0.7071067811865475 0.7071067811865475]);

JogRaterFIS = addmf(JogRaterFIS, 'input', 3, 'Very Steep (>45 Degree Slope)', 'trapmf', [0.7071067811865475 0.7071067811865475 1 1]);

% Define Membership Functions for the 'Mean Heart Rate (BPM) % of Average Maximum Heart Rate' Input

JogRaterFIS = addmf(JogRaterFIS, 'input', 4, 'Low', 'trapmf', [0 0 50 50]);

JogRaterFIS = addmf(JogRaterFIS, 'input', 4, 'Target', 'trapmf', [50 50 85 85]);

JogRaterFIS = addmf(JogRaterFIS, 'input', 4, 'High', 'trapmf', [85 85 100 100]);

% Define Membership Functions for the 'Observed Athleticism' Output

JogRaterFIS = addmf(JogRaterFIS, 'output', 1, 'Very Low', 'trimf', [0 0 20]);

JogRaterFIS = addmf(JogRaterFIS, 'output', 1, 'Low', 'trapmf', [10 20 40 50]);

JogRaterFIS = addmf(JogRaterFIS, 'output', 1, 'Moderate', 'gaussmf', [3 50]);

JogRaterFIS = addmf(JogRaterFIS, 'output', 1, 'High', 'trapmf', [50 60 80 90]);

JogRaterFIS = addmf(JogRaterFIS, 'output', 1, 'Very High', 'trimf', [80 100 100]);

% Plot the Membership Functions of the Inputs to the TipFIS on a Graph

figure('Name','Tip % Fuzzy Inference System','NumberTitle','off');

% Define System Rule Base

% Abstract Rules

rule1 = [0 0 0 1 2 1 1]; % If Heart Rate is Low then Athleticism is Low

rule2 = [0 0 0 3 2 1 1]; % If Heart Rate is High then Athleticism is Low

rule5 = [0 1 0 0 5 0.8 1]; % If Distance is Marathon then Athleticism is Very High

rule6 = [0 2 0 0 4 0.8 1]; % If Distance is Very Long then Athleticism is High

% Specific Rules (All use Heart Rate of Target))

% If (Pace = Crawling) and (Distance = Long)

rule7 = [1 3 1 2 3 0.6 1]; % Elevation = Level

rule8 = [1 3 2 2 3 0.6 1]; % Elevation = Nearly Level

rule9 = [1 3 3 2 3 0.6 1]; % Elevation = Very Gentle

rule10 = [1 3 4 2 3 0.6 1]; % Elevation = Gentle

rule11 = [1 3 5 2 4 0.6 1]; % Elevation = Moderate

rule12 = [1 3 6 2 4 0.6 1]; % Elevation = Strong

rule13 = [1 3 7 2 4 0.6 1]; % Elevation = Very Strong

rule14 = [1 3 8 2 4 0.6 1]; % Elevation = Extreme

rule15 = [1 3 9 2 5 0.6 1]; % Elevation = Steep

rule16 = [1 3 10 2 5 0.6 1]; % Elevation = Very Steep

% If (Pace = Slow Walking) and (Distance = Long)

rule17 = [2 3 1 2 3 0.6 1]; % Elevation = Level

rule18 = [2 3 2 2 3 0.6 1]; % Elevation = Nearly Level

rule19 = [2 3 3 2 3 0.6 1]; % Elevation = Very Gentle

rule20 = [2 3 4 2 3 0.6 1]; % Elevation = Gentle

rule21 = [2 3 5 2 4 0.6 1]; % Elevation = Moderate

rule22 = [2 3 6 2 4 0.6 1]; % Elevation = Strong

rule23 = [2 3 7 2 4 0.6 1]; % Elevation = Very Strong

rule24 = [2 3 8 2 4 0.6 1]; % Elevation = Extreme

rule25 = [2 3 9 2 5 0.6 1]; % Elevation = Steep

rule26 = [2 3 10 2 5 0.6 1]; % Elevation = Very Steep

% If (Pace = Walking) and (Distance = Long)

rule27 = [3 3 1 2 3 0.6 1]; % Elevation = Level

rule28 = [3 3 2 2 3 0.6 1]; % Elevation = Nearly Level

rule29 = [3 3 3 2 3 0.6 1]; % Elevation = Very Gentle

rule30 = [3 3 4 2 4 0.6 1]; % Elevation = Gentle

rule31 = [3 3 5 2 4 0.6 1]; % Elevation = Moderate

rule32 = [3 3 6 2 4 0.6 1]; % Elevation = Strong

rule33 = [3 3 7 2 4 0.6 1]; % Elevation = Very Strong

rule34 = [3 3 8 2 4 0.6 1]; % Elevation = Extreme

rule35 = [3 3 9 2 5 0.6 1]; % Elevation = Steep

rule36 = [3 3 10 2 5 0.6 1]; % Elevation = Very Steep

% If (Pace = Fast Walking) and (Distance = Long)

rule37 = [4 3 1 2 3 0.6 1]; % Elevation = Level

rule38 = [4 3 2 2 3 0.6 1]; % Elevation = Nearly Level

rule39 = [4 3 3 2 3 0.6 1]; % Elevation = Very Gentle

rule40 = [4 3 4 2 4 0.6 1]; % Elevation = Gentle

rule41 = [4 3 5 2 4 0.6 1]; % Elevation = Moderate

rule42 = [4 3 6 2 5 0.6 1]; % Elevation = Strong

rule43 = [4 3 7 2 5 0.6 1]; % Elevation = Very Strong

rule44 = [4 3 8 2 5 0.6 1]; % Elevation = Extreme

rule45 = [4 3 9 2 5 0.6 1]; % Elevation = Steep

rule46 = [4 3 10 2 5 0.6 1]; % Elevation = Very Steep

% If (Pace = Jogging) and (Distance = Long)

rule47 = [5 3 1 2 4 0.6 1]; % Elevation = Level

rule48 = [5 3 2 2 4 0.6 1]; % Elevation = Nearly Level

rule49 = [5 3 3 2 4 0.6 1]; % Elevation = Very Gentle

rule50 = [5 3 4 2 4 0.6 1]; % Elevation = Gentle

rule51 = [5 3 5 2 5 0.6 1]; % Elevation = Moderate

rule52 = [5 3 6 2 5 0.6 1]; % Elevation = Strong

rule53 = [5 3 7 2 5 0.6 1]; % Elevation = Very Strong

rule54 = [5 3 8 2 5 0.6 1]; % Elevation = Extreme

rule55 = [5 3 9 2 5 0.6 1]; % Elevation = Steep

rule56 = [5 3 10 2 5 0.6 1]; % Elevation = Very Steep

% If (Pace = Sprinting) and (Distance = Long)

rule57 = [6 3 1 2 5 0.6 1]; % Elevation = Level

rule58 = [6 3 2 2 5 0.6 1]; % Elevation = Nearly Level

rule59 = [6 3 3 2 5 0.6 1]; % Elevation = Very Gentle

rule60 = [6 3 4 2 5 0.6 1]; % Elevation = Gentle

rule61 = [6 3 5 2 5 0.6 1]; % Elevation = Moderate

rule62 = [6 3 6 2 5 0.6 1]; % Elevation = Strong

rule63 = [6 3 7 2 5 0.6 1]; % Elevation = Very Strong

rule64 = [6 3 8 2 5 0.6 1]; % Elevation = Extreme

rule65 = [6 3 9 2 5 0.6 1]; % Elevation = Steep

rule66 = [6 3 10 2 5 0.6 1]; % Elevation = Very Steep

% If (Pace = Crawling) and (Distance = Medium)

rule67 = [1 4 1 2 3 0.6 1]; % Elevation = Level

rule68 = [1 4 2 2 3 0.6 1]; % Elevation = Nearly Level

rule69 = [1 4 3 2 3 0.6 1]; % Elevation = Very Gentle

rule70 = [1 4 4 2 3 0.6 1]; % Elevation = Gentle

rule71 = [1 4 5 2 4 0.6 1]; % Elevation = Moderate

rule72 = [1 4 6 2 4 0.6 1]; % Elevation = Strong

rule73 = [1 4 7 2 4 0.6 1]; % Elevation = Very Strong

rule74 = [1 4 8 2 4 0.6 1]; % Elevation = Extreme

rule75 = [1 4 9 2 5 0.6 1]; % Elevation = Steep

rule76 = [1 4 10 2 5 0.6 1]; % Elevation = Very Steep

% If (Pace = Slow Walking) and (Distance = Medium)

rule77 = [2 4 1 2 3 0.6 1]; % Elevation = Level

rule78 = [2 4 2 2 3 0.6 1]; % Elevation = Nearly Level

rule79 = [2 4 3 2 3 0.6 1]; % Elevation = Very Gentle

rule80 = [2 4 4 2 3 0.6 1]; % Elevation = Gentle

rule81 = [2 4 5 2 4 0.6 1]; % Elevation = Moderate

rule82 = [2 4 6 2 4 0.6 1]; % Elevation = Strong

rule83 = [2 4 7 2 4 0.6 1]; % Elevation = Very Strong

rule84 = [2 4 8 2 4 0.6 1]; % Elevation = Extreme

rule85 = [2 4 9 2 5 0.6 1]; % Elevation = Steep

rule86 = [2 4 10 2 5 0.6 1]; % Elevation = Very Steep

% If (Pace = Walking) and (Distance = Medium)

rule87 = [3 4 1 2 3 0.6 1]; % Elevation = Level

rule88 = [3 4 2 2 3 0.6 1]; % Elevation = Nearly Level

rule89 = [3 4 3 2 3 0.6 1]; % Elevation = Very Gentle

rule90 = [3 4 4 2 4 0.6 1]; % Elevation = Gentle

rule91 = [3 4 5 2 4 0.6 1]; % Elevation = Moderate

rule92 = [3 4 6 2 4 0.6 1]; % Elevation = Strong

rule93 = [3 4 7 2 4 0.6 1]; % Elevation = Very Strong

rule94 = [3 4 8 2 4 0.6 1]; % Elevation = Extreme

rule95 = [3 4 9 2 5 0.6 1]; % Elevation = Steep

rule96 = [3 4 10 2 5 0.6 1]; % Elevation = Very Steep

% If (Pace = Fast Walking) and (Distance = Medium)

rule97 = [4 4 1 2 3 0.6 1]; % Elevation = Level

rule98 = [4 4 2 2 3 0.6 1]; % Elevation = Nearly Level

rule99 = [4 4 3 2 3 0.6 1]; % Elevation = Very Gentle

rule100 = [4 4 4 2 4 0.6 1]; % Elevation = Gentle

rule101 = [4 4 5 2 4 0.6 1]; % Elevation = Moderate

rule102 = [4 4 6 2 5 0.6 1]; % Elevation = Strong

rule103 = [4 4 7 2 5 0.6 1]; % Elevation = Very Strong

rule104 = [4 4 8 2 5 0.6 1]; % Elevation = Extreme

rule105 = [4 4 9 2 5 0.6 1]; % Elevation = Steep

rule106 = [4 4 10 2 5 0.6 1]; % Elevation = Very Steep

% If (Pace = Jogging) and (Distance = Medium)

rule107 = [5 4 1 2 4 0.6 1]; % Elevation = Level

rule108 = [5 4 2 2 4 0.6 1]; % Elevation = Nearly Level

rule109 = [5 4 3 2 4 0.6 1]; % Elevation = Very Gentle

rule110 = [5 4 4 2 4 0.6 1]; % Elevation = Gentle

rule111 = [5 4 5 2 5 0.6 1]; % Elevation = Moderate

rule112 = [5 4 6 2 5 0.6 1]; % Elevation = Strong

rule113 = [5 4 7 2 5 0.6 1]; % Elevation = Very Strong

rule114 = [5 4 8 2 5 0.6 1]; % Elevation = Extreme

rule115 = [5 4 9 2 5 0.6 1]; % Elevation = Steep

rule116 = [5 4 10 2 5 0.6 1]; % Elevation = Very Steep

% If (Pace = Sprinting) and (Distance = Medium)

rule117 = [6 4 1 2 4 0.6 1]; % Elevation = Level

rule118 = [6 4 2 2 4 0.6 1]; % Elevation = Nearly Level

rule119 = [6 4 3 2 4 0.6 1]; % Elevation = Very Gentle

rule120 = [6 4 4 2 5 0.6 1]; % Elevation = Gentle

rule121 = [6 4 5 2 5 0.6 1]; % Elevation = Moderate

rule122 = [6 4 6 2 5 0.6 1]; % Elevation = Strong

rule123 = [6 4 7 2 5 0.6 1]; % Elevation = Very Strong

rule124 = [6 4 8 2 5 0.6 1]; % Elevation = Extreme

rule125 = [6 4 9 2 5 0.6 1]; % Elevation = Steep

rule126 = [6 4 10 2 5 0.6 1]; % Elevation = Very Steep

% If (Pace = Crawling) and (Distance = Short)

rule127 = [1 5 1 2 1 0.6 1]; % Elevation = Level

rule128 = [1 5 2 2 1 0.6 1]; % Elevation = Nearly Level

rule129 = [1 5 3 2 1 0.6 1]; % Elevation = Very Gentle

rule130 = [1 5 4 2 1 0.6 1]; % Elevation = Gentle

rule131 = [1 5 5 2 2 0.6 1]; % Elevation = Moderate

rule132 = [1 5 6 2 2 0.6 1]; % Elevation = Strong

rule133 = [1 5 7 2 3 0.6 1]; % Elevation = Very Strong

rule134 = [1 5 8 2 3 0.6 1]; % Elevation = Extreme

rule135 = [1 5 9 2 3 0.6 1]; % Elevation = Steep

rule136 = [1 5 10 2 4 0.6 1]; % Elevation = Very Steep

% If (Pace = Slow Walking) and (Distance = Short)

rule137 = [2 5 1 2 2 0.6 1]; % Elevation = Level

rule138 = [2 5 2 2 2 0.6 1]; % Elevation = Nearly Level

rule139 = [2 5 3 2 2 0.6 1]; % Elevation = Very Gentle

rule140 = [2 5 4 2 3 0.6 1]; % Elevation = Gentle

rule141 = [2 5 5 2 3 0.6 1]; % Elevation = Moderate

rule142 = [2 5 6 2 3 0.6 1]; % Elevation = Strong

rule143 = [2 5 7 2 3 0.6 1]; % Elevation = Very Strong

rule144 = [2 5 8 2 3 0.6 1]; % Elevation = Extreme

rule145 = [2 5 9 2 4 0.6 1]; % Elevation = Steep

rule146 = [2 5 10 2 4 0.6 1]; % Elevation = Very Steep

% If (Pace = Walking) and (Distance = Short)

rule147 = [3 5 1 2 3 0.6 1]; % Elevation = Level

rule148 = [3 5 2 2 3 0.6 1]; % Elevation = Nearly Level

rule149 = [3 5 3 2 3 0.6 1]; % Elevation = Very Gentle

rule150 = [3 5 4 2 3 0.6 1]; % Elevation = Gentle

rule151 = [3 5 5 2 3 0.6 1]; % Elevation = Moderate

rule152 = [3 5 6 2 3 0.6 1]; % Elevation = Strong

rule153 = [3 5 7 2 4 0.6 1]; % Elevation = Very Strong

rule154 = [3 5 8 2 4 0.6 1]; % Elevation = Extreme

rule155 = [3 5 9 2 4 0.6 1]; % Elevation = Steep

rule156 = [3 5 10 2 5 0.6 1]; % Elevation = Very Steep

% If (Pace = Fast Walking) and (Distance = Short)

rule157 = [4 5 1 2 3 0.6 1]; % Elevation = Level

rule158 = [4 5 2 2 3 0.6 1]; % Elevation = Nearly Level

rule159 = [4 5 3 2 3 0.6 1]; % Elevation = Very Gentle

rule160 = [4 5 4 2 3 0.6 1]; % Elevation = Gentle

rule161 = [4 5 5 2 4 0.6 1]; % Elevation = Moderate

rule162 = [4 5 6 2 4 0.6 1]; % Elevation = Strong

rule163 = [4 5 7 2 4 0.6 1]; % Elevation = Very Strong

rule164 = [4 5 8 2 5 0.6 1]; % Elevation = Extreme

rule165 = [4 5 9 2 5 0.6 1]; % Elevation = Steep

rule166 = [4 5 10 2 5 0.6 1]; % Elevation = Very Steep

% If (Pace = Jogging) and (Distance = Short)

rule167 = [5 5 1 2 3 0.6 1]; % Elevation = Level

rule168 = [5 5 2 2 3 0.6 1]; % Elevation = Nearly Level

rule169 = [5 5 3 2 3 0.6 1]; % Elevation = Very Gentle

rule170 = [5 5 4 2 3 0.6 1]; % Elevation = Gentle

rule171 = [5 5 5 2 4 0.6 1]; % Elevation = Moderate

rule172 = [5 5 6 2 4 0.6 1]; % Elevation = Strong

rule173 = [5 5 7 2 5 0.6 1]; % Elevation = Very Strong

rule174 = [5 5 8 2 5 0.6 1]; % Elevation = Extreme

rule175 = [5 5 9 2 5 0.6 1]; % Elevation = Steep

rule176 = [5 5 10 2 5 0.6 1]; % Elevation = Very Steep

% If (Pace = Sprinting) and (Distance = Short)

rule177 = [6 5 1 2 3 0.6 1]; % Elevation = Level

rule178 = [6 5 2 2 3 0.6 1]; % Elevation = Nearly Level

rule179 = [6 5 3 2 3 0.6 1]; % Elevation = Very Gentle

rule180 = [6 5 4 2 4 0.6 1]; % Elevation = Gentle

rule181 = [6 5 5 2 4 0.6 1]; % Elevation = Moderate

rule182 = [6 5 6 2 5 0.6 1]; % Elevation = Strong

rule183 = [6 5 7 2 5 0.6 1]; % Elevation = Very Strong

rule184 = [6 5 8 2 5 0.6 1]; % Elevation = Extreme

rule185 = [6 5 9 2 5 0.6 1]; % Elevation = Steep

rule186 = [6 5 10 2 5 0.6 1]; % Elevation = Very Steep

% If (Pace = Crawling) and (Distance = Very Short)

rule187 = [1 6 1 2 1 0.6 1]; % Elevation = Level

rule188 = [1 6 2 2 1 0.6 1]; % Elevation = Nearly Level

rule189 = [1 6 3 2 1 0.6 1]; % Elevation = Very Gentle

rule190 = [1 6 4 2 1 0.6 1]; % Elevation = Gentle

rule191 = [1 6 5 2 2 0.6 1]; % Elevation = Moderate

rule192 = [1 6 6 2 2 0.6 1]; % Elevation = Strong

rule193 = [1 6 7 2 3 0.6 1]; % Elevation = Very Strong

rule194 = [1 6 8 2 3 0.6 1]; % Elevation = Extreme

rule195 = [1 6 9 2 3 0.6 1]; % Elevation = Steep

rule196 = [1 6 10 2 3 0.6 1]; % Elevation = Very Steep

% If (Pace = Slow Walking) and (Distance = Very Short)

rule197 = [2 6 1 2 1 0.6 1]; % Elevation = Level

rule198 = [2 6 2 2 1 0.6 1]; % Elevation = Nearly Level

rule199 = [2 6 3 2 2 0.6 1]; % Elevation = Very Gentle

rule200 = [2 6 4 2 2 0.6 1]; % Elevation = Gentle

rule201 = [2 6 5 2 3 0.6 1]; % Elevation = Moderate

rule202 = [2 6 6 2 3 0.6 1]; % Elevation = Strong

rule203 = [2 6 7 2 3 0.6 1]; % Elevation = Very Strong

rule204 = [2 6 8 2 3 0.6 1]; % Elevation = Extreme

rule205 = [2 6 9 2 3 0.6 1]; % Elevation = Steep

rule206 = [2 6 10 2 3 0.6 1]; % Elevation = Very Steep

% If (Pace = Walking) and (Distance = Very Short)

rule207 = [3 6 1 2 2 0.6 1]; % Elevation = Level

rule208 = [3 6 2 2 2 0.6 1]; % Elevation = Nearly Level

rule209 = [3 6 3 2 3 0.6 1]; % Elevation = Very Gentle

rule210 = [3 6 4 2 3 0.6 1]; % Elevation = Gentle

rule211 = [3 6 5 2 3 0.6 1]; % Elevation = Moderate

rule212 = [3 6 6 2 3 0.6 1]; % Elevation = Strong

rule213 = [3 6 7 2 3 0.6 1]; % Elevation = Very Strong

rule214 = [3 6 8 2 3 0.6 1]; % Elevation = Extreme

rule215 = [3 6 9 2 4 0.6 1]; % Elevation = Steep

rule216 = [3 6 10 2 4 0.6 1]; % Elevation = Very Steep

% If (Pace = Fast Walking) and (Distance = Very Short)

rule217 = [4 6 1 2 3 0.6 1]; % Elevation = Level

rule218 = [4 6 2 2 3 0.6 1]; % Elevation = Nearly Level

rule219 = [4 6 3 2 3 0.6 1]; % Elevation = Very Gentle

rule220 = [4 6 4 2 3 0.6 1]; % Elevation = Gentle

rule221 = [4 6 5 2 3 0.6 1]; % Elevation = Moderate

rule222 = [4 6 6 2 3 0.6 1]; % Elevation = Strong

rule223 = [4 6 7 2 4 0.6 1]; % Elevation = Very Strong

rule224 = [4 6 8 2 4 0.6 1]; % Elevation = Extreme

rule225 = [4 6 9 2 4 0.6 1]; % Elevation = Steep

rule226 = [4 6 10 2 4 0.6 1]; % Elevation = Very Steep

% If (Pace = Jogging) and (Distance = Very Short)

rule227 = [5 6 1 2 3 0.6 1]; % Elevation = Level

rule228 = [5 6 2 2 3 0.6 1]; % Elevation = Nearly Level

rule229 = [5 6 3 2 3 0.6 1]; % Elevation = Very Gentle

rule230 = [5 6 4 2 3 0.6 1]; % Elevation = Gentle

rule231 = [5 6 5 2 3 0.6 1]; % Elevation = Moderate

rule232 = [5 6 6 2 4 0.6 1]; % Elevation = Strong

rule233 = [5 6 7 2 4 0.6 1]; % Elevation = Very Strong

rule234 = [5 6 8 2 4 0.6 1]; % Elevation = Extreme

rule235 = [5 6 9 2 4 0.6 1]; % Elevation = Steep

rule236 = [5 6 10 2 4 0.6 1]; % Elevation = Very Steep

% If (Pace = Sprinting) and (Distance = Very Short)

rule237 = [6 6 1 2 3 0.6 1]; % Elevation = Level

rule238 = [6 6 2 2 3 0.6 1]; % Elevation = Nearly Level

rule239 = [6 6 3 2 3 0.6 1]; % Elevation = Very Gentle

rule240 = [6 6 4 2 3 0.6 1]; % Elevation = Gentle

rule241 = [6 6 5 2 4 0.6 1]; % Elevation = Moderate

rule242 = [6 6 6 2 4 0.6 1]; % Elevation = Strong

rule243 = [6 6 7 2 4 0.6 1]; % Elevation = Very Strong

rule244 = [6 6 8 2 4 0.6 1]; % Elevation = Extreme

rule245 = [6 6 9 2 4 0.6 1]; % Elevation = Steep

rule246 = [6 6 10 2 4 0.6 1]; % Elevation = Very Steep

% Make Rule List

rulelist = [rule1; rule2; rule5; rule6; rule7; rule8;...

rule9; rule10; rule11; rule12; rule13; rule14; rule15; rule16;...

rule17; rule18; rule19; rule20; rule21; rule22; rule23; rule24;...

rule25; rule26; rule27; rule28; rule29; rule30; rule31; rule32;...

rule33; rule34; rule35; rule36; rule37; rule38; rule39; rule40;...

rule41; rule42; rule43; rule44; rule45; rule46; rule47; rule48;...

rule49; rule50; rule51; rule52; rule53; rule54; rule55; rule56;...

rule57; rule58; rule59; rule60; rule61; rule62; rule63; rule64;...

rule65; rule66; rule67; rule68; rule69; rule70; rule71; rule72;...

rule73; rule74; rule75; rule76; rule77; rule78; rule79; rule80; rule81;...

rule82; rule83; rule84; rule85; rule86; rule87; rule88; rule89;...

rule90; rule91; rule92; rule93; rule94; rule95; rule96; rule97;...

rule98; rule99; rule100; rule101; rule102; rule103; rule104;...

rule105; rule106; rule107; rule108; rule109; rule110; rule111;...

rule112; rule113; rule114; rule115; rule116; rule117; rule118;...

rule119; rule120; rule121; rule122; rule123; rule124; rule125;...

rule126; rule127; rule128; rule129; rule130; rule131; rule132;...

rule133; rule134; rule135; rule136; rule137; rule138; rule139;...

rule140; rule141; rule142; rule143; rule144; rule145; rule146;...

rule147; rule148; rule149; rule150; rule151; rule152; rule153;...

rule154; rule155; rule156; rule157; rule158; rule159; rule160;...

rule161; rule162; rule163; rule164; rule165; rule166; rule167;...

rule168; rule169; rule170; rule171; rule172; rule173; rule174;...

rule175; rule176; rule177; rule178; rule179; rule180; rule181;...

rule182; rule183; rule184; rule185; rule186; rule187; rule188;...

rule189; rule190; rule191; rule192; rule193; rule194; rule195;...

rule196; rule197; rule198; rule199; rule200; rule201; rule202;...

rule203; rule204; rule205; rule206; rule207; rule208; rule209;...

rule210; rule211; rule212; rule213; rule214; rule215; rule216;...

rule217; rule218; rule219; rule220; rule221; rule222; rule223;...

rule224; rule225; rule226; rule227; rule228; rule229; rule230;...

rule231; rule232; rule233; rule234; rule235; rule236; rule237;...

rule238; rule239; rule240; rule241; rule242; rule243; rule244;...

rule245; rule246;];

% Add Rules to System

JogRaterFIS = addrule(JogRaterFIS, rulelist);

% Output Rules

%rules = showrule(JogRaterFIS)

% Set Defuzzification Method

JogRaterFIS.defuzzMethod = 'mom';

% Declare Output Array

outputarray = zeros(size(TestInputs,1),1);

% Run Tests

for i=1:size(TestInputs,1) % Loop Through Output Array

% Get Result

Result = evalfis([TestInputs(i, 2), TestInputs(i, 3), TestInputs(i, 4), TestInputs(i, 5)], JogRaterFIS);

% Output

fprintf('Pace = %.4f Distance = %.4f Elevation = %.4f BPM = %.4f Result = %.4f', TestInputs(i, 2), TestInputs(i, 3), TestInputs(i, 4), TestInputs(i, 5), Result)

% Save Result in Output Array

outputarray(i, 1) = Result; % Assign Result Values to Array

end

% Output Rules

ruleview(JogRaterFIS)

%Output

xlswrite(InputSpreadsheet,outputarray,1,'G2');

% Output Diagrams

subplot(5,1,1), plotmf(JogRaterFIS,'input',1);

subplot(5,1,2), plotmf(JogRaterFIS,'input',2);

subplot(5,1,3), plotmf(JogRaterFIS,'input',3);

subplot(5,1,4), plotmf(JogRaterFIS,'input',4);

subplot(5,1,5), plotmf(JogRaterFIS,'output',1);

**C1)** Test Data:

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| No: | Pace | Distance | Elevation | Heart Rate % | Expected Output | Given Output | Test Pass? |
| 1 | 1 | 2 | 0.11 | 0 | 30 | 30 | **Pass** |
| 2 | 4 | 15 | 0.65 | 100 | 30 | 30 | **Pass** |
| 3 | 3 | 43 | 0.38 | 50 | 30 | 30 | **Pass** |
| 4 | 12 | 19 | 0.57 | 85 | 30 | 30 | **Pass** |
| 5 | 14 | 36 | 0.12 | 60 | 70 | 70 | **Pass** |
| 6 | 9 | 27 | 0.23 | 72 | 70 | 70 | **Pass** |
| 7 | 7 | 19 | 0.97 | 54 | 70 | 70 | **Pass** |
| 8 | 6 | 21 | 1 | 69 | 70 | 70 | **Pass** |
| 9 | 9 | 30 | 0.43 | 80 | 70 | 70 | **Pass** |
| 10 | 3 | 33 | 0.55 | 53 | 70 | 70 | **Pass** |
| 11 | 5 | 37 | 0.72 | 67 | 70 | 70 | **Pass** |
| 12 | 5 | 25 | 0.95 | 68 | 70 | 70 | **Pass** |
| 13 | 8 | 28 | 0 | 70 | 70 | 70 | **Pass** |
| 14 | 2 | 42.5 | 0.1 | 59 | 98 | 98 | **Pass** |
| 15 | 9 | 5 | 0.05 | 60 | 50 | 50 | **Pass** |
| 16 | 18 | 9 | 0.24 | 65 | 70 | 70 | **Pass** |
| 17 | 14 | 10 | 0.44 | 82 | 70 | 70 | **Pass** |
| 18 | 17 | 12 | 0.23 | 75 | 70 | 70 | **Pass** |
| 19 | 13 | 17 | 0.88 | 50 | 30 | 30 | **Pass** |
| 20 | 7 | 32 | 0.37 | 64 | 70 | 70 | **Pass** |

**D1)** System Rule Base, Linguistic Interpretation:

rules =

244×277 char array

'1. If (Mean Heart Rate (BPM) % of Average Maximum Heart Rate is Low) then (Minimum Athleticism is Low) (1) '

'2. If (Mean Heart Rate (BPM) % of Average Maximum Heart Rate is High) then (Minimum Athleticism is Low) (1) '

'3. If (Distance (KM) is Marathon) then (Minimum Athleticism is Very High) (0.8) '

'4. If (Distance (KM) is Very Long) then (Minimum Athleticism is High) (0.8) '

'5. If (Pace (Min per KM) is Crawling) and (Distance (KM) is Long) and (Cumulative Elevation Gain Per KM (KM) is Level (0 to .3 Degree Slope)) and (Mean Heart Rate (BPM) % of Average Maximum Heart Rate is Target) then (Minimum Athleticism is Moderate) (0.6) '

'6. If (Pace (Min per KM) is Crawling) and (Distance (KM) is Long) and (Cumulative Elevation Gain Per KM (KM) is Nearly Level (.3 to 1.1 Degree Slope)) and (Mean Heart Rate (BPM) % of Average Maximum Heart Rate is Target) then (Minimum Athleticism is Moderate) (0.6) '

'7. If (Pace (Min per KM) is Crawling) and (Distance (KM) is Long) and (Cumulative Elevation Gain Per KM (KM) is Very Gentle (1.1 to 3 Degree Slope)) and (Mean Heart Rate (BPM) % of Average Maximum Heart Rate is Target) then (Minimum Athleticism is Moderate) (0.6) '

'8. If (Pace (Min per KM) is Crawling) and (Distance (KM) is Long) and (Cumulative Elevation Gain Per KM (KM) is Gentle (3 to 5 Degree Slope)) and (Mean Heart Rate (BPM) % of Average Maximum Heart Rate is Target) then (Minimum Athleticism is Moderate) (0.6) '

'9. If (Pace (Min per KM) is Crawling) and (Distance (KM) is Long) and (Cumulative Elevation Gain Per KM (KM) is Moderate (5 to 8.5 Degree Slope)) and (Mean Heart Rate (BPM) % of Average Maximum Heart Rate is Target) then (Minimum Athleticism is High) (0.6) '

'10. If (Pace (Min per KM) is Crawling) and (Distance (KM) is Long) and (Cumulative Elevation Gain Per KM (KM) is Strong (8.5 to 16.5 Degree Slope)) and (Mean Heart Rate (BPM) % of Average Maximum Heart Rate is Target) then (Minimum Athleticism is High) (0.6) '

'11. If (Pace (Min per KM) is Crawling) and (Distance (KM) is Long) and (Cumulative Elevation Gain Per KM (KM) is Very Strong (16.5 to 24 Degree Slope)) and (Mean Heart Rate (BPM) % of Average Maximum Heart Rate is Target) then (Minimum Athleticism is High) (0.6) '

'12. If (Pace (Min per KM) is Crawling) and (Distance (KM) is Long) and (Cumulative Elevation Gain Per KM (KM) is Extreme (24 to 35 Degree Slope)) and (Mean Heart Rate (BPM) % of Average Maximum Heart Rate is Target) then (Minimum Athleticism is High) (0.6) '

'13. If (Pace (Min per KM) is Crawling) and (Distance (KM) is Long) and (Cumulative Elevation Gain Per KM (KM) is Steep (35 to 45 Degree Slope)) and (Mean Heart Rate (BPM) % of Average Maximum Heart Rate is Target) then (Minimum Athleticism is Very High) (0.6) '

'14. If (Pace (Min per KM) is Crawling) and (Distance (KM) is Long) and (Cumulative Elevation Gain Per KM (KM) is Very Steep (>45 Degree Slope)) and (Mean Heart Rate (BPM) % of Average Maximum Heart Rate is Target) then (Minimum Athleticism is Very High) (0.6) '

'15. If (Pace (Min per KM) is Slow Walking) and (Distance (KM) is Long) and (Cumulative Elevation Gain Per KM (KM) is Level (0 to .3 Degree Slope)) and (Mean Heart Rate (BPM) % of Average Maximum Heart Rate is Target) then (Minimum Athleticism is Moderate) (0.6) '

'16. If (Pace (Min per KM) is Slow Walking) and (Distance (KM) is Long) and (Cumulative Elevation Gain Per KM (KM) is Nearly Level (.3 to 1.1 Degree Slope)) and (Mean Heart Rate (BPM) % of Average Maximum Heart Rate is Target) then (Minimum Athleticism is Moderate) (0.6) '

'17. If (Pace (Min per KM) is Slow Walking) and (Distance (KM) is Long) and (Cumulative Elevation Gain Per KM (KM) is Very Gentle (1.1 to 3 Degree Slope)) and (Mean Heart Rate (BPM) % of Average Maximum Heart Rate is Target) then (Minimum Athleticism is Moderate) (0.6) '

'18. If (Pace (Min per KM) is Slow Walking) and (Distance (KM) is Long) and (Cumulative Elevation Gain Per KM (KM) is Gentle (3 to 5 Degree Slope)) and (Mean Heart Rate (BPM) % of Average Maximum Heart Rate is Target) then (Minimum Athleticism is Moderate) (0.6) '

'19. If (Pace (Min per KM) is Slow Walking) and (Distance (KM) is Long) and (Cumulative Elevation Gain Per KM (KM) is Moderate (5 to 8.5 Degree Slope)) and (Mean Heart Rate (BPM) % of Average Maximum Heart Rate is Target) then (Minimum Athleticism is High) (0.6) '

'20. If (Pace (Min per KM) is Slow Walking) and (Distance (KM) is Long) and (Cumulative Elevation Gain Per KM (KM) is Strong (8.5 to 16.5 Degree Slope)) and (Mean Heart Rate (BPM) % of Average Maximum Heart Rate is Target) then (Minimum Athleticism is High) (0.6) '

'21. If (Pace (Min per KM) is Slow Walking) and (Distance (KM) is Long) and (Cumulative Elevation Gain Per KM (KM) is Very Strong (16.5 to 24 Degree Slope)) and (Mean Heart Rate (BPM) % of Average Maximum Heart Rate is Target) then (Minimum Athleticism is High) (0.6) '

'22. If (Pace (Min per KM) is Slow Walking) and (Distance (KM) is Long) and (Cumulative Elevation Gain Per KM (KM) is Extreme (24 to 35 Degree Slope)) and (Mean Heart Rate (BPM) % of Average Maximum Heart Rate is Target) then (Minimum Athleticism is High) (0.6) '

'23. If (Pace (Min per KM) is Slow Walking) and (Distance (KM) is Long) and (Cumulative Elevation Gain Per KM (KM) is Steep (35 to 45 Degree Slope)) and (Mean Heart Rate (BPM) % of Average Maximum Heart Rate is Target) then (Minimum Athleticism is Very High) (0.6) '

'24. If (Pace (Min per KM) is Slow Walking) and (Distance (KM) is Long) and (Cumulative Elevation Gain Per KM (KM) is Very Steep (>45 Degree Slope)) and (Mean Heart Rate (BPM) % of Average Maximum Heart Rate is Target) then (Minimum Athleticism is Very High) (0.6) '

'25. If (Pace (Min per KM) is Walking) and (Distance (KM) is Long) and (Cumulative Elevation Gain Per KM (KM) is Level (0 to .3 Degree Slope)) and (Mean Heart Rate (BPM) % of Average Maximum Heart Rate is Target) then (Minimum Athleticism is Moderate) (0.6) '

'26. If (Pace (Min per KM) is Walking) and (Distance (KM) is Long) and (Cumulative Elevation Gain Per KM (KM) is Nearly Level (.3 to 1.1 Degree Slope)) and (Mean Heart Rate (BPM) % of Average Maximum Heart Rate is Target) then (Minimum Athleticism is Moderate) (0.6) '

'27. If (Pace (Min per KM) is Walking) and (Distance (KM) is Long) and (Cumulative Elevation Gain Per KM (KM) is Very Gentle (1.1 to 3 Degree Slope)) and (Mean Heart Rate (BPM) % of Average Maximum Heart Rate is Target) then (Minimum Athleticism is Moderate) (0.6) '

'28. If (Pace (Min per KM) is Walking) and (Distance (KM) is Long) and (Cumulative Elevation Gain Per KM (KM) is Gentle (3 to 5 Degree Slope)) and (Mean Heart Rate (BPM) % of Average Maximum Heart Rate is Target) then (Minimum Athleticism is High) (0.6) '

'29. If (Pace (Min per KM) is Walking) and (Distance (KM) is Long) and (Cumulative Elevation Gain Per KM (KM) is Moderate (5 to 8.5 Degree Slope)) and (Mean Heart Rate (BPM) % of Average Maximum Heart Rate is Target) then (Minimum Athleticism is High) (0.6) '

'30. If (Pace (Min per KM) is Walking) and (Distance (KM) is Long) and (Cumulative Elevation Gain Per KM (KM) is Strong (8.5 to 16.5 Degree Slope)) and (Mean Heart Rate (BPM) % of Average Maximum Heart Rate is Target) then (Minimum Athleticism is High) (0.6) '

'31. If (Pace (Min per KM) is Walking) and (Distance (KM) is Long) and (Cumulative Elevation Gain Per KM (KM) is Very Strong (16.5 to 24 Degree Slope)) and (Mean Heart Rate (BPM) % of Average Maximum Heart Rate is Target) then (Minimum Athleticism is High) (0.6) '

'32. If (Pace (Min per KM) is Walking) and (Distance (KM) is Long) and (Cumulative Elevation Gain Per KM (KM) is Extreme (24 to 35 Degree Slope)) and (Mean Heart Rate (BPM) % of Average Maximum Heart Rate is Target) then (Minimum Athleticism is High) (0.6) '

'33. If (Pace (Min per KM) is Walking) and (Distance (KM) is Long) and (Cumulative Elevation Gain Per KM (KM) is Steep (35 to 45 Degree Slope)) and (Mean Heart Rate (BPM) % of Average Maximum Heart Rate is Target) then (Minimum Athleticism is Very High) (0.6) '

'34. If (Pace (Min per KM) is Walking) and (Distance (KM) is Long) and (Cumulative Elevation Gain Per KM (KM) is Very Steep (>45 Degree Slope)) and (Mean Heart Rate (BPM) % of Average Maximum Heart Rate is Target) then (Minimum Athleticism is Very High) (0.6) '

'35. If (Pace (Min per KM) is Fast Walking) and (Distance (KM) is Long) and (Cumulative Elevation Gain Per KM (KM) is Level (0 to .3 Degree Slope)) and (Mean Heart Rate (BPM) % of Average Maximum Heart Rate is Target) then (Minimum Athleticism is Moderate) (0.6) '

'36. If (Pace (Min per KM) is Fast Walking) and (Distance (KM) is Long) and (Cumulative Elevation Gain Per KM (KM) is Nearly Level (.3 to 1.1 Degree Slope)) and (Mean Heart Rate (BPM) % of Average Maximum Heart Rate is Target) then (Minimum Athleticism is Moderate) (0.6) '

'37. If (Pace (Min per KM) is Fast Walking) and (Distance (KM) is Long) and (Cumulative Elevation Gain Per KM (KM) is Very Gentle (1.1 to 3 Degree Slope)) and (Mean Heart Rate (BPM) % of Average Maximum Heart Rate is Target) then (Minimum Athleticism is Moderate) (0.6) '

'38. If (Pace (Min per KM) is Fast Walking) and (Distance (KM) is Long) and (Cumulative Elevation Gain Per KM (KM) is Gentle (3 to 5 Degree Slope)) and (Mean Heart Rate (BPM) % of Average Maximum Heart Rate is Target) then (Minimum Athleticism is High) (0.6) '

'39. If (Pace (Min per KM) is Fast Walking) and (Distance (KM) is Long) and (Cumulative Elevation Gain Per KM (KM) is Moderate (5 to 8.5 Degree Slope)) and (Mean Heart Rate (BPM) % of Average Maximum Heart Rate is Target) then (Minimum Athleticism is High) (0.6) '

'40. If (Pace (Min per KM) is Fast Walking) and (Distance (KM) is Long) and (Cumulative Elevation Gain Per KM (KM) is Strong (8.5 to 16.5 Degree Slope)) and (Mean Heart Rate (BPM) % of Average Maximum Heart Rate is Target) then (Minimum Athleticism is Very High) (0.6) '

'41. If (Pace (Min per KM) is Fast Walking) and (Distance (KM) is Long) and (Cumulative Elevation Gain Per KM (KM) is Very Strong (16.5 to 24 Degree Slope)) and (Mean Heart Rate (BPM) % of Average Maximum Heart Rate is Target) then (Minimum Athleticism is Very High) (0.6) '

'42. If (Pace (Min per KM) is Fast Walking) and (Distance (KM) is Long) and (Cumulative Elevation Gain Per KM (KM) is Extreme (24 to 35 Degree Slope)) and (Mean Heart Rate (BPM) % of Average Maximum Heart Rate is Target) then (Minimum Athleticism is Very High) (0.6) '

'43. If (Pace (Min per KM) is Fast Walking) and (Distance (KM) is Long) and (Cumulative Elevation Gain Per KM (KM) is Steep (35 to 45 Degree Slope)) and (Mean Heart Rate (BPM) % of Average Maximum Heart Rate is Target) then (Minimum Athleticism is Very High) (0.6) '

'44. If (Pace (Min per KM) is Fast Walking) and (Distance (KM) is Long) and (Cumulative Elevation Gain Per KM (KM) is Very Steep (>45 Degree Slope)) and (Mean Heart Rate (BPM) % of Average Maximum Heart Rate is Target) then (Minimum Athleticism is Very High) (0.6) '

'45. If (Pace (Min per KM) is Jogging) and (Distance (KM) is Long) and (Cumulative Elevation Gain Per KM (KM) is Level (0 to .3 Degree Slope)) and (Mean Heart Rate (BPM) % of Average Maximum Heart Rate is Target) then (Minimum Athleticism is High) (0.6) '

'46. If (Pace (Min per KM) is Jogging) and (Distance (KM) is Long) and (Cumulative Elevation Gain Per KM (KM) is Nearly Level (.3 to 1.1 Degree Slope)) and (Mean Heart Rate (BPM) % of Average Maximum Heart Rate is Target) then (Minimum Athleticism is High) (0.6) '

'47. If (Pace (Min per KM) is Jogging) and (Distance (KM) is Long) and (Cumulative Elevation Gain Per KM (KM) is Very Gentle (1.1 to 3 Degree Slope)) and (Mean Heart Rate (BPM) % of Average Maximum Heart Rate is Target) then (Minimum Athleticism is High) (0.6) '

'48. If (Pace (Min per KM) is Jogging) and (Distance (KM) is Long) and (Cumulative Elevation Gain Per KM (KM) is Gentle (3 to 5 Degree Slope)) and (Mean Heart Rate (BPM) % of Average Maximum Heart Rate is Target) then (Minimum Athleticism is High) (0.6) '

'49. If (Pace (Min per KM) is Jogging) and (Distance (KM) is Long) and (Cumulative Elevation Gain Per KM (KM) is Moderate (5 to 8.5 Degree Slope)) and (Mean Heart Rate (BPM) % of Average Maximum Heart Rate is Target) then (Minimum Athleticism is Very High) (0.6) '

'50. If (Pace (Min per KM) is Jogging) and (Distance (KM) is Long) and (Cumulative Elevation Gain Per KM (KM) is Strong (8.5 to 16.5 Degree Slope)) and (Mean Heart Rate (BPM) % of Average Maximum Heart Rate is Target) then (Minimum Athleticism is Very High) (0.6) '

'51. If (Pace (Min per KM) is Jogging) and (Distance (KM) is Long) and (Cumulative Elevation Gain Per KM (KM) is Very Strong (16.5 to 24 Degree Slope)) and (Mean Heart Rate (BPM) % of Average Maximum Heart Rate is Target) then (Minimum Athleticism is Very High) (0.6) '

'52. If (Pace (Min per KM) is Jogging) and (Distance (KM) is Long) and (Cumulative Elevation Gain Per KM (KM) is Extreme (24 to 35 Degree Slope)) and (Mean Heart Rate (BPM) % of Average Maximum Heart Rate is Target) then (Minimum Athleticism is Very High) (0.6) '

'53. If (Pace (Min per KM) is Jogging) and (Distance (KM) is Long) and (Cumulative Elevation Gain Per KM (KM) is Steep (35 to 45 Degree Slope)) and (Mean Heart Rate (BPM) % of Average Maximum Heart Rate is Target) then (Minimum Athleticism is Very High) (0.6) '

'54. If (Pace (Min per KM) is Jogging) and (Distance (KM) is Long) and (Cumulative Elevation Gain Per KM (KM) is Very Steep (>45 Degree Slope)) and (Mean Heart Rate (BPM) % of Average Maximum Heart Rate is Target) then (Minimum Athleticism is Very High) (0.6) '

'55. If (Pace (Min per KM) is Sprinting) and (Distance (KM) is Long) and (Cumulative Elevation Gain Per KM (KM) is Level (0 to .3 Degree Slope)) and (Mean Heart Rate (BPM) % of Average Maximum Heart Rate is Target) then (Minimum Athleticism is Very High) (0.6) '

'56. If (Pace (Min per KM) is Sprinting) and (Distance (KM) is Long) and (Cumulative Elevation Gain Per KM (KM) is Nearly Level (.3 to 1.1 Degree Slope)) and (Mean Heart Rate (BPM) % of Average Maximum Heart Rate is Target) then (Minimum Athleticism is Very High) (0.6) '

'57. If (Pace (Min per KM) is Sprinting) and (Distance (KM) is Long) and (Cumulative Elevation Gain Per KM (KM) is Very Gentle (1.1 to 3 Degree Slope)) and (Mean Heart Rate (BPM) % of Average Maximum Heart Rate is Target) then (Minimum Athleticism is Very High) (0.6) '

'58. If (Pace (Min per KM) is Sprinting) and (Distance (KM) is Long) and (Cumulative Elevation Gain Per KM (KM) is Gentle (3 to 5 Degree Slope)) and (Mean Heart Rate (BPM) % of Average Maximum Heart Rate is Target) then (Minimum Athleticism is Very High) (0.6) '

'59. If (Pace (Min per KM) is Sprinting) and (Distance (KM) is Long) and (Cumulative Elevation Gain Per KM (KM) is Moderate (5 to 8.5 Degree Slope)) and (Mean Heart Rate (BPM) % of Average Maximum Heart Rate is Target) then (Minimum Athleticism is Very High) (0.6) '

'60. If (Pace (Min per KM) is Sprinting) and (Distance (KM) is Long) and (Cumulative Elevation Gain Per KM (KM) is Strong (8.5 to 16.5 Degree Slope)) and (Mean Heart Rate (BPM) % of Average Maximum Heart Rate is Target) then (Minimum Athleticism is Very High) (0.6) '

'61. If (Pace (Min per KM) is Sprinting) and (Distance (KM) is Long) and (Cumulative Elevation Gain Per KM (KM) is Very Strong (16.5 to 24 Degree Slope)) and (Mean Heart Rate (BPM) % of Average Maximum Heart Rate is Target) then (Minimum Athleticism is Very High) (0.6) '

'62. If (Pace (Min per KM) is Sprinting) and (Distance (KM) is Long) and (Cumulative Elevation Gain Per KM (KM) is Extreme (24 to 35 Degree Slope)) and (Mean Heart Rate (BPM) % of Average Maximum Heart Rate is Target) then (Minimum Athleticism is Very High) (0.6) '

'63. If (Pace (Min per KM) is Sprinting) and (Distance (KM) is Long) and (Cumulative Elevation Gain Per KM (KM) is Steep (35 to 45 Degree Slope)) and (Mean Heart Rate (BPM) % of Average Maximum Heart Rate is Target) then (Minimum Athleticism is Very High) (0.6) '

'64. If (Pace (Min per KM) is Sprinting) and (Distance (KM) is Long) and (Cumulative Elevation Gain Per KM (KM) is Very Steep (>45 Degree Slope)) and (Mean Heart Rate (BPM) % of Average Maximum Heart Rate is Target) then (Minimum Athleticism is Very High) (0.6) '

'65. If (Pace (Min per KM) is Crawling) and (Distance (KM) is Medium) and (Cumulative Elevation Gain Per KM (KM) is Level (0 to .3 Degree Slope)) and (Mean Heart Rate (BPM) % of Average Maximum Heart Rate is Target) then (Minimum Athleticism is Moderate) (0.6) '

'66. If (Pace (Min per KM) is Crawling) and (Distance (KM) is Medium) and (Cumulative Elevation Gain Per KM (KM) is Nearly Level (.3 to 1.1 Degree Slope)) and (Mean Heart Rate (BPM) % of Average Maximum Heart Rate is Target) then (Minimum Athleticism is Moderate) (0.6) '

'67. If (Pace (Min per KM) is Crawling) and (Distance (KM) is Medium) and (Cumulative Elevation Gain Per KM (KM) is Very Gentle (1.1 to 3 Degree Slope)) and (Mean Heart Rate (BPM) % of Average Maximum Heart Rate is Target) then (Minimum Athleticism is Moderate) (0.6) '

'68. If (Pace (Min per KM) is Crawling) and (Distance (KM) is Medium) and (Cumulative Elevation Gain Per KM (KM) is Gentle (3 to 5 Degree Slope)) and (Mean Heart Rate (BPM) % of Average Maximum Heart Rate is Target) then (Minimum Athleticism is Moderate) (0.6) '

'69. If (Pace (Min per KM) is Crawling) and (Distance (KM) is Medium) and (Cumulative Elevation Gain Per KM (KM) is Moderate (5 to 8.5 Degree Slope)) and (Mean Heart Rate (BPM) % of Average Maximum Heart Rate is Target) then (Minimum Athleticism is High) (0.6) '

'70. If (Pace (Min per KM) is Crawling) and (Distance (KM) is Medium) and (Cumulative Elevation Gain Per KM (KM) is Strong (8.5 to 16.5 Degree Slope)) and (Mean Heart Rate (BPM) % of Average Maximum Heart Rate is Target) then (Minimum Athleticism is High) (0.6) '

'71. If (Pace (Min per KM) is Crawling) and (Distance (KM) is Medium) and (Cumulative Elevation Gain Per KM (KM) is Very Strong (16.5 to 24 Degree Slope)) and (Mean Heart Rate (BPM) % of Average Maximum Heart Rate is Target) then (Minimum Athleticism is High) (0.6) '

'72. If (Pace (Min per KM) is Crawling) and (Distance (KM) is Medium) and (Cumulative Elevation Gain Per KM (KM) is Extreme (24 to 35 Degree Slope)) and (Mean Heart Rate (BPM) % of Average Maximum Heart Rate is Target) then (Minimum Athleticism is High) (0.6) '

'73. If (Pace (Min per KM) is Crawling) and (Distance (KM) is Medium) and (Cumulative Elevation Gain Per KM (KM) is Steep (35 to 45 Degree Slope)) and (Mean Heart Rate (BPM) % of Average Maximum Heart Rate is Target) then (Minimum Athleticism is Very High) (0.6) '

'74. If (Pace (Min per KM) is Crawling) and (Distance (KM) is Medium) and (Cumulative Elevation Gain Per KM (KM) is Very Steep (>45 Degree Slope)) and (Mean Heart Rate (BPM) % of Average Maximum Heart Rate is Target) then (Minimum Athleticism is Very High) (0.6) '

'75. If (Pace (Min per KM) is Slow Walking) and (Distance (KM) is Medium) and (Cumulative Elevation Gain Per KM (KM) is Level (0 to .3 Degree Slope)) and (Mean Heart Rate (BPM) % of Average Maximum Heart Rate is Target) then (Minimum Athleticism is Moderate) (0.6) '

'76. If (Pace (Min per KM) is Slow Walking) and (Distance (KM) is Medium) and (Cumulative Elevation Gain Per KM (KM) is Nearly Level (.3 to 1.1 Degree Slope)) and (Mean Heart Rate (BPM) % of Average Maximum Heart Rate is Target) then (Minimum Athleticism is Moderate) (0.6) '

'77. If (Pace (Min per KM) is Slow Walking) and (Distance (KM) is Medium) and (Cumulative Elevation Gain Per KM (KM) is Very Gentle (1.1 to 3 Degree Slope)) and (Mean Heart Rate (BPM) % of Average Maximum Heart Rate is Target) then (Minimum Athleticism is Moderate) (0.6) '

'78. If (Pace (Min per KM) is Slow Walking) and (Distance (KM) is Medium) and (Cumulative Elevation Gain Per KM (KM) is Gentle (3 to 5 Degree Slope)) and (Mean Heart Rate (BPM) % of Average Maximum Heart Rate is Target) then (Minimum Athleticism is Moderate) (0.6) '

'79. If (Pace (Min per KM) is Slow Walking) and (Distance (KM) is Medium) and (Cumulative Elevation Gain Per KM (KM) is Moderate (5 to 8.5 Degree Slope)) and (Mean Heart Rate (BPM) % of Average Maximum Heart Rate is Target) then (Minimum Athleticism is High) (0.6) '

'80. If (Pace (Min per KM) is Slow Walking) and (Distance (KM) is Medium) and (Cumulative Elevation Gain Per KM (KM) is Strong (8.5 to 16.5 Degree Slope)) and (Mean Heart Rate (BPM) % of Average Maximum Heart Rate is Target) then (Minimum Athleticism is High) (0.6) '

'81. If (Pace (Min per KM) is Slow Walking) and (Distance (KM) is Medium) and (Cumulative Elevation Gain Per KM (KM) is Very Strong (16.5 to 24 Degree Slope)) and (Mean Heart Rate (BPM) % of Average Maximum Heart Rate is Target) then (Minimum Athleticism is High) (0.6) '

'82. If (Pace (Min per KM) is Slow Walking) and (Distance (KM) is Medium) and (Cumulative Elevation Gain Per KM (KM) is Extreme (24 to 35 Degree Slope)) and (Mean Heart Rate (BPM) % of Average Maximum Heart Rate is Target) then (Minimum Athleticism is High) (0.6) '

'83. If (Pace (Min per KM) is Slow Walking) and (Distance (KM) is Medium) and (Cumulative Elevation Gain Per KM (KM) is Steep (35 to 45 Degree Slope)) and (Mean Heart Rate (BPM) % of Average Maximum Heart Rate is Target) then (Minimum Athleticism is Very High) (0.6) '

'84. If (Pace (Min per KM) is Slow Walking) and (Distance (KM) is Medium) and (Cumulative Elevation Gain Per KM (KM) is Very Steep (>45 Degree Slope)) and (Mean Heart Rate (BPM) % of Average Maximum Heart Rate is Target) then (Minimum Athleticism is Very High) (0.6) '

'85. If (Pace (Min per KM) is Walking) and (Distance (KM) is Medium) and (Cumulative Elevation Gain Per KM (KM) is Level (0 to .3 Degree Slope)) and (Mean Heart Rate (BPM) % of Average Maximum Heart Rate is Target) then (Minimum Athleticism is Moderate) (0.6) '

'86. If (Pace (Min per KM) is Walking) and (Distance (KM) is Medium) and (Cumulative Elevation Gain Per KM (KM) is Nearly Level (.3 to 1.1 Degree Slope)) and (Mean Heart Rate (BPM) % of Average Maximum Heart Rate is Target) then (Minimum Athleticism is Moderate) (0.6) '

'87. If (Pace (Min per KM) is Walking) and (Distance (KM) is Medium) and (Cumulative Elevation Gain Per KM (KM) is Very Gentle (1.1 to 3 Degree Slope)) and (Mean Heart Rate (BPM) % of Average Maximum Heart Rate is Target) then (Minimum Athleticism is Moderate) (0.6) '

'88. If (Pace (Min per KM) is Walking) and (Distance (KM) is Medium) and (Cumulative Elevation Gain Per KM (KM) is Gentle (3 to 5 Degree Slope)) and (Mean Heart Rate (BPM) % of Average Maximum Heart Rate is Target) then (Minimum Athleticism is High) (0.6) '

'89. If (Pace (Min per KM) is Walking) and (Distance (KM) is Medium) and (Cumulative Elevation Gain Per KM (KM) is Moderate (5 to 8.5 Degree Slope)) and (Mean Heart Rate (BPM) % of Average Maximum Heart Rate is Target) then (Minimum Athleticism is High) (0.6) '

'90. If (Pace (Min per KM) is Walking) and (Distance (KM) is Medium) and (Cumulative Elevation Gain Per KM (KM) is Strong (8.5 to 16.5 Degree Slope)) and (Mean Heart Rate (BPM) % of Average Maximum Heart Rate is Target) then (Minimum Athleticism is High) (0.6) '

'91. If (Pace (Min per KM) is Walking) and (Distance (KM) is Medium) and (Cumulative Elevation Gain Per KM (KM) is Very Strong (16.5 to 24 Degree Slope)) and (Mean Heart Rate (BPM) % of Average Maximum Heart Rate is Target) then (Minimum Athleticism is High) (0.6) '

'92. If (Pace (Min per KM) is Walking) and (Distance (KM) is Medium) and (Cumulative Elevation Gain Per KM (KM) is Extreme (24 to 35 Degree Slope)) and (Mean Heart Rate (BPM) % of Average Maximum Heart Rate is Target) then (Minimum Athleticism is High) (0.6) '

'93. If (Pace (Min per KM) is Walking) and (Distance (KM) is Medium) and (Cumulative Elevation Gain Per KM (KM) is Steep (35 to 45 Degree Slope)) and (Mean Heart Rate (BPM) % of Average Maximum Heart Rate is Target) then (Minimum Athleticism is Very High) (0.6) '

'94. If (Pace (Min per KM) is Walking) and (Distance (KM) is Medium) and (Cumulative Elevation Gain Per KM (KM) is Very Steep (>45 Degree Slope)) and (Mean Heart Rate (BPM) % of Average Maximum Heart Rate is Target) then (Minimum Athleticism is Very High) (0.6) '

'95. If (Pace (Min per KM) is Fast Walking) and (Distance (KM) is Medium) and (Cumulative Elevation Gain Per KM (KM) is Level (0 to .3 Degree Slope)) and (Mean Heart Rate (BPM) % of Average Maximum Heart Rate is Target) then (Minimum Athleticism is Moderate) (0.6) '

'96. If (Pace (Min per KM) is Fast Walking) and (Distance (KM) is Medium) and (Cumulative Elevation Gain Per KM (KM) is Nearly Level (.3 to 1.1 Degree Slope)) and (Mean Heart Rate (BPM) % of Average Maximum Heart Rate is Target) then (Minimum Athleticism is Moderate) (0.6) '

'97. If (Pace (Min per KM) is Fast Walking) and (Distance (KM) is Medium) and (Cumulative Elevation Gain Per KM (KM) is Very Gentle (1.1 to 3 Degree Slope)) and (Mean Heart Rate (BPM) % of Average Maximum Heart Rate is Target) then (Minimum Athleticism is Moderate) (0.6) '

'98. If (Pace (Min per KM) is Fast Walking) and (Distance (KM) is Medium) and (Cumulative Elevation Gain Per KM (KM) is Gentle (3 to 5 Degree Slope)) and (Mean Heart Rate (BPM) % of Average Maximum Heart Rate is Target) then (Minimum Athleticism is High) (0.6) '

'99. If (Pace (Min per KM) is Fast Walking) and (Distance (KM) is Medium) and (Cumulative Elevation Gain Per KM (KM) is Moderate (5 to 8.5 Degree Slope)) and (Mean Heart Rate (BPM) % of Average Maximum Heart Rate is Target) then (Minimum Athleticism is High) (0.6) '

'100. If (Pace (Min per KM) is Fast Walking) and (Distance (KM) is Medium) and (Cumulative Elevation Gain Per KM (KM) is Strong (8.5 to 16.5 Degree Slope)) and (Mean Heart Rate (BPM) % of Average Maximum Heart Rate is Target) then (Minimum Athleticism is Very High) (0.6) '

'101. If (Pace (Min per KM) is Fast Walking) and (Distance (KM) is Medium) and (Cumulative Elevation Gain Per KM (KM) is Very Strong (16.5 to 24 Degree Slope)) and (Mean Heart Rate (BPM) % of Average Maximum Heart Rate is Target) then (Minimum Athleticism is Very High) (0.6) '

'102. If (Pace (Min per KM) is Fast Walking) and (Distance (KM) is Medium) and (Cumulative Elevation Gain Per KM (KM) is Extreme (24 to 35 Degree Slope)) and (Mean Heart Rate (BPM) % of Average Maximum Heart Rate is Target) then (Minimum Athleticism is Very High) (0.6) '

'103. If (Pace (Min per KM) is Fast Walking) and (Distance (KM) is Medium) and (Cumulative Elevation Gain Per KM (KM) is Steep (35 to 45 Degree Slope)) and (Mean Heart Rate (BPM) % of Average Maximum Heart Rate is Target) then (Minimum Athleticism is Very High) (0.6) '

'104. If (Pace (Min per KM) is Fast Walking) and (Distance (KM) is Medium) and (Cumulative Elevation Gain Per KM (KM) is Very Steep (>45 Degree Slope)) and (Mean Heart Rate (BPM) % of Average Maximum Heart Rate is Target) then (Minimum Athleticism is Very High) (0.6) '

'105. If (Pace (Min per KM) is Jogging) and (Distance (KM) is Medium) and (Cumulative Elevation Gain Per KM (KM) is Level (0 to .3 Degree Slope)) and (Mean Heart Rate (BPM) % of Average Maximum Heart Rate is Target) then (Minimum Athleticism is High) (0.6) '

'106. If (Pace (Min per KM) is Jogging) and (Distance (KM) is Medium) and (Cumulative Elevation Gain Per KM (KM) is Nearly Level (.3 to 1.1 Degree Slope)) and (Mean Heart Rate (BPM) % of Average Maximum Heart Rate is Target) then (Minimum Athleticism is High) (0.6) '

'107. If (Pace (Min per KM) is Jogging) and (Distance (KM) is Medium) and (Cumulative Elevation Gain Per KM (KM) is Very Gentle (1.1 to 3 Degree Slope)) and (Mean Heart Rate (BPM) % of Average Maximum Heart Rate is Target) then (Minimum Athleticism is High) (0.6) '

'108. If (Pace (Min per KM) is Jogging) and (Distance (KM) is Medium) and (Cumulative Elevation Gain Per KM (KM) is Gentle (3 to 5 Degree Slope)) and (Mean Heart Rate (BPM) % of Average Maximum Heart Rate is Target) then (Minimum Athleticism is High) (0.6) '

'109. If (Pace (Min per KM) is Jogging) and (Distance (KM) is Medium) and (Cumulative Elevation Gain Per KM (KM) is Moderate (5 to 8.5 Degree Slope)) and (Mean Heart Rate (BPM) % of Average Maximum Heart Rate is Target) then (Minimum Athleticism is Very High) (0.6) '

'110. If (Pace (Min per KM) is Jogging) and (Distance (KM) is Medium) and (Cumulative Elevation Gain Per KM (KM) is Strong (8.5 to 16.5 Degree Slope)) and (Mean Heart Rate (BPM) % of Average Maximum Heart Rate is Target) then (Minimum Athleticism is Very High) (0.6) '

'111. If (Pace (Min per KM) is Jogging) and (Distance (KM) is Medium) and (Cumulative Elevation Gain Per KM (KM) is Very Strong (16.5 to 24 Degree Slope)) and (Mean Heart Rate (BPM) % of Average Maximum Heart Rate is Target) then (Minimum Athleticism is Very High) (0.6) '

'112. If (Pace (Min per KM) is Jogging) and (Distance (KM) is Medium) and (Cumulative Elevation Gain Per KM (KM) is Extreme (24 to 35 Degree Slope)) and (Mean Heart Rate (BPM) % of Average Maximum Heart Rate is Target) then (Minimum Athleticism is Very High) (0.6) '

'113. If (Pace (Min per KM) is Jogging) and (Distance (KM) is Medium) and (Cumulative Elevation Gain Per KM (KM) is Steep (35 to 45 Degree Slope)) and (Mean Heart Rate (BPM) % of Average Maximum Heart Rate is Target) then (Minimum Athleticism is Very High) (0.6) '

'114. If (Pace (Min per KM) is Jogging) and (Distance (KM) is Medium) and (Cumulative Elevation Gain Per KM (KM) is Very Steep (>45 Degree Slope)) and (Mean Heart Rate (BPM) % of Average Maximum Heart Rate is Target) then (Minimum Athleticism is Very High) (0.6) '

'115. If (Pace (Min per KM) is Sprinting) and (Distance (KM) is Medium) and (Cumulative Elevation Gain Per KM (KM) is Level (0 to .3 Degree Slope)) and (Mean Heart Rate (BPM) % of Average Maximum Heart Rate is Target) then (Minimum Athleticism is High) (0.6) '

'116. If (Pace (Min per KM) is Sprinting) and (Distance (KM) is Medium) and (Cumulative Elevation Gain Per KM (KM) is Nearly Level (.3 to 1.1 Degree Slope)) and (Mean Heart Rate (BPM) % of Average Maximum Heart Rate is Target) then (Minimum Athleticism is High) (0.6) '

'117. If (Pace (Min per KM) is Sprinting) and (Distance (KM) is Medium) and (Cumulative Elevation Gain Per KM (KM) is Very Gentle (1.1 to 3 Degree Slope)) and (Mean Heart Rate (BPM) % of Average Maximum Heart Rate is Target) then (Minimum Athleticism is High) (0.6) '

'118. If (Pace (Min per KM) is Sprinting) and (Distance (KM) is Medium) and (Cumulative Elevation Gain Per KM (KM) is Gentle (3 to 5 Degree Slope)) and (Mean Heart Rate (BPM) % of Average Maximum Heart Rate is Target) then (Minimum Athleticism is Very High) (0.6) '

'119. If (Pace (Min per KM) is Sprinting) and (Distance (KM) is Medium) and (Cumulative Elevation Gain Per KM (KM) is Moderate (5 to 8.5 Degree Slope)) and (Mean Heart Rate (BPM) % of Average Maximum Heart Rate is Target) then (Minimum Athleticism is Very High) (0.6) '

'120. If (Pace (Min per KM) is Sprinting) and (Distance (KM) is Medium) and (Cumulative Elevation Gain Per KM (KM) is Strong (8.5 to 16.5 Degree Slope)) and (Mean Heart Rate (BPM) % of Average Maximum Heart Rate is Target) then (Minimum Athleticism is Very High) (0.6) '

'121. If (Pace (Min per KM) is Sprinting) and (Distance (KM) is Medium) and (Cumulative Elevation Gain Per KM (KM) is Very Strong (16.5 to 24 Degree Slope)) and (Mean Heart Rate (BPM) % of Average Maximum Heart Rate is Target) then (Minimum Athleticism is Very High) (0.6) '

'122. If (Pace (Min per KM) is Sprinting) and (Distance (KM) is Medium) and (Cumulative Elevation Gain Per KM (KM) is Extreme (24 to 35 Degree Slope)) and (Mean Heart Rate (BPM) % of Average Maximum Heart Rate is Target) then (Minimum Athleticism is Very High) (0.6) '

'123. If (Pace (Min per KM) is Sprinting) and (Distance (KM) is Medium) and (Cumulative Elevation Gain Per KM (KM) is Steep (35 to 45 Degree Slope)) and (Mean Heart Rate (BPM) % of Average Maximum Heart Rate is Target) then (Minimum Athleticism is Very High) (0.6) '

'124. If (Pace (Min per KM) is Sprinting) and (Distance (KM) is Medium) and (Cumulative Elevation Gain Per KM (KM) is Very Steep (>45 Degree Slope)) and (Mean Heart Rate (BPM) % of Average Maximum Heart Rate is Target) then (Minimum Athleticism is Very High) (0.6) '

'125. If (Pace (Min per KM) is Crawling) and (Distance (KM) is Short) and (Cumulative Elevation Gain Per KM (KM) is Level (0 to .3 Degree Slope)) and (Mean Heart Rate (BPM) % of Average Maximum Heart Rate is Target) then (Minimum Athleticism is Very Low) (0.6) '

'126. If (Pace (Min per KM) is Crawling) and (Distance (KM) is Short) and (Cumulative Elevation Gain Per KM (KM) is Nearly Level (.3 to 1.1 Degree Slope)) and (Mean Heart Rate (BPM) % of Average Maximum Heart Rate is Target) then (Minimum Athleticism is Very Low) (0.6) '

'127. If (Pace (Min per KM) is Crawling) and (Distance (KM) is Short) and (Cumulative Elevation Gain Per KM (KM) is Very Gentle (1.1 to 3 Degree Slope)) and (Mean Heart Rate (BPM) % of Average Maximum Heart Rate is Target) then (Minimum Athleticism is Very Low) (0.6) '

'128. If (Pace (Min per KM) is Crawling) and (Distance (KM) is Short) and (Cumulative Elevation Gain Per KM (KM) is Gentle (3 to 5 Degree Slope)) and (Mean Heart Rate (BPM) % of Average Maximum Heart Rate is Target) then (Minimum Athleticism is Very Low) (0.6) '

'129. If (Pace (Min per KM) is Crawling) and (Distance (KM) is Short) and (Cumulative Elevation Gain Per KM (KM) is Moderate (5 to 8.5 Degree Slope)) and (Mean Heart Rate (BPM) % of Average Maximum Heart Rate is Target) then (Minimum Athleticism is Low) (0.6) '

'130. If (Pace (Min per KM) is Crawling) and (Distance (KM) is Short) and (Cumulative Elevation Gain Per KM (KM) is Strong (8.5 to 16.5 Degree Slope)) and (Mean Heart Rate (BPM) % of Average Maximum Heart Rate is Target) then (Minimum Athleticism is Low) (0.6) '

'131. If (Pace (Min per KM) is Crawling) and (Distance (KM) is Short) and (Cumulative Elevation Gain Per KM (KM) is Very Strong (16.5 to 24 Degree Slope)) and (Mean Heart Rate (BPM) % of Average Maximum Heart Rate is Target) then (Minimum Athleticism is Moderate) (0.6) '

'132. If (Pace (Min per KM) is Crawling) and (Distance (KM) is Short) and (Cumulative Elevation Gain Per KM (KM) is Extreme (24 to 35 Degree Slope)) and (Mean Heart Rate (BPM) % of Average Maximum Heart Rate is Target) then (Minimum Athleticism is Moderate) (0.6) '

'133. If (Pace (Min per KM) is Crawling) and (Distance (KM) is Short) and (Cumulative Elevation Gain Per KM (KM) is Steep (35 to 45 Degree Slope)) and (Mean Heart Rate (BPM) % of Average Maximum Heart Rate is Target) then (Minimum Athleticism is Moderate) (0.6) '

'134. If (Pace (Min per KM) is Crawling) and (Distance (KM) is Short) and (Cumulative Elevation Gain Per KM (KM) is Very Steep (>45 Degree Slope)) and (Mean Heart Rate (BPM) % of Average Maximum Heart Rate is Target) then (Minimum Athleticism is High) (0.6) '

'135. If (Pace (Min per KM) is Slow Walking) and (Distance (KM) is Short) and (Cumulative Elevation Gain Per KM (KM) is Level (0 to .3 Degree Slope)) and (Mean Heart Rate (BPM) % of Average Maximum Heart Rate is Target) then (Minimum Athleticism is Low) (0.6) '

'136. If (Pace (Min per KM) is Slow Walking) and (Distance (KM) is Short) and (Cumulative Elevation Gain Per KM (KM) is Nearly Level (.3 to 1.1 Degree Slope)) and (Mean Heart Rate (BPM) % of Average Maximum Heart Rate is Target) then (Minimum Athleticism is Low) (0.6) '

'137. If (Pace (Min per KM) is Slow Walking) and (Distance (KM) is Short) and (Cumulative Elevation Gain Per KM (KM) is Very Gentle (1.1 to 3 Degree Slope)) and (Mean Heart Rate (BPM) % of Average Maximum Heart Rate is Target) then (Minimum Athleticism is Low) (0.6) '

'138. If (Pace (Min per KM) is Slow Walking) and (Distance (KM) is Short) and (Cumulative Elevation Gain Per KM (KM) is Gentle (3 to 5 Degree Slope)) and (Mean Heart Rate (BPM) % of Average Maximum Heart Rate is Target) then (Minimum Athleticism is Moderate) (0.6) '

'139. If (Pace (Min per KM) is Slow Walking) and (Distance (KM) is Short) and (Cumulative Elevation Gain Per KM (KM) is Moderate (5 to 8.5 Degree Slope)) and (Mean Heart Rate (BPM) % of Average Maximum Heart Rate is Target) then (Minimum Athleticism is Moderate) (0.6) '

'140. If (Pace (Min per KM) is Slow Walking) and (Distance (KM) is Short) and (Cumulative Elevation Gain Per KM (KM) is Strong (8.5 to 16.5 Degree Slope)) and (Mean Heart Rate (BPM) % of Average Maximum Heart Rate is Target) then (Minimum Athleticism is Moderate) (0.6) '

'141. If (Pace (Min per KM) is Slow Walking) and (Distance (KM) is Short) and (Cumulative Elevation Gain Per KM (KM) is Very Strong (16.5 to 24 Degree Slope)) and (Mean Heart Rate (BPM) % of Average Maximum Heart Rate is Target) then (Minimum Athleticism is Moderate) (0.6) '

'142. If (Pace (Min per KM) is Slow Walking) and (Distance (KM) is Short) and (Cumulative Elevation Gain Per KM (KM) is Extreme (24 to 35 Degree Slope)) and (Mean Heart Rate (BPM) % of Average Maximum Heart Rate is Target) then (Minimum Athleticism is Moderate) (0.6) '

'143. If (Pace (Min per KM) is Slow Walking) and (Distance (KM) is Short) and (Cumulative Elevation Gain Per KM (KM) is Steep (35 to 45 Degree Slope)) and (Mean Heart Rate (BPM) % of Average Maximum Heart Rate is Target) then (Minimum Athleticism is High) (0.6) '

'144. If (Pace (Min per KM) is Slow Walking) and (Distance (KM) is Short) and (Cumulative Elevation Gain Per KM (KM) is Very Steep (>45 Degree Slope)) and (Mean Heart Rate (BPM) % of Average Maximum Heart Rate is Target) then (Minimum Athleticism is High) (0.6) '

'145. If (Pace (Min per KM) is Walking) and (Distance (KM) is Short) and (Cumulative Elevation Gain Per KM (KM) is Level (0 to .3 Degree Slope)) and (Mean Heart Rate (BPM) % of Average Maximum Heart Rate is Target) then (Minimum Athleticism is Moderate) (0.6) '

'146. If (Pace (Min per KM) is Walking) and (Distance (KM) is Short) and (Cumulative Elevation Gain Per KM (KM) is Nearly Level (.3 to 1.1 Degree Slope)) and (Mean Heart Rate (BPM) % of Average Maximum Heart Rate is Target) then (Minimum Athleticism is Moderate) (0.6) '

'147. If (Pace (Min per KM) is Walking) and (Distance (KM) is Short) and (Cumulative Elevation Gain Per KM (KM) is Very Gentle (1.1 to 3 Degree Slope)) and (Mean Heart Rate (BPM) % of Average Maximum Heart Rate is Target) then (Minimum Athleticism is Moderate) (0.6) '

'148. If (Pace (Min per KM) is Walking) and (Distance (KM) is Short) and (Cumulative Elevation Gain Per KM (KM) is Gentle (3 to 5 Degree Slope)) and (Mean Heart Rate (BPM) % of Average Maximum Heart Rate is Target) then (Minimum Athleticism is Moderate) (0.6) '

'149. If (Pace (Min per KM) is Walking) and (Distance (KM) is Short) and (Cumulative Elevation Gain Per KM (KM) is Moderate (5 to 8.5 Degree Slope)) and (Mean Heart Rate (BPM) % of Average Maximum Heart Rate is Target) then (Minimum Athleticism is Moderate) (0.6) '

'150. If (Pace (Min per KM) is Walking) and (Distance (KM) is Short) and (Cumulative Elevation Gain Per KM (KM) is Strong (8.5 to 16.5 Degree Slope)) and (Mean Heart Rate (BPM) % of Average Maximum Heart Rate is Target) then (Minimum Athleticism is Moderate) (0.6) '

'151. If (Pace (Min per KM) is Walking) and (Distance (KM) is Short) and (Cumulative Elevation Gain Per KM (KM) is Very Strong (16.5 to 24 Degree Slope)) and (Mean Heart Rate (BPM) % of Average Maximum Heart Rate is Target) then (Minimum Athleticism is High) (0.6) '

'152. If (Pace (Min per KM) is Walking) and (Distance (KM) is Short) and (Cumulative Elevation Gain Per KM (KM) is Extreme (24 to 35 Degree Slope)) and (Mean Heart Rate (BPM) % of Average Maximum Heart Rate is Target) then (Minimum Athleticism is High) (0.6) '

'153. If (Pace (Min per KM) is Walking) and (Distance (KM) is Short) and (Cumulative Elevation Gain Per KM (KM) is Steep (35 to 45 Degree Slope)) and (Mean Heart Rate (BPM) % of Average Maximum Heart Rate is Target) then (Minimum Athleticism is High) (0.6) '

'154. If (Pace (Min per KM) is Walking) and (Distance (KM) is Short) and (Cumulative Elevation Gain Per KM (KM) is Very Steep (>45 Degree Slope)) and (Mean Heart Rate (BPM) % of Average Maximum Heart Rate is Target) then (Minimum Athleticism is Very High) (0.6) '

'155. If (Pace (Min per KM) is Fast Walking) and (Distance (KM) is Short) and (Cumulative Elevation Gain Per KM (KM) is Level (0 to .3 Degree Slope)) and (Mean Heart Rate (BPM) % of Average Maximum Heart Rate is Target) then (Minimum Athleticism is Moderate) (0.6) '

'156. If (Pace (Min per KM) is Fast Walking) and (Distance (KM) is Short) and (Cumulative Elevation Gain Per KM (KM) is Nearly Level (.3 to 1.1 Degree Slope)) and (Mean Heart Rate (BPM) % of Average Maximum Heart Rate is Target) then (Minimum Athleticism is Moderate) (0.6) '

'157. If (Pace (Min per KM) is Fast Walking) and (Distance (KM) is Short) and (Cumulative Elevation Gain Per KM (KM) is Very Gentle (1.1 to 3 Degree Slope)) and (Mean Heart Rate (BPM) % of Average Maximum Heart Rate is Target) then (Minimum Athleticism is Moderate) (0.6) '

'158. If (Pace (Min per KM) is Fast Walking) and (Distance (KM) is Short) and (Cumulative Elevation Gain Per KM (KM) is Gentle (3 to 5 Degree Slope)) and (Mean Heart Rate (BPM) % of Average Maximum Heart Rate is Target) then (Minimum Athleticism is Moderate) (0.6) '

'159. If (Pace (Min per KM) is Fast Walking) and (Distance (KM) is Short) and (Cumulative Elevation Gain Per KM (KM) is Moderate (5 to 8.5 Degree Slope)) and (Mean Heart Rate (BPM) % of Average Maximum Heart Rate is Target) then (Minimum Athleticism is High) (0.6) '

'160. If (Pace (Min per KM) is Fast Walking) and (Distance (KM) is Short) and (Cumulative Elevation Gain Per KM (KM) is Strong (8.5 to 16.5 Degree Slope)) and (Mean Heart Rate (BPM) % of Average Maximum Heart Rate is Target) then (Minimum Athleticism is High) (0.6) '

'161. If (Pace (Min per KM) is Fast Walking) and (Distance (KM) is Short) and (Cumulative Elevation Gain Per KM (KM) is Very Strong (16.5 to 24 Degree Slope)) and (Mean Heart Rate (BPM) % of Average Maximum Heart Rate is Target) then (Minimum Athleticism is High) (0.6) '

'162. If (Pace (Min per KM) is Fast Walking) and (Distance (KM) is Short) and (Cumulative Elevation Gain Per KM (KM) is Extreme (24 to 35 Degree Slope)) and (Mean Heart Rate (BPM) % of Average Maximum Heart Rate is Target) then (Minimum Athleticism is Very High) (0.6) '

'163. If (Pace (Min per KM) is Fast Walking) and (Distance (KM) is Short) and (Cumulative Elevation Gain Per KM (KM) is Steep (35 to 45 Degree Slope)) and (Mean Heart Rate (BPM) % of Average Maximum Heart Rate is Target) then (Minimum Athleticism is Very High) (0.6) '

'164. If (Pace (Min per KM) is Fast Walking) and (Distance (KM) is Short) and (Cumulative Elevation Gain Per KM (KM) is Very Steep (>45 Degree Slope)) and (Mean Heart Rate (BPM) % of Average Maximum Heart Rate is Target) then (Minimum Athleticism is Very High) (0.6) '

'165. If (Pace (Min per KM) is Jogging) and (Distance (KM) is Short) and (Cumulative Elevation Gain Per KM (KM) is Level (0 to .3 Degree Slope)) and (Mean Heart Rate (BPM) % of Average Maximum Heart Rate is Target) then (Minimum Athleticism is Moderate) (0.6) '

'166. If (Pace (Min per KM) is Jogging) and (Distance (KM) is Short) and (Cumulative Elevation Gain Per KM (KM) is Nearly Level (.3 to 1.1 Degree Slope)) and (Mean Heart Rate (BPM) % of Average Maximum Heart Rate is Target) then (Minimum Athleticism is Moderate) (0.6) '

'167. If (Pace (Min per KM) is Jogging) and (Distance (KM) is Short) and (Cumulative Elevation Gain Per KM (KM) is Very Gentle (1.1 to 3 Degree Slope)) and (Mean Heart Rate (BPM) % of Average Maximum Heart Rate is Target) then (Minimum Athleticism is Moderate) (0.6) '

'168. If (Pace (Min per KM) is Jogging) and (Distance (KM) is Short) and (Cumulative Elevation Gain Per KM (KM) is Gentle (3 to 5 Degree Slope)) and (Mean Heart Rate (BPM) % of Average Maximum Heart Rate is Target) then (Minimum Athleticism is Moderate) (0.6) '

'169. If (Pace (Min per KM) is Jogging) and (Distance (KM) is Short) and (Cumulative Elevation Gain Per KM (KM) is Moderate (5 to 8.5 Degree Slope)) and (Mean Heart Rate (BPM) % of Average Maximum Heart Rate is Target) then (Minimum Athleticism is High) (0.6) '

'170. If (Pace (Min per KM) is Jogging) and (Distance (KM) is Short) and (Cumulative Elevation Gain Per KM (KM) is Strong (8.5 to 16.5 Degree Slope)) and (Mean Heart Rate (BPM) % of Average Maximum Heart Rate is Target) then (Minimum Athleticism is High) (0.6) '

'171. If (Pace (Min per KM) is Jogging) and (Distance (KM) is Short) and (Cumulative Elevation Gain Per KM (KM) is Very Strong (16.5 to 24 Degree Slope)) and (Mean Heart Rate (BPM) % of Average Maximum Heart Rate is Target) then (Minimum Athleticism is Very High) (0.6) '

'172. If (Pace (Min per KM) is Jogging) and (Distance (KM) is Short) and (Cumulative Elevation Gain Per KM (KM) is Extreme (24 to 35 Degree Slope)) and (Mean Heart Rate (BPM) % of Average Maximum Heart Rate is Target) then (Minimum Athleticism is Very High) (0.6) '

'173. If (Pace (Min per KM) is Jogging) and (Distance (KM) is Short) and (Cumulative Elevation Gain Per KM (KM) is Steep (35 to 45 Degree Slope)) and (Mean Heart Rate (BPM) % of Average Maximum Heart Rate is Target) then (Minimum Athleticism is Very High) (0.6) '

'174. If (Pace (Min per KM) is Jogging) and (Distance (KM) is Short) and (Cumulative Elevation Gain Per KM (KM) is Very Steep (>45 Degree Slope)) and (Mean Heart Rate (BPM) % of Average Maximum Heart Rate is Target) then (Minimum Athleticism is Very High) (0.6) '

'175. If (Pace (Min per KM) is Sprinting) and (Distance (KM) is Short) and (Cumulative Elevation Gain Per KM (KM) is Level (0 to .3 Degree Slope)) and (Mean Heart Rate (BPM) % of Average Maximum Heart Rate is Target) then (Minimum Athleticism is Moderate) (0.6) '

'176. If (Pace (Min per KM) is Sprinting) and (Distance (KM) is Short) and (Cumulative Elevation Gain Per KM (KM) is Nearly Level (.3 to 1.1 Degree Slope)) and (Mean Heart Rate (BPM) % of Average Maximum Heart Rate is Target) then (Minimum Athleticism is Moderate) (0.6) '

'177. If (Pace (Min per KM) is Sprinting) and (Distance (KM) is Short) and (Cumulative Elevation Gain Per KM (KM) is Very Gentle (1.1 to 3 Degree Slope)) and (Mean Heart Rate (BPM) % of Average Maximum Heart Rate is Target) then (Minimum Athleticism is Moderate) (0.6) '

'178. If (Pace (Min per KM) is Sprinting) and (Distance (KM) is Short) and (Cumulative Elevation Gain Per KM (KM) is Gentle (3 to 5 Degree Slope)) and (Mean Heart Rate (BPM) % of Average Maximum Heart Rate is Target) then (Minimum Athleticism is High) (0.6) '

'179. If (Pace (Min per KM) is Sprinting) and (Distance (KM) is Short) and (Cumulative Elevation Gain Per KM (KM) is Moderate (5 to 8.5 Degree Slope)) and (Mean Heart Rate (BPM) % of Average Maximum Heart Rate is Target) then (Minimum Athleticism is High) (0.6) '

'180. If (Pace (Min per KM) is Sprinting) and (Distance (KM) is Short) and (Cumulative Elevation Gain Per KM (KM) is Strong (8.5 to 16.5 Degree Slope)) and (Mean Heart Rate (BPM) % of Average Maximum Heart Rate is Target) then (Minimum Athleticism is Very High) (0.6) '

'181. If (Pace (Min per KM) is Sprinting) and (Distance (KM) is Short) and (Cumulative Elevation Gain Per KM (KM) is Very Strong (16.5 to 24 Degree Slope)) and (Mean Heart Rate (BPM) % of Average Maximum Heart Rate is Target) then (Minimum Athleticism is Very High) (0.6) '

'182. If (Pace (Min per KM) is Sprinting) and (Distance (KM) is Short) and (Cumulative Elevation Gain Per KM (KM) is Extreme (24 to 35 Degree Slope)) and (Mean Heart Rate (BPM) % of Average Maximum Heart Rate is Target) then (Minimum Athleticism is Very High) (0.6) '

'183. If (Pace (Min per KM) is Sprinting) and (Distance (KM) is Short) and (Cumulative Elevation Gain Per KM (KM) is Steep (35 to 45 Degree Slope)) and (Mean Heart Rate (BPM) % of Average Maximum Heart Rate is Target) then (Minimum Athleticism is Very High) (0.6) '

'184. If (Pace (Min per KM) is Sprinting) and (Distance (KM) is Short) and (Cumulative Elevation Gain Per KM (KM) is Very Steep (>45 Degree Slope)) and (Mean Heart Rate (BPM) % of Average Maximum Heart Rate is Target) then (Minimum Athleticism is Very High) (0.6) '

'185. If (Pace (Min per KM) is Crawling) and (Distance (KM) is Very Short) and (Cumulative Elevation Gain Per KM (KM) is Level (0 to .3 Degree Slope)) and (Mean Heart Rate (BPM) % of Average Maximum Heart Rate is Target) then (Minimum Athleticism is Very Low) (0.6) '

'186. If (Pace (Min per KM) is Crawling) and (Distance (KM) is Very Short) and (Cumulative Elevation Gain Per KM (KM) is Nearly Level (.3 to 1.1 Degree Slope)) and (Mean Heart Rate (BPM) % of Average Maximum Heart Rate is Target) then (Minimum Athleticism is Very Low) (0.6) '

'187. If (Pace (Min per KM) is Crawling) and (Distance (KM) is Very Short) and (Cumulative Elevation Gain Per KM (KM) is Very Gentle (1.1 to 3 Degree Slope)) and (Mean Heart Rate (BPM) % of Average Maximum Heart Rate is Target) then (Minimum Athleticism is Very Low) (0.6) '

'188. If (Pace (Min per KM) is Crawling) and (Distance (KM) is Very Short) and (Cumulative Elevation Gain Per KM (KM) is Gentle (3 to 5 Degree Slope)) and (Mean Heart Rate (BPM) % of Average Maximum Heart Rate is Target) then (Minimum Athleticism is Very Low) (0.6) '

'189. If (Pace (Min per KM) is Crawling) and (Distance (KM) is Very Short) and (Cumulative Elevation Gain Per KM (KM) is Moderate (5 to 8.5 Degree Slope)) and (Mean Heart Rate (BPM) % of Average Maximum Heart Rate is Target) then (Minimum Athleticism is Low) (0.6) '

'190. If (Pace (Min per KM) is Crawling) and (Distance (KM) is Very Short) and (Cumulative Elevation Gain Per KM (KM) is Strong (8.5 to 16.5 Degree Slope)) and (Mean Heart Rate (BPM) % of Average Maximum Heart Rate is Target) then (Minimum Athleticism is Low) (0.6) '

'191. If (Pace (Min per KM) is Crawling) and (Distance (KM) is Very Short) and (Cumulative Elevation Gain Per KM (KM) is Very Strong (16.5 to 24 Degree Slope)) and (Mean Heart Rate (BPM) % of Average Maximum Heart Rate is Target) then (Minimum Athleticism is Moderate) (0.6) '

'192. If (Pace (Min per KM) is Crawling) and (Distance (KM) is Very Short) and (Cumulative Elevation Gain Per KM (KM) is Extreme (24 to 35 Degree Slope)) and (Mean Heart Rate (BPM) % of Average Maximum Heart Rate is Target) then (Minimum Athleticism is Moderate) (0.6) '

'193. If (Pace (Min per KM) is Crawling) and (Distance (KM) is Very Short) and (Cumulative Elevation Gain Per KM (KM) is Steep (35 to 45 Degree Slope)) and (Mean Heart Rate (BPM) % of Average Maximum Heart Rate is Target) then (Minimum Athleticism is Moderate) (0.6) '

'194. If (Pace (Min per KM) is Crawling) and (Distance (KM) is Very Short) and (Cumulative Elevation Gain Per KM (KM) is Very Steep (>45 Degree Slope)) and (Mean Heart Rate (BPM) % of Average Maximum Heart Rate is Target) then (Minimum Athleticism is Moderate) (0.6) '

'195. If (Pace (Min per KM) is Slow Walking) and (Distance (KM) is Very Short) and (Cumulative Elevation Gain Per KM (KM) is Level (0 to .3 Degree Slope)) and (Mean Heart Rate (BPM) % of Average Maximum Heart Rate is Target) then (Minimum Athleticism is Very Low) (0.6) '

'196. If (Pace (Min per KM) is Slow Walking) and (Distance (KM) is Very Short) and (Cumulative Elevation Gain Per KM (KM) is Nearly Level (.3 to 1.1 Degree Slope)) and (Mean Heart Rate (BPM) % of Average Maximum Heart Rate is Target) then (Minimum Athleticism is Very Low) (0.6)'

'197. If (Pace (Min per KM) is Slow Walking) and (Distance (KM) is Very Short) and (Cumulative Elevation Gain Per KM (KM) is Very Gentle (1.1 to 3 Degree Slope)) and (Mean Heart Rate (BPM) % of Average Maximum Heart Rate is Target) then (Minimum Athleticism is Low) (0.6) '

'198. If (Pace (Min per KM) is Slow Walking) and (Distance (KM) is Very Short) and (Cumulative Elevation Gain Per KM (KM) is Gentle (3 to 5 Degree Slope)) and (Mean Heart Rate (BPM) % of Average Maximum Heart Rate is Target) then (Minimum Athleticism is Low) (0.6) '

'199. If (Pace (Min per KM) is Slow Walking) and (Distance (KM) is Very Short) and (Cumulative Elevation Gain Per KM (KM) is Moderate (5 to 8.5 Degree Slope)) and (Mean Heart Rate (BPM) % of Average Maximum Heart Rate is Target) then (Minimum Athleticism is Moderate) (0.6) '

'200. If (Pace (Min per KM) is Slow Walking) and (Distance (KM) is Very Short) and (Cumulative Elevation Gain Per KM (KM) is Strong (8.5 to 16.5 Degree Slope)) and (Mean Heart Rate (BPM) % of Average Maximum Heart Rate is Target) then (Minimum Athleticism is Moderate) (0.6) '

'201. If (Pace (Min per KM) is Slow Walking) and (Distance (KM) is Very Short) and (Cumulative Elevation Gain Per KM (KM) is Very Strong (16.5 to 24 Degree Slope)) and (Mean Heart Rate (BPM) % of Average Maximum Heart Rate is Target) then (Minimum Athleticism is Moderate) (0.6)'

'202. If (Pace (Min per KM) is Slow Walking) and (Distance (KM) is Very Short) and (Cumulative Elevation Gain Per KM (KM) is Extreme (24 to 35 Degree Slope)) and (Mean Heart Rate (BPM) % of Average Maximum Heart Rate is Target) then (Minimum Athleticism is Moderate) (0.6) '

'203. If (Pace (Min per KM) is Slow Walking) and (Distance (KM) is Very Short) and (Cumulative Elevation Gain Per KM (KM) is Steep (35 to 45 Degree Slope)) and (Mean Heart Rate (BPM) % of Average Maximum Heart Rate is Target) then (Minimum Athleticism is Moderate) (0.6) '

'204. If (Pace (Min per KM) is Slow Walking) and (Distance (KM) is Very Short) and (Cumulative Elevation Gain Per KM (KM) is Very Steep (>45 Degree Slope)) and (Mean Heart Rate (BPM) % of Average Maximum Heart Rate is Target) then (Minimum Athleticism is Moderate) (0.6) '

'205. If (Pace (Min per KM) is Walking) and (Distance (KM) is Very Short) and (Cumulative Elevation Gain Per KM (KM) is Level (0 to .3 Degree Slope)) and (Mean Heart Rate (BPM) % of Average Maximum Heart Rate is Target) then (Minimum Athleticism is Low) (0.6) '

'206. If (Pace (Min per KM) is Walking) and (Distance (KM) is Very Short) and (Cumulative Elevation Gain Per KM (KM) is Nearly Level (.3 to 1.1 Degree Slope)) and (Mean Heart Rate (BPM) % of Average Maximum Heart Rate is Target) then (Minimum Athleticism is Low) (0.6) '

'207. If (Pace (Min per KM) is Walking) and (Distance (KM) is Very Short) and (Cumulative Elevation Gain Per KM (KM) is Very Gentle (1.1 to 3 Degree Slope)) and (Mean Heart Rate (BPM) % of Average Maximum Heart Rate is Target) then (Minimum Athleticism is Moderate) (0.6) '

'208. If (Pace (Min per KM) is Walking) and (Distance (KM) is Very Short) and (Cumulative Elevation Gain Per KM (KM) is Gentle (3 to 5 Degree Slope)) and (Mean Heart Rate (BPM) % of Average Maximum Heart Rate is Target) then (Minimum Athleticism is Moderate) (0.6) '

'209. If (Pace (Min per KM) is Walking) and (Distance (KM) is Very Short) and (Cumulative Elevation Gain Per KM (KM) is Moderate (5 to 8.5 Degree Slope)) and (Mean Heart Rate (BPM) % of Average Maximum Heart Rate is Target) then (Minimum Athleticism is Moderate) (0.6) '

'210. If (Pace (Min per KM) is Walking) and (Distance (KM) is Very Short) and (Cumulative Elevation Gain Per KM (KM) is Strong (8.5 to 16.5 Degree Slope)) and (Mean Heart Rate (BPM) % of Average Maximum Heart Rate is Target) then (Minimum Athleticism is Moderate) (0.6) '

'211. If (Pace (Min per KM) is Walking) and (Distance (KM) is Very Short) and (Cumulative Elevation Gain Per KM (KM) is Very Strong (16.5 to 24 Degree Slope)) and (Mean Heart Rate (BPM) % of Average Maximum Heart Rate is Target) then (Minimum Athleticism is Moderate) (0.6) '

'212. If (Pace (Min per KM) is Walking) and (Distance (KM) is Very Short) and (Cumulative Elevation Gain Per KM (KM) is Extreme (24 to 35 Degree Slope)) and (Mean Heart Rate (BPM) % of Average Maximum Heart Rate is Target) then (Minimum Athleticism is Moderate) (0.6) '

'213. If (Pace (Min per KM) is Walking) and (Distance (KM) is Very Short) and (Cumulative Elevation Gain Per KM (KM) is Steep (35 to 45 Degree Slope)) and (Mean Heart Rate (BPM) % of Average Maximum Heart Rate is Target) then (Minimum Athleticism is High) (0.6) '

'214. If (Pace (Min per KM) is Walking) and (Distance (KM) is Very Short) and (Cumulative Elevation Gain Per KM (KM) is Very Steep (>45 Degree Slope)) and (Mean Heart Rate (BPM) % of Average Maximum Heart Rate is Target) then (Minimum Athleticism is High) (0.6) '

'215. If (Pace (Min per KM) is Fast Walking) and (Distance (KM) is Very Short) and (Cumulative Elevation Gain Per KM (KM) is Level (0 to .3 Degree Slope)) and (Mean Heart Rate (BPM) % of Average Maximum Heart Rate is Target) then (Minimum Athleticism is Moderate) (0.6) '

'216. If (Pace (Min per KM) is Fast Walking) and (Distance (KM) is Very Short) and (Cumulative Elevation Gain Per KM (KM) is Nearly Level (.3 to 1.1 Degree Slope)) and (Mean Heart Rate (BPM) % of Average Maximum Heart Rate is Target) then (Minimum Athleticism is Moderate) (0.6)'

'217. If (Pace (Min per KM) is Fast Walking) and (Distance (KM) is Very Short) and (Cumulative Elevation Gain Per KM (KM) is Very Gentle (1.1 to 3 Degree Slope)) and (Mean Heart Rate (BPM) % of Average Maximum Heart Rate is Target) then (Minimum Athleticism is Moderate) (0.6) '

'218. If (Pace (Min per KM) is Fast Walking) and (Distance (KM) is Very Short) and (Cumulative Elevation Gain Per KM (KM) is Gentle (3 to 5 Degree Slope)) and (Mean Heart Rate (BPM) % of Average Maximum Heart Rate is Target) then (Minimum Athleticism is Moderate) (0.6) '

'219. If (Pace (Min per KM) is Fast Walking) and (Distance (KM) is Very Short) and (Cumulative Elevation Gain Per KM (KM) is Moderate (5 to 8.5 Degree Slope)) and (Mean Heart Rate (BPM) % of Average Maximum Heart Rate is Target) then (Minimum Athleticism is Moderate) (0.6) '

'220. If (Pace (Min per KM) is Fast Walking) and (Distance (KM) is Very Short) and (Cumulative Elevation Gain Per KM (KM) is Strong (8.5 to 16.5 Degree Slope)) and (Mean Heart Rate (BPM) % of Average Maximum Heart Rate is Target) then (Minimum Athleticism is Moderate) (0.6) '

'221. If (Pace (Min per KM) is Fast Walking) and (Distance (KM) is Very Short) and (Cumulative Elevation Gain Per KM (KM) is Very Strong (16.5 to 24 Degree Slope)) and (Mean Heart Rate (BPM) % of Average Maximum Heart Rate is Target) then (Minimum Athleticism is High) (0.6) '

'222. If (Pace (Min per KM) is Fast Walking) and (Distance (KM) is Very Short) and (Cumulative Elevation Gain Per KM (KM) is Extreme (24 to 35 Degree Slope)) and (Mean Heart Rate (BPM) % of Average Maximum Heart Rate is Target) then (Minimum Athleticism is High) (0.6) '

'223. If (Pace (Min per KM) is Fast Walking) and (Distance (KM) is Very Short) and (Cumulative Elevation Gain Per KM (KM) is Steep (35 to 45 Degree Slope)) and (Mean Heart Rate (BPM) % of Average Maximum Heart Rate is Target) then (Minimum Athleticism is High) (0.6) '

'224. If (Pace (Min per KM) is Fast Walking) and (Distance (KM) is Very Short) and (Cumulative Elevation Gain Per KM (KM) is Very Steep (>45 Degree Slope)) and (Mean Heart Rate (BPM) % of Average Maximum Heart Rate is Target) then (Minimum Athleticism is High) (0.6) '

'225. If (Pace (Min per KM) is Jogging) and (Distance (KM) is Very Short) and (Cumulative Elevation Gain Per KM (KM) is Level (0 to .3 Degree Slope)) and (Mean Heart Rate (BPM) % of Average Maximum Heart Rate is Target) then (Minimum Athleticism is Moderate) (0.6) '

'226. If (Pace (Min per KM) is Jogging) and (Distance (KM) is Very Short) and (Cumulative Elevation Gain Per KM (KM) is Nearly Level (.3 to 1.1 Degree Slope)) and (Mean Heart Rate (BPM) % of Average Maximum Heart Rate is Target) then (Minimum Athleticism is Moderate) (0.6) '

'227. If (Pace (Min per KM) is Jogging) and (Distance (KM) is Very Short) and (Cumulative Elevation Gain Per KM (KM) is Very Gentle (1.1 to 3 Degree Slope)) and (Mean Heart Rate (BPM) % of Average Maximum Heart Rate is Target) then (Minimum Athleticism is Moderate) (0.6) '

'228. If (Pace (Min per KM) is Jogging) and (Distance (KM) is Very Short) and (Cumulative Elevation Gain Per KM (KM) is Gentle (3 to 5 Degree Slope)) and (Mean Heart Rate (BPM) % of Average Maximum Heart Rate is Target) then (Minimum Athleticism is Moderate) (0.6) '

'229. If (Pace (Min per KM) is Jogging) and (Distance (KM) is Very Short) and (Cumulative Elevation Gain Per KM (KM) is Moderate (5 to 8.5 Degree Slope)) and (Mean Heart Rate (BPM) % of Average Maximum Heart Rate is Target) then (Minimum Athleticism is Moderate) (0.6) '

'230. If (Pace (Min per KM) is Jogging) and (Distance (KM) is Very Short) and (Cumulative Elevation Gain Per KM (KM) is Strong (8.5 to 16.5 Degree Slope)) and (Mean Heart Rate (BPM) % of Average Maximum Heart Rate is Target) then (Minimum Athleticism is High) (0.6) '

'231. If (Pace (Min per KM) is Jogging) and (Distance (KM) is Very Short) and (Cumulative Elevation Gain Per KM (KM) is Very Strong (16.5 to 24 Degree Slope)) and (Mean Heart Rate (BPM) % of Average Maximum Heart Rate is Target) then (Minimum Athleticism is High) (0.6) '

'232. If (Pace (Min per KM) is Jogging) and (Distance (KM) is Very Short) and (Cumulative Elevation Gain Per KM (KM) is Extreme (24 to 35 Degree Slope)) and (Mean Heart Rate (BPM) % of Average Maximum Heart Rate is Target) then (Minimum Athleticism is High) (0.6) '

'233. If (Pace (Min per KM) is Jogging) and (Distance (KM) is Very Short) and (Cumulative Elevation Gain Per KM (KM) is Steep (35 to 45 Degree Slope)) and (Mean Heart Rate (BPM) % of Average Maximum Heart Rate is Target) then (Minimum Athleticism is High) (0.6) '

'234. If (Pace (Min per KM) is Jogging) and (Distance (KM) is Very Short) and (Cumulative Elevation Gain Per KM (KM) is Very Steep (>45 Degree Slope)) and (Mean Heart Rate (BPM) % of Average Maximum Heart Rate is Target) then (Minimum Athleticism is High) (0.6) '

'235. If (Pace (Min per KM) is Sprinting) and (Distance (KM) is Very Short) and (Cumulative Elevation Gain Per KM (KM) is Level (0 to .3 Degree Slope)) and (Mean Heart Rate (BPM) % of Average Maximum Heart Rate is Target) then (Minimum Athleticism is Moderate) (0.6) '

'236. If (Pace (Min per KM) is Sprinting) and (Distance (KM) is Very Short) and (Cumulative Elevation Gain Per KM (KM) is Nearly Level (.3 to 1.1 Degree Slope)) and (Mean Heart Rate (BPM) % of Average Maximum Heart Rate is Target) then (Minimum Athleticism is Moderate) (0.6) '

'237. If (Pace (Min per KM) is Sprinting) and (Distance (KM) is Very Short) and (Cumulative Elevation Gain Per KM (KM) is Very Gentle (1.1 to 3 Degree Slope)) and (Mean Heart Rate (BPM) % of Average Maximum Heart Rate is Target) then (Minimum Athleticism is Moderate) (0.6) '

'238. If (Pace (Min per KM) is Sprinting) and (Distance (KM) is Very Short) and (Cumulative Elevation Gain Per KM (KM) is Gentle (3 to 5 Degree Slope)) and (Mean Heart Rate (BPM) % of Average Maximum Heart Rate is Target) then (Minimum Athleticism is Moderate) (0.6) '

'239. If (Pace (Min per KM) is Sprinting) and (Distance (KM) is Very Short) and (Cumulative Elevation Gain Per KM (KM) is Moderate (5 to 8.5 Degree Slope)) and (Mean Heart Rate (BPM) % of Average Maximum Heart Rate is Target) then (Minimum Athleticism is High) (0.6) '

'240. If (Pace (Min per KM) is Sprinting) and (Distance (KM) is Very Short) and (Cumulative Elevation Gain Per KM (KM) is Strong (8.5 to 16.5 Degree Slope)) and (Mean Heart Rate (BPM) % of Average Maximum Heart Rate is Target) then (Minimum Athleticism is High) (0.6) '

'241. If (Pace (Min per KM) is Sprinting) and (Distance (KM) is Very Short) and (Cumulative Elevation Gain Per KM (KM) is Very Strong (16.5 to 24 Degree Slope)) and (Mean Heart Rate (BPM) % of Average Maximum Heart Rate is Target) then (Minimum Athleticism is High) (0.6) '

'242. If (Pace (Min per KM) is Sprinting) and (Distance (KM) is Very Short) and (Cumulative Elevation Gain Per KM (KM) is Extreme (24 to 35 Degree Slope)) and (Mean Heart Rate (BPM) % of Average Maximum Heart Rate is Target) then (Minimum Athleticism is High) (0.6) '

'243. If (Pace (Min per KM) is Sprinting) and (Distance (KM) is Very Short) and (Cumulative Elevation Gain Per KM (KM) is Steep (35 to 45 Degree Slope)) and (Mean Heart Rate (BPM) % of Average Maximum Heart Rate is Target) then (Minimum Athleticism is High) (0.6) '

'244. If (Pace (Min per KM) is Sprinting) and (Distance (KM) is Very Short) and (Cumulative Elevation Gain Per KM (KM) is Very Steep (>45 Degree Slope)) and (Mean Heart Rate (BPM) % of Average Maximum Heart Rate is Target) then (Minimum Athleticism is High) (0.6) '