**Mathematics Specialist Investigation Marking Rubric - 50 Marks**

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| **Grade** | **A** | **B** | **C** | **D** |
| **Identifies and organises relevant information**  **10 Marks** | Identifies the underlying assumptions related to the relevant mathematics of the investigation.  Assume flies are travelling in a straight line in 3 dimensional space .**✓** on a constant velocity.**✓** | Identifies suitable variables and constant parameters related to various aspects of an investigation.  Parameters include the original location for the flies and the velocity vectors of the flies and the locations of the people. **✓**  Variables are time and displacement . **✓** | Identifies some mathematical content related to various aspects of an investigation in a given context.  Vectors are to be used to model the path that two flies are travelling on (location of the flies). **✓**  Investigate the time it takes the flies to reach a person. **✓**  The closest distance the files are apart and when this happens. **✓**  Determine the best position for a can of inspect spray to be located in order to hit the two flies. **✓** | Identifies limited mathematical content of an investigation.  Use vectors to represent the position **✓**and velocity of two flies in space. **✓** |
| **Chooses effective models and methods and carries through the methods correctly**  **15 Marks** | Produces results, carries out analysis and generalises in situations requiring investigative techniques.  Interprets for a person to hit both flies with insect repellent it would be beneficial for the flies to be a minimum distance apart. **✓**  Need to determine a plane or other shape to model the insect repellent. **✓** | Attempts to analyse and calculate specific cases of generalisation in situations requiring investigative techniques.  Realises the people need to lie on the path of the flies. **✓**  Realises that the distance between the two flies is expressed in terms of time and the time needs to be a minimum, but greater than or equal to zero, for the distance to be a minimum. **✓**  Determines a vector equation of a line to model the insect repellent. **✓** | Selects an appropriate strategy to carry out analysis in situations requiring investigative techniques.  Chooses positions for the people. **✓**  Determine the time it takes for the flies to reach the person(s) by equating each component of the position vector of the person to the path of the fly and solving the equation. **✓**  Determine the vector equation between the paths of the two flies. **✓**  Determine the equation for the distance between the two flies at any instant by using the magnitude. **✓**  Determine when the two flies are at their closest using either graphical, vector or calculator methods. **✓**  Determine the smallest distance between the by substituting the time into the distance equation. **✓** | Attempts to select an appropriate strategy to carry out analysis in situations requiring investigative techniques.  Chooses sensible initial positions **✓**and velocity **✓**vectors for the flies.  Determine a vector equation of a line for the path of each fly. **✓**  Convert the equation of the lines to parametric equations. **✓** |
| **Follows mathematical conventions and attends to accuracy**  **15 Marks (follows through on above)** | Completes concise and accurate solutions to mathematical problems set in applied and theoretical contexts.  Completes the process described above with nearly accurate (more than 80%) workings.  Models insect repellent with a plane or other model. | Completes mostly accurate solutions to mathematical problems set in applied and theoretical contexts.  Completes the process described above with most (more than 65%) accurate workings. | Generates some accurate and generally complete solutions to mathematical problems set in applied and theoretical contexts.  Completes the process described above with some (more than 50%) accurate workings. | Attempts to select an appropriate strategy to carry out analysis in situations requiring investigative techniques.  Completes the process described above |
| **Links mathematical results to data and contexts to reach reasonable conclusions**  **6 Marks** | Identifies and explains the limitations of complex models.  Interprets the result and draws the correct conclusion about the effect of changing conditions.  Uses counter-examples and general cases in mathematical analysis of an investigation.  No consideration of the strength or time needed for the insect spray to reach the flies. **✓** | Identifies and explains the limitations of simple models.  Links the effect of changing conditions to the original solution.  Uses examples in mathematical analysis of an investigation and draws valid conclusions related to a given context.  Any issues with the time that the flies are the least distance apart? **✓** | Identifies and describes limitations of simple models.  Recognises that changing conditions will affect the outcome.  Makes inferences from analysis and uses these to draw conclusions related to a given context for investigation.  Person being located at a point, clearly a person is larger than a fly and occupies more space. **✓**  Flies being limited to travelling on a straight line in space which is not realistic. **✓** | Identifies limitations of simple models and, on occasions, recognises specified conditions.  Makes some inferences from analysis of an investigation.  Examines the speed of the flies, are these reasonable? **✓**  Flies travelling with constant velocities, which is not true in real life, but would complicate the model. **✓** |
| **Communicates mathematical reasoning, results and conclusions**  **4 Marks** | Communicates investigation findings with a comprehensive interpretation of mathematical results in the context of the investigation.  **✓** | Communicates investigation findings in a systematic and concise way using mathematical language and relating the solution to the original problem or statement.  .**✓** | Communicates investigation findings in a systematic way using some mathematical expression and everyday language.  **✓** | Offers simple conclusions that are not supported by data or calculations.  **✓** |

**E** grade: does not meet the requirements of a D grade and/or has completed insufficient assessment tasks to be assigned a higher grade.