**Stage 1 Digital Technologies**

**Assessment Type 1: Project Skills**

**Programming: Creating an Autonomous Vehicle**

**Purpose**

Driverless cars are already a reality, with Google leading the way through the production and testing through their company Waymo, in California. These vehicles are capable of sensing their environment and navigating without human intervention. It is expected that in the near future automated vehicles will be in full production with many major car suppliers.

The purpose of this task is to learn the skills required to create a basic autonomous vehicle, which will avoid obstacles.

**Assessment Description**

* Create a design brief which identifies the necessary features and components of a basic autonomous vehicle.
* Learn the basic skills required to connect and program various components using a micro-controller system (Arduino, Raspberry Pi) etc. Analyse algorithms learnt and extensions required in applying them to your product.
* Create a design plan for the proposed vehicle. This should include:
  + a flowchart, relationship/object diagram, or similar (as appropriate)  
    *(Note: these diagrams can be created using* [*https://www.draw.io*](https://www.draw.io)*)*
  + for each feature/component, represent the required attributes and related algorithms using pseudocode and/or UML diagram   
    *(Note: these diagrams can be created using* [*https://www.draw.io*](https://www.draw.io)*)*
  + the order features are to be developed.
* Based on the design plan, develop the autonomous vehicle.
  + Add or remove features, based on issues or ideas, as the product develops.
* Prepare a multimodal presentation (up to 5 minutes in length, or equivalent), which includes:
  + the vehicle in use
  + an evaluation regarding the extent of the automation.

**Assessment Conditions**

* Identification and analysis of alternative algorithms to program various components, justifying their inclusion in your design.
* Design brief and plan.
* Video presentation of the automated vehicle.

**Assessment Design Criteria**

CT2 Development and application of programming skills to create a digital solution or prototype

CT3 Analysis of patterns and relationships in data sets and/or algorithms to draw conclusions

DE1 Development and application of program-design skills to create a digital solution or prototype

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|  | **Computational Thinking** | **Development and Evaluation** | **Research and Ethics** |
| **A** | Insightful and sustained application of computational thinking skills to explore problems and possible solutions.  Focused development and strategic application of a wide range of programming skills to create a digital solution or prototype.  In-depth analysis of patterns and relationships in data sets and/or algorithms to draw insightful conclusions. | Purposeful and well-considered development and application of program-design skills to create digital solutions or a prototype that include innovative features.  Insightful evaluation of the effectiveness of a digital solution or prototype.  Insightful and proactive contribution to collaborative work. | In-depth research into and discussion of the ethical considerations in digital solutions and/or data use. |
| **B** | Some insights in the application of computational thinking skills to explore problems and possible solutions.  Thorough development and well-considered application of a range of programming skills to create a digital solution or prototype.  Some depth in analysis of patterns and relationships in data sets and/or algorithms to draw well-informed conclusions. | Well-considered development and application of program-design skills to create digital solutions or a prototype that include one or more innovative features.  Well-considered evaluation of the effectiveness of a digital solution or prototype.  Mostly consistent and effective contribution to collaborative work. | Some depth in research into and discussion of the ethical considerations in digital solutions and/or data use. |
| **C** | Application of computational thinking skills to explore problems and possible solutions.  Competent development and application of programming skills to create a digital solution or prototype.  Description, with some analysis of patterns and relationships in data sets and/or algorithms, to draw generally informed conclusions. | Development and application of program-design skills to create digital solutions or a prototype that may include one or more innovative features.  Description, with some evaluation of the effectiveness, of a digital solution or prototype.  Effective contribution to collaborative work. | Considered research into and discussion of the ethical considerations in digital solutions and/or data use. |
| **D** | Some application of basic computational thinking skills to describe problems and possible solutions.  Basic development and some application of programming skills to create one or more partial solutions or prototypes.  Basic description of patterns and relationships in data sets and/or algorithms to draw one or more basic conclusions. | Some development and application of program-design skills to create one or more partial solutions or prototypes.  Basic description of a digital solution or prototype and one or more aspects of its effectiveness.  Some contribution to collaborative work. | Basic research into and discussion of the ethical considerations in digital solutions and/or data use. |
| **E** | Attempted application of a limited number of simple computational thinking skills to describe a problem and/or possible solution.  Attempted development and/or application of basic programming skills.  Attempted description of one or more patterns and relationships in data sets and/or algorithms. | Attempted development and application of program-design skills.  Attempted description of a digital solution or prototype.  Limited contribution to collaborative work. | Attempted discussion of an ethical consideration in digital solutions and/or data use. |