**INVESTIGATION: GRADE 8 MEMORANDUM**

**ACTIVITY 1**

1.1 Use the given nets of prisms in ADDENDUM A, build the prism and complete the table below.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **SOLID** | **SHAPE OF THE BASE** | **VER**  **TICES (V)** | **EDGES**  **(E)** | **FACES (F)** | **RELATIONSHIP** |
| Triangular prism | ***Triangle*** | ***6*** | ***9*** | ***5*** |  |
| Rectangular prism | ***Rectangle*** | ***8*** | ***12*** | ***6*** |  |
| Pentagonal prism | ***Pentagon*** | ***10*** | ***15*** | ***7*** |  |
| Hexagonal prism | ***Hexagon*** | ***12*** | ***18*** | ***8*** |  |
| Octagonal prism | ***Octagon*** | ***16*** | ***24*** | ***10*** |  |

**(Two marks for each row of work = 10 marks)**

1.2 Make use of the information in the table to determine a relationship between the number of faces, vertices and edges. Use the last column of the table to record your findings.

***HINT: Try different operations with the number of faces, vertices and edges to find the relationship, must be the same for all given prism for it to become a rule.***

**(2 marks for showing relationship, alternatively can also be**

**or )**

1.3 Write the relationship found in 1.2 in words and then in the form of an equation.

The sum of the number of vertices and number of faces minus the number of edges is equal to two/ The sum of the number of vertices and number of faces minus two equals the number of edges/ The sum of the number of vertices and number of faces is equal to the number of edges plus two.

**(2 marks for relationship in words and 2 marks for correct equation)**

1.4 Test your relationship found in 1.2 on the following polyhedra.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **PLATONIC SOLIDS** | **V(vertices)** | **E(edges)** | **F(faces)** | **Relationship** |
| CUBE | ***8*** | ***12*** | ***6*** |  |
| OCTAHEDRON | ***6*** | ***12*** | ***8*** |  |

**(2 Marks for each row correct = 4 marks)**

**[20]**

**ACTIVITY 2**

2.1 It will not always be that the solid will be provided in diagrammatic form. If this is the case explain how you will determine the number of faces, vertices and edges of a prism with a 100 – sided base.

**HINT: Make use of the two tables completed in activity 1 to assist you.**

**Each column must be viewed separately and the number of sides of the polygon of the base of the prism must be considered**

**FACES:**

**triangular prism =**

**rectangular prism =**

**pentagonal prism =**

**hexagonal prism =**

**prism (100 – sided base )= 100**

|  |  |  |
| --- | --- | --- |
| Solid | Vertices | Edges |
| Triangular prism |  |  |
| Rectangular prism |  |  |
| Pentagonal prism |  |  |
| Hexagonal prism |  |  |
| Prism (100 – sided  polygon in base) |  |  |

***(2 marks for each explanation = 6 marks + 2 marks for correct calculation of the prism with the 100 – sided polygon in its base )***

2.2 Write a relationship to determine the faces, vertices and edges of a prism with *n* – sided polygons in its base.

*The number of faces, vertices and edges of a prism with an n – sided polygon in it base are:*

***(1 mark for each relationship/ rule = 3 marks)***

2.3 Use your rule in 2.2 to determine the number of faces, vertices and edges of the following prisms. Check whether your relationship found in 1.2 still works.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Solid** | **V** | **E** | **F** | **Euler’s formula (theorem)** |
| 1. 50 – sided polygon in base | **100** | **150** | **52** | **100 + 52 – 150 = 2** |
| 1. 70 – sided polygon in base | **140** | **210** | **72** | **140 + 72 – 210 = 2** |
| 1. 115 – sided polygon in base | **230** | **345** | **117** | **230 + 117 – 345 = 2** |

***(1 mark for each correct row = 3 marks + 1 mark for showing Euler’s formula in each case)***

**[15]**

**ACTIVITY 3**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Pyramid** | **V** | **E** | **F** | **Euler’s formula** |
| Triangular pyramid | ***4*** | ***6*** | ***4*** |  |
| Square pyramid | ***5*** | ***8*** | ***5*** |  |
| Pentagonal Pyramid | ***6*** | ***10*** | ***6*** |  |
|  |  |  |  |  |

***CONCLUSION***

***Euler’s formula works for pyramids as well, but to determine the number of faces, vertices and edges for a pyramid with an n – sided polygon in its base a different formula MUST be used.***

***(2 Marks for use of table to prove and 3 marks for conclusion = 5 marks)***

**[5]**