# 9.9 Geometry (3)

**Title**: Use geometry skills when solving problems
**Year Level**: 9
**Assessment**: Internal
**Points**: 3

**Achievement Criteria**

| Achievement | Achievement with Merit | Achievement with Excellence |
|---|---|---|
| Use geometry skills when solving problems | Use geometry skills, using relational thinking, when solving problems | Use geometry skills, using extended abstract thinking, when solving problems |

**Explanatory Notes**

1. This achievement standard is derived from Level 4 and 5 of The New Zealand Curriculum, Learning Media, Ministry of Education, 2007. The following achievement objectives, are related to this achievement standard:
    - GM4.5 Identify classes of two- and three-dimensional shapes by their geometric properties.
    - GM4.6 Relate three-dimensional models to two-dimensional representations, and vice versa.
    - GM4.8 Use the invariant properties of figures and objects under transformations (reflection, rotation, translation, or enlargement).
    - GM5.5 Deduce the angle properties of intersecting and parallel lines and the angle properties of polygons and apply these properties.
    - GM5.6 Create accurate nets for simple polyhedra and connect three-dimensional solids with different two-dimensional representations.
    - GM5.7 Construct and describe simple loci.
    - GM5.8 Interpret points and lines on co-ordinate planes, including scales and bearings on maps.
    - GM5.9 Define and use transformations and describe the invariant properties of figures and objects under these transformations.
    - GM5.10 Apply trigonometric ratios and Pythagoras' theorem in two dimensions.

2. ***Using geometry skills*** involves
    - selecting and using a range of methods in solving problems
    - demonstrating knowledge of number concepts and terms
    - communicating solutions which would usually require only one or two steps

    ***Relational Thinking*** involves one or more of:
    - selecting and carrying out a logical sequence of steps
    - connecting different concepts and representations
    - demonstrating understanding of concepts
    - forming and using a model;

    and also relating findings to a context, or communicating thinking using appropriate mathematical statements.

***Extended Abstract Thinking*** involves:

- devising a strategy to investigate or solve a problem
- identifying relevant concepts in context
- developing a chain of logical reasoning, or proof
- forming a generalisation;

and also using correct mathematical statements, or communicating mathematical insight

3. The phrase ‘a range of methods’ indicates that evidence of the application of at least three different methods is required

4. The skills students need to be familiar with are:
    - Identify shapes by their geometric properties
    - Identify solids by their geometry properties
    - Relate three dimensional models to two dimensional representations
        - Nets (for simple polyhedra)
        - Side Views
        - Isometric Drawings
    - Use transformations (reflections, rotation, translation and enlargement)
    - Read and interpret maps
        - Scales
        - Bearings

5. The extension skills associated with this topic are:
    - Describe transformations (reflections, rotation, translation and enlargement)
    - Pythagoras in two dimensions
    - Trigonometry in two dimensions
    - Angle properties of intersecting and parallel lines
    - Angle properties of polygons.
    - Construct and describe simple loci.