Faces, Vertices and Edges

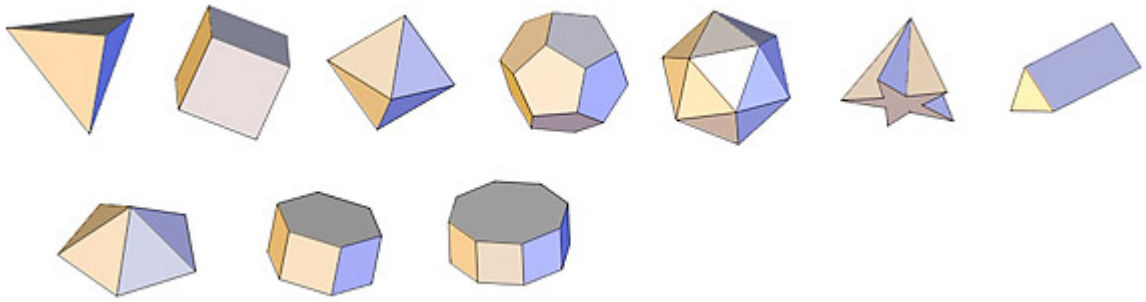
Annotation

Nadia understands and uses correct mathematical terms to describe solid figures. She systematically investigates their features and groups them based on her geometric observations and knowledge. She notices that there is a mathematical relationship between faces, vertices and edges and she accurately describes the two features that differentiate platonic solids from other polyhedra.

Problem: Faces, Vertices and Edges

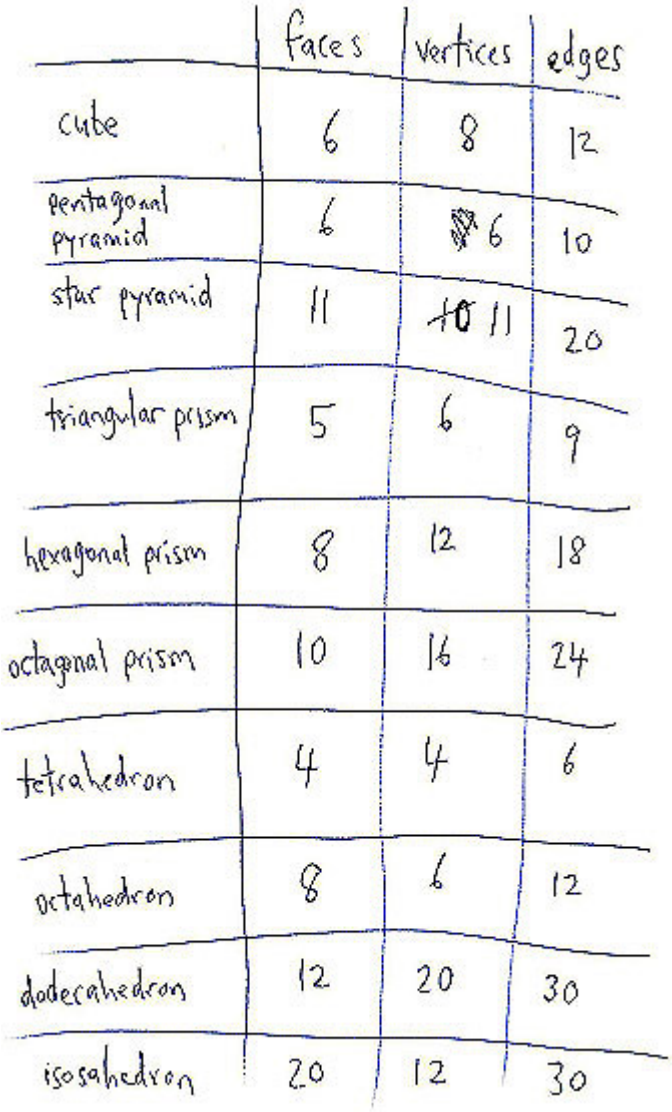
The teacher shows the student these polyhedra, and poses this problem:

Can you name and explain the features of each of these shapes? Can you explain any relationships between the shapes you know about?



Student response

Nadia correctly creates the following table.



	faces	vertices	edges
cube	6	8	12
pentagonal pyramid	6	6	10
star pyramid	11	11	20
triangular prism	5	6	9
hexagonal prism	8	12	18
octagonal prism	10	16	24
tetrahedron	4	4	6
octahedron	8	6	12
dodecahedron	12	20	30
isosahedron	20	12	30

Teacher: Tell me how you worked out the answer and why you did it that way.

Nadia: Well I knew all of their names so I drew a table and filled in the number of faces, vertices and edges for each, checking as I went if I wasn't sure. I grouped them on the table so it would be easier to identify polyhedra that have similarities. Polyhedra is plural of polyhedron.

Teacher: What do you know that helped you?

Nadia: I know that a polyhedron is a many-sided 3-dimensional figure. I know that each side or face of a polyhedron must be a polygon. I know that five of these are sometimes called platonic solids. In platonic solids, all the faces are identical regular polygons, and the same number of faces meet at each vertex.
By looking at my table, I found that if I add the numbers of faces and vertices it always comes to the number of edges + 2. It's interesting.