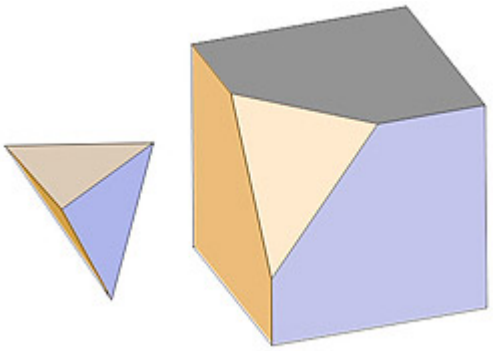
Cross Sections

Annotation

Jacob understands the properties of 2-dimensional and 3-dimensional shapes and can use this knowledge to solve the problem. He thinks abstractly and can visualise the shapes of the cross sections.

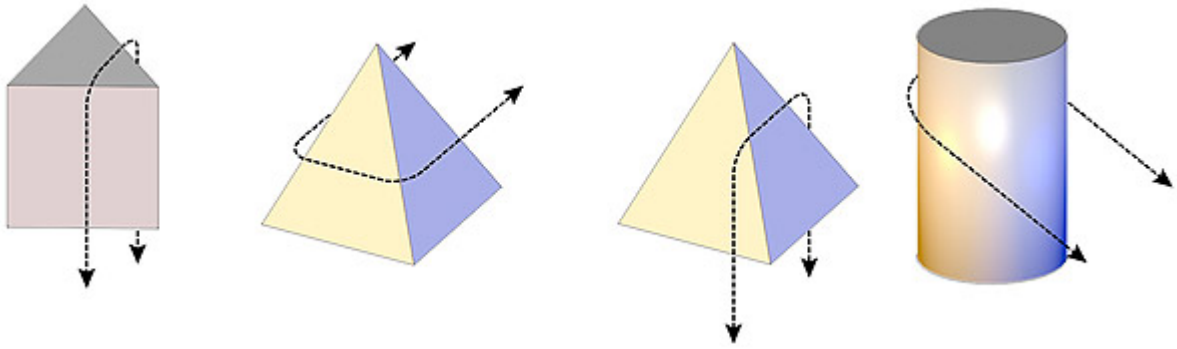
Problem: Cross Sections

The teacher shows the student an illustration of a cube that has had the corner cut off. The face of the cut off piece is a triangle.



She shows the student four more illustrations and poses this problem:

What shape would the face of the cut off pieces be, if lumps of clay were moulded into these shapes and pieces cut off at the angles shown?



Student response

Jacob correctly names the faces of the cut off shapes: rectangle, rectangle, trapezium, ellipse.

Teacher: Tell me how you worked these out and what do you know that helped you?

I know that in prisms a cross section cut parallel to the base will be the same shape as the base. Prisms have sides that are perpendicular to the base and are the same size all along its length. Cross sections that are not parallel to its base are more difficult to work out. Pyramids are 3-dimensional objects with a base and edges leading to a single top vertex. This means that cross sections cut parallel to the base will be the same shape as the base, getting smaller and smaller the closer it is to the top vertex.
So in the first one, the prism, the cut section is a rectangle. The cut face is the same shape as the face it is parallel to.

Jacob: In the second one, the first pyramid, the cut-section parallel to the base is a rectangle. It's the same shape as the base. It would be a square if the base is square.
In the third shape, the second pyramid, the cut section is a trapezium because it has one set of parallel sides. That's the top and bottom sides of the cross section. But the other two sides are not parallel.
In the fourth shape, the cylinder, the cross section is an ellipse. If the cut was parallel to the base it would be a circle, which is a special kind of ellipse. But since the cut isn't parallel to the base, the circle gets stretched or elongated. An elongated circle is called an ellipse.