shapes in the real world

properties of shapes and their relationships

9-12

Although real objects never perfectly match a geometric figure, they more or less approximate them, so that what is known about geometric figures and relationships can be applied to objects.

Both shape and scale can have important consequences for the performance of systems.

Symmetry (or a lack of it) may determine properties of many objects, from molecules and crystals to organisms and designed structures.

When the linear dimensions of an object change by some factor, its area and volume change disproportionately: area in proportion to the square of the factor and volume in proportion to its cube. Properties of an object that depend on

6-8

Some of the properties an object has depend on its shape: triangular shapes tend to make structures rigid, and spheres give the least possible boundary for a given amount of interior volume.

Geometric relationships can be described using symbolic equations.

Describe spatial relationships in geometric terms such as perpendicular, parallel, tangent, similar, congruent, and symmetrical.

Relationships exist among the angles between the sides of triangle and the lengths of those sides. For example, when two sides of a triangle are perpendicular, the sum of the squares of the lengths of those sides is equal to the square of the third side

Calculate the circumferences and areas of rectangles, triangles, and circles, and the volumes of rectangular solids.

Shapes can be compared in terms of concepts such as parallel and perpendicular, congruence and similarity, and symmetry.

For regularly shaped objects, relationships exist between the linear dimensions, surface area, and volume.

3-5

Objects can be described in terms of their shape or the shapes of their parts.

Two shapes can match exactly or be identical except for their sizes.

Two lines can be parallel, perpendicular, or slanted with respect to one another.

Sometimes two shapes will match if one of them is rotated or flipped.

Length can be thought of as unit lengths joined together, area as a collection of unit squares, and volume as a set of unit cubes.

K-2

Circles, squares, triangles, spheres, cubes, cylinders and other shapes can be observed in things found in nature and in things that people build.