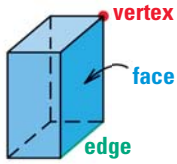
7 TAKS PREPARATION

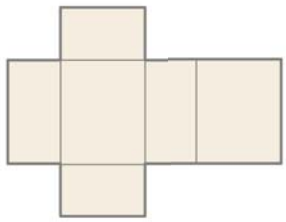
TAKS Obj. 7
TEKS G.6.B, G.9.D

REVIEWING NETS AND COMPONENTS OF SOLIDS

A *polyhedron* is a solid that is bounded by polygons, called *faces*, that enclose a single region of space. An *edge* of a polyhedron is a line segment formed by the intersection of two faces. A *vertex* of a polyhedron is a point where three or more edges meet.



A *net* is a two-dimensional representation of all the faces of a solid.



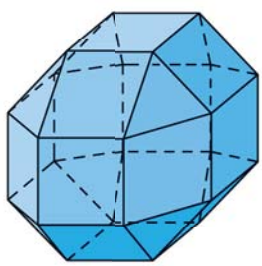
To solve a problem involving the numbers of faces, vertices, and edges of a polyhedron, you need to be familiar with the following theorem.

Euler's Theorem

The numbers of faces F, vertices V, and edges E of a polyhedron are related by the formula $F + V = E + 2$.

EXAMPLE

The solid at the right has 26 faces: 18 squares and 8 triangles. Calculate the number of vertices of the solid.



Solution

STEP 1 **Count** edges. On their own, 18 squares and 8 triangles have $18(4) + 8(3) = 96$ edges.

In the solid, each edge is shared by exactly two polygons. So, the number of edges is $\frac{1}{2}(96) = 48$.

STEP 2 **Find** the number of vertices using Euler's theorem.

$F + V = E + 2$ — Write equation from Euler's theorem.

$26 + V = 48 + 2$ — Substitute 26 for F and 48 for E.

$V = 24$ — Solve for V.

▶ The solid has 24 vertices.