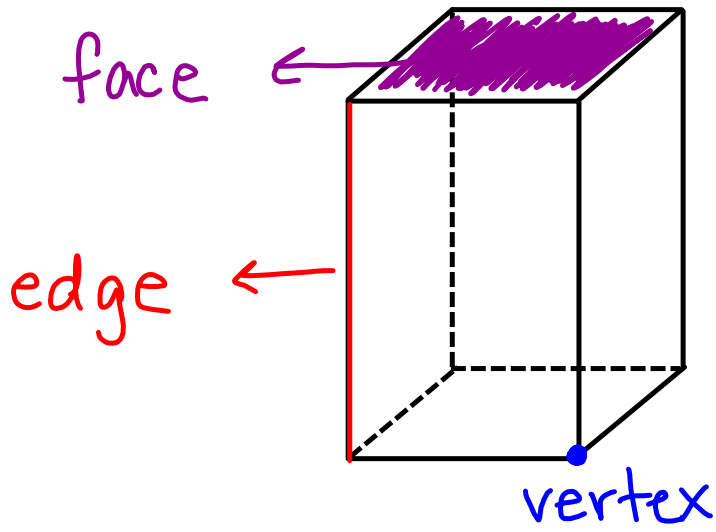
11.1 Space figures and Cross Sections

Polyhedron: three dimensional figure whose surfaces are polygons.

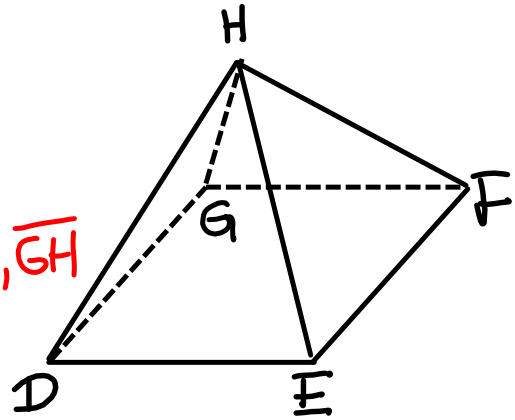


Ex 1 | How many vertices, edges, and faces are in the polyhedron? list them.

vertices: 5
D, E, F, G, H

edges: 8
$\overline{DE}$, $\overline{EF}$, $\overline{FG}$, $\overline{GD}$, $\overline{DH}$, $\overline{EH}$, $\overline{FH}$, $\overline{GH}$

faces: 5
$\triangle DEH$, $\triangle EFH$, $\triangle FGH$, $\triangle GDH$,
quadrilateral DEFG



Euler's Formula

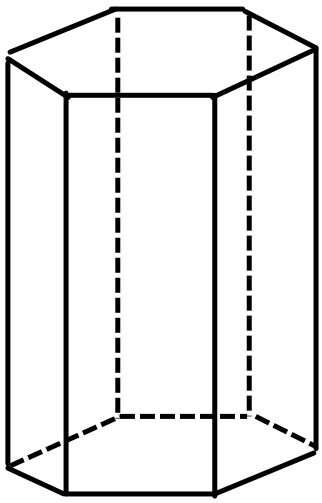
The sum of the number of face(F) and vertices(V) of a polyhedron is two more than the number of its edges.

$$F + V = E + 2$$

Ex 2 | How many vertices, edges, and faces does the polyhedron have? Confirm results with Euler's formula.

V: 12
E: 18
F: 8

$V + F = E + 2$
$12 + 8 = 18 + 2$
$20 = 20$
✓



Ex 3 | For each polyhedron, use Euler's Formula to find the missing value.

$F + V = E + 2$

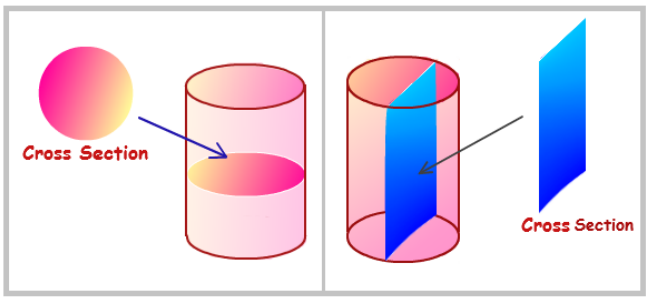
a) faces = 12
edges = 30
vertices = 20

$F + 20 = 30 + 2$
$F + 20 = 32$
$-20 \quad -20$
$F = 12$

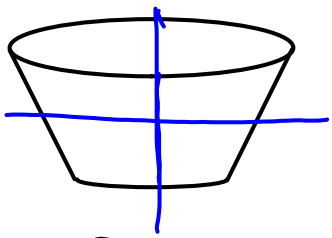
b) faces = 20
edges = 30
vertices = 12

$20 + 12 = E + 2$
$32 = E + 2$
$-2 \quad -2$
$30 = E$

A cross section is the intersection of a solid and a plane.



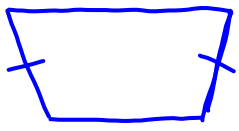
Ex 4 | describe the cross section formed by each of the following intersections.



a) a horizontal plane.

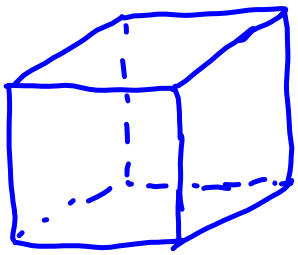
circle

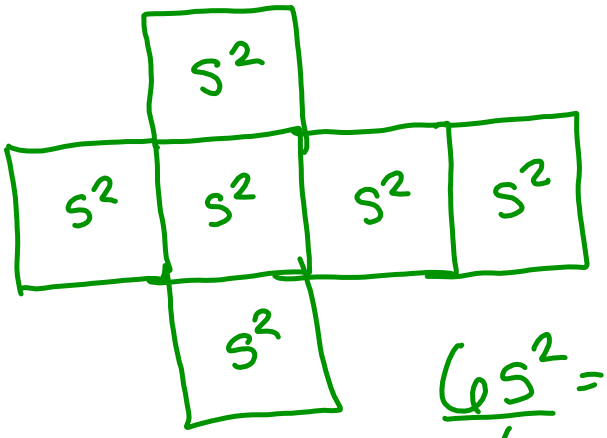
b) a vertical plane that divides the solid in half.



isosceles trapezoid

Ex5] A cube has a net with area 486 in^2. How long is an edge of the cube?





$$\frac{6s^2}{6} = \frac{486}{6}$$

$$s^2 = 81$$

$$s = 9 \text{ in}$$