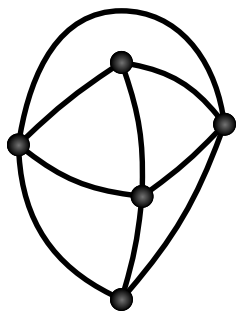


## DISCOVER CARD 3

## Euler characteristic



The graph on the left has 5 vertices, 9 edges and divides the plane into 6 areas, or faces. Five of the faces are inside, bounded by the edges, and the sixth face is the whole outer area.

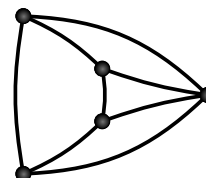
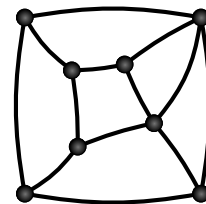
We add the number of vertices and faces and subtract the number of edges:

$$V + F - E = 5 + 6 - 9 = ?$$

This number is the EULER CHARACTERISTIC of the graph, named after the mathematician Leonhard Euler. For the graph of a polyhedron, it can be directly calculated from the  $f$ -vector, where the number of vertices, edges and faces are noted.

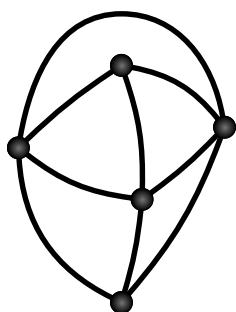
### Exercises

1. Count the number of vertices, edges and faces of each of the graphs shown and use them to calculate their Euler characteristics.
2. What is the Euler characteristic of the graph of your polyhedron? Write it on the board.
3. What did the others write on the board? Try to guess what the Euler characteristic of the graph of a polyhedron must always be.



## DISCOVER CARD 3

## Euler characteristic



The graph on the left has 5 vertices, 9 edges and divides the plane into 6 areas, or faces. Five of the faces are inside, bounded by the edges, and the sixth face is the whole outer area.

We add the number of vertices and faces and subtract the number of edges:

$$V + F - E = 5 + 6 - 9 = ?$$

This number is the EULER CHARACTERISTIC of the graph, named after the mathematician Leonhard Euler. For the graph of a polyhedron, it can be directly calculated from the  $f$ -vector, where the number of vertices, edges and faces are noted.

### Exercises

1. Count the number of vertices, edges and faces of each of the graphs shown and use them to calculate their Euler characteristics.
2. What is the Euler characteristic of the graph of your polyhedron? Write it on the board.
3. What did the others write on the board? Try to guess what the Euler characteristic of the graph of a polyhedron must always be.

