

T-Shirt Explanation: Westmont's 32nd Annual Mathematics Field Day

Begin with a single point, represented below. Conceptually, it is a “zero-dimensional” object.



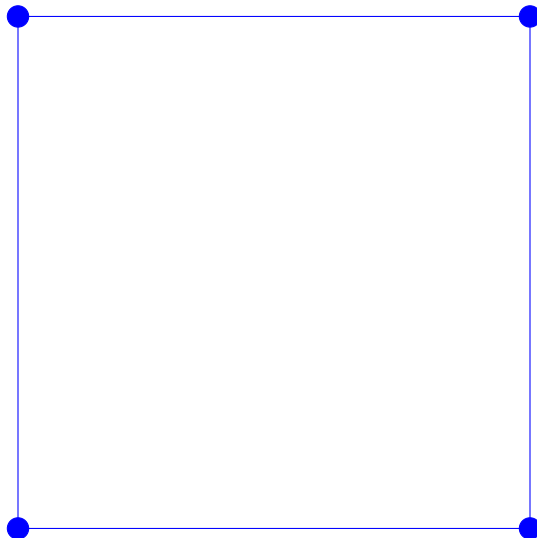
Make a copy of this point, extend this new point in one direction, and connect the points. These two points can be thought of as vertices at the end of a one-dimensional line segment.



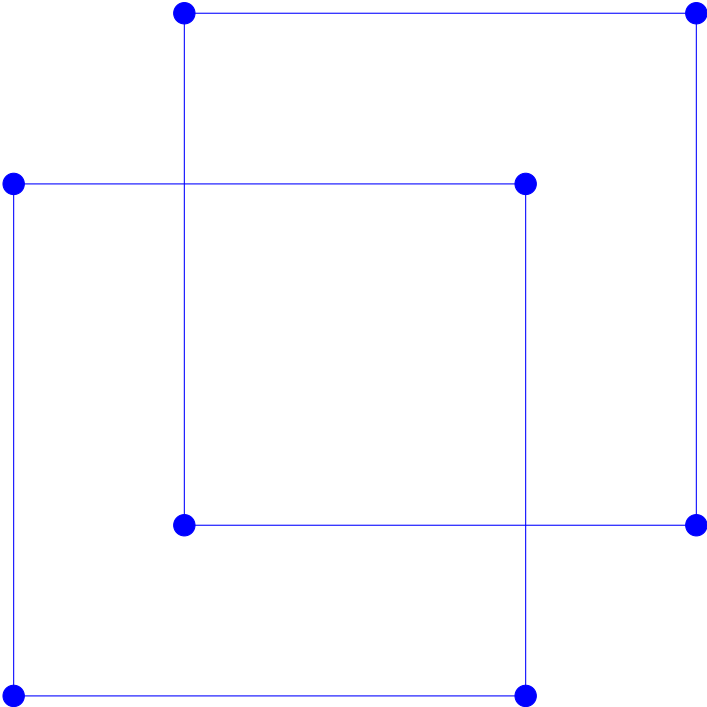
Move a copy of this line segment in a perpendicular direction. The number of vertices doubles.



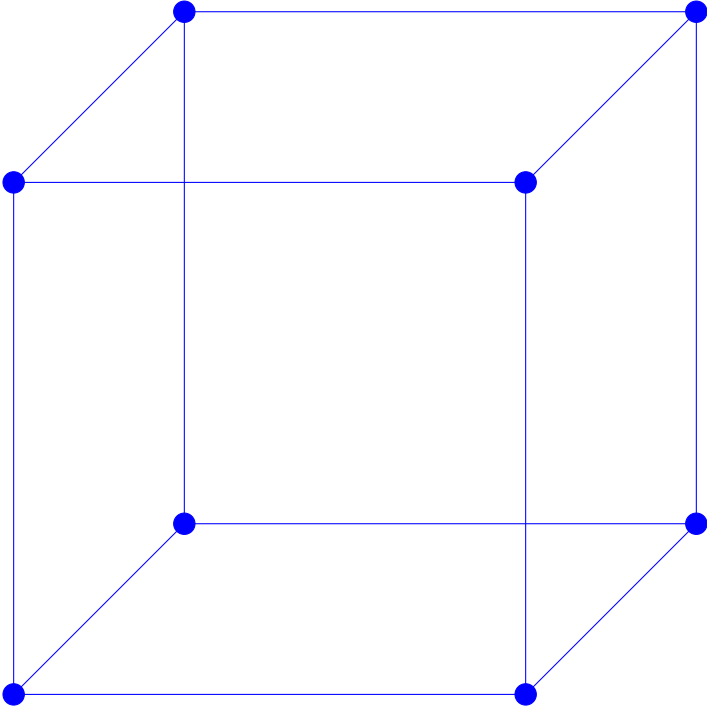
Connect these four vertices to form a two-dimensional square.



Make a copy of this square and extend the copy into a (new) perpendicular direction.

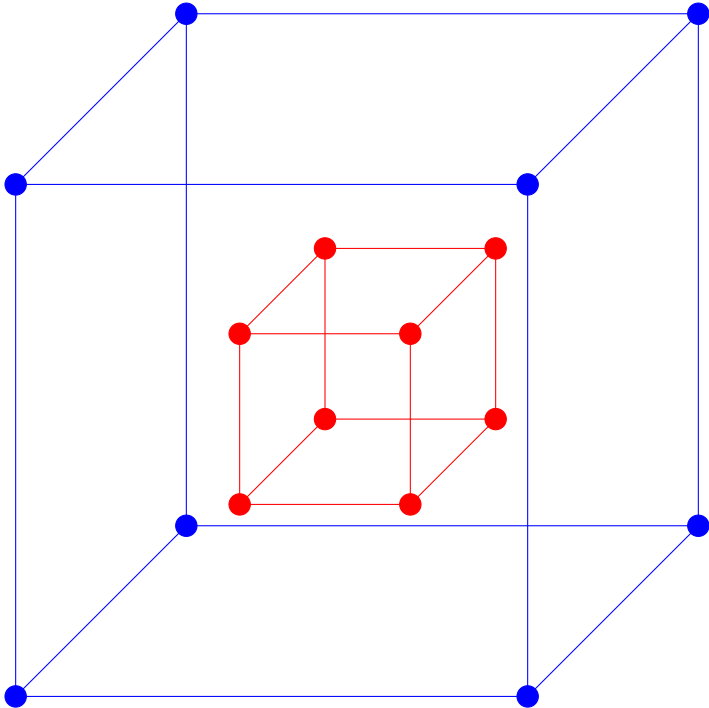


Connecting the eight vertices yields a three-dimensional cube.

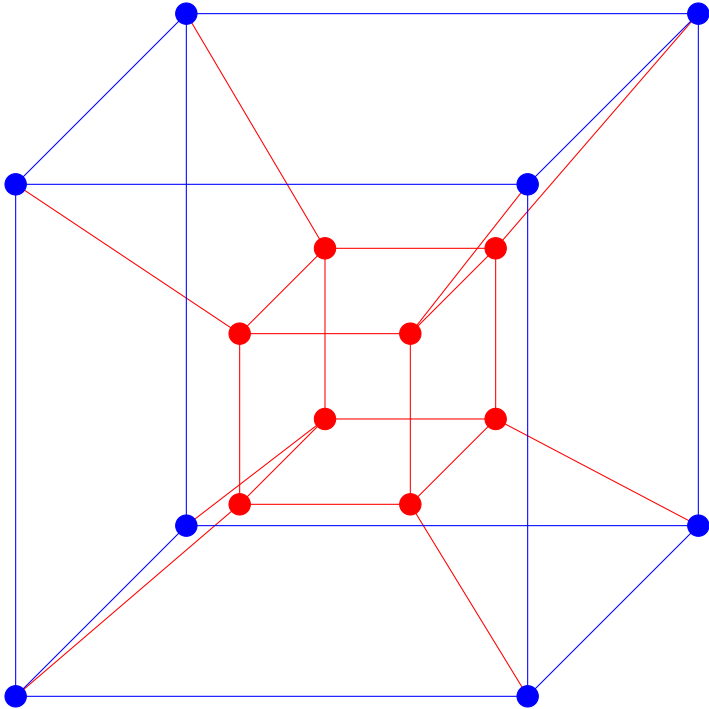


The above picture, of course, is not a genuine cube. It is distorted somewhat because it is a two-dimensional rendering of the three-dimensional object.

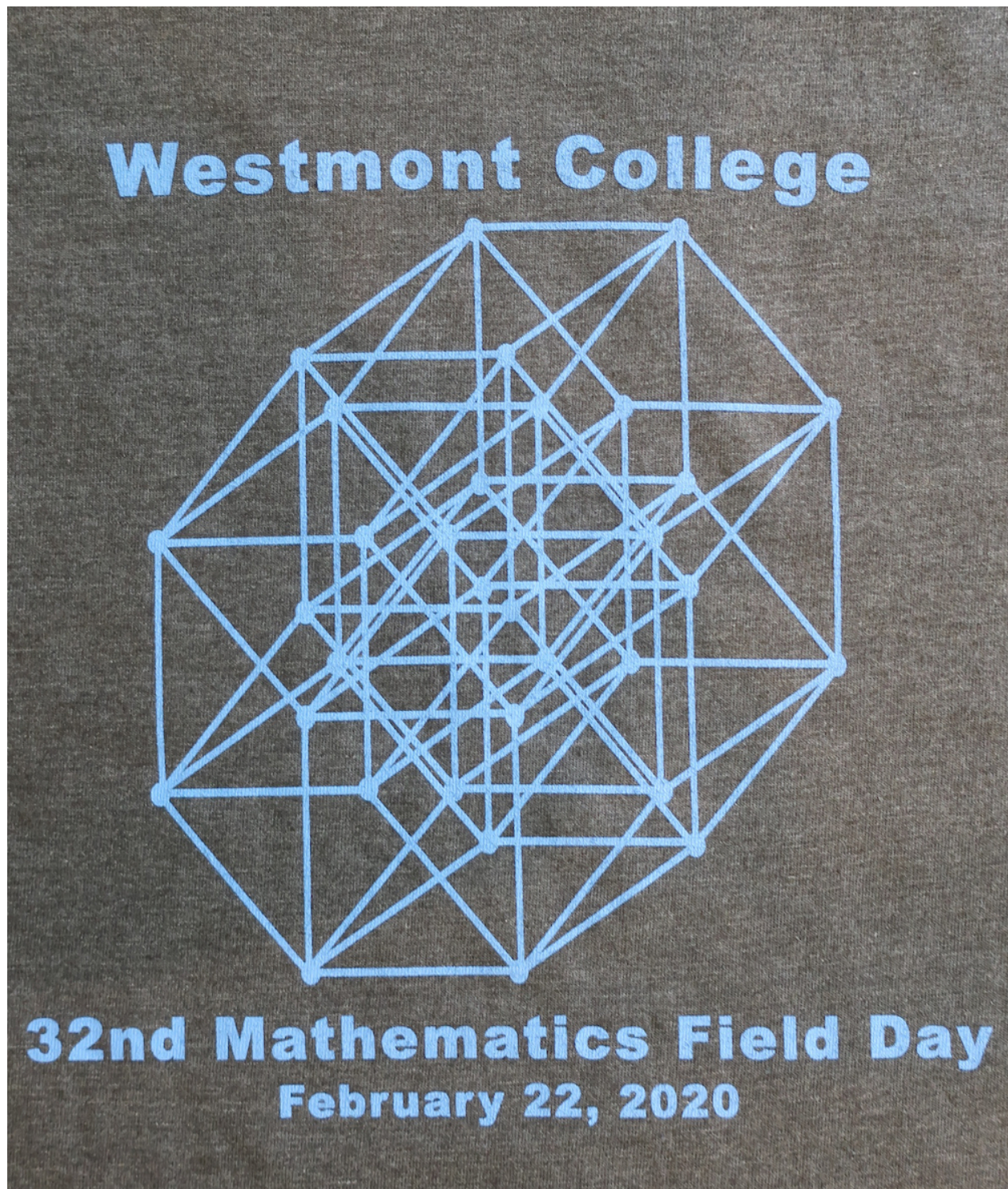
Imagine making a copy (shown in red) of this cube, and extending it—somehow—in yet another perpendicular direction, whatever that might mean.



Connecting the 16 vertices produces a four-dimensional “hypercube.” The figure below gives a two-dimensional rendering of the three-dimensional depiction of this four-dimensional object. Known as as a *Tesseract*, this structure can be described mathematically even if it does not exist physically. A Tesseract plays a prominent role in Madeleine L’Engle’s *A Wrinkle in Time*.



What would a five-dimensional hypercube look like? Constructing one involves a process similar to that followed for lower dimensions: make a copy of the four-dimensional hypercube, move it in a “perpendicular” direction, and connect the 32 vertices. Because 2020 marks Westmont’s 32nd annual Mathematics Field Day, its accompanying T-shirt displays a five-dimensional hypercube.



Westmont’s 16th annual Mathematics Field Day T-shirt features a four-dimensional hypercube (with 16 vertices). It can be viewed on the Field Day website for the year 2001 (there was no Field Day held in the years 2007 and 2015). For a further excursion into the ideas of different dimensions the interested reader is referred to the novel *Flatland* by Edwin Abbott Abbott.