

Drone delivery - Teacher Guide

Principles

This activity has a focus on graph theory. We're looking at a type of graph called a flow network, or a transport network. They are so named because they revolve around flow of resources or traffic through a system. Flow networks have a direction of movement and a capacity. In this type of graph, the input that our comes from traffic is referred to as a source, and the output that is the destination for our graph is called a sink. In this example, we're trying to maximise the flow between one source and one sink.

Logic

There are a few ways to approach this question. Students might attempt to start by maximising the connections to either the source or the sink, but by maximising either of these two options, we find that we're limited in our ability to maximise the other. A better approach is to maximise both. Using the layout in on the sheet, the source and the sink both have 3 possible connections. This means that we have a total of 6 connections leaving and entering the main system.

Sample Answer

If we use 3 of our high capacity (3) lines on the source, making it so that 9 drones can enter the system, we're limited to having 1 high capacity (3) line and 2 mid capacity (2) lines for the sink, so that only 7 drones can reach the destination.

Since we only have 4 high capacity (3) lines, a way to improve the connections for both would be to use 2 high capacity (3) lines and 1 mid capacity (2) line for each, to maximise the number of connections entering and leaving the system at 8.

A sample answer using the logic above is displayed in the image below.

