

## THE SEVEN BRIDGES OF KONIGSBURG

*Clever Counting Unit*



**Materials:** Tracing Worksheets, pencil and paper

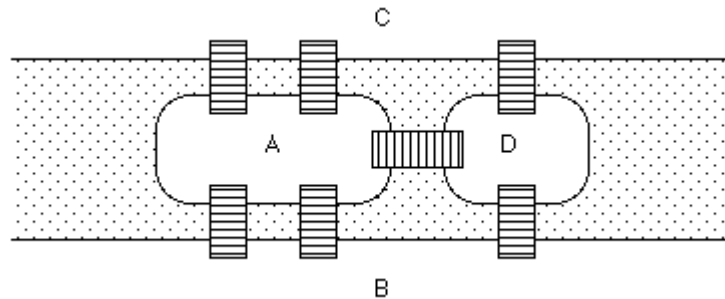
**Key Learning:** Tracing Networks



Understand odd and even nodes in a network. Many engineering applications, such as power grids, cellular phone networks, and game theory depend upon a thorough understanding of network topology.

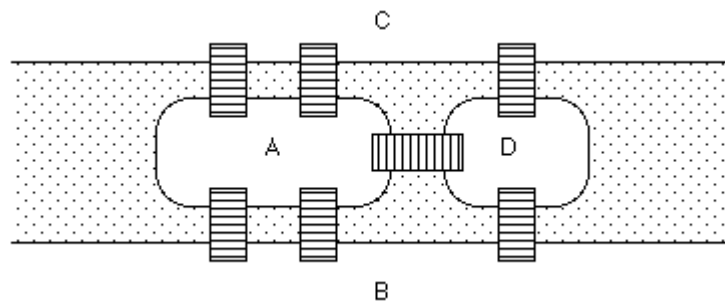
## The Seven Bridges of Konigsburg

The river Pregel runs through the town of Konigsburg. In the river are two islands, connected to each other and the rest of the city by seven bridges.

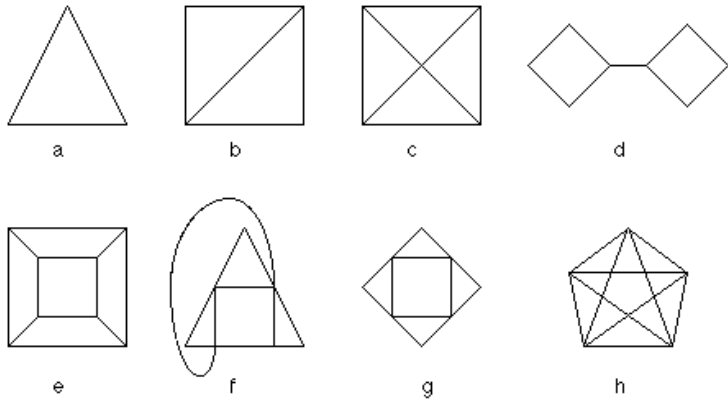


The students of Konigsburg often challenged each other to try to make a trip crossing all seven bridges exactly once. Try to trace a path which crosses each of the bridges exactly once (no swimming allowed). You must start from land, either point A, B, C, or D.

*Below is a second figure for you to try more paths. A separate worksheet is also available.*



Can you trace the following figures without lifting your pencil or tracing any line more than once? If you can, mark your starting point with an **S** and your finishing point with an **F**.



*A separate worksheet has been provided so that you can attempt more tracings.*

We call these figures networks. Any point where two or more line segments intersect (meet) is called a node. If there are an even number of lines coming from a node, then that node is **EVEN**. If there are an odd number of lines coming from a node, then that node is **ODD**.

Now we will try to find a way to predict which networks can be traced and which networks we cannot trace. We will also look for clues about the best place to start tracing.

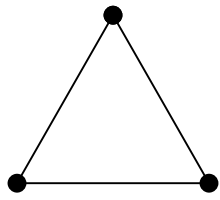
1. Circle all the odd nodes in the above networks.
2. For each network, count the number of odd nodes and the number of even nodes, then complete the table below.

Network	No. of even nodes	No. of odd nodes	Can it be traced?
(a)			
(b)			
(c)			
(d)			
(e)			
(f)			
(g)			
(h)			

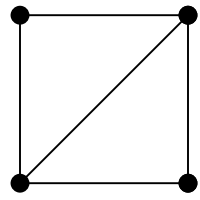
Using the information in this table, answer the following questions:

1. Can a network with no odd nodes be traced? List examples (from a thru h) and explain.
2. Can a network with two odd nodes be traced? Did you start at an odd or even node? Did you finish at an odd or even node? List examples (from a thru h).

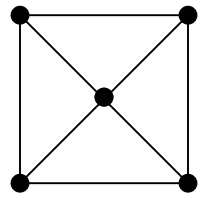




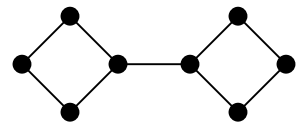
a



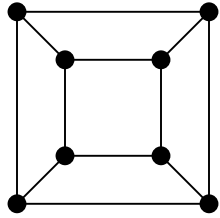
b



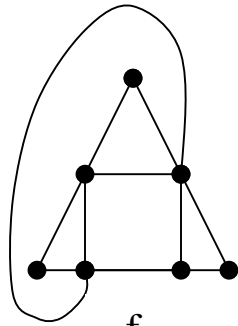
c



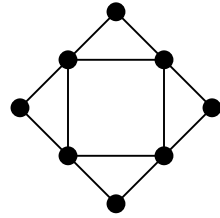
d



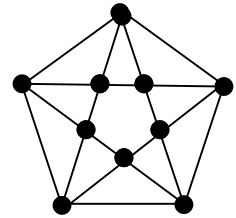
e



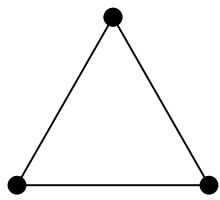
f



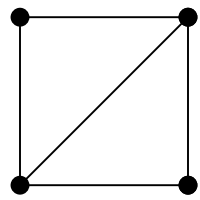
g



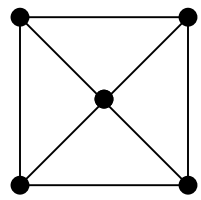
h



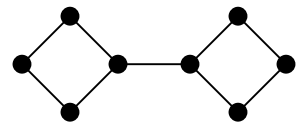
a



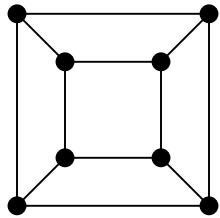
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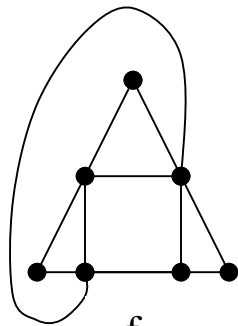
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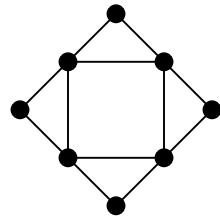
d



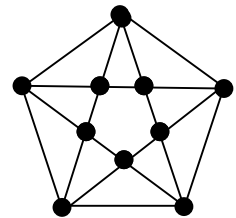
e



f



g



h