

Grade 7/8 Math Circles

October 14, 2020

BCC Prep - Problem Set

1. *Dogs versus Beavers (BCC 2015)*

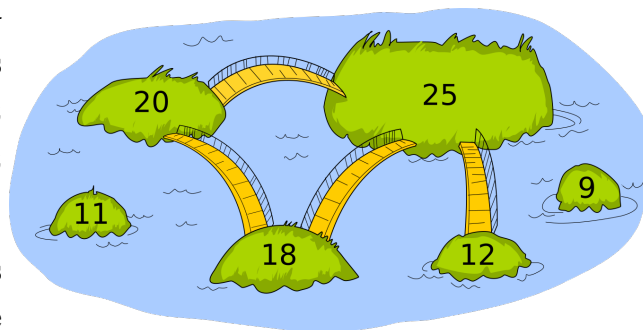
Beavers and dogs compete. The nine participants scored the following points: 1, 2, 2, 3, 4, 5, 5, 6, 7. We know that no dog scored more than any beaver, but one dog had the same score as a beaver and two dogs had the same score. How many dogs took part in the competition?

2. *Connect the Islands (BCC 2018)*

People of Kastoria use only one rule to decide where bridges are to be built:

They choose one number called the *bridge number*. If the sum of the populations of two islands is greater than the bridge number, a bridge is built between the islands. Otherwise, a bridge is not built between the two islands.

The six islands of Kastoria and their populations are shown below. The bridges built using the above rule are also shown. What bridge number was chosen?

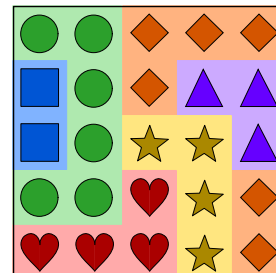


- a) 34 b) 35 c) 36 d) 37

3. *So Many Layers (Based on "Wallpapers" (BCC 2017))*

Tanu covered a wall with six overlapping rectangular sheets of wallpaper as shown. Each sheet of wallpaper is designed using a different image in a repeating pattern.

- (a) Give possible dimensions for the six wallpaper sheets Tanu used.
(b) Determine in what order Tanu placed the wallpaper sheets on the wall.

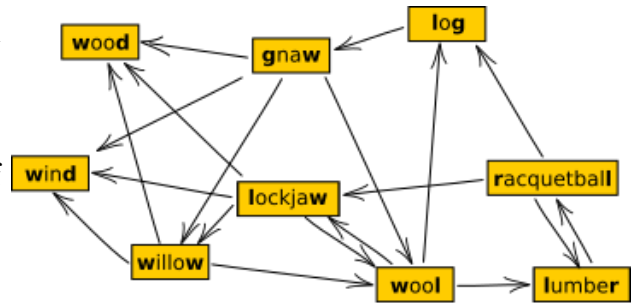


Try this online activity once you have attempted the problem on your own:

<https://www.geogebra.org/m/c5j6anan>

4. *Longest Word Chain (BCC 2018)*

Beavers play a word chain game. One beaver starts by saying a word. The other beaver must say a different word which begins with the last letter of the previous word. Then the first beaver says another word (which was not said yet) using this same rule, and so on. If a beaver is unable to say a new word, that beaver loses the game. These beavers do not know many words. In fact, they can draw their entire vocabulary like this:



Notice that an arrow out of a word points at the next possible word(s) that can be said.

What is the largest possible number of words that can be said in one game?

5. *Timetabling (BCC 2018)*

Bebras Tech offers the following evening classes: Computing (**C**), Geography (**G**), Language (**L**), Math (**M**), and Science (**S**).

Three beavers would like to sign up for these courses:

- Xavier wants to take **C**, **L** and **M**;
- Yvette wants to take **C**, **G**, and **S**;
- Zoey wants to take **L**, **M** and **S**.

Bebras Tech wants to squeeze these courses into as few evenings as possible such that each course is offered on exactly one evening, and beavers can take at most one course per evening.

What is the least number of evenings needed for Bebras Tech to schedule these courses?

- a) 2 b) 3 c) 4 d) 5

6. *More Problems*

Looking for more practice problems? Check for daily practice problems on Piazza or check out the following links:

Past Contest:

https://beavercomputingchallenge.ca/index.php?action=user_competitions

Past Contests and Solutions:

https://cemc.uwaterloo.ca/contests/past_contests.html