

WATERLOO | MATHEMATICS

The CENTRE for EDUCATION in MATHEMATICS and COMPUTING



2015
*Beaver
Computing
Challenge*
(Grade 7 & 8)

Questions

Part A

Favourite Numbers

Story

Billy Beaver writes down his favourite numbers, from smallest to largest when read from left to right.

Question

Which of the following orderings of numbers is the one that Billy Beaver wrote down?

- (A) 2 3 4 5 10 31 29
- (B) 5123 5148 5171 5149 5189
- (C) 3 10 19 24 99 101
- (D) 1 100 1000 100000 10000

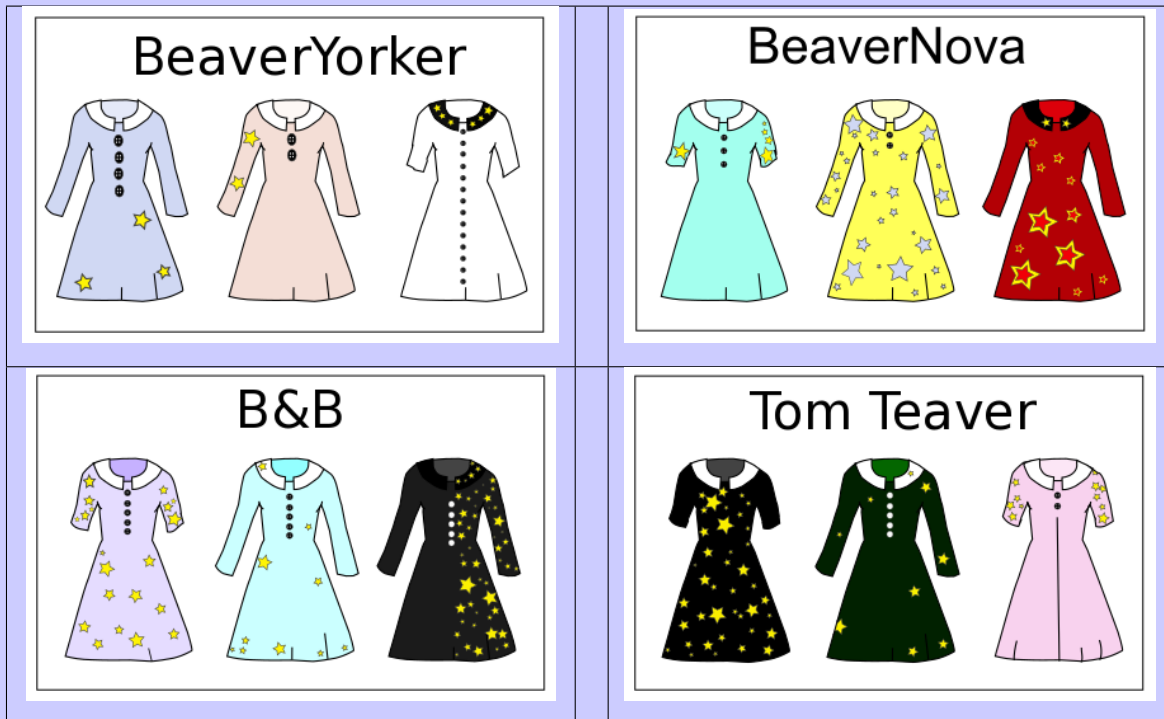
Dream Dress

Story

Kate wants to buy her dream dress. It must

- have short sleeves, and
- have more than 3 buttons, and
- have stars on its sleeves.

Four shops sell only the dresses shown:



Question

Which of these shops sells Kate's dream dress?

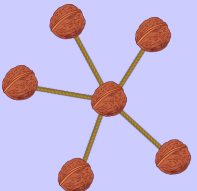
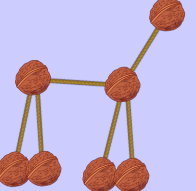
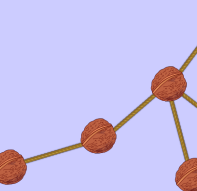
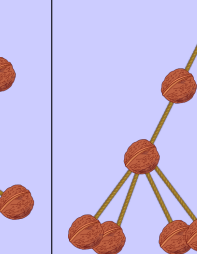
- (A) BeaverYorker
- (B) Beaver Nova
- (C) B & B
- (D) Tom Teaver

Chestnut Animals

Story

Tommy Beaver was inspired by the picture of an animal made from nuts (shown to the right), and created 4 animals by himself using chestnuts, strings and glue (shown below):

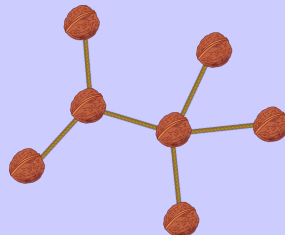


Starfish	Dog	Sea lion	Giraffe
			

His sister plays with these animals by moving the chestnuts around without breaking any connections. This makes it hard to recognize which shapes correspond to which animals.

Question

Which animal was the following shape before Tommy Beaver's sister played with it?



- (A) Starfish
- (B) Dog
- (C) Sea lion
- (D) Giraffe

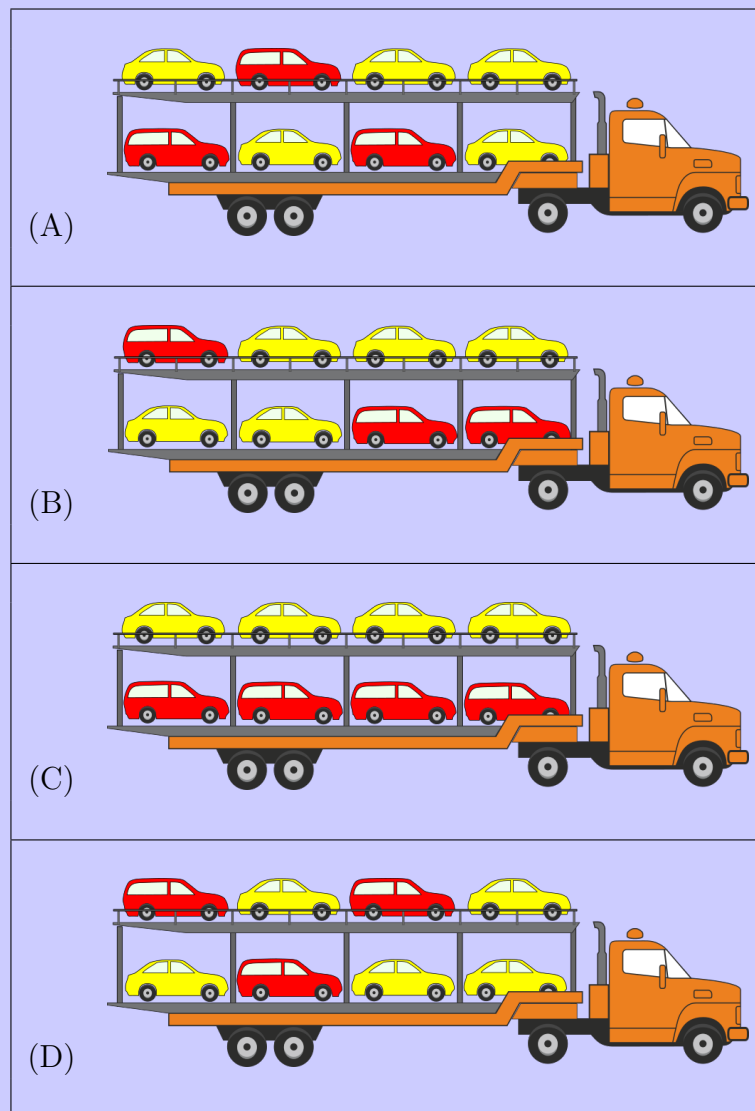
Car Transportation

Story

A new red car comes from a manufacturing line every 7 minutes. A new yellow car comes from another manufacturing line every 5 minutes. Both manufacturing lines start working at the same time. A driver parks the cars on the back of a large transport truck in the order the cars leave their respective manufacturing lines. The top floor of the transport truck is loaded first.

Question

What will the large transport truck look like after loading?



QB-Code

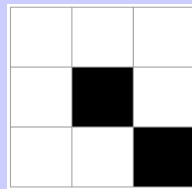
Story

Beavers want to encode numbers for keeping track of how many trees they have chewed down. Therefore they developed the Quick-Beaver-Code (QB-Code). This is a graphical code consisting of nine 1×1 squares arranged into a 3×3 square. Every square has a certain value. The squares are filled line by line from the bottom to the top, from right to left. The next square has double the value of the square before. In the example, you see the values of the first five squares.

...
...	16	8
4	2	1

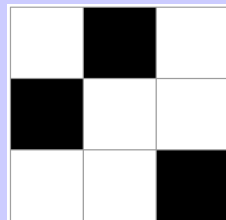
To encode a number, the beavers darken some squares. The number encoded is the sum of the values of the dark squares.

For example, the number encoded in this QB-Code is 17:



Question

Which of the following encodes the largest number?



(A)	(B)	(C)	(D)

Part B

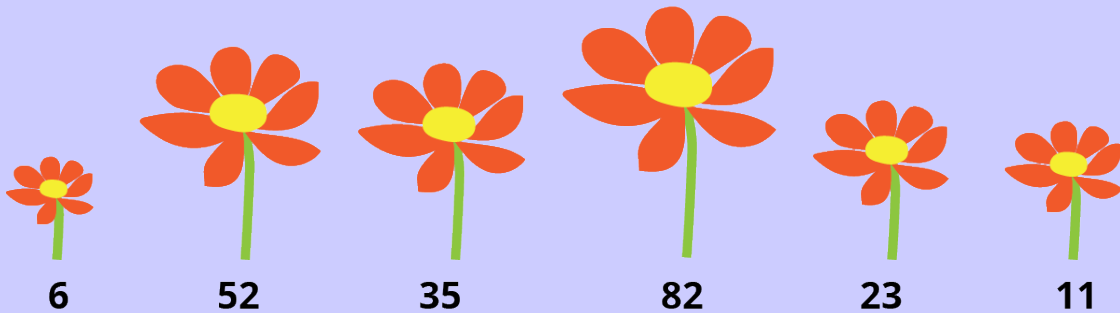
Collecting Pollen

Story

Beever the bee flies to a field of flowers to collect pollen. On each flight, he visits only one flower and can collect up to 10 mg of pollen. He may return to the same flower more than once.



The initial amount of pollen in each flower (in mg) is shown below.



Question




What is the maximum total amount of pollen that Beever can collect in 20 flights?

- (A) 179 mg
- (B) 195 mg
- (C) 196 mg
- (D) 200 mg

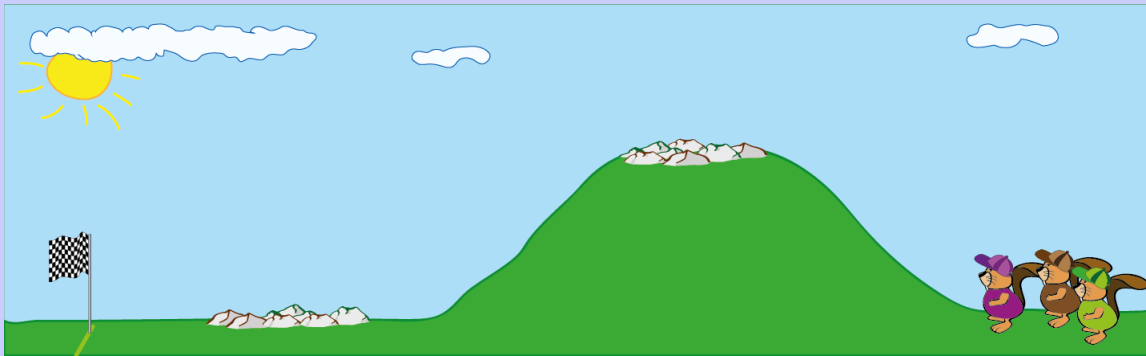
Cross-Country

Story

Three competitive runners will compete in a cross-country race.

When running uphill, Mr. Brown will overtake one beaver.	
When running downhill, Mrs. Pink will overtake one beaver.	
When running over rocks, Mrs. Green will overtake one beaver.	

The terrain is as shown in the picture: uphill, followed by some rocks, downhill and then again some rocks. Mrs. Pink starts in the first position, followed next by Mr. Brown and finally by Mrs. Green.



Question




In which order will they finish the race?

- (A) Mrs. Pink, Mr. Brown, Mrs. Green
- (B) Mr. Brown, Mrs. Green, Mrs. Pink
- (C) Mrs. Green, Mrs. Pink, Mr. Brown
- (D) Mr. Brown, Mrs. Pink, Mrs. Green

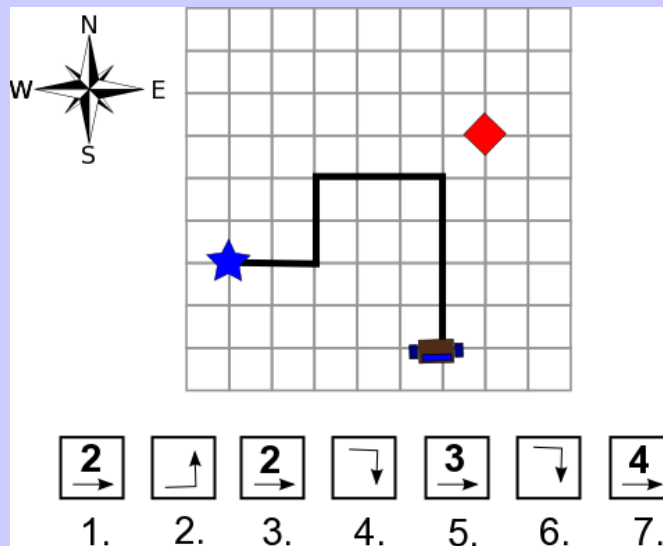
Mistakes

Story

Three kinds of buttons control a robot:

Button	Description
	robot turns left
	robot turns right
	robot moves X units in the direction it is facing

The robot starts at the blue star facing east. John presses the seven buttons shown (from left to right) to try and move the robot to the red diamond. Unfortunately, he presses two extra buttons by mistake.



Question

Which two button presses should be removed so that the robot ends at the correct location?

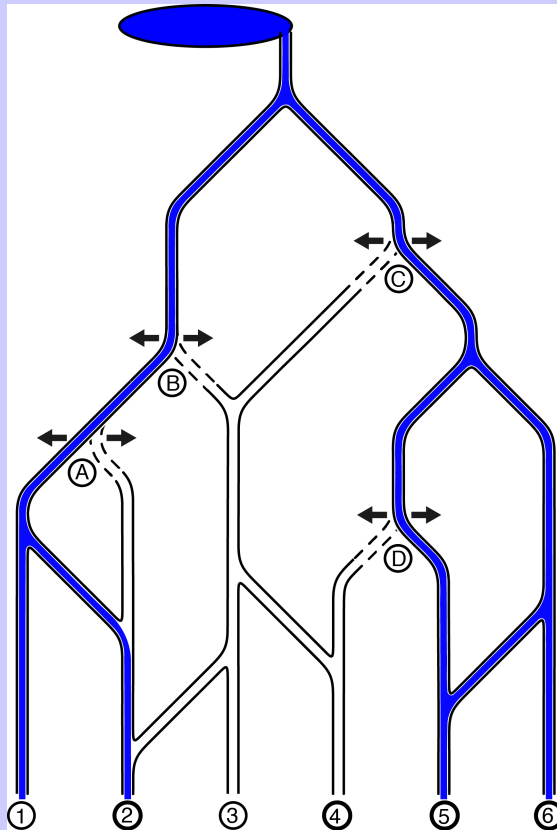
- (A) the 1st and the 2nd
- (B) the 1st and the 4th
- (C) the 3rd and the 4th
- (D) the 2nd and the 6th

Irrigation System

Story

Beavers have created a nifty irrigation system for their fields. The water flows from a lake at the top of the hill all the way down to the fields numbered 1 to 6 at the bottom.

Along the water canals, the beavers have installed four water gates A to D, where the water can only flow either to the left (←) or to the right (→). An example showing how these may be set to have the water flow to fields 1, 2, 5 and 6 is shown below.



Question

What is the correct configuration for the water gates to irrigate only fields 2, 4, 5 and 6?

- (A) A: ← B: ← C: → D: ←
- (B) A: → B: ← C: ← D: →
- (C) A: → B: ← C: → D: ←
- (D) A: ← B: → C: → D: →

Dogs versus Beavers

Story

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 also had the same score.

Question

How many dogs took part in the competition?

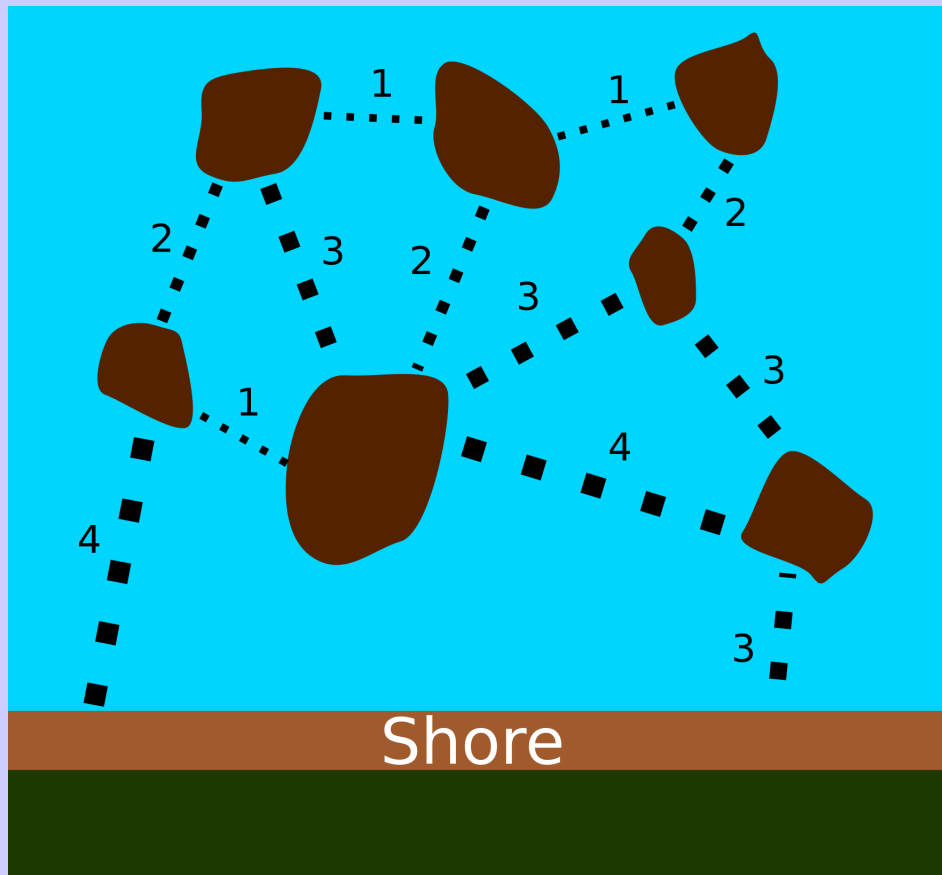
- (A) 2
- (B) 3
- (C) 6
- (D) 7

Part C

Connecting Beaver Dens

Story

There are seven dens in a pond just off a shore as shown below. Dotted lines show where bridges can be built. The numbers show how many trees are needed to build each possible bridge. A beaver needs to decide which bridges to build so that any den can be reached from the shore without swimming.



Question

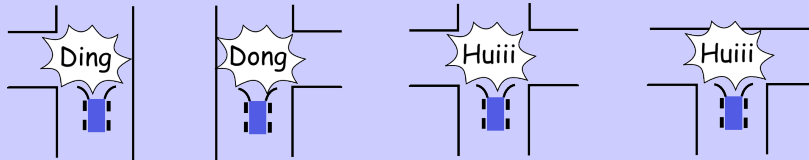
What is the fewest number of trees needed to build the bridges?

- (A) 12
- (B) 13
- (C) 17
- (D) 18

Robotic Car

Story

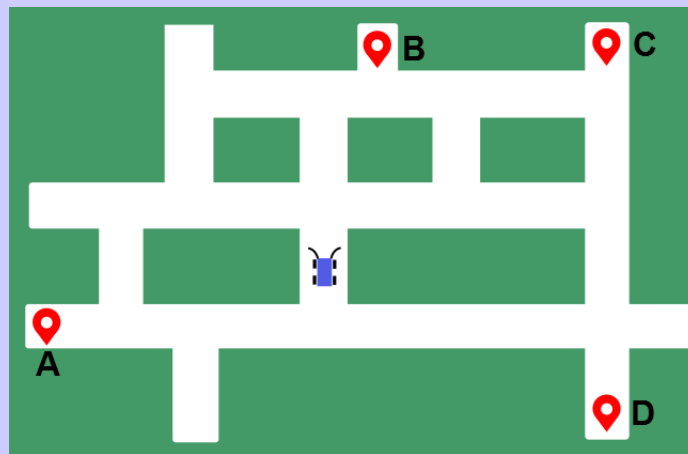
Beavers have developed a robotic car. It has sensors that detect intersections. It produces the sounds shown below, when it is possible to turn left, right or both directions. The robotic car can go straight through an intersection (when possible), turn right (when possible) or turn left (when possible). The robotic car cannot make U-turns and cannot reverse.



It automatically stops when it senses an obstacle in front of it.

Question

The car drives around the map shown below, starting at the indicated position. As it drives around the map, it produces the sounds **Huiii Ding Huiii Dong**, in that order.














At which location  does the car stop?

- (A) Location A
- (B) Location B
- (C) Location C
- (D) Location D

Fireworks

Story

Two beavers live in lodges separated by a large forest. They decide to send messages to each other by shooting fireworks into the sky above the trees. Each message is a sequence of words, but the beavers only know five words. They shoot two types of fireworks one after the other according to the following code:

Word	Code
log	 
tree	  
rock	  
den	 
food	

For example, to send the (strange) message “food, log, food”, a beaver would shoot:



Question

How many different meanings does the following sequence of fireworks have?



- (A) 1
- (B) 2
- (C) 3
- (D) 4

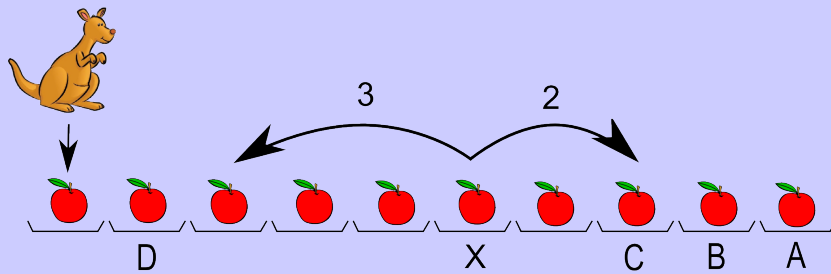
Jumping Kangaroo

Story

There are 10 plates in a row. There is one apple on each plate.

Kangaroo Thomas loves to jump. First, he jumps onto the leftmost plate. On each single jump after this, he either jumps forward two plates, or backwards three plates. Thomas only jumps onto plates with an apple. If he jumps onto a plate, he collects the apple from it, and therefore, can only jump on each plate at most once.

An example of the two possible jumps from one plate, labelled X, is shown with arrows in the picture below:



Question

If Thomas collects all 10 apples, which apple does he collect last?

- (A) The rightmost apple
- (B) The second apple from the right
- (C) The third apple from the right
- (D) The second apple from the left

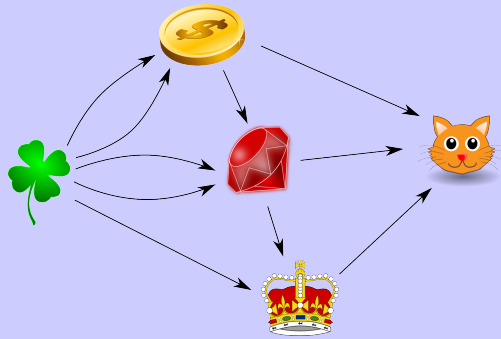
Beaver the Alchemist

Story

Beaver the Alchemist can convert objects into other objects. He can convert:

- two clovers into a coin;
- a coin and two clovers into a ruby;
- a ruby and a clover into a crown;
- a coin, a ruby, and a crown into a kitten.

After objects have been converted to another object, they disappear.



Initially Beaver the Alchemist has lots of clovers, but no coins, rubies, crowns or kittens.

Question

How many clovers does Beaver the Alchemist need to create one kitten?

- (A) 5
- (B) 10
- (C) 11
- (D) 12