Part A
Skyline

A skyline consists of 14 towers as shown. The height of a tower is measured from the bottom of its base to its highest point, including any flagpoles or antennas.

If the towers are listed from shortest to tallest, which tower would be 10th in the list?

(A)  
(B)  
(C)  
(D)
Beavertown Library has only a small pile of books. When a beaver wishes to borrow a book, they take the book that is on the top of the pile and record their name. When a beaver returns a book, they place their book on the top of the pile and record their name again.

At the beginning of the week the pile of books was arranged as shown:

| Charlotte’s Web | Curious George | Go, Dog, Go! | The Hobbit | Fox in Socks |

The library’s records at the end of the week show the following information:

- Alba - Borrow
- Felix - Borrow
- Alba - Return
- Marta - Borrow
- Felix - Return
- Cato - Borrow

Question
Which book did Cato borrow?

(A) Charlotte’s Web

(B) Curious George

(C) Go, Dog, Go!

(D) The Hobbit
Locked Chests

Story

Five different chests are engraved with letters as shown:

- BEB
- RAB
- ERB
- EAB
- AER

Each chest has a key labelled with digits corresponding to the chest’s engraved letters. Each digit always corresponds to the same letter.

The keys fell on the floor and one label was lost:

- 934
- 346
- 636
- 396

Question

What is the lost label?

(A) 496  
(B) 639  
(C) 436  
(D) 649
Dani is required to entirely fill as many empty water bottles as possible using a 50 litre tank.

Suppose she is given the following 10 empty bottles where each bottle is labelled with the number of litres it can hold.

![Image of bottles with capacities 6, 4, 3, 15, 9, 7, 5, 11, 9, 8]

What is the maximum number of bottles that Dani can fill entirely?

(A) 4  
(B) 7  
(C) 8  
(D) 10
Symbols form the titles of ancient texts. Each type of symbol is associated with a digit as shown below. Some different symbols are associated with the same digit.

<table>
<thead>
<tr>
<th>symbol</th>
<th>□</th>
<th>△</th>
<th>☆</th>
<th>○</th>
<th>◊</th>
<th>◇</th>
<th>▽</th>
<th>♂</th>
<th>♀</th>
<th>≅</th>
<th>≈</th>
<th>⚖</th>
</tr>
</thead>
<tbody>
<tr>
<td>digit</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
<td>8</td>
<td>9</td>
<td>0</td>
<td>1</td>
<td>2</td>
</tr>
</tbody>
</table>

The *special number* of a text is the sequence of digits associated with the symbols in the title of the text (in order). For example, 56432 is the special number of the text with the title ◊◊○☆△.

**Question**

Which of the following texts has the same special number as the red text below?

(A) ![Book A](image)

(B) ![Book B](image)

(C) ![Book C](image)

(D) ![Book D](image)
Part B
For security reasons, a secret message was broken into four parts (1, 2, 3, and 4). Copies of these parts were then sent to the divisions and subgroups of the Beaver Intelligence Agency (BIA) as shown:

Labels on the copies of the message parts indicate who has access to it:

- “+” means everyone in the BIA has access to this copy.
- “#” means the division that receives it and the division’s subgroups (indicated by arrows) have access.
- “=” means only the division or subgroup that receives it has access to this copy.

Which one of the following has access to all four parts of the message?

(A) Fox Subgroup
(B) Wolf Division
(C) Rabbit Division
(D) Chipmunk Subgroup
Binsa is climbing in the mountain range shown which has 11 peaks each of a different height.

Binsa climbs by starting at the top of a random peak, then looking left and right. If she sees a peak immediately beside her that is higher than the one she is currently on, she climbs to the top of this higher peak. If two neighbouring peaks are both higher, she climbs to the top of the higher one. She continues to do this until there is no higher peak immediately beside her.

From how many of the peaks (including the highest peak) will Binsa reach the highest peak?

(A) 3
(B) 4
(C) 6
(D) 7
The following five images represent the letters I, T, O, C and L, respectively. Each image is a 3-by-3 grid made up of nine pixels that are each black or white.

When a machine scans an image, instead of recording black or white at a pixel, it records how many of the other four images have the same shade (black or white) at that pixel.

For example, when scanning the image \( \begin{array}{ccc} 1 & 0 & 1 \\ 1 & 1 & 1 \\ 0 & 1 & 1 \end{array} \), the machine records \( \begin{array}{ccc} 0 & 3 & 1 \\ 1 & 1 & 3 \\ 1 & 4 & 1 \end{array} \).

If the machine records \( \begin{array}{ccc} 3 & 3 & 2 \\ 2 & 2 & 0 \\ 2 & 4 & 2 \end{array} \), what image did it scan?

(A) \( \begin{array}{ccc} 1 & 1 & 1 \\ 1 & 1 & 1 \\ 1 & 1 & 1 \end{array} \)  (B) \( \begin{array}{ccc} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{array} \)  (C) \( \begin{array}{ccc} 1 & 0 & 1 \\ 0 & 1 & 0 \\ 1 & 0 & 1 \end{array} \)  (D) \( \begin{array}{ccc} 0 & 1 & 0 \\ 1 & 0 & 1 \\ 0 & 1 & 0 \end{array} \)
As a practical joke, someone has connected appliances to buttons $P$, $Q$, $R$, $S$, and $T$ in a very strange way. Pressing a button toggles the on/off state of each appliance it is connected to. For example, pressing button $T$ will turn the vacuum cleaner on if it is off and off if it is on. Pressing button $T$ will also turn the television on if it is off and off if it is on.

All of the appliances are off.

You want only the television and coffee machine on (the third and fourth appliances from the left in the picture).

Which of the following sequences of buttons should you press?

(A) $T, R, Q, P$
(B) $R, Q, P, S$
(C) $S, P, T, R$
(D) $Q, S, R, T$
A beaver has a puzzle with 12 different types of pieces, 4 of which are red, 4 of which are yellow, and 4 of which are blue, as shown below. There is an unlimited number of each type of piece.

Using these pieces, the beaver can create various colour sequences. The first piece in a sequence must have a flat left side and the last piece must have a flat right side. Pieces join in the usual way but two pieces can’t be joined on their flat sides and pieces can’t be rotated. One possible sequence is shown below.

**Question**

Which of the following colour sequences **cannot** be constructed?

(A) YELLOW → BLUE → BLUE → RED → BLUE
(B) BLUE → YELLOW → RED → YELLOW → RED
(C) RED → RED → YELLOW → BLUE → BLUE
(D) BLUE → RED → YELLOW → BLUE → RED
Part C
The following shapes are available to make a craft. There is no limit on how many times each shape can be used, but you have to pay every time you use a shape. The number on a shape is the shape’s cost (in dollars). The shapes can be rotated.

One way to make the craft shown on the left is by arranging shapes as shown on the right. The total cost of this construction is 18 dollars.

What is the minimum possible total cost to make the same craft?

(A) 13 dollars
(B) 14 dollars
(C) 15 dollars
(D) 16 dollars
A nation consists of six islands called Alpha, Beta, Gamma, Delta, Eta, and Kappa. All vegetables are grown on Alpha and shipped to the other islands. Vegetables are shipped only on the transportation routes indicated by the dotted arrows in the diagram. The number on each arrow represents the maximum amount of vegetables (in tonnes) that can be shipped along that route in a single day.

For example, up to 2 tonnes can be sent from Beta to Gamma in a single day, and up to 8 tonnes can be sent from Delta to Eta in a single day. Alpha always has enough vegetables to ship 20 tonnes per day.

Shipments take very little time to complete. For example, it is possible for vegetables to be shipped from Alpha to Gamma to Delta in a single day, as long as the individual daily route limits are not exceeded.

What is the largest amount of vegetables that can be shipped from Alpha to Kappa in a single day?

(A) 19 tonnes
(B) 18 tonnes
(C) 15 tonnes
(D) 12 tonnes
Genes in cells contain DNA which can tell us a lot about a living thing. A DNA sequence is formed from nitrogen bases. Each nitrogen base is one of four types: Adenine (A), Guanine (G), Cytosine (C), or Thymine (T). DNA can mutate to form a new sequence that is different from the original sequence.

Vormi is a creature for which each mutation is one of three kinds:

1. Substitution: Change one occurrence of a base to another base type.
   Example: AGGTC becomes AGATC (change second G to A).

2. Deletion: Remove one occurrence of a base.
   Example: AGGTC becomes AGTC (delete one G).

3. Duplication: Replace one occurrence of a base with two occurrences of the same base.
   Example: AGGTC becomes AGGTTC (duplicate T).

If Vormi’s DNA sequence is initially GTATCG, what sequence cannot be the result after exactly three mutations?

(A) GCAATG
(B) ATTATCCG
(C) GAATGC
(D) GGTAAC
A doctor has 16 patients numbered 0, 1, 2, \ldots, 15 and 8 test tubes labelled $A, B, C, D, E, F, G,$ and $H$.

Exactly one patient is ill. The doctor takes a blood sample from each patient and divides it into four test tubes mixing it with samples from other patients.

The Test Tube Distribution shown indicates which test tubes the blood samples for each beaver are mixed into. For example, the blood of patient 0 was divided amongst test tubes $A$, $C$, $E$ and $G$.

Sending a test tube to a lab will produce an infected result if it contains the blood from the ill patient. Otherwise, a test tube will produce a healthy result. The first three lab results are shown below.

**Test results so far:**
- Test tube C - healthy
- Test tube A - infected
- Test tube E - healthy

**Question**

In order to identify the ill beaver on the fourth lab test, which of the following test tubes could be sent to the lab?

(A) Test tube B
(B) Test tube D
(C) Test tube F
(D) Test tube G
Hira has a box with nine compartments:

Hira chooses 0, 1, 2, 3, 4, 5, 6, 7, 8, or 9 marbles and places them in the box according to the following rules:

- Each marble is in a different compartment.
- The total number of marbles in each row is even.
- The total number of marbles in each column is even.

In how many different ways can Hira place the marbles in the box?

(A) 12
(B) 16
(C) 64
(D) 512