Solution of Question 1

Q1) To B: +2, +7

To A: +1, +3, +4, -5, +6

Hence the Answer is option: A)7

Solution of Question 2

Q2)
1. Thomson : He told us we have consecutive letters on our papers
2. Thompson : Yeah he told me too.
3. Thomson : I don't know what your letter is.
4. Thompson : Neither do I know your letter.
5. Thomson : Now I know.

From 3, we can infer that Thomson's letter is not A/Z.

From 4, we can infer that Thompson's letter is also not A/Z.

Had Thomson's letter been B/Y, then Thompson's letter will become C/X from the Excerpt 3,4&5.

Had Thomson's letter been C/X, then, from 3&4, we understand that Thompson's letter cannot be B/Y as, then, statement 4 will be false (as then Thompson will realise that Thomson's letter is C, as A is not possible from 3). Hence, for 1&4 to be true, Thompson's letter had to be D/W.

For any other letter combination, there is no conclusive answer.

The Combination therefore is, BC/CD/YX/XW

Hence the answer is option: C)4 tries

Solution of Question 3

Q3) If we see from the centre then the the maximum distance horizontally and vertically can be 4 and minimum can be 0.

Possibilities A^2 + B^2 with for finding the order :

X,Y Distances^2

0,1 01

1,1 02

0,2 04

1,2 05

2,2 08

0,3 09

1,3 10

2,3 13

3,3 18
0,4 16
1,4 17
2,4 20
3,4 25
4,4 32

which are 14 possibilities and that means all will be used in this puzzle as no two distance can be equal.
So there will be 4,4 difference in 14,15... 3,4 in 13 ,14 and so on...

Now we start from the sides and write variable for which positions are possible, then we see different positions possible and continue till we reach one solution. WE go back from it to fill all the remaining squares and we will get a=6 and b=10
Answer will be 16

Solution of Question 4

Q4) If you start observing behaviour of games starting from n=1, you can observe patterns which you can generalize. It is easy to see that in the first round each person sitting at an even numbered position will be thrown out of the game as he/she has 1 coin initially, receives 1 coin from right but has to now pass both the coins to the left. Also observe that the 1st person will be always thrown out of the game. If n = 2k, after the first round k-1 will remain. If n = 2k+1, then k will remain.
Case 1 : n is even
for n=2k , after the first round configuration would look like
3(4) 5(2) 7(2) … 2k-1(2)
where a(b) denotes position a with b coins. at this point of time. Number of remaining people are k, if k is odd the game will not terminate because a person who looses one coin in a round will gain one coin in the next round.
Case 2 : n is odd
for n=2k+1, after the first round configuration would look like
3(3) 5(2) … 2k+1(2)
If k is odd, the game will not terminate. If both the cases if k is even, at the end of two rounds exactly half will remain. Because a person who looses a coin will keep loosing in subsequent round.
After this elimination you again have to deal with cases where remaining people are odd or even. Thus you can observe that if after the first round people remain then the game will always terminate. This can happen if initially there are or person are there.

Hence, the Answer is option: C)10

Solution of Question 5

Q5) The answer is

10 9

11 7 2 12 4

5 8 1 6 3

Solution of Question 6

Q6) This puzzle seems rather difficult to solve by trying random moves that appear to get one closer to the solution. However, consider the board a sequence of integers, each being the number of pennies at that location, and the moves as adding or subtracting (+1, -1, +1) to three consecutive values.

Then by inspection we can come up with a solution, not worrying about whether the number of pennies is always positive, by adding the columns:

```
  0   0   0   0   0   0  +1 (start)
  0   0   0   0  -1 +1   -1
  0   0   0  -1 +1 -1    0
  0 +1  -1 +1   0  0    0
+1  -1 +1   0   0  0    0
--------------------------
 +1   0   0    0   0  0    0 (end)
```

This gives you the four critical moves that must be in any solution. However, applying them directly is illegal. [But you can] just [keep] splitting the left penny (7 times), then [do the] "critical 4 moves" and you come up with the mirror image position, so you now combine to the final position. Ergo,

```
0 0 0 0 0 0 0 1 0
0 0 0 0 0 0 1 0 1
0 0 0 0 0 1 0 1 1
0 0 0 0 1 0 1 1 1
0 0 0 1 0 1 1 1 1
0 0 1 0 1 1 1 1 1
0 1 0 1 1 1 1 1 1
1 0 1 1 1 1 1 1 1
1 1 0 2 1 1 1 1 1  <--  +1 -1 +1
1 1 1 1 2 1 1 1 1  <--   +1 -1 +1
1 1 1 1 1 2 0 1 1
1 1 1 1 1 1 1 0 1  <--            -1 +1 -1
1 1 1 1 1 1 0 1 0  <--           -1 +1 -1
1 1 1 1 1 0 1 0 0
1 1 1 1 0 1 0 0 0
```

1 1 1 0 1 0 0 0 0
1 1 0 1 0 0 0 0 0
1 0 1 0 0 0 0 0 0
0 1 0 0 0 0 0 0 0

Solution of Question 7

Q7) Four sittings are needed to fulfill the requirements. A sitting must include all possible ordered pairs (a, p), where a are the ones sleeping while p are the ones controlling the ship. There are 6×5 = 30 such ordered pairs. In any sitting, if exactly m people to control the ship, the number of ordered pairs covered is m(6 − m). This is maximised if m = 3 and m(6 − m) = 9. Hence three sittings can cover at most 3 × 9 = 27 ordered pairs. This is insufficient since we require 30 ordered pairs. To show that four concerts are sufficient, number the people 1 to 6 and use the following construction.

Controlling the Ship:
456
235
136
124
Sleeping:
123
146
245
356
It is easy to check that every ordered pair is covered by this construction.

Hence, the Answer is 4

Solution of Question 8

Q8) Since we have to divide 47 bamboo sticks to 60 people in equal quantities, every person must end up with 47/60 of the initial piece.

Let us look at, 47/60 = 1/3 + 1/4 + 1/5.

For the first cut, Tintin puts the 47 sticks side by side in a way that he will cut 20 sticks at 1/3 of the length, 15 sticks at 1/4 of the length and 12 sticks at 1/5 of the length.
He obtaines
- 20 parts of length 1/3 (that he keeps for the moment)
- 20 parts of length 2/3 (to be cut later)
- 15 parts of length 1/4 (that he keeps for the moment)
- 15 parts of length 3/4 (to be cut later)

- 12 parts of length 1/5 (that he keeps for the moment)
- 12 parts of length 4/5 (to be cut later)

For the 2nd cut, Tintin puts side by side 20 parts of length 2/3 in the middle, 15 parts of length 3/4 at 1/3rd it's length(i.e., 1/4th of total length) and 12 parts of length 4/5 that he will cut in the middle.
He obtaines
- 40 additional parts of length 1/3, that he adds to the 20 parts obtained previously. He can now distribute these 60 pieces of length 1/3.
- 15 additional fragments of length 1/4 (which he adds to the existing ones) and 15 fragments of 2/4 length (to be cut later)
- 24 fragments of length 2/5 (to be cut later)

On the same principle, Tintin needs to cut the rest of the sticks once more to divide the 15 fragments of length 2/4 in 30 fragments of length 1/4 and 24 fragments of length 2/5 into 48 fragments of length 1/5.
He can now distribute all the 60 pieces of ¼ and 60 pieces of 1/5.
Hence the Answer is 3.

Solution of Question 9

Q9) Two extra people are needed to return correct hats using the following method-
Let the extra people have names E1 and E2.
Step 1: Arrange the 64 people into lines such that - In each line, every person is having the hat of the person directly behind. Except the last person whose hat is with the first person in that line.
Note : If two people have each others' hats, they will make a separate line of only two people.

Step 2:: For a single line, first E1 swaps hats with the last person. Then E2 swaps hats with each person in middle one at a time from front to back. Finally E1 will swap hats with the first person.Then E1 & E2 swap each others' hats. This way everyone in this line along with E1 & E2 will have their own hats.

Step 3: Repeat Step 2 for each line.

Solution of Question 10

Q10) If you have the first move to make, what will be your stretagy? One thing is for sure that you can not always win. For example in a configuration (1,2) it is impossible for you to

win no matter what move you make. In a sense (1,2) is a losing state. Your job is to find out whether given configuration is a winning state or not and if it is a winning state, what will be the sequence of moves that will lead you to victory. There cannot be any losing state which has a difference of 1 since they can be brought to (1,2) which is a losing state and there is no other losing state with one of the 2 numbers i.e 1,2 since they can be brought to losing state.
Next (3,5) is a losing state and then (4,7) (5,9) (6,11) (8,14) (10,17) (11,19) (12,21) (13,23) (15,26)
From (12,15), the only loosing state you can bring to is (4,7) which requires TinTin to eat 16 apples(8 from each)

Solution of Question 11

Q11) First note that a jar shall not become zero with other jars being nonzero.(Think !).

Yes mario can always empty the jars. Basic idea is to reduce one from every jar until a jar contains only one, then double that jar and continue. This will ensure emptying, though not in minimum steps.

For minimum steps- we shall reduce the unnecessary steps.
The method is to first double each jar until it reaches a number less than or equal to the highest number, then deduct all jars by one until a jar becomes one OR if a jar can again be doubled under above condition (note that this doubling will not add any extra work & infact reduce some.). Then check above rule after every deduction & double the necessary jars.

For eg, consider only 2 jars- with 1 4 as initial counts. Then he shall follow these steps-

1. Double the jar 1 (gives 2 4)
2. Double the jar 1 (gives 4 4)
3. Reduce both jars one by one (3 3 -> 2 2 -> 1 1 -> 0 0)(4 times)

Which gives 6 as the minimum steps to empty the jars.

eg 2: in the case 2 6 8, the number shall drop as follows (11 steps)-
2 6 8 >> 4 6 8 >> 8 6 8 (double each jar close to highest number)
8 6 8 -> 7 5 7 ->6 4 6 -> 5 3 5 ->4 2 4 (reduce all ONLY until there is a double possible again!)
4 2 4 >> 4 4 4 ->3 3 3>>2 2 2>>1 1 1>>0 0 0 (then follow same procedure)

Now that you have an idea, the original question will be easy to answer.

4	2	6	7	3	4	5	8	3

(reach following in 6 steps by doubling respective jars)

8	8	6	7	6	8	5	8	6

(reach following in 2 steps by reducing the jars)

6	6	4	5	4	6	3	6	4

(1 step - double the 3 jar)

6	6	4	5	4	6	6	6	4

(2 reductions)

4	4	2	3	2	4	4	4	2

(3 doubles)

4	4	4	3	4	4	4	4	4

(2 reductions)

2	2	2	1	2	2	2	2	2

(1 double & 2 reductions)

2	2	2	2	2	2	2	2	2
0	0	0	0	0	0	0	0	0

Which gives that minimum 19 steps are required for emptying the jars.

Solution of Question 12

Q12) answer is 16days.
Tip: Look at the horizontal number-line on keyboard for reference (with '0' as room no 10).
Let the rooms be numbered from 1 to 10.

Mario can open any door, one in a day. While ghost has to keeping sliding to an adjacent room (i.e. Each day ghost's room number follows odd-even pattern).
This means if mario starts from an even numbered room, while ghost is initially in odd numbered room, on next day mario will be in odd & ghost will be in even i.e. it is impossible to catch the ghost without switching the even-odd pattern.

The ghost always has two doors to shift into, except when at end rooms 1 & 10. We can block only one room at a time for it. So in the worst case, it may escape us by shifting to the other(which we didn't block) room every time. But we can surely catch it when it is at end rooms 1 or 10 & we are at two rooms distance from it (3 or 8), then ghost will be caught in room 2 or room 9.

The way to ensure this is : sequentially open rooms from 2 to 9(both inclusive) and then go backwards from rooms 9 to 2. Note that we open room 9 twice consecutively so that we switch our odd-even pattern.

If ghost is in even room number in the start .. You will catch in the forward move

If ghost is in odd room number in the start .. You will catch in the backward move

- Why did we start from 2 & not other number, say 3 ? -> Starting from 3 onwards will give it a chance to oscillate in between 1 & 2 (starting from even no= 2), so we have to start from 2.
- Why did we come backwards from 9 to 2? -> If ghost was in odd room at start, we won't catch it in foreward move, then in such cases the backward move is required.

Solution of Question 13

Q13) From the hint, we realize that the 3 words are cyclic. Therefore,

M	K	E
K	E	M
E	M	K

Where, M: Message, K: Key, E: Encoding.

Observe that, this function is unary in nature.

Since, we only had the last 3 alphabets of the key, let us only focus on the last 3 alphabets of the messages and the encodings.

Every message ended with ADC.

Therefore, using the 3rd formula,

DBD
ADC
DCB = the key.

Now, using the key, the encoding's BBDBD last 3 words DBD and the 2nd formula,

DCB
DBD
ADC

Hence, the message ends with ADC, which is Option B.

Solution of Question 14

Q14) From the conditions of the problem, the number of voters is 3n for some odd positive integer n. Each of the candidates A, B and C received n first preferences and n second preferences. Let the number of voters who voted A > B > C be x and the number of voters who voted A > C > B be y. Then x + y = n and the size of the remaining voting groups can be easily computed: A > B > C : x, A > C > B : y, B > C > A: x, B > A > C : y, C > A > B : x, C > B > A: y. When only comparing B against C, we have B > C : x + x + y = n + x, C > B : y + x + y = n + y. Similarly (noting the cyclic symmetry), we have A > B : n + x, B > A: n + y; A > C : n + y, C > A: n + x. Since n is odd, x 6= y. If x > y, then B wins against C but goes on to lose against A. If y > x, then C beats B then also goes on to lose against A. Therefore Christie is right, Adrian will always win under the proposed system.

Solution of Question 15

Q15) Bonus for All …..Want to know the solution ?? Check Juniors paper for correct Question and Solution !

Solution of Question 16-17

Q16) Toggle all the doors except 5th, 10th, 15th, 20th, 25th, 30th, 35th, 40th, 45th, 49th
This way, Only Door 1 will be opened and all others closed.
That means minimum steps required are 39 ….. So any odd number equal to or greater than 39 is the possible steps
So 49 steps is the answer

Q17) Number of doors and 15 should not have any common factor.
So, 53 is the answer

Solution of Question 18

Q18) Ans: 143
Solution: The first thing that comes to mind (my mind) is to count the ways the joints could bend when every one is a 90 degree turn to the left or right. Twelve segments, that's eleven joints.
One joint = two ways
Two joints = 4 ways
Three joints = 8 ways
Etc.
Etc.

But, in our puzzle the first joint is welded firmly with a 90 degree turn to the right. Then 10 more single type segments for a total of 11 solid pieces, or 10 joints that can go either left or right at 90 degree turns. So, 2^10= 1024 ways or patterns.
We have one more restriction, just to make it fun. The stick can't touch itself. So, we have to subtract, from the 1024 number, the number of instances that have the stick touching itself. How in the world would we do that?
Let's think about the very first thing that could go wrong. We could have the first choice available to us be a (R,R) followed by a (R,L,R,L,R,L,R,L,R). That would make a little box at the start of our pattern and foul the deal. So, that's one of the bad patterns which we must subtract from the 1024 number. What's next. Well, - - - - - . But, wait there must be an easier way to do this.
Let's subtract all the patterns that have any little four sided boxes in them in one fell swoop. In order to compute this number, I'm going to go at it backwards and compute all the total number of patterns that "**DON'T**" have at least one little box in them. That gets us there so to speak.
We have a neat trick available to us here. Our first joint after the welded head piece could be either (R) or (L). Two choices. The next joint after that has 3 choices etc. Study this and you will see:

Joint	Choices
1	2
2	3
3	5
4	8
5	13
6	21
7	34
8	55
9	89
10	144

We could subtract 144 from the 1024 to calculate the 880 patterns that DO have little four sided boxes in them. It's the 144 figure though that we were looking for.

That's quite a trick. We are using the famous Fibonacci sequence here, where each succeeding number is the sum of the previous two. And 144 is the 12^{th} one of these. Our stick, remember, has twelve segments, it's just that the first two are welded together in a fixed right hand turn.

This is great fun. I wish that were all there was too it. But, no! We have more problems.

Consider the joints (Rweld,R,L,R,R,L,R,R,L,R,R).

Here, in this cases, we don't have any little four sided boxes, but the snake does touch itself. There is only this case as the first joint is welded.

This is another case is another case that must be subtracted from 144 and hence 143 is the answer!!

Solution of Question 19

Q19) The answer to this question is 10^5. Instead of finding a six digit number with two different digits in any two numbers, find a 5 digit number with 1 different digit in any two numbers (which will always have a different digit between 2 numbers) and just add the last digit in the units place. This 5 digit number can be anything from 0 to 99999 and can be done in 10^5 ways. The 6^{th} digit is obtained by adding the first 5 digits and taking the units place of the sum.

Solution of Question 20

Q20) The hint was the term, 'Spiralling' which indicated that, it was a square inside square kind of spiral. Start from the outermost "SQUARE",

To get the alphabet corresponding to that particular square,

Connect each white square to the nearest x white squares in that chosen SQUARE, where x corresponds to the number in that square

For the 6^{th} square (the central square of the whole box) use the directions given to figure the path.

Hence the answer is option A)H.

Solution of Question 21

Q21) Consider the solution for a general case one where there are n padlocks and a set of k keys are able to open the padlocks. Suppose a set S of k-1 keys are trying to open the chest, there must be atleast one padlock L which will remain locked. Now get an additional key which doesn't belong to S. This key will be able to open the last padlock L. In other words, the padlock L can be opened only if the key doesn't belong to the set S. By the same argument, for any set of k−1 keys, there exists a lock identified by the set. Hence we must have at least (n)C(k−1) locks in total. To show that (n)C(k−1) locks are sufficient, simply biject the locks to the sets of k − 1 keys. Therefore the required answer is 12C7−1 = 924

Solution of Question 22

Q22) We get 40*40*1 = 1600 (Since the last round, it opens immediately) - 1 (Case of 000) = 1599

Solution of Question 23-24

To check which face is rotated check the orientation of center letter of each face which has been changed after the two rotation have been made. Observe along the line U-B-D-F . We see that the orientation of the U face is been changed clockwise.

The moves that are made in order are :
1. LEFT face clockwise
2. RIGHT face clockwise
3. UP face clockwise

We need to trace back the letters to get them in their original position. For this we have to see the effect of following moves on the current configuration.

1. UP face anticlockwise.
2. RIGHT face anticlockwise.
3. LEFT face anticlokwise.

Trace the changes in the letters on each face. i.e. When Up face is rotated clockwise it will change letters in right , left , front , back face will change. Postions of the letters in the Up face will change and no effect will be observe on the Down face. Similarly Left and Right face rotation wont effect letters of the other one.

Letters can be guessed even when they are rotated. But some letters can have different possiblities like W and M which can be found by observing the orientation of a nearby lettter.

Hence after all the moves are made letters on the face are::

Front face : F D R E A M S

Back face : B W O R K

Hence the common letter is only R.