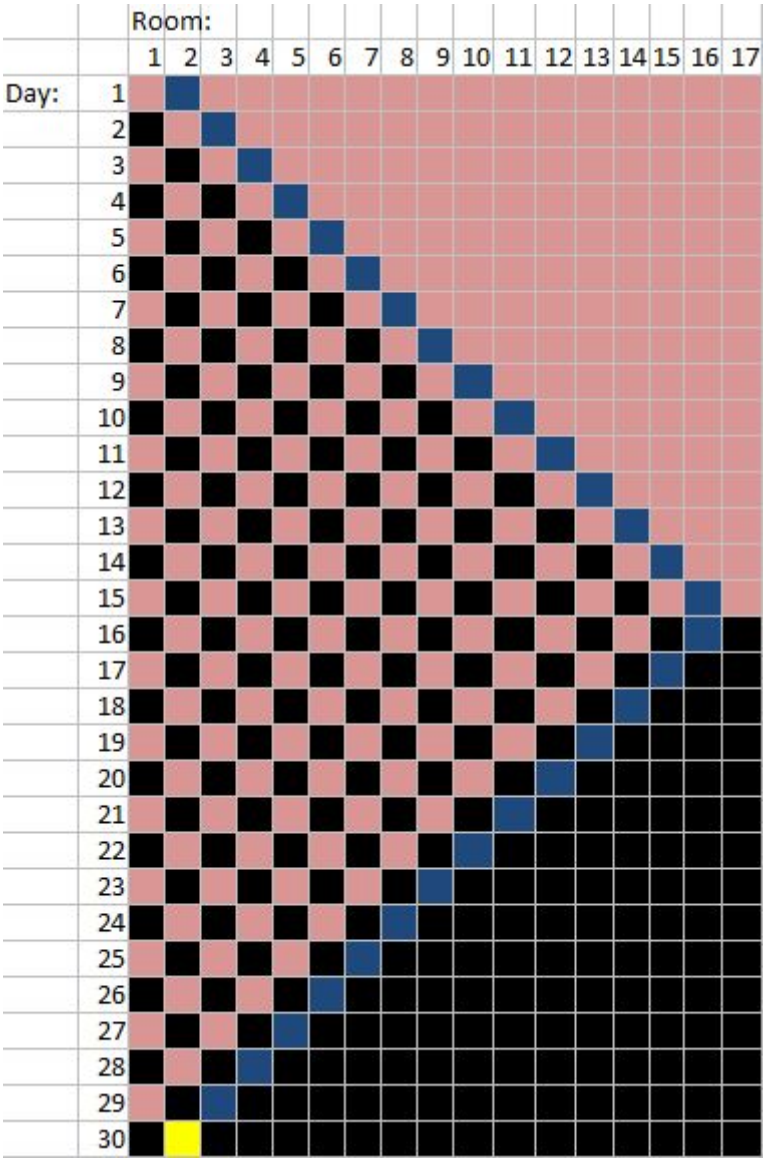
Question 1:

The Pink squares are rooms where the gift could be on the given day, the blue squares are where Max checks that day, and the black squares are rooms in which it logically cannot be. On day 30 all rooms but room 2 have been eliminated, meaning that if he has not found the gift already, he will find it there on day 30.



Question 2:

https://www.checkmyworking.com/2011/12/solving-the-princess-on-a-graph-puzzle/

Question 3:

23

This is based on the fact that HCF or GCD of (a,a-b) or (a-b,b) is the same that of (a,b). This Follows from the fact that every mutual factor of a and b are also the factor of a+b and |a-b|.

And so becomes the grid. This will happen at each stage of reach for some (a,b);

Thus lion can only reach those points whose gcd or hcf is (8,10)==2;

Therefore the answer is all the coordinates whose hcf is 2;

{(2,2)}*1

{(2,4) (4,6) (6,8) (8,10) (10,12)

(2,6) (6,10)

(2,8) (4,10)

(2,10) (2,12)} * 2(As these could be both a,b and b,a)

Ans 11*2 + 1 = **23**

Question 4:

D-D, C-D, B-L, A-DR, D-LU, X-ULUR

Question 5:

Option A is more likely to win. Let max choose option A and Brock choose option B. And let's assume a new character, Alice selects the pokeball that will contain the pokemon.

Label a Pokeball with a "b" (respectively, a "c") if Max (respectively, Brock) reaches that Pokeball more quickly, and also record Max's (respectively, Brock's) score upon reaching that Pokeball. Label Pokeballs A and L with "xx" since both players reach those Pokeballs simultaneously.
We obtain:

xx b2 b3 b4
c2 c5 b7 b8
c3 c6 c9 xx

Note that there are five b Pokeballs and five c Pokeballs. So the cases in which the pokemon is in pokeball A or Pokeball L are equally split between Max and Brock. Similarly if Alice selects two b Pokeballs then Max necessarily wins, but these are balanced out by an equal number of cases in which Alice selects two c Pokeballs and C necessarily wins.

The crucial cases occur when Alice selects one b Pokeball and one c Pokeball. Max wins if the b Pokeball has a lower score than the c Pokeball:

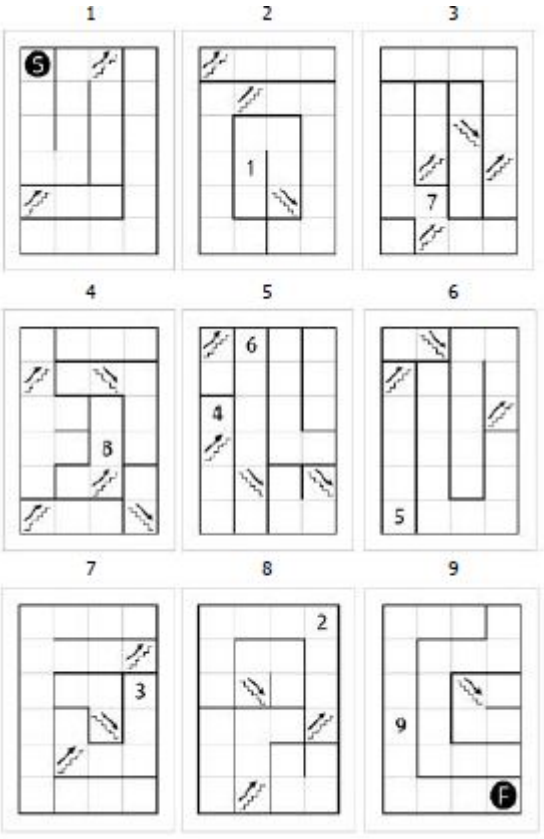
b2 and (c3 or c5 or c6 or c9)
b3 and (c5 or c6 or c9)
b4 and (c5 or c6 or c9)
b7 and c9
b8 and c9

Brock wins if the c Pokeball has a lower score than the b Pokeball:

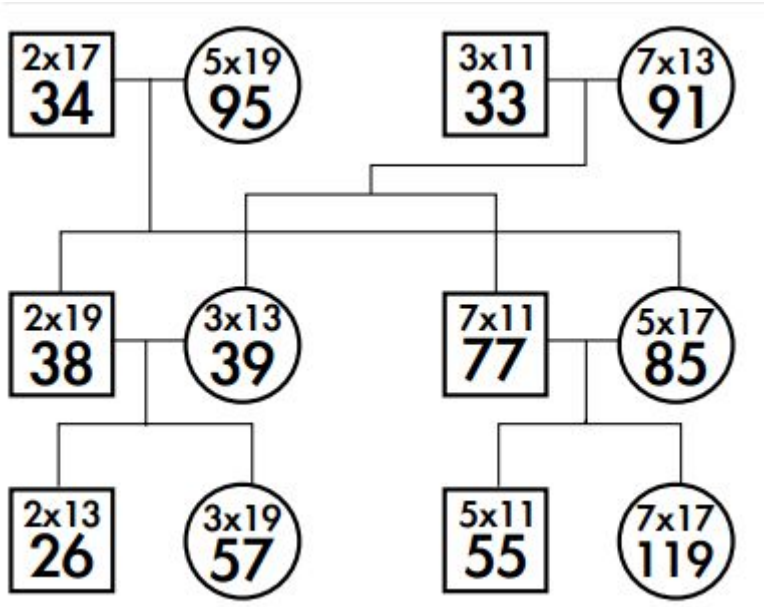
c2 and (b3 or b4 or b7 or b8)
c3 and (b4 or b7 or b8)

Question 6:

Can be found out by the process of elimination. You can retrace the path from the top- most floor and make your way to the bottom and simultaneously, trace from the bottom to the top.



Question 7:



By eliminating some of the numbers because the product of the primes will exceed the given limit, we can arrive at this solution.

Question 8:

The answer:
They **can** escape, and will do so in **four days**.

The explanation:
Let's start on the time of release and follow the thought process.

Max learns that Jenny has 8 bars on the morning of the 4th day. To avoid long lists of "he knows she knows" let's use some shorthand. M represents Max and R represents Jenny "M12: R=6,8" means "In the case that Max has 12 bars, Max knows that Jenny has 6 or 8 bars". On the next indent level, "R6" and "R8" describes both possible cases. Here's the thought process of Max on the morning of the 4th day, just before he announces that there are 20 bars in total. The logic starts like this: Max knows Jenny has 6 or 8 bars. If Jenny had 6 bars, she would think Max had 12 or 14 bars. If Jenny had 6 bars and assumed Max had 12, Max would think... etc.
M12: R=6,8
- R6: M=12,14
- - M14: R=4,6
- - - R4: M=14,16
- - - - M16: R=2,4
- - - - - R2: M=16,18
- - - - - - M18: **If M had 18 bars, he would have answered "20" on the first morning**
- - - - - - M16: **Since M didn't answer day 1, R would answer "18" on the first evening.**
- - - - - R4: **That didn't happen, so M would answer "20" on second morning**
- - - - M14: **That didn't happen, so R would answer "18" on second evening**

- - - R6: **That didn't happen, so M would answer "20" on the third morning**
- - M12: **That didn't happen, so R would answer "18" on the third evening**
- R8: **None of the above happened, so this is the only remaining choice**
Max announces that 20 is the answer on the fourth morning.

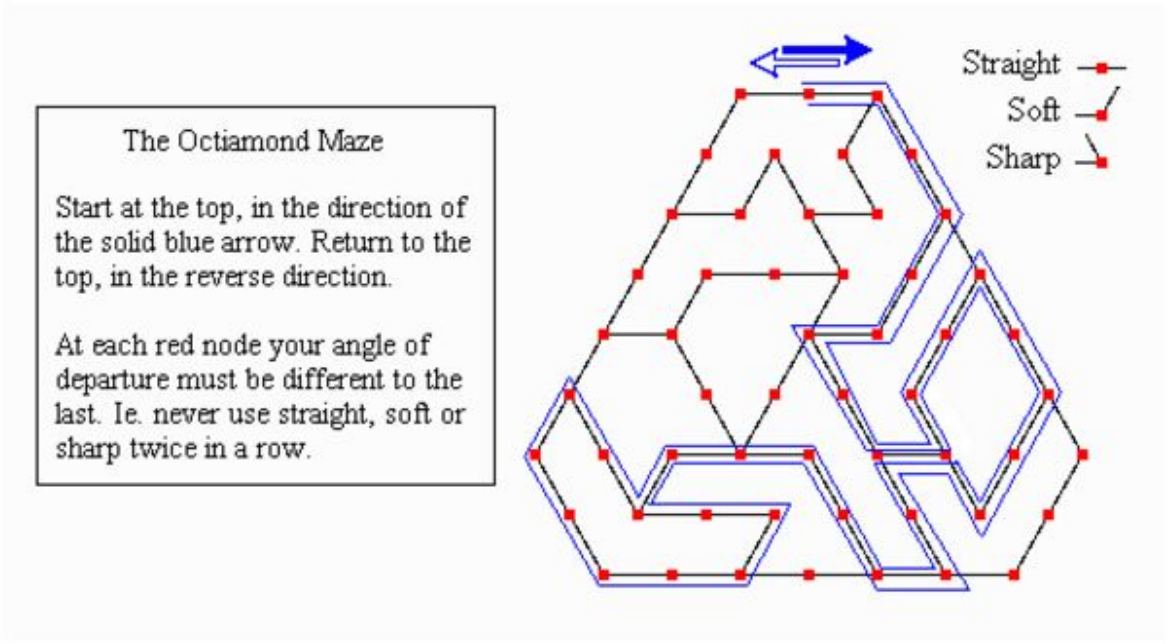
Question 9: Bonus

Answer: **7**

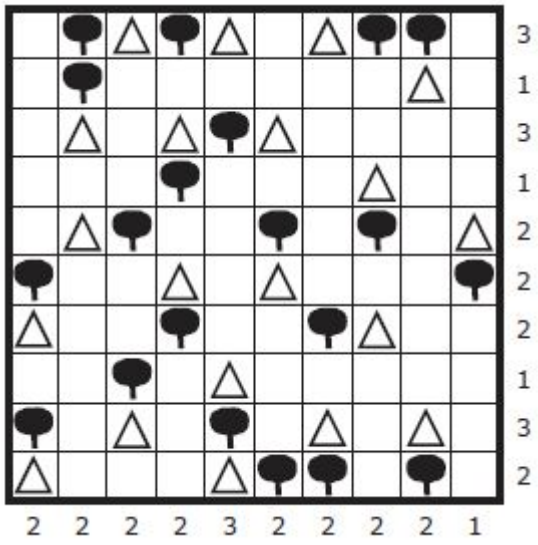
Question 10:

Answer : **8**

Question 11:



Question 12:



Question 13:

The answer is very close to 4! More precisely, it will take about 3.994987 blows. Why?

Let's start with a smaller number of candles and work our way up. Suppose you have a cake with just a single candle. You'll blow it out in one blow, for sure. Suppose there are two. Half the time you'll blow them both out in one go, and half the time it'll take two blows. Let's make a list:

One candle: 1

Two candles: $(1/2)\cdot 1+(1/2)\cdot 2=1.5$
Three candles: $(1/3)\cdot 1+(1/3)\cdot (1+1.5)+(1/3)\cdot (1+1)=1.83^{-}$
Four candles: $(1/4)\cdot 1+(1/4)\cdot (1+1.83^{-})+(1/4)\cdot (1+1.5)+(1/4)\cdot (1+1)=2.083^{-}$

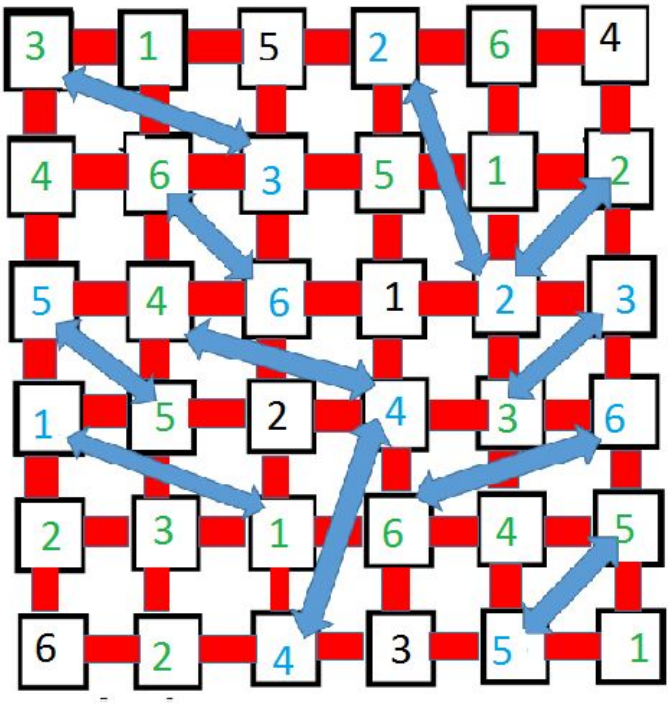
With each additional candle, you have an equal chance of blowing them out in one go and of only snuffing some specific number, leaving some to tackle on the next blow. Notice the pattern! For one candle, the average number of blows is one. For two, it's 1+1/2. For three, it's 1+1/2+1/3. For four, it's 1+1/2+1/3+1/4. And so on. So to get the answer, we simply compute this harmonic sum:

$\sum$ (1/i), i goes from 1 to 30 = ≈3.994987

Question 14:

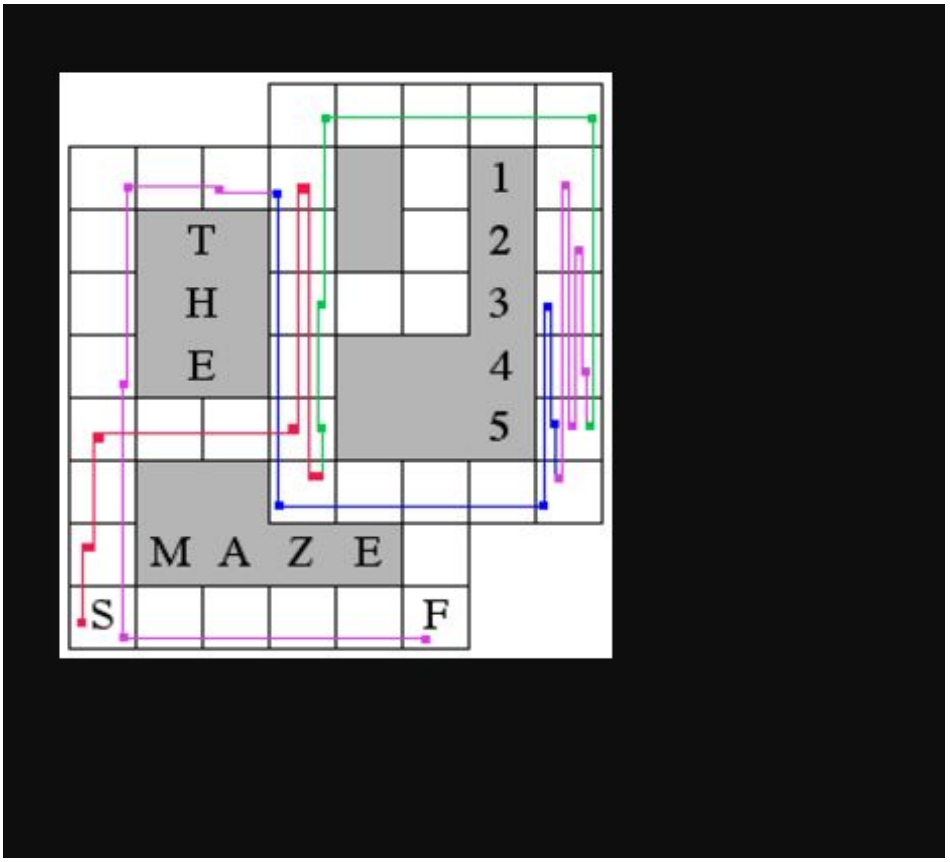
2 from the first pile and **9** from the second. The trick here is to minimize the losses. What might seem like a wrong move might get compensated for in the following moves. This can be solved using a computer algorithm but for the purposes of the quiz, using intelligent guesswork should suffice.

Question 15:



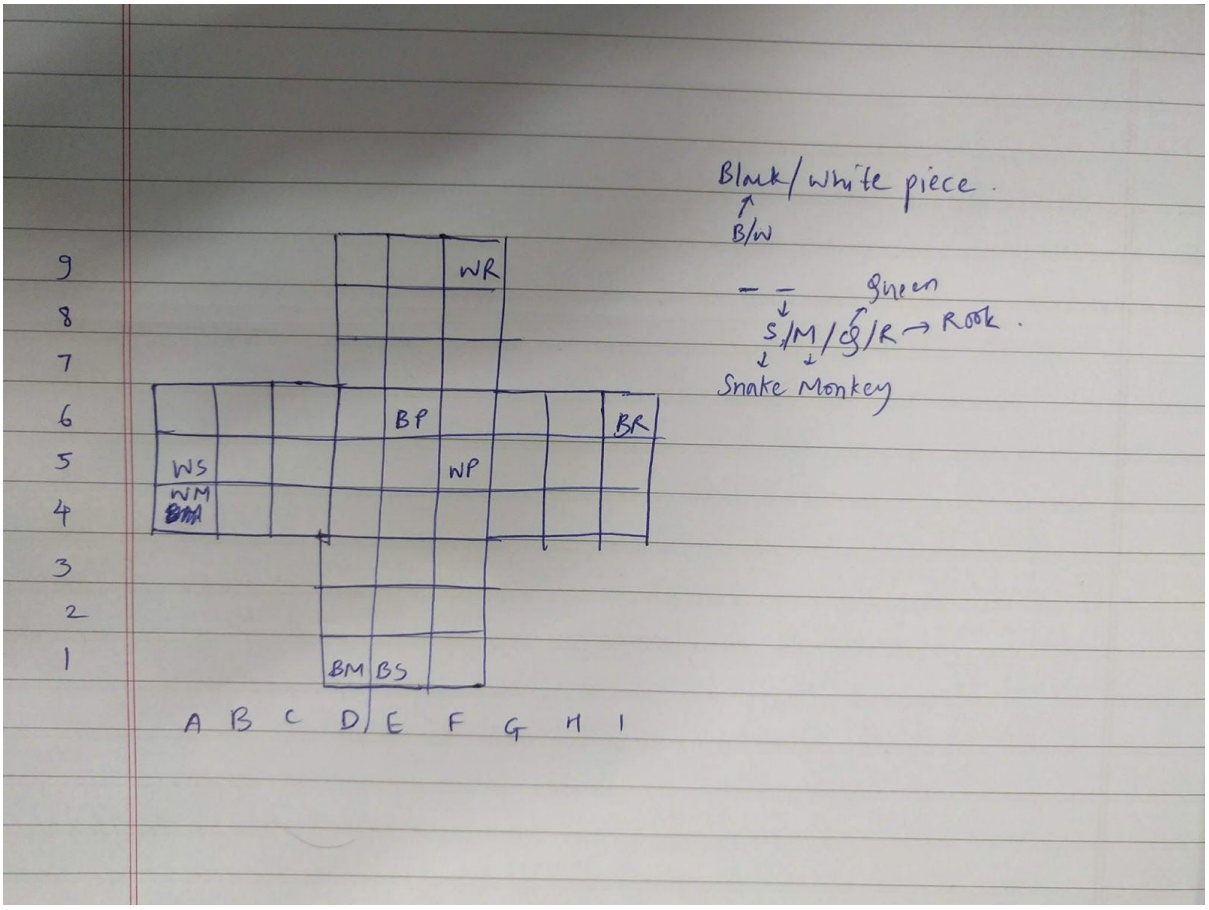
The question asked is, how many soldiers are outside the central 4 blocks without the cloned extra soldiers. Clearly, from the given information, rest of the squares can be filled.

Question 16:



5 set of moves

Question 17, 18:



Question 19:

1,4,1,3,3,4, -1

Max score = **15**

Question 20:

Answer: The code is BOSCOMBE. All the four figures with green circles can be rearranged so that they become exactly similar to the template figure(in yellow) except at two circles.

The circles at which they are dissimilar contains the alphabets: B-O; S-C; O-M; B-E in order (when the figures are considered in clockwise order)

So the letter B appears **2** times