PUZZLES

Ashirbad Swain

1. A plane crashed on the border of India and Pakistan. Where do they bury the survivors?
   ans: Survivors will not be buried.

2. Some months have 30 days, some months have 31 days. How many months have 28 days?
   ans: 12 Months
   All months of year have at least 28 days, while February is the month that is comprised of only 28 days (except for leap year).

3. You have two buckets – one holds exactly 5 liters and the others 3 liters. How can you measure 4 liters of water into the 5 liter bucket? (Assume you have an unlimited supply of water and that there are no measurement markings of any kind on the buckets)
   ans:
   method 1:
   - Fill the 5 liter bucket from the tap
   - Empty the 5 litre bucket into the 3 litre bucket – leaving 2 litres in the 5 litre bucket
   - Pour away the contents of the 3 litre bucket
   - Fill the 3 litre bucket with 2 litres from the 5 litre bucket – leaving 2 litres in the 3 litre bucket
   - Again fill the 5 litre bucket from the tap
   - Fill the remaining 1 litre space in the 3 litre bucket from the 5 litre bucket
   - Leaving 4 litres in the 5 litre bucket 😊

   Method 2:

   - Fill the 3 litre bucket from the tap
   - Empty the contents of the 3 litre bucket into the 5 litre bucket
   - Again fill the 3 litre bucket from the tap
   - Empty the contents of the 3 litre bucket into 5 litre bucket – leaving the 5 litre bucket full and 1 litre in the 3 litre bucket
   - Pour away the contents of the 5 litre bucket
   - Pour the 1 litre from the 3 litre bucket into the 5 litre bucket
   - Fill the 3 litre bucket from the tap
   - Empty the contents of the 3 litre bucket into 5 litre bucket
   - Leaving 4 litres in the 5 litre bucket 😊

4. How can you drop an egg on the floor without breaking it?
   ans: many possibilities are there,
   1) We can drop a raw egg onto a concrete floor without cracking it. Here, it means concrete floor. So, concrete floors are very hard. We cannot crack it. So, this is possible.
   2) Put everything underwater. The egg will sink very slowly to the concrete.
   3) Covering the egg with a bubble wrap or in a padded box might technically work
   4) Drop an egg in low/no gravity
   5) Freeze the egg and drop
   6) Release close to the floor
   7) Drop the egg in wet concrete!

5. Why are manhole covers round?
   ans: It can not be dropped in, in any angle
   Reasons for the shape might include: A round manhole cover cannot fall through its circuar opening, whereas a square manhole cover might fall in if it were inserted diagonally in the hole. A round manhole cover can be more easily moved by being rolled.

6. If 7 spiders make 7 webs in 7 days, then how many days are needed for 1 spider to make 1 web?
   ans:
   Let the required number of days be X.
   Less spiders, More days (indirect proportion)
   Less webs, Less days (Direct Propertion)

   Spiders 1 : 7
   Webs 7 : 1 :: 7 : x

   1 x 7 x X = 7 x 1 x 7
   => x = 7

   OR:

   When ever you found these kind of problems, come from the back.
   Means if 7 spiders 7 webs in 7 days so,
   1 spider work = (7 * 7)/7 = 7

   One person work = (days * workdone)/number of workers

7. Tom's mother has three children. One is named April, one is named May. What is the third one named?
   ans: Tom

8. Perform this calculation in your head, mentally adding the numbers as quickly as you can. Start with 1000 and add 40. Now add 1000. Add 30 to that, then add another 1000. Now add 20 to that result. Add another 1000 and finally, add 10 to that. What is the total?
   ans: 4100

9. If you were to spell out the number, how far would you have to go before encountering the letter "A".
   ans: 1000 (Thousand)

10. You are standing outside a closed door. On the other side of the door is a room that has three light bulbs in it. The room is completely sealed off from the outside. It has no windows and nothing can get in or out except through the door. On the outside of the room there are three light switchs that control each of the respective light bulbs on the other side of the door. Your assignement is to determine which light switch controls which light bulb. Your are allowsed to enter the room only once, and you come out, you must be able to state with 100% certainty which light switch controls which light bulb.

ans:

- Switch on switches 1 & 2, wait a moment and switch off number 2
- Enter the room. Whichever bulb is on wired to switch 1, whichever is off and hot is wired to switch 2, and the third is wired to switch 3

11. If a doctor gives you 3 pills and tells you to take on pill every half hour, how long would it bee before all the pills had been taken?

ans:

1 hr

12. I went to bed at 8 o 'clock in the evening and wound up my clock and set the alarm to sound at 9 o'clock in the morning. How many hours sleep would I get before being awoken by the alarm?

ans:

One hour of sleep. Alarm clock don't have AM/PM settings.

13. Divide 30 by half and add ten. What do you get?

ans:

30/(1/2) + 10 = 70

14. A farmer had 17 sheep. All but 9 died. How many live sheep were left?

ans:

"all but 9 die" and it means that all other sheep died except 9.
Hence, 9 sheep are left alive.

15. If you drove a bus with 43 people on board from Warangle and stopped at Khammam to pick up 7 more people and drop off 5 passengers and at Kodad to drop off 8 passengers and pick up 4 more and eventually arrive at Vijayawada 06 hours later, what's the name of the driver?

ans: Yourself

16. If you had only one match and entered a COLD and DARK room, where there was an oil heater, an oil lamp and a candle, which would you, light first?

ans:

Match stick

17. By moving one of the following digits, make the equation correct.

62 – 63 = 1

ans: $2^6 - 63 = 1$

18. You have 12 black socks and 12 white socks mixed up in a drawer. You're up very early and it's too dark to tell them apart. What's the smallest number of socks you need to take out (blindly) to be sure of having matching pair?

ans:

for smallest no of possibility : 02

but, for sure :

3 socks. If the first socks is black, the second one could be black, in which case you have matching pair. If the second socks is white, the third socks will be either black and match the first socks, or white and match the second socks.

19. What is special about the following sequence of numbers?

8 5 4 9 1 7 6 10 3 2 0

ans:

The numbers are in alphabetical order.

8 = eight
5 = five
4 = four
9 = nine
1 = one
7 = seven
6 = six
10 =ten
3 = three
2 = two
0 = zero

20. Why is it very common to have a 9 minute snooze interval on alarm clocks, why not 10 instead?

ans:

By setting the snooze time to 9 minutes, the alarm clock only needs to watch the last digit of the time. So, if you hit snooze at 6.45, the alarm goes off again when the last digit equals 4. They couldn't make it 10 minutes, otherwise the alarm would go off right way, or it would take more circuitary.

21. An Arab sheikh tells his two sons to race their camels to a distant city to see who will inherit his fortune. The one whose camel is slower will win. The brothers, after wandering aimlessly for days, ask a wise man for advise. After hearing the advice they jump on the camels and race as fast as they can to the city. What does the wise man say?

ans:

The wise man told the two sons to switch their camels

22. If you had a ton of feathers and a ton of stones which would be heavier?

ans: Both weigh the same

23. Two women apply for a job. They are identical and have the same mother, father and birthday. The interviewer asks, “Are you twins” to which they honestly reply, ‘No’. How is this possible?

ans:

There are two possibilities:

- May be they are triplets
- Birth year and month are may be different.

24. A prisoner is told “if you tell a lie we will hang you, if you tell the truth we will shoot you.” What can he say to save himself?

ans:

You will hang me. If they hang him, then the statement was true and they could only hang him for telling a lie. If they shoot him, then it makes the statement a lie and they were only to shoot him for telling the truth. An alternate solution is to say, “You will not shoot me,” leading to the same quandary for the killers.

25. You have a fox, a chicken and a sack of grain. You must cross a river with only one of them at a time. If you leave the fox with the chicken he will eat it; if you leave the chicken with the grain he will eat it. How can you get all three across safely?

ans:

- Take the chicken over first
- Go back and bring the grain next
- But instead of leaving the chicken with the grain, come back with the chicken
- Leave the chicken on the first side and the fox with you
- Leave it on the other side with the grain
- Finally, go back over and get the chicken and bring it over.

26. A man is travelling with a fox and two chickens, if he leaves the fox alone with the chickens the fox will eat the chickens. He comes to a river and needs to cross it, he finds a small boat that can carry only him and one animal, how does he get himself, the fox and two chickens across the river safety?

ans:

- Take the fox over, return with nothing
- Go over with one chicken, return with the fox.
- Go over with the second chicken, return with nothing
- Finally, take the fox over

27. Three closed boxes have either white marbles, black marbles or both, and they are labeled white, black and both. However, you’re told that each of the labels are wrong. You may reach into one of the boxes and pull out only one marble. Which box should you remove a marble from to determine the contents of all three boxes?

ans:

The one labeled both. Since you kow it’s labeled incorrectly, it must have all black marbels or all white marbles. After you determine what it contains, you can identify the other two boxes by the process of elimination.

28. A glass of water have one ice cube in it. When the ice has completely melted, will the level of the water have increased, decreased or remain unchanged?

ans:

According to the Archimedes principle, the floating substance displaces some liquid, so when the ice melts, there will be no change in the water level as the melted ice will occupy the same volume as it was occupying earlier.

29. How far can a horse run into the forest?

ans:

half way – after which it would be running out! of the forest.

30. A murderer is condemned to death. He has to choose between three rooms. The first is full of raging fires, the second is full of assassins with loaded guns, and the third is full of lions that haven't eaten in 3 years. Which room is safest for him?

ans:

The third room because as the Lions haven't eaten for 3 years, they would have died.

31. Name three consecutive days without using words Wednesday, Friday or Sunday?

ans:

Yesterday, Today & Tomorrow

32. There are six glasses in a row. The first three are full of water, and the next three are empty. By moving only one glass how can you make them alternate between full and empty?

ans:

Pour the water from the 2nd glass into the 5th glass

33. Two children were playing chess and each played five games. Both children won the same number of games yet there were no ties. How is this possible?

ans:

They were not playing against eachother.

34. 44 33 555 555 666 9 666 777 555 3

What is the message in this code?

ans:

HELLO WORLD

If you are using pen and paper, Know, it won't even get you close to the answer. All you need is the basic number and alphabet keypad old mobile. When pressing the digits 44 33 555 555 666 9 666 777 555 3 on an old mobile with the basic number and alphabet keypad, you can check the numbers turn into a text message saying "HELLO WORLD."

You cannot solve this riddle with a QUERTY keypad.

- By pressing the number 4 two times, letter H is acquired
- When 3 is pressed two times we get the letter E, in the same way,
- Pressing the number 5 three times would display L on the screen
- Pressing 6 for 3 will give you a letter O.
- Pressing 9 will give you letter W,

- Pressing 6 for 3 will give you a letter O.
- When 7 is pressed for 3 times you will get the letter 'R'
- Pressing 5 for 3 times will give L
- Pressing 3 will give you the letter 'D'.

Thus, the decrypted answer is HELLO WORLD.

35. What seven-letter word has hundreds of letter in it?
    ans:
    Mailbox

36. Rearrange the letters in the words “new door” to make one word?
    ans:
    One word

37. Two fathers and two sons go fishing together in the same boat. They all catch a fish but the total catch for the day is three fish. How is this possible?
    ans:
    There are three men : A grandfather, a father (the grandfather’s son) and the father’s son

38. 0_2345 and stands 0_23456789 what does this represent?
    ans:
    no one understands

39. On a regular 12-hour digital clock how many times would the same three digits in a row be displayed (e.g. 1:11, 11:12, 12:22) in one day?
    ans:

    34 times. These 17 instances will be visible twice in a 24-hour period.

    1:11
    2:22
    3:33
    4:44
    5:55
    10:00
    11:10
    11:11
    11:12
    11:13
    11:14
    11:15
    11:16
    11:17
    11:18
    11:19
    12:22

40. A man says his dog can jump over his house. No one believes him but he is right. How is that possible?

ans:

The dog can jump over his dog house

41. How can I rearrange the letters to form a word which means 'a single helping' with the latters: rotpoin?

ans:

PORTION

In the English language, the meaning of the word portion is a single helping.

42. An employee works for an employer for 7 days. The employer has a gold rod of 7 units. How does the employer pay to the employee, so that the number of employee's units increases by one at the end of each day. The employer can make at most 2 cuts in the road.

ans:

Employer can pay for seven days by making 2 cuts in a way that he has 3 rods of size 1, 2 and 4.

1st Day: Employer gives 1 unit cut

2nd Day: Takes back 1 unit cut from the employee given on first day and gives 2 unit cut.

3rd Day: Gives 1 unit and then the employer is left with 4 unit rod lengths

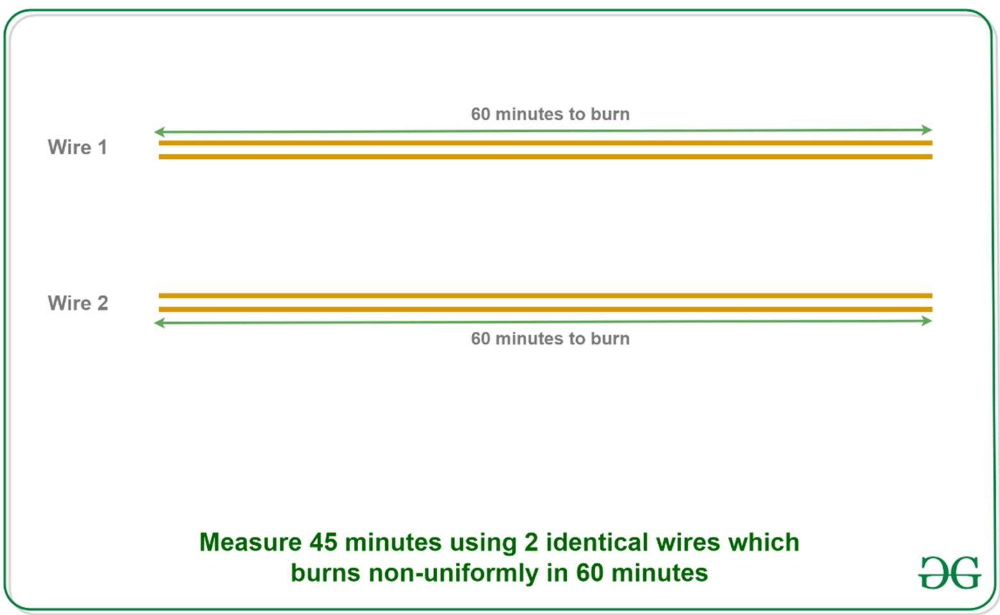
4th Day: Takes back cuts of 1 and 2 units. Gives the cut of 4 units

5th Day: Gives cut of 1 unit

6th Day: Take back cut of 1 unit and gives cut of 2 units

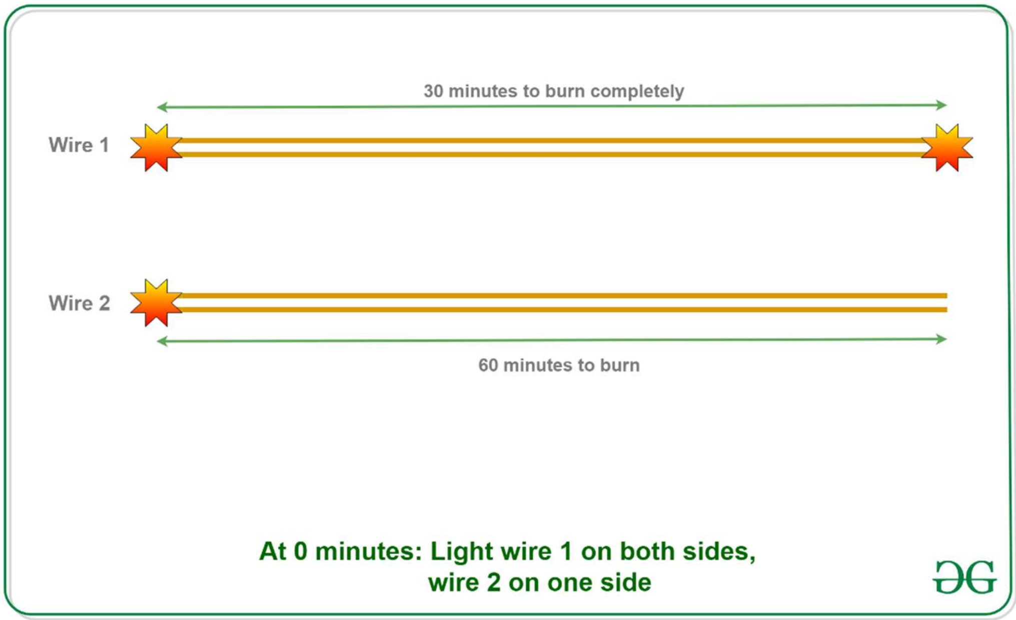
7th Day: Gives cut of 1 unit

43. How do we measure forty-five minutes using two identical wires, each of which takes an hour to burn? We have matchsticks with us. The wires burn non-uniformly. So, for example, the two halves of wire might burn in 10 minutes and 50 minutes respectively.

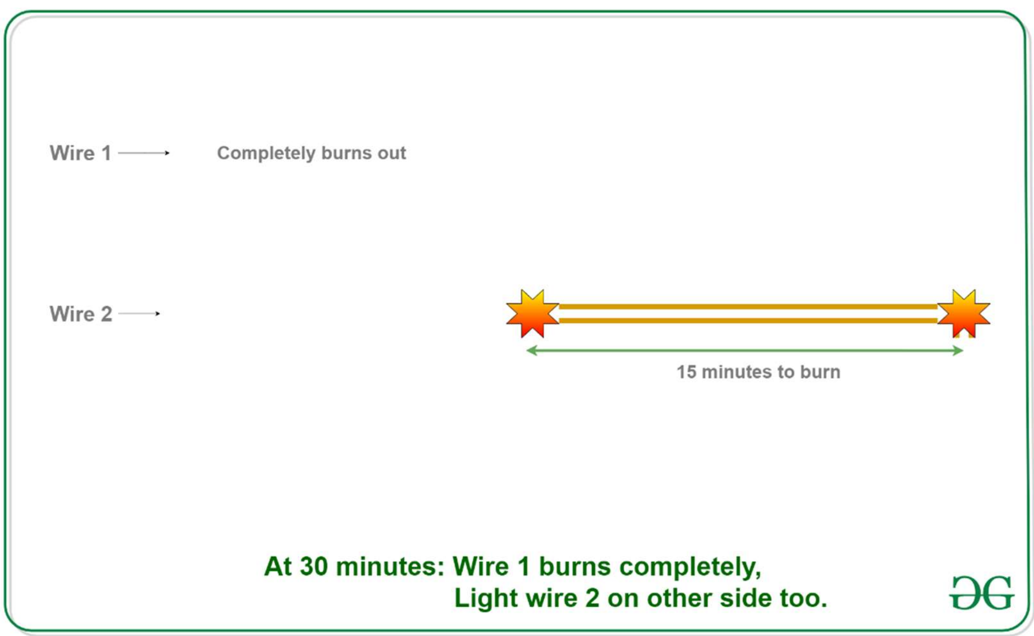


Ans:
If we light a stick it takes 60 minutes to burn completely. What if we light the stick from both sides? It will take exactly half of the time, i.e. 30 minutes to burn completely.

1. **0 minutes** – Light stick 1 on both sides and stick 2 on one side.



2. **30 minutes** – Stick 1 will be burnt out. Light the other end of stick 2.



3. **45 minutes** – Stick 2 will be burnt out. Thus 45 minutes is completely measured.

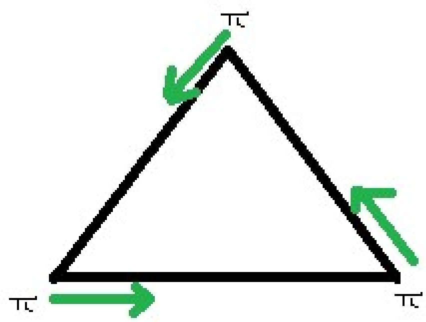
44. There are 3 ants sitting on three corners of a triangle. All ants randomly pick a direction and start moving along edge of the triangle. What is the probability that any two ants collide? Hint: Every ant has two choices (pick either of two edges going through the corner on which ant is initially sitting).

Answer:

Collision doesn't happen only in following two cases

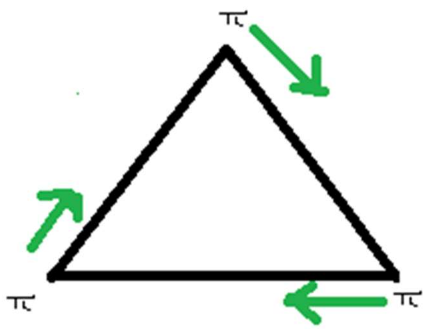
Case 1:

All ants move in counter clockwise direction.



Case 2:

All ants move in clockwise direction.



Since every ant has two choices (pick either of two edges going through the corner on which ant is initially sitting), there are total 2^3 possibilities.

Out of 2^3 possibilities, only 2 don't cause collision. So, the probability of collision is 6/8 and the probability of non-collision is 2/8.

45. Mark a line to make the equation true.

5 + 5 + 5 + 5 = 555

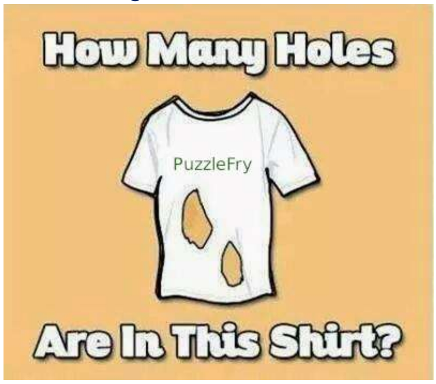
Answer:

Strike a line on the first "+" and make it "4".

This would make it,

545 + 5 + 5 = 555

46. How many holes are in the tshirt?



Answer:

Logically 8 holes, as shown –

47. There are two empty bowls in a room. You have 50 white balls and 50 black balls. After you place the balls in the bowls, a random ball will be picked from a random bowl. Distribute the balls (all of them) into the bowls to maximize the chance of picking a white ball.

Answer: (Maximize probability of White Ball)

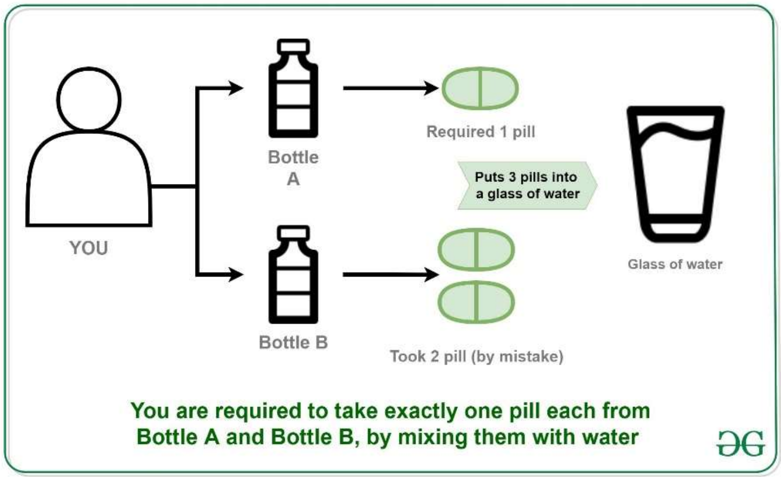
First, let us assume that we divided the balls into jars equally so each jar will contain 50 balls.

So, the probability of selecting a white ball will be = probability of selecting the first jar * probability of white ball in the first jar + probability of selecting the second jar * probability of white ball in the second jar
= (1/2) * (0/50) + (1/2) * (50/50)
= 0.5

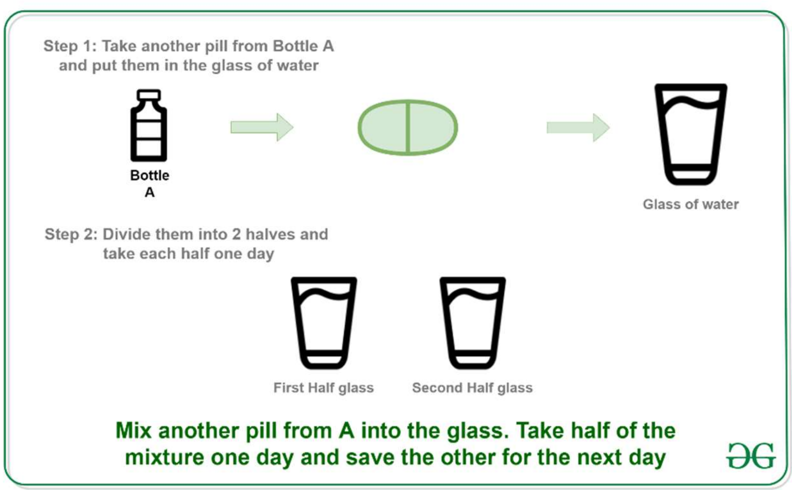
Since we have to maximize the probability so we will increase the probability of white ball in the first jar and keep the second probability same mean equal to 1.
So we add 49 white balls with 50 black balls in the first jar and only one white ball in the second jar.

So the probability will be now = (1/2) * (49/99) + (1/2) * (1/1) = 0.747
Therefore, probability of getting white ball becomes = 1/2 * 1 + 1/2 * 49/99 which is approximately ¾.

48. A man has a medical condition that requires him to take two kinds of pills, call them A and B. The man must take exactly one A pill and exactly one B pill each day. Or he will die. The pills are taken by first dissoving them in water.
The man has a jar of A pills and a jar of B pills. Oneday, as he is about to take his pills, he takes out one A pill from the A jar and puts it in a glass of water. Then he accidentally takes out two B pills from the B ar and puts them in the water. Now, he is in the situation of having a glass of water with three dissolved pills, one A pill and two B pills. Unfortunately, the pills are very expensive, so the thought of throwing out the water with the 3 pills and starting over is out of the question. How should the man proceed in order to get the right quantity of A and B while not wasting any pills?



Answer:
Follow this step-wise approach to help the man take his medicine in a correct way.
Step 1: Add one more A pill to the glass and let it dissolve.



Step 2: Take half of the water today and half tomorrow.
It works under the following assumptions.
- The dissolved pills can be used the next day.
- The man has to take pills at least for one more day.

49. Alok has three daughters. His friend Shyam wants to know the ages of his daughters. Alok gives him first hint.

1) The product of their age is 72.

Shyam says this is not enough information Alok gives him a second hint.

2) The sum of their ages is equal to my house number.

Shyam goes out and look at the house number and tells “I still do not have enough information to determine the ages”.

Alok admits that Shyam can not guess and gives him the third hint.

3) The oldest of the girls likes strawberry ice-cream.

Shyam is able to guess after the third hint. Can you guess what are the ages of three daughters?

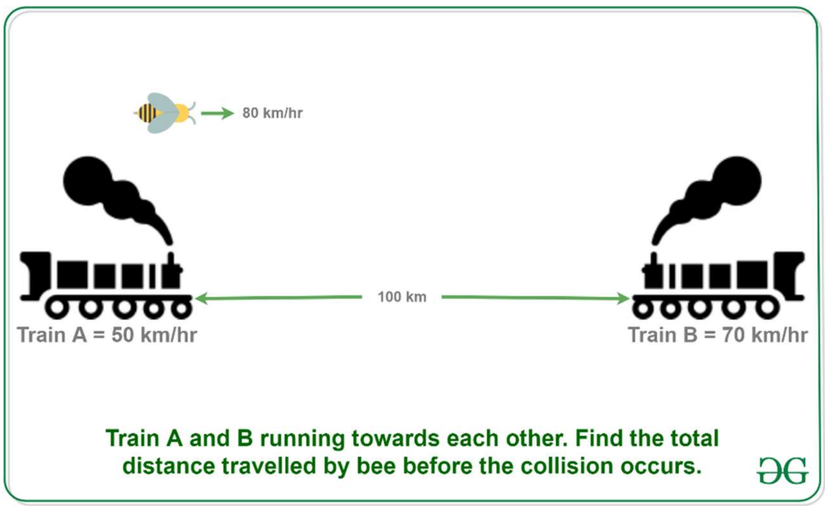
Answer:

Product of ages is 72.
Below are all possibilities to get 72 from product of three different ages:
1 * 1 * 72 = 72
1 * 2 * 36 = 72
1 * 3 * 24 = 72
1 * 4 * 18 = 72
1 * 6 * 12 = 72
1 * 8 * 9 = 72
2 * 2 * 18 = 72
2 * 3 * 12 = 72
2 * 4 * 9 = 72
2 * 6 * 6 = 72
3 * 3 * 8 = 72
3 * 4 * 6 = 72

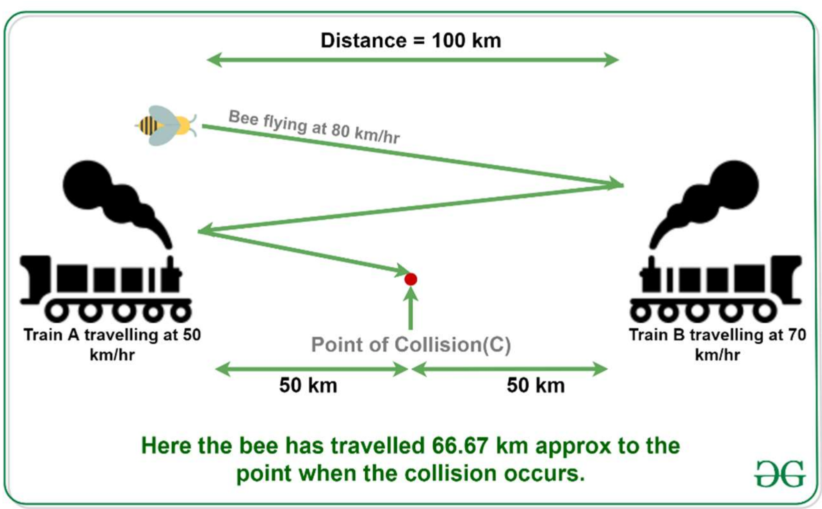
Sum of the ages is given
1 + 1 + 72 = 74
1 + 2 + 36 = 39
1 + 3 + 24 = 28
1 + 4 + 18 = 23
1 + 6 + 12 = 19
1 + 8 + 9 = 18
2 + 2 + 18 = 22
2 + 3 + 12 = 17
2 + 4 + 9 = 15
2 + 6 + 6 = 14
3 + 3 + 8 = 14
3 + 4 + 6 = 13
All sums are unique except 14.
So the age sum must have been 14, otherwise Shyam would have gussed the ages from hint 2 only.

So we have two possible combination to get sum 14.
2 + 6 + 6 = 14
3 + 3 + 8 = 14
From the hint 3: Alok has an oldest girl (not two!). So, the ages must be 3, 3 and 8.

50. Two trains are on same track and they are coming toward each other. The speed of the first train is 50km/h and the speed of the second train is 70 km/h. A bee starts flying between the trains when the distance between two trains is 100 km. The bee first flies from first train to second train. Once it reaches the second train, it immediately flies back to the first train and so on until trains collide. Calculate the total distance travelled by the bee. Speed of bee is 80 km/h.



Answer:



Let the first train A move at u km/h.
Let the second train B move at v km/h.
Let the distance between two trains be d km.
Let the speedof the bee be b km/h.
Therefore, the time taken by trains to collide = d/(u+v)

Now putting all known value to the equation, we get,
u = 50 km/hr
v = 70 km/hr
d = 100 km
b = 80 km/hr

Therefore, the total distance travelled by bee
= b * d / (u + v)
= 80 * 100 / (50 + 70)
= 66.67 km (approx.)

51. In a Medical Laboratory, you have 240 injections, one of which is for Anesthesia for a rat. After injecting, one rat fainted exactly in 24 hours. You have 5 rats whom you are willing to sacrifice in order to determine which injections contains the Anesthesia. How do you achieve this in 48 hours?

Answer:

Let us number the Injections with 5 digit numbers consisting of 0, 1 and 2. Let us number the Rats as 1, 10, 100, 1000, 10000.

Number 0 on a Injections represents the Anesthesia will not be inject to rat.
Number 1 on a Injections represents the Anesthesia will be injected to rat on 1st day.
Number 2 on a Injections represents the Anesthesia will be injected to rat on 2nd day (after 24 hours).

The action corresponding to the digit in the unit place will be executed by rat numbered 1.
The action corresponding to the digit in the tenth place will be executed by rat numbered 10.
The action corresponding to the digit in the 100th place will be executed by rat numbered 100.
The action corresponding to the digit in the 1000th place will be executed by rat numbered 1000.
The action corresponding to the digit in the 10000th place will be executed by rat numbered 10000.

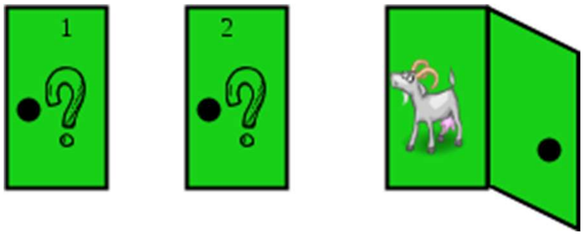
Example: Let us say the Injection is numbered 11201. The Injections is injected on the first day to rat numbered 10000, 1000 and 1. It is injected on the second day to rat numbered 100. And it is not injected to rat numbered 10.

So if the rat numbered 10000, 1000 and 1 faints within first 24 hours, rat numbered 100 does not faint, then the Anesthesia Injection has to be 11201.

This way total number possible is,
= 3 * 3 * 3 * 3 * 3 = 3^5 = 243 Injections

So with the help of 5 rats and within 48 hours we will be able to find a Anesthesia Injection among 243 Injections.

52. Suppose you're on a game show, and you're given the choice of three doors: Behind one door is a car; behind the others, goats. You pick a door, say No. 1, and the host, who knows what's behind the doors, opens another door, say No. 3, which has a goat. He then says to you, "Do you want to pick door No. 2"? Is it to your advantage to switch your choice?

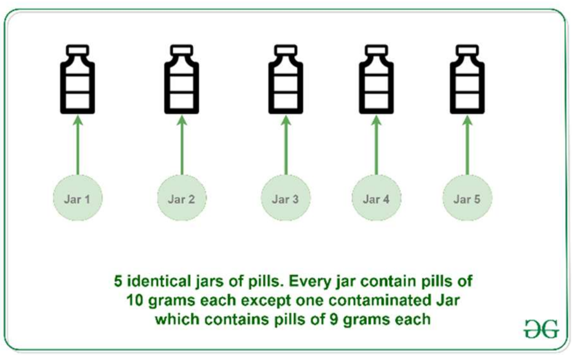


Answer:

If you switch, you get the car with probability 2/3. So switching is always a good choice.

53. (Find the Jar with contaminated pills)

You have 5 jars of pills. Each pill weighs 10 grams, except for contaminated pills contained in one jar, where each pill weighs 9 grams. Given a scale, how could you tell which jar had the contaminated pills in just one measurement?



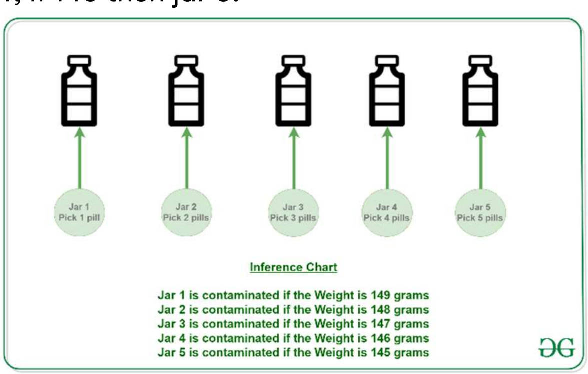
Answer:

To find the contaminated Jar, follow this step-wise approach.

Step 1: Take out 1 pill from jar 1, 2 pills from jar 2, 3 pills from jar 3, 4 pills from jar 4 and 5 pills from jar 5.

Step 2: Put all these 15 pills on the scale. The correct weight is 150 (15 * 10). But one of the jrs has contaminated pills. So the weight will definitely be less than 150.

Step 3: If the wieght is 149 then jar 1 has contaminated pills because there is only one contaminated pill. If the wight is 148 then jar 2, if the weight is 147 then jar 3, if 146 then jar 4, if 145 then jar 5.



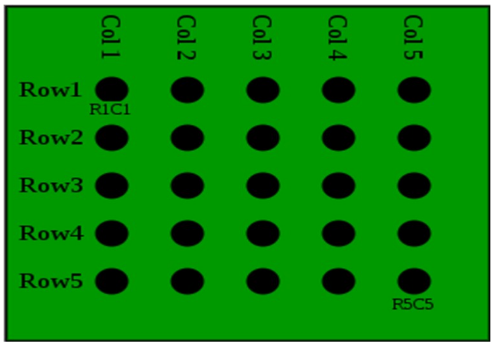
54. (Find the fastest 3 horses)

There are 25 horses among which you need to find out the fastest 3 horses. You can conduct race among at most 5 to find out their relative speed. At no point you can find out the actual speed of the horse in a race. Find out how many races are required to get the top 3 horses.

Answer:

The solution is 7.

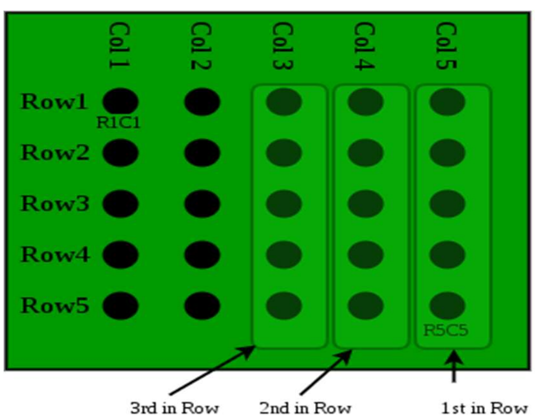
First, we group the horses into groups of 5 and race each group in the race course. This gives us 5 races.



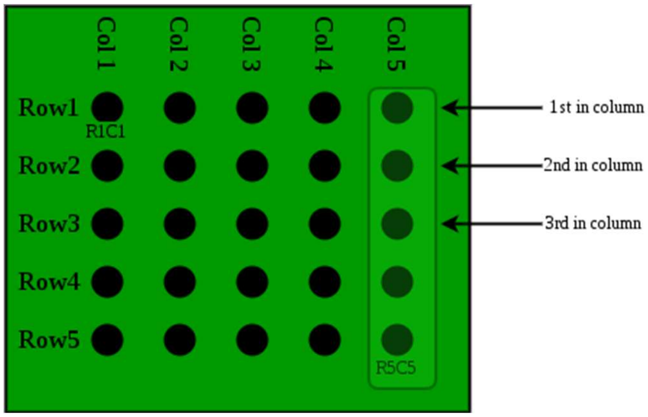
In the image, each row represents one race of 5 horses. For convenienc, let us name the horses using row and column index. Therefore, the first race (row 1) was contested between the horses R1C1, R2C2, R1C3, R1C4 and R1C5.

The second race (row 2) was contested between the horses R2C1, R2C2 and so on.

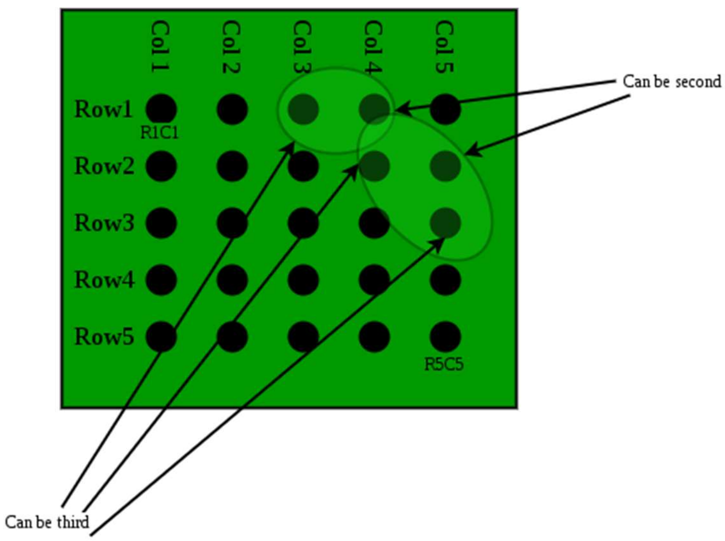
Let us assume that the fifth member of each row own the race (R1C5 won the first race, R2C5 won the second race and so on), the fourth member of each row came second (R1C4 came second in the first race, R2C4 came second in the second race and so on) and the third member of each group came third (R1C3 came third in the first race, R2C3 came third in the second race and so on).



Next we race the 5 level 1 winners (R1C5, R2C5, R3C5, R4C5 and R5C5). Let’s say R1C5 wins this race, R2C5 comes second and R3C5 comes third.



The winner of this race (R1C5) is the fastest horse of the entire group. Now, the horse which is second in the entire group can either be R2C5 or R1C4. The horse which is third in the entire group can either be R3C5, R2C4 or R1C3. Therefore, we race these 5 horses.



Therefore, the horse R1C5 is the fatsest horse. The horses which come second and third in the last race are the horses which are second and third in the entire group respectively. In this way, the minimum number of races required to determine the first, second and third horses in the entire group is 7.

55. (1000 Coins and 10 Bags)

A dealer has 1000 coins and 10 bags. He has to divide the coins over the ten bags so that he can make any number of coins simply by handing over a few bags. How must divide his money into the ten bags?

Answer:

We can fill coins in the 10 bags inincreasing order of 2^n where n varies from 0…8, filling the last bag with all remaining coins as follows:

$1 = 2^0 = 1$
$2 = 2^1 = 2$
$3 = 2^2 = 4$
$4 = 2^3 = 8$
$5 = 2^4 = 16$
$6 = 2^5 = 32$
$7 = 2^6 = 64$
$8 = 2^7 = 128$
$9 = 2^8 = 256$
10 = remaining coins = 489

Now, the dealer can make any number of coins just by handing over the bags.
As,
Number of coins needed = some bag 1 + some bag 2 + ….. + some bag n
Example:
519 coins = bag 2 + bag 4 + bag 8 + bag 16 + bag 489

56. (100 Prisoners with Red/Black Hats)

100 prisoners in jail are standing in a queue facing in one direction. Each prisoner is wearing a hat of color either black or red. A prisoner can see hats of all prisoners in front of him in the queue, but cannot see his hat and hats of prisoners standing behind him. The jailer is going to ask color of each prisoner's hat starting from the last prisoner in queue. If a prisoner tells the correct color, then is saved, otherwise executed. How many prisoners can be saved at most if they are allowed to discuss a strategy before the jailer starts asking color of their hats.

Answer:

At most 99 prisoners can be saved and the 100^{th} prisoner has 50-50 chances of being executed.

The idea is that every prisoner counts number of red hats in front of him.

100^{th} prisoner says red if the number of red hats is even. He may or may not be saved, but he conveys enough information to save 99^{th} prisoner.
The 99^{th} prisoner decides his answer on the basis of answer of 100^{th} prisoner's answer. There are following possibilities and 99^{th} prisoner can figure out of his hat in every case.

If 100^{th} prisoner said 'Red' (There must have been even number of red hats in front of him).

- If 99^{th} prisoner sees even number of red hats in front of him, then his color is black.
- If 99^{th} prisoner sees odd number of red hats in front of him, then his color is red.

If 100th prisoner said 'Black' (There must have been odd number of red hats in front of him).

- If 99th prisoner sees even number of red hats in front of him, then his color is Red.
- If 99th prisoner sees odd number of red hats in front of him, then his color is Black.

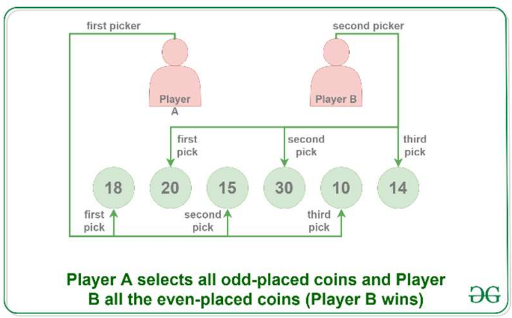
The 98th prisoner decides his answer on the basis of answer of 99th prisoner's answer ans uses the same logic.

Similarly other prisoners from 97 to 1 are saved.

57. (Strategy for a 2 Player Coin Game)

Consider a two-player coin game where each Player A and Player B gets the turn one by one. There is a row of even number of coins, and a player on his/her turn can pick a coin from any of the two corners of the row. The player that collects coins with more value wins the game. Develop a strategy for the player making the first turn i.e, Player A, such that he/she never loses the game.

Note that the strategy to pick a maximum of two corners may not work. In the following example, the first player, Player A loses the game when he/she uses a strategy to pick a maximum of two corners.



Example:

```
Initial row:  18 20 15 30 10 14

Player A picks 18, now row of coins is


After first pick:  20 15 30 10 14

Player B picks 20, now row of coins is


After second pick:  15 30 10 14

Player A picks 15, now row of coins is


After third pick:  30 10 14

Player B picks 30, now row of coins is


After 4th pick:  10 14
```

```
Player A picks 14, now row of coins is


Last pick:  10

Player B picks 10, game over.


The total value collected by Player B is more (20 +

30 + 10) compared to first player (18 + 15 + 14).

So, the second picker, Player B wins.
```

Solution:

The idea is to count the sum of values of all even coins and odd coins, compare the two values. The player that makes the first move can always make sure that the other player is never able to choose an even coin if the sum of even coins is higher.

Similarly, he/she can make sure that the other player is never able to choose an odd coin if the sum of odd coins is higher.

So, here are the steps to a proper algorithm of either winning the game or getting a tie:

Step 1: Count the sum of all the coins in the even places (2^{nd}, 4^{th}, 6^{th} and so on).

Let the sum be "EVEN".

Step 2: Count the sum of all the coins in the odd places (1^{st}, 3^{rd}, 5^{th} and so on).

Let the sum be "ODD".

Step 3: Compare the value of EVEN and ODD and this is how the first player, here Player A must begin its selection.

- If (EVEN > ODD), start choosing from the right-hand corner and select all the even placed coins.
- If (EVEN < ODD), start choosing from the left-hand corner and select all the odd placed coins.
- If (EVEN == ODD), choosing only the odd-placed or only the even placed coins will throw a tie.

Example: Suppose you are given the following rows of coins:

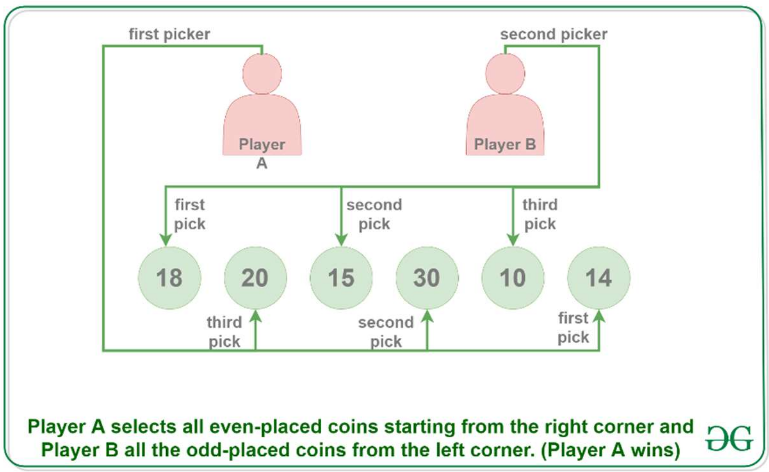
```
18 20 15 30 10 14
```

Coins at even places: *20, 30, 14*
Coins at odd places: *18, 15, 10*
These places are fixed independent of whether the choice of selection must begin from the left or the right-hand side.
Step 1: Sum of all even placed coins = 20 + 30 + 14 = 64
Step 2: Sum of all odd placed coins = 18 + 15 + 10 = 43
Step 3: Comparing the even and the odd placed coins where EVEN > ODD

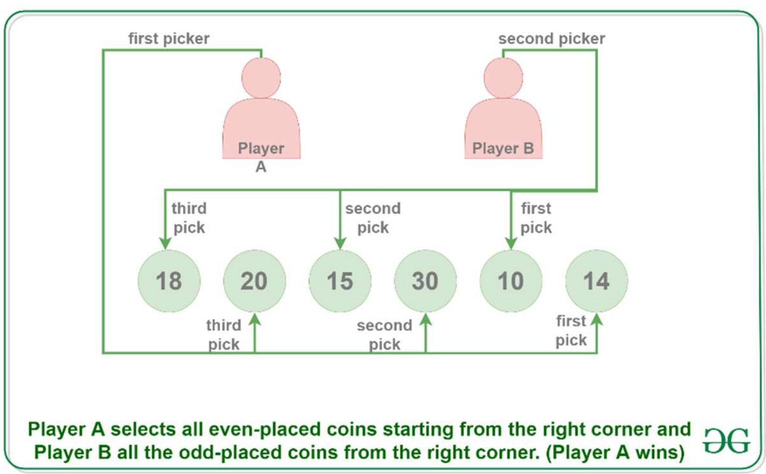
Therefore, Player A must start selecting from the right-hand side and choose all the even-placed coins every time (here they are 14, 30 and 20). So, first picker, Player A picks 14. Now, irrespective of whether the second Player B starts selecting from the left-hand side i.e., 18 or from the right-hand side i.e., 20, the even placed coins i.e., 14, 30 and 20 are booked for the Player A. Therefore, be any situation arise, the first picker Player A will always win the game.

Here are the illustrations to both the cases of pick by Player B:

Case 1: When Player B starts picking from the left corner.



Case 2: When Player B starts picking from the right corner after Player A.



58. (Camel and Banana puzzle)

A person has 3000 bananas and a camel. The person wants to transport the maximum number of bananas to a destination which is 1000 KMs away, using only the camel as a mode of transportation. The camel cannot carry more than 1000 bananas at a time and eats a banana every km it travels. What is the maximum number of bananas that can be transferred to the destination using only camel (no other mode of transportation is allowed).

Solution:

Let's see what we can infer from the question:

- We have a total of 3000 bananas.
- The destination is 1000KMs
- Only 1 mode of transport.
- Camel can carry a maximum of 1000 banana at a time.
- Camel eats a banana every km it travels.

With all these points, we can say that person won't we able to transfer any banana to the destination as the camel is going to eat all the banana on its way to the destination.

But the trick here is to have intermediate drop points, then, the camel can make several short trips in between.

Also, we try to maintain the number of bananas at each point to be multiple of 1000.

Let's have 2 drop points in between the source and destination.

With 3000 bananas at the source. 2000 at a first intermediate point and 1000 at 2nd intermediate point.

```
Source—————IP1——————IP2————————-Destination
3000      x km       2000    y km         1000        z km
———————> |   —————> | ————————>

<———————-   |   <————— |

———————->   |   —————> |

<———————     |                    |



———————->    |                    |
```

- To go from source to IP1 point camel has to take a total of 5 trips 3 forward and 2 backward. Since we have 3000 bananas to transport.
- The same way from IP1 to IP2 camel has to take a total of 3 trips, 2 forward and 1 backward. Since we have 2000 bananas to transport.
- At last from IP2 to a destination only 1 forward move.

Let's see the total number of bananas consumed at every point.

- From the **source to IP1** its 5x bananas, as the distance between the source and IP1 is x km and the camel had 5 trips.

- From **IP1 to IP2** its 3y bananas, as the distance between IP1 and IP2 is y km and the camel had 3 trips.
- From **IP2 to destination** its z bananas.

We now try to calculate the distance between the points:

1. **3000 – 5x = 2000** so we get **x = 200**
2. **2000-3y = 1000** so we get **y = 333.33** but here the distance is also the number of bananas and it cannot be fraction so we take y =333 and at **IP2** we have the number of bananas equal **1001,** so its **2000-3y = 1001**
3. **So** the remaining distance to the market is **1000 -x-y =z** i.e **1000-200-333 => z =467.**

So from **IP2 to the destination** point camel eats **467 bananas.** The remaining **bananas are 533.**

So the **maximum number of bananas that can be transferred is 533.**

59. (100 Doors)

There are 100 doors in a row, all doors are initially closed. A person walks through all doors multiple times and toggle (if open then close, if close then open) them in following way:

In first walk, the person toggles every door

In second walk, the person toggles every second door, i.e., 2^{nd}, 4^{th}, 6^{th}, 8^{th}, …
In third walk, the person toggles every third door, i.e. 3^{rd}, 6^{th}, 9^{th}, …
………
……….

In 100^{th} walk, the person toggles 100^{th} door.
Which doors are open in the end?
Solution:
A door is toggled in i^{th} walk if i divides door number. For example the door number 45 is toggled in 1^{st}, 3^{rd}, 5^{th}, 9^{th} ,15^{th} and 45^{th} walk.
The door is switched back to an initial stage for every pair of divisors. For example, 45 is toggled 6 times for 3 pairs (5, 9), (15, 3) and (1, 45).
It looks like all doors would become closes at the end. But there are door numbers which would become open, for example, 16, the pair (4, 4) means only one walk. Similarly all other perfect squares like 4, 9, ….
So the answer is 1, 4, 9, 16, 25, 36, 49, 64, 81 and 100.

60. (Ratio of Boys and Girls in a country where people want only boys)

In a country, all families want a boy. They keep having babies till a boy is born. What is the expected ratio of boys and girls in the country?

Solution:
Assumptions: Probability of having a boy or girl is same. Also, the probability of next kid being a boy doesn't depend on history.

The problem can be solved by counting expected number of girls before a baby boy is born.

Let **NG** be the expected no. of girls before a boy is born

Let p be the probability that a child is girl and (1-p)
be probability that a child is boy.

NG can be written as sum of following infinite series.

NG = 0*(1-p) + 1*p*(1-p) + 2*p*p*(1-p) + 3*p*p*p*(1-p) + 4*p*p*p*p*(1-p) +.....

Putting p = 1/2 and (1-p) = 1/2 in above formula.

NG = $0*(1/2) + 1*(1/2)^2 + 2*(1/2)^3 + 3*(1/2)^4 + 4*(1/2)^5 + \ldots$
1/2*NG = $0*(1/2)^2 + 1*(1/2)^3 + 2*(1/2)^4 + 3*(1/2)^5 + 4*(1/2)^6 + \ldots$

NG - NG/2 = $1*(1/2)^2 + 1*(1/2)^3 + 1*(1/2)^4 + 1*(1/2)^5 + 1*(1/2)^6 + \ldots$

Using sum formula of infinite geometrical progression with
ratio less than 1
NG/2 = (1/4)/(1-1/2) = 1/2

NG = 1

So Expected Number of number of girls = 1

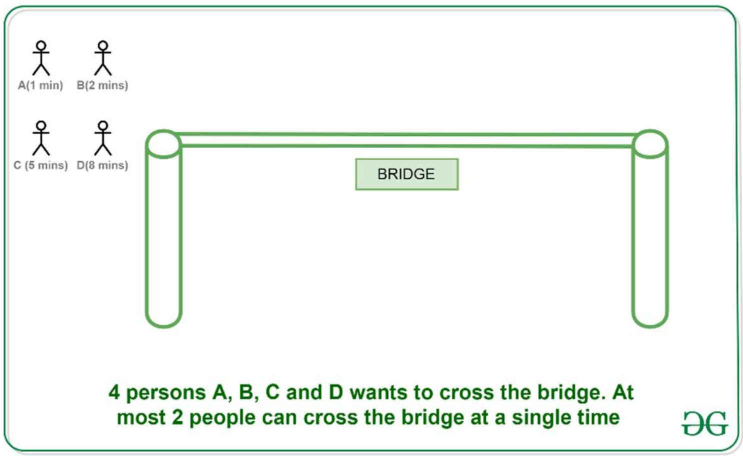
Since the expected number of girls is 1 and there is always a baby boy, the expected ratio of boys and girls is 50:50.

61. (Torch and Bridge)

There are 4 persons (A, B, C and D) who want to cross a bridge in night.

1. A take 1 minute to cross the bridge.
2. B takes 2 minutes to cross the bridge.
3. C takes 5 minutes to cross the bridge.
4. D takes 8 minutes to cross the bridge.

There is only one torch with them and the bridge cannot be crossed without the torch. There cannot be more than two persons on the bridge at any time, and when two people cross the bridge together, they must move at the slower person's pace.

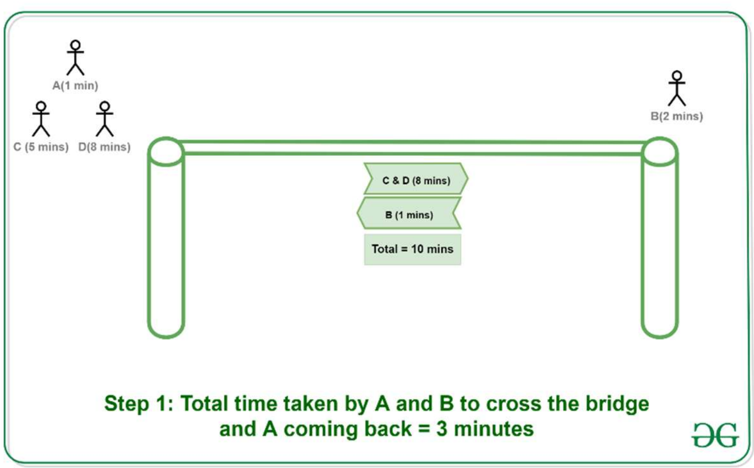


Can they all cross the bridge in 15 minutes?

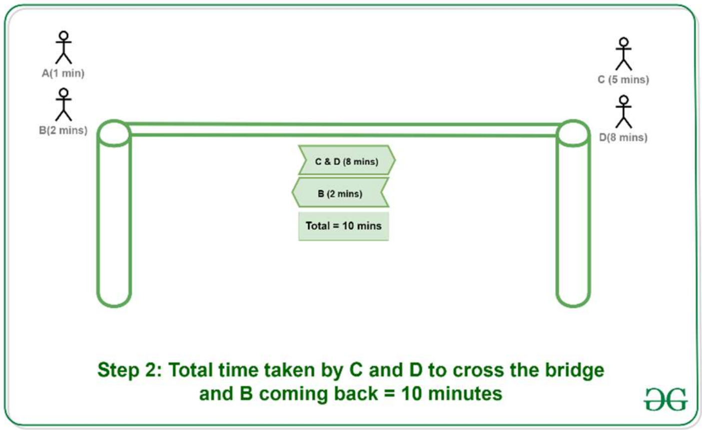
<u>Solution:</u>

They must cross the bridge in the following way:

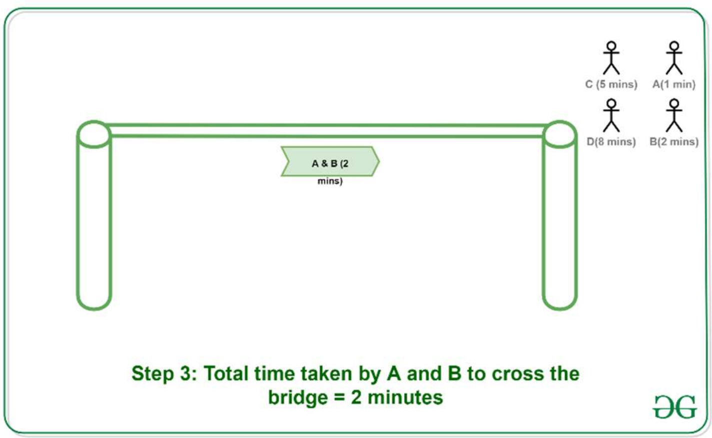
Step 1: A and B cross the bridge. A comes back. Time taken 3 minutes. Now B is on the other side.



Step 2: C and D cross the bridge. B comes back. Time taken 8 + 2 = 10 minutes. Now C and D are on the other side.



Step 3: A and B cross the bridge. Time taken is 2 minutes. All are on the other side.



Total time spent: 3 + 10 + 2 = 15 minutes

62. (Poison and Rat)

There are 1000 wine bottles. One of the bottles contains poisoned wine. A rat dies after one hour of drinking the poisoned wine. How many minimum rats are needed to figure out which bottle contains poison in hour?

Solution:
We need to figure out in hour. We need 10 rats to figure out the poisoned bottle. The result is based on binary number system. We get 10 using [$Log_2 1000$].

The idea is to number bottles from 1 to 1000 and write their corresponding binary numbers on the bottle. Each rat is assigned a position in the binary numbers written on bottles. Let us take an example. Rat 1 represents first bit in every bottle, rat 2 represents second bit and so on. If rat numbers 5, 7 and 9 die, then bottle number 42 (Binary 0000101010) is poisoned.

63. (Pirates and 100 Gold Coins)

There are 5 pirates, they must decide how to distribute 100 gold coins among them. The pirates have seniority levels, the senior-most is A, then B, then C, then D, and finally the junior-most is E.

Rules of distribution are:

1. The most senior pirate proposes a distribution of coins.
2. All pirates vote on whether to accept the distribution.
3. The distribution is approved if at least half of the pirates agree (including the proposer)
4. If the distribution is accepted, the coins are disbursed and the game ends.
5. If not, the proposer is thrown and dies, and the next most senior pirate makes a new proposal to begin the system again.
6. In case of a tie vote, the proposer can have the casting vote

Rules every pirate follows.

1. Every pirate wants to survive
2. Given survival, each pirate wants to maximize the number of gold coins he receives.

What is the maximum number of coins that pirate A might get?

Answer:

The answer is 98 which is not intuitive.

A uses the facts below to get 98.

1. Consider the situation when A, B, and C die, only D and E are left. E knows that he will not get anything (D is senior and will make a distribution of **(100, 0)**. So E would be fine with anything greater than 0.
2. Consider the situation when A and B die, C, D, and E are left. D knows that he will not get anything (C will make a distribution of **(99, 0, 1)**and E will vote in favor of C).
3. Consider the situation when A dies. B, C, D, and E are left. To survive, B only needs to give 1 coin to D. So distribution is **(99, 0, 1, 0)**
4. Similarly, A knows about point 3, so he just needs to give 1 coin to C and 1 coin to E to get them in favor. So distribution is **(98, 0, 1, 0, 1)**.

64. (Maximum Chocolates)

You have 15 Rs with you. You go to a shop and shopkeeper tells you price as 1 Rs per chocolate. He also tells you that you can get a chocolate in return of 3 wrappers. How many maximum chocolates you can eat?

Answer: 22

Buy and eat **15** chocolates

Return 15 wrappers and get **5** more chocolates.

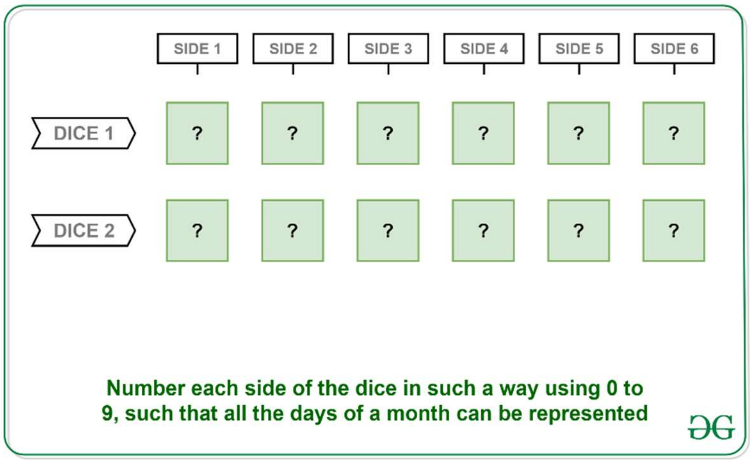
Return 3 wrappers, get **1** chocolate and eat it (keep 2 wrappers)

Now we have 3 wrappers. Return 3 and get **1** more chocolate.

So total chocolates = 15 + 5 + 1 + 1

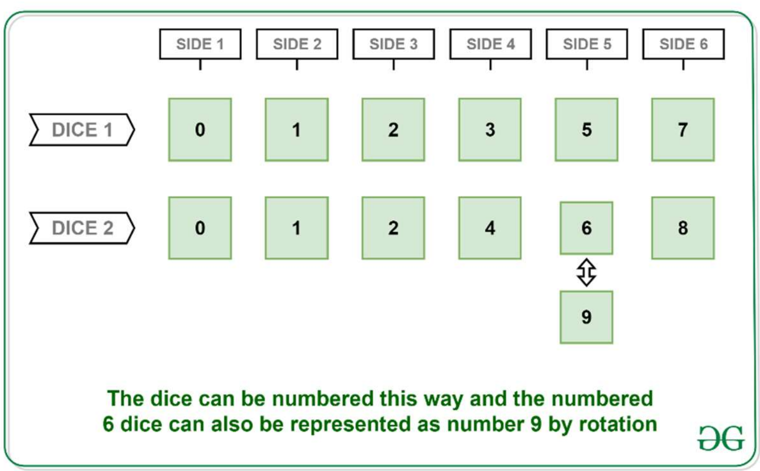
65. (Days of month using 2 dice)

How can you represent days of month using two 6-sided dice? You can write one number on each face of the dice from 0 to 9 and you have to represent days from 1 to 31, for example for 1, one dice should show 0 and another should show 1, similarly for 29 one dice should show 2 and another should show 9.

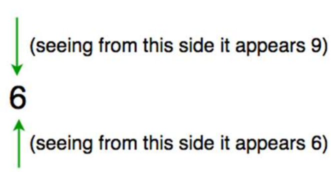


<u>Answer</u>:
Dice 1: 0 1 2 3 5 7
Dice 2: 0 1 2 4 6 8

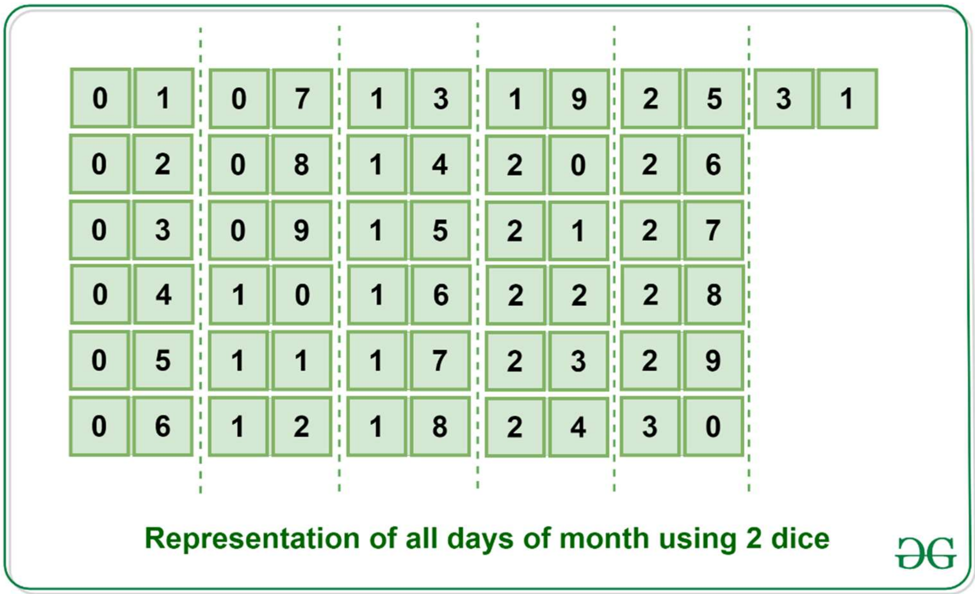
<u>Explanation</u>



You have to show 11, 22 so 1 and 2 should be present in both dices, similarly to show 01, 09. 0 should be present in both dices, now the trick is for showing 9 you can use dice with 6 printed on one of the faces.



Here is the overall representation of all the days in 2 dice:



Representation of all days of month using 2 dice

66. (10 coins puzzle)

You are blindfolded and 10 coins are place in front of you on table. You are allowed to touch the coins, but can't tell which way up they are by feel. You are told that there are 5 coins head up, and 5 coins tails up but not which ones are which.

Can you make two piles of coins each with the same number of heads up? You can flip the coins any number of times.

ANSWER: Yes

Explanation:
Make 2 piles with equal number of coins. Now, flip all the coins in one of the pile.

Let's consider a simple case:

P1 : H T T T T
P2 : H H H H T
By filping **P1**
P1 : T H H H H
P2 : H H H H T
P1(heads) = **P2**(heads)

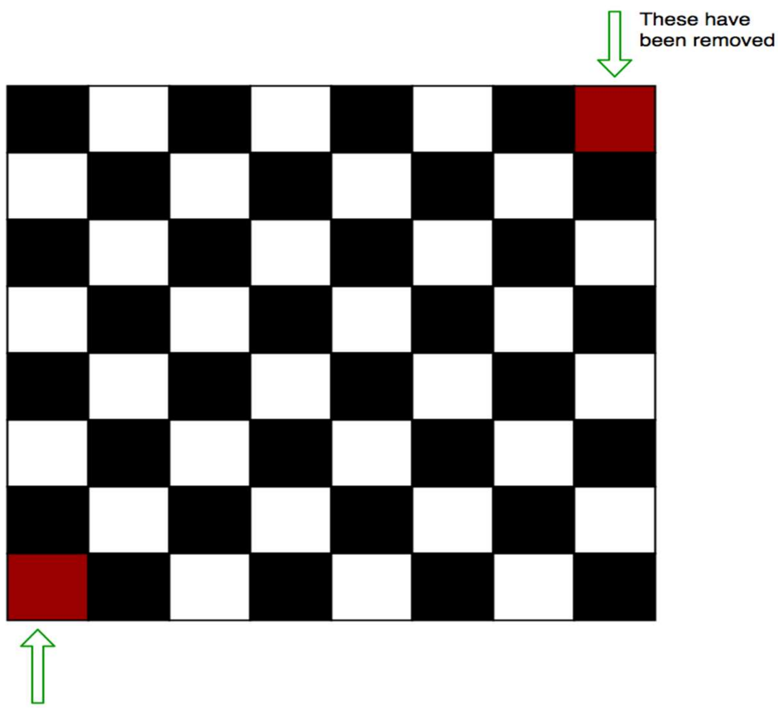
67. (Chessboard and dominos)

There is an 8 by 8 chessboard in which two diagonally opposite corners have been cut off. You are given 31 dominos, and a single domino can cover exactly two squares. Can you use the 31 dominos to cover the entire board?

Answer:
No

Explanation:
At first it seems that there were 8*8 = 64 squares
then 2 have been cut off so Squares remaining= 64-2 = 62
And there are 31 dominos, so they will cover the remaining chessboard coz = 31*2 = 62
But this is not the answer:

Let's visualize it:



Each domino we set on the chessboard will always take **1 Black** and **1 White** square. Therefore, **31 dominos** will take **31 white** square and 31 black squares exactly. On this chessboard however, we must have **32 black** and **30 white** squares. Hence it is not possible to do so.

68. (Know average salary without disclosing individual salaries)

Three Employees want to know the average of their salaries. They are not allowed to share their individual salaries.

Answer:
1) X adds a Random Number and his salary and tells the sum to Y.

2) Y also adds a Random Number and his salary to the sum told by X and tells new sum to Z.

3) Z also adds a Random Number and his salary to the sum told by Y and tells new sum to X.

4) X subtracts its random number from the sum told by Z and tells the new number to Y.

5) Y subtracts its random number from the sum told by X and tells the new number to Z.

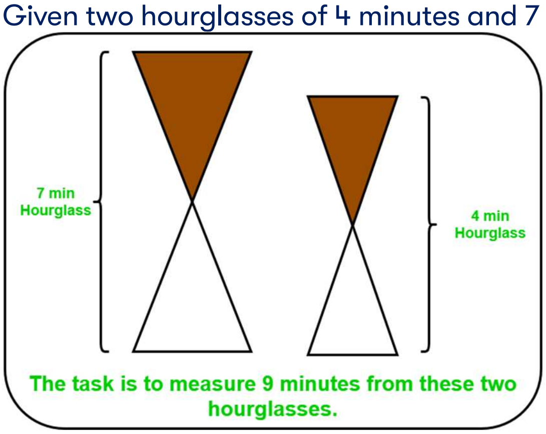
6) Z subtracts its random number from the sum told by Y and announces the new number.

The new number is now the sum of three salaries and average can be calculated by dividing the sum by 3.

Finally, nobody knows the salary of others, but all know average.

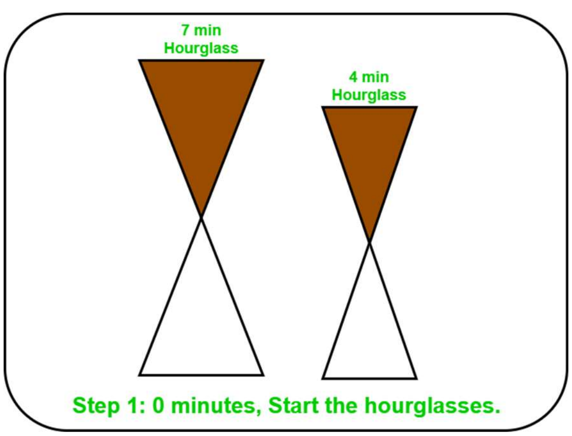
This can be extended to more than 3 employees also.

69. (Hourglasses Puzzle)
Given two hourglasses of 4 minutes and 7 minutes, the task is to measure 9 minutes.

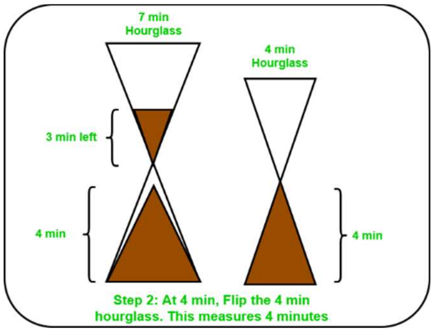


Solution:

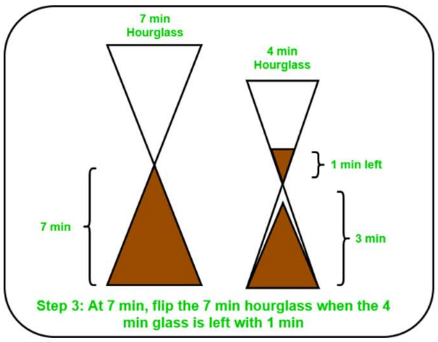
- **At 0 minutes:** Start both hourglasses at the same time.



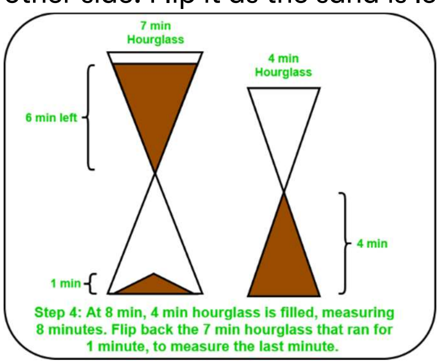
- **At 4 minutes:** 4 minutes hourglasses run out and flip it. 7 minutes hourglass is left with 3 minutes.



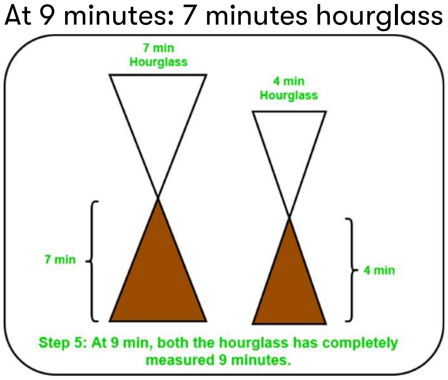
- **At 7 minutes:** 4 minutes hourglass is left with 1 minute. 7 minutes hourglass runs out and flip it.



- **At 8 minutes:** 4 minutes hourglass runs out and 7 is filled with 6 minutes and 1 minute on the other side. Flip it as the sand is left with 1 minute.

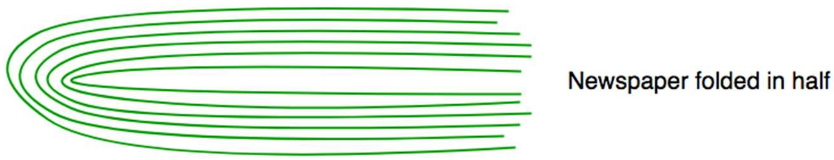


- At 9 minutes: 7 minutes hourglass becomes empty from above side.



70. (Newspaper Puzzle)

A newspaper made of 16 large sheets of paper folded in half. The newspaper has 64 pages altogether. The first sheet contains pages 1, 2, 63, 64.



If we pick up a sheet containing page number 45. What are the other pages that this sheet contains?

Answer:

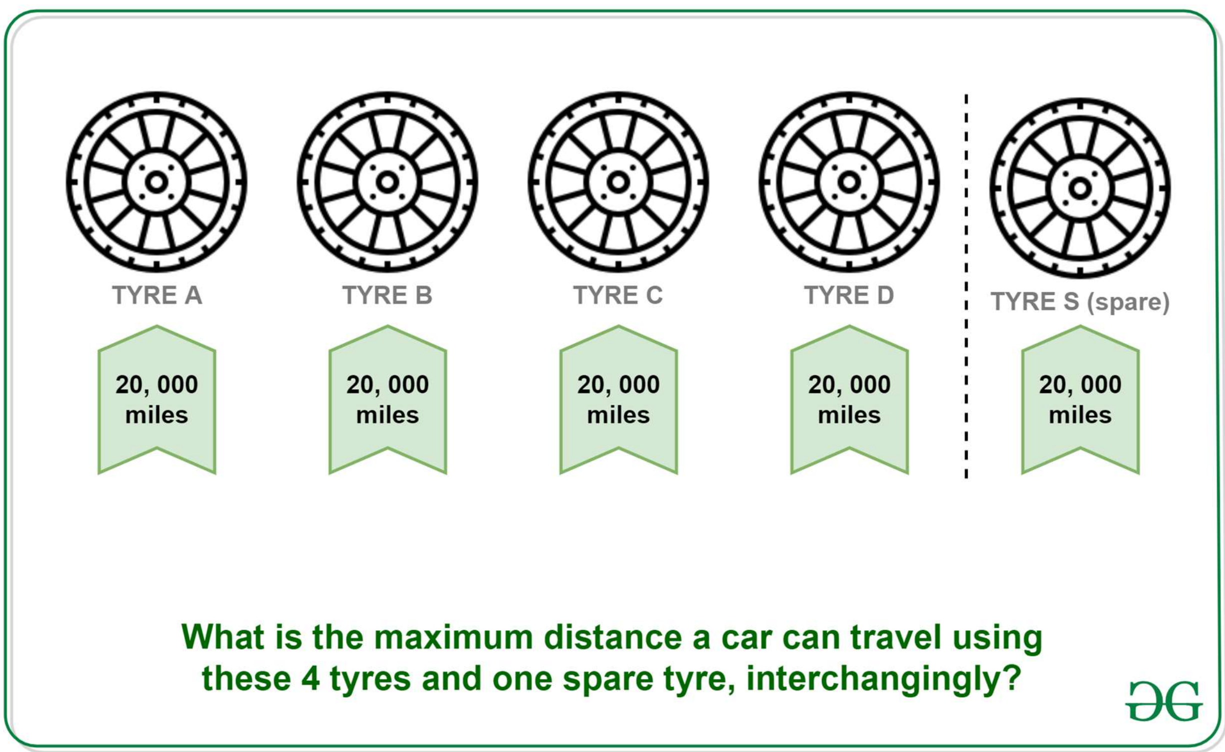
On the back of 45, it is 46. The pages are such that for each page p, 65-p will be also on the same page.

Then,
65-45 = 20
65-46 = 19

So, the four pages in this sheet are 19, 20, 45, 46.

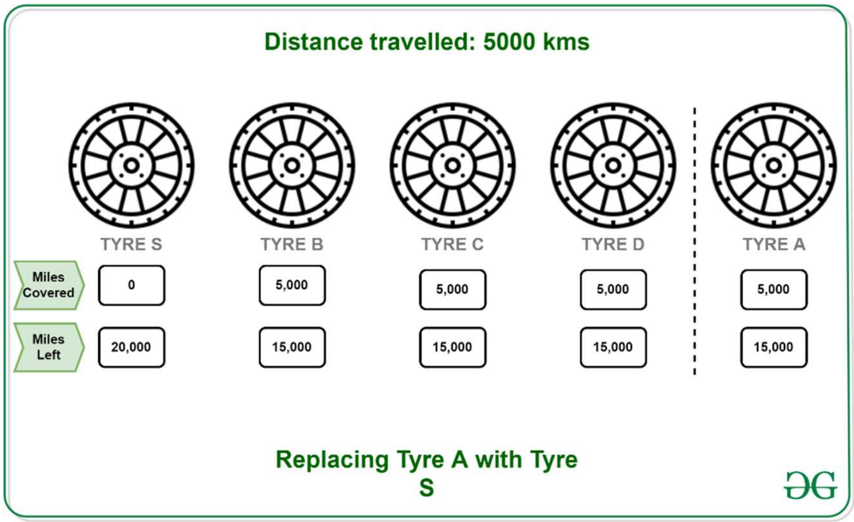
71. (car wheel puzzle)

A car has 4 tyres and 1 spare tyre. Each tyre can travel a maximum distance of 20000 miles before wearing off. What is the maximum distance the car can travel before you are forced to buy a new tyre? You are allowed to change tyres (using the spare tyre) an unlimited number of times.

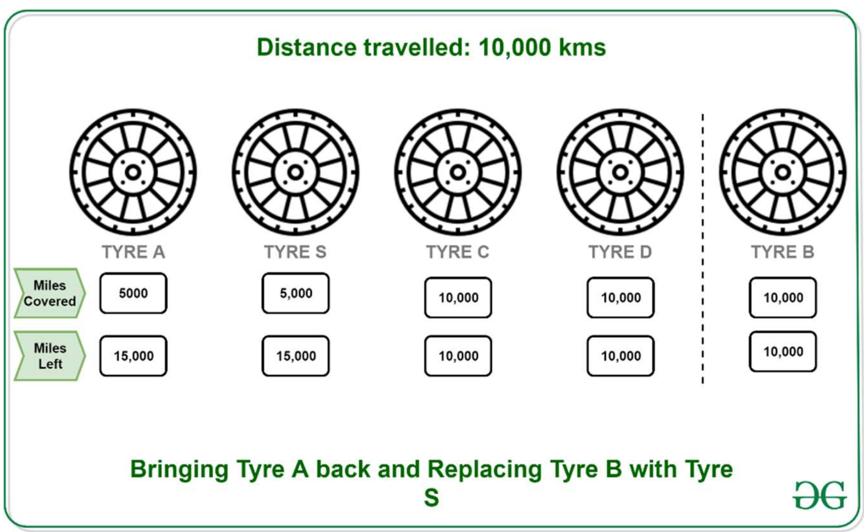


Answer: 25000 kms
Solution: Divide the lifetime of the spare tire into 4 equal part i.e., 5000 and swap it at each completion of 5000 miles distance.
Let four tyres be named as A, B, C and D and spare tyre be S.

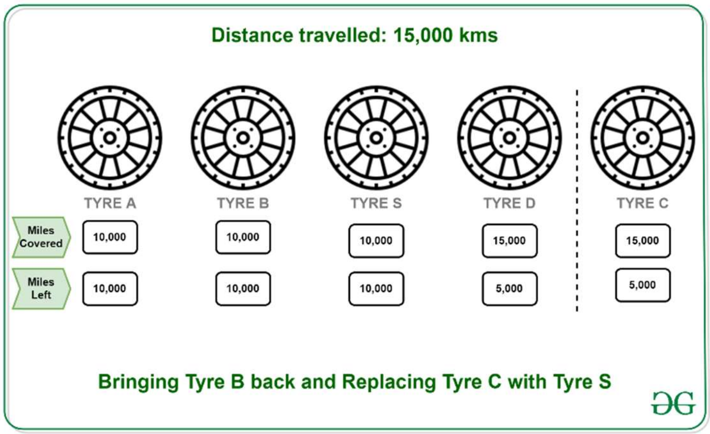
- **5000 KMs:** Replace A with S. Remaining distances (A, B, C, D, S) : 15000, 15000, 15000, 15000, 20000.



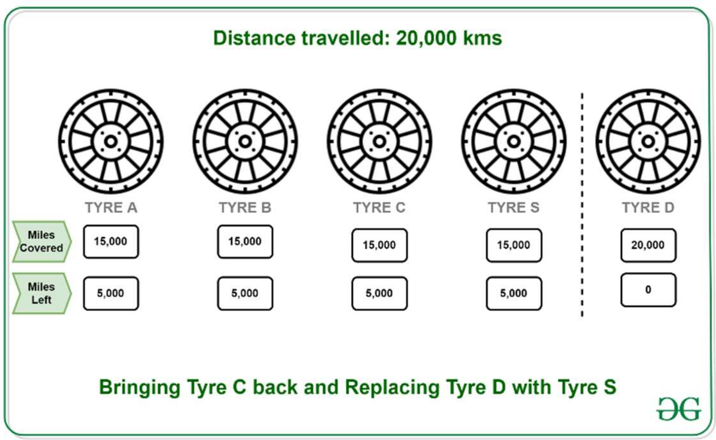
- **10000 KMs:** Put A back to its original position and replace B with S. Remaining distances (A, B, C, D, S) : 15000, 10000, 10000, 10000, 15000.



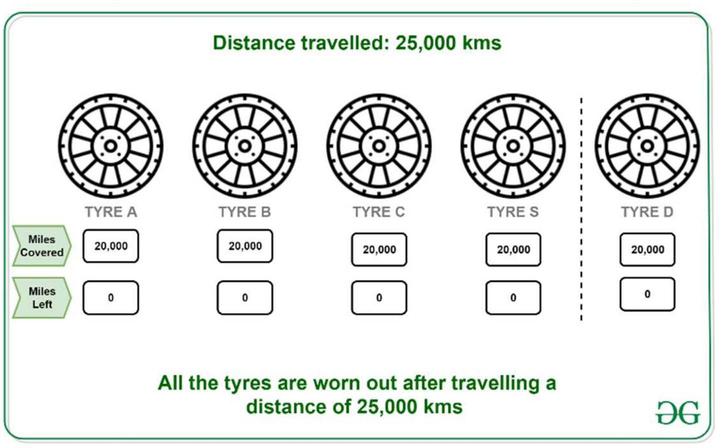
- **15000 KMs:** Put B back to its original position and replace C with S. Remaining distances (A, B, C, D, S) : 10000, 10000, 5000, 5000, 10000.



- **20000 KMs:** Put C back to its original position and replace D with S. Remaining distances (A, B, C, D, S) : 5000, 5000, 5000, 0, 5000.



- **25000 KMs:** Every tyre is now worn out completely.



All tyres are used to their full strength.

72. (Last Palindrome Date before 10/02/2001)

In year 2001 on October 2, 2001, the date in MMDDYYYY format was a palindrome (same forwards as backwards), 10/02/2001 -> "10022001"

When was the last palindrome date before 10/02/2001?

Answer:
One year can have only one palindrome as the year fixes the month and date too, so the year has to be less than 2001 since we already have the palindrome for 10/02. It can't be any year in 1900 because that would result in a day of 91, same for 1800 down to 1400. it could be a year in 1300 because that would be the 31st day.

So what's the latest year in 1300 that would make a month?

When you first look at it, 12th month comes to mind as we have to find the latest date, so it seems it would be 1321. But we have to keep in mind that we want the maximum year in 1300 century with a valid date, so lets think about 1390 that will give the date as 09/31, is this a valid date...? No, because September has only 30 days, so last will be the 31st August. Which means the correct date would be 08/31/1380.

73. (completion of task)

A man is allocated a task. He doubles the task done every day. If the man completely does the task in 18 days, how many days did it take for the man to complete 25% of the task?

Answer: 16
100% of task = 18 days

As he doubles the task every day. So,

50% of task = 17 days

25% of task = 16 days.

74. (Rs 500 note puzzle)
A Lady (L) bought an item of Rs 100 from the Shopkeeper (C). She paid him through a 500 Rs Note. Realizing that he did not have change, the shopkeeper C got change for that note from other shopkeeper (S) and paid Rs 400 to the Lady.

After a few days, S realized that the note is fake, and this railed at C and took 500 Rs back from him. So, in this whole process how much money did C loose in the end?

Answer: 500
Explanation:
The total loss for shopkeeper = 500 (given back to the person who had provided the change)

Consider a transaction box, the lady came with a counterfeit 500 Rs note which can be considered of 0 value.
Now the lady took the item (cost of the item 100 Rs) and 400 Rs (the change given by shopkeeper(C) to the lady)
from the transaction box, total of 500 Rs. Now the equivalent amount should be lost by someone, thus shopkeeper(C) lost 500 Rs. Another shopkeeper(S) gave 500 Rs and took back the same amount hence no loss for him.

75. (2 Eggs and 100 Floors)

The following is a description of the instance of this famous puzzle involving 2 eggs and a building with 100 floors.

Suppose that we wish to know which stories in a 100-story building are safe to drop eggs from, and which will cause the eggs to break on landing. What strategy should be used to drop eggs such that total number of drops in worst case is minimized and we find the required floor.

We may make a few assumptions:

- An egg that survives a fall can be used again.
- A broken egg must be discarded.
- The effect of a fall is the same for all eggs.
- If an egg breaks when dropped, then it would break if dropped from a higher floor.
- If an egg survives a fall then it would survive a shorter fall.

If **only one egg is available** and we wish to be sure of obtaining the right result, the experiment can be carried out in only one way. Drop the egg from the first-floor window; if it survives, drop it from the second floor window. Continue upward until it breaks. In the worst case, this method may require 100 droppings.
Suppose 2 eggs are available. What is the least number of egg-droppings that is guaranteed to work in all cases?
The problem is not actually to find the critical floor, but merely to decide floors from which eggs should be dropped so that total number of trials are minimized.

If we use **Binary Search Method** to find the floor and we start from 50'th floor, then we end up doing 50 comparisons in worst case. The worst case happens when the required floor is 49'th floor.
Optimized Method:
The idea is to do optimize the solution using below equation:

```
Let us make our first attempt on x'th floor.


If it breaks, we try remaining (x-1) floors one by one.

So in worst case, we make x trials.


If it doesn't break, we jump (x-1) floors (Because we have

already made one attempt and we don't want to go beyond

x attempts.  Therefore (x-1) attempts are available),

   Next floor we try is floor x + (x-1)


Similarly, if this drop does not break, next need to jump

up to floor x + (x-1) + (x-2), then x + (x-1) + (x-2) + (x-3)

and so on.
```

Since the last floor to be tried is 100'th floor, sum of series should be 100 for optimal value of x.

x + (x-1) + (x-2) + (x-3) + ... + 1 = 100

x(x+1)/2 = 100

x = 13.651

Therefore, we start trying from 14'th floor. If Egg breaks we one by one try remaining 13 floors. If egg doesn't break we go to 27th floor.

If egg breaks on 27'th floor, we try floors form 15 to 26.

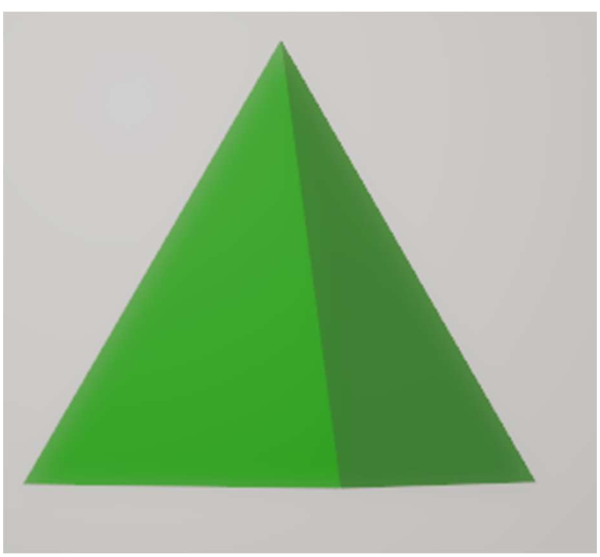
If egg doesn't break on 27'th floor, we go to 39'th floor.

An so on...

The optimal number of trials is 14 in worst case.

76. (Matchstick Puzzle)
How to make 4 equilateral triangles with 6 identical match sticks?

Answer: Make a tetrahedron.



77. (Maximum run-in cricket)

Question: In a ***one day international cricket match***, considering no extras(no wides, no 'no' balls, etc.) and no overthrows.
What is the maximum number of runs that a batsman can score in an ideal case?

Note: "Here we assume ideal and little practical scenario. We assume that batsman can not run for more than 3 runs in a ball, as otherwise there is no limit, he can run infinite runs(theoretically) in a ball, as far as opposite team does not catch the ball."

Answer:
49*(6*5+3)+(6*6)= **1653**
From Over 1 to 49:
1st ball:- 6 runs(hit six)

2nd ball:- 6 runs(hit six)

3rd ball:- 6 runs(hit six)

4th ball:- 6 runs(hit six)

5th ball:- 6 runs(hit six)

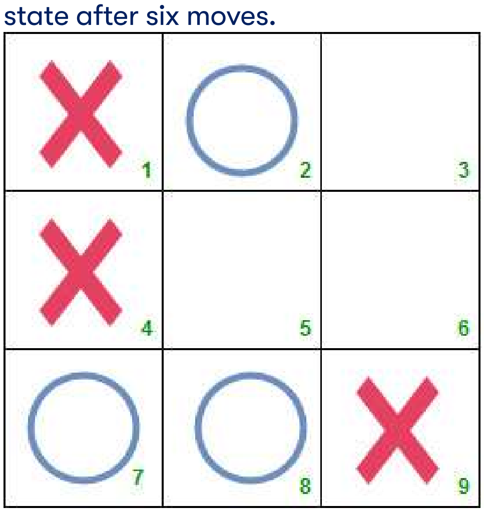
6th ball:- 3 runs(took 3 runs between the wickets and take back the strike)

= >49*(6*5+3)

50th Over:
Hit six sixes in a row.

= >6*6

78. (Tic Tac Toe Puzzle)
Statement: The game of Tic-Tac-Toe is being played between two players and it is in below state after six moves.



Can you answer following questions?

- Who will win the game, O or X?
- Which was the sixth mark and at which position?

Assume that both players are intelligent enough.

Solution:

O will win the game. The sixth mark was X in square 9.

Explanation:
The 7th mark must be placed in square 5 which is the win situation for both X and O. Hence, the 6th mark must be placed in a line already containing two of the opponent's marks. There are two such possibilities – the 6th mark would have been either O in square 7 or X in square 9.
As we know both the players are intelligent enough, the 6th mark could not be O in square 7. Instead, he would have placed O in square 5 and would have won.

Hence, the sixth mark must be X placed in square 9. And the seventh mark will be O. Thus O will win the game.

79. (100 coins puzzle)

100 coins are lying flat on a table. 10 of them are heads up and 90 are tails up. You can't see which one is which. How can we split the coins into two piles such that there are same number of heads up in each pile?

Note: It is allowed to flip the coins of one pile once.

Answer: Make 2 piles with 10 coins and 90 coins each. Now, flip all the coins in the smaller pile.
Explanation:
Let's consider a case
Pile 1: 88T, 2H
Pile 2: 2T, 8H

Flipping the coins in Pile 2

Pile 1: 88T, 2H
Pile 2: 2H, 8T

Pile 1(heads) = Pile 2(heads)

80. (Find the missing row in excel)

We are given an excel sheet which contains integers from 1 to 50, including both. However, the numbers are in a jumbled form and there is 1 integer missing. You have to write a code to identify the missing integer. Only the logic is required.
Solution:
We know that the sum of all the numbers from 1 to n is (n*(n+1)/2)
Therefore, sum of all the numbers from 1 to 50 is

```
50*(50+1)/2  (Here, n = 50)
 = 50*(51)/2
 = 25*51
 = 1275.
```

Therefore, all we need to do is to sum all the integers present in the file and subtract the sum from 1275. The difference between 1275 and this sum would give us the missing integer.

81. (Guess color of Hat)

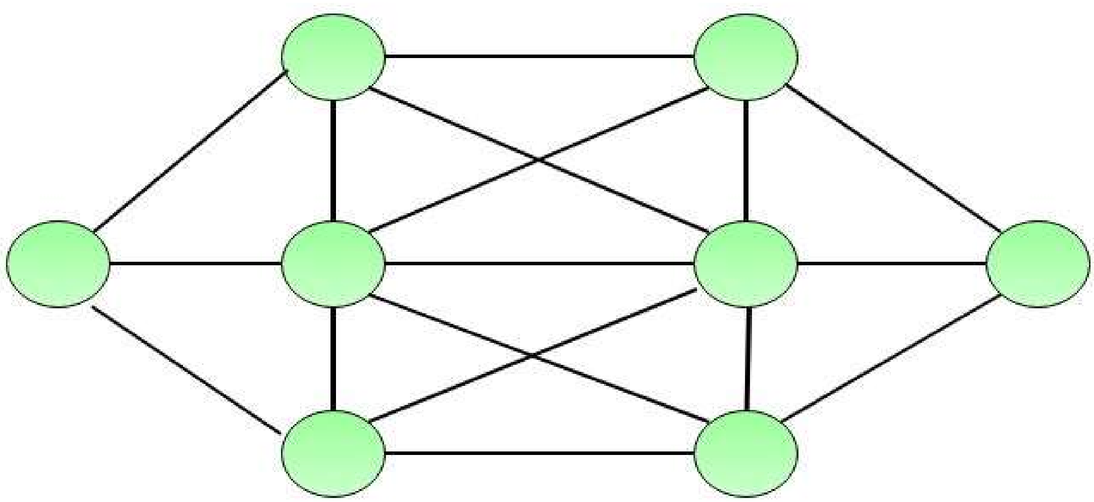
There are 20 people standing in a line, one behind the other. Each is made to wear a hat, which can either be white or black. There can be any number of white or black hats between 0 and 20. Each person can see the hat of all the persons ahead of him in the line, but not those of the people standing behind. Each person is required to guess (loudly) the color of his/her own hat. The objective is for the group to get as many correct guesses as possible. The group is allowed to discuss and form a strategy before the exercise. What is the best strategy? What is the maximum number of correct guesses in this strategy?

Solution:
The person who stands last in the queue, behind everyone else, will count the number of white hats on the heads of the 19 people present ahead of him. If this number is even, he (loudly) guesses the hat on his head as 'Black'. if the number is odd, he guesses 'White'. The probability of the hat on his head being what he guessed is 50%. There is no way this person can guess the hat on his head correctly. However, his guess functions as a message to others in front of him.
Suppose the 20th person guesses 'Black'. Now, the person who is 19th in the queue knows that the number of white hats on the first 19 people (the 18 people in front of him and himself) is even. He then checks whether the number of white hats in front of him is even or odd. If the number is even, that means the hat on his head is black. If the number is odd, that means the hat on his head is white and calls that out (loudly). Therefore, the 19th person in the queue always guesses correctly, based on the message the 20th person passed on.

A similar strategy is followed by each person in turn. Therefore, everyone except the last (20th) person guesses correctly for sure. The answer to this puzzle, therefore, is 19.

82. (Placing the number)

Place the numbers **1, 2, 3, 4, 5, 6, 7, 8** into the eight circles in figure given below, in such a way that no number is adjacent to a number that is next to it in the sequence. For example, **1** should not be adjacent to 2 but can be adjacent to **3, 4, 5, 6, 7, 8**. Similarly for others.

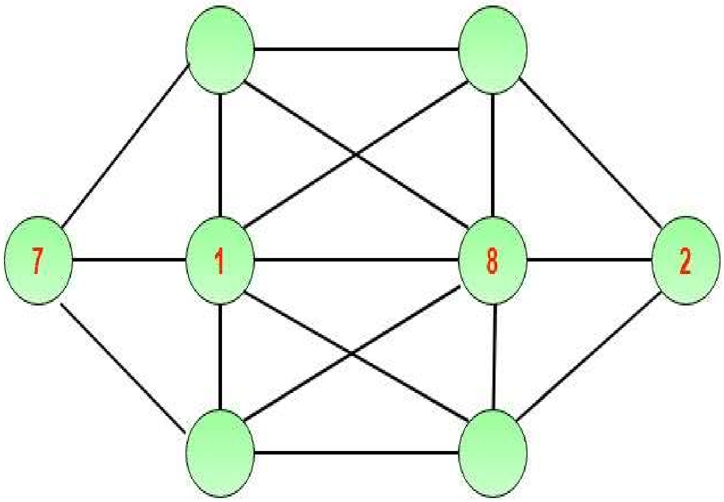


Trivial Solution:
Trying for 8! =40320 combination would be tedious task.

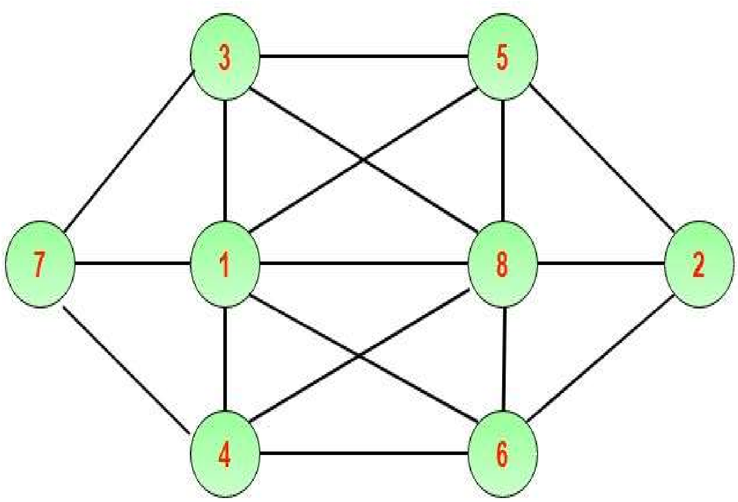
Smart Solution:

- The easiest numbers to place are 1 and 8, because each has only one number to which it cannot be adjacent, namely, 2 and 7, respectively.
- The hardest circles to fill are those in the middle, as each is adjacent to six others.

This suggests that we place 1 and 8 in the middle circles. If we place 1 to the left of 8, then the only possible positions for 2 and 7 are shown figure below:



The number 3 must now be placed on the left-hand side of the diagram, and 6 must be placed on the right-hand side.
Now it is easy to place all the remaining number as shown in figure below:



83. (Muddy Heads)

A mother tells her two children, a boy and a girl, to play without getting dirty.
However, while playing, both children get mud on their foreheads.
The mother says "At least one of you has a muddy forehead". She then asks the children to answer "Yes" or "No" to the question: "Do you know whether you have a muddy forehead?"
The mother asks this question twice.
What will the children answer each time this question is asked, assuming that a child can see whether his/her sibling has a muddy forehead, but cannot see his or her own forehead? Assume that both children are honest and that the children answer each question simultaneously.

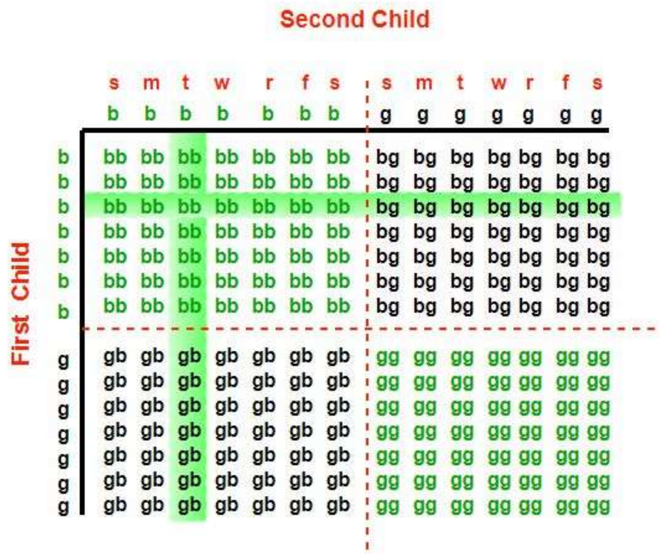
Solution:

Let s be the statement that the son has a muddy forehead and let d be the statement that the daughter has a muddy forehead. When the mother says that at least one of the two children has a muddy forehead, she is stating that the disjunction $s \vee d$ is true.
Both children will answer "No" the first time the question is asked because each sees mud on the other child's forehead. That is, the son knows that d is true, but does not know whether s is true, and the daughter knows that s is true, but does not know whether d is true.
After the son has answered "No" to the first question, the daughter can determine that d must be true. This follows because when the first question is asked, the son knows that $s \vee d$ is true, but cannot determine whether s is true. Using this information, the daughter can conclude that d must be true, for if d were false, the son could have reasoned that because $s \vee d$ is true, then s must be true, and he would have answered "Yes" to the first question. The son can reason in a similar way to determine that s must be true. It follows that both children answer "Yes" the second time the question is asked.

84. (Girl or Boy)

The **Boy or Girl problem** consists of a bunch of questions in probability which has kept the mathematicians on discussion about its possibilities. But different from them, here is one puzzle for you with no ambiguity.
Suppose that I have a friend whose name is Ankur. Ankur has his elder brother who got married 10 years before. But Ankur being a silly guy has the habit of forgetting things; you can say a "Short time memory loss". This summer he is going to meet his brother after 10 years, and he has planned to purchase some clothes for his brother's kids as a token of love. Each and every time he faces a problem he comes to me, so this time also, he came to seek help, and I have not left him empty handed. I told him that as far as I can recall, his brother has two offspring's and one of the boy was born on Tuesday. Now, it's your turn to help him. What is the probability that Ankur's brother has two boys? Assume an equal chance of giving birth to either sex and an equal chance to giving birth on any day.

Solution: If you think the answer should be 1/2, you would be wrong. If you knew which child was a boy (say, the younger one), you would be closer to the truth. But since the boy could be either the younger or the older child, the analysis is more subtle. The answer would be 13/27.
There can be four cases, i.e. either his brother has two boys, or one boy(elder) and one girl, one girl(elder) and one boy, or both of them are girls. And there are 7 equally likely possibilities for any one of the children of taking birth on Tuesday for all these four cases. Therefore, the total cases are $7 \times 4 - 1$(as there is repetition of two boys two times). The possibility for having two boys with both of them taking birth on Tuesday will be $7 \times 2 - 1$. Therefore, the answer would be 13/27. The things can be made more clear from the image shown below.



85. Gem in Pockets

Vijay Dinanath Chauhan aka “VDC” was travelling from Bangalore to New Delhi along with his friends. VDC was wearing a Cargo Jeans with finite number of small pockets. And in his pockets, there were packets of gems, not the real ones, actually the Cadbury gems to eat when he reaches Delhi. In each pocket there was “number of packets”, that was equal to the “number of pockets”. In each packet there was a “number of gems”; and the “number of gems” was equal to the “number of packets”. Unfortunately, when he reaches Delhi and gets down from the train, due to huge crowd he lost one of his Cadbury gems packet.

Shocked by the incident, as he loves the gems most, he decided not to eat the gems that day, and donate all of them to the beggars sitting nearby. But when he went to them, they all started rushing towards him to get the gems. He being a good human wanted to distribute those gems equally. Find the number of beggars so that he can distribute the gems equally?

Note: No. of beggars>1, No. of pockets>1

Solution:
6,VDC was silly, he could have eaten the gems any other day! Hahaha, Let the number of pockets be N. The number of gems in each packet is equal to the “no. of packets”, and the “number of packets” was equal to the “no of pockets”.
There for the total no. of gems = NxNxN –(N) (for the lost packet), i.e. equal to N^3-N. N^3-N = N(N^2-1) = N(N+1) (N-1). This last expression is divisible by 6 in all cases, since a number is divisible by 6 when it is both divisible by 3 and even. And substituting 2, 3, 4……and so on, the expression yields 6, 24, 60…… where all numbers are divisible by 6.

86. Rich or Poor

A place has two kinds of residents, Poor, who always tell the truth, and their opposites, Rich, who always lie. You encounter two people A and B. What are A and B if A says “B is a Poor” and B says “The two of us are opposite types”?

Answer: Both A and B are Rich

Solution: Let p and q be the statements that A is a Poor and B is a Poor, respectively, so that $\neg p$ and $\neg q$ are the statements that A is a Rich and B is a Rich, respectively. Let us consider the possibility that A is a Poor, this is the statement that p is true. If A is a Poor, then he is telling the truth when he says that B is a Poor, so that q is true, and A and B are the same type. However, if B is a Poor, then B’s statement that A and B are of opposite types, the statement $(p \wedge \neg q) \vee (\neg p \wedge q)$, would have to be true, which it is not, because A and B are both Poor’s. Consequently, we can conclude that A is not a Poor, that is, that p is false. If A is a Rich, then because everything a Rich says is false, A’s statement that B is a Poor, that is, that q is true, is a lie. This means that q is false and B is also a Rich. Furthermore, if B is a Rich, then B’s statement that A and B are opposite types is a lie, which is consistent with both A and B being Rich. We can conclude that both A and B are Rich.

87. Red Hat vs Blue Hat

A team of three people decide on a strategy for playing the following game. Each player walks into a room. On the way in, a fair coin is tossed for each player, deciding that player’s hat color, either red or blue. Each player can see the hat colors of the other two players, but cannot see her own hat color. After inspecting each other’s hat colors, each player decides on a response which are one of the following:

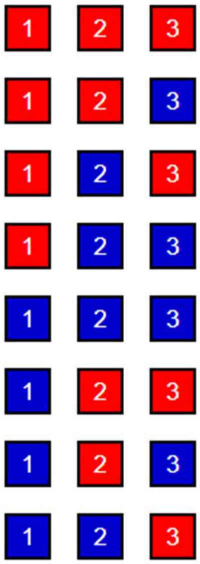
> “I have a red hat”, or “I had a blue hat”, or “I pass”

The player’s responses are recorded, but the responses are not shared until every player has recorded her response. The team wins if at least one player responds with a color and every color response correctly describes the hat color of the player making the response. In other words, the team loses if either everyone responds with “I pass” or someone responds with a color that is different from her hat color. What strategy should one use to maximize the team’s expected chance of winning?

For example, one possible strategy is to single out one of the three players. This player will respond “I have a red hat” and the others will respond “I pass”. The expected chance of winning with this strategy is 50%. Can you do better?

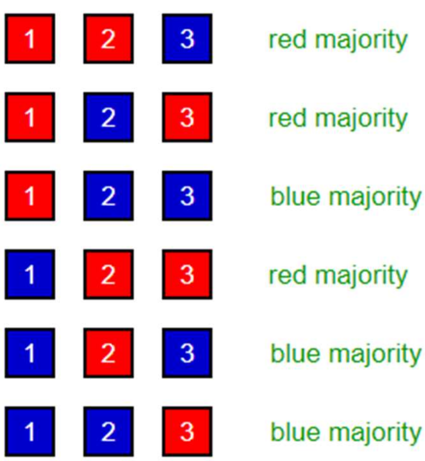
Answer: A better solution exists for 75% chance of winning.
Solution: With three players and two hat colors, there are a total of eight equally likely outcomes:

Eight Outcomes

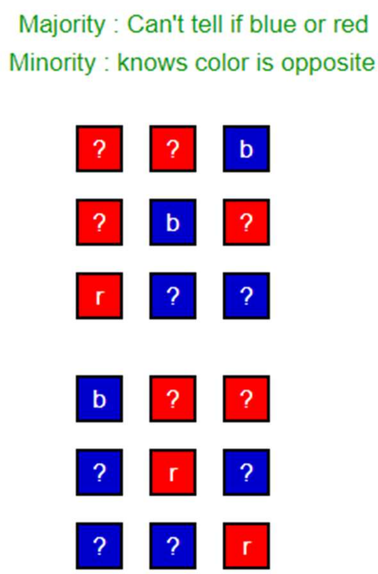


One special feature about the distribution is that most outcomes—six of them—include at least one hat of both colors. Only two extreme outcomes don't—the ones with all red hats or all blue hats. We can analyze further. Among outcomes with both hat colors, there logically has to be two hats of one color (the "majority" color) and one hat of another color (the "minority" color). See pic below

Majority & Minority Colors

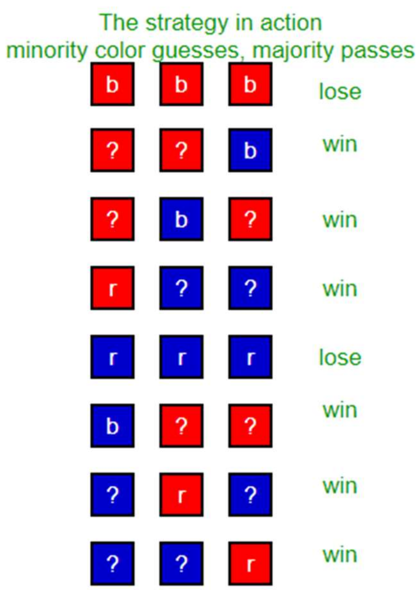


Now, by looking at the other hats, players can identify whether they are wearing a majority color or a minority color. For instance, if a player sees both a red and blue hat, then the player must be wearing the majority color (which could be red or blue). If a player sees two blue or two red hats, then the player must be wearing the minority color, which will be the opposite color of what the player sees. Here is what players can reason among the six choices:



Now the idea is to get the player with the minority hat color to guess and force the other people to pass.
So here is the strategy :
If you see both a red and a blue hat, then "pass"
If you see two red hats, then guess "blue"
If you see two blue hats, then guess "red"

This strategy wins in all six cases with at least one hat of each color. It only loses in the two cases of all-red or all-blue, in which all players guess incorrectly. Here is how players would guess:



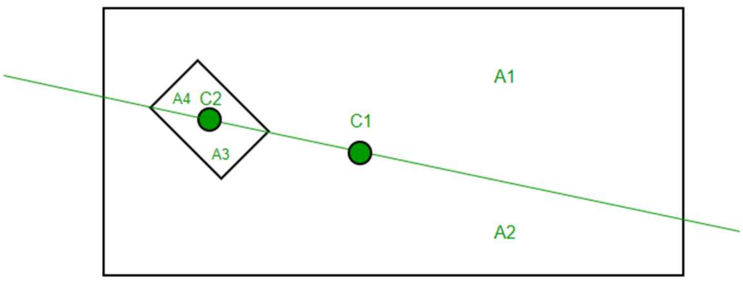
So, the group wins in six of eight possible outcomes– a whopping 75 percent chance.

88. Rectangular Cardboard

Given a rectangular cardboard with a rectangular piece removed (of any size and orientation) how one can cut the rectangular cardboard in two equal parts with one straight line cut.

Solution:
Using the fact: "any line passing through the center of a rectangle divides the rectangle in two equal pieces."
One can cut the rectangular cardboard by the line joining the center of the original rectangular cardboard and the center of the removed piece, this will divide the rectangular cardboard in exactly two pieces.

For example: refer below figure



A1 = A2 ....(1)
A4 = A3 ....(2)

So, using **(1)** and **(2)**
A1-A4 = A2-A3

89. King and his Elephant

A king dies after writing an agreement to divide the elephant power to his three sons, the first son has to get 1/2 of elephants, second son gets 3/4th of remaining elephants left after giving away to the first son, third son gets 1/2th of remaining elephants left after giving away to the second son. The total number of elephants are 15. All elephants are to be divided without leaving anyone of them behind. Can you solve it?

Solution:

One more imaginary elephant can be added to the elephants, making them 16,
now the first son gets 1/2 of 16=8 , 8 are remaining
the second son gets 3/4 of 8 =6, 2 are remaining
the third son gets 1/2 if remaining , 1 is left , which is your imaginary elephant
therefore no one elephant is left behind and the required proportions are satisfied.

90. The Boat Wreckage

Let's make this one easy! Ankur with his friends went to river the bank of river Ganges, as the exams are over for fun and recreation. But while crossing to other side of the river, a storm came and he along with fourteen other people are trapped in a boat in the mid of the river. None of them know how to swim, and due to a hole in the base the boat is about to sink in 20 minutes. Their only chance to survival is the five-person raft stowed on their vessel.

But still, there is some ray of hope for these people. A round trip to the nearest side takes nine minutes on the raft. You have to help Ankur by saying that how many people will remain at raft so that he can go away by raft as soon as possible.

Solution: The correct answer is 2. You may give a cracking answer by giving the logic that after 2 rounds when (20 -18) i.e. only two minutes are left, the rest of five people can leave the boat. But dear, it's a raft and you always need one person to move the raft, and that person has to return back with the raft to rescue other people. So the first time, 5 people went and one returned, again five went and one returned, and when only two minutes were left, five people went and no one returned leaving two people (20-(5-1) -(5-1)-5=2) back in the boat.
1ST Trip: 5-1, 11 minutes remaining
2nd Trip: 5-1, 2 minutes remaining
3rd Trip: 5, Time over

91. Cheryl's Birthday puzzle and solution

Cheryl's Birthday is the unofficial name given to a mathematics brain teaser that was asked in the Singapore and Asian Schools Math Olympiad, and was posted online on 10 April 2015 by Singapore TV presenter. It is an interesting problem and might be asked in the interviews. It is based on logical deduction. It doesn't require any prior mathematical acumen. It is advised that you try to hustle through the problem yourself without looking at the solution and just to motivate you further to solve the problem, the problem has been talked about in international newspapers like Telegraph and Guardian, so If you are able to solve the problem without looking at the solution you deserve a pat on the back!

Problem: It is known that Cheryl's birthday is one of the following 10 dates listed in the table.

May 15,May 16,May 19,June 17,June 18,July 14,
July 16,August 14,August 15,August 17.

May		15	16			19
June				17	18	
July	14		16			
August	14	15		17		

Cheryl tells Albert and Bernard separately the month and the day of her birthday respectively.

Then following conversation takes place
Albert: I don't know when Cheryl's birthday is, but I know that Bernard doesn't know too.
Bernard: At first I didn't know when Cheryl's birthday is, but I know now.
Albert: Then I also know when Cheryl's birthday is.
So when is Cheryl's birthday?

Solution: It is clear that we'll try to eliminate the 10 choices and finally narrow down to one correct answer based on the arguments given by Albert and Bernard. So let's eliminate the choices argument by argument.
Argument 1: Albert says, I don't know when Cheryl's birthday is, but I know that Bernard doesn't know too.
If we look at the dates we observe that if May 18 or June 19 were Cheryl's birthday then Bernard would have known it instantly because there are only one date with 18 and 19.If Albert knows this fact then he is either told July or August Month. Hence all the dates of May and June are eliminated.

Now the remaining choices are

July	14		16	
August	14	15		17

Argument 2: Bernard says, At first I didn't know when Cheryl's birthday is, but I know now.

This eliminates July 14 and August 14 because If Bernard know the exact date, it can't be 14 as that will create ambiguity between July 14 and August 14.These two dates are eliminated.

The remaining choices are

July		16	
August	15		17

Argument 3 Albert says, Then I also knows when Cheryl's birthday is.
If Albert knows the date then it has to be JULY 16 because, in August there are two choices and Albert can't be sure of his decision. If Albert is absolutely sure then answer is July 16 and all the august dates are eliminated.

Answer: July 16

92. Boy with Marbles

A boy goes to 20 of his friend's houses with 'n' number of newly purchased marbles in his hands. At every house he visits , he gives away half of marbles he have and take one of his friend's marble's and adds it with the one's he is left with , he never had a problem of dividing an odd number of marbles left and finally after leaving the his 20th friends house, he is left with 2 marbles, can you guess the 'n' value?

Answer: 2
Explanation: n=2; The boys purchases two marbles from the shop and travels to his first friend's house, where he gives away half of them which is n/2=2/2=1 to his first friend ,and thereby left with 1 marble, and takes 1 marble from his first friend and adds it to the remaining he is left with, which is 1 ,therefore he is now having 2 marbles with him.
Then he goes to his second friend's house and again gives away half of what he hive which is again 2/2=1 and he is left with 1 marble, and takes 1 marble from his second friend and adds it to the remaining he is left with, which is 1 ,therefore he is now having 2 marbles with him.
And in the same way he continues to all his friend's houses and will return back with two marbles.
So, Finally after he comes from his 20th friends house, he is left with 2 marbles.

93. The Counterfeit Coin

A box contains n coins, of which 7 of them are counterfeit with tails on both sides and the rest are fair coins. If one coin is selected from the bag and tossed, the probability of getting a tail is 17/20. Find the value of 'n'.

Answer: n = 10
Explanation:
Probability of getting a tail can be in two ways
1) Selecting any of those 7 coins with tails on two side is = (7/n)
2) Selecting any one, other than those 7 biased coins is (n-7)/n

Therefore:

```
(7/n) (1)       +     (n-7/n)*(1/2) = 17/20
|                        |
|                        |
|                        |
probability of         probability of
getting a tail from     getting a tail from
biased coins           fair coins
```

solving above equation, we get n = 10

94. Fill the Jug

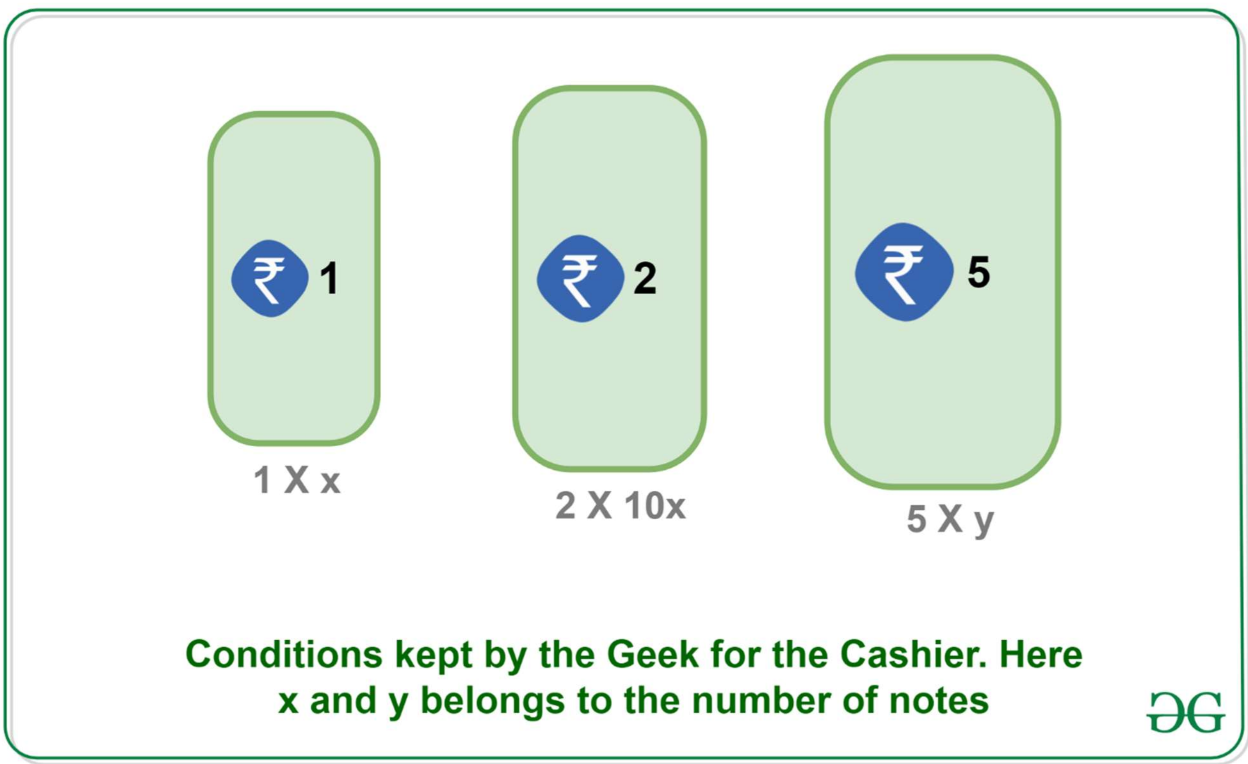
There are two jugs each of 4 and 3 liters respectively, without any measuring marks. how many minimum steps are required to have 2 liters of water into the 4-liter jug (the jugs can be filled any number of times with water, and they can be emptied any number of times).

Answer: 6
Explanation:
Step 1 : Fill 3-litre jug with water completely
Step 2 : Empty water from 3-litre jug into 4-litre
Step 3 : Again, fill 3-litre jug with water completely
Step 4 : And pour water from 3-litre jug into 4-litre jug until 4-litre jug becomes full
Step 5 : Empty the 4-litre jug. Now, we are left with 2 litre water in 3-litre jug and 4-litre jug is empty.
Step 6: Transfer water of 3-litre jug to 4-litre jug, resulting in 2 litre water in 4-litre jug.

95. Geek and Cashier

A Geek asks a cashier to pay Rs 200 for a cool program written by him. He asks the cashier to pay only in the following way:

a. Few 1 Rs Notes. Let x.
b. Few 2 Rs Notes. Must ten times of 1 Rs Notes, i.e., 10x.
c. Rest of the money as 5 Rs Notes (Minimum number Rs 5 notes should be used)

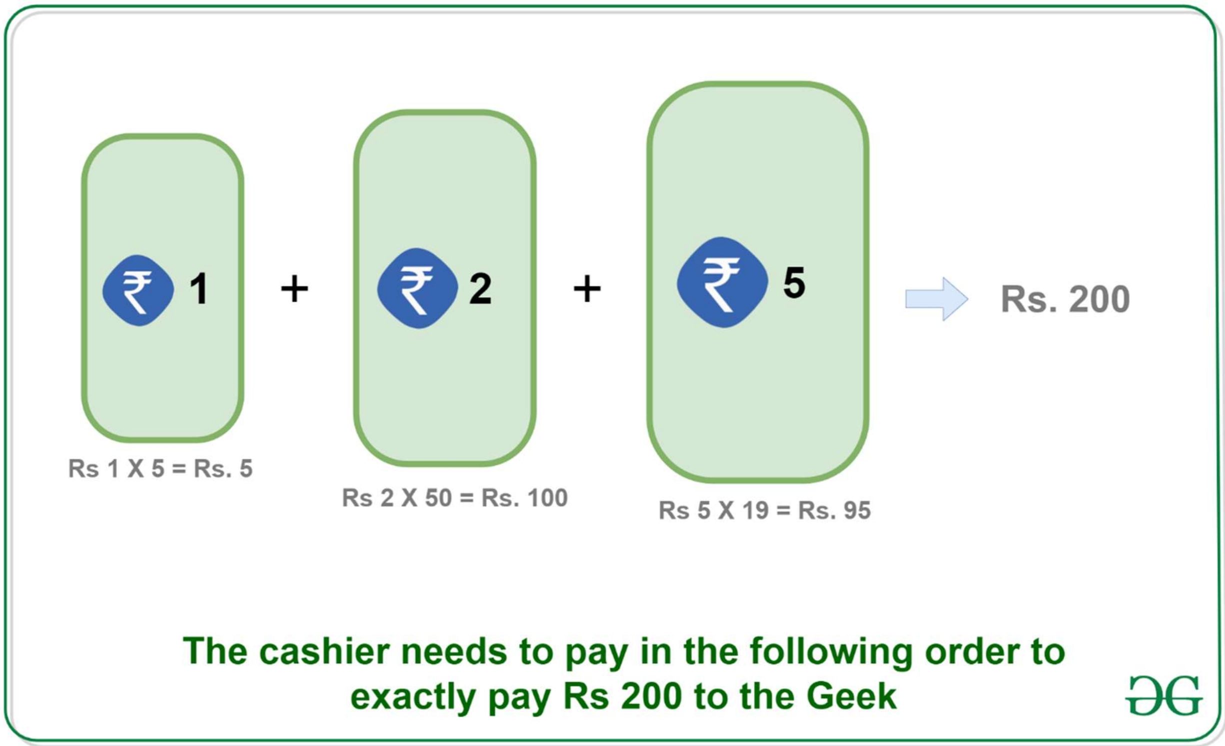


How does the Geek's Cashier plan to pay?

Solution: Let's solve this in a stepwise manner:
The smallest amount of 1 Rs and 2 Rs notes the cashier may pay is 21 (1 one-rupee note + 10 two rupees notes). So the cashier must pay in multiples of 21 to satisfy the first two conditions and also the amount must not exceed the total Rs. 200.
Multiples of 21 are:

21, 42, 63, 84, 105, 126, 147 and 189.

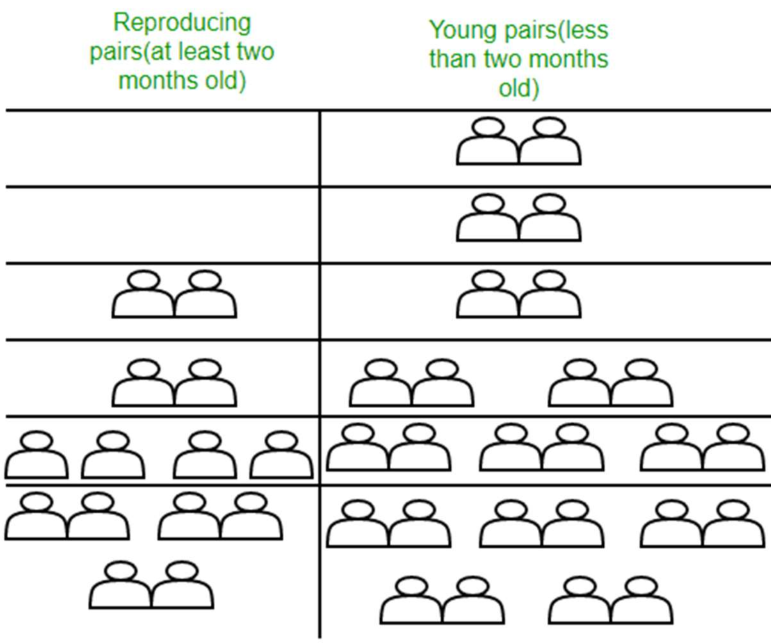
Out of this, only 105 is the multiple of 5. So he must give the balance of 95 in Rs 5 bills.



Therefore, the Cashier must give 5 one-Rs bills, 50 two-Rs bills and 19 five-Rs bills.

96. Chinchillas Relations

A young pair of chinchillas (one of each sex) is placed on an island. A pair of chinchillas does not breed until they are 2 months old. After they are 2 months old, each pair of chinchillas produces another pair each month (See pic below). Find a recurrence relation for the number of pairs of chinchillas on the island after n months, assuming that no chinchillas ever die.



Month	Reproducing pairs	Young pairs	Total pairs
1	0	1	1
2	0	1	1
3	1	1	2
4	1	2	3
5	2	3	5
6	3	5	8

Solution:

Let us denote the number of pairs of chinchillas after n months by f(n).

The chinchilla population can be modeled using a recurrence relation. At the end of the first month, the number of pairs of chinchillas on the island is f(1) = 1. Because this pair does not breed during the second month, f(2) = 1 also. To find the number of pairs after n months, add the number on the island the previous month, f(n−1) , and the number of newborn pairs, which equals f(n−2) , because each newborn pair comes from a pair at least 2 months old.

Consequently, the sequence {f(n)} satisfies the recurrence relation

$f(n) = f(n-1) + f(n-2)$

for $n \geq 3$ together with the initial conditions f(1) = 1 and f(2) = 1.This recurrence relation and the initial conditions uniquely determine this sequence.

If you closely observe, this is the recurrence relation for Fibonacci numbers. (See 'Total Pairs' column in the pic)

Hence, the number of pairs of chinchillas on the island after n months is given by the nth Fibonacci number.

97. Priests in Temple

There are 20 priests in a temple. One day, Lord Shiva appears before them and tells them that some of them have sinned, and that a black spot would appear on the forehead of all the priests who have sinned. The priests are not allowed to look into a mirror or communicate with each other. When any priest finds out that there is a spot on his forehead, he should leave the temple on that day itself. At least 1 priest has sinned. How can a priest find out whether he has a spot on his forehead. What would be the pattern of the priests leaving the temple?

Solution:

Scenario 1 (Only 1 priest has sinned): On the first day itself, the priest who has sinned would see that no other priest has the spot on his forehead and would know that he is the one who has sinned(because Lord Shiva said that at least one of them had sinned). Therefore, he would leave on the first day. Note that, in this case, the priest left because he did NOT see the spot on anyone's forehead.

Scenario 2 (2 priests have sinned): In this case, one of the priests (Priest A) who has sinned would see only 1 priest with the spot (Priest B). However, unlike the first case, this priest (Priest B) does not leave on the first day because he can see 1 priest with the spot (Priest A). Now, priest A knows that since priest B did not leave on the first day, he must be seeing another priest with the spot. The same is true for priest B. Therefore, they both realize on the second day that both of them have the black spot and they both leave on the second day.

Scenario 3 (3 priests have sinned): Following the same approach from scenario 2, one of the priests (Priest A) who has sinned would now see two priests with the spot (Priests B & C). However, unlike the second case, priests B and C do not leave on the second day because they can each see 2 priests with the spot (Priest A). Now, priest A knows that since priests B & C did not leave on the second day, they must be seeing two more priests with the spot. The same is true for priests B & C. Therefore, all three realize on the third day that all three of them have the black spot and they all leave on the third day.

In a similar manner, by extension, we can determine that if n priests have sinned, all n of them would leave on the nth day together.

98. Friends after ages

Two old friends, Jacky and Bob, meet after a long time.

Jacky: Hey, how are you man?

Bob: Not bad, got married and I have three kids now.

Jacky: That's awesome. How old are they?

Bob: The product of their ages is 72 and the sum of their ages is the same as your birth date.

Jacky: Cool... But I still don't know.

Bob: My eldest kid just started taking piano lessons.

Jacky: Oh now I get it.

How old are Bob's kids?

Answer:

3,3,8

Solution:

All we have gained from the conversation is that the product of their ages is 72 and the sum lies between (1,31) ; ie; (possible dates a month can have).

So what are the possible choices?

2, 2, 18 sum(2, 2, 18) = 22

2, 4, 9 sum(2, 4, 9) = 15

2, 6, 6 sum(2, 6, 6) = 14
2, 3, 12 sum(2, 3, 12) = 17
3, 4, 6 sum(3, 4, 6) = 13
3, 3, 8 sum(3, 3, 8) = 14
1, 8, 9 sum(1,8,9) = 18
1, 3, 24 sum(1, 3, 24) = 28
1, 4, 18 sum(1, 4, 18) = 23
1, 2, 36 sum(1, 2, 36) = 39
1, 6, 12 sum(1, 6, 12) = 19

But we remember that Jacky still had a problem figuring out their ages. It means there are two or more combinations with the same sum. From the choices above, only two of them are possible now.

2, 6, 6 sum(2, 6, 6) = 14
3, 3, 8 sum(3, 3, 8) = 14

Now since the eldest kid is taking piano classes, we can eliminate combination 1 since there are two eldest ones. The answer is 3, 3 and 8.

99. Catch the Thief
Problem: Three cars, an Alto, a Zen and a Nano were stolen. There are 3 suspects (Arun, Kartik and Varun). Each stole 1 vehicle. Here is what they say:
Arun: Varun stole the Alto
Kartik: Varun stole the Zen
Varun: I stole neither the Alto nor the Zen
Later, the police find that the suspect who stole the Alto told the truth. Using only this information, can you identify which suspect stole which car?

Solution:
We know that the suspect who stole the Alto told the truth. However, both Arun and Varun claim that they did not steal the Alto. Therefore, neither of them could have actually stolen the Alto, which means Kartik stole the Alto.

This also means that Kartik told the truth and that Varun stole the Zen. Since each suspect stole 1 vehicle, it is obvious that Arun stole the Nano.

100. Colliding Stars

Gyani baba is fond of giving new theories about stars. He discovered that there are two type of stars in this universe; one "X" type and another "Y" type stars. In one of his theories about these stars, he states that if n "X" type of stars collide with m "Y" type of stars, the collision results to formation of (m+n) new "Y" type of stars, elimination of previous n "X" type of stars, and change of type from "Y" to "X" of previous "Y" type of stars. He termed this whole phenomenon as a "Big Bang". The phenomenon is governed by following rules:

- All the stars collide together at once.
- Further "Big Bang" may occur only after one "Big Bang" has happened. No two 'Big Bang's can happen at the same instant .
- The next "Big Bang" can only occur if all the products from previous "Big Bang" collides together.
- In the year 1800A.D., people on the earth were able to count the total no. of stars in the universe. The total count of stars was 144 in the whole universe.

Find the total no. of "Big Bangs" happened till then, if initially there were only 2 stars?

Solution:

9 "Big Bangs". If initially, there were two stars , then for the number of stars to increase there must have been one "X" type and "Y" type star each. As you can observe from the problem, "Big Bangs" increases the no. of stars as the Fibonacci series- 1, 1, 2, 3, 5, 8, 13, 21….and so on. Now, if the total count of stars were 144, then it must be a Fibonacci number, as a sum of previous two Fibonacci numbers which are 55 and 89. Since, 55 is the 10th Fibonacci number, therefore the answer will be 10-1 =9, as already 1 "X" type and 1 "Y" type stars were present.

101. Cake and my friend

Praveer **'the most hungry guy'** in college went to get some delicious cakes for his friends birthday. When he entered the famous shop "Taste the variety", he was thrilled to see variety of cakes being displayed. He went to the seller and asked for cake. Seller told him that he has a very unique arrangement for cakes. He would be getting **chunk of cakes pieces in boxes of 7, 11 or 17.** Obviously he could purchase exactly 18 pieces by buying a box of 7 and a box of 11. Hearing this, he started imagining the largest number for which it is **impossible** to purchase exactly that number of pieces using above combination. Well as always, his hunger was deviating him from thinking, he asked for your help.

Solution: - The largest number that would be impossible to buy using above combination is 37. You can see he could form 7 using a single seven box, 25 using 7, 7 and 11. You have no combinations for number 30. Then numbers from 31 to 36 can be easily formed using above combination. **For 37, he has no options fulfilling his needs.** Further incrementing to 38, he could use 7, 7, 7, 17. Rest numbers above 37 can be formed using above combinations.

102. Gold or Silver

There are three boxes box1, box2 and box3 containing gold, silver and mixture of silver and gold respectively.

- Each of the three boxes contain a label on them describing the contents.
- Mr. Hurricane comes and mess up all labels. Now each box is labeled with the name which it exactly doesn't contain.

You are given only **one chance to open a box** and you should guess all the remaining two box contents correctly. Which box will you choose to open keeping in mind that all the three boxes are labeled wrong?
(There is a chance of the mixed box having all the gold coins towards the bottom and silver filled on the top(or vice versa) to deceive that it is a silver box.

Solution:
Choose the box labeled as mixed.
Explanation:
If the box labeled as mixed is chosen and opened, it can contain gold or silver, cannot contain both because the label written is exactly opposite. Say, If the box contains gold, then two boxes will now be left to be guessed. Obviously, the box labeled as silver contains mixed.

103. Paper ball and three friends

It's summer time and three of the college friends, A, B and C went to sports club to enjoy the vacation. They saw an interesting game being played there.

Game name is "hit and win". There was a triangular setup of green ropes on ground. You have to move on the triangular path and on the turn you have to hit other mate using paper ball until only one is left for winning.

- A's chances of hitting is 0.3.
- B has hitting chance of 0.5 .
- C has 100% chance of hitting the target.
- If a person is hit, he is out from path and cannot take a turn.

Suppose order of throwing balls is A, B, C. You being close to A, what strategy would you suggest A for having maximum chance of winning.

Solution: A has to miss the target first time purposely.
Explanation: Suppose if A tries to hit B and A is successful, then in the next turn C would definitely hit A and A looses.
If A tries to hit C and hits him, then B would go for A. Now if A purposely miss his target then B would go for C, he being more stronger than A. If he hits, its between A and B and A has a first chance to hit. If B misses the target, then C would go for B in next turn and he would definitely hit him and it would be now between A and C but again A has a first chance to hit.

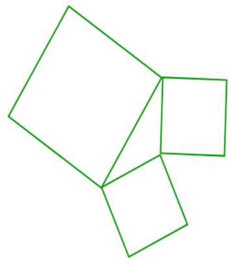
104. Surround the Villages
In a district called Daulatpur, which is one of the best planned city in the world, there is a certain arrangements of villages. The arrangement adheres the following design patterns:

- All the boundaries of a villages are straight, and all the villages are surrounded by four such boundaries of the same length.
- The length of the line joining the non – adjacent points are equal.
- All the villages are divided into a group of three villages, having a common playground fully surrounded by one boundary of each villages.

Then, the villages are further categorized into category of special villages. The special villages have the property that area of one of the villages among their group is equal to sum of the area of the other two villages. You have been given that the boundaries of a village may vary from 1 km to 15 km in length.
Find out the sum of the area of the playgrounds for those group of villages which have been categorized into special villages.

Note: It's given that for each set of boundaries of the villages, only one special group exists.

Solution: 114 Km^2 .
Explanation: In the above question, it's given that the boundaries of the villages are straight, equal, and in four in number. The length of the line joining the non – adjacent points => the length of the diagonal of the polygon. As the sides and diagonals of the polygon are equal, this implies that polygon is a square. So , the whole district is collection of given triplets of villages, where area in between the squares is playground.



Now, the question says that the special villages are those villages having the sum of areas of two equal to the third one. Let the side of the villages in a triplet be a, b, & c respectively, which implies that

a^2 = b^2 + c^2

- Now, from 1 to 15 you have to find the Pythagorean triplets which are (3, 4, 5), (5, 12, 13),(9, 12, 15) and (6, 8, 10) respectively.
- As a^2 = b^2 + c^2, the triangular playgrounds are right angled. And as there are only one such special group.
- Therefore, the answer is (1/2) x 3 x 4 + (1/2) x 5 x 12 + (1/2) x 6 x 8 + (1/2) x 9 x 12= **114**.

105. Hats Off

A king wants his daughter to marry one of 3 young princes, so he devises an intelligence test. The princes are gathered into a room and are shown 2 black hats and 3 white hats. They are blindfolded, and 1 hat is placed on each of their heads, with the remaining hats hidden in a different room. The king tells them that the first prince to deduce the color of his hat without removing it or looking at it will marry his daughter. A wrong guess will mean death. The blindfolds are then removed. You are one of the princes. You see 2 white hats on the other prince's heads. After some time you realize that the other princes are unable to guess the color of their hat. What is the color of your hat?

Solution:

There are two possibilities – either the hat on your head could be black or white. There are 3 cases:

1) either the king could have chosen 2 black hats and 1 white hat,

2) the king could have chosen 1 black and 2 white hats, and

3) the king could have chosen 3 white hats.

Let us examine these cases 1 by 1.

Case 1: There are 2 black hats and 1 white hat on the princes' heads. In this case, the prince wearing the white hat can see that the other two princes have black caps on their heads and can immediately guess that he is wearing a white cap. This case is obviously not true.

Case 2: There is 1 black hat and 2 white hats on the princes' heads. In this case, any prince wearing the white hat (Prince A) can see that one other prince is wearing a white hat (Prince B), while the third is wearing a black hat (Prince C). Now, if he was wearing a black hat (as in case 1), then the prince with the white hat (Prince B) would immediately have guessed the color of his hat. However, this is not true because the other prince was unable to guess the color of his hat. Hence, it is easy for this prince (Prince A) to guess that he is wearing a white hat. This does not happen, as we know that the princes are unable to guess the color of their hats. Therefore, this case is also not true.

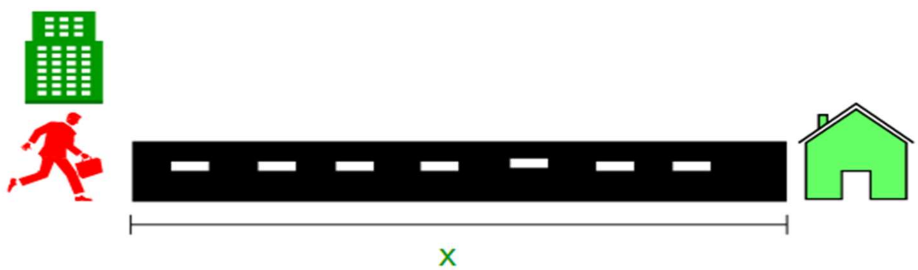
Case 3: This only leaves us with the case where the king chose 3 white hats. Therefore, any of the three princes can, after waiting for a while, safely guess that they are wearing a white hat.

106. Walk to Office

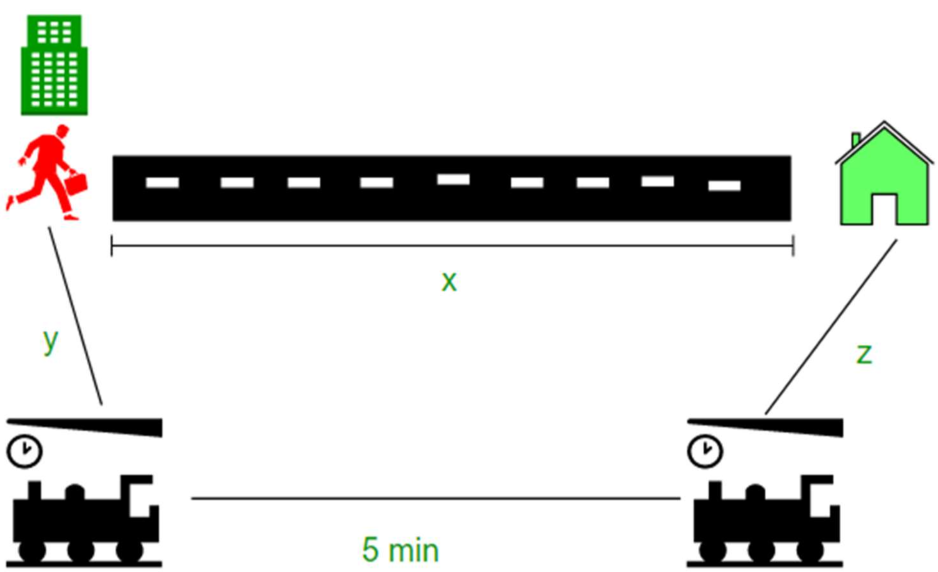
Alex's friend Grace drops her every day to work in the morning to her office, but cannot help to drop her back home in the evening. She walks back home from work every day . But after a few days, As a reward of her sincerity in work, her boss offered her a metro pass. Now she needs to walk only from her office to a nearby metro station and from a station nearby her house to her house . Following this routine, she walks 1/8th times less than before. Assume that she always walks with the same speed, she reached home 15 minutes earlier than usual. If the time she traveled in the metro (apart from her walking) is 5 minutes, what is the total amount of time she used to walk in her older routine (without taking metro)?

Solution:

Let the distance she used to walk from work to her home be 'x' and the time take be 't'



Let the distance she walks in her new routine from her office to a nearby station be 'y' and the ti me she takes be 't1' and the distance from a station nearby her home to her home be 'z' and the time he takes be 't2'



She walks 1/8th times less than before taking the new routine, which implies x-x/8 = z+y ————-{1}

distance = speed * Time

x = v * t

y = v * t1

z = v * t2

From equation {1}

7/8 (v*t) = v*t1 + v*t2

7/8(t) = t1 + t2 ————-{2}

She reached home 15 minutes earlier, which means

t-15 = t2 + t3 + Time taken in the metro

t-15 = t2 + t3 + 5

From equation {2}

t-15=7/8t+5

By solving the above equation, we get

t=160

Therefore, she used to walk **160 minutes** everyday.

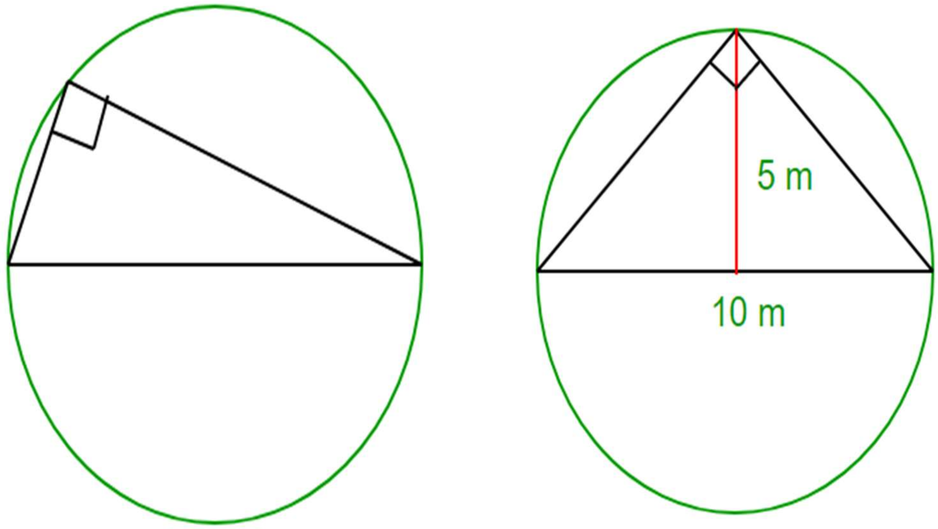
107. Fit Triangle

Sameer asks his friend Kartik a question to test his intelligence.

Sameer – You have been given a right-angled triangle ABC, right-angled at B. The hypotenuse length is 10m and the altitude to the hypotenuse from B is 6m.
Kartik – Go on.
Sameer – Tell me the area of the triangle ABC.
Kartik – 30 sq. Metres.
Sameer – I knew you would say this, but you're wrong my friend. Try some geometry.
Kartik needs your help to answer this question.

Answer: Such a triangle can never exist
Solution: At first it would seem that 30 sq. Meters is the correct answer, using the formula
0.5*Base*Height
=0.5*10*6
=30

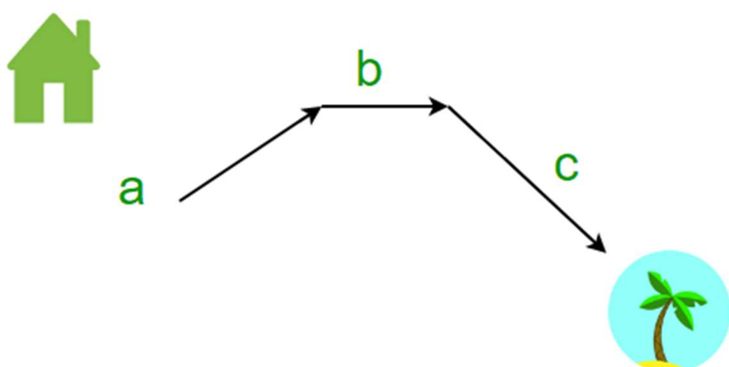
A triangle with given dimensions can never exist. The maximum altitude to the hypotenuse of a triangle can be half of the length of the hypotenuse. (See pic)



So, the maximum altitude can be half of the diameter, which is 10m in this case. Hence the maximum altitude to the hypotenuse can be half of 10m , i.e. 5m only.

108. Walking down the hill

I can walk 3 miles per hour uphill and 4 miles per hour on flat land and 6 miles per hour downhill. If I reached
beach near by me, walking for 50 minutes and I walked back home in 1 hour, can you calculate t he total distance from my house to the beach? (Note: I walk with same uniform speed.)



Solution: This might seem like an incomplete data problem, but it is not.
Let us assume that I walk in total from my home to the beach

a mile's uphill
b miles on flat land
c miles' downhill
The total distance is a+b+c

When walking from beach to my home, uphill will be downhill and vice versa

Therefore,

c miles' uphill
b miles on flat land
a mile's downhill
The total distance is a+b+c

distance/speed = time

By solving the above two, we get two equations

$a/3 + b/4 + c/6 = 50$ minutes
$c/3 + b/4 + a/6 = 60$ minutes
=> $20a + 15b + 10c = 50$

$20c + 15b + 10a = 60$

Now we need the distance $a + b + c$

By adding the above two equations, we get

$30a + 30b + 30c = 110$

Therefore $a + b + c = 110/30 = 3$ and 2/3 miles

109. The Number Game

Ankur and Vijay are fond of playing Number games. In one of the games, Ankur has to choose a number X, such that X belongs to [1, 10000] . Vijay has to guess the chosen number as soon as possible. Ankur will let Vijay know whether his guess is smaller than, larger than or equal to the number. The warning is that Vijay loses the game if his guess is larger than Ankur's chosen number two or more times.

Q1. How to make guesses, and how many guesses are necessary?

Q2. What if Ankur is allowed to pick a very large positive number without any given limits?

Solution:
Both the problems can be treated in the following ways:

Ans1:
When Ankur chooses a number between 1 and n, here n=10000, Vijay should start guessing $\sqrt{n}$, $2\sqrt{n}$, $3\sqrt{n}$, $4\sqrt{n}$, and so on. The first time his guess exceeds Ankur's number, the range of numbers has been narrowed down to $\sqrt{n}$ numbers; he then starts guessing sequentially in that range.
Ans2: If Ankur guesses an arbitrarily large number n, then Vijay may guess 1, 4, 9, 16, 25, and so on, to discover k such that Ankur's number lies between k^2 and (k+1)2. Then guess k2+1, k2+2, k2+3 and so on. On the whole, this requires $O(\sqrt{n})$ steps.

110. Tom and Jerry

Once upon a time Tom and Jerry thought of having a race on a circular track. The diameter of the track was 200 yards.

- They both started from same starting point. Tom being confident did not move until he found jerry has moved 1/8-th of the distance.
- Now Tom starts to move and meets jerry on the circular track. Tom finds that at this point of time, he has moved only 1/6th of total distance. Now the fear of losing the race starts to disturb him.
- He starts wondering how much faster should he move comparatively to win the race. Please help him.

Solution: Tom has to move 85/4 times faster than his current speed to win the race.

Explanation:

Initially, Jerry has traveled 3/24 of the distance of circular track. When Tom and Jerry met, we can find that Jerry had moved a distance of 17/24 of the circular track. We can subtract 7/8th of total distance to 1/6th of total distance.

At this time, Tom had moved a distance of 4/24th distance of circular track. Now we can find that speed of Jerry is 17/4 times faster than that of Tom. So, basically Jerry is 17/4 times faster than Tom. Now, Tom has to move 5/6th of the track while Jerry has only 1/6th left. So, in order to win Tom has to move 5 times faster than jerry's rate which is 85/4 to overcome .

Therefore, if Tom moves at a little faster speed than 85/4 times of previous speed, he would certainly win the race.

111. Correct Number to save life

Gabbar and his **Sambha** are fond of playing number games. But as usual, if Sambha loses the g ame, he dies.

Gabbar and Sambha take their turn to call out a number between 1 to n. They follow the followin g rules while playing the game:

- Anyone of them can start the game by calling a number between 1 to 10.
- The person who's chance in next, should must call a number by increasing the last number by 1 to 10, both inclusive.

Whosoever, from Gabbar and Sambha calls out "101" first wins. Sambha tries to win this game, as it's the run for his life. Can you help him by providing the right strategy to win the game?

Solution: Sambha wants to call 101 first. He can do this if Gabbar calls any integer between 91 and 100 (both included), which will happen if he calls 90. He can go ahead, if Gabbar calls any integer between 80 and 89 (both included), which will happen if he calls 79. If he goes on like this, he would find out that he should call 101, 90 (=101-11), 79 (=90-11), 68 (=79-11), ..., 2.

Reverse, start with 2, let say that Gabbar calls the least one ahead, i.e. 3, then, 13, 14, 24, 25, 35, 36, 46, 47, 57, 58, 68, 69, 79, 90, 91, 101 are called by them alternatively. If incremented by 10 each time, then 101-2 falls at odd factor of 10 and Sambha starting at the odd turn will finish it at odd turn. By the above two explanations you can say that the right strategy to save his life ; he should start the game by calling 2.

112. Diseases and Tests

Dinoo is worried that he might have a rare disease. He decides to get himself tested, and suppose that the testing methods for this disease are correct 99 percent of the time (in other words, if he has the disease, it shows that he does with 99 percent probability, and if he doesn't have the disease, it shows that he does not with 99 percent probability). Suppose this disease is actually quite rare, occurring randomly in the general population in only one of every 10,000 people. **If his test results come back positive, what are his chances that he actually has the disease?**

1. .99
2. .90,
3. .10
4. .01

Solution: The answer is **(d)**, less than 1 percent chance that he has the disease.

Explanation:
After discussing the reasons for the surprising probability (below), you should see how changing the parameters affects the outcome. Would the result be so surprising if the disease were more common? How would the probability change if you allow the percentage of false positives and false negatives to be different?
This fact may be deduced using something called Bayes' theorem, which helps us find the probability of event A given event B, written P(A|B), in terms of the probability of B given A, written P(B|A), and the probabilities of A and B:

$$P(A|B) = P(A)P(B|A) / P(B)$$

$$\Rightarrow P(B) = P(A)P(B|A)/P(A/B)$$

- In this case, event A is the event he has this disease, and event B is the event that he tests positive.
- Thus P(B | not A) is the probability of a "false positive": that he tests positive even though he doesn't have the disease. Here, P(B|A)=.99, P(A)=.0001, and P(B) may be derived by conditioning on whether event A does or does not occur: P(B)=P(B|A)P(A)+P(B | not A)P(not A) OR .99*.0001+.01*.9999. Thus the ratio you get from Bayes' Theorem is less than 1 percent.

The basic reason we get such a surprising result is because the disease is so rare that the number of false positives greatly outnumbers the people who truly have the disease. This can be seen by thinking about what we can expect in 1 million cases. In those million, about 100 will have the disease, and about 99 of those cases will be correctly diagnosed as having it. Otherwise about 999,900 of the million will not have the disease, but of those cases about 9999 of those will be false positives (test results that are positive because of errors). So, if he tests positive, then the likelihood that he actually have the disease is about 99/(99+9999), which gives the same fraction as above, approximately .0098 or less than 1 percent!

113. The Card Game

A blind man is handed a deck of 52 cards and told that exactly 10 of these cards are facing up. How can he divide the cards into two piles, not necessarily of equal size, with each pile having the same number of cards facing up?

Solution:
If the original pile has c cards with f cards facing up, then the blind man divides them into piles of size f and c – f. Then he flips all cards in the pile with f cards. Let's see why it works for c = 52 and f = 10. The blind man would divide the cards into two piles with 10 and 42 cards each. If there are k face-up cards in the 10-card pile, then there must be 10 – k face-up cards in the 42-card pile (because the total number of face-up cards is 10). So, by flipping all cards in the 10-card pile, the number of face-up cards in both piles would become equal to 10 – k.

114. Chocolate love

Priyanka visited a famous monument called "holyghar" located near Himalayas. It was a round structure consisting of 100 steps in spiral stairway to reach top. From top you can have overview of natural beauty surrounding that place. Priyanka thought of reaching the top. She also carried a lot of chocolates with her for kids. In the process of climbing up, with each step a chocolate falls from her bag. When she reaches top, she donates half of the chocolates left with her to small kids. Again, in the process of climbing down a chocolate falls down with each step. She repeats the same process at five holyghars and now she is left with no chocolates. Can you find out the total number of chocolates she had with her initially?

Solution: 9300 chocolates

Explanation: Let us begin from the end. We have fifth holyghar to consider first.

- Priyanka climbed down hundred steps so after donating she must be left with 100 chocolates. Now she donates half of total chocolates so before donating she must be having 200 chocolates.
- Now she loses 100 chocolates while climbing up so in total she must be having 300 chocolates before climbing fifth holyghar.
- Now the same procedure is followed for fourth holyghar. So before climbing fourth she must be having (300+100)*2+100 chocolates which amounts to 900.
- Before climbing third, she must be having (900+100)*2+100 which amounts to 2100. Now before climbing second she must be having 4500 chocolates.
- At last , before climbing first she must be having 9300 chocolates. So initially she had in total 9300 chocolates.

115. Prisoner's Hat

A Police officer caught four criminals. He plays a game with these four men. He lines up three of the prisoners (A, B, C) in one room and the fourth prisoner(D) is placed in a separate room. Each prisoner is given a hat to wear. The officer tells them that there are in total two blue hats and two red hats. If any of them can guess the color of the hat they are wearing right, he promises to set all four of them free. They cannot communicate with each other, the only information is that

- The prisoner A can see the colors of hats worn by prisoner B and prisoner C.
- Prisoner B can ONLY see the color of hat worn by prisoner C.

After a few minutes of silence, one of the prisoner gets the answer right, who is it?

Solution: Prisoner B gets the answer right.
Explanation: Based on the arrangement made by the officer, the only thing that prisoner B can see is prisoner C wearing a blue hat. Prisoner B has no information about the other two prisoner's hat colors.
Then he calculates,

- He can be wearing either a blue hat or a red hat.
- If he is wearing a blue hat, prisoner A should be seeing a blue hat on him (prisoner B) and a blue hat on prisoner C and therefore the remaining two are red hats, he must have declared his answer way before without any thinking, but he is silent. This means that he (prisoner B) is not wearing a blue hat. Hence he figures out that he is wearing a red hat.

116. Toggling Prison Cell

There was a prison consisting of 1000 cells numbered from 1 to 1000.

- Each cell can be marked with '+' or '-'sign. Initially, all cells were marked with '-' sign.
- From days 1 to 1000,the jailor toggles marks on the cell from + to – or vice versa.
- On the i-th day ,the signs on cells that are multiples of i get toggled.
- Now in the process of verification on 1001-th day, all cells marked with + signs are opened.

Can you identify the cell numbers with '+' sign?

Solution: Cell numbers are 1, 4 ,9, 16, 25, 36 and so on.
Explanation:

A cell gets toggled as many times as the number of divisor it has. For example let's take cell number 20, it gets toggled on days 1, 2 ,4, 5, 10 and 20.

- Now we can see that divisors come in pairs like 20=1*20=2*10=4*5. We can see that total number of divisor is even. But this trend is not followed if the number is a perfect square.
- In perfect square , total number of divisors is odd. We see that cells are initially marked with – sign and only cell numbered as perfect square gets changed to + sign as it is having odd number of divisors.

These cells are **1, 4 ,9, 16,25,36,49 and so on.**

117. The Better Choice

Many students applied for a technical job for a month(April) but only two among them successfully completed the technical rounds. It was time for the final Interview. The interviewer asked both the students whether they would like to have 10 crores rupees for the month or, Re. 1 on day 1, Rs. 2 on day 2, Rs. 4 on day 3 , doubling up everyday till the last day of the month. Student 1 chose 10 crore rupees. Student 2 chose the other option.
Which student made a better choice and how much was the profit?

Solution: Student 2 made a better choice.
Explanation: Student 1 chose 10 crore rupees. Congratulations to that student! It is a lot of money but about 97.4 crore rupees lesser than what student 2 had opted for.
Student 2 will get Re. 1 on day 1, Rs. 2 on day 2, Rs. 4 on day 3 ....The amount sequence is a geometric progression – 1,2,4,8,16,.....and so on.
Total no. of terms = 30 (April has 30 days)
G.P. summation formula for n terms having first term a and common ratio r : a((r^n) -1) / (r-1)

Here a= 1 , r=2, n=30
Sum = (2^30 -1)/(2-1) = 1073741823

Profit = 1073741823 – 10,00,00,000 = 97,37,41,823

118.The lost bus Number

Jay was an old friend of Rakesh and was coming to visit him from a small town. Jay came over late. When Rakesh asked him the reason, Jay told him that when he was coming to the city in the bus, he had placed his luggage under his seat. While getting off, he had forgotten to take back the luggage and by the time he had realized, the bus had left. So he went to a police station to report about it, which took him time. Rakesh inquired what happened next, to which Jay replied that he does not remember the bus number but there was a certain peculiarity about it – the bus number was a perfect square and when turned upside down, then it was also a perfect square! Jay requested his friend Rakesh to help him.
Rakesh quickly phoned the bus company and came to know they had only 500 buses numbered from 1 to 500. Using this information, Rakesh deduced the bus number within a minute. Can you tell what was the number?

Solution: Bus number was 196.
Explanation: We know that the only digits which can be turned upside down and still be read as a digit are 0, 1, 6, 8 and 9. The digits, 0, 1 and 8 remain 0, 1 and 8 when turned upside down, but 6 becomes 9 and 9 becomes 6. Therefore, the possible numbers on the bus are 9, 16, 81, 100, 169 and 196. Out of these, 196 is the only number which becomes a perfect square when turned over because 961 is the perfect square of 31. Hence, 196 is the bus number.

119. Magical Matrix

Two friends Satyam and Ankit decides to play a game. They have 9 cards lying face up with numbers 1 to 9 written on them. They have to start picking up these cards alternately, without replacement. The person with exactly 3 cards which adds up to 15 wins the game. Satyam is given first chance to pick up a card . Does Satyam have a winning strategy?

Solution: No
Explanation: We see that there are eight subsets of {1,9} that sums up to 15. These are:
{1, 5, 9}, {2, 8, 5}, {3, 5, 7}, {4, 5, 6}, {1, 6, 8}, {2, 4, 9}, {2, 7, 6} and {3, 8, 4}
We can try to form a magic square which should be able to derive all possible combinations that sums up to 15.
8 1 6
3 5 7
4 9 2
Here we see each row, column or diagonals sums up to 15. These rows, columns and diagonals represents all the possible ways the number fifteen can be arrived at.
We can observe it's like playing a tic-tac-toe on the magic square. We also know one cannot guarantee winning in this game. At maximum, we can have strategy of not losing the game.

120. Tic Tac Toe revisited

Ank and Mini play a game of tick-tack-toe. In this game, the players try to get three circles or three crosses in a row (horizontal, vertical, or diagonal).
They follow the following rules:

- A player always tries to win: if a player can place his own symbol (X or O) in a row that already contains two of his own symbols, he will do so.
- A player always tries to avoid that his opponent wins: if a player can place his own symbol (X or O) in a row that already contains two of the symbols of his opponent, he will do so.

Of course, the first rule has precedence over the second rule, because the game can be won in this way.
In the game shown on the right, six moves have been made. Ank plays with crosses (X) and Mini plays with circles (0). However, we do not know who started the game. **Who will win the game?**

O	O	
O	X	
X	X	

Solution:
It is clear that if we know who made the sixth move, we also know who can make the seventh move and wins. If Mini (circles) has made the sixth move, there are three possibilities for the situation after five moves:

Possibility 1

O		
O	X	
X	X	

Possibility 2

	O	
O	X	
X	X	

Possibility 3

O	O	
	X	
X	X	

Based on the rules of the game, only possibility 1 could have resulted in the situation after six moves. In that case, there are three possibilities for the situation after four moves:

Possibility 1

O		
O	X	
	X	

Possibility 2

O		
O		
X	X	

Possibility 3

O		
O	X	
X		

Based on the rules of the game, Ank (crosses) would have made the winning move, which however did not happen. From this, we can conclude that Ank did not make the fifth move and Mini did not make the sixth move. Therefore, Ank must have made the sixth move and Mini can make the seventh, winning move!

To check that Ank could indeed have made the sixth move, we look at the following three possibilities after five moves:

Possibility 1

O	O	
O		
X	X	

Possibility 2

O	O	
O	X	
X		

Possibility 3

O	O	
O	X	
	X	

Based on the rules of the game, only possibility 3 can result in the situation after six moves. Therefore, Ank could indeed have made the sixth move.

Conclusion: Ank has made the sixth move, and Mini will make the seventh move and win.

121. 100 People in a circle with gun puzzle

100 people standing in a circle in an order 1 to 100. No. 1 has a sword. He kills the next person (i.e. No. 2) and gives the sword to the next (i.e. No. 3). All people do the same until only 1 survives. Which number survives at the last?
There are 100 people starting from 1 to 100.

Solution: **73rd** person will survive at last
Explanation:
Here, we can define an array with 100 elements with values from 1 to 100.

- No.1 has a sword. He kills next person (i.e. no. 2) and gives sword to next to next (i.e no. 3).
  We have taken array element as a person. 1st person kills the next. So, starting from 1, we'll remove next element i.e. 2.
- Then first person gives sword to next to next i.e. 3. That person will also kill next person and this continues. Means, in array, we need to start with 1 and remove the every other (alternate) element till 100. (all the even numbers will be removed and we'll be left with odd numbers only in array).

Round 1: 1, 3, 5, 7, 9, 11, 13, 15, 17, 19, 21, 23, 25, 27, 29, 31, 33, 35, 37, 39, 41, 43, 45, 47, 49, 51, 53, 55, 57, 59, 61, 63, 65, 67, 69, 71, 73, 75, 77, 79, 81, 83, 85, 87, 89, 91, 93, 95, 97, 99
Round 2: 1, 5, 9, 13, 17, 21, 25, 29, 33, 37, 41, 45, 49, 53, 57, 61, 65, 69, 73, 77, 81, 85, 89, 93, 97
Round 3: 1, 9, 17, 25, 33, 41, 49, 57, 65, 73, 81, 89, 97
Round 4: 9, 25, 41, 57, 73, 89
Round 5: 9, 41, 73
Round 6: 9, 73
Round 7: 73

To avoid the manual calculation done above, here the general algorithm :
Step 1 : For a given value of N, find the "Power of 2" immediately greater than N. Let's call it P
Step 2 : Subtract N from (P-1). Lets call it M, i.e, M = (P-1)- N
Step 3 : Multiply M by 2. i.e M*2
Step 4 : Subtract M*2 from P-1. Let's call it ans, i.e, ans = (P-1) – (M*2)
So, the person with number "ans" will survive till last.

122. Different Pairings
Joey has to arrange 2N sandwiches which are wrapped by different color wrapper in N pairs such that he can feed his N girlfriends (A hypothetical situation it is where we have to ignore the fact "JOEY DOESN'T SHARE FOOD "). He has to serve them for 2N-1 Days. Girls don't like repeated pair of color wrapper of their sandwiches.
Design an algorithm for joey so that for 2N-1 days no pair would be same.

Hint: One can solve problem by using 2*N table.
Solution:
Here is one of the way to generate 2N-1 sets of different pairs efficiently. For convenience, number the different color from 1 to 2N and place these numbers in a 2N table. The pairs for the first set are given by the columns of this table. To generate the next 2N –2 sets, rotate—say, clockwise—all the entries except 1 in the last generated table.

Figure shows the example for N = 3. The entry 1 is fixed and all other entries are rotated clockwise.

1	2	3
6	5	4

1	6	2
5	4	3

1	5	6
4	3	2

1	4	5
3	2	6

1	3	4
2	6	5

123. Interesting MCQ

There is only one correct answer to this question. Which answer is this?

A. Answer A

B. Answer A or B

C. Answer B or C

Geeks are stuck at this question. Help them out.

Solution: C

Explanation: If answer A would be correct, then answer B ("Answer A or B") would also be correct. If answer B would be correct, then answer C ("Answer B or C") would also be correct. This leads to the conclusion that if either answer A or answer B would be the correct answer, there are at least two correct answers. This contradicts with the statement "there is only one correct answer to this question". If answer C would be correct, then there are no contradictions. Therefore, the solution is answer **C.**

124. Inverted Matrix

You have been given the following matrix:

18	99	86	61

Fill in the matrix, in such a way that the sum of the numbers in each row (horizontally, vertically, and diagonally) is 264, even if you hold the matrix upside down. You are only allowed to use the digits 1, 6, 8, and 9, and each number may appear only once in the matrix.

Solution: The possible solutions are:

18	99	86	61
81	66	19	98
69	88	91	16
96	11	68	89

18	99	86	61
66	81	98	91
91	16	69	88
89	68	11	96

You can see that any two digit number formed by 1,6,8, and 9 , if inverted will also be a valid number. Now, the task becomes easy. Start by trying to form two digit numbers, and different sets by selecting any 4 numbers from them which sums to 264.

125. Chain Link Puzzle

You have five pieces of chain, each consisting of three links. You want to make one long chain of these five pieces. Breaking open a link costs 1 Rs, and welding an open link costs 3 **Rs.**
Is it possible to make one long chain of the five pieces, if you have just **15 Rs?**

Solution:
Let us name the chains as **1, 2, 3, 4, 5** each having three links.
Take chain **1** and break open all three links: 1×3=**3 Rs.**
Take one open link to connect chain **2** and **3**: **3 Rs.**
Take another open link to connect chain **3** and **4**: **3** Rs
Take third open link to connect chain **4** and **5**: **3 Rs.**
Now you have one long chain ready in only **12 Rs.**

126. Four people on a Rickety Bridge

Four people need to cross a rickety bridge at night. Unfortunately, they have one torch and the bridge is too dangerous to cross without a torch. The bridge can support only two people at a time. All the people don't take the same time to cross the bridge. Time for each person: 1 min, 2 mins, 7 mins and 10 mins. What is the shortest time needed for al four of them to cross the bridge?

Answer: 17 mins

Steps:

1 and 2 cross the bridge and move to the other side.

Now 2 comes back with the torch from the other side.

7 and 10 cross the bridge and 2 remains to this side only.

Now 1 comes back with the torch from the other side.

At last, 1 and 2 crosses the bridge and we are done.

Total time taken = 2 + 2 + 10 + 1 + 2 = 17 mins

127. What will be angle between minute hand and hour hand, when it is exactly 3:15?

At 3:15 the minute hand will be perfectly horizontal pointing towards 3, whereas the hour hand will be moving towards 4. Also, the hour hand must have covered 1/4 of angle between 3 and 4. The angle between two adjacent digits is 360/12 = 30 degrees. Hence, 1/4 of it is 7.5 degrees.

OR

It is very simple but tricky, just calculate the 25% of 30 degree which is 7.5.