Puzzles

Puzzles are asked in interviews to test how fast and out-of-the-box a student thinks. They are used to test a student's logical reasoning capabilities and how he/she can think under pressure.

In this section, you will find some of the most commonly asked puzzles in interviews. Try to solve them yourself before you look at the answers.

Q.1 Suppose there are 25 horses. There is a race course in which we can race 5 horses at a time. What is the minimum number of races that need to be conducted in order to determine the first, second and third fastest horses among the 25?

Show/Hide Answer

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

In the image, each row represents one race of 5 horses. For convenience, let us name the horses using row and column index. Therefore, the first race(row 1) was contested between the horses R1C1, R1C2, 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 won 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 ocmes 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 fastest 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.

Q.2 You 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 interger missing. You have to write a code to identify the missing integer. Only the logic for the code is required and not the actual code.

Show/Hide Answer

We know that the sum of all the numbers from 1 to 50 is (n*(n+1)/2 => 50*51/2 = 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.

Q.3 You have been given 12 identical looking boxes. All but one weigh the same (One of the boxes weighs slightly lesser than the other 11). You also have a weight balance, using which you can compare two sets of weights. If you place one set of weights on one side and another set on another side, you can determine which is heavier than the other. What is the minimum number of iterations required to determine which box weighs lesser than the others?

Show/Hide Answer

Divide the weights into groups of 4. Let's call these groups A, B and C. Now, we compare the groups A and B. If the weight of group A is less than that of group B, then the lesser weight belongs to group A. If the weight of group B is less than that of group A, then the lesser weight belongs to group B. If both A and B are of equal weight, then the lesser weight belongs to group C. Now, after 1 iteration, the problem is reduced to finding the lesser weight from among 4 weights.

Now, we simply divide the 4 remaining weights into groups of two and weigh them. This will give us the group of two which contains the lesser weight. By comparing the remaining two weights, we can identify the lesser weight. In this way, in 3 iterations, we are able to identify the weight which was lesser than the other 11.

By the way, even if you initially divide the boxes in 2 groups of 6 each, then also you can solve the puzzle in 3 iterations. Think how?

Q.4 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 requred 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?

Show/Hide Answer

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.

Q.5 You are given a rope which takes 60 minutes to burn completely. Note that the rope is nonhomogenous, which means the burn speed is different for different parts of the rope (first half may burn in 5 mins and the next half may take 55 mins). Given two such ropes, how can you measure 45 minutes?

Show/Hide Answer

Light 1 rope from both ends and the other rope from 1 end only. The first rope finishes burning in 30 minutes. Now, the second rope has 3o minutes of burn time left. Now, light the other end of the second rope. This rope finishes burning 15 minutes after the first rope. The total burn time for both the ropes is, therefore, 30 + 15 = 45 minutes.

Q.6 There is a shopkeeper who sells chocolates. He keeps his chocolates in boxes such that, whenever a customer comes and asks for a specific number of chocolates between 1 to 100, he can directly pick out some boxes of chocolates and give it to the customer. The shopkeeper should not have to transfer any chocolate to or from any box. What are the minimum number of boxes that are required in order to be able to achieve this?

Show/Hide Answer

Let us approach this problem, from the beginning. If a customer comes in and asks for 1 chocolate, then the shopkeeper should be able to give it to the customer in a box. Hence, there should definitely be a box containing 1 chocolate. Similarly, it is required to have a box containing 2 chocolates. Now, if a customer comes in and asks for 3 chocolates, the shopkeeper can give him the first and second boxes. Therefore, there is no need for a box with 3 chocolates. However, he would need a box with 4 chocolates. With the boxes, containing 1(first box), 2(second box) and 4(third box) chocolates, the shopkeeper can give out chocolates in any number from 1 to 7 in this manner:

For 1 chocolate: only 1st box
For 2 chocolates: only 2nd box
For 3 chocolates: 1st and 2nd boxes
For 4 chocolates: Only 3rd box

For 5 chocolates: 1st and 3rd box
For 6 chocolates: 2nd and 3rd boxes
For 7 chocolates: 1st, 2nd and 3rd boxes

For 8, again the shopkeeper would need a new box (fourth box). Now, with the four boxes, the shopkeeper can cover all the options from 1 to 15. For 16, again he would need a box (fifth box). Using these five boxes, the shopkeeper would be able to cover all the options from 1 to 31. The sixth box would contain 32 chocolates, using which the shopkeeper would be able to cover all options from 1 to 63. The seventh and final box would contain 64 chocolates. Using these seven boxes, the shopkeeper can cover all the options from 1 to 100.

If you look more closely, you will realize that the number of chocolates required to be put into the boxes are the first seven powers of 2 starting from 0.

Q.7 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 preists 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?

Show/Hide Answer
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 atleast 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.

Q.8 5 pirates of different ages have a treasure of 10 gold coins. On their ship, they decide to split the coins using this scheme:
The oldest pirate proposes how to share the coins, and ALL pirates (including the oldest) vote for or against it.
If 50% or more of the pirates vote for it, then the coins will be shared that way. Otherwise, the pirate proposing the scheme will be thrown overboard, and the process is repeated with the pirates that remain.
Assuming all the pirates are rational and intelligent, what is the number of coins the eldest pirate will get?

Show/Hide Answer
Case 1- Let us solve this for only 2 pirates: In this case, the elder pirate (pirate 2) will choose to keep all the coins for himself and not give a single coin to pirate 1. Since pirate 2 alone constitutes 50%, his proposal will be accepted. Distribution: (pirate 1, pirate 2) : (0,10)

Case 2- In case of 3 pirates: In this case, the eldest pirate (pirate 3) needs 1 more vote apart from his own to get majority. He knows that if his proposal is not accepted and he is thrown overboard, pirate 1 would get nothing (see case 1). Therefore, he offers pirate 1 a single gold coin. Pirate 1 knows that something is better than nothing and therefore accepts this proposal. Distribution: (pirate 1, pirate 2, pirate 3) : (1,0,9)

Case 3- In case of 4 pirates: In this case, the eldest pirate (pirate 4) again needs 1 more vote apart from his own to get 50% votes. He knows that if his proposal is not accepted and he is thrown overboard, pirate 2 would get nothing (see case 2). Therefore, he offers pirate 2 a single gold coin. In this case, pirates 2 and 4 vote for this proposal and it is accepted. Distribution: (pirate 1, pirate 2, pirate 3, pirate 4) : (0,1,0,9)

Case 4- In case of 5 pirates: In this case, the eldest pirate (pirate 5) again needs 2 more votes apart from his own to get majority votes. He knows that if his proposal is not accepted and he is thrown overboard, pirates 1 and 3 would get nothing (see case 3). Therefore, he offers pirates 1 and 3 a single gold coin each. In this case, pirates 1,3 and 5 vote for this proposal and it is accepted. Distribution: (pirate 1, pirate 2, pirate 3, pirate 4, pirate 5) : (1,0,1,0,8)

Hence, the eldest pirate gets 8 gold coins.

Q.9 You are given 10 boxes of balls (each ball weighing exactly 100gm). However, one of the boxes contains defective balls (each one of the defective balls weighing 90gm). You have an electronic weighing machine and only one chance to use it. How will find out which box has the defective balls?

Show/Hide Answer
In order to solve this problem, we have to make use of the fact that you know exactly what each good ball is supposed to weigh and what each defective ball is supposed to weigh. The trick to solving this problem is to take a different number of balls from each box. Suppose we pick 1 ball from box 1, 2 balls from box 2, and so on. In total we will have 55 balls. If none of these balls were defective, then the total weight of these balls would be 5500gm.

Now, if box 1 has defective balls, then the total weight of the 55 balls should be 10gm less than expected as the group would contain only one ball weighing 90gm. If box 2 has defective balls, then the total weight should be 20gm less than expected as there are two balls weighing 90gm. In this manner, the difference between the weights 55 balls and 5500 gives us the number of balls in the group that are defective, which eventually, tells us which box has the defective balls.

Q.10 On one side of a bridge, there are 4 people. They need to cross the bridge. However, it is very dark and they have only 1 flashlight. Therefore, a maximum of two people can cross the bridge at a time with the flashlight. Person A takes 1 minute to cross the bridge, person B takes 2 minutes to cross the bridge, person C takes 5 minutes and person D takes 10 minutes to cross the bridge. What is the least time in which all 4 of them can cross the bridge?

Show/Hide Answer

Since, we want all of them to cross the bridge in the least possible time, we have to make the slowest two people cross the bridge together. However, once they have crossed the bridge, one of them would be required to bring the flashlight back, so that others can cross. This would be time consuming.

Therefore, the solution is to first make A and B cross the bridge (2 minutes). Then A comes back with the flashlight (1 minute). Now, C and D cross the bridge, while A stays back on this side (10 minutes). Now, B comes back with the torch (2 minutes) and then A and B both cross with the torch (2 minutes). Therefore, it would take a total of 17 minutes for all 4 of them to cross the bridge.

By giving it a little thought, you can arrive at the generic formula for such problems (total time = a+3b+d). Note that this time is independent of c, of the time taken by the second slowest person.

Q.11 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 on, 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?

Show/Hide Answer
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.

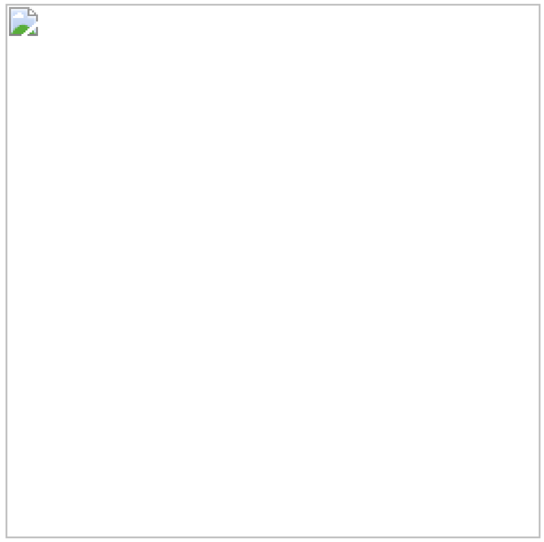
Q.12 Three co-workers (A, B and C) would like to know average of their salaries. However, none of them must come to know the individual salary of any of his co-workers. How can they compute the average without disclosing their individual salaries to each other?

Show/Hide Answer
First, A adds a random number to his salary, writes the total on a piece of paper and passes it to B. Now, B adds a random number to his salary, adds that to the number passed on by A and passes the total to C. C repeats the same process (adds a random number to his salary, adds the total to the number passed on by B and passes it back to A). Now, the total number which is passed by C consists of the salaries of A, B and C and the random numbers each of them had added.

Now, A takes the number, subtracts his random number from it, and passes it onto B. B then subtracts his number and passes it onto C. C subtracts his number and tells the result to A and B. The remaining number is now the sum of the salaries of A, B and C. They divide this number by 3 to get the average salary.

Q.13 Three ants stand at the corners of an equilateral triangle. Each ant randomly picks a direction and starts to move along the edge of the triangle. What is the probability that none of the ants collide?

Show/Hide Answer
Each ant can either start moving towards its left or its right. Let us examine all the cases one by one. Suppose all three ants start moving in left direction. Then, no collision occurs. If ants 1 and 2 start moving in the left direction, and ant 3 starts moving in the right direction, then two of the ants will collide. Similarly, we can list out all the possible scenarios and check when the ants will collide.



We can see that, out of the 8 possible scenarios, there are 2 scenarios in which the collisions would not occur, that is, when all the ants either start moving to the left or all of them start moving to the right. Therefore, the probability of no collisions is 2/8 or 1/4.

Q.14 Find the total number of squares on a standard 8-by-8 chess board.

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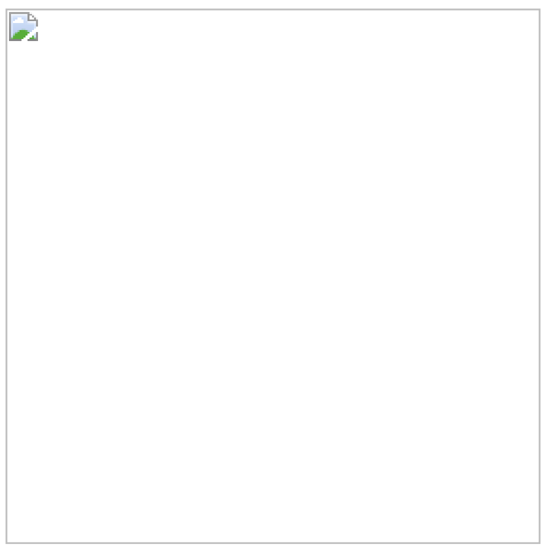
On a standard 8-by-8 chess board, we have squares of different sizes. The smallest squares are the (1 x 1), which occupy 1 tile each. There are 8 such squares in each row and in each column. Hence, there are 8 x 8 = 64 such squares.

Next, let us look at the (2 x 2), which occupy 4 tiles each. There are 7 such squares in each row and in each column (see image below). Hence, there are 7 x 7 = 49 such squares.



Next, we solve for the 3 x 3 squares, which occupy 9 tiles each. There are 6 such squares in each row and column. Hence, there are 6 x 6 = 36 such squares on the board.

Similarly, we can find the number of squares of each size. The following table shows number of squares of each size.

Therefore, we have a total of 204 squares on a chess board.

Q.15 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 prince's are unable to guess the color of their hat. What is the color of your hat?

Show/Hide Answer

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.

Q.16 There are twenty coins on the table out of which ten are currently showing heads and tens are currently showing tails. You are sitting at the table with a blindfold and gloves on. You are able to feel where the coins are, but are unable to see or feel their orientation. You are required to create two sets of coins such that each set has the same number of heads and tails as the other set. How do you create two even groups of coins with the same number of heads and tails in each group?

Show/Hide Answer

First, we divide the coins into two groups of 10 each, irrespective of their orientation. Now, suppose the first group has x number of coins which are oriented as heads. Then, the group has 10-x number of coins which are oriented as tails. Conversely, the second group has 10-x coins oriented as heads and 10-(10-x) = x coins oriented as tails.

Now, all we need to do is to flip all the coins in the second group so that it has x coins oriented in the heads direction and 10-x coins oriented in the y direction. Now, both the groups have an equal number of coins oriented as heads and tails.

Q.17 A man is at a river with a 9 liter bucket and a 4 liter bucket. He needs exactly 6 liters of water. How can he use both buckets to get exactly 6 liters of water?

Show/Hide Answer

The man can achieve this using the following steps:

First, the man fills the 9 liter bucket completely.
Then, he pours water from this bucket to the 4 liter bucket. Then, he would be left with 5 liters of water in the big bucket.
Now, he throws away the water from the 4 liter bucket and again fill it using the water from the big bucket. Now, he is left with 1 liter of wated in the big bucket.
He now throws away the water from the small bucket and transfer the 1 liter wated from the big bucket to the small bucket. Now, he has 1 liter of water in the small bucket.
He then again fills the big bucket with 9 liters of water. This time, he transfers water into the smaller bucket without throwing away the 1 liter of water already present in it. He stops pouring water when the small bucket is full.
Now, the smaller bucket has 4 liters of water, and the big bucket has 6 liters of water

This is how the man can measure 6 liters of water using the two buckets.

Q.18 Suppose you want to watch a youtube video and you have a very slow internet connection. Then, in order to watch the complete video uninterrupted, you would want to buffer a part of it before you start watching. What is the minimum percentage of video that you need to buffer before you start playing the video, so that you can watch the video uninterrupted? Assume the download speed (same as buffer speed) to be i, the size of the video to be s and the total play time of the video is t.

Show/Hide Answer

Suppose, we start playing the video after x% has buffered. Now, in order to watch the video uninterrupted, we require that the time taken to play the video is same as the time taken to buffer (l00-x)% of the video.

Now, the time taken for the video to play is t. x% of the video is xs/100. Hence, (s-xs/100) of the video needs to be buffered. This will take (s-xs/100)/i time.These two times should be same.

Hence, t = s(1 - x/100)/i. This gives us x = 100(1 - it/s)%.

Q.19 You have a block weighing 40kg and have tools to divide it as you want. How do you cut it into 4 pieces such that using those 4 pieces and a two-way balancing pan, you can measure any weight from 1kg to 40kg (only whole numbers i.e. 4,6,8,22, etc.)?

Show/Hide Answer

The answer for this question is 1,3,9 and 27.

Let us see how we can measure different weights from 1 to 40 using these pieces. Obviously, we can measure a piece weighing 1 kg by directly comparing it with the 1 kg piece. We can measure a weight of 2 kg by placing it with the 1kg piece and comparing with the 3kg piece.

Some more examples: 18 = 27 - 9, 29 = 27 + 3 - 1

Q.20 There is an island with infinte grass and vegetation. The island is inhabited by 1 sheep and n number of lions. The lions can survive by eating the sheep or vegetation, but obviously they prefer to eat the sheep. The catch is that, when a lion eats the sheep, it gets converted into a sheep itself and then can in turn be eaten by other lions. The lions want to eat the sheep, but not at the risk of being eaten themselves. What is the number n for which the sheep will be safe?

Show/Hide Answer

Case 1: Assume there is only 1 lion. In this case, if the lion eats the sheep, it becomes the sheep and there are no lions to eat it. Therefore, in this case, the sheep is not safe.

Case 2: Assume there are 2 lions. In this case, if, either of the two lions eat the sheep, it will get converted into a sheep and there will still be a lion left (same as case 1). This lion would then eat the new sheep and become a sheep itself. Therefore, in this case, neither of the two lions would eat the sheep and the sheep would be safe.

Case 3: Assume there are 3 lions. In this case, if any one of the three lions eat the sheep, it will get converted into a sheep and there will be 2 lions left (same as case 2). We know from case 2 that this is a stable state where neither of the two remaining lions eat the sheep. Therefore, in this case, one of the lions will definitely eat the sheep and the sheep is not safe.

Case 4: Assume there are 4 lions. In this case, if any one of the three lions eat the sheep, it will get converted into a sheep and there will be 3 lions left (same as case 3). We know from case 3 that this the lion which ate the sheep will itself be eaten. Therefore, no lion would eat the sheep and the sheep would be safe.

Similarly, it can be seen that, for every case where n is odd, the sheep would be in danger and for every case where n is even, the sheep would be safe.

Q.21 Two cars are moving on a circle in opposite directions (one clockwise and the other anti-clockwise) with speed of 10m/s and 15m/s respective. There is a bee at the centre of the circle. At t=0, the bee starts flying towards the first car at a constant speed of 5m/s, touches it and starts flying towards the 2nd car. It touches the 2nd car and again starts flying towards the first car and so on. This goes on for 1 hour. If the radius of the circle is 500 Metres; what would be the total distance covered by the bee in the to & fro motion by the end of one hour.

Show/Hide Answer
18Kms (5m/s, which is the speed of the bee, multipled by 1 Hr (3600 seconds))

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(content.php?topic_id=163&module_id=10&course=finishing_school)