Mathematics Interview Questions

1. An ant starts at one vertex of a solid cube with side of unity length. Can you calculate the distance of the shortest route the ant can take to the furthest vertex from the starting point?
2. Can you show that if n is an integer, n^3 - n is divisible by 6?
3. A telephone company has run a very long telephone cable all the way round the middle of the earth. Assuming the Earth to be a sphere, and without recourse to pen and paper, can you estimate how much additional cable would be required to raise the telephone cable to the top of the 10m tall telephone poles?
4. A thin hoop of diameter d is thrown on to an infinitely large chessboard with squares of side L. What is the chance of the hoop enclosing two colours?
5. What is the volume of the largest cube that fits entirely within a sphere of unity volume?
6. What is the area if an n-sided regular polygon inscribed within a circle of radius r?
7. For a circle inscribed in inside a regular n-sided polygon, what is the minimum n so that the ratio of the area of part outside the circle to the area of the circle is less than or equals to 1/1000?
8. I have a chess board, but two of the corner squares have been removed. Is it possible to cover the board with dominoes if the two squares removed are adjacent corners? What if they were diagonally opposite corners?
9. If a cannon is pointed straight at a monkey in a tree, and the monkey lets go and falls towards the ground at the same instant the cannon is fired, will the monkey be hit?
10. Can you prove by contradiction that when z^2 = x^2 + y^2 has whole number solutions that x and y cannot both be odd?
11. What is the square root of I?
12. If each face of a cube is coloured with one of 6 different colours, how many ways can it be done?
13. If you have n non-parallel lines in a plane, how many points of intersection are there?
14. If we have 25 people, what is the likelihood that at least one of them is born each month of the year?
15. What makes a tennis ball spin as it's travelling through the air?
16. If (cos(x))^2 = 2sin(a), what are the intervals of values of a in the interval 0 ≤ a ≤ pi so that this equation has a solution?
17. If a round table has n people sitting around it, what is the probability of person A sitting exactly k seats away from person B?
18. Imagine a ladder leaning against a vertical wall with its feet on hte groun. The middle rung of the ladder has been painted a differnt colour on the side, so that we can see it when we look at the ladder from side on. What shape does that middle rung trace out as the ladder falls to the floor?
19. You have n points on the plane. Can you show me a way to connect them in a closed circuit using line segments, so that the circuit doesn’t intersect itself?
20. I have the parabola y=x2. The points A, B, C, all lie on the parabola, with B being the origin. A lies to the left of B, while C lies to the right. Where can I put A and C so that the triangle ABC is equilateral?
21. How many pieces of pizza can I get from n cuts?
22. There are 40 people in a room. What is the probability that 2 of them share a birthday?

23. My friend and I are playing a game where we take it in turns to eat hot peppers. 6 of the peppers are mild, and 2 are hot. I want to avoid eating the hot peppers. What is the probability that I eat a hot pepper if I go first? Is it a disadvantage for me to go first? What if there were instead 7 mild peppers and 1 hot pepper?
24. How many 0s does the number 30! have?
25. How long does a mirror have to be for you to see your whole body?
26. If you have n non-parallel lines in a plane, how many points of intersection are there?
27. I am an oil baron in the desert and I need to deliver oil to four different towns which happen to lie on a straight line. In order to deliver the correct amounts to each town, I must visit each town in turn, returning to my warehouse in between each visit. Where should I position my warehouse in order to drive the shortest distance possible? Roads are no problem since I have a friend who is a sheikh and will build me as many roads as I like for free.
28. I drove to this interview at 50 km/h and will drive back at 30km/h because of the traffic. What is my average speed
29. How would you prove that any integer can be expressed factors or is itself a prime number?
30. You are a knight in the castle of Camelot, seated at the round table with 9 other knights (making there 10 people at the table in total). You are all about to shake hands with exactly 1 other person. However, it is an understood custom in Camelot that no arms should cross when you do this. How many ways can you shake hands?