

Question 1: Name a disaster that was caused by computer hardware or software failure. How do you define “disaster” and “failure”?

On April 30 2014, the air traffic control system of LAX airport crashed because of running out of memory. This is due to a U-2 spy plane flew over southwestern US without information about altitude in its flight plan, and a controller entered an approximately number of 60000 ft. It caused the system to calculate every possible path to prevent the U-2 to collide with other planes under that altitude and soon ran out of memory. This accident continued for over an hour, and hundreds of flights were canceled or delayed and the cost of its damage is around 2 billion US dollars.

Failure is caused by errors, and hence a system or some component is unavailable to perform its normal function.

Disaster is large-scale failure, and it can damage things and cause a large amount people to get hurt or lose considerable money.

Question 2: Which of these patterns is more random?

I think the pattern on the right is more random. On the left hand side, some dots connect to each other while the pattern on the right don't. Which means they are distributed more randomly.

Question 3: Which do you think is more likely: the event that everyone in this class was born in the first half of the year or the event that at least two people were born on the same day of the year?

I already know there are about 30 people in the class,

and the probability of the first event is $\left(\frac{181}{365}\right)^{30} = 7.27 \times 10^{-10}$

the probability of the second event is $1 - \frac{365}{365} \times \frac{364}{365} \times \frac{363}{365} \dots \times$

$$\frac{336}{365} = 0.706316$$

so at least two people were born on the same day of the year is much more likely.

Question 4: In a game show, there is a prize behind one of 3 doors with equal probabilities. You pick Door A. The host opens Door B to reveal that there is no prize behind

**it. The host then gives you a chance to switch to Door C.
Is it better to switch or to stick to your choice?**

We can put it another way -- What is behind Door A?
After that, we can separate this problem into 2 parts.

1st case: Prize is behind door A
 $P \{\text{Prize is behind door A} \mid (\text{a prize is behind 3 doors})\} = 1/3,$
If switch, I will definitely get nothing.

2nd case: Prize is NOT behind door A
 $P \{\text{nothing behind door A} \mid (\text{a prize is behind 3 doors})\} = 2/3,$
If switch, I will definitely get the prize.

There is 2/3 chance to get the prize if switch so it is better.

Question 5: Does this photo depict a mishap due to design flaw, implementation bug, procedural inadequacies, or human error?

As far as I am concerned, this mishap is a human error. There must be a manual for the fork truck. It would state that how much weight can this truck lift, what is the maximum height it can lift, and how to keep balance of it. I think the operator didn't follow the standard operation procedure and caused the fork truck to rollover.

Question 6: Name an emergency backup system (something not normally used unless another system fails) that is quite commonplace

In commercial jet airplanes, there is a small emergency electrical generator called ram air turbine, also known as RAT. RAT is usually placed inside the bottom of a plane. When all the engines and auxiliary power unit fail in the air, RAT will mount and use the wind to generate power for systems such as hydraulic system of landing gears and other vital instrument in the cockpit.

Question 7: Which is more reliable: plane X or plane Y that carries four times as many passengers as plane X and is twice as likely to crash?

In my opinion, plane X is more reliable. The main job of the plane is to carry

people and cargo to their destination safe and sound. If a plane is likely to crash, it is not reliable.

Question 8: Which is more reliable: a 4-wheel vehicle with one spare tire or an 18-wheeler with 2 spare tires?

Both vehicle's driver need to pullover and can no longer drive any farther whenever they have a flat tire.

Assume that the probability for a currently using tire to be broken is p , and all the tires are independent.

For simplicity, we don't consider the situation that multiple tires break at the same time.

The probability that the vehicle has to stop and wait for rescue:

Case 1: (4-wheel vehicle)

$$4p \cdot 4p = 16p^2$$

Case 2: (18-wheeler)

$$18p \cdot 18p \cdot 18p = 5832p^3$$

So we can't determine which is probability is bigger, and the reliability depends on the probability for a currently using tire to be broken

Question 9: Which surgeon would you prefer for an operation that you must undergo: Surgeon A, who has performed some 500 operations of the same type, with 5 of his patients perishing during or immediately after surgery, or surgeon B who has a perfect record in 25 operations?

Surgeon A. In this kind of situation, I prefer a more experienced surgeon, and surgeon B has too little sample that I can reference from.

Question 10: Which is more probable at your home or office: a power failure or an Internet outage? Which is likely to last longer?

Internet outage is more probable at my home. It happens once or twice in a month; however, power failure happens maybe once in a year.

Power failure will last longer because it often results from equipment failure, and replacing equipment is usually more dangerous and takes more time than

internet outage.