

# What Are the Odds? A Cupcake Mishap

by

Helen S. Joyner

School of Food Science

University of Idaho, Moscow, ID



Gerri was not having a good day. She had been up since 5a.m. working in her bakery, PennCakes, and had already dealt with a batch of burned cupcakes, runny icing, several last-minute order changes, and a mixer mishap that resulted in flour all over the kitchen. Now she had to deal with her semi-hysterical assistant, Kelsey, who was crying because she had lost her engagement ring that morning. Between sobs, Kelsey explained that she had been icing cupcakes when she looked down and noticed her engagement ring was missing. After a search of the kitchen, it was nowhere to be found.

“Did you have it on this morning?” Gerri asked. “I keep telling you not to wear it when you’re baking, especially because you said it was kind of loose.”

“Yeah, I know I had it on when I got in because the diamond caught the light when I opened the back door,” Kelsey sniffled.

“Okay, so tell me what you did after you got here,” Gerri said.

“Well, I washed my hands before I started; you said to always do that. Oh! I know I had my ring then too because water always gets under it and I have to move it to dry my hands all the way. Then I made the fifty lemon cupcakes and twenty red velvet cupcakes for that wedding order first thing like you told me to yesterday. Then I made the thirty chocolate cupcakes. Then I made the cinnamon icing and the lime icing and the cream cheese icing. Then I put the cinnamon icing on the lemon cupcakes and the cream cheese icing on the red velvet—oh shoot, I didn’t get those backwards, right?” Kelsey teared up again.

Gerri sighed. “No, no, that’s right. So when did you notice your ring was missing?”

“Well, I was icing the chocolate cupcakes with the lime icing—that’s what I was supposed to use, right?”

“Right, so what happened?”

“Okay, good. Well, I was icing the chocolate cupcakes with the lime icing but the icing bag got too empty and I had to refill it. And I got icing on my hand when I refilled the bag and when I wiped it off, I saw that my ring was gone.” More tears from Kelsey. “I can’t find it anywhere!”

“You checked everywhere in the kitchen, behind the mixers and on the floor, right?”

Kelsey nodded.

“Okay, well, then it might have fallen into the batter when you mixed it. And that means...” Gerri broke off, realizing that there was only one place the ring could be if that had happened.

“Are you saying it’s in the cupcakes?” Kelsey’s voice was a squeak. “There’s like a hundred of them! How are we going to find it? I mean, we have to deliver those cupcakes today! I can’t believe this happened! I know the ring was kind of wiggly on my finger, so I got a ring guard to fix it. It shouldn’t have fallen off, even though the ring guard broke yesterday. I mean, I would have felt the sharp edges on my finger, because that was how I knew it broke!”

“Wait, you had a ring guard and it broke?” Gerri asked.

Kelsey nodded. “In half. I did glue it back together, though! I thought that would fix it!”

Gerri looked at her in disgust. “Are you serious? So now there’s not only a ring in these cupcakes, there’s a ring and two pieces of ring guard? And glue?”

More tears from Kelsey. “So what are we going to do?”

“*You* are going to make and frost another 100 cupcakes for that wedding. In one hour,” Gerri snapped. “*I* am going to deal with that line of customers that just showed up. And make sure you put those cupcakes you made this morning off to the side somewhere. No customer of mine is going to eat a cupcake with bits of metal in it! I’ll deal with them, and you, later.” With that parting shot, Gerri stalked out of the kitchen.

### Questions

- If Kelsey’s ring and ring guard pieces stayed attached to each other (i.e., the ring and guard can be considered one object), what is the probability of finding them in the chocolate cupcakes she baked?
  - Draw a diagram illustrating the situation.
  - Write the mathematical equation for this probability scenario.
  - What is the probability, stated in percent?
- What is the probability of finding the ring in the chocolate cupcakes and the ring guard pieces in the lemon cupcakes?
  - Draw a diagram illustrating the situation.
  - Write the mathematical equation for this probability scenario.
  - What is the probability, stated in percent?
- What is the probability of finding the ring in the chocolate cupcakes, one of the ring guard pieces in the red velvet cupcakes, and the other guard piece in the lemon cupcakes?
  - Draw a diagram illustrating the situation.
  - Write the mathematical equation for this probability scenario.
  - What is the probability, stated in percent?
- How can the ring and ring guard pieces be found without breaking open the cupcakes?
- Suppose it is not possible to apply your answer to Question 4 above towards solving this problem and it is necessary to break open the cupcakes one-by-one until the ring and guard pieces are found. Brainstorm an effective way to apply probability theorems towards strategically inspecting cupcakes with the goal of damaging as few cupcakes as necessary. Specify which probability theorem(s) you would use towards solving this problem. If you would use a sequence of probability theorems, state the order in which you would use them.
- This case study presented the story of a local bakery having issues with cross contamination with a physical food safety hazard (metal) in cupcakes.
  - Briefly summarize the preventative controls that the most recent edition of the Food Code suggests should be applied towards preventing instances like this one. Cite the section in the Food Code that you reference.
  - Briefly summarize how the FDA’s cGMPs in Title 21 Part 110 of the Code of Federal Regulations states hazards such as this one should be controlled. Cite the Section in this regulation that you reference.
- What should be done with the cupcakes into which the ring and ring guard pieces were baked?

8. What are the financial repercussions resulting from this scenario? Is Kelsey responsible for any financial losses? Why or why not?
9. Should Gerri take any disciplinary action towards Kelsey? If so, what? If not, why not?
10. What if this scenario occurred in a large-scale manufacturing facility that produced thousands of cupcakes per hour? Discuss how management should handle the situation of an employee losing a piece of jewelry in a production area and possible contamination of product by that jewelry.

### References

- Besterfield, D.H. 2009. *Quality Control*. 8<sup>th</sup> ed. Upper Saddle River, NJ: Pearson Education, Inc.
- Food and Drug Administration. Code of Federal Regulations, Title 21. Available at: <http://www.gpo.gov/fdsys/browse/collectionCfr.action?collectionCode=CFR>. Accessed on January 15, 2014.
- Oakland, J.S. 2008. *Statistical Process Control*. 6<sup>th</sup> ed. New York, NY: Routledge.
- University of Nebraska Cooperative Extension. Food Safety: HACCP. Available at: <http://www.foodsafety.unl.edu/haccp/haccp.html>. Accessed on January 15, 2014.



Case copyright held by the **National Center for Case Study Teaching in Science**, University at Buffalo, State University of New York. Originally published July 14, 2014. Please see our **usage guidelines**, which outline our policy concerning permissible reproduction of this work. Image in title block by © arinahabich | Fotolia.com, ID#49313323, licensed.