**Category: Interviewing – Brainteasers**

Investment banking interview brainteasers

[**You have 100 balls (50 black balls and 50 white balls) and 2 buckets. How do you divide the balls into the two buckets so as to maximize the probability of selecting a black ball if 1 ball is chosen from 1 of the buckets at random?**](http://www.ibankingfaq.com/interviewing-brainteasers/you-have-a-100-balls-50-black-balls-and-50-white-balls-and-2-buckets-how-do-you-divide-the-balls-into-the-two-buckets-so-as-maximize-the-probability-of-selecting-a-black-ball-if-1-ball-is-chosen-f/)

Just to be perfectly clear, you are assuming that one of the two buckets is chosen at random and then one of the balls from that bucket is chosen at random.  You want to put 1 black ball in 1 of the buckets and all of the other 99 balls in the other bucket.   This gives you just slightly less than a 75% change of having a black ball chosen.  The math works as follows:  There’s a 50% chance of selecting the bucket containing 1 ball with a 100% chance of selecting a black ball from that bucket.  And a 50% chance of selecting the bucket containing 99 balls with a ~49.5% (49/99) chance of selecting a black ball from that bucket.  Total probability of selecting a black ball is (50% % 100%) + (50% \* 49.5%) = 74.7%.

Posted on[January 27, 2010](http://www.ibankingfaq.com/interviewing-brainteasers/you-have-a-100-balls-50-black-balls-and-50-white-balls-and-2-buckets-how-do-you-divide-the-balls-into-the-two-buckets-so-as-maximize-the-probability-of-selecting-a-black-ball-if-1-ball-is-chosen-f/)Categories[Interviewing - Brainteasers](http://www.ibankingfaq.com/category/interviewing-brainteasers/)

[**A car travels a distance of 60 miles at an average speed of 30 mph. How fast would the car have to travel the same 60 mile distance home to average 60 mph over the entire trip?**](http://www.ibankingfaq.com/interviewing-brainteasers/a-car-travels-a-distance-of-60-miles-at-an-aveage-speed-of-30-mph-how-fast-would-the-car-have-to-travel-the-same-60-mile-distance-home-to-average-60-mph-over-the-entire-trip/)

Most people say 90 mph but this is actually a trick question!  The first leg of the trip covers 60 miles at an average speed of 30 mph.  So, this means the car traveled for 2 hours (60/30).  In order for the car to average 60 mph over 120 miles, it would have to travel for exactly 2 hours (120/60).  Since the car has already traveled for 2 hours, it is impossible for it to average 60 mph over the entire trip.

Posted on[November 5, 2007](http://www.ibankingfaq.com/interviewing-brainteasers/a-car-travels-a-distance-of-60-miles-at-an-aveage-speed-of-30-mph-how-fast-would-the-car-have-to-travel-the-same-60-mile-distance-home-to-average-60-mph-over-the-entire-trip/)Categories[Interviewing - Brainteasers](http://www.ibankingfaq.com/category/interviewing-brainteasers/)

[**Three envelopes are presented in front of you by an interviewer. One contains a job offer, the other two contain rejection letters. You pick one of the envelopes. The interviewer then shows you the contents of one of the other envelopes, which is a rejection letter. The interviewer now gives you the opportunity to switch envelope choices. Should you switch?**](http://www.ibankingfaq.com/interviewing-brainteasers/three-envelopes-are-presented-in-front-of-you-by-an-interviewer-one-contains-a-job-offer-the-other-two-contain-rejection-letters/)

The answer is yes.  Say your original pick was envelope A.  Originally, you had a 1/3 chance that envelope A contained the offer letter.  There was a 2/3 chance that the offer letter was either in envelope B or C.  If you stick with envelope A, you still have the same 1/3 chance.  Now, the interviewer eliminated one of the envelopes (say, envelope B), which contained a rejection letter.  So, by switching to envelope C, you now have a 2/3 chance of getting the offer and you’ve doubled your chances.

Note that you will often get this same question but referring to playing cards (as in 3-Card Monte) or doors (as in Monte Hall/Let’s Make a Deal) instead of envelopes.

Posted on[November 5, 2007](http://www.ibankingfaq.com/interviewing-brainteasers/three-envelopes-are-presented-in-front-of-you-by-an-interviewer-one-contains-a-job-offer-the-other-two-contain-rejection-letters/)Categories[Interviewing - Brainteasers](http://www.ibankingfaq.com/category/interviewing-brainteasers/)

[**A windowless room has 3 lightbulbs. You are outside the room with 3 switches, each controlling one of the lightbulbs. If you can only enter the room one time, how can you determine which switch controls which lightbulb?**](http://www.ibankingfaq.com/interviewing-brainteasers/a-windowless-room-has-3-lightbulbs-you-are-outside-the-room-with-3-switches-each-controlling-one-of-the-lightbulbs-if-you-can-only-enter-the-room-one-time-how-do-you-determine-which-switch-contr/)

Turn on two switches (call them A and B) on and leave them on for a few minutes.  Then turn one of them off (switch B) and enter the room.  The bulb that is lit is controlled by switch A.  Touch the other two bulbs (they should be off).  The one that is still warm is controlled by switch B.  The third bulb (off and cold) is controlled by switch C.

Posted on[November 5, 2007](http://www.ibankingfaq.com/interviewing-brainteasers/a-windowless-room-has-3-lightbulbs-you-are-outside-the-room-with-3-switches-each-controlling-one-of-the-lightbulbs-if-you-can-only-enter-the-room-one-time-how-do-you-determine-which-switch-contr/)Categories[Interviewing - Brainteasers](http://www.ibankingfaq.com/category/interviewing-brainteasers/)

[**What is the sum of numbers from 1 to 100?**](http://www.ibankingfaq.com/interviewing-brainteasers/what-is-the-sum-of-numbers-from-1-to-100/)

The trick here is that you have 50 pairs which each sum to 101 (e.g. 1+100, 2+99, 3+98, etc.).  So, 50 times 101 = 5050.

Posted on[November 5, 2007](http://www.ibankingfaq.com/interviewing-brainteasers/what-is-the-sum-of-numbers-from-1-to-100/)Categories[Interviewing - Brainteasers](http://www.ibankingfaq.com/category/interviewing-brainteasers/)

[**You are given 12 balls and a scale. Of the 12 balls, 11 are identical and 1 weighs EITHER slightly more or less. How do you find the ball that is different using the scale only three times AND tell if it is heavier or lighter than the others?**](http://www.ibankingfaq.com/interviewing-brainteasers/you-are-given-12-balls-and-a-scale-of-the-12-balls-11-are-identical-and-1-weighs-either-slightly-more-or-less-how-do-you-find-the-ball-that-is-different-using-the-scale-only-three-times-and-tell/)

Significantly harder than the last question!  Weigh 4 vs 4 (1st Weighing).  If they are identical then you know that all of 8 of these are “normal” balls.  Take 3 “normal” balls and weigh them against 3 of the unweighed balls (2nd Weighing).  If they are identical, then the last ball is “different.”  Take 1 “normal” ball and weigh against the “different” one (3rd Weighing).  Now you know if the “different” ball is heavier or lighter.

If, on the 2nd weighing, the scales are unequal then you now know if the “different” ball is heavier (if the 3 non-normal balls were heavier) or lighter (if the 3 non-normal balls were lighter).  Take the 3 “non-normal” balls and weigh 1 against the other (3rd Weighing).  If they are equal then the third ball not weighed is the “different” one.  If they are not equal then either the heavier or lighter ball is “different” depending on if the 3 “non-normal” balls were heavier or lighter in the 2nd Weighing.

If, on the 1st Weighing, the balls were not equal then at least you know that the 4 balls not weighed are “normal.”  Next, take 3 of the “normal balls” and 1 from the heavier group and weigh against the 1 ball from the lighter group plus the 3 balls you just replaced from the heavier group (2nd Weighing).  If they are equal then you know that the “different” ball is lighter and is 1 of the 3 not weighed.  Of these 3, weigh 1 against 1 (3rd Weighing)  If one is lighter, that is the “different” ball, otherwise, the ball not weighed is “different” and lighter.

If, on the 2nd weighing from the preceding paragraph, the original heavier group (containing 3 “normal” balls) is still heavier, then either one of the two balls that were NOT replaced are “different.”  Take the one from the heavier side and weigh against a normal ball (3rd Weighing).  If it is heavier, it is “different,” and heavier otherwise the ball not weighed is “different” and lighter.  If, on the 2nd weighing, the original lighter side is now heavier, then we know that one of the 3 balls we replaced is “different.”  Weigh one of these against the other (3rd Weighing).  If they are equal, the ball not weighed is “different” and heavier.  Otherwise, the heavier ball is the “different” one (and is heavier).

If you get this right and can answer within the 30 minutes alloted for the interview, then you probably do deserve the job.

Posted on[November 5, 2007](http://www.ibankingfaq.com/interviewing-brainteasers/you-are-given-12-balls-and-a-scale-of-the-12-balls-11-are-identical-and-1-weighs-either-slightly-more-or-less-how-do-you-find-the-ball-that-is-different-using-the-scale-only-three-times-and-tell/)Categories[Interviewing - Brainteasers](http://www.ibankingfaq.com/category/interviewing-brainteasers/)

[**You are given 12 balls and a scale. Of the 12 balls, 11 are identical and 1 weighs slightly more. How do you find the heavier ball using the scale only three times?**](http://www.ibankingfaq.com/interviewing-brainteasers/you-are-given-12-balls-and-a-scale-of-the-12-balls-11-are-identical-and-1-weighs-slightly-more-how-do-you-find-the-heavier-ball-using-the-scale-only-three-times/)

First, weigh 5 balls against 5 balls (1st Use of Scale).  If the scale is equal, then discard those 10 balls and weigh the remaining 2 balls against each other (Second Use of Scale).  The heavier ball is the one you are looking for.

If on the first weighing (5 vs 5), one group is heavier, then of the heavier group weigh 2 against 2 (2nd Use of Scale).  If they are equal, then the 5th ball from the heavier group (the one not weighed) is the one you are looking for.  If one of the groups of 2 balls is heaver, then take the heaver group of 2 balls and weigh them against each other (Third Use of Scale).  The heavier ball is the one you are looking for.

Posted on[November 5, 2007](http://www.ibankingfaq.com/interviewing-brainteasers/you-are-given-12-balls-and-a-scale-of-the-12-balls-11-are-identical-and-1-weighs-slightly-more-how-do-you-find-the-heavier-ball-using-the-scale-only-three-times/)Categories[Interviewing - Brainteasers](http://www.ibankingfaq.com/category/interviewing-brainteasers/)

[**What is the angle between the hour-hand and minute-hand of a clock at 3:15?**](http://www.ibankingfaq.com/interviewing-brainteasers/what-is-the-angle-between-the-hour-hand-and-minute-hand-of-a-clock-at-315/)

At quarter past the hour, the minute-hand is exactly at 3:00 but the hour-hand has moved 1/4 of the way between 3:00 and 4:00.  Therefore 1/4 times 1/12 = 1/48 of the clock.  With the clock having 360 degrees, 360/48 = 7.5 degrees.

Posted on[November 5, 2007](http://www.ibankingfaq.com/interviewing-brainteasers/what-is-the-angle-between-the-hour-hand-and-minute-hand-of-a-clock-at-315/)Categories[Interviewing - Brainteasers](http://www.ibankingfaq.com/category/interviewing-brainteasers/)[1 Commenton What is the angle between the hour-hand and minute-hand of a clock at 3:15?](http://www.ibankingfaq.com/interviewing-brainteasers/what-is-the-angle-between-the-hour-hand-and-minute-hand-of-a-clock-at-315/#comments)

[**You’ve got a 10 x 10 x 10 cube made up of 1 x 1 x 1 smaller cubes. The outside of the larger cube is completely painted red. On how many of the smaller cubes is there any red paint?**](http://www.ibankingfaq.com/interviewing-brainteasers/youve-got-a-10-x-10-x-10-cube-made-up-of-1-x-1-x-1-smaller-cubes-the-outside-of-the-larger-cube-is-painted-red-on-how-many-of-the-smaller-cubes-have-any-red-paint/)

First, note that the larger cube is made up of 1000 smaller cubes.  The easiest way to think about this is how many cubes are NOT painted?  8 x 8 x 8 inner cubes are not painted which equals 512 cubes.  Therefore, 1000 – 512 = 488 cubes that have some paint.  Alternatively, we can calculate this by saying that two 10 x 10 sides are painted (200) plus two 10 x 8 sides (160) plus two 8 x 8 sides (128).  200 + 160 + 128 = 488.

Posted on[November 5, 2007](http://www.ibankingfaq.com/interviewing-brainteasers/youve-got-a-10-x-10-x-10-cube-made-up-of-1-x-1-x-1-smaller-cubes-the-outside-of-the-larger-cube-is-painted-red-on-how-many-of-the-smaller-cubes-have-any-red-paint/)Categories[Interviewing - Brainteasers](http://www.ibankingfaq.com/category/interviewing-brainteasers/)[1 Commenton You’ve got a 10 x 10 x 10 cube made up of 1 x 1 x 1 smaller cubes. The outside of the larger cube is completely painted red. On how many of the smaller cubes is there any red paint?](http://www.ibankingfaq.com/interviewing-brainteasers/youve-got-a-10-x-10-x-10-cube-made-up-of-1-x-1-x-1-smaller-cubes-the-outside-of-the-larger-cube-is-painted-red-on-how-many-of-the-smaller-cubes-have-any-red-paint/#comments)

[**Four investment bankers need to cross a bridge at night to get to a meeting. They have only one flashlight and 17 minutes to get there. The bridge must be crossed with the flashlight and can only support two bankers at a time. The Analyst can cross in 1 minute, the Associate can cross in 2 minutes, the VP can cross in 5 minutes and the MD takes 10 minutes to cross. How can they all make it to the meeting in time?**](http://www.ibankingfaq.com/interviewing-brainteasers/four-investment-bankers-need-to-cross-a-bridge-to-get-to-a-meeting-they-have-only-one-flashlight-and-17-minutes-to-get-there/)

First, the Analyst takes the flashlight and crosses the bridge with the Associate.  This takes 2 minutes.  The Analyst then returns across the bridge with the flashlight taking 1 more minute (3 minutes passed so far).  The Analyst gives the flashlight to the VP and the VP and MD cross together taking 10 minutes (13 minutes passed so far).  The VP gives the flashlight to the Associate, who recrosses the bridge taking 2 minutes (15 minutes passed so far).  The Analyst and Associate now cross the bridge together taking 2 more minutes.  Now, all are across the bridge at the meeting in exactly 17 minutes.   Note, that instead of investment bankers, you’ll often see the same question using members of musical bands (usually either the Beatles or U2).

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[**You are given a 3-gallon jug and a 5-gallon jug. How do you use them to get 4 gallons of liquid?**](http://www.ibankingfaq.com/interviewing-brainteasers/you-are-given-a-3-gallon-jug-and-a-5-gallon-jug-how-do-you-use-them-to-get-4-gallons-of-liquid/)

Fill the 5-gallon jug completely.  Pour the contents of the 5-gallon jug into the 3-gallon jug, leaving 2 gallons of liquid in the 5-gallon jug.  Next, dump out the contents of the 3-gallon jug and pour the contents of the 5-gallon jug into the 3-gallon jug.  At this point, there are 2 gallons in the 3-gallon jug.  Fill up the 5-gallon jug and then pour the contents of the 5-gallon jug into the 3-gallon jug until the 3-gallon jug is full.  You will have poured 1 gallon, leaving 4 gallons in the 5-gallon jug.

# Microsoft: How many gas stations are there in the US?

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Reuters

Senior Program Managers at Microsoft are expected to be able to conduct market sizing on the fly, as of June 2013.

How might one answer this question? Start by estimating how many gas stations might be in a town of around 30,000 people, and then extrapolate for the U.S. population, which is about 314 million people.

It turns out there are upwards of 117,000 gas stations in the U.S. A ccording to the U.S. Census Bureau, in 2008 there was one gas station for every 2,500 people.

# IBM: How would you test a calculator?

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statigr.am/fredpears

IBM asked software engineer candidates this question as recently as May 2013.

It's a vague question, with little direction and little context. It's really about the details here.

You might provide this type of response:

Test the functionality of the calculator's computing accuracy by evaluating whether inputs provide their expected outputs. Also, test the device's basic system functions — like the power button, the clear function, and so on, to determine whether you'll be facing system errors before you can compute anything.

Depending on the position for which you're interviewing, you may have to delve deeper into the world of calculators.

# IBM: How many golf balls are there in Florida?

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Getty Images/Richard Heathcote

IBM threw their operations specialist wannabes this market-sizing question during May 2013 interviews.

To get an answer, you might start by estimating the U.S. population, then the percentage that plays golf, then the number of balls each player users in a year. Then estimate what percentage of U.S. golfing occurs in sunny Florida. Then toss in an extra 50% for old or unused balls.

BrainTeaser Bibles used a similar method to estimate that there 2 billion golf balls are used in the U.S. each year, to which we'll add 1 billion in old or unused balls. Seeing as 7% of America's golf courses are in Florida, we'll say there are 210 million golf balls in Florida.

# JP Morgan: How many street lights are there in NYC?

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Flickr / gabesk

In case you flunked out of your interview at IBM, don't go to JPMorgan Chase, where they, too, ask market-sizing questions.

Let's start by estimating lights on the ordered grid of Manhattan. Estimate the number of horizontal blocks and vertical blocks, and then the number of street lights on each. Then multiply by 5 to account for the other 5 boroughs.

It turns out there are approximately 300,000 street lights in NYC, according to NYC.gov.

Epic Systems: An apple costs 40 cents, a banana costs 60 cents, and a grapefruit costs 80 cents. How much does a pear cost?

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Jennifer Polland/ Business Insider

Healthcare technology company Epic Systems asked its project manager and implementation consultant candidates in February 2013 to answer this fruity riddle.

Here's one way to do it, with regards to "Wheel Of Fortune":

# If you charge 20 cents per vowel, the two-vowel word "apple" would cost 40 cents, three-vowel "banana" 60 cents, and four-vowel "grapefruit" 80 cents. Therefore a pear would costs 40 cents.

Bain: Estimate the demand for plastic bags in the US.

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AP

During a January 2013 interview for an advanced Ph.D. internship, Bain & Company really drove home the need for candidates to analyze a market.

The trick with this question is that typical population analysis isn't enough. You must take into account residential use of plastic bags, as well as that of businesses, government employees, and so on, until you can muster some convoluted quantity to appease your interviewer. Also consider bans on plastic bags, as found in cities like Los Angeles.

According to HowStuffWorks, 380 billion plastic bags are used in the US annually.

# Digitas: Describe the Internet to someone who just woke up from a 30-year coma.

Digitas: Describe the Internet to someone who just woke up from a 30-year coma.

Flickr/puuikibeach

Analyst-hopefuls at Digitas were asked to describe something that they use in their everyday lives.

Once you get over how ridiculous the scenario is, you can begin to pick apart the request.

You might get away with comparing the Internet to something the awoken person would have recognized 30 years ago, maybe from some sci-fi movie. If they don't remember one, inject a bit of humor into your response. Hopefully your interviewer isn't offended by your attempts to win them over with your charm.

# American Express: Which of these pieces of information would be most useful in estimating the number of people who work in a 30-story building?

American Express: Which of these pieces of information would be most useful in estimating the number of people who work in a 30-story building?

Andrew Turner via flickr Creative Commons

a. The number of cars in the parking lot.

b. The number of people eating lunch in the cafeteria.

c. The number of people on the 11th floor.

As recently as June 2013, American Express asked candidates for the position of Manager-Strategic Analysis and Testing to answer this question.

Any one of these three are pretty inadequate without more data. If you can get information on whether the building's suburban or urban, you can make a guess as to how many people might drive or take public transportation, and go with . Otherwise, the number of people on one floor will give some idea of the building's capacity.

Mostly, you need to be able to justify your answer well while eliminating the others.

# Morgan Stanley: How much does the Starbucks in Times Square bring in, in annual revenue?

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Summer analysts at Morgan Stanley were asked this question as recently as March 2013.

Even for an insanely busy Starbucks, you can get pretty far by estimating the average ticket cost and the average traffic per hour, multiplied by 24, multiplied by 365. As always with market sizing questions, justify your assumptions, and use round numbers so you can get an estimate quickly and without errors.

It turns out Starbucks averages around $1 million in sales per store. We'll guess that the busy Times Square location is nearly twice as high.

# T3 Trading: A scientist puts a bacteria in a petri dish at exactly noon. Every minute, the bacteria divides into two. At exactly 1 pm, the petri dish is full. At what time was the dish half full?

Shutterstock.com

In March 2013, propriety trader candidates of the T3 Trading Group were asked this question.

Don't think exponential growth.

Don't think about the kind of bacteria that's in the dish.

Don't over-think anything.

If the bacteria doubles every minute, and it's full at 1 pm, it must have been half-full a minute earlier, at 12:59.

# Oliver Wyman: How many potatoes (in kg) does McDonald's sell in a year in the UK?

Screengrab from McDonaldsCanada on YouTube

This market-sizing question was asked of a management consultant interviewee in February 2013. The company actually has a list of example brain teasers on its careers site.

Like most of these questions, it's less about how much you know about McDonald's or potatoes, but rather how you approach the problem.

Start by estimating the number of restaurants in the region. As for potatoes per restaurant, you could estimate the number of orders of fries or hash browns every day, and the number of potatoes that go into each order, and the number of potatoes in a kilo. Hope you're good at mental math!

According to The Telegraph, McDonald's used more than 200 million kg of potatoes in 2011 in the UK.

# Susquehanna International Group: What is the probability of five people with different ages sitting in ascending or descending order at a round table?

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flickr/wonderlane

This question was asked of an assistant trader interviewee in March 2013.

Here's the probability approach:

Number people 1, 2 , 3 ,4 , 5 meaning their ordinal age; there are five ways they can sit around a round table in increasing order of age: [ 1 2 3 4 5 ] [2 3 4 5 1] etc. There are 5 x 4 x 3 x 2 x 1 possible seating arrangements around the table, so dividing 5 by 5 x 4 x 3 x 2 we get probability = 1/24

# ZS Associates: You have 12 coins and one is weight-deformed. Use a measuring balance just three times to find the right one.

flickr/lifeontheedge

The Chicago area business services firm asked this of an applicant for an operations associate position in March 2013.

This question is a more difficult variation on the classic "balance problem." The procedure depends on whether you have a normal coin for reference.

Easy way to solve is weigh 6 on one side and 6 on other side. Discard lighter/heaiver . now weigh candidates 6 by dividing 3 and 3 on each side. And then finally weigh 2 and keeping 1 and compare .

One user from Math forum.org offers his solution:

"So all we have to do is to distribute the 12 coins over the scales of

the three measurements in such a way that no coin participates in the

three measurements in the same way (or mirrored) as any other coin.

The distribution below is one of many possible distributions that

fulfills this requirement:

1, 2, 7, 10 against 3, 4, 6, 9

1, 3, 8, 11 against 2, 5, 6, 7

2, 3, 9, 12 against 1, 4, 5, 8

If the measurements result unequally, then it can be seen from this

distribution that coin 8 is lighter than the other coins. No other

coin can explain the unequal outcome."