K. J. Somaiya Institute of Management Studies & Research

August 2011 Volume 2: Issue 2

Quantinuum Newsletter

Quantinuum - The Quants Forum

Its all about NUMBERS...

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Quantinuum Newsletter

VOLUME 2:ISSUE 2 AUGUST 11'

From the Faculty's Desk...

Hi All,

I am happy to see the new team in action from this year. We will be improving the contents of the newsletter to provide more food for your thoughts. This issue, we have tried to streamline the contents by bringing all elements introduced so far; next issue, we will be introducing quants case discussion series, hosted by some of the quants faculties.

We are also planning to dispatch the newsletter to external recipients - companies, senior executives etc. to obtain more traction from our activities. for that we also need more support from students in the form of articles, news reports, etc.

Hope all of you will be able to pitch in and make the Quantinuum newsletter a roaring success.
Thanks and wish you all a good reading.

Regards
Prof N.S.Nilakantan

TEAM QUANTINUUM

Main Story: What's the Error???

There's a difference between a simple mistake and a fallacy. A typical **mathematical fallacy** leads to an absurd result. But it's not very easy to identify the error. The resolution of a fallacy needs a deeper insight to the subject. The errors are comparatively subtle, or designed to show that certain steps are conditional, and should not be applied in the cases that are the exceptions to the rules.

Let's have a look at some examples:
Suppose a=b
Therefore, a^2=a*b [Multiplying both sides by a]
a^2 – b^2 = a*b – b^2
(a + b)(a – b) = b(a – b)
a + b = b
2b = b
2 = 1
Here is another example:
Let b=10 and c=0
Again let a = (b+c)/2
2a = b+c
2a (b-c) = (b+c)(b-c) [Multiplying both sides by (b – c)]
2ab-2ac = b^2 – c^2
c ^2-2ac = b^2 – 2ab
c^2-2ac + a^2 = b^2 – 2ab +a^2
(c-a)^2 = (b-a)^2
c-a = b-a [Taking square root]
b = c
0 = 10

So what's wrong here?
In the first example we divided both sides of line 3 by (a – b) to arrive at the expression a + b = b.
But that is wrong. Because we assumed that a = b. So (a – b) = 0 and anything divided by 0 is undefined.

In the next example the problem occurred when we took square root of both the sides. There are potentially two roots to any square: one positive and another negative. But the above proof considers only the positive root. If we consider the negative root we'll see:
c – a = a – b
a = (b + c)/2
So the negative root leads back to the original equation.

Try another one:
x=1 + 1 + 1 + ... + 1 [x ones]
=> x^2=x + x + ... + x [Multiply both side by x]
=> 2x=1+1+...+1 [Differentiating both sides w.r.t x]
=> 2x=x [First assumption]
=> 2=1 !!!!!
The problem is x is a constant here. So if we differentiate we'll get only 0.

So we can see that these fallacies are often subtle and are not very easy to detect. But when found they can teach us a lot and complex problems present a real challenge to straighten out.

SAYAK GUPTA
PGDM A
2011-2013

QUANT NEWS DIGEST

Beyond 'Moneyball': The rapidly evolving world of sports analytics - Analytics e-Newsletter August 30, 2011

Michael Lewis' best-selling book, "Moneyball: The Art of Winning an Unfair Game," did for sports what Tom Davenport and Jeanne Harris' book, "Competing on Analytics: The Science of Winning," did for business: It put "analytics" on the minds of key decision-makers while rocking their respective worlds.
Published in 2003, "Moneyball" chronicles the story of Oakland A's general manager Billy Beane's successful attempt to assemble a competitive major league baseball club on a tight budget by employing computer-generated analysis of player and game statistics. Along with winning over millions of fans in baseball and in the analytics community, the book was recently made into a movie starring Brad Pitt. "Moneyball" (the movie) is scheduled to premiere in September.

COMPILED BY PROF. N.S.NILAKANTAN

Quest to Count Earth's Species Hits New Number - *Our Amazing Planet –August24, 2011*

How many species live on planet Earth? Scientist Camilla Mora and his colleagues at Canada's Dalhousie University found the answer: 8.7 million species. (Give or take 1.3 million.)They arrived at the estimate using a model that crunched the new numbers. Their work was published in a paper online in PLoS Biology this week. Of the 8.7 million species the model predicts, roughly 6.5 million dwell on land, and 2.2 million live in the sea. To put those numbers in context, in the 250 years since Swedish botanist Carl Linnaeus developed the basic classification system we now use, humans have, so far, catalogued a comparatively measly 1.2 million species on our planet. Based on the new model's numbers, that means only 14 percent of the globe's total species have been catalogued. In the ocean, that number drops to 9 percent.

COMPILED BY PROF. N.S.NILAKANTAN

England take mathematician's help to quiet Sachin Tendulkar

England used a mathematician's plan and modern technology to keep Sachin Tendulkar's bat quiet in the ongoing Test series against the Indian cricket team. England has relied on drawing Tendulkar outside his off stump in the early part of his innings rather than let him get his runs on the onside and this ploy is the result of a computer simulator plan, created by team analyst Nathan Leamon.
"We feed into the simulator information about pitches and the 22 players who might play, and it plays the game a number of times and tells us likely outcomes." Leamon was quoted as saying in a British newspaper.
Editors Note: for more details, please refer http://www.indianexpress.com/news/england-take-mathematicians-help-to-quiet-tendulkar/834960/0

VINAYAK NAIK
PGDM –IB
2011-2013

Quancept of the month: Nash Equilibrium

Nash equilibrium is a fundamental concept in the theory of games and the most widely used method of predicting the outcome of a strategic interaction in the social sciences. A game (in strategic or normal form) consists of the following three elements: a set of players, a set of actions (or pure-strategies) available to each player, and a payoff (or utility) function for each player.

The payoff functions represent each player's preferences over action profiles, where an action profile is simply a list of actions, one for each player. A *pure-strategy Nash equilibrium* is an action profile with the property that no single player can obtain a higher payoff by deviating unilaterally from this profile.

This concept can best be understood by looking at some examples. Consider first a game involving two players, each of whom has two available actions, which we call *A* and *B*. If the players choose different actions, they each get a payoff of 0. If they both choose *A*, they each get 2, and if they both choose *B*, they each get 1. This "coordination" game may be represented as follows, where player 1 chooses a row, player 2 chooses a column, and the resulting payoffs are listed in parentheses, with the first component corresponding to player 1's payoff: The action profile *(B,B)* is an equilibrium, since a unilateral deviation to *A* by any one player would result in a lower payoff for the deviating player. Similarly, the action profile (*A,A*) is also an equilibrium.

	A	*B*
A	(2,2)	(0,0)
B	(0,0)	(1,1)

Figure 1

	H	*T*
H	(1,−1)	(−1,1)
T	(−1,1)	(1,−1)

Figure 2

As another example, consider the game "matching pennies," which again involves two players, each with two actions. Each player can choose either heads (H) or tails (T); player 1 wins a dollar from player 2 if their choices are the same, and loses a dollar to player 2 if they are not.

This game has no pure-strategy Nash equilibria.
In some cases, instead of simply choosing an action, players may be able to choose probability distributions over the set of actions available to them. Such randomizations over the set of actions are referred to as mixed strategies. Any profile of mixed strategies induces a probability distribution over action profiles in the game. Under certain assumptions, a player's preferences over all such lotteries can be represented by a function (called a von Neumann-Morgenstern utility function) that assigns a real number to each action profile.

One lottery is preferred to another if and only if it results in a higher expected value of this utility function, or expected utility. A mixed strategy Nash-equilibrium is then a mixed strategy profile with the property that no single player can obtain a higher value of expected utility by deviating unilaterally from this profile.

The American mathematician John Nash (1950) showed that every game in which the set of actions available to each player is finite has at least one mixed-strategy equilibrium. In the matching pennies game, there is a mixed-strategy equilibrium in which each player chooses heads with probability 1/2.

Similarly, in the coordination game of the above example, there is a third equilibrium in which each player chooses action A with probability 1/3 and B with probability 2/3. Such multiplicity of equilibria arises in many economically important games, and has prompted a large literature on equilibrium refinements with the purpose of identifying criteria on the basis of which a single equilibrium might be selected.

	C	D
C	(2,2)	(0,3)
D	(3,0)	(1,1)

Figure 3

Nash equilibria can sometimes correspond to outcomes that are inefficient, in the sense that there exist alternative outcomes that are both feasible and preferred by all players. This is the case, for instance, with the equilibrium (B,B) in the coordination game above. An even more striking example arises in the prisoner's dilemma game, in which each player can either "cooperate" or "defect," and payoffs are as follows:

The unique Nash equilibrium is mutual defection, an outcome that is worse for both players than mutual cooperation. Now consider the game that involves a repetition of the prisoner's dilemma for n periods, where n is commonly known to the two players. A pure strategy in this repeated game is a plan that prescribes which action is to be taken at each stage, contingent on every possible history of the game to that point. Clearly the set of pure strategies is very large. Nevertheless, all Nash equilibria of this finitely repeated game involve defection at every stage. When the number of stages *n* is large, equilibrium payoffs lie far below the payoffs that could have been attained under mutual cooperation.

It has sometimes been argued that the Nash prediction in the finitely repeated prisoner's dilemma (and in many other environments) is counterintuitive and at odds with experimental evidence. However, experimental tests of the equilibrium hypothesis are typically conducted with monetary payoffs, which need not reflect the preferences of subjects over action profiles. In other words, individual preferences over the distribution of monetary payoffs may not be exclusively self-interested.

Furthermore, the equilibrium prediction relies on the hypothesis that these preferences are commonly known to all subjects, which is also unlikely to hold in practice. To address this latter concern, the concept of Nash equilibrium has been generalized to allow for situations in which players are faced with incomplete information. If each player is drawn from some set of types, such that the probability distribution governing the likelihood of each type is itself commonly known to all players, then we have a Bayesian game. A pure strategy in this game is a function that associates with each type a particular action. A Bayes-Nash equilibrium is then a strategy profile such that no player can obtain greater expected utility by deviating to a different strategy, given his or her beliefs about the distribution of types from which other players are drawn.

Allowing for incomplete information can have dramatic effects on the predictions of the Nash equilibrium concept. Consider, for example, the finitely repeated prisoner's dilemma, and suppose that each player believes that there is some possibility, perhaps very small, that his or her opponent will cooperate in all periods provided that no defection has yet been observed, and defect otherwise. If the number of stages n is sufficiently large, it can be shown that mutual defection in all stages is inconsistent with equilibrium behavior, and that, in a well-defined sense, the players will cooperate in most periods.

Hence, in applying the concept of Nash equilibrium to practical situations, it is important to pay close attention to the information that individuals have about the preferences, beliefs, and rationality of those with whom they are strategically interacting.

GAURAV AGARWAL
PGDM FINANCE
2010-2012

ALUMNI QUANNECT

Nirav Parekh from the batch of MMS Marketing 2003-2005 is currently working as Planning Director at Ogilvy & Mather Advertising.
Prof Anjali is part of the Operations Management & Operations Research Department at SIMSR. She has 11 years of work experience of which three years were spent in market Research. She worked with Market Research Firms – TNS Global and AC Nielsen before joining SIMSR.

Prof Anjali Chopra: Can you tell us the two years you spent at TNS Mode. What did you learn there? What kind of clients did you handle? What was the scope of your work?
Nirav Parekh: My two years of TNS were a great mix of ongoing and new projects. I worked in the quantitative department there. Ongoing studies were for tracking impact of Advertising on Brand Parameters, and my clients were Parle Biscuits, Godrej Soaps, Hair Dyes and Colors, and ellogg's. Another ongoing study was for the fortnightly Economic Times rankings for BEst and BEkaar ads. The biggest learning for me from these studies was how uncertain an ad's success is. Companies could spend months and millions on a campaign and yet would be unsure throughout this period of whether they will achieve the objective or not. If this was the case with only one 'P', I could only imagine the overall uncertainty that marketers would operate in, from the 4Ps perspective.

Some unexpected lessons were provided by a couple of ad-hoc projects. One was an online Sex Survey while another was a product testing of sanitary napkins. It took a lot of time for me to get over the initial discomfort and objectively talk about the findings the same way I would about biscuits and hair dyes.) Formulating the questionnaire for the sex survey itself was a great lesson in going beyond stereotypical thinking and asking the right questions and in the right manner too.

My work as a Research Executive required me to co-ordinate between the field-work (data Collection through questionnaires), Analysis team and Clients. An average executive would handle 2-4 projects at a time, so how to be on top of all the work was a great learning too.

From the quantitative perspective, a lot of work involved seeing trends over time, and so statistically, it was only significance testing. However, the segmentation studies helped me learn Factor and Cluster analyses in detail. Something that I learned on-the-job was a tool called Jaccard Analysis. Quite useful in market understanding of any category.

Prof Anjali Chopra: How did you move to O&M? What is the kind of work you are handling at O&M?
Nirav Parekh: Staying in research makes us see only limited information from the client. The move to O&M was with an intention to go beyond those limitations and learn more of marketing too.

The Account Planning job profile is about contributing consumer understanding to the creative process. Thus, the work involves cultural understanding too, in addition to the qualitative and quantitative research understanding. The work I have handled here is consumer research, brand identity and communication strategy, and a part of brand portfolio management.

ALUMNI QUANNECT contd...

Prof Anjali Chopra: What is the difference between qualitative and quantitative research? How easy is to convince clients with the findings of qualitative research given that sample sizes are small and results are based on FGD and depth interviews?
Nirav Parekh: To give an analogy of economics, Qualitative research is micro-economics and Quantitative research is macro-economics. Quali research serves the purpose of getting attitudes, needs, fears and ambitions of individuals, while Quanti research helps us understand brand perceptions, and consumer behavior on a larger level. Thus, Quali and Quanti research rarely overlap.

Having said this, it does become tough to analyze Quali research output. To start of with, the sample size is small, and add to that the personal filters each of us use to understand words spoken by others. It is quite amazing how each of us is so selective about what we listen to. The way we deal with this is by bringing our past experience to the table. Since we have dealt with the product category over a long period of time (agency-client relationship can last for years!) we know what to pick and what to avoid as a one-off comment.

Prof Anjali Chopra: What were your learning's from your BMS and MMS days that have helped you in the last 6 years?
Nirav Parekh: Studying management over 5 years has proved quite fruitful for me, since I got enough time to read as well as critically analyze the theories taught in class. While the conceptual clarity gained during that time helped, the true learning was only after we went through the trial-and-error process of applying it.

Having a numbers inclination during and after my education also helped me see through mis-reporting of statistical analyses and findings. The courses in Research especially taught me not to take numbers at face value, and to make sure I interpret them in the context set by the research design rather than in isolation. We have come across numerous occasions where the arguments between different parties involved are comparing a new research output to past outputs and taking findings out of context is a common trap we tend to fall into.

NIRAV PAREKH
MMS ALUMNI
2003-2005

Trends in Market Research: The new Socio Economic Classification

The **SEC Classification** (also called the **Socio-Economic Classification**) is a classification of households used by surveyors, market researchers, media and marketing companies in India to categorize consumer behavior. Originally developed by IMRB International as a way of understanding market segments, and consumer behavior it was standardized and adopted by the Market Research Society of India in the mid-1980s as a measure of socio-economic class and is now commonly used as a market segmentation tool in India.

The SEC Classification consists of two grids-

- The Urban SEC Grid, which uses Education levels and Occupational criteria of the Chief Wage Earner (CWE) of a household as measures to determine socio-economic classification, and segments urban India into 7 groups (A1 to E2)
- The Rural SEC Grid, which uses Education and Type of House (pucca, semi-pucca, and katcha) as measures of socio-economic class, and segments rural India into 4 groups (R1,R2,R3,R4)

These grids are used to determine the consumption preferences, and purchasing power of households, and are common tools used by social and business researchers working in India. The SEC grid does not use family income levels as a measure as this data is hard to collect and it has been demonstrated that education levels and occupation criteria in India are better determinants of consumer preference.

The SEC of the CWE determines the SEC of the family members. SEC A1+ is the only classification which also has an income filter (MHI Rs 10,000 + per month). This SEC grid is followed by all media measurement in India including but not restricted to National Readership Survey - NRS, Indian Readership Survey NRS, Television Audience Measurement TAM, Audience Measurement and Analytics a Map, Target Group Index TGI.

The new SEC

The decision to revisit the SEC grading system was initiated over five years back by MRUC and MRSI, in order to give more relevance to the system. This was done especially because the earlier SEC system was put in place in the mid-1980s and was therefore, dated.

In the old SEC grid extraordinarily diverse segments of the population often had the same classification. For instance, a junior officer with a high-school degree and an entrepreneur with no formal schooling would both be classified as B2. Moreover, other extremes of the classificatory schema appeared nonsensical or null sets, for example it would be virtually impossible to find an unskilled worker with a graduate or professional degree (SEC D) or an illiterate senior executive (SEC B1). Further marketers found that durable ownership did not depend on education of people and often people belonging to lower SEC were users of mobile phones, washing machines, air conditioners etc. The old SEC grid was found to be lacking on these fronts.

Lloyd Mathias, chairman, MRUC (also, president, corporate monitoring, Tata Teleservices), said "In 2006, extensive research and inputs from industry experts had thrown up a burning need to revisit the classification system, given that the market environment, as also consumer profiles, preferences and attitudes had undergone a sea-change over the last three decades."

Trends in Market Research contd..

It were these findings, he notes, that led MRUC to set up a core team to work on putting together a new SEC system that would be a true reflection of the actual standing of Indian households. A committee representing both MRUC and MRSI had identified some key requirements for the development of a new SEC System over a period of five years. These were:

• The new SEC system needed to be more discriminating, with sharper identification of the upper-most segment of the society
• The new system needed to continue to be easy to administer
• There needed to be a common classification for urban and rural India

Ashutosh Sinha, vice-president IMRB, explained that the new system classifies Indian households by using two parameters -- educational qualifications of the chief wage owner in the household, and the number of assets owned (out of a pre-specified list of 11 assets). Based on these two parameters, each household will be classified in one of 12 SEC groups -- A1, A2, A3, B1, B2, C1, C2, D1, D2, E1, E2 and E3. These 12 groups are applicable to both urban and rural India.

Thomas Puliyel, president, IMRB International says, "The new socio-economic classification system is the culmination of many years of hard work by some of the best brains in the industry. With the growth of the economy and of small towns and rural, it has become imperative to look at a single system for both urban and rural India."

The Building blocks

The building blocks that were available to design the new SEC were:

- 'Demographic' variables: e.g. occupation of chief earner, education of chief earner, education of housewife, claimed monthly household income
- Dwelling type and amenities: e.g. construction material, tap, bathroom, number of rooms
- Ownership of consumer durables

The team used the Lorenz curve, and the associated Gini coefficient, as a basis for measuring discrimination or inequality with the assumption that the system that throws up more inequality is more discriminating. In other words, the system that shows a bigger difference in ownership/consumption between the top half and the bottom half is the better one.

According to MRSI the new SEC system is able to reduce heterogeneity within social grade-and stretch the differences by grade

The classification of a household according to the new SEC gird is done by answering the following two questions:

Q1aPlease take a look at this list and tell me which of these items do you have at home? (It could be owned by you, your family, or provided by the employer or it could be available in the house you live in; but it should be for the use of just you or your family)

EXPLAIN, IF NECESSARY:

We have a standard list of items that we use in all kinds of cities and villages. So don't worry if an item appears irrelevant for you, or too ordinary-just go ahead and tell me which items you do have. We need this information just for survey purpose only.

Do you have a...(ITEM) in your home (which is in working condition)?

Trends in Market Research contd..

Q1bDoes your family own any agricultural land, by agricultural land I mean land that is currently under cultivation or plantation?
SHOW CARD/READ OUT
Question number 1 has a pre-identified list of 10 items – electricity connection, Ceiling fan, LPG stove, Two wheeler, Colour TV, Refrigerator, Washing machine, Personal computer/Laptop, Car/Jeep/Van, Air conditioner and agricultural land.

Q2 Could you tell me something about the person who makes the biggest contribution to the running of the household. To what level has he studied?
If the education of the chief wage earner is Graduation General and the household has 8 items out of the list of 11 items then the household gets classified as A2. **(Refer complete grid below)**

	Education of Chief Wage Earner / Main Income Earner (MIE)						
No. of durables	Illiterate	Lit. no sch/ school upto 4 years	Sch 5-9 yrs	SSC/ HSC	Some College but not Grad.	Grad./ Post-Grad. General	Grad./ Post-Grad. Professional
1	E3	E2	E2	E2	E2	E1	D2
2	E2	E1	E1	E1	D2	D2	D2
3	E1	E1	D2	D2	D1	D1	D1
4	D1	C2	C2	C1	C1	B2	B2
5	C2	C1	C1	B2	B1	B1	B1
6	C1	B2	B2	B1	A3	A3	A3
7	C1	B1	B1	A3	A3	A2	A2
8	B1	A3	A3	A3	A2	A2	A2
9+	B1	A3	A3	A2	A2	A1	A1

According to MRSI, the system is simple, and easy to administer and provides a good discrimination; the social grades created are more homogenous. However the team plans to
revisit the system at least once every two years; and make sure that when a change is needed, this is a smooth process.
However, not everyone is convinced about the two new parameters used in the new system. "A uniform yardstick for the urban and rural landscape is a good step. While the team must have done enough permutations and combinations to include education and durable ownership, I am curious why occupation was eliminated from the equation, as it would have created a more granular segmentation. The concern here is that the mix of durables will keep changing and then the samples will not be strictly comparable," said Nandini Dias, COO, Lodestar UM.

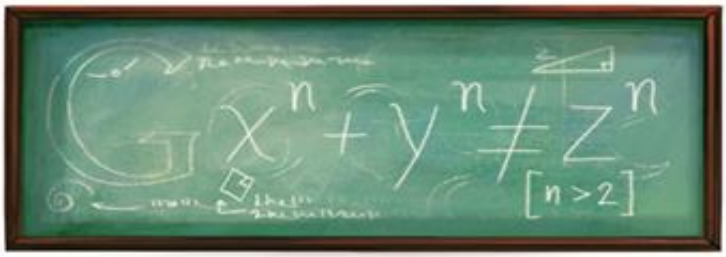
MRUC and MRSI will review the list of assets from time to time. Of the 11 assets specified, laptops are a part of the list but mobile handsets have been excluded. Other assets include ceiling fan, LPG gas/stove, air conditioners, cars and/or other vehicles, colour television sets, agricultural land, refrigerators, and electricity connection. These parameters will be applicable for both urban and the rural markets.

Source- Hindustan Times May 08 2011, Agency FAQ and MRSI

COMPILED BY PROF. ANJALI CHOPRA

A TRIBUTE TO FERMAT

Are you able to identify the figure below?



This is Google's doodle tribute to Fermat (1601-1665), whose 410th birthday fell on 17th August. The doodle illustrates Fermat's theory of infinitesimal calculus with the principal equation written in chalk on a blackboard with a partially erased Google logo.

Here follows a piece on Fermat written by members of Quantinuum as a tribute to the great mathematician, whose proof for his Last theorem was quite enigmatic.

COMPILED BY PROF N.S. NILAKANTAN

Pierre de Fermat—Last theorem

In number theory, Fermat's Last Theorem states that no three positive integers a, b, and c can satisfy the equation a^n + b^n = c^n for any integer value of n greater than two.

This theorem was first conjectured by Pierre de Fermat in 1637. He claimed he had a proof that was too large to fit in the margin. No successful proof was published until 1995 despite the efforts of countless mathematicians during the 358 intervening years. It is among the most famous theorems in the history of mathematics and prior to its 1995 proof was in the Guinness Book of World Records for "most difficult math problems"

Sir Andrew John Wiles provided the proof of Fermat's Last Theorem. His proof uses many techniques from algebraic geometry and number theory. It also uses standard constructions of modern algebraic geometry, such as the category of schemes and Iwasawa theory. His proof is itself of 100 pages and it took seven years of Wiles' research time.

EDITORIAL TEAM

QUANT *GURU* of the MONTH

August 28, 1867 - Sept 12, 1918

Maxime Bôcher (August 28, 1867 – September 12, 1918) was born in Boston, Massachusetts. Maxime's father was professor of modern languages at the Massachusetts Institute of Technology when Maxime was born, and became Professor of French at Harvard in 1872.

He graduated at the Cambridge Latin School in 1883 and took the bachelor's degree at Harvard in 1888. Then followed three years of study at Gottingen, where he received the degree of doctor of philosophy in 1891, and at the same time the prize offered in mathematics by the philosophical faculty of the university. From 1891 till his death he was a member of the Department of Mathematics in Harvard University.

He was an American mathematician who published about 100 papers on differential equations, series, and algebra. He also wrote elementary texts such as *Trigonometry* and *Analytic Geometry*. Bôcher's theorem, Bôcher's equation, and the Bôcher Memorial Prize are named after him. He was awarded a doctorate in 1891 for his dissertation *Über die Reihenentwicklungen der Potentialtheorie (Development of the Potential Function into Series)* having been encouraged to study this topic by Klein who acted as supervisor. It was an outstanding piece of work which received a university prize from Gottingen.

He wrote Introduction to Higher Algebra (1907) and Introduction to the Study of Integral Equations (1909). He was one of the editors of the Annals of Mathematics, of the Transactions of the American Mathematical Society, and collaborator on the Encyclopädie der mathematischen Wissenschaften. His final book was Leçons sur les méthodes de Sturm dans la théorie des équations différentielles linéaires et leurs développements modernes.

Bôcher Theorem states that the finite zeros of the derivative $r'(z)$ of a non constant rational function $r(z)$ that are not multiple zeros of $r(z)$ are the positions of equilibrium in the field of force due to particles of positive mass at the zeros of $r(z)$ and particles of negative mass at the poles of $r(z)$, with masses numerically equal to the respective multiplicities, where each particle repels with a force equal to the mass times the inverse distance.

Bôcher's equation is a second-order ordinary differential equation of the form:

$$y''+\frac{1}{2}\left[\frac{m_1}{x-a_1}+\cdots+\frac{m_{n-1}}{x-a_{n-1}}\right]y'+\frac{1}{4}\left[\frac{A_0+A_1x+\cdots+A_\ell x^\ell}{(x-a_1)_1^m(x-a_2)_2^m\cdots(x-a_{n-1})_{n-1}^m}\right]y=0.$$

VAIBHAV GOEL
PGDM –IB
2011-2013

Event of the month: QUANTIZ

Quantiz the annual intra college Quants quiz contest was conducted successfully at SIMSR on 26th August, 2011. Quantiz is basically a contest which tests the individuals numeral thinking and memory for numbers along with logical reasoning. The whole concept behind conducting such a Quiz is to keep the interest of Quants alive amongst the students and to give them the opportunity to test their skills with numbers because sometimes we forget that an MBA student too has to be proficient with numbers be it any specialization such as Operations or Finance.

The quiz got an immense participation for the first time with 78 Teams of two each from all courses PGDM, MMS and FINANCIAL SERVICES took part compete together. The quiz was conducted in 3 rounds. In the first round there was a written quiz and from 78 teams, 21 teams qualified for the second round. Second round was a buzzer round in which 4 teams were able to make to the finals.

The final round was a mind boggling round and there was tough fight between all the teams. In the end two teams from course PGDM-IB first year and course MMS first year had a tie and MMS second year won from a margin of 1 question. The whole quiz was conducted in a period of 2 hrs from 6pm to 8pm. The prize of Rs 1000 to the winners , Rs 500 to the second team and Rs 250 to third team was awarded. The questions were a good mix of logical thinking and general awareness and all the participants seem to enjoyed the process. The prize was awarded to the winners by Prof Nilakantan.

The members of the winning teams are as follows:

Winners
Ajinkya Chaobal and Nitesh Pinge of MMS 2010-12 batch

Runner up
Shivam Awasthi and Pratichi Kumar Swain of PGDM-IB 2011-13 batch.

GUNJAN JADON
PGDM B
2011-2013

FUN FACTS: Quants in a lighter vein

Ambulance chiefs could face fines totaling £3million if they fail to hit 999 call response time targets.

When I read this news on Google, I was a little confused. What does that number mean? Was it the number of calls they have to respond to in a week, month, or year? Nothing of that sort.
On further googling, I found out that this is the number for emergency used in a few countries including the U.K. The news article does not throw any light on the target. However, we may assume that monthly targets will be fixed by higher authorities based on their experience.

First introduced in the London area on 30 June 1937, the UK's 999 number is the world's oldest emergency call service. The 9-9-9 format was chosen based on the 'button A' and 'button B' design of pre-payment coin-operated public payphones in wide use (first introduced in 1925) which could be easily modified to allow free use of the 9 digit on the rotary dial, without allowing free use of any other number combination.
The choice of 999 was because in the dark or in dense smoke, 999 could be dialed by placing a finger against the dial stop and rotating the dial to the full extent three times. This enables all users including the visually impaired to easily dial the emergency number.
With the introduction of mobile telephones, accidental or "silent" 999 calls have become an increasing problem. Hoax calls and improper use are also an issue. For these reasons, there are frequent public information campaigns in the UK on the correct use of the 999 system.

Montana dog becomes local celebrity for his math skills- Reuters 17th Aug 2011
Owner David Madsen says if he tells Beau there are six dogs at the park and three dogs leave, and then asks him how many are left, the dog replies: "Woof, woof, woof.""He counts, he adds and subtracts, he can do some division and has memorized square roots," Madsen said.
He taught Beau to count using dog biscuits, laying out a handful and rewarding the dog when the number of his barks corresponded to the number of treats. "He caught on that rewards were associated with the correct number of barks," Madsen said.
Madsen, who says his canine calculator is accurate about 85 percent of the time, said he was not signaling the dog in any fashion and has allowed others to quiz Beau in his absence.

COMPILED BY PROF. N.S.NILAKANTAN

QUANT TRIVIA

"Pure mathem-atics is, in its way, the poetry of logical ideas."
—Albert Einstein

QUANT QUERY OF THE MONTH

25	13	10	1	17
8	24	11	12	4
19	6	21	7	5
9	15	5	18	3
14	20	22	16	2

What no. is two places away from itself plus 3, three places away from itself doubled, two places away from itself minus 2, two places away from itself plus 4, two places away from itself minus 1 and two places away from itself plus 6.

SUDOKU OF THE MONTH

	8		5	6				
1				4			6	
3		7				4		
					2	6		
	7	9				1	4	
		3	9					
		6				8		4
	3			9				2
				2	1		3	6

Answers and name of solvers will be published in the next issue. Mail your answers to simsr.quantinuum@gmail.com

Solutions to Last Month's QUANT QUERY 1

There must have been a multiple of 3 as well as 4 plus one children.
So, the minimum number of children riding on this Merry-Go-Round could be thirteen.
Those who rode ahead of Raj at the same time came behind him.
If there were twelve, we simply add three-quarter of twelve to one-third of twelve, which gives thirteen, the total number including Raj himself.

Solutions to Last Month's QUANT QUERY 2

Six arrows: because 17+17+17+17+16+16=100

The correct answer to Quant Query 1 was given by Khitish Kakar of PGDM A, 2011-2013 batch. Congratulations!

EDITORIAL TEAM

Quantinuum, the Quant's forum of KJ Somaiya Institute of Management Studies and Research is formed with two objectives. Firstly to remove the common myth from the students mind that mathematics is difficult. Secondly to give students an exposure on how to make decisions in real life business problems using quantitative techniques. This helps to bridge the gap between theory and the practical application.

For any further queries and feedback, please contact the following address

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