

Creativity, Problem Solving and Innovation

This Course is created

by Anil S. Patel Ph.D. in Seattle, USA

**Supported by Anil and Asha Patel endowment fund
for creativity course for Gyan Daan to your educational institution**

Creator of the course & his wife as key reviewer



Anil S. Patel, Ph.D.



Asha Patel, Ph.D.



WARNING FOR THE ENTIRE COURSE

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CREATIVITY, PROBLEM SOLVING AND INNOVATION

Week #1

Creativity as a teachable skill & Various types of thinking

Confidential Course created by Anil S. Patel, Ph.D. in Seattle, USA



SPECIFIC DISCLOSURE FOR WEEK # 1

- None since it is created by Anil S Patel, Ph.D. with no specific source requiring disclosure.



Important for this and all classes of this course

For maximum benefit from the course



**Required strict Time Management
especially during Individual Test and
Group Test**



Important reminder for you as teachers

- Please keep in mind while experiencing this FDP training that this course is designed for undergraduate beginning students and not for you.
- Please follow instructions for both tests and experience full participation which will help you as a teacher when you teach the course to your students with expectation of their full participation.
- Do not judge your own experience with this course and its training without considering above two important caveats.



Session Flow as Learning Objectives

- Definitions of creativity, problem solving and innovation
- Creativity is a skill & can be developed like muscles
- Past achievements of India & Indians need to solve India's problems now
- Needed skills for 21st Century & why CPI course is needed
- Various types of thinking
- Need of confidence of creativity
- Psychology of Problem solving
- **Learning Outcomes**
 - Creativity is a teachable skill which can be developed by anyone
 - Various types of thinking and approaches to problem solving



Four Human Abilities

- “Yadshakti” or ability to memorize can help recollect information and may help you pass some examinations and even get good grades.
- But without the required need and ability for understanding or “Samajshakti”, while you may pass exams, it will not help you progress much in your chosen field much further as required in your job, career or life.



Four Human Abilities

- Ability to follow up your understanding by further **thinking** or “**Vicharshakti**” needs to be developed for your skill for Creativity, Problem solving and Innovation (**CPI**).
- Further development of the ability of **imagining** or “**Kalpanashakti**” will really help you much further for application of what you learnt in newer and much improved way to enhance your skill for CPI.



What is Creativity Problem Solving and innovation ?

- Yadshakti + Samajshakti + Vicharshakti + Kalpanashakti
- All these four human abilities are involved in what is generally known as skill for Creativity, Problem Solving and Innovation.
- Raising curiosity and teaching how to think creatively is the essence of this course. It attempts to give you ways of developing these abilities of your brain by exposing to you many strategies and illustrative videos.



Creativity , Problem Solving & Innovation

- **Creativity** is an ability to think of new idea or make new things. Poets, artist, cartoonists, comedians, scientists, engineers, ordinary citizens without formal education, group of people are capable for creativity.
- **Problem Solving** is a creative way to find solution for the problem.
- **Innovation** is the end result of transforming creative idea into reality by needed actions.

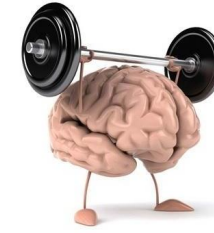


Can Creativity be Developed?

- There is a false wide spread belief that somehow either you are born with creativity as a genetic inheritance with your birth or you do not have any ability for creativity.
- Latest results of neuroscience and psychology research has shown that the building blocks for creativity are possessed by all human beings.

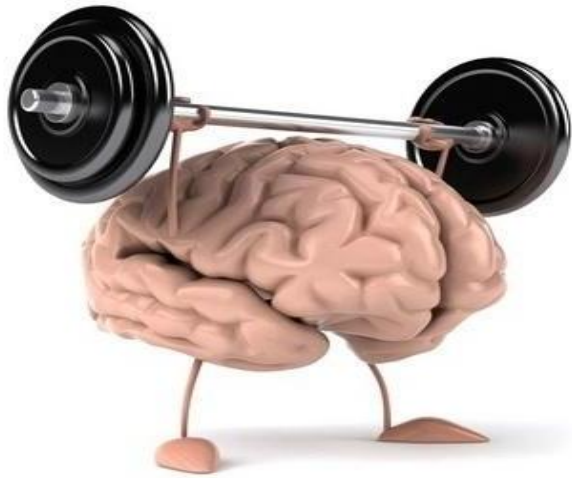


Can Creativity be Developed?



- But these inherent building blocks of the brain require **training & exercises** for full development of your four abilities for creativity analogous to development of muscles by exercises.
- The latest scientific research considers creativity as a **teachable skill** similar to skills for reading, writing, arithmetic which were introduced in the past. Recently we have added learnable skills of use of mobile phones, computer, etc., digital devices.





This course teaches several methods for brain development similar to body development shown here



India's history of creativity and innovations

- In the past India had created many note worthy innovations in agriculture, herbal medicine, metallurgy, mathematics, language, literature, etc., and only in last few hundred years fell behind the western world by feudal infighting and external invasions.
- But Indian civilization is resilient and thus has survived and thrived for millenniums.
- Given opportunity to learn, Indians have the same capacity as human being to be creative as any other human being from any other parts of the world including the western world.



Innovations by Indians

Pi, zero

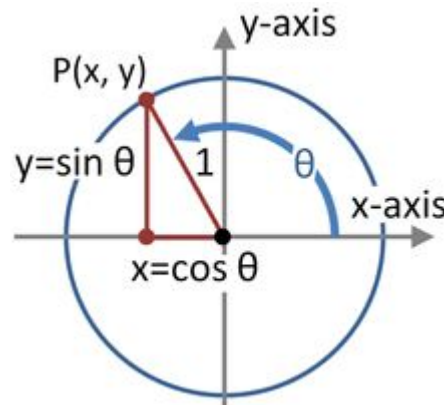
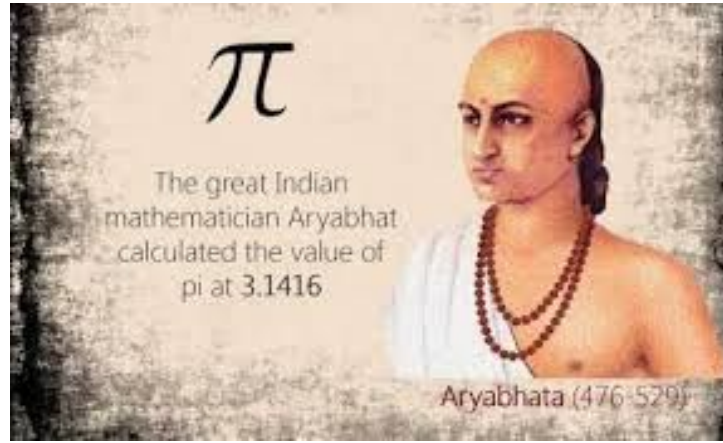
Ruler (scale): 2400 BCE

Weighing balance

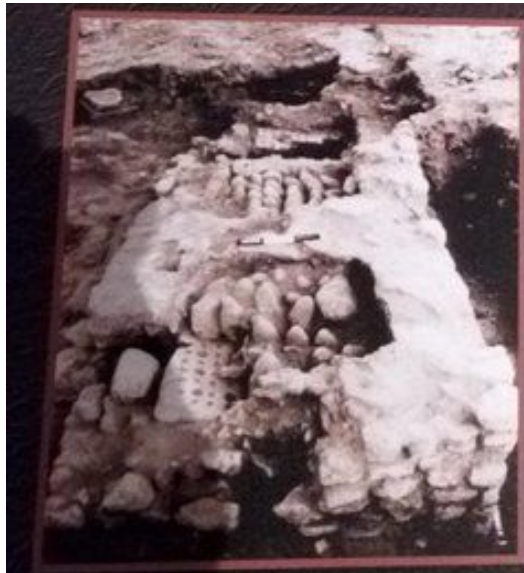
Steel

Astronomy – earth revolves around the sun

Zinc distillation



Zinc Distillation



Zinc smelting furnaces at Zawar Mala
site 30



Graphical representation of the furnace

COMMON IRON TOOLS

Iron tools and implements for daily use and agriculture became common in India during first century CE.



Ancient Indian Zinc Metallurgy

Ancient Zinc Retort Furnaces
at Zawar Mines, Near Udaipur (Rajasthan)

Zn



Schematic representation of the Indian method for producing zinc.

Picture Courtesy Mr. Fathi Abashi

✓ The production of metallic zinc was described in the **Rasarnava** written around 1200 A.D.

✓ The fourteenth century work **Rasaratnassamuchchaya** describes how the “tin-like” metal was made.

✓ Calamine was heated indirectly with charcoal to around 1000°C in a covered crucible fitted with a condenser. Zinc vapour was evolved and the vapour was air cooled in the condenser located below the refractory crucible (See Figure).

Indians in USA

- Recently Indians have gone to USA as students and have demonstrated this fact in that society which has needed resources and gives equal opportunity based on merit.
- Corporations such as Google, Microsoft, Oracle, Amazon, Pepsi Cola etc., and major US business schools and Universities are where Indians are playing leading creative roles.



India's contribution to the world

- You tube videos by Nick Booker released in 2016 gives a fresh latest account. Please go and see them to gain more confidence that as an Indian you have inherited potential for similar creativity. Just search videos by Nick Booker on you tube.
 - <https://www.youtube.com/watch?v=qAbvbXu42LY>
 - <https://www.youtube.com/watch?v=OzZ18EfBZT8>
 - <https://www.youtube.com/watch?v=0W6ucek9XVY>
 - <https://www.youtube.com/watch?v=L0G9jL2hVQQ>
- and many more additionally as a series by Nick Booker.
- Thus please do not consider that west or any other civilization has monopoly in human Creativity, Problem solving and Innovation



Indians Need To Solve India's Problems

- There are many reasons for development of flow of history and you should be proud of India who in an innovative way gained independence.
- **You must have confidence that as an Indian you have as good a potential for creativity as any other human being.**
- India once again can improve the life of its people by taking charge of its destiny by solving its problems and not only catch up but improve further human life in India by fusion of science, technology and Indian values of tolerance of diversity, compassion as demonstrated heritage and other cultural heritage.



Indians Need To Solve India's Problems

- Since last few hundred years many innovations came from the western world. Also India's current education system was designed by the needs of the British Empire (now U.K.) for primarily to control and exploit India as its colony.
- Thus at this juncture of India after its independence, it is necessary and wise to examine latest existing teaching techniques and the best available resources for developing skills for creativity, problem solving and innovation from anywhere in the world.
- USA has made the most dramatic progress in innovations as an independent nation after it ceased to be colony of the British Empire.



Indians Need To Solve India's Problems

- Thus as independent India we should sincerely examine its educational techniques for the subject of this course.
- Why is this CPI course important?
 - Reference:
<http://asiasociety.org/education/seven-skills-students-need-their-future>

Next two slides as summary from the above link



Why is this CPI course important?

What is The “Global Achievement Gap”?

The Global Achievement Gap is the gap between what even our *best* schools are teaching and testing

Versus

The skills *all* students will need for careers, college, and citizenship in the 21st century



Why is this CPI course important?

The Seven Survival Skills for Careers, College, And Citizenship

- 1. Critical Thinking and Problem-Solving**
- 2. Collaboration Across Networks and Leading by Influence**
- 3. Agility and Adaptability**
- 4. Initiative and Entrepreneurialism**
- 5. Effective Oral and Written Communication**
- 6. Accessing and Analyzing Information**
- 7. Curiosity and Imagination**

from The Global Achievement Gap: Why Even Our Best Schools Don't Teach The New Survival Skills Our Children Need—And What We Can Do About It, by Tony Wagner (Basic Books, 2008)



Benefits of this Course

This course will provide various training modules

- to develop creative and critical thinking, problem solving and innovation skills.
- to enhance use of **your inherent abilities either as an individual and especially when working with others as a group** to collectively create, solve problems and achieve needed innovation for your lives as well as for India.



It's video time



CPI-W1-1 CC m6.33 Creativity and Problem solving.mp4

Intrinsic motivation yield more creativity then motivated by fame and/or fortune. Thus your own curiosity or need driven effort is most important for CPI.



Types of thinking classified

- **Divergent** thinking
- **Convergent** thinking
- **Critical or Vertical** thinking
- **Lateral or “Out of box”** thinking



Well Defined Problem Solving Examples



- Video of a thinking crow.
- Video gives experiments carried out at a university in New Zealand for a hungry crow.
- It also depicts how water level on which the food is floating is raised.



CPI-W1-2 m1.44 Physics-minded crow brings Aesop's fable to life.mp4



Show the video again to pay careful attention



- Video of a thinking crow.
- Video gives experiments carried out at a university in New Zealand for a hungry crow.
- It also depicts how water level on which the food is floating is raised.



CPI-W1-2 m1.44 Physics-minded crow brings Aesop's fable to life.mp4



Transform your observation

From the video seen by you



Learning how to ask questions as a crow

- What is my goal? To get the floating food on the water.
- What problem is preventing achievement of the goal?
- My beak cannot reach the floating food.



Learning how to ask questions as a crow

- What was the creativity required to solve the problem to achieve the goal? If I add heavy big object in appropriate container the water rises in the container which had the floating food. The crow actually uses simple action in initial experiment and then uses trial and error and observation skills as the experiment gets more difficult.
- Did crow knew this ahead of time or learnt as he went along? Raise hand if you think he knew ahead of time? Raise hand if he learnt as he went along? Who did not raise hand? Please give your reason and your explanation.



It's video time

Can a donkey demonstrate inherent ability to think ?



CPI-W1-3 m0.3A Smart donkey.mp4



Seek comments from students about the video on the big donkey

Why the title of the video is Smart Donkey?



Human Brain

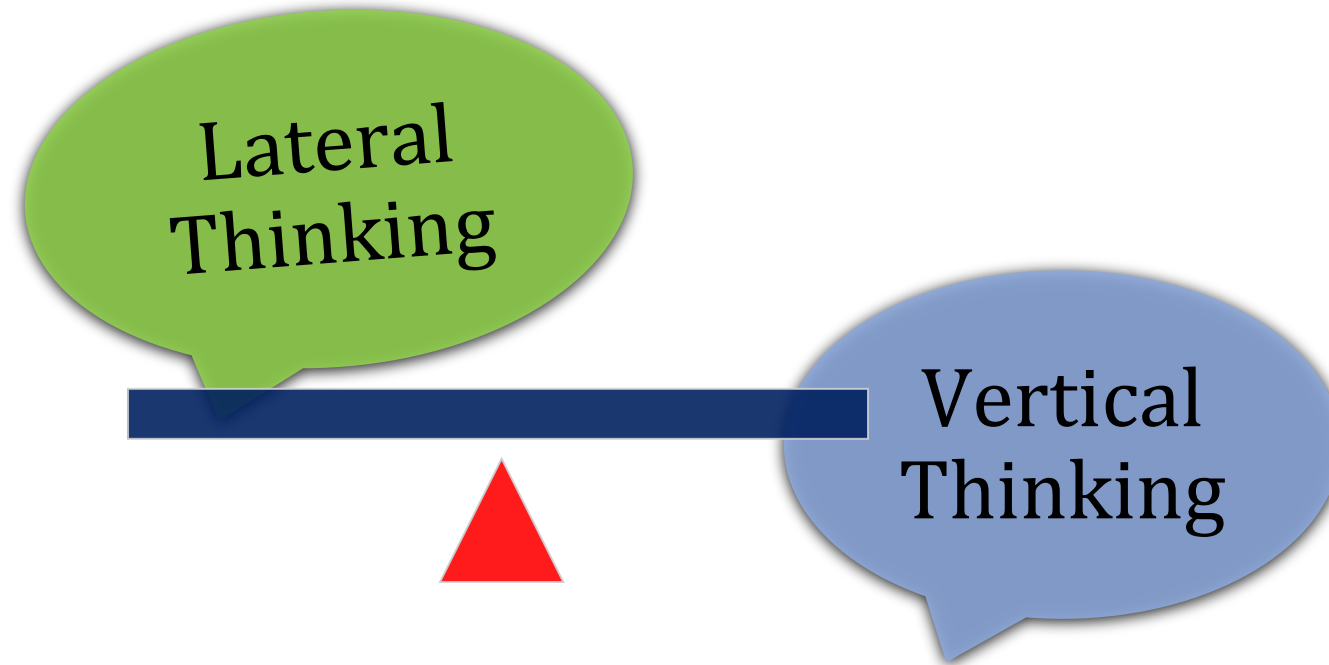
- Features
 - Larger
 - Capable
- Have ability or skills for
 - Creativity
 - Problem Solving
 - Innovation



CPI-W1-4 CCm8.17 The Psychology of Problem-Solving.mp4



What is Lateral Thinking?



CPI-W1-5 CCm3.09 Edward de Bono - discusses Lateral Thinking™

CPI-W1-6 CCm4.01 Lateral Thinking Generate Brilliant Ideas.mp4



Indian Scenario on CPI



**NO DIGGING MACHINE OR SPACE FOR IT
REQUIRED, JUST HOLD THE TWO FEET UNTIL
UNDERGROUND FIXING IS DONE!**



Indian Scenario on CPI



**TRAIN STOPS FOR LIMITED TIME ANY MANY TEA
ORDERS TO FILL!**



WHY NOT DOUBLE THE CAPACITY!



Indian Scenario on CPI



NO SEPARATE TRANSPORTATION VEHICLE NEEDED FOR WORKERS!



Rules for individual and group tests for each week

- While the each side of the index card can be used for individual test as puzzles , it is suggested that the top half of one side of the index card be used only for the name of the student as well answers of both puzzles **so that when posted both answers are visible along with name of the student.**
- After each lateral thinking test answers will be randomly selected and then correct answer will be given and discussed by the teacher. **Each student will submit his/ her index card as suggested above for posting.**
- After each group test which requires discussion of the results from each group, all students will go back to class room from group activity room and the teacher will facilitate such discussion. **Each group will submit its result output for posting.**
- After some group test it will be required to go back to class room from group activity room **for viewing required video** or if time permits optional video.



Rules for individual and group tests for each week for online teaching


- Online-Link is provided in chat box, please click on the link and provide your answers
- Students will be randomly selected and then correct answers will be given and discussed by the teacher.
- After each group test all students will go back to the main class team and the teacher will facilitate such discussion. Each group will submit its result in the onedrive link provided. The name of the team and date will be written in the file name. The names of members will be written in the first line of the file.
- After some group test it will be necessary or required to go back to main class team from group activity team for viewing required video or if time permits optional video.



Suggested preparations by Teacher for tests

The teacher can give prepared earlier 30 index cards using both sides with names written up in advance in each class where they will be required. This will minimize time available for the rest of the class.

The names of the rotating group members for each group test can also be planned earlier with for each group test as a master list. This master list needs to be distributed to all students so that they can assemble as per this master list for each week.

If you are late the group leader will start without you and you will receive partial grade only and not full grade for this activity. 

Individual test as two puzzles



Its now time for



Individual Test for 5 minutes:

Take an index card for two well-defined problems.

Write your name

Leave space for your two answers

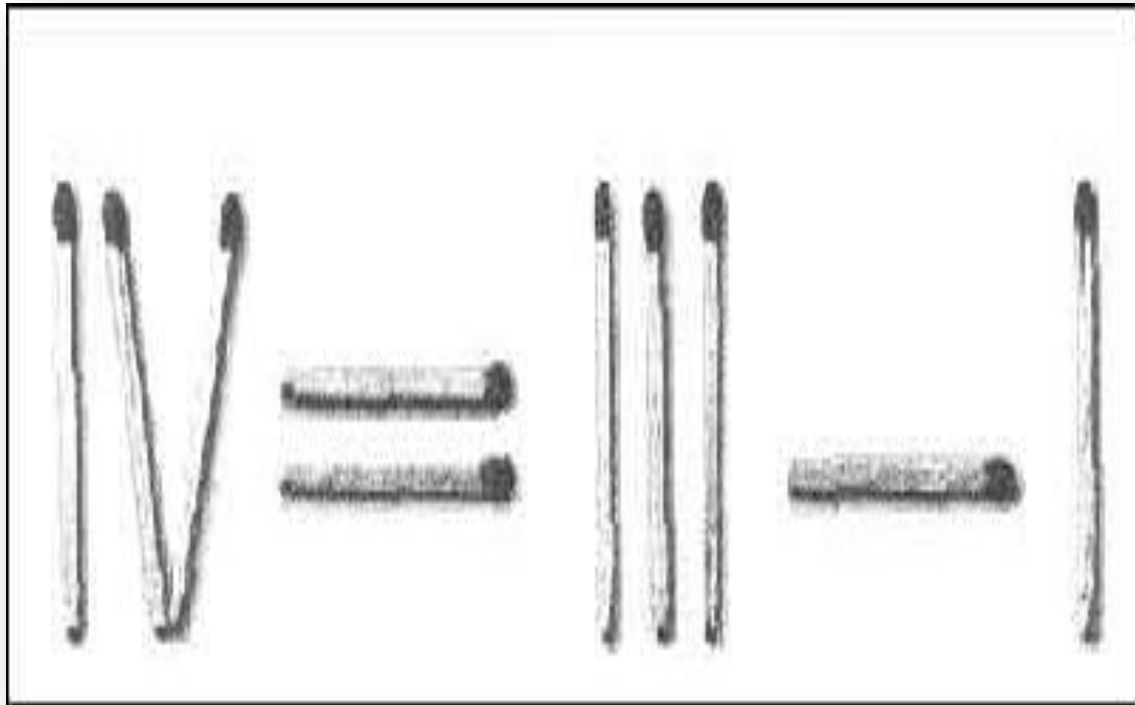
Solve one for each side of the card

Time allocated is **5 minutes** for two problems



Problem #1 draw on one side of an index card

Do you
know?



Move only one stick by an arrow for its current position to the new position required to make this a correct equation.



Problem #2 Draw IX on other side of the index card

Make a 6 without moving any stick out of 9 which will be drawn as roman numeral IX on your index card.



Experience Sharing on Individual Test

- Provide Answers and discuss in context to vertical versus lateral thinking.
- Puzzle Benefits
 - doing brain exercise
 - more you do them, your ability will improve
- Remember everyone has ability for creativity



Bathroom break for 5 minutes

Please only for those who must & others just relax.

Remember strict discipline of time which must be observed by all.



Some of you may have easy time while some of you may have difficulty during individual tests.

Puzzles are like doing brain exercise and more you do them, your ability will improve and you will be surprised.

In order to help you better understand the message that everyone has ability for creativity, but some of us lack self confidence, the next video is from Mr. David Kelly who created world renowned Stanford d School, d being for design.

He also created IDIO company about which you will learn later.



Build Creative Confidence



CPI-W1-8m11.43

Creative

confidence

DavidKelley_2012-480p-en.mp4

- Brief discussion after showing this video of about 11 minutes



Discuss the video by David Kelly on Creative Confidence

- Briefly summarize the video
- What snake represents in context to creativity?
- Fear of judgment?
- Seek comments from students. Teacher randomly selects students .



Build Creative Confidence

- What are your learnings from this video?????
 - Build self confidence that you are creative
- You can be even more creative if you pay attention and enjoy this course.
- The goal of this course is to help you achieve it in a systematic manner.



Concluding Interaction with another video

- **Show this video by Simerjeet Singh- a motivational speaker from India**



-W1-9A m 7.05 Developing Creativity in Students- Changes required in the Indian Education System by Simerjeet Singh.mp4



Video on “Developing Creativity in Students-Changes required in the Indian Education System” by Simerjeet Singh

- Seek comments from students.
Teacher randomly selects students .



Optional video for 7.29 minutes before group test if there is still time left for 20 minutes group test, otherwise it will be shown in week 8 on Importance of play

- Shows how
 - human brain by curiosity and creative thinking and playfulness over thousands of years made significant progress.
- It also illustrates
 - many strategies for creativity which will be discussed later over the weeks in this course.



CPI-W1-7m7.29 Importance of Play StevenJohnson_2016V-480p-en.mp4



Optional video if time permits for 20 minutes group test

It is worth watching from Tony Buzan of U.K. who strongly believes that all of us are creative.

It is humorous and students should watch it on their own if time does not allow in the class.



9B CC last m8.43 Tony Buzan The Power of a Mind TEDxSquareMile 2012 -



Finally lets have a.....



Group Test of 20 minutes



Group Test and its Rules are here.....

- Each student will think and contribute to create list of key points you learnt today as a group.
- Each student verbalizes first any new key point yet not given thus far and then it is written on a large sheet either circulated or to a volunteer with good hand writing.
- Randomly a leader will be selected who will start and sequentially give opportunity to verbalize and write his/her one key point in as short a time as possible but not to exceed 1 minutes.



Group Test and its Rules are here.....

- Then it will be the turn of next student with similar restriction to give his/her learnt key new point.
- Others will keep thinking for his/her turn and each student must contribute at least three new points not given yet by others by the end of 20 minutes.
- The rotation will continue for 20 minutes and this process can generate minimum 18 and maximum much larger number of key points learnt during this class.
- If each member has already given 3 new points then conduct voting to arrive at 10 key points from the list with highest votes, each member having three votes to give to any one or more of the generated list. Member can vote on any key point not necessarily those contributed by him or her.



Group Test and its Rules are here.....

- There is no limit for giving more than 3 new points beyond minimum 3 new points/student.
- All sheets must be submitted to the teacher who puts on a bulletin board for the entire class to see outcome from all groups.
- This first group test is to start getting used to group formation and to emphasize importance to paying close attention all throughout the entire class. Later group test will be much more interactive and will require significant discussion and brain storming within the group with input from each member of the group.



Thank You!

