$E=MC^2$ Pr (a)

THE PROPOSED SOLUTION FOR HODGE CONJECTURE

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ABSTRACT

The event of our life exists as hidden information and if we get sucked into black hole we might be able to live forever as a repeated life.

A highly speculative idea of modern astrophysics, wormholes are theoretical possibilities allowed within the mathematical framework of Einstein's general theory of relativity. In Wormhole theory, matter falling into a black hole at one point should emerge through a proposed "white hole" – the reverse of a black hole – at the other end.

The research paper titled "Black hole and soft hair says that information is stored in the event horizon. Where did we come from and where are we going? Albert Einstein's Theory of relativity, published in 1915, for the first time gave a mathematical formula to answer these questions. Among other things, Einstein explained why gravity works the way it does. He described that gravitational pull occurs because matter causes a bend in space – time.

INTRODUCTION:

"The Gita"

"Chapter 7, verses 20 to 23, LORD KRISHNA says

"Arjuna, people worship limited as they are by their nature and their yearnings. From me comes their faith. The restricted stay restrained. Those who shatter the boundaries discover me: the limitless."

In the twentieth century of mathematicians discovered powerful ways to investigate the shapes of complicated objects. The basic idea is to ask to what extent we can approximate the shape of a given object by gluing together simple geometric building blocks of increasing dimension.

The techniques turned out to be so useful that it got generalized in many different ways, eventually leading to powerful tools that enabled mathematicians to make great progress in cataloging the variety of objects they encountering in their investigation. Unfortunately, the geometric origins of the procedure became obscured in this generalization. In some sense it was necessary to add pieces that did not have any geometric interpretation. The Hodge Conjecture asserts that for particularly nice types of spaces called projective algebraic varieties, the pieces called Hodge cycles are actually (rational linear) combinations of geometric pieces called algebraic cycles.

In algebraic geometry, a projective variety over an algebraically closed field k is a subset of some projective n – space over k that is the zero – locus n – space over k that is the zero – locus of some finite of homogenous polynomials of n+1 variables with co – efficient in k, that generate a prime ideal. The defining is ideal of the variety.

In mathematics, the concept of a projective space originated from the visual effect of perspective, where parallel lines seem to meet at infinity.

History – In 1650 BC Rhind Mathematical Papyrus, copy of a lost scroll from around 1850 BC, the scribe Ahmes presents one of the first known approximate values of Pi at 3.16, the first attempt of squaring the circle, earliest known us of a sort of cotangent, and knowledge of solving first order linear equations.

Aryabhata writes the "Aryabhata Siddhanta", which first introduces the trigonometric function of calculating their approximate numerical values. It defines the concept of sine of cosine values (in 3.75 – degrees interval from 0 degree to 90 degrees). In 7th century, Bhaskara I gives a rational approximation of the sine function

Hodge Conjecture is a complex millennium problem in mathematics that relates the algebraic topology of a non – singular complex algebraic variety and the sub varieties of that variety. More specifically, the conjecture says that certain de Rham cohomology classes are algebraic, that is, they are sums of Poincare duals of the homology classes of sub varieties.

PROOF START WITH

Growing Pattern (LIFE) – A pattern is anything that can be predicted. A growing pattern happens when something is added (multiplied each time).

And

Shrinking Pattern (DEATH) – A shrinking or reducing pattern happen when something is taken away (subtracted/divided) each time.

THE FACT

"SUM OF LOCAL CIRCULATION = GLOBAL CIRCULATION".

In continuance of "Birch and Dyer Conjecture", where proposed solution by life and its transformation and in this equation we are proposed solution for Hodge Conjecture with death and it's connection of After Life.

Light: Life is the manifestation of consciousness in the gross body, through the medium of the subtle body (mind), just like light is the manifestation of electricity in the bulb, through the mediums of the filament just as the electricity is one in all the electric gadgets, consciousness is the same in all living beings.

Is there any possibility the Hodge Conjecture is connected with Chamber 6, Vault B, of "NARAYAN MANDIR". Although, I don't know much about its details but on social media, you tube, and in news we heard story about it.

Peoples have fear about death related to open Chamber -6, because Priests tell us so many stories without understanding the actual meaning of image of that door.

"LAWYER COME OUT FROM THE DOOR", a perfect love story, NOVEL, tell you the hidden meaning of that image.

"ABOVE ADULT BEACH BREAD CANDY" is the pattern which solves the mystery of Hodge Conjecture with the powerful word DEATH.

DEATH

Scientist named Leonard Susskind defines death as

"No event be erased but every event be hidden and so does our life. Our life remains but hidden".

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Space – Time is the expanse in which this universe exists. The binding of space – time set and has kept the celestial bodies in motion.

Einstein's theory predicted existence of black hole, which is considered as a death zone where matter ends. Nothing escapes from the black hole. In a way, Einstein's theory of relativity explained the destination of the universe death in the black hole.

But the other question kept troubling scientists – where did we come from? The same theory of Einstein's gave a clue. If there is death, there must be birth.

The research paper – titled, Black Hole and Soft Hair – says that information is stored in the event horizon.

Event horizon is entry point of a body including light into the black hole and contains information of death – of celestial body – in sheens of photons. This seen of photos is called soft hair so, information paradox has been explained but it is not yet clear as to how much information is stored in soft hair and how this information would be retrieved.

As we all know "Gravitational waves transport energy as gravitational radiation, a form of radiant energy similar to electromagnetic radiation."

Event horizon is entry point body including light into the black hole. This event horizon surrounds the black hole and contains information of death – of celestial body – in sheen of photons. This seen of photos is called soft hair so, information paradox has been explained but it is not yet clear as to how much information is stored in soft hair and how this information would be retrieved.

We can retrieve information by quantity equal to the square root – 1 in computer language with using formula $E = mc^2$ Pr (a)

Without doubt $E = mc^2$ is the most famous equation. Energy = mass* the speed of light squared.

In other words:

- E = energy (measured, in Joules J)

- m= mass (measured in kilograms, kg)
- c = the speed of light (measured in metres per second), but this needs to be "squared".
  The equation is derived directly from Einstein's Special Theory of Relativity.

WAVES IN EKG - There are three main components to an ecg: the p wave, which represents the depolarization of the atria; the qrs complex, which represents the depolarization of the ventricles; and the t wave, which represents the repolarization of the ventricles.

During each heartbeat, a healthy heart has an orderly progression of depolarization that starts with pacemaker cells in the sinoatrial node, spreads throughout the atrium, and passes through the atrioventricular node down into the bundle of his and into the purkinje fibers, spreading down and to the left throughout the ventricles. This orderly pattern of depolarization gives rise to the characteristic ecg tracing. To the trained clinician, an ecg conveys a large amount of information about the structure of the heart and the function of its electrical conduction system. Among other things, an ecg can be used to measure the rate and rhythm of heartbeats, the size and position of the heart chambers, the presence of any damage to the heart's muscle cells or conduction system, the effects of heart drugs, and the function of implanted pacemakers.

We can retrieve hidden information like this happy pattern. A very happy pattern that is designed to bring peace and tranquility for human beings

"A Light or Music in a New Life can be protected by Meditation and Prayer to reach the Star for Pride in King's Kingdom".

1) **Swati** **Star**
2) **Guard** **Protect**
3) **Narinder** **King, King's Kingdom**
4) **Nabaneeta** **A NEW LIFE**
5) **Mala** **Meditation and Prayer**
6) **Gaurav** **Pride**
7) **Deepika -** **Light, Music**

Information behind this message retrieve from "Sri Ramcharitmanas", "Srimad Bhagwat Gita" and Holy Bible" and the information hidden behind this pattern is –

This message is a secret beautiful gospel

A Light or Music in a New Life can be protected by Meditation and Prayer to reach the Star for Pride in King's Kingdom.

We identify in "The Bhagawad Gita"

idaṁ te nātapaskyāya nābhaktāya kadāchana
na chāśhuśhruṣhave vāchyaṁ na cha māṁ yo 'bhyasūtayi

This secret gospel of the Gita should never be imparted to a man who lacks in austerity, nor to him who is wanting in devotion, nor even to him who is not willing to hear; and in no case to him who finds fault with me.The demonstrative pronoun "Idam" in this verse covers the entire range of the Lord's teaching's imparted to Arjuna from verse 11 of chapter 2nd to the preceding verse with a view to expounding the truth of his own virtues, glory, mystery, and essential character. In order to determine the eligibility for receiving this gospel the Lord forbids Arjuna to repeat it to those who labour under the four disqualifications mentioned in this verse.

Out of the four types of unqualified person referred to above the Lord mentions first of all him who lacks austerity. By shutting out such a man from the portals of the Gita, the Lord seeks to impress upon Arjuna that the gospel of the Gita is an extremely profound secret that Arjuna was His most loving devotee and endowed with divine virtues, hence He had confided it to him in his own interest, recognizing him as qualified to receive it.

Therefore He warns Arjuna not to repeat the Gita, replete as it is with an exposition of His virtues, glory and reality, to a man who is not given to austerity in the form of discharging his own sacred obligations, who having abandoned his duty has given himself over to sinful ways out of greed for worldly pleasure due to attachment for sensuous enjoyments. For such a man would be incapable of assimilating this teaching and would thereby bring dishonor to the same as well as to the Lord Himself. The compound word "Abhaktya" stands for the unbeliever who has no faith in God, much less love or reverence for Him, and who regards himself as everything. The most esoteric gospel of the Gita should not be delivered to such a man either, for being incapable of grasping its secret he would be unable to assimilate it. Even if a man practices austerity in the shape of performing his sacred duties, but having no reverence and love for teaching of the Gita does not care to lend his ear to it, this most esoteric gospel should not be delivered to him. For a man of this type would get disgusted with it, and would not be able to appreciate it. Thereby he would only belittle the teaching as well as the Lord.

In no case should this teaching be related to a man who cavils at the Lord, - who has assumed a form with attributes for redeeming the world, who paints His virtues as a vice and vilifies Him.

For being jealous of the Lord's virtues, glory and divinity, he would treat the Lord with even greater contempt and thereby aggravate his sin.

He who is free from all the four disqualifications mentioned in this verse is unquestionably fully qualified to receive this gospel. Next to him, he who lacks penance in the form of devotion to his duty, but is free from the other three disqualifications is also eligible for it. And he too who is neither given to austerity nor fully devoted to the Lord, but who is willing to hear the Gita, is qualified to a certain extent. He, however, who looks on the Lord with a carping eye or vilifies Him as absolutely unqualified.

य इदं परमं गुह्यं मद्भक्तेष्वभिधास्यति |
भक्तिं मयि परां कृत्वा मामेवैष्यत्यसंशय: || 68||

ya idaṁ paramaṁ guhyaṁ mad-bhakteṣhv abhidhāsyati
bhaktiṁ mayi parāṁ kṛitvā mām evaiṣhyaty asanśhayaḥ

He who, offering the highest love to Me, preaches the most profound gospel of the Gita among My devotees, shall come to Me alone, there is no doubt it. Possessed of extreme reverence for the Lord Himself or His utterances. A devotee of God *is overwhelmed with love by the thought of His name, virtues, sports, glory and essential character and preaches the gospel of the Gita among His devotees in a disinterested spirit for the sake of His pleasure alone.*

IN STATISTICS

POISSON DISTRIBUTION

1 – Events occur several times within a limited time.

2 – Number of occurrences is unknown.

3 – Time elapsed between successive distribution is exponential.

Condition for Poisson distribution =

When n ⇒ total numbers tends to infinite

And P ………………when chance of succession single trial tends to 0

and chance of un succession will be q ……tends to 1

But Mean (np) remains finite

Then we use Poisson distributed instead of Bionomial Distribution.

For Example – How many calls come in single months – means total no. calls can be infinite but infinite does not mean we cannot count.

Have you received unknown numbers call?

If answer is no - chance of succession in single trial is zero …and what is the probability in during one particular minute to receive call with three unknown numbers.

Are you denying this that there is no probability?

Yes, there are probabilities to receive call by unknown numbers.

But in this condition you cannot use Binomial. You have to use only poisson distribution to count.

IN PROBABILITY THEORY AND STATISTICS

The **Poisson binomial distribution** is the discrete probability distribution of a sum of independent Bernoulli trials that are not necessarily identically distributed. The concept is named after Siméon Denis Poisson.

In other words, it is the probability distribution of the number of successes in a sequence of *n* independent yes/no experiments with success probabilities $p_1, p_2, \ldots, p_n$. The ordinary binomial distribution is a special case of the Poisson binomial distribution, when all success probabilities are the same, that is $p_1 = p_2 = \cdots = p_n$

Since a Poisson binomial distributed variable is a sum of *n* independent Bernoulli distributed variables, its mean and variance will simply be sums of the mean and variance of the *n* Bernoulli distributions:

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$$\mu = \sum_{i=1}^{n} p_i$$

$$\sigma^2 = \sum_{i=1}^{n} (1 - p_i) p_i$$

For fixed values of the mean (μ) and size (*n*), the variance is maximal when all success probabilities are equal and we have a binomial distribution. When the mean is fixed, the variance is bounded from above by the variance of the Poisson distribution with the same mean which is attained asymptotically as *n* tends to infinity.

PROBABILITY MASS FUNCTION

The probability of having *k* successful trials out of a total of *n* can be written as the sum

$$\Pr(K = k) = \sum_{A \in F_k} \prod_{i \in A} p_i \prod_{j \in A^c} (1 - p_j)$$

where F_k is the set of all subsets of *k* integers that can be selected from {1,2,3,...,*n*}. For example, if *n* = 3, then. $F_2 = \{\{1,2\},\{1,3\},\{2,3\}\}$ is A^c the complement of A, i.e. $A^c = \{1,2,3,\dots,n\} \setminus A$.

F_k will contain $n!/((n-k)!k!)$ elements, the sum over which is infeasible to compute in practice unless the number of trials *n* is small (e.g. if *n* = 30, F_{15} contains over 10^{20} elements). However, there are other, more efficient ways to calculate $\Pr(K = k)$

As long as none of the success probabilities are equal to one, one can calculate the probability of *k* successes using the recursive formula

$$\Pr(K = k) = \begin{cases} \prod_{i=1}^{n} (1 - p_i) & k = 0 \\ \frac{1}{k} \sum_{i=1}^{k} (-1)^{i-1} \Pr(K = k - i) T(i) & k > 0 \end{cases}$$

where

$$T(i) = \sum_{j=1}^{n} \left(\frac{p_j}{1 - p_j} \right)^i.$$

The recursive formula is not numerically stable, and should be avoided if 'n' is greater than approximately 20. Another possibility is using the discrete Fourier transform.

$$\Pr(K=k)=\frac{1}{n+1}\sum_{l=0}^{n}C^{-lk}\prod_{m=1}^{n}\left(1+(C^{l}-1)p_m\right)$$

where $C=\exp\left(\frac{2i\pi}{n+1}\right)$ and $i=\sqrt{-1}$.

CHERNOFF BOUND

The probability that a Poisson binomial distribution gets large, can be bounded using its moment generating function:

$$\begin{aligned}
\Pr[S\ge s] &\le \exp(-st)\,\mathrm{E}\left[\exp\left[t\sum_i X_i\right]\right]\\
&= \exp(-st)\prod_i(1-p_i+e^t p_i)\\
&= \exp\left(-st+\sum_i \log\left(p_i(e^t-1)+1\right)\right)\\
&\le \exp\left(-st+\sum_i \log\left(\exp(p_i(e^t-1))\right)\right)\\
&= \exp\left(-st+\sum_i p_i(e^t-1)\right)\\
&= \exp\left(s-\mu-s\log\frac{s}{\mu}\right),
\end{aligned}$$

where we took $t=\log(s/\sum_i p_i)$. This is similar to the tail bounds of a binomial distribution.

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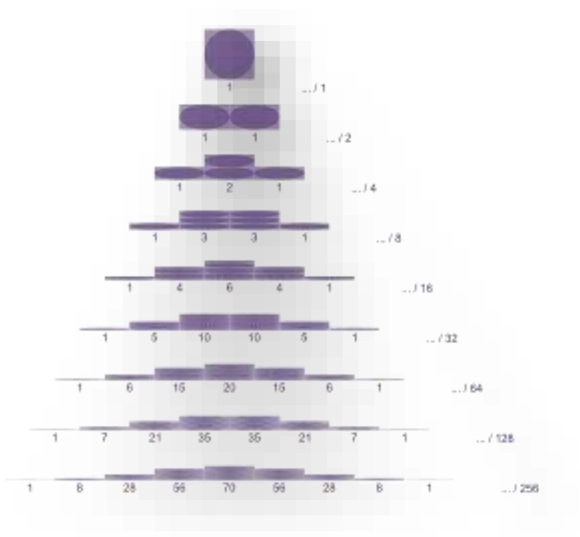


Binomial distribution for $p = 0.5$
with *n* and *k* as in Pascal's triangle

The probability that a ball in a Galton box with 8 layers (*n* = 8) ends up in the central bin (*k* = 4) is $70/256$

Probability mass function

In general, if the random variable *X* follows the binomial distribution with parameters $n \in \mathbb{N}$ and $p \in [0,1]$, we write $X \sim B(n, p)$. The probability of getting exactly *k* successes in *n* independent Bernoulli trials is given by the probability mass function:

$$f(k,n,p) = \Pr(k;n,p) = \Pr(X = k) = \binom{n}{k} p^k (1-p)^{n-k}$$

for *k* = 0, 1, 2, ..., *n*, where

$$\binom{n}{k} = \frac{n!}{k!(n-k)!}$$

is the binomial coefficient, hence the name of the distribution. The formula can be understood as follows. *k* successes occur with probability p^k and $n - k$ failures occur with probability $(1 - p)^{n-k}$. However, the *k* successes can occur anywhere among the *n* trials, and there are $\binom{n}{k}$ different ways of distributing *k* successes in a sequence of *n* trials.

In creating reference tables for binomial distribution probability, usually the table is filled in up to *n*/2 values. This is because for *k* > *n*/2, the probability can be calculated by its complement as $f(k,n,p) = f(n-k,n,1-p)$.

Looking at the expression $f(k, n, p)$ as a function of k, there is a k value that maximizes it. This k value can be found by calculating

$$\frac{f(k+1,n,p)}{f(k,n,p)} = \frac{(n-k)p}{(k+1)(1-p)}$$

and comparing it to 1. There is always an integer M that satisfies[1]

$$(n+1)p - 1 \leq M < (n+1)p.$$

$f(k, n, p)$ is monotone increasing for $k < M$ and monotone decreasing for $k > M$, with the exception of the case where $(n + 1)p$ is an integer. In this case, there are two values for which f is maximal: $(n + 1)p$ and $(n + 1)p - 1$. M is the *most probable* outcome (that is, the most likely, although this can still be unlikely overall) of the Bernoulli trials and is called the mode.

Some closed-form bounds for the cumulative distribution function are given

Cumulative distribution function

The cumulative distribution function can be expressed as:

$$F(k;n,p) = \Pr(X \leq k) = \sum_{i=0}^{\lfloor k \rfloor} \binom{n}{i} p^i (1-p)^{n-i}$$

where $\lfloor k \rfloor$ is the "floor" under k, i.e. the greatest integer less than or equal to k.

It can also be represented in terms of the regularized incomplete beta function, as follows:[2]

$$\begin{aligned} F(k;n,p) &= \Pr(X \leq k) \\ &= I_{1-p}(n-k, k+1) \\ &= (n-k)\binom{n}{k} \int_0^{1-p} t^{n-k-1}(1-t)^k \, dt. \end{aligned}$$

which is equivalent to the cumulative distribution function of the F-distribution[3]

$$F(k;n,p) = F_{F-distribution}\left(x = \frac{1-p}{p}\frac{k+1}{n-k}; d_1 = 2(n-k), d_2 = 2(k+1)\right).$$

Suppose a biased coin comes up heads with probability 0.3 when tossed. What is the probability of achieving 0, 1,..., 6 heads after six tosses?

$$\Pr(0\text{ heads}) = f(0) = \Pr(X=0) = \binom{6}{0}0.3^0(1-0.3)^{6-0} = 0.117649$$

$$\Pr(1\text{ heads}) = f(1) = \Pr(X=1) = \binom{6}{1}0.3^1(1-0.3)^{6-1} = 0.302526$$

$$\Pr(2\text{ heads}) = f(2) = \Pr(X=2) = \binom{6}{2}0.3^2(1-0.3)^{6-2} = 0.324135$$

$$\Pr(3\text{ heads}) = f(3) = \Pr(X=3) = \binom{6}{3}0.3^3(1-0.3)^{6-3} = 0.18522$$

$$\Pr(4\text{ heads}) = f(4) = \Pr(X=4) = \binom{6}{4}0.3^4(1-0.3)^{6-4} = 0.059535$$

$$\Pr(5\text{ heads}) = f(5) = \Pr(X=5) = \binom{6}{5}0.3^5(1-0.3)^{6-5} = 0.010206$$

$$\Pr(6\text{ heads}) = f(6) = \Pr(X=6) = \binom{6}{6}0.3^6(1-0.3)^{6-6} = 0.000729$$

Expected value and variance

If $X \sim B(n, p)$, that is, X is a binomially distributed random variable, n being the total number of experiments and p the probability of each experiment yielding a successful result, then the expected value of X is:

$$\mathrm{E}[X] = np.$$

This follows from the linearity of the expected value along with fact that X is the sum of n identical Bernoulli random variables, each with expected value p. In other words, if $X_1, \ldots, X_n$ are identical (and independent) Bernoulli random variables with parameter p, then $X = X_1 + \cdots + X_n$ and

$$\mathrm{E}[X] = \mathrm{E}[X_1 + \cdots + X_n] = \mathrm{E}[X_1] + \cdots + \mathrm{E}[X_n] = p + \cdots + p = np.$$

The variance is:

$$\mathrm{Var}(X) = np(1-p).$$

This similarly follows from the fact that the variance of a sum of independent random variables is the sum of the variances.

HIGHER MOMENTS

The first 6 central moments are given by

$$\begin{aligned}
\mu_1 &= 0,\\
\mu_2 &= np(1-p),\\
\mu_3 &= np(1-p)(1-2p),\\
\mu_4 &= np(1-p)(1+(3n-6)p(1-p)),\\
\mu_5 &= np(1-p)(1-2p)(1+(10n-12)p(1-p)),\\
\mu_6 &= np(1-p)(1-30p(1-p)(1-4p(1-p))+5np(1-p)(5-26p(1-p))+15n^2p^2(1-p)^2).
\end{aligned}$$

Usually the mode of a binomial $B(n, p)$ distribution is equal to , where is the floor function. However, when $(n + 1)p$ is an integer and p is neither 0 nor 1, then the distribution has two modes: $(n + 1)p$ and $(n + 1)p - 1$. When p is equal to 0 or 1, the mode will be 0 and n correspondingly. These cases can be summarized as follows:

$$\text{mode} = \begin{cases} \lfloor (n+1)\,p \rfloor & \text{if } (n+1)p \text{ is 0 or a noninteger},\\ (n+1)\,p \ \text{ and } \ (n+1)\,p-1 & \text{if } (n+1)p \in \{1,\dots,n\},\\ n & \text{if } (n+1)p = n+1. \end{cases}$$

.

Proof: Let

$$f(k) = \binom{n}{k} p^k q^{n-k}.$$

For $p=0$ only $f(0)$ has a nonzero value with $f(0)=1$. For $p=1$ we find $f(n)=1$ and $f(k)=0$ for $k \neq n$. This proves that the mode is 0 for $p=0$ and $p=1$ for .

Let $0<p<1$. We find

$$\frac{f(k+1)}{f(k)} = \frac{(n-k)p}{(k+1)(1-p)}$$

.

From this follows

$$\begin{aligned}
k > (n+1)p-1 &\Rightarrow f(k+1) < f(k)\\
k = (n+1)p-1 &\Rightarrow f(k+1) = f(k)\\
k < (n+1)p-1 &\Rightarrow f(k+1) > f(k)
\end{aligned}$$

So when $(n+1)p-1$ is an integer, then $(n+1)p-1$ and $(n+1)p$ is a mode. In the case that $(n+1)p-1 \notin \mathbb{Z}$, then only $\lfloor (n+1)p-1 \rfloor + 1 = \lfloor (n+1)p \rfloor$ is a mode

In general, there is no single formula to find the median for a binomial distribution, and it may even be non-unique. However several special results have been established:

- If np is an integer, then the mean, median, and mode coincide and equal np.
- Any median m must lie within the interval $\lfloor np \rfloor \le m \le \lceil np \rceil$.
- A median m cannot lie too far away from the mean: $|m - np| \le \min\{ \ln 2, \max\{p, 1 - p\} \}$.
- The median is unique and equal to $m = \text{round}(np)$ when $|m - np| \le \min\{p, 1 - p\}$ (except for the case when $p = 1/2$ and n is odd).
- When $p = 1/2$ and n is odd, any number m in the interval $1/2(n - 1) \le m \le 1/2(n + 1)$ is a median of the binomial distribution. If $p = 1/2$ and n is even, then $m = n/2$ is the unique median.

TAIL BOUNDS

For $k \le np$, upper bounds for the lower tail of the distribution function can be derived. Recall that $F(k; n, p) = \Pr(X \le k)$, the probability that there are at most k successes.

Hoeffding's inequality yields the bound

$$F(k;n,p) \le \exp\left(-2\frac{(np-k)^2}{n}\right),$$

and Chernoff's inequality can be used to derive the bound

$$F(k;n,p) \le \exp\left(-\frac{1}{2p}\frac{(np-k)^2}{n}\right).$$

Moreover, these bounds are reasonably tight when $p = 1/2$, since the following expression holds for all $k \ge 3n/8$[11]

$$F(k;n,\tfrac{1}{2}) \le \frac{14}{15}\exp\left(-\frac{16(\frac{n}{2}-k)^2}{n}\right).$$

However, the bounds do not work well for extreme values of p. In particular, as p 1, value $F(k;n,p)$ goes to zero (for fixed k, n with $k < n$) while the upper bound above goes to a positive constant. In this case a better bound is given by

$$F(k;n,p) \le \exp\left(-nD\left(\frac{k}{n} \parallel p\right)\right) \qquad \text{if } 0 < \frac{k}{n} < p$$

where $D(a \parallel p)$ is the relative entropy between an a-coin and a p-coin (i.e. between the Bernoulli(a) and Bernoulli(p) distribution):

$$D(a \parallel p) = (a)\log\frac{a}{p} + (1-a)\log\frac{1-a}{1-p}.$$

Asymptotically, this bound is reasonably tight; see [12] for details. An equivalent formulation of the bound is

$$\Pr(X \geq k) = F(n-k; n, 1-p) \leq \exp\left(-nD\left(\frac{k}{n} \parallel p\right)\right) \qquad \text{if } p < \frac{k}{n} < 1.$$

Both these bounds are derived directly from the Chernoff bound. It can also be shown that,

$$\Pr(X \geq k) = F(n-k; n, 1-p) \geq \frac{1}{(n+1)^2}\exp\left(-nD\left(\frac{k}{n} \parallel p\right)\right) \qquad \text{if } p < \frac{k}{n} < 1.$$

We can also change the $(n+1)^2$ in the denominator to $\sqrt{2n}$, by approximating the binomial coefficient with Stirling's formula.[14]

Additionally, the $(n+1)^2$ in the denominator can also be changed to $\max\left(2, \sqrt{4\pi nD\left(\frac{k}{n} \parallel p\right)}\right)$ by exploiting relationships between the binomial and Standard Normal Distributions, and applying an approximation of Mills' ratio.

IN PHYSICS:

A wave transmits energy from one point to another. Transmission of Electromagnetic waves does not require a medium – there are no particles. These waves are comprised of oscillating electric and magnetic fields and are quite happy to propagate in a vacuum. Water waves appear to be transverse – boats bob – up and down due to water waves. However, a detailed study shows that the molecules of water actually perform a circular motion, which can be considered as a combination of transverse and longitudinal wave motion.

MOON HAS NO ATMOSPHERE –

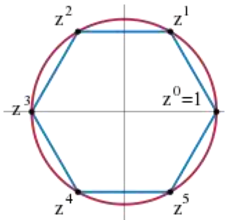
The atmosphere on the moon has much less gas in it; on Earth, the sea-level atmosphere has 10 quintillion molecules per cubic centimeter, while that same cubic centimeter only has 1 million molecules on the moon. So while the lunar atmosphere is quite thin, it nevertheless exists.

The Moon has essentially no atmosphere. The Moon might have had an atmosphere when it was formed, or outgassed significant atmosphere since then, but it has since lost any previous atmosphere. Thus, it has no protective blanket to moderate its temperatures or to shield it from meteors.

ABSTRACT ALGEBRA

CYCLIC GROUPS: **A cyclic group is a group that can be generated by one element. An element (g) generates the group if every element of the group can be obtained by repeatedly applying the group operation or its inverse to g.**

(IJUSE) 2019, Vol. No. 5, Jan-Dec e-ISSN: 2454-759X, p-ISSN: 2454-7581



6TH COMPLEX ROOTS OF UNITY FORM A CYCLIC GROUP UNDER MULTIPLICATION. HERE *Z* IS GENERATOR, BUT *Z*^{2} IS NOT, BECAUSE ITS POWERS FAIL TO PRODUCE THE ODD POWERS OF *Z*.

For any element g in any group G, one can form the subgroup of all integer powers $\langle g\rangle = \{g^k \mid k \in \mathrm{Z}\}$, called the cyclic subgroup of g. The order of g is the number of elements in $\langle g\rangle$; that is, the order of an element is equal to the order of its cyclic subgroup.

A *cyclic group* is a group which is equal to one of its cyclic subgroups: $G = \langle g\rangle$ for some element g, called a *generator*.

For a finite cyclic group G of order n we have $G = \{e, g, g^2, \ldots, g^{n-1}\}$, where e is the identity element and $g^i = g^j$ whenever $i \equiv j \pmod{n}$; in particular $g^n = g^0 = e$, and $g^{-1} = g^{n-1}$. An abstract group defined by this multiplication is often denoted C_n, and we say that G is isomorphic to the standard cyclic group C_n. Such a group is also isomorphic to Z/nZ, the group of integers modulo n with the addition operation, which is the standard cyclic group in additive notation. Under the isomorphism χ defined by $\chi(g^i) = i$ the identity element e corresponds to 0, products correspond to sums, and powers correspond to multiples.

For example, the set of complex 6th roots of unity

$$G=\left\{\pm 1,\pm\left(\tfrac{1}{2}+\tfrac{\sqrt{3}}{2}i\right),\pm\left(\tfrac{1}{2}-\tfrac{\sqrt{3}}{2}i\right)\right\}$$

forms a group under multiplication. It is cyclic, since it is generated by the primitive root $z=\frac{1}{2}+\frac{\sqrt{3}}{2}i=e^{2\pi i/6}$: that is, $G = \langle z\rangle = \{ 1, z, z^2, z^3, z^4, z^5 \}$ with $z^6 = 1$. Under a change of letters, this is isomorphic to (structurally the same as) the standard cyclic group of order 6, defined as $C_6 = \langle g\rangle = \{ e, g, g^2, g^3, g^4, g^5 \}$ with multiplication $g^j \cdot g^k = g^{j+k \pmod 6}$, so that $g^6 = g^0 = e$. These groups are also isomorphic to Z/6Z = {0,1,2,3,4,5} with the operation of addition modulo 6, with z^k and g^k corresponding to k. For example, $1 + 2 \equiv 3 \pmod 6$ corresponds to $z^1 \cdot z^2 = z^3$, and $2 + 5 \equiv 1 \pmod 6$ corresponds to $z^2 \cdot z^5 = z^7 = z^1$, and so on. Any element generates its own cyclic subgroup, such as $\langle z^2\rangle = \{e, z^2, z^4\}$ of order 3, isomorphic to C_3 and Z/3Z; and $\langle z^5\rangle = \{ e, z^5, z^{10} = z^4, z^{15} = z^3, z^{20} = z^2, z^{25} = z \} = G$, so that z^5 has order 6 and is an alternative generator of G.

Instead of the quotient notations Z/nZ, Z/(n), or Z/n, some authors denote a finite cyclic group as Z_n, but this conflicts with the notation of number theory, where Z_p denotes a p-adic number ring, or localization at a prime ideal.

On the other hand, in an infinite cyclic group $G = \langle g\rangle$, the powers g^k give distinct elements for all integers k, so that $G = \{ \ldots, g^{-2}, g^{-1}, e, g, g^2, \ldots \}$, and G is isomorphic to the standard group $C = C_\infty$ and to Z, the additive group of the integers. An example is the first frieze group. Here there are no finite cycles, and the name "cyclic" may be misleading.

To avoid this confusion, Bourbaki introduced the term monogenous group for a group with a single generator and restricted "cyclic group" to mean a finite monogenous group, avoiding the term "infinite cyclic group".

For Example –The Reserve Bank of India is India's central bank, which controls the issue and supply of the Indian rupee. RBI is the regulator of entire Banking in India. RBI plays an important part in the Development Strategy of the Government of India. **Reserve Bank of India can be expressed on the PCW surface as its sub varieties.**

GROUP THEORY - Group theory, in modern algebra, the study of groups, which are systems consisting of a set of elements and a binary operation that can be applied to two elements of the set, which together satisfy certain axioms.

GROUP THEORY COSETS

Consider the group of integers Z under addition. Let H be the subgroup of even integers. Notice that if you take the elements of H and add one, then you get all the odd elements of Z. In fact if you take the elements of H and add any odd integer, then you get all the odd elements. On the other hand, every element of Z is either odd or even, and certainly not both (by convention zero is even and not odd), that is, we can partition the elements of Z into two sets, the evens and the odds, and one part of this partition is equal to the original subset H. Somewhat surprisingly this rather trivial example generalizes to the case of an arbitrary group G and subgroup H, and in the case of finite groups imposes rather strong conditions on the size of a subgroup.

Definition 3.1. *Let X be a set. An* **equivalence relation** $\sim$ *is a relation on X, which is*

(1) (**reflexive**) *For every $x \in X$, $x \sim x$.*
(2) (**symmetric**) *For every x and $y \in X$, if $x \sim y$ then $y \sim x$.*
(3) (**transitive**) *For every x and y and $z \in X$, if $x \sim y$ and $y \sim z$ then $x \sim z$.*

Example 3.2. *Let S be any set and consider the relation*

$$a \sim b \qquad \text{if and only if} \qquad a = b.$$

A moments thought will convince the reader this is an equivalence relation.

Let S be the set of people in this room and let

$$a \sim b \qquad \text{if and only if } a \text{ and } b \text{ have the same colour top.}$$

Then $\sim$ is an equivalence relation.

Let $S = \mathbb{R}$ and

$$a \sim b \qquad \text{if and only if} \qquad a \geq b.$$

Then $\sim$ is reflexive and transitive but not symmetric. It is not an equivalence relation.

Lemma 3.3. *Let G be a group and let H be a subgroup. Let $\sim$ be the relation on G defined by the rule*

$$a \sim b \qquad \text{if and only if} \qquad b^{-1}a \in H.$$

Then $\sim$ is an equivalence relation.

Definition 3.4. *Let $\sim$ be an equivalence relation on a set X. Let $a \in X$ be an element of X. The* **equivalence class** *of a is*

$$[a] = \{\, b \in X \mid b \sim a \,\}.$$

Example 3.5. *In the examples (3.2), the equivalence classes in the first example are the singleton sets, in the second example the equivalence classes are the colours.*

Definition 3.6. *Let X be a set. A* **partition** *P of X is a collection of subsets A_i, $i \in I$, such that*

(1) The A_i cover X, that is,

$$\bigcup_{i \in I} A_i = X.$$

(2) The A_i are pairwise disjoint, that is, if $i \neq j$ then

$$A_i \cap A_j = \emptyset.$$

Lemma 3.7. *Given an equivalence relation $\sim$ on X there is a unique partition of X. The elements of the partition are the equivalence classes of $\sim$ and vice-versa. That is, given a partition P of X we may construct an equivalence relation $\sim$ on X such that the partition associated to $\sim$ is precisely P.*

Concisely, the data of an equivalence relation is the same as the data of a partition.

Proof. Suppose that $\sim$ is an equivalence relation. Note that $x \in [x]$ as $x \sim x$. Thus certainly the set of equivalence classes covers X. The only thing to check is that if two equivalence classes intersect at all, then in fact they are equal.

We first prove a weaker result. We prove that if $x \sim y$ then $[x] = [y]$. Since $y \sim x$, by symmetry, it suffices to prove that $[x] \subset [y]$. Suppose that $a \in [x]$. Then $a \sim x$. As $x \sim y$ it follows that $a \sim y$, by transitivity. But then $a \in [y]$. Thus $[x] \subset [y]$ and by symmetry $[x] = [y]$.

So suppose that $x \in X$ and $y \in X$ and that $z \in [x] \cap [y]$. As $z \in [x]$, $z \sim x$. As $z \in [y]$, $z \sim y$. But then by what we just proved $[x] = [z] = [y]$.

Thus if two equivalence classes overlap, then they coincide and we have a partition.

Now suppose that we have a partition

$$P = \{\, A_i \mid i \in I \,\}.$$

Define a relation $\sim$ on X by the rule $x \sim y$ iff $x \in A_i$ and $y \in A_i$ (same i, of course). That is, x and y are related iff they belong to the same part. It is straightforward to check that this is an equivalence relation, and that this process reverses the one above. Both of these things are left as an exercise to the reader. □

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Example 3.8. *Let X be the set of integers. Define an equivalence relation on $\mathbb{Z}$ by the rule $x \sim y$ iff $x - y$ is even.*

Then the equivalence classes of this relation are the even and odd numbers.

More generally, let n be an integer, and let $n\mathbb{Z}$ be the subset consisting of all multiples of n,

$$n\mathbb{Z} = \{\, an \mid a \in \mathbb{Z} \,\}.$$

Since the sum of two multiples of n is a multiple of n,

$$an + bn = (a + b)n,$$

and the inverse of a multiple of n is a multiple of n,

$$-(an) = (-a)n,$$

$n\mathbb{Z}$ is closed under multiplication and inverses. Thus $n\mathbb{Z}$ is a subgroup of $\mathbb{Z}$.

The equivalence relation corresponding to $n\mathbb{Z}$ becomes $a \sim b$ iff $a - b \in n\mathbb{Z}$, that is, $a - b$ is a multiple of n. There are n equivalence classes,

$$[0], [1], [2], [3], \dots [n-1].$$

Definition-Lemma 3.9. *Let G be a group, let H be a subgroup and let $\sim$ be the equivalence relation defined in (3.3). Let $g \in G$. Then*

$$[g] = gH = \{\, gh \mid h \in H \,\}.$$

gH is called a **left coset** *of H.*

Proof. Suppose that $k \in [g]$. Then $k \sim g$ and so $g^{-1}k \in H$. If we set $h = g^{-1}k$, then $h \in H$. But then $k = gh \in gH$. Thus $[g] \subset gH$.

Now suppose that $k \in gH$. Then $k = gh$ for some $h \in H$. But then $h = g^{-1}k \in H$. By definition of $\sim$, $k \sim g$. But then $k \in [g]$. □

In the example above, we see that the left cosets are

$$\begin{aligned}
[0] &= \{\, an \mid a \in \mathbb{Z} \,\} \\
[1] &= \{\, an + 1 \mid a \in \mathbb{Z} \,\} \\
[2] &= \{\, an + 2 \mid a \in \mathbb{Z} \,\} \\
&\vdots \\
[n-1] &= \{\, an - 1 \mid a \in \mathbb{Z} \,\}.
\end{aligned}$$

It is interesting to see what happens in the case $G = D_3$. Suppose we take $H = \{I, R, R^2\}$. Then

$$[I] = H = \{I, R, R^2\}.$$

Pick $F_1 \notin H$. Then

$$[F_1] = F_1H = \{F_1, F_2, F_3\}.$$

Thus H partitions G into two sets, the rotations, and the flips,

$$\{\{I, R, R^2\}, \{F_1, F_2, F_3\}\}.$$

Note that both sets have the same size.

Now suppose that we take $H = \{I, F_1\}$ (up to the obvious symmetries, this is the only other interesting example).

In this case

$$[I] = IH = H = \{I, F_1\}.$$

Now R is not in this equivalence class, so

$$[R] = RH = \{R, RF_1\} = \{R, F_2\}.$$

Finally look at the equivalence class containing R^2.

$$[R^2] = R^2H = \{R^2, R^2F_1\} = \{R^2, F_3\}.$$

4

The corresponding partition is

$$\{\{I, F_1\}, \{R, F_2\}, \{R^2, F_3\}\}.$$

Note that, once again, each part of the partition has the same size.

Definition 3.10. *Let G be a group and let H be a subgroup.*
The **index of** H **in** G, *denoted $[G : H]$, is equal to the number of left cosets of H in G.*

Note that even though G might be infinite, the index might still be finite. For example, suppose that G is the group of integers and let H be the subgroup of even integers. Then there are two cosets (evens and odds) and so the index is two.
We are now ready to state our first Theorem.

Theorem 3.11. *(Lagrange's Theorem) Let G be a group. Then*

$$|H||[G : H] = |G|.$$

In particular if G is finite then the order of H divides the order of G.

Proof. Since G is a disjoint union of its left cosets, it suffices to prove that the cardinality of each coset is equal to the cardinality of H.
Suppose that gH is a left coset of H in G. Define a map

$$A : H \longrightarrow gH,$$

by sending $h \in H$ to $A(h) = gh$. Define a map

$$B : gH \longrightarrow H,$$

by sending $k \in gH$ to $B(k) = g^{-1}k$. These maps are both clearly well-defined.
We show that B is the inverse of A. We first compute

$$B \circ A : H \longrightarrow H.$$

Suppose that $h \in H$, then

$$\begin{aligned}(B \circ A)(h) &= B(A(h)) \\ &= B(gh) \\ &= g^{-1}(gh) \\ &= h.\end{aligned}$$

Thus $B \circ A : H \longrightarrow H$ is certainly the identity map. Now consider

$$A \circ B : gH \longrightarrow gH.$$

5

Suppose that $k \in gH$, then

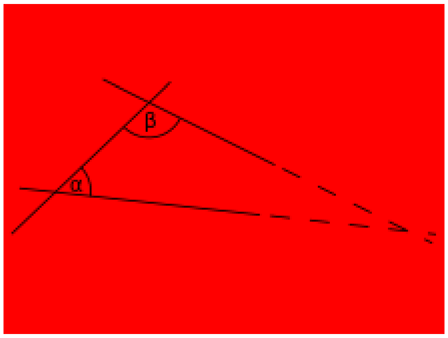
$$\begin{aligned}(A \circ B)(k) &= A(B(k)) \\ &= A(g^{-1}k) \\ &= g(g^{-1}k) \\ &= k.\end{aligned}$$

Thus B is indeed the inverse of A. In particular A must be a bijection and so H and gH must have the same cardinality. □

GEOMETRY

Euclid's 5th Postulate –

If a straight line falling on two straight lines makes the interior angles on the same side of it taken together less than two right angles, then the two straight lines, if produced indefinitely, meet on that side on which the sum of angles is less than two right angles.



The parallel postulate (Postulate 5): If two lines intersect a third in such a way that the sum of the inner angles on one side is less than two right angles, then the two lines inevitably must intersect each other on that side if extended far enough.

OBSERVATION

HISTORY:

Stargazing evolved into systematic observation, and ancient cultures began to chart the movements of the Sun, moon, and planets more methodically. Much of this record keeping tied into astrology and the belief that the movement and position of celestial bodies can predict or influence events.

Jantar Mantar in Jaipur, India, was built by Maharajah Jai Sawai Singh ll between 1727 and 1734. The world's largest stone observatory, it houses 14 instruments used to predict astronomical events such as eclipses.

The Babylonians identified constellations with mythological characters and natural objects, as well as establishing the 12 – constellation zodiac.

These ancient astronomers took note of the first and last appearance of planets in the sky, caused by seasonal cycles. They kept such good records that by about 600 B.C. they were able to predict future first and last appearance dates.

HEAT DEATH – The second law of Thermodynamics can be explained, properly, with the help of entropy. The law states, in an isolated system, for a reversible process entropy remains the same and for an irreversible process the entropy increases and in no way the entropy of an isolated system decreases. In simple words it can be said that energy scatters itself. When all the energy packets will scatters itself. When all the energy packets will scatter

themselves in such a way that the energy density becomes the same throughout the universe, it will reach its heat – death.

QUANTUM PHYSICS – Quantum behavior is also useful to understand it. Quantum Theory is a fundamental theory in physics which describes the nature of atoms and subatomic particles, like electrons, protons, etc. It also talks about the photos, particle of light. Quantum mechanics is used in designing transistors ICs, means without it there will be no phone, computers, GPS, internet, etc.

QUANTUM ENTANGLEMENT

Quantum entanglement is a physical phenomenon which occurs when pairs or groups of particles are generated, interact, or share spatial proximity in ways such that the quantum state of each particle cannot be described independently of the state of the other (s), even when the particles are separated by a large distance – instead, a quantum state must be described for the system as a whole.

Measurements of physical properties such as position, momentum, spin, and polarization, performed or entangle particles are found to be correlated.

You can solve this equation by ORGANIC CONVERSION also.

WORK IS ORDERED MOTION

Energy transferred by stimulating particles with coherent and ordered motion. Heat is disordered motion.

Temperature is a measure of average kinetic energy.

We can easily reproduce “Boiling Point” and “Melting Point”.

When temperature increases, average distance between atoms increases like a photographic enlargement.

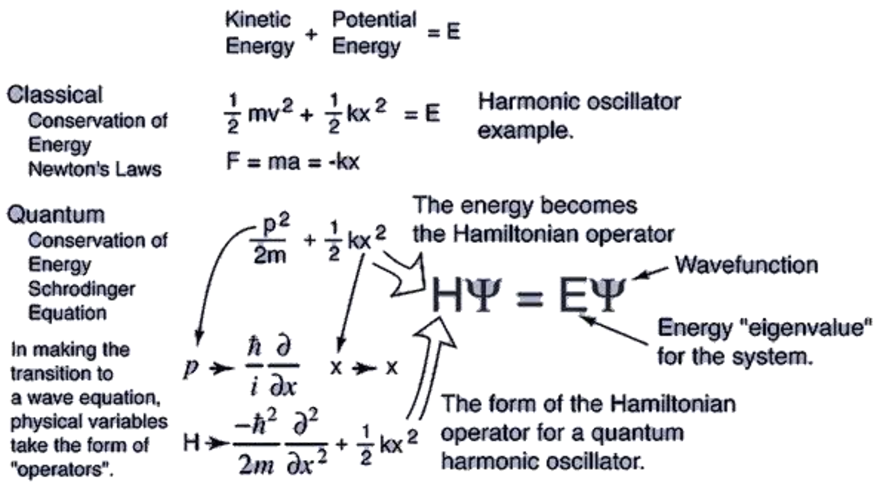
SCHRODINGER EQUATION

Properties of WAVE FUNCTION - Single Valued, finite, continuous and square integretable

“What does “WAVE FUNCTION” “MEASURE”

The Schrodinger equation plays the role of Newton's laws and conservation of energy in classical mechanics - i.e., it predicts the future behavior of a dynamic system. It is a wave equation in terms of the wave function which predicts analytically and precisely the probability of events or outcome. The detailed outcome is not strictly determined, but given a large number of events, the Schrodinger equation will predict the distribution of results.

(IJUSE) 2019, Vol. No. 5, Jan-Dec e-ISSN: 2454-759X, p-ISSN: 2454-7581



ESCAPE VELOCITY - "The velocity with which an object will escape earth's gravitational force and go and stop at infinity and will not fall back is called escape velocity"

The existence of escape velocity is a consequence of conservation of energy and an energy field of finite depth. For an object with a given total energy, which is moving subject to conservative forces (such as a static gravity field) it is only possible for the object to reach combinations of locations and speeds which have that total energy; and places which have a higher potential energy than this cannot be reached at all. By adding speed (kinetic energy) to the object it expands the possible locations that can be reached, until, with enough energy, they become infinite.

For a given gravitational potential energy at a given position, the escape velocity is the minimum speed an object without propulsion needs to be able to "escape" from the gravity (i.e. so that gravity will never manage to pull it back). Escape velocity is actually a speed (not a velocity) because it does not specify a direction: no matter what the direction of travel is, the object can escape the gravitational field (provided its path does not intersect the planet).

An elegant way to derive the formula for escape velocity is to use the principle of conservation of energy. For the sake of simplicity, unless stated otherwise, we assume that an object will escape the gravitational field of a uniform spherical planet by moving away from it and that the only significant force acting on the moving object is the planet's gravity. In its initial state, i, imagine that a spaceship of mass m is at a distance r from the center of mass of the planet, whose mass is M. Its initial speed is equal to its escape velocity.

At its final state, f, it will be an infinite distance away from the planet, and its speed will be negligibly small and assumed to be 0. Kinetic energy K and gravitational potential energy U_g are the only types of energy that we will deal with, so by the conservation of energy,

$$(K + U_g)_i = (K + U_g)_f$$

$K_f = 0$ because final velocity is zero, and $U_{gf} = 0$ because its final distance is infinity, so

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$$\Rightarrow \frac{1}{2}mv_e^2 + \frac{-GMm}{r} = 0 + 0$$

$$\Rightarrow v_e = \sqrt{\frac{2GM}{r}} = \sqrt{\frac{2\mu}{r}}$$

where μ is the standard gravitational parameter.

The same result is obtained by a relativistic calculation, in which case the variable r represents the radial coordinate or reduced circumference of the Schwarzschild metric.

Defined a little more formally, "escape velocity" is the initial speed required to go from an initial point in a gravitational potential field to infinity and end at infinity with a residual speed of zero, without any additional acceleration.[8] All speeds and velocities are measured with respect to the field. Additionally, the escape velocity at a point in space is equal to the speed that an object would have if it started at rest from an infinite distance and was pulled by gravity to that point.

In common usage, the initial point is on the surface of a planet or moon. On the surface of the Earth, the escape velocity is about 11.2 km/s, which is approximately 33 times the speed of sound (Mach 33) and several times the muzzle velocity of a rifle bullet (up to 1.7 km/s). However, at 9,000 km altitude in "space", it is slightly less than 7.1 km/s.

The escape velocity is independent of the mass of the escaping object. It does not matter if the mass is 1 kg or 1,000 kg; what differs is the amount of energy required. For an object of mass 'm' the energy required to escape the Earth's gravitational field is GMm / r, a function of the object's mass (where r is the radius of the Earth, G is the gravitational constant, and M is the mass of the Earth, $M = 5.9736 \times 10^{24}$ kg). A related quantity is the specific orbital energy which is essentially the sum of the kinetic and potential energy divided by the mass. An object has reached escape velocity when the specific orbital energy is greater than or equal to zero.

An alternative expression for the escape velocity v_e particularly useful at the surface on the body is:

$$v_e = \sqrt{2gr}$$

where r is the distance between the center of the body and the point at which escape velocity is being calculated and g is the gravitational acceleration at that distance (i.e., the surface gravity).

For a body with a spherically-symmetric distribution of mass, the escape velocity v_e from the surface is proportional to the radius assuming constant density, and proportional to the square root of the average density ρ.

$$v_e = Kr\sqrt{\rho}$$

where

$$K = \sqrt{\frac{8}{3}\pi G} \approx 2.364 \times 10^{-5} \text{ m}^{1.5} \text{ kg}^{-0.5} \text{ s}^{-1}$$

The escape velocity relative to the surface of a rotating body depends on direction in which the escaping body travels. For example, as the Earth's rotational velocity is 465 m/s at the equator, a rocket launched tangentially from the Earth's equator to the east requires an initial velocity of about 10.735 km/s relative to Earth to escape whereas a rocket launched tangentially from the Earth's equator to the west requires an initial velocity of about 11.665 km/s relative to Earth. The surface velocity decreases with the cosine of the geographic latitude, so space launch facilities are often located as close to the equator as feasible, e.g. the American Cape Canaveral (latitude 28°28' N) and the French Guiana Space Centre (latitude 5°14' N).

ELECTRIC FIELD

The electrostatic force, like the gravitational force, is a force that acts at a distance, even when the objects are not in contact with one another. To justify such the notion we rationalize action at a distance by saying that one charge creates a field which in turn acts on the other charge.

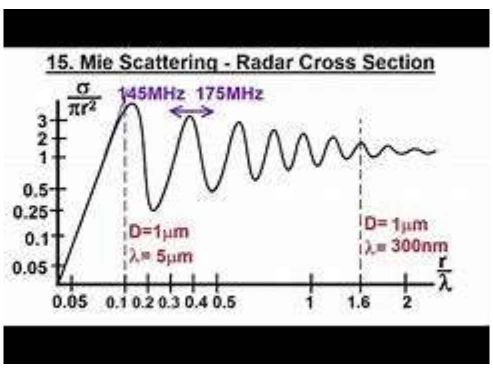
An electric charge q produces an electric field everywhere. To quantify the strength of the field created by that charge, we can measure the force a positive "test charge" experiences at some point.

But something is conserved here which were not seen something is conserved various effects were interchangeable Electrical Effect, Magnetic Effect; Mechanical effect….conversion was somehow linked to conservation. All these effects were same in this m. To prove all effects similar Quantitavely show fixed amount of one effect no matter how it is produced.

Always produced fixed amount of other effect, Idea was extended to all other effects and conserved quantity was called energy. (Unified All Effects)

RADAR CROSS SECTION

Mono static radar cross section (RCS) is a perfectly conducting metal sphere as a function of frequency (calculated by Mie theory). In the low-frequency Rayleigh scattering limit, where the circumference is less than the wavelength, the normalized RCS is $\sigma/(\pi R^2) \sim 9(kR)^4$. In the high-frequency optical limit $\sigma /(\pi R^2) \sim 1$.



BASIC FEATURES OF A VECTOR QUANTITY

Vector quantities have two characteristics, a magnitude and a direction. Scalar quantities have only a magnitude. When comparing two vector quantities of the same type, you have to compare both the magnitude and the direction. For scalars, you only have to compare the magnitude. When doing any mathematical operation on a vector quantity (like adding, subtracting, multiplying).

Our fundamental forces are gravity, electromagnetism, strong nuclear force, weak nuclear force.

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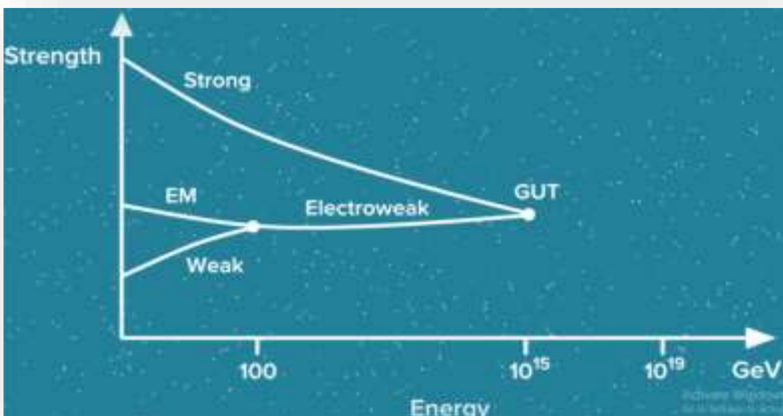
Higgs B… is fifth force → is a reason why two different forces has different phenomenon but the join force is electro weak.

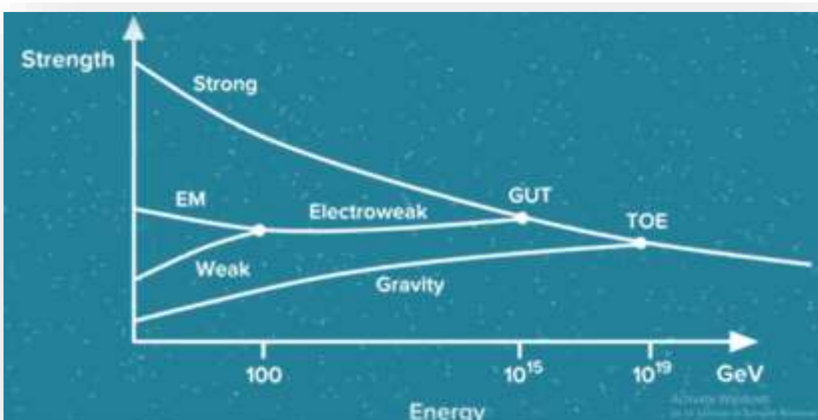
Naturally scientists wonder if the seemingly independent remaining forces.

1. Gravity,
2. Strong Nuclear Force,
3. Electro Weak Force.

If we look strong, weak, and Electromagnetic force. We find them the strength depend on the energy which we studied some getting hyper…unification is natural some getting stronger and some getting and the most provocative incidence. The strength of three forces becomes the same as the single energy.

The energy of these peoples is extremely high. Specification 10 to the power of 15 which 100 billion times higher energy particle accelerator ever built.





According to second law – "Entropy always increase". Gases are always around you, but the molecules of a gas are much farther apart than the molecules in a liquid. If a gas has an odor, you'll often be able to smell it before you can see it.

IN BIOLOGY -

BODY FLUIDS AND CIRCULATION

Simple organisms like sponges and coelenterates circulate water from their surroundings through their body cavities to facilitate the cells to exchange these substances.

More complex organisms use special fluids within their bodies to transport such materials like Blood and lymph (tissue fluid).

BLOOD GROUPS

Various types of grouping of blood has been done.

Two such groupings – the ABO and Rh – are widely used all over the world.

Blood Groups and Donor Compatibility

Blood Group	Antigens on RBCs	Antibodies in Plasma	Donor's Group
A	A	anti-B	A, O
B	B	anti-A	B, O
AB	A, B	nil	AB, A, B, O
O	nil	anti-A, B	O

Group 'O' blood can be donated to persons with any other blood group and hence 'O' group individuals are called 'universal donors'.

'AB' group can accept blood from persons with AB as well as the other groups of blood. Therefore, such persons are called 'universal recipients'.

LYMPH (TISSUE FLUID)

As the blood passes through the capillaries in tissues, some water along with many small water soluble substances move out into the spaces between the cells of tissues leaving the larger proteins and most of the formed elements in the blood vessels.

This fluid released out is called the interstitial fluid or tissue fluid.

It has the same mineral distribution as that in plasma.

Exchange of nutrients, gases, etc., between the blood and the cells always occur through this fluid.

CIRCULATORY PATHWAYS

The circulatory patterns are of two types – open or closed.

Open circulatory system is present in arthropods and molluscs in which blood pumped by the heart passes through large vessels into open spaces or body cavities called sinuses.

Annelids and chordates have a closed circulatory system in which the blood pumped by the heart is always circulated through a closed network of blood vessels. This pattern is considered to be more advantageous as the flow of fluid can be more precisely regulated.

All vertebrates possess a muscular chambered heart.

Fishes have a 2-chambered heart with an atrium and a ventricle. Amphibians and the reptiles (except crocodiles) have a 3-chambered heart with two atria and a single ventricle, whereas crocodiles, birds and mammals possess a 4-chambered heart with two atria and two ventricles.

In fishes the heart pumps out deoxygenated blood which is oxygenated by the gills and supplied to the body parts from where deoxygenated blood is returned to the heart (single circulation).

In amphibians and reptiles, the left atrium receives oxygenated blood from the gills/lungs/skin and the right atrium gets the deoxygenated blood from other body parts. However, they get mixed up in the single ventricle which pumps out mixed blood (incomplete double circulation).

In birds and mammals, oxygenated and deoxygenated blood received by the left and right atria respectively passes on to the ventricles of the same sides. The ventricles pump it out without any mixing up, i.e., two separate circulatory pathways are present in these organisms, hence, these animals have double circulation.

HEART BLOOD CIRCULATION - HUMAN CIRCULATORY SYSTEM

Human circulatory system, also called the blood vascular system consists of a muscular chambered heart, a network of closed branching blood vessels and blood, the fluid which is circulated.

HEART

Heart, the mesodermally derived organ, is situated in the thoracic cavity, in between the two lungs, slightly tilted to the left.

It has the size of a clenched fist.

It is protected by a double walled membranous bag, pericardium, enclosing the pericardial fluid.

Our heart has four chambers, two relatively small upper chambers called atria and two larger lower chambers called

A thin, muscular wall called the interatrial septum separates the right and the left atria, whereas a thick-walled, the inter-ventricular septum, separates the left and the right ventricles.

The atrium and the ventricle of the same side are also separated by a thick fibrous tissue called the atrio-ventricular septum.

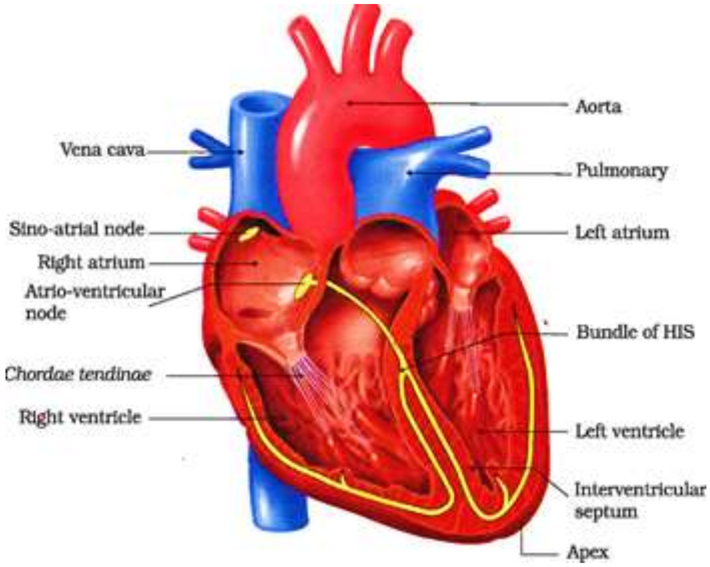
However, each of these septa are provided with an opening through which the two chambers of the same side are connected.

The opening between the right atrium and the right ventricle is guarded by a valve formed of three muscular flaps or cusps, the tricuspid valve, whereas a bicuspid or mitral valve guards the opening between the left atrium and the left ventricle.

The openings of the right and the left ventricles into the pulmonary artery and the aorta respectively are provided with the semilunar valves. The valves in the heart allows the flow of blood only in one direction, i.e., from the atria to the ventricles and from the ventricles to the pulmonary artery or aorta. These valves prevent any backward flow.

The entire heart is made of cardiac muscles.

The walls of ventricles are much thicker than that of the atria.



A specialized cardiac musculature called the nodal tissue is also distributed in the heart.

A patch of this tissue is present in the right upper corner of the right atrium called the sino-atrial node (SAN).

Another mass of this tissue is seen in the lower left corner of the right atrium close to the atrio-ventricular septum called the atrio-ventricular node (AVN).

A bundle of nodal fibres, atrioventricular bundle (AV bundle) continues from the AVN which passes through the atrio-ventricular septa to emerge on the top of the interventricular septum and immediately divides into a right and left bundle.

These branches give rise to minute fibres throughout the ventricular musculature of the respective sides and are called purkinje fibres.

These fibres alongwith right and left bundles are known as bundle of HIS.

The nodal musculature has the ability to generate action potentials without any external stimuli, i.e., it is autoexcitable.

However, the number of action potentials that could be generated in a minute vary at different parts of the nodal system.

The SAN can generate the maximum number of action potentials, i.e., 70-75 min^{-1}, and is responsible for initiating and maintaining the rhythmic contractile activity of the heart. Therefore, it is called the pacemaker.

Our heart normally beats 70-75 times in a minute (average 72 beats min^{-1}).

CARDIAC CYCLE

To begin with, all the four chambers of heart are in a relaxed state, i.e., they are in joint diastole.

As the tricuspid and bicuspid valves are open, blood from the pulmonary veins and vena cava flows into the left and the right ventricle respectively through the left and right atria. The semilunar valves are closed at this stage.

The SAN now generates an action potential which stimulates both the atria to undergo a simultaneous contraction – the atrial systole. This increases the flow of blood into the ventricles by about 30 per cent.

The action potential is conducted to the ventricular side by the AVN and AV bundle from where the bundle of HIS transmits it through the entire ventricular musculature.

This causes the ventricular muscles to contract, (ventricular systole), the atria undergo relaxation (diastole), coinciding with the ventricular systole.

Ventricular systole increases the ventricular pressure causing the closure of tricuspid and bicuspid valves due to attempted backflow of blood into the atria.

As the ventricular pressure increases further, the semilunar valves guarding the pulmonary artery (right side) and the aorta (left side) are forced open, allowing the blood in the ventricles to flow through these vessels into the circulatory pathways.

The ventricles now relax (ventricular diastole) and the ventricular pressure falls causing the closure of semilunar valves which prevents the backflow of blood into the ventricles.

As the ventricular pressure declines further, the tricuspid and bicuspid valves are pushed open by the pressure in the atria exerted by the blood which was being emptied into them by the veins. The blood now once again moves freely to the ventricles.

The ventricles and atria are now again in a relaxed (joint diastole) state, as earlier. Soon the SAN generates a new action potential and the events described above are repeated in that sequence and the process continues.

This sequential event in the heart which is cyclically repeated is called the cardiac cycle and it consists of systole and diastole of both the atria and ventricles.

The heart beats 72 times per minute, i.e., that many cardiac cycles are performed per minute.

From this it could be deduced that the duration of a cardiac cycle is 0.8 seconds.

During a cardiac cycle, each ventricle pumps out approximately 70 mL of blood which is called the stroke volume.

The stroke volume multiplied by the heart rate (no. of beats per min.) gives the cardiac output.

Therefore, the cardiac output can be defined as the volume of blood pumped out by each ventricle per minute and averages 5000 mL or 5 litres in a healthy individual.

The body has the ability to alter the stroke volume as well as the heart rate and thereby the cardiac output. For example, the cardiac output of an athlete will be much higher than that of an ordinary man.

During each cardiac cycle two prominent sounds are produced which can be easily heard through a stethoscope.

The first heart sound (lub) is associated with the closure of the tricuspid and bicuspid valves whereas the second heart sound (dub) is associated with the closure of the semilunar valves. These sounds are of clinical diagnostic significance.

ELECTROCARDIOGRAPH (ECG)

ECG is a graphical representation of the electrical activity of the heart during a cardiac cycle.

To obtain a standard ECG, a patient is connected to the machine with three electrical leads (one to each wrist and to the left ankle) that continuously monitor the heart activity.

For a detailed evaluation of the heart's function, multiple leads are attached to the chest region.

Each peak in the ECG is identified with a letter from P to T that corresponds to a specific electrical activity of the heart.

The P-wave represents the electrical excitation (or depolarisation) of the atria, which leads to the contraction of both the atria.

The QRS complex represents the depolarisation of the ventricles, which initiates the ventricular contraction. The contraction starts shortly after Q and marks the beginning of the systole.

The T-wave represents the return of the ventricles from excited to normal state (repolarization). The end of the T-wave marks the end of systole.

By counting the number of QRS complexes that occur in a given time period, one can determine the heart beat rate of an individual.

Since the ECGs obtained from different individuals have roughly the same shape for a given lead configuration, any deviation from this shape indicates a possible abnormality or disease. Hence, it is of a great clinical significance.

DOUBLE CIRCULATION

The blood pumped by the right ventricle enters the pulmonary artery, whereas the left ventricle pumps blood into the aorta.

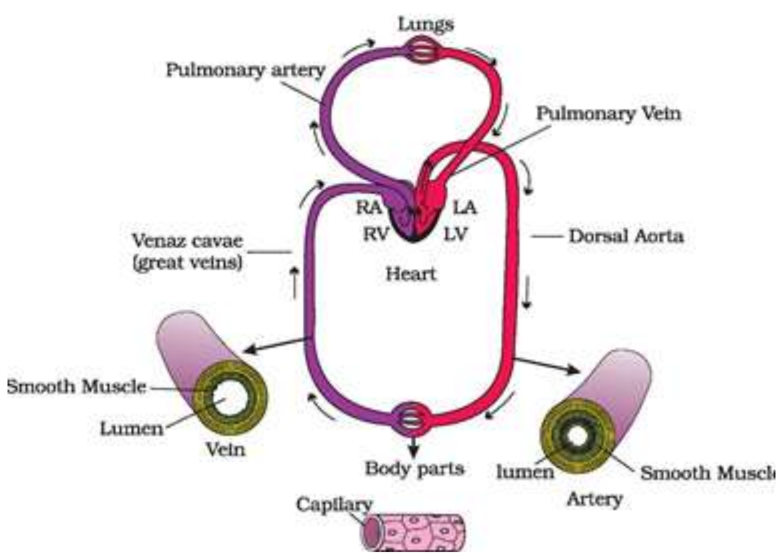
The deoxygenated blood pumped into the pulmonary artery is passed on to the lungs from where the oxygenated blood is carried by the pulmonary veins into the left atrium. This pathway constitutes the pulmonary circulation.

The oxygenated blood entering the aorta is carried by a network of arteries, arterioles and capillaries to the tissues from where the deoxygenated blood is collected by a system of venules, veins and vena cava and emptied into the right atrium. This is the systemic circulation.

The systemic circulation provides nutrients, O_2 and other essential substances to the tissues and takes CO_2 and other harmful substances away for elimination.

A unique vascular connection exists between the digestive tract and liver called hepatic portal system. The hepatic portal vein carries blood from intestine to the liver before it is delivered to the systemic circulation.

A special coronary system of blood vessels is present in our body exclusively for the circulation of blood to and from the cardiac musculature.



REGULATION OF CARDIAC ACTIVITY

Normal activities of the heart are regulated intrinsically, i.e., auto regulated by specialized muscles (nodal tissue), hence the heart is called myogenic.

A special neural centre in the medulla oblangata can moderate the cardiac function through autonomic nervous system (ANS).

Neural signals through the sympathetic nerves (part of ANS) can increase the rate of heart beat, the strength of ventricular contraction and thereby the cardiac output.

On the other hand, parasympathetic neural signals (another component of ANS) decrease the rate of heart beat, speed of conduction of action potential and thereby the cardiac output.

Adrenal medullary hormones can also increase the cardiac output.

DISORDERS OF CIRCULATORY SYSTEM

HIGH BLOOD PRESSURE (HYPERTENSION):

Hypertension is the term for blood pressure that is higher than normal (120/80).

In this measurement 120 mm Hg (millimetres of mercury pressure) is the systolic, or pumping, pressure and 80 mm Hg is the diastolic, or resting, pressure.

If repeated checks of blood pressure of an individual is 140/90 (140 over 90) or higher, it shows hypertension.

High blood pressure leads to heart diseases and also affects vital organs like brain and kidney.

CORONARY ARTERY DISEASE (CAD)

Coronary Artery Disease, often referred to as atherosclerosis, affects the vessels that supply blood to the heart muscle.

It is caused by deposits of calcium, fat, cholesterol and fibrous tissues, which makes the lumen of arteries narrower.

ANGINA

It is also called 'angina pectoris'.

A symptom of acute chest pain appears when no enough oxygen is reaching the heart muscle.

Angina can occur in men and women of any age but it is more common among the middle-aged and elderly.

It occurs due to conditions that affect the blood flow.

HEART FAILURE

Heart failure means the state of heart when it is not pumping blood effectively enough to meet the needs of the body.

It is sometimes called congestive heart failure because congestion of the lungs is one of the main symptoms of this disease.

Heart failure is not the same as cardiac arrest (when the heart stops beating) or a heart attack (when the heart muscle is suddenly damaged by an inadequate blood supply).

DERIVING ESCAPE VELOCITY USING CALCULUS

Let G be the gravitational constant and let M be the mass of the earth (or other gravitating body) and m be the mass of the escaping body or projectile. At a distance r from the centre of gravitation the body feels an attractive force

$$F = G\frac{Mm}{r^2}.$$

The work needed to move the body over a small distance dr against this force is therefore given by

$$dW = F\,dr = -G\frac{Mm}{r^2}\,dr,$$

where the minus sign indicates the force acts in the opposite sense of dr.

The total work needed to move the body from the surface r_0 of the gravitating body to infinity is then

$$W = \int_{r_0}^{\infty} -G\frac{Mm}{r^2}\,dr = -G\frac{Mm}{r_0} = -mgr_0.$$

This is the minimal required kinetic energy to be able to reach infinity, so the escape velocity v_0 satisfies

$$W + K = 0 \Rightarrow \frac{1}{2}mv_0^2 = G\frac{Mm}{r_0},$$

which results in

$$v_0 = \sqrt{\frac{2GM}{r_0}} = \sqrt{2gr_0}.$$

CONCLUSION – **"Don't miss out the treasure of 6th chamber. Vault B. It is very easy to open. Follow the pattern.**

"ABOVE ADULT BEACH BREAD CANDY"

Mystery of Hodge conjecture is also hidden behind it as I proposed the solution for the same with the 6th complex roots of unity form a cyclic group under multiplication. Here z is generator, but z^2 is not, because its powers fail to produce the odd powers of z.

In mythological stand point, the infinite truth alone is real and the world is illusion

ACKNOWLEDGEMENT:

Thank you GOD.

Reality is allowing things to come to us naturally. I respect your words that "A person who sees equality in all, and its equanimous in all pleasant and unpleasant situations, has realized the divine for the divine is impartial too. The idea flows through the Gita and plays a key role to solve these millennium equations. Joy in our lives by the way we measure, delimit and apportion the world. The world itself has no intrinsic measurement.

REFERENCES: - GOOGLE, YOU TUBE, WIKIPAEDIA