GYAN-VIGYAN SARITA:शिक्षा

A non-remunerative, non-commercial and non-political initiative to Democratize Education as a Personal Social Responsibility (PSR)
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Our Provisional Symbol:

ज्ञान-विज्ञान सरिता is not an organization. It is a spirit aimed at **democratization of education.** It is a systematic process of creating a thrill of acquiring knowledge, finger holding during infancy at learning, helping to envision and striving hard to make dreams come true. Democratization is making opportunities open and accessible to one and all at an affordable level.

The logo is within a **grey circumscribing circle** signifies unknown beyond what we know. **Blue Sky** reminds of immense possibilities. **Sun** emanates light in the form of enlightenment, wisdom, inspiration and source of energy. **Clouds** with silver lining designates optimism, despite odds, for life cycle to continue. Its preparedness to descend from a high potential in the form **rains** to reach out to those who are at ground level. **Mountains** provide **eco-balance** by storing water and releasing it gradually in the form of stream, and spring head of सरिता (**river**), a lifeline of flora and fauna. ज्ञान-विज्ञान (knowledge with scientific fervor) is essence of human civilization.

***Editorial**

शिक्षा प्रणाली में बदलाव की जरूरत

मुझे बताओ और मैं भूल जाऊंगा, मुझे दिखाओ और शायद मैं याद रखूँगा, मुझे शामिल करो और मैं समझूंगा - चीनी कहावत

"उत्तिष्ठ जाग्रत प्राप्य वरान्निबोधत" अर्थात, उठो, जागो और योग्य से सीखो । कठोपनिषद का यह उपदेशात्मक वाक्य बताता है कि हमें किससे सीखना है, और किस सीख के बल पर जीवन चलाना है । सीखना, अथवा ज्ञानार्जन करना ही शिक्षा है । नवजात शिशु असहाय होता है । वह अपने जन्म के समय न बोलना जानता है और न चलना । उसे अपने चारों ओर के समाज के नियमों अथवा वहां के रीति-रिवाजों की जानकारी नहीं होती है । उसे किसी परंपरा का ज्ञान नहीं होता है । माता उसकी पहलु शिक्षिका बनती है । माँ, बालक को अपने साथ रखकर उसे सोना, जागना, भूख लगने पर दुग्धपान करना सिखाती है । धीरे-धीरे बालक माँ की भावनाओं को समझने लगता है । माँ से उसका अपनापन बढ़ने लगता है और वह माँ लाड़-प्यार को समझने लगता है । उसके डांट और प्यार के अंतर को समझने लगता है । संवेदनाओं की पहचान उसकी शिक्षा का आधार बनती है ।

प्राकृतिक बालक और उसके चारों ओर के समाज के बीच में गहरी खाई रहती है । शिक्षा इसी खाई को भरने का कार्य करती है । वह सीखने वाले की माता के सामान पालन करती है, पिता के सामान उचित मार्ग-दर्शन करती है, और पत्नी के समान सांसारिक चिंताओं को दूर करती है । जिस प्रकार सूर्य का प्रकाश पाकर कमल खिल उठता है और सूर्य की अनुपस्थिति में कुम्हलाकर अपनी पंखुड़ियों को समेट लेता है, ठीक उसी प्रकार शिक्षा पाकर व्यक्ति का भविष्य उज्ज्वल हो जाता है । शिक्षा बालक की जन्मजात शक्तियों का विकास करती है और उसे कीर्ति दिलाती है ।

शिक्षा आदिकाल से ही आवश्यक रही है । सीखने की लिए उम्र की बाध्यता नहीं रही है । हर सीखने वाला तब तक बालक है जब तक वह सीख नहीं लेता है । व्यक्तिगत रूप में सीखने और समाज को सामूहिक रूप में सिखाने की आवश्यकता सदा से रही है । प्रारंभिक काल में मनुष्य जंगलों में रहता था, जानवरों का शिकार करता था और कृषि से अपने पारिवार का जीवन यापन करता था । शिकार करने के लिये उसे उपकरणों की आवश्यकता होती थी । कृषि के लिए उसे साधनों की आवश्यकता पड़ती थी | इन उपकरणों के बनाने, साधनों की खोज करने, और उनके प्रयोग की कला सीखना व सिखाना ही उस समय, उसके लिए पर्याप्त शिक्षा थी ।

वैदिक युग में समाज ने अपने बारे में, अपने चारों ओर की वस्तुओं के बारे में जानने की जिज्ञासा किया । युद्ध में श्रेष्ठता साबित करने के लिए उसे निपुणता की जरूरत पड़ी । इन्हें पूरा करने के लिए गुरुकुलों का विकास हुआ, जहां इन सबकी शिक्षा दी गयी । हमारी शिक्षा व्यवस्था पुराने पाठ्यक्रमों पर आधारित होने के कारण वह परिणाम नहीं दे पा रही है जो आज की आवश्यकता है । जमीनी हकीकतों से दूर हमारा शिक्षक, परंपरागत तरीके से पढ़ाते हुये वैश्विक स्तर की शिक्षा की तुलना में महत्त्वपूर्ण योगदान नहीं दे पा रहा है । शिक्षण व उससे सम्बंधित शोध आदि कार्यों में व्यस्त रहने वाले शिक्षकों की संख्या कम हो रही है । शिक्षण के अलावा राजनीतिक कार्यों में व्यस्त रहने वालों की संख्या बढ़ रही है । अपने बौद्धिक स्तर को बढ़ाते रहने वालों की संख्या नहीं बढ़ रही है । सीखने में अभिरुचि बढ़ाने वाले तरीकों की खोज नहीं हो रही है । प्रश्नपत्र बनाने से लेकर उनकी जांच करने तक गलतियां हो रही है । इन परिस्थितियों के कारण अच्छे बच्चों में पढाई के प्रति उत्साह कम हो रहा है, और साथ ही साथ शिक्षकों के प्रति आदर भी कम हो रहा है । आज की शिक्षा लाभ कमाने का व्यवसाय वन गयी है । सीखने वाले की सोच, उसकी मौलिकता की पहिचान करने, और उसकी मानसिक क्षमता को समझने के लिए, सिखाने वाले के पास समय ही नहीं है । पुस्तकीय ज्ञान को रटाने और परीक्षाओं में असफल न होने देने तक ही सिखाने वाले की भूमिका सिमट गयी है ।

शिक्षा किसी भी विकासशील देश की प्रथम आवश्यकता है । विगत माह में बिहार बोर्ड से कक्षा १२ में उत्तीर्ण सर्वश्रेष्ठ छात्र-छात्राओं से मीडिया-पत्रकारों द्वारा पूछे प्रश्नों के उत्तर सुनकर ऐसा लगा कि न तो उन्हें किसी ने ठीक से पढ़ाया है और न ही वे स्वयं ठीक से पढ़े हैं | ऐसे परीक्षा फल उन्हें कहाँ ले जायेंगे, यह सोच का विषय है । कहीं ऐसा तो नहीं कि, हम इस विचारधारा के मानने वाले बनते जा रहे हैं कि, न तो हमने स्वयं कुछ सीखा है और न ही हम किसी को कुछ सीखने देंगे ?

दी टाइम्स हायर एजुकेशन (**THE**: The **T**imes **H**igher **E**ducation) संस्थान विश्व के श्रेष्ठ शिक्षण संस्थानों की रैंकिंग के लिए 2004 में बना | इसकी 2015 की रिपोर्ट के अनुसार भारत का कोई भी विश्वविद्यालयीय शिक्षण संस्थान विश्व के 100 प्रमुख संस्थानों में अपना स्थान नहीं बना पाया |

CONTENTS

विश्व में प्राथमिक शिक्षा में दक्षिण कोरिया, सबसे अच्छी शिक्षा व्यवस्था के साथ जहाँ पहले स्थान पर है, वहीं जापान, सिंगापुर और हांगकांग क्रमशः दूसरे, तीसरे और चौथे स्थान पर हैं । दक्षिण कोरिया के बच्चे प्रायः सातों दिन स्कूल जाते हैं ।

अच्छी शिक्षा देने के लिए, शिक्षक को मनोवैज्ञानिक बनना पड़ता है । उसे हर छात्र को समझना पड़ता है, हर रोज समझना पड़ता है, हर पल समझना पड़ता है और उसकी आँखों में आँखें डालकर विषय पढ़ाने से पहले उसे पढना होता है । बालक को केंद्र में रखकर शिक्षक को नित-नये प्रयोग करने पड़ते हैं । छात्रों को नयी चींजें सिखाने के लिए विभिन्न प्रकार के प्रयास करने पड़ते हैं । हर बच्चे के लिए एक ही विधि सदैव कारगर नहीं होती है ।

एक बार मदनमोहन मालवीय जी से मिलने काशी हिन्दू विश्वविद्यालय में एक छात्र आया । उसने बताया कि वह परीक्षा शुल्क देने में असमर्थ है । लोगों ने मालवीय जी से कहा कि वह छात्र एक सम्पन्न घराने से है और झूठ बोल रहा है । उसने अपने पैसों को गलत व्यय कर दिया है । मालवीय जी ने कहा, "यह विद्यार्थी कुछ वर्षों से हमारे यहाँ पढ़ रहा है, फिर भी ऐसा व्यवहार करता है । उसमें हमारा भी कोई दायित्व है कि नहीं? इसे परीक्षा में बैठने की अनुमति दी जाये " ।

आचार्य विनोबा भावे कहा करते थे कि आचार्य वही है जो अपने शिष्यों को अपने आचरण से शिक्षा दे । एक वार प्रोफेसर यशवंतराव केलकर ने कुछ रूपये एक छात्र को दिए । उस छात्र ने अपना व्यवसाय प्रारंभ किया । कुछ समय बाद, जब वह अपने व्यवसाय में स्थापित हो गया तब वह छात्र प्रो. केलकर को रूपये वापस करने गया । प्रोफेसर साहब ने कहा कि वह इसका प्रयोग अपने जैसे जरूरतमंद लोगों की मदद के लिए करे । सच है, हम अपने व्यवहार से ही सीखने वाले में परिवर्तन ला सकते है ।

शिक्षा में ज्ञान, उचित आचरण और तकनीकी दक्षता समाहित रहती है । शिक्षा कौशल, व्यापार और विकास का माध्यम है । आज के समय की मांग है कि व्यावसायिक शिक्षक (professional teacher) ही शिक्षा दे, क्योंकि वह शिक्षा देने की कला (pedagogy) को अच्छे प्रकार से जानता है । आज क्रियात्मक और प्रायोगिक (kinesthetic) शिक्षण विधि से सिखाने की जरूरत है, जिसमें सीखनेवाला देखकर और सुनकर (visual and audio) तथ्यों को सदा के लिए समझ जाये । अच्छी शिक्षा तभी संभव है जब शिक्षक विषय को रुचिकर बनाने के तरीक़ों की खोज करे । शिक्षक ऐसा होना चाहिए कि छात्र अगले दिन उसकी प्रतीक्षा करें, न कि उससे दूर भागें । पंचतंत्र में विष्णुशर्मा की सिखाने की युक्ति ऐसी ही थी, जिसने बच्चों में सीखने के प्रति अनन्य रूचि पैदा की ।

शिक्षा एक उद्देश्य परक कार्य है । बिना उद्देश्य शिक्षा नहीं दी जा सकती है । लार्ड मैकाले ने हिंदुस्तान की शिक्षा-व्यवस्था में 1835 ई. में अंग्रेजी और पाश्चात्य संकल्पना का समानिवेश इस उद्देश्य से किया कि शिक्षा समाप्ति के बाद यहाँ के लोग ब्रिटिश हुकूमत के लिए कार्य करने वाले कर्मचारी बन सकेंगे । अब स्थिति बदल चुकी है । हम विश्व के देशों के साथ प्रतिस्पर्धा में हैं । हमें अपनी व्यवस्था बदलनी होगी । हमें वह सीखना होगा जो आज की परिस्थिति के लिए अनुकूल है, तभी स्वप्न साकार हो सकेंगे, ध्येय उपलब्धि में बदल सकेंगे और सोच परिणाम का रूप ले सकेंगे ।

उद्देश्य निश्चित और स्पष्ट होना चाहिए । उद्देश्य के अभाव में शिक्षक उस नाविक की भांति हो जाता है जिसे अपने लक्ष्य का ज्ञान ही नहीं है, और उसका छात्र उस पतवार विहीन नौका के समान बन जाता है जो समुद्र में थपेड़े खाती रहती है और तट की ओर बढती जाती है ।

शिक्षा के उद्देश्य को हम प्राचीन स्पार्टा के उदाहरण से समझ सकते हैं । स्पार्टा पर शत्रुओं का आक्रमण हमेशा होता रहता था । इससे बचने के लिये उस राज्य को शक्तिशाली योद्धाओं की आवश्यकता होती थी । अतएव, उस राज्य के नागरिकों के जीवन का उद्देश्य हो गया कि वे सशक्त बनें और संघर्ष में विजयी रहें । उनकी मान्यता हो गयी कि जीवन एक संघर्ष है । बालकों में देश-प्रेम, उत्साह, आज्ञा-पालन, शारीरिक बल की वृद्धि, राज्य की रक्षा के लिए आवश्यकता बन गयी और राज्य को बचाने के लिए यही सब सीखना उनके बालकों की शिक्षा का उद्देश्य बन गया ।

शिक्षा के उद्देश्य के बारे में जब हम कई लोगों की राय लेते हैं तब हर एक की सलाह अलग-अलग होती है । कोई विज्ञान की शिक्षा की बात करता है, कोई आदर्शों की शिक्षा की बात करता है, कोई संस्कारों के शिक्षा की पैरवी करता है, तो कोई कला और साहित्य सिखाने के लिए जोर देता है , अर्थात कोई एक मत नहीं होता है कि क्या सबके लिए उपयोगी है, जबकि वास्तविकता यह है कि

अच्छी शिक्षा हर दरवाजे जानी चाहिये । यदि एक खेतिहर का बालक, शिक्षा तक नहीं पहुँच पाता है तो उसके हल के पास शिक्षा को जाना चाहिये ।

शिक्षा का उद्देश्य सीखने वाले पर अपना मत थोपना, अथवा अपने विचारों से उसके विचारों को प्रभावित करना नहीं होता है । डॉ. हार्डी ने रामानुजन के साथ यही किया । उन्हें पूरी आजादी दी कि वह अपने ज्ञान को अपने अनुसार व्यक्त करें । प्रभाव हुआ कि एक गुरु को भी अपने शिष्य के ज्ञान का लोहा मानना पड़ा ।

फ्रांसीसी गणितज्ञ फरमेट ने 1637 में एक महत्त्वपूर्ण प्रमेय लिखी जो कालांतर में फरमेटस लास्ट थ्योरम (Fermat's Last Theorem) कहलायी । यह प्रमेय कहती है कि कोई भी तीन धनात्मक पूर्णांक a, b, c-, ऐसे नहीं है जो समीकरण $a^n+b^n=c^n$ को संतुष्ट करते हों, यदि n का मान २ से बड़ा है । इस प्रमेय को करीब 358 सालों तक कोई हल नहीं कर पाया । एंड्रू वाइल्स (Andrew Wiles) एक ब्रिटिश गणितज्ञ है । बचपन से इनकी इच्छा थी कि वह फरमेट थ्योरम को हल करे । उन्होंने 1986 से शुरू कर 1995 तक इस प्रमेय पर लगातार कार्य किया और अंत में इसे सिद्ध करने में सफलता पायी । आज आवश्यता है कि हम ऐसे छात्रों का विकास करें जो अपनी लगन से असंभव को संभव कर दिखायें ।

ग्रीक गणितज्ञ इरेटोस्थेनीज़ (Eratosthenes) नई बिना मिश्र छोड़े पृथ्वी के व्यास को ठीक-ठीक मापा और दर्शाया कि लगन हो तो कठिन से कठिन कार्य भी किया जा सकता है । क्या हमें ऐसे शोधकर्ता बनाने मैं रूचि नहीं रखनी चाहिए?

शिक्षा मानसिक शक्तियों का विकास करती है जो स्वतंत्रतापूर्वक विचार कर पता करती है कि क्या ठीक है और क्या ठीक नहीं है । शिक्षा का मतलब कदापि यह नहीं है कि सीखने वाले के दिमाग में ऐसी बातें भर दी जायें कि वह अंतर्विरोधों में फंस जाये और उसका दिमाग उसे जीवन भर पचा न सके । शिक्षा हमेशा एक ही युक्ति पर निर्भर रहने की आदत से दूर करती है, अर्थात हर परिस्थिति में वैकल्पिक युक्ति के बारे में सोचने पर बाध्य करती है ।

डॉ. राधाकृष्णनन के अनुसार असली शिक्षा वही है जो मानव को उसके भीतर ईश्वरीय तत्त्व का अनुभव करा दे । वास्तव में संसार में जितने प्रकार की प्राप्तियां हैं, उनमें शिक्षा सबसे बढ़कर है ।   यदि हमारी शिक्षा हमारे मन को संयम में लाना सिखा दे, मन की शक्तियों को विभिन्न परिस्थितियों में आवश्यकतानुसार उपयोग करना सिखा दे, साथ ही साथ दूसरे लोगों के अनुपयोगी विचारों को अपने अंदर इकट्ठा न होने देने का तरीका बता दे, तो इससे अच्छा सीखने का और कुछ हो ही नहीं सकता है । हमें नहीं भूलना चाहिये कि शिक्षा हमें कभी कभी ऐसे लोगों से मिलती है जिन्हें हम अभिमानवश अज्ञानी मानते हैं ।

शिक्षा की शैली वह होनी चाहिए जो सीखने वाले में "सर्वे भवन्तु सुखिनः" का भाव जगाये न कि "सर्व एवं मम" । शिक्षण शैली में आज बहुत परिवर्तन हो चुका है । यह बहुमुखी प्रतिभा (multiple intelligence) संपन्न हो चुकी है । छात्र का आई क्यू (IQ) स्तर निरंतर बढ़ रहा है । उसकी जिज्ञासा बढ़ रही है । इंटरनेट के आगमन से वह कक्षा में जाने से पहले ही बहुत कुछ जान रहा है । अब शिक्षक को भविष्य में झांककर, बच्चे की मानसिकता को पढ़कर, उसकी रूचि को समझना होगा तथा उससे अधिक तैयार होकर कक्षा में जाना होगा । केवल किताबी ज्ञान से वह कक्षा में नहीं टिक पायेगा । उसे अपने विषय में पारंगत होना होगा ।

वैश्वीकरण (globalization) के कारण शिक्षक के लिए आवश्यक हो गया है कि वह जाने कि भिन्न-भिन्न देशों में उसके विषय में क्या विकास हो रहा है, उनकी तुलना में उसके ज्ञान का स्तर क्या है, और वह कितना जानता है । यदि वह गणित पढ़ा रहा है तो उसे मानकर चलना होगा कि उसका छात्र सामान्य प्रश्न से लेकर ओलंपियाड (Olympiad) तक के प्रश्नों से सज्जित है । उसे बालक की जिज्ञासा को संतुष्ट करने के लिए उन सभी संभावित प्रश्नों का हल पहले से तैयार कर रखना होगा । छात्र के पास प्रश्न पहुंचे उसके पहले शिक्षक को उस प्रश्न को जानना होगा ।

हम, ऐसी शिक्षा-प्रणाली के पक्षधर हैं जो सिखाते समय, सीखने वाले के अंदर, सीखने का जुनून पैदा करे ताकि सीखने और सिखाने का प्रयास कभी रुके नहीं । शिक्षा का परिणाम एक मुक्त और रचनात्मक व्यक्ति हो जो ऐतिहासिक परिस्थितियों एवं प्राकृतिक आपदाओं के विरुद्ध लड़े और मानवता को उन जड़ों तक ले जाये जहां से अनुशासन एवं स्वतंत्रता दोनों का उद्गम हो ।

बिना अपना आपा खोये और आत्मविश्वास खोये, कुछ भी सुन सकने की योग्यता ही शिक्षा है: रॉबर्ट फ्रॉस्ट

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Coordinator's Views

Why ज्ञान-विज्ञान सरिता?

Quest for knowledge, better performance, good institutes and hefty start in career is growing, despite gap in schools and institutions to fulfil the academic needs of large number of students spread around the country. In near past this quest provided an opportunity for mushroom growth of highly commercial tuitions and coaching centres, a parallel schools. In this scenario it is quite encouraging to notice some young and entrepreneurs coming up with websites which provide structured videos on various subjects with a facility to raise questions, notes, tests etc., in different formats, and all of these **free of cost**. This web-based education has relevance at high school and intermediate level, where students have reasonable maturity. It takes quite a good effort and investment to create the archive and required infrastructure and bandwidth. Some of sites, and their originators, that we have interacted with, are unacademy.in, examfear.com, khanacademy.org, krittikalmathematics.com and tiwariacademy.com, There may be many more such sites which are not listed, is in absence of their knowledge. Efforts were made to proactively volunteer to mutually complement efforts of each other. It may not be out of place to mention that, out of these sites, claiming tall numbers and expertise, only Shri Rakesh Tiwari (tiwariacademy.com) and an eminent Prof. S.B. Dhar (krittikalmathematics.com) pro-acted to ***collectively complement efforts*** of Online Mentoring.

At the outset, use of web-technology in the endeavour is commendable. It provides mutual accessibility between mentors and students and have no constraint of geography, time and physical constraint. Financial constraints of beneficiaries on IT infrastructure, a pre-requisite, is negligible as compared to cost of coaching, tuition, travel and time spent on it. Nevertheless, it takes away freedom of movement and interacting with other students at their age and stage, a relevant parameter. Web-based initiatives apparently optimize efforts, and is quite fascinating and lucrative and tends to grow fast and thus earn a high ROI.

It is, however, pertinent to understand why there is non-response from most of the fore-runners in imparting free educational guidance through their websites.

At this point it may not be out of context to cite an interaction, in recent past, with Prof. Krishna Kumar, an exponent of educational psychology and philosophy. It is an established fact that there is no substitute to classroom teaching. But, in the backdrop of various reports and critique on status of education, the root cause lies in non-availability of mentors and just not teachers; not the number of teachers, which is already reported o deficient, but passionate mentors to ignite fire of learning; just not the guide but committed and compassionate mentors to extend a finger-hold to learning toddlers; just not an authority to order or direct but make the ignited minds dream. In management, administrative or political parlance achieving this, in a country of our size requires multitude of resources, and that too on an astronomical scale. It needs to be remembered that reform in education is a cultural, sociological, economical and a political change; it is related to all dimensions of life that can be thought of. Therefore, even after deployment of all the resources accomplishing a change, like a step function, is a short span is unbelievable.

It, therefore, calls for exploring possibilities and pursuing them for just not to reform but to transform the educational ethos of the society. Education, is aimed to convert orthodox, obedient and dormant individuals into an inquisitive minds which have a capacity to reason out visible and invisible effects, and can commit to resolution of problems just not confronted by themselves but in the larger good, in a manner such that they are feasible, reliable and sustainable, a characteristic of a responsible citizen.

Non-availability of educational opportunities to unprivileged children is a matter of compassion, but abuse of educational opportunities by children of elite group is pitiable. It is observed that unprivileged children grow into a notion that आज की अभी देखो कल की राम जाने, They have suffer from a mental block to envision through education. And, by chance if any child is motivated glamorization in commercial world is too effective to distract them from whatever little drive is there.

In the process a passion developed to **Democratize Education** with a sense of **Personal Social Responsibility (PSR).** It is just not a fascination; it derives desperation from discomfort caused by the prevalent state of education. This has led to evolution of **Online Mentoring of students**. It recognizes ground realties and uses technology as a resource to bridge gap between passionate-committed mentors and desperate students. A broad comparison of web-resource and Online Mentoring is brought out in a seprate table.

Education is not a production, run of the mill, it is transformation of thought process which is slow, gradual, and perpetual over a long period. Online mentoring being well intended and very thoughtfully conceived mission, to connect passionate mentors to students deprived of educational guidance. Based on experience of its persuasion for about Four year, a caution is needed in identifying learning centres. These must be able to sustain firstly, recurring cost of a tariff plan for broadband internet connectivity with requisite data-capacity. It is insignificant as compared to the cost-benefit of learning from other sources, a small fraction of wages of an attendant.. Secondly, out of their teachers they should manage at their end a coordinator who would bridge the learning gaps, take care of carryover of learning and ensure discipline-cum usage of facility. It is seen that initial response to this novel initiative is enthusiastic, but on both the concerns there is no ownership, and remotely located mentor, connected on internet, can't do much about it. System which has

responsibility towards betterment of education and society which is the first beneficiary, shall have to awaken to its needs, role and responsibilities so as to come out of complacence and avail best out of the initiative.

Parameters	Web-resource	Online Mentoring
Reach	Vast, but for those who can afford it	Targets those who can't afford it
Discipline Required	Students awareness and convenience	Classroom culture
Direct Interaction and time delay	Indirect interaction with students. It is being articulated, but cost of reducing time-lag us large	Direct Online interaction with the teacher, alongwith Dynamics of Group Learning an additional advantage.
Control	Monopolized methodology and passive in nature. Abuse of free access to web-resource by students can't be ruled out.	Distributed participation across mentors, facilitator and Coordinator. Methodology is dynamically governed by extempore response of students. Check abuse of web-resource
Capability Building	Students who can take it	Mentors, Coordinators and Students, all together, along with transfer of capability
Pace of growth	Fast, and self-centric	Slow and perpetual. It needs perseverance
Financial Model	Commercial perspective of backend operator, to support individual's passion and monopoly in growth can't be ruled out. Individually, the enormous cost and effort involved in web-resource appears to be unsustainable. On student side, it is proprietary in nature.	On Mentors' side: it is driven by passion and sense of PSR and spirit to collectively complement by those who can afford, the nominal add-on cost, such are in plenty. On learning centre: Zero-Fund-&-Zero-Asset, Schools and social initiatives use available IT setup with notional incremental cost of broadband internet connection. Beneficiary students are those who can't afford web connectivity.
Management Model	ROI, growth and sustainability	Participative and Cooperative
Teaching resources	Replaces teachers with web resource	Collectively complements teachers along with capability transfer

There are different school of thoughts and in democracy each one has a right to choose a course of action suiting oneself, without encroaching upon others' rights. Choice was either to stay in a state of complacence and just be a passive observer; or be a reactionary elite activist to challenge system arouse people's sentiments through inflammatory narrations and create a chaos; or organize thoughts, actions and people around and engage in corrective course of action. It was a considered decision to choose last of the aforesaid options.

Thus came into existence **ज्ञान-विज्ञान सरिता** a non-remunerative, non-commercial and non-political spirit with co-passionate persons, and not an organization. It believes in collectively complementing the cause and thereby entail metaphysical satisfaction in being able to discharge PSR and democratize education. It is an open philosophy, and just not a model, which provides for interaction, participation, modification and/or take away that one wishes to carry on with one's own conviction. There is just one request "*please do not discard it without seeing and understanding it*". In this materialistic world where most of the elite are racing for name, fame and wealth, even later part of life when they are free from all family obligations. Nevertheless, it is believed that there are quite a good number of person who bear a sense of satisfaction in life and are at discomfort in absence of opportunities where they can engage selflessly with sense of PSR, to transform and reform people around them. Such persons are invited to interact and explore immense potential to complement to create an environment where individuals are thoughtful, responsible, sensitive and committed to pro-act with PSR, the best that one can make to beloved descendants.

In this process there is no single formula that can meet wide-range of problems. Therefore, everything that is well intended, thought over and conceived should be given a fair try without aborting it prematurely. Moreover, no system is perfect and in economics and social sciences relevance of every solution is time-variant. Moreover, boundary conditions are not only applicable in laws of science, they are valid in socio-economics too. Newtonian Mechanics is not valid in high speed approaching velocity of light, and there is the need to use relativity theory. Likewise, regulation of means of living and opportunities of growth is necessary when disparity is large, but when this disparity is bridged liberalizations becomes necessary for allowing competence to flourish. Competence is not something which can be controlled. It will grow like a snowball. But, the society, system and state will have to come out hand-in-hand with has an indispensible role in creating opportunities of growth and welfare of the all, at the base of it is education, just not primary education.

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WISDOM OF TOLERANCE

(Extracts of Convocation Address by Sh. Raghuram Rajan, former Governor, RBI, at IIT-Delhi progress. Full text of his address at the IIT-Delhi Convocation on October 31, 2015)

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Nevertheless, I am going to look beyond my personal incentives and fulfil my dharma as Chief Guest. I will speak on why India's tradition of debate and an open spirit of enquiry is critical for its economic progress. Let me explain.

Robert Solow, won the Nobel Prize in Economics for work that showed that the **bulk of economic growth did not come from putting more factors of production such as labour and capital to work. Instead, it came from putting those factors of production together more cleverly, that is, from what he called total factor productivity growth.** Put differently, *new ideas, new methods of production, better logistics — these are what lead to sustained economic growth*. Of course, a poor country like ours can grow for some time by putting more people to work, by moving them from low productivity agriculture to higher value added industry or services, and by giving them better tools to do their jobs. As many of you who have taken economics will recognise, we in India are usually far from the production possibility frontier, so we can grow for a long while just by catching up with the methods of industrial countries.

But more intelligent ways of working will enable us to leapfrog old methods and come more quickly to the production possibility frontier — as for example, we have done in parts of the software industry. And, of course, once you are at the frontier and using the best methods in the world, **the only way to grow is to innovate and be even better than others in the world**. This is what our software firms are now trying to do.

Our alums, whom you students will shortly join, are leading India's charge to the frontier and beyond. Take the fantastic developments in E-commerce, ranging from the creation of electronic market places to new logistics networks and payments systems. Today, a consumer in a small town can have the same choice of clothing fashions that anyone from the large metros enjoy, simply because the Internet has brought all the shops in India to her doorstep. And while her local shop no longer can sell shoddy apparel, it now focuses on the perishable items she needs in a hurry, even while sub-contracting to provide the last leg of the logistic network that reaches her. *Economic growth through new ideas and production methods is what our professors and alums contribute to the nation.*

So what does an educational institution or a nation need **to do to keep the idea factory open?** The first essential is to foster competition in the market place for ideas. This means encouraging challenge to all authority and tradition, even while acknowledging that the only way of dismissing any view is through empirical tests.

What this rules out is anyone imposing a particular view or ideology because of their power. Instead, all ideas should be scrutinized critically, no matter whether they originate domestically or abroad, whether they have matured over thousands of years or a few minutes, whether they come from an untutored student or a world-famous professor.

I am sure many of you have come across Richard Feynman's Lectures on Physics, a must-read when we were at IIT. The Nobel prize-winning physicist was one of the giants of the twentieth century. In his autobiography, though, he writes how he found the atmosphere at the Institute of Advanced Studies at Princeton stultifying. Now, as you know, the Institute of Advanced Studies brings together some of the finest scholars in the world to ponder problems in a multi-disciplinary environment. But he found the atmosphere sterile because there were no students to ask him questions, questions that would force him to rethink his beliefs and perhaps discover new theories. Ideas start with questioning and alternative viewpoints, sometimes seemingly silly ones. After all, Einstein built his theory of relativity pondering the somewhat wacky question of what someone travelling in a train at the speed of light would experience. So nothing should be excluded but everything should be subject to debate and constant testing. *No one should be allowed to offer unquestioned pronouncements. Without this competition for ideas, we have stagnation.*

This then leads to a second essential: *Protection, not of specific ideas and traditions, but the right to question and challenge, the right to behave differently so long as it does not hurt others seriously.* In this protection lies societal self-interest, for it is by encouraging the challenge of innovative rebels that society develops, that it gets the ideas that propel Solow's total factor productivity growth. Fortunately, India has always protected debate and the right to have different views. Some have even embedded these views in permanent structures. Raja Raja Chola, in building the magnificent Brihadeeswara Shaivite temple at Thanjavur, also incorporated sculptures of Vishnu as well as the meditating Buddha thus admitting to alternative viewpoints. When Shahenshah Jalaluddin Muhammad Akbar invited scholars of all manner of persuasion to debate the eternal verities at his court, he was only following older traditions of our Hindu and Buddhist kings, who encouraged and protected the spirit of enquiry.

What then of group sentiment? Should ideas or behaviour that hurt a particular intellectual position or group not be banned? Possibly, but a quick resort to bans will chill all debate as everyone will be anguished by ideas they dislike. It is far better to improve the environment for ideas through tolerance and mutual respect.

Let me explain. Actions that physically harm anyone, or show verbal contempt for a particular group so that they damage the group's participation in the marketplace for ideas, should certainly not be allowed. For example, sexual harassment, whether physical or verbal, has no place in society. At the same time, groups should not be looking for slights any and everywhere, so that too much is seen as offensive; the *theory of confirmation bias in psychology* suggests that once one starts looking for insults, one can find them everywhere, even in the most innocuous statements. Indeed, if what you do offends me but does not harm me otherwise, there should be a very high bar for prohibiting your act. After all, any ban, and certainly any vigilante acts to enforce it, may offend you as much, or more, than the offense to me. Excessive political correctness stifles progress as much as excessive license and disrespect.

Put differently, while you should avoid pressing the buttons that upset me to the extent possible, when you do push them you should explain carefully why that is necessary so as to move the debate forward, and how it should not be interpreted as a personal attack on me. You have to tread respectfully, assuring me that a challenge to the ideas I hold is necessary for progress. At the same time, I should endeavour to hold few ideas so closely intertwined with my personality that any attack on them is deemed an intolerable personal affront. Tolerance means not being so insecure about one's ideas that one cannot subject them to challenge — it implies a degree of detachment that is absolutely necessary for mature debate.

Finally, respect requires that in the rare case when an idea is tightly associated with a group's core personality, we are extra careful about challenging it.

Tolerance can take the offense out of debate, and indeed instil respect. If I go berserk every time a particular button is pressed, rebels are tempted to press the button, while mischief-makers indeed do so. But if I do not react predictably, and instead ask button pressers to explain their concerns, rebels are forced to do the hard work of marshalling arguments. So, rebels do not press the button frivolously, while the thuggish mischief makers who abound in every group are left without an easy trigger. Tolerance and respect then lead to a good equilibrium where they reinforce each other.

For example, rebellious youth in the United States used to burn the American flag. It was calculated to upset the older generation that had fought in America's wars, for the flag was a symbol of all they had fought for. And the police, many of whom were veterans, used to react with violence, which was precisely the reaction the rebels sought to further their cause. Over time, though, U.S. society has become more tolerant of flag-burning. Because it no longer triggers a reaction, it is no longer used as an instrument to shock. In sum, if group sentiment becomes more tolerant and less easily hurt, the actions that try to hurt it will diminish. As Mahatma Gandhi said, "The golden rule of conduct is mutual toleration, seeing that we will never all think alike and we shall always see Truth in fragments and from different points of vision."

Let me conclude. IITians like you will graduate into is much more capable of using your technological prowess than the India we graduated into. I wish you unlimited ambition, and forecast great success for those of you who continue thinking and challenging. But as you go out in the world, remember our tradition of debate in an environment of respect and tolerance. By upholding it, by fighting for it, you will be repaying your teachers in this great institution, and your parents who worked so hard to send you here. And you will be doing our country a great patriotic service

. . . ."

(**Source:** *http://www.thehindu.com/news/resources/rbi-governor-raghuram-rajans-convocation-address-at-iitdelhi/article7827245.ece*)

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ABOUT US: This is an initiative, not an abrupt eruption, but driven by spirit of returning back to society with a spirit of Personal Social Responsibility (PSR) by a team of co-passionate persons who have survived many decades of rough weather conditions. It is not an organization, and it aims at Democratization of Education, in spiritual sense.

It works on non-remunerative, non-commercial and non-political manner. Its financial model is based on Zero-Fund-&-Zero-Asset, wherein participation is welcome from those who wish to contribute, with तन और मन. As and when the feel need of धन to supplement the initiative ownership of Funds and Assets is theirs, we are just user if it.

INTRODUCTION TO THE CONCEPT OF BASIS FOR GENERATING N-DIMENSIONAL EUCLIDEAN SPACE

Prof. Pournima. L. Powar

Abstract: *The dictionary meaning of basis is foundation. As the word sounds, it is the basic building block of the analytic part of Mathematics. Any non-empty set along with some algebraic structure is called a space. In order to study certain properties and the behaviour of space, it would be quite complicated if we study each and every element of the space. In this article, the author has described how the smaller part (BASIS) of the space represents the entire space.*

1.   **Introduction:** In order to clarify this concept of basis, we first consider few examples of Basis involved in the real life.

Example 1.1 : Have you seen cooking of rice in a very big vessel (Deg) for the parties? If yes, how it is decided that the entire stuff is cooked? Do you check each and every grain of rice.

The answer is obviously no, we do not check each and every grain. Rather, with the help of spoon, we take out a very small part of the rice, press some grain by fingers and decide whether the entire stuff is cooked or not. By studying the smaller part, the property of a big part is established. This small part behaves as a **BASIS** for the large stuff.

Example 1.2: Suppose there is a single storied building and its extension up to say three floors is proposed. How to check the possibility of proposed extension?

The answer is; by studying the foundation of the building. Instead of studying the entire structural part of the building, it is enough to focus on the foundation which is a **BASIS**.

Example 1.3: Suppose there are industries producing some items like cloth, food, steel etc. in bulk and the quality control unit of the industry would like to test the quality of the produced items. What is the process of testing?

Associated to each industry, there is a quality control, in some cases it is also called research and development unit. It executes a testing process by analyzing samples drawn of different lots of output. These samples are **BASIS** for predicting the quality of entire lot.

2.   **Mathematical Formulation:** The mathematical analysis has given the appropriate and systematic formulation to this idea of studying larger part with the help of smaller part which is called the **BASIS**. This section, briefly recalls some basic definitions which are easily available in any undergraduate book.

Let V be the vector space and $S = \{x_1, x_2, \ldots, x_n\} \subseteq V$. Also consider $\alpha_1, \alpha_2, \ldots, \alpha_n$ scalars (real or complex numbers), then $\sum_{i=1}^{n} \alpha_i x_i$ is called the linear combination of the vectors $x_1, x_2, \ldots, x_n$.

Definition 2.1: A subset $S = \{x_1, x_2, \ldots, x_n\}$ of a vector space, V is said to be linearly dependent if $\sum_{i=1}^{n} \alpha_i x_i = 0 \Rightarrow$ at least one $\alpha_j (i = j) \neq 0$.

Definition 2.2: A subset $S = \{x_1, x_2, \ldots, x_n\}$ of a vector space, V is said to be linearly independent if $\sum_{i=1}^{n} \alpha_i x_i = 0 \Rightarrow \alpha_j = 0 \ \forall \ i = 1,2,3, \ldots, n$.

Example 2.1: Consider a vector space $\mathbb{R}$ and the following subsets of $\mathbb{R}$

   i) $S = \{0\}$; ii) $S = \{1\}$,   iii) $S = \{2, 3\}$

The first is linearly dependent as $\alpha. 0 = 0 \Rightarrow \alpha \neq 0$ necessarily. The second is linearly independent as $\alpha. 1 = 0 \Rightarrow \alpha = 0$ essentially. The third is linearly dependent for $\alpha_1. 2 + \alpha_2. 3 = 0$ with $\alpha_1 = \frac{1}{2}, \alpha_2 = -\frac{1}{3}$

Definition 2.3: Consider a vector space V and let S be the subset of V. S is said to be the BASIS which generates the vector space V if

i)   S is linearly independent subset of V
ii)   S is the maximal linearly independent subset of V in the sense that if we add one more element to S, it turns linearly dependent.

Remark 2.1

- S spans V ([S]=V) mean each vector $v \in V$ can be expressed as the linear combination of elements of S.
- S is not unique. But in general, S has been chosen in such a way that it spans V easily with less computations.

2.1 Standard or Canonical Basis for $n^* -$dimensional Euclidean space for $n^* = 1, 2, \dots, n$

- Consider $V = R, S = \{1\} \subseteq R$. It is obvious that$[S] = R$. Any arbitrary $x \in R$ can be expressed as $x = x.1$.
- Consider $V = R^2, S = \{(1,0), (0,1)\}$. It is direct that $[S] = R^2$. Any $(x,y) \in R^2$ can be expressed as $(x,y) = x(1,0) + y(0,1)$ (Applying scalar multiplication and poin-wise addition). Continuing in this way finally, for $n^* = n$, we have
- Consider $V = R^n, S = \{(1,0,0,\dots,0), (0,1,0,\dots,0), \dots, (0,0,0,\dots,1 =.$ Any $(x_1, x_2, \dots, x_n) \in R^n$ can be expressed as

$$(x_1, x_2, \dots, x_n) = x_1(1,0,0,\dots,0) + x_2(0,1,0,\dots,0) + \dots + x_n(0,0,\dots,1)$$
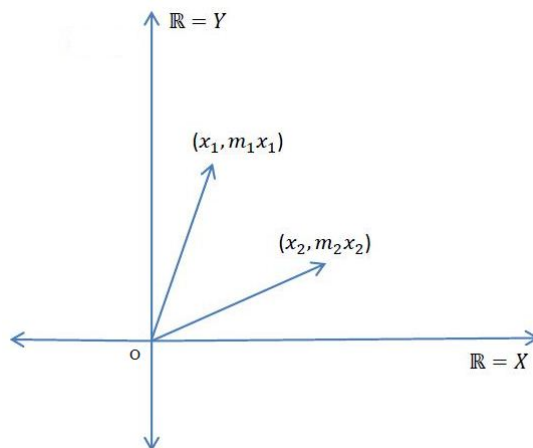
3. Non-uniqueness of Basis

The main objective of this article is to study in details, under what geometric position, the collection of $n -$vectors would form the basis. Before we proceed, we start with the simple example

Example 3.1 Consider $V \in R^2, S = \{(\frac{1}{2}, \frac{1}{2}), (\frac{1}{2}, 1)\}$. It may be verified that this set is linearly independent i.e.

$$\alpha\left(\frac{1}{2}, \frac{1}{2}\right) + \beta\left(\frac{1}{2}, 1\right) = (0,0) \Rightarrow \left(\frac{\alpha + \beta}{2}, \frac{\alpha}{2} + \beta\right) = (0,0)$$
$$\Rightarrow \alpha = 0, \beta = 0$$

Any $(x, y) \in R^2$ can be expressed as
$(x,y) = \alpha\left(\frac{1}{2}, \frac{1}{2}\right) + \beta(\frac{1}{2}, 1)$ for $\alpha = (4x - 2y), \beta = 2(y - x)$

Remark 3.1 It may be noted that the collection of two vectors is not always linearly independent. For example $S_1 = \{(\frac{1}{2}, \frac{1}{2}), (1,1)\}, S_2 = \{(1,2), (2,4)\}, S_3 = \{(0,1), (0,10)\}, S_4 = \{(2,0), (20,0)\}$ etc.

4. Generalized form of the Basis for $\mathbb{R} \times \mathbb{R}$

Referring example 3.1, it may be noted that the basis is not unique. Also, the collection of two vectors may not be linearly independent. In this section, we study that under what geometric condition, the collection of two vectors turns out to be linearly independent.
Consider $V = \mathcal{R} \times \mathcal{R}$ and we define
$$S = \{(x_1, m_1 x_1), (x_2, m_2 x_2): m_1 \neq m_2\} \qquad (4.1)$$

We show that S is linearly independent set for $m_1 \neq m_2$

$\alpha(x_1, m_1 x_1) + \beta(x_2, m_2 x_2) = (0,0) \Rightarrow \beta x_2(m_2 - m_1) = 0$
Since $m_1 \neq m_2$ and $x_2 \neq 0, \beta = 0$.
Similarly, we may show that $\alpha = 0$
In this case $m_1 = m_2$ implies that two vectors are collinear (cf. Fig. 4.1). Any arbitrary $(x, y) \in R^2$ can be expressed as

$\alpha(x_1, m_1 x_1) + \beta(x_2, m_2 x_2) = (x, y)$ for $\alpha = \frac{m_2 x - y}{x_1(m_2 - m_1)}, \beta = \frac{y - m_1 x}{x_2(m_2 - m_1)}$

$x_1, x_2 \neq 0, m_1 \neq m_2$

Remark on Fig. 1: The canonical Basis viz {(1, 0), (0,1)} is not the special case of S described in it. It is quite interesting to note that although x-axis and y-axis are orthogonal but the condition $m_1 m_2 = -1$ is not fulfilled ($m_1 = \tan 0 = 0$ and $m_2 = \tan 90° = \infty$)

5.   The most general form of Basis which generates Consider $V = \mathcal{R} \times \mathcal{R}$ and two vectors $v_1 = (x_1, y_1)$ and $v_2 = (x_2, y_2)$ of length r_1 and r_2 making angles of θ_1 and θ_2 with the x-axis respectively (see Fig. 5.1). It is clear that $x_1 = r_1 \cos\theta_1$, $y_1 = r_1 \sin\theta_1$, $x_2 = r_2 \cos\theta_2$ and $y_2 = r_2 \sin\theta_2$.

Consider: $B = \{(r_1 \cos\theta_1, r_1 \sin\theta_1), (r_2 cos\theta_2, r_2 \sin\theta_2)\}$

Our aim is to study under what restriction B is linearly independent .
Consider

$\alpha(r_1 \cos\theta_1, r_1 \sin\theta_1) + \beta(r_2 cos\theta_2, r_2 \sin\theta_2) = (0,0)$
 We get

$$\beta r_2 \sin(\theta_1 - \theta_2) = 0.$$

Since, $r_2 \neq 0$ and $\theta_1 - \theta_2 \neq 2n\pi \Rightarrow \beta = 0$.
Similarly, we may show that $\alpha = 0$.
Here, we conclude that B (cf. relation (5.1)) is linearly independent
when two vectors are non-collinear. It may be verified that B spans $\mathcal{R} \times \mathcal{R}$. Consider

$$\alpha(r_1 \cos\theta_1, r_1 \sin\theta_1) + \beta(r_2 cos\theta_2, r_2 \sin\theta_2) = (rcos\theta, rsin\theta)$$

   For $\alpha = \frac{rsin(\theta_2 - \theta)}{r_1 sin(\theta_2 - \theta_1)}, \beta = \frac{rsin(\theta_1 - \theta)}{r_2(sin(\theta_1 - \theta_2))}$

Where $x = rcos\theta, y = rsin\theta, \theta_1 - \theta_2 \neq 2n\pi, r_1 \neq 0, r_2 \neq 0$.

Remark 5.1 The standard Basis is a special case of B (cf. relation (5.1)) for $\theta_1 = 0°$ and $\theta_2 = 90°$ with $r_1 = r_2 = 1$.

6.   **Extension to higher dimensional spaces :**The set of $n-$vectors $(v_1, v_2, \dots, v_n)$, $v_j \in \mathbb{R}^n (j = 1,2, \dots, n)$is linearly independent if no all n vectors should lie in the same hyperplan of dimension $n - 1$ and it may be treated as basis which generates $\mathbb{R}^n$.

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OUR TEAM: **A team of co-passionate persons pursuing this mission comprises of a) Dr. SB Dhar, an eminent professor, mentor and connoisseur of mathematics and competitive examinations, b) Shri Shailendra Parolkar, an IIT Kharagpur Alumunus and a successgul IT professional at Texas, US, and a mentor of Mathematics and Physics for IIT JEE, c) Smt. Kumd Bala an experience teacher and retired principal of Govt. Higher Secondary School, d) and Dr Subhash Joshi, a passionate coordinator-cum-mentor , and all them are mentoring Online.**

These efforts are backed chalk-&talk mentoring by Prof. Ramesh Chandra, an experienced teacher of Mathematics, Shri S.N. Khanna, a retired professional from pharmaceutical company, a mentor of English Usage and social Ethics, and Smt Shalini Mathur, a Mentor of English. We have a mentoring philosophy.

FOUNDATION OF UNDER-PRIVILEGED CHILDREN

Sunita Bhasin   **K. Ashok Rao**
Director, SSMI[1]   Genl. Secy, SSMI

Preamble: Early child development refers to the ordered emergence of interdependent skills of sensorimotor, cognitive-language, and social-emotional functioning. This emergence depends on and is interlinked with the child's good nutrition and health. The focus is on children under eight, and particularly in the first year of life because this is the period of the child's life when development is most rapid and requires most environmental input and protection from risks.

The term "holistic approach to early child development" refers to policies and programming that ensures that a child has rights to health, nutrition, cognitive and psychosocial development and protection are all met. All interventions should reach children, including the most marginalized. A number of studies suggest that there are additive and even synergistic effects among interventions that result in greater impacts on the child development. A requirement of the holistic approach to Early Child Development is protecting and promoting women's rights; it is the first step in securing gains for children[2].

In March 1990, the international education community, gathered in Jomtien, Thailand, announced the World Declaration on Education for All (known as the Jomtien Declaration), recognising that all human beings have a right to equal opportunities to meet their basic learning needs. The Jomtien Declaration, which focused on the concept of basic education, noted in Article 5 that "learning begins at birth," and placed early childhood within the purview of basic education. It further stated that provision of these early childhood services could be made through arrangements involving families, communities or institutional programmes. The statement affirms that early childhood, the foundation of all human learning, is an area of education that requires national policy attention. Early childhood was no longer to be considered the private domain of the family[3].

The above stated paragraphs sum up the focus of this paper. The national and international obligations that the Indian state has to fulfill are discharged in a token and sluggish manner. There is more of a public discourse and national clamour inside and outside Parliament for setting up more export oriented IITs and IIMs.

Even the discussions relating to common schools or school education focus mostly on secondary school education. Discussion on education at the lower levels is derisively dismissed by the teachers of the secondary schools with comments like, *"we do our best, but what can we do?, the _stuff_ coming from below is so bad !!."* The stuff referred to is not an inanimate object, but the child of the under-privileged.

Vital and critical missing links: Although it is never too late to improve the quality of a child's life, the first three years are the most crucial for their survival and thriving. Frequent illness, unsanitary environments and poor nutrition steal a child's potential. If the extraordinarily receptive brain of the child lacks the stimulation for which it is primed during the first three years, the possibility for various types of learning may be substantially reduced – during key developmental periods, some parts of a child's brain can nearly double in size in a year.

The process of giving children the best start in life begins even before birth. Poor nutrition and ill health on the part of a mother can lead to low birth weight in her children, putting them at much greater risk of developmental delay, malnutrition and death. Out of 100 children born in 2000, 30 suffered, most likely, from malnutrition in their first five years of life.

But even when children did not survive, they too often did not thrive. At least 10 per cent of all children – over 200 million in all – suffered some form of physical and/or mental disability or developmental delay (significantly low cognitive ability). It is a fact that an even larger number suffer from diminished learning capabilities and other disadvantages that limit their overall prospects for reaching their full potential.

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[2] Programme Communication for Early Child Development for Every Child - First Edition November 2006 UNICEF.

[3] Early Childhood Care and Education in E-9 Countries: Status and Outlook: Section for Early Childhood and Inclusive Education Division of Basic Education, Education Sector UNESCO, Paris

The World Bank estimates that India ranks second after Bangladesh for the most number of children who suffer with malnutrition. The prevalence of under-weight children in India is amongst the highest in the world and is nearly double that of Sub-Saharan Africa.[4]. Considering that about 17.5 % of India's population are children below the age of six[5] the problem is staggering in immensity.

The main instrument of policy in India has been the Integrated Child Development Scheme (ICDS). The Anganwadi centers were created under the ICDS programme, which started in 1975 with the following objectives:

- Improve the nutritional and health status of children in the age group 0-6 years;
- Lay the foundation for proper psychological, physical and social development of the child;
- Reduce the incidence of mortality, morbidity, malnutrition and school drop-out;
- Achieve effective coordinated policy and its implementation amongst the various departments
- Promote child development;
- Enhance the capability of the mother
- Look after the normal health and nutritional needs of the child through proper nutrition and health education.

Given the physical infrastructure and the staffing[6] (their status and training) of the Anganwadi, the most neglected areas in the above stated objectives of ICDS are:
- Lay the foundation for proper psychological, physical and social development of the child;
- Promote child development;

A comparative study made by UNESCO of 9 countries[7] indicates that "While Pre-primary education normally follows a fixed curriculum, in practice in the E-9 countries, only Brazil, China, Egypt, Pakistan and Indonesia have a national curriculum for pre-primary education. India and Nigeria do not have one.

India's National Curriculum Framework for education includes a section on early childhood, which is used by government-run public services, and which can, if necessary, be elaborated into a separate curriculum for early childhood.

The 2008-09 budget for the export oriented Indian Institute of Technology was Rs. 1545.65 crores (being 53.5 % of the total budget for technical education) The budget of the Kendriya Vidyalaya Sangathan and the Navodaya Vidyalaya Samiti put together was Rs. 1853.25 Crores. These figures show the emphasis and fiscal support given to the elite education within the public sector education. In comparison, the District Primary Education Programme has a budget of Rs. 50 Crores and the Support to One Year Pre-Primary in Government Local Body Schools is Rs. 90 Crores.[8]

Table: Status of ECCE Curriculum in India

	Presence of a national curriculum	*Services concerned*	*Pedagogical emphasis*
India	No independent national early childhood curriculum; existing is a section on pre-school education included in the "National Curriculum Framework" Training curriculum for workers of ICDS programmes	Government-run services All childcare services for 0-6-year-olds	Physical growth, socialisation, cognitive development, language development and play Early stimulation, psychosocial development, home-based care

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[4] World Bank report on malnutrition in India (2009)

[5] 1991 Census

[6] The Anganwadi worker is not a paid employee but a recipient of an honorarium

[7] The nine populous countries – Bangladesh, Brazil, China, Egypt, India, Indonesia, Mexico, Nigeria and Pakistan

[8] The well funded programme is however the Sarva Siksha Abhiyan with a direct funding of Rs. 4250 Crores and Rs. 7690 Crores funding through the Prarambhik Shiksha Kosh (PSK)

It is more than obvious that the Government of India has neglected pre-school education and its only claim of doing something in the area of Early Childhood Care and Education (ECCE) is courtesy the ICDS.

Neglect of Early Childhood Care and Education.

At the beginning of the last century Dr. Maria Montessori developed what came to be called the *Montessori Method.*[9] The Montessori educational philosophy is built upon the idea that children develop and think differently from adults; that they are not merely "adults in small bodies". The Montessori method discourages traditional measurements of achievement (grades, tests) on the premise that it damages the emotional inner-growth of children (and adults), yet, it does measure feedback and qualitative analyses of a child's schooling performance, usually recorded as a list of *skills, activities,* and *critical points,* and sometimes including a narrative explanation of the child's educational achievements, strengths, and weaknesses.

Again in Italy, after the World War II, the Reggio Emilia Approach[10] is an educational philosophy was started by the parents of the villages around Reggio Emilia in Italy. The Reggio Emilia philosophy is based upon the following set of principles:
- Children must have some control over the direction of their learning;
- Children must be able to learn through experiences of touching, moving, listening, seeing, and hearing;
- children have a relationship with other children and with material items in the world that children must be allowed to explore and
- Children must have endless ways and opportunities to express themselves.

Parents are a vital component to the Reggio Emilia philosophy. Parents are viewed as partners, collaborators and advocates for their children. Reggio Emilia's tradition of community support for families with young children expands on a view, more strongly held in Emilia Romagna and Tuscany, of children as the collective responsibility of the local community. In Reggio Emilia, the infant/toddler and pre-primary program is a vital part of the community, as reflected in the high level of financial support. Community involvement is also apparent in citizen membership in La Consulta, a school committee that exerts significant influence over local government policy.

It is most unfortunate that in India due to the priorities that we have assigned there is no equivalent of an indigenously developed systems like the Montessori or the Reggio Emilia. Another fact that is glaring is the near absence of the involvement of the Parents or the Community. In India we see education as an exclusive preserve of Government, private vested interests and teachers with each having a hierarchical master-servant relationship with the other.

SSMI's efforts
The Swami Sivananda Memorial Institute (SSMI) through four decades of association with early child care and education (Balwadi), primary and secondary schools has recognized the following as important components to be incorporated in order to create a holistic approach towards educating the under-privileged child:
1. Improve the quality of pre-school and primary education
2. Track the non performing child and take remedial action
3. Evolving, the *"Sanjay Deepak Balwadis"*

Improve the quality of pre-school and primary education
Some of the major problem areas identified was:
   i)   Lack of continuous training and motivation of the teachers
   ii)   Exclusive reliance on the top-down: "Teacher – textbook - blackboard – student" vector as the teaching method.
   iii)   Non involvement of parents.

The remedial actions initiated were:

Tracking the non performing child and taking remedial action
Generally both the parents and the teachers resort to the simple device of branding the non-performing child as "Nalayak"[11]. Most private schools even conduct pre admission test to keep the school uncontaminated.

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[9] Wikepedia

[10] ibid

[11] A derisive word in Hindi to suggest an idiot

With a team consisting of a clinical child psychologist, a pediatrician, an educational counselor and remedial teachers each of the non performing children are individually examined and their problem identified. Wherever necessary members of the team along with a social worker visit the child's home and interact with the parents and neighbours to identify the circumstances in which the child is growing. The major causes for under-performance can be attributed to a child having a) physiological problems like dyslexia, emotional and/ or social problems caused by various factors ranging from abusive parents, complete lack of privacy to social and economic deprivation etc.

Evolving, the *"Sanjay Deepak Balwadis"*
SSMI has embarked on a plan to evolve an indigenous equivalent of Montessori and Reggio Emilia - the *"Sanjay Deepak Balwadis"*. Named after two children who were killed in the bombing of Air India's Kanishka aircraft, the Sanjay Deepak Balwadis would be designed as standard cost effective models for early child care and education of the children of the most backward urban slums of Indian cities. One of the essential characteristics of these Balwadis would be that women from within the beneficiary community would be trained as teachers. Every slum has a few women with at least secondary level education. The ongoing programme is training teachers and setting up Balwadis in some of the worst slums of Delhi. Thereafter, through an iterative process of field testing ideas models mentioned above would be evolved.

Conclusions: The 1990 Jomtien Declaration stated that learning begins at birth, and embraced early childhood care and education (ECCE) as being within the purview of basic education. The Declaration, however, contributed little to the expansion of ECCE in countries. Ten years later, the world community renewed its commitment to ECCE in the Dakar Framework for Action, whose first goal is to expand access, improve quality and ensure equity in ECCE.

India has neither a plan (outside the all inclusive ICDS) nor significant funding for Early Childhood Care and Education. Since both primary and pre primary education are neglected for the under-privileged children they do not stand a chance in secondary and subsequent higher education. This reflects itself in the poor standards and results obtained by students in the Government and Municipal schools notwithstanding qualified staff and in many cases good infrastructure. Another consequence visible is the exponential growth of the tuitions and tutorial education industry.

Natural science teaches us two things, first that the strength of the chain is its weakest link and second that neglecting the foundation and concentrating exclusively on the super structure is inherently dangerous. It is time to demand that the well funded Sarva Siksha Abhiyan devotes its attention and resources to pre-school education besides strengthening primary education.

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OUR MENTORING PHILOSOPHY: Mentoring is not teaching, neither tuition nor coaching. It is an activity driven by passion and commerce has no place in it. In this effort is to caution students that -

- This place is not where they will be taught how to score marks and get higher ranks, but to conceptualize and visualize subject matter in their real life so that it becomes intuitive.

- This place is not to aim at solutions but inculcate competence to analyze a problem and evolve solution.

- This place does not extend selective and personalized attention, rather an opportunity to become a part of which is focused on learning and problem solving ability collectively.

- This place provides an opportunity to find students above and below one's own level of learning. Thus students develop not in isolation but learn from better ones and associate in problem solving to those who need help. This group dynamics while create a team spirit, an essential attribute of personality, while one learns more by teaching others.

- This place has strategically chosen Online Mentoring, so that those who are unprivileged can gather at one point and those who can facilitate learning of such students by creating, necessary IT setup. Aseperate Mentor's Manual isbeing developed to support the cause.

PSYCHO-EMOTIONAL PRESSURES AND CHILD DEVELOPMENT

Aarti Sharma

Children in various age groups taking education in the schools of our country are a stressed lot . Thanks to our education system whose curriculum is overwhelmingly focussed towards academics and outmoded teaching methodologies which merely involve a monologue of reproducing text as given in the books either orally or on blackboard   . There is little or no scope for understanding a child's difficulties and confusions in understanding the concepts and to how to improve upon them.

Collateral Impact: The combined impact of these two(curriculum and methodologies) is manifest in the form of abstract concepts which are to be mugged up with rote learning techniques   and   pressure to score high marks/grades for these concepts which a healthy   creative growing brain of the child finds impossible to grasp. This collective strain impacts the psycho emotional development of the child in varying degrees.

 Child undergoing rigours of the system : Some of such situatuins are brought out =here under

a.   At home: A typical day in the daily routine of a school going child consists of getting up early in the morning and starting to prepare for a prestigious school which his/ her parents have thought is the best in terms of education and whose tag would ensure a secure future for the child . The school bus is about to arrive in a few minutes. All the school insignia must be steadfastly worn. Nothing should be left back .

As the mother comes with a glass of milk and some seasonal fruit, the child hurriedly checks all his copies and   books for the day as per the time table. While checking all this, he has his milk and leaves for the bus stop in a few moments. All through the journey he has a lurking fear of one or the other subject in mind probably due to the fear of reprimand of not understanding a concept or of not completing class or home assignment.

b. At school: In the school,   period after period teacher of every academic discipline gorges down the abstract concepts without any respite. There are targets to be met and goals to be achieved. In the six day time table , academic concepts are given prime importance everyday but creative arts such as music and drawing are given just one period in the six day schedule as if they are the most useless subjects in the curriculum .

Little do curriculum setters realise that music and drawing unleash the creativity hidden in every child and soothen his nerves strained by continuous pressure of academics . But that is just given a pass . Back from school the child reaches home tired and fatigued after having received lessons from the elite school his parents had enrolled him in . He has lunch and just sinks himself in TV or play station for an hour till the clarion call for tuition time comes .

c. Post school: He grudgingly picks up the school bag and goes for the tutor waiting in the neighbourhood who helps in finishing assignments or repeats the lessons taught in the class albeit by giving little bit of personal attention . It is very strange and in fact the parents have never contemplated as to how a non B.ed tutor can explain concepts to the child better which he cannot understand from a B. ed Qualified teacher .Surely , there is something wrong with the teaching degree which compels the child parents to supplement his studies by coaching.

Again back home from coaching in the evening , the exhausted child, is served a glass of milk as he unwinds himself by watching tv or playing games . But the concerned parents don't want him to waste any further time and his study time prowls back again. Grudgingly , he picks up the books and sits down for studying again trying to grasp concepts which his mind justifiably is not willing to grasp as being theoretical ,they are least engaging and have little practical utility .

Skewed development: In this whole build up, neither the parents nor do the school authorities realise that due to heavy orientation towards   academics during his/her students years , the child develops just one skill perfectly ie the ability of   rote learn /memorise   the concepts at the cost of other personality traits and thus affecting his psycho emotional and cognitive development .

The child is screwed up round the clock to get good marks in exams and memorise assignments and exercises. His growing mind with infinite imagination and inquisitiveness firstly finds it unable to adjust to this kind of unwanted pressure . But slowly as this academic load subdues his creativity, he becomes   disconnected with real world .   His social skills remain in embryonic stage . He has no desire to comingle with kith and kin. In fact,   he does not know how to socialise and even if he does he behaves very awkwardly shying to talk to others .

Underdeveloped behavioural and personality traits: The nitpicking assignments create a never ending spell of anxiety and stress and the child becomes irritable, morose and grumpy. His mood swings vary according to his academic performance and scores. Owing to system pressure, parents also aggravate load on the child and never focus on fostering good personality and behavioural traits.

Due to this skewed priority towards developing sole mental skill ie memorising assignments, many quintessential personality traits which are a must for facing potential challenges in life also remain underdeveloped . Sometimes , the

burden of academic pressure and low marks takes its toll on the students as due to weak mental state of mind students take their own lives . Else ways , a student exposed to such rigors in the system develops a self centred approach towards self betterment which is   bereft of any concern and sensitivity towards society and nation.

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Online Web-enabled Mentoring of Unprivileged Children – A Proposition

Premise: *If imperfections are eradicated, elite and managers would be left jobless. Therefore, elite should feel not only responsive but obliged to the prevalent system where they are offered a role to play to correct imperfections. God willing, if it really happens, a new scenario would emerge which will definitely not depose elite; perfection is like a mirage which keeps demanding more, and as it is approached. Such oncoming demands shall be more orderly and competitive and would require everyone to be worth what they may **a**spire, **b**elong, **c**laims, **d**emands or **e**xpects (a,b,c, d and e) in life.*

Proposal: *A proposal has been made to many social initiatives for Online Web-enabled classes. It has received an applauding response from various quarters. The proposal is about complementing efforts of initiatives engaged in **Grooming Competence to Compete** among unprivileged children with a sense of **Personal Social Responsibility I (PSR)** in a **non-remunerative, non-commercial and non-political manner**. This complementing of efforts is through our experience of moving on to **Online Web-enabled classes** on **Zero-Fund-&-Zero-Asset (ZFZA)** basis. In view of this the proposal has been **submitted to Vidyanjali**, an initiative of MHRD, and is available on our website for perusal. Readers may like to visit the proposal, and make their **invaluable suggestions** to us to make it more purposeful and advise areas of their affiliation in furtherance of the cause.*

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GROWING WITH CONCEPTS

Concepts of an expert are not like a static foundation of a huge structure; rather it is like blood flowing in a vibrant mind.

*During growing into an expert, each one must have used best of the books available on subject and received guidance of best of the teachers. Authors might have had limitations to take every concept thread bare from first principle and so also must be the constraint of teacher while mentoring a class with a diversity of inquisitiveness and focus. As a result, there are instances when on a certain concept a discomfort remains. The only remedy is to live with the conceptual problem and continue to visualize it thread bare till it goes to bottom of heart and that is an **ingenious illustration**.*

In this column an effort is being made to take one topic on Mathematics, Physics and Chemistry in each e-Bulletin and provide its illustration from First Principle. We invite all experts in these subjects to please mail us their ingenious illustrations and it would be our pleasure to include it in the column.

We hope this repository of ingenious illustrations, built over a period of time, would be helpful to ignite minds of children, particularly to aspiring unprivileged students, that we target in this initiative, and in general to all, as a free educational web resource.

This e-Bulletin covers – a) Mathematics,   b) Physics , and c) Chemistry. This is just a beginning in this direction. These articles are not replacement of text books and reference books. These books provide a large number of solved examples, problems and objective questions, necessary to make the concepts intuitive.

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Nothing in all the world is more dangerous than sincere ignorance and consceintious stipudity

- Marton Luther King, Jr

Nothing is Impossible, Even Impossible Says – I M POSSIBLE

Sandhya Tanwar

This topic relates to "**India at Paralympics Games** - **2016**". Having clinched a silver and a bronze medal in Rio Olympics 2016, India did much better at the Paralympic Games 2016 by bagging two golds, a silver and a bronze. These games were held between 7th Sept - 18th Sept, 2016. It's a proud moment for us and especially about the fact that these 19 para-athletes who were representing India had managed to do what the normal athletes couldn't do at Rio Olympics 2016. Yes, they won gold medals for us. This depicts the courage, dedication and hard-determination of these people who have won the battle despite of having life challenges and disabilities. There is a great learning here that we should not hold ourselves back because of the challenges we face in our lives. These para-athletes are so much inspiring and we should definitely get inspiration and motivation from them. The objective of this article is that we should never give-up, no matter what criticalities we face in life, we should not lose hope and always stay motivated, inspired and positive.

Now, let me introduce you to our country's pride:

Devendra Jhajaria won gold medal in Men's Javelin Throw event. This is the second Paralympic gold medal that he had won for India. He broke his own world record in javelin throw in the year 2004 in Athens Paralympics. Currently, he is ranked third in the world. He lost his left hand at the age of eight after accidentally touching an electric wire while climbing a tree. But that didn't deter his spirit. He began participating in para-athletics in 1995 while in school. He made his international debut in 2002 Asian Games in South Korea. He was awarded the Arjuna award in 2004. He became the first paralympian to receive Padma Shri in 2012.

Mariyappan Thangavelu won gold medal in the Men's High Jump category. He was permanently disabled after a bus ran over his right leg at the age of five. He has donated Rs. 30 lakh from the prize money towards his school in Tamil Nadu.

Deepa Malik won silver medal in shotput. Deepa has created history as she became first Indian women athlete to win a silver medal at the Paralympic Games in shotput. She was confined to a wheelchair in 1999 owing to a spinal tumour which made her paraplegic (paralysed from waist down). She had three tumour surgeries and 183 stitches between her shoulder blades. The gifted athlete has a total of 54 national gold medals and 13 international medals in swimming, javelin throw and shot put.

Varun Singh Bhati took bronze in the Men's high Jump category. Varun was struck by polio at a young age. In 2014, Varun won gold medal at the China Open Athletics Championship.

Let's salute all the winners and all other athletes who had participated in these games. Life is not easy for them but they still have that courage to outshine despite of all the challenges. As per Wikipedia, courage is defined as the choice and willingness to confront agony, pain, danger or uncertainty. Courage is of two kinds – physical and moral. Physical courage is the courage in the face of physical pain, hardship while moral courage is the ability to act rightly in the face of popular opposition, shame, scandal, discouragement, or personal loss.

We face lots of challenges at workplace, home, in society etc. on a daily basis. All we have to do is to have the courage to overcome all difficulties and that will come only if we detour our mindset from negative to a positive route and behave more wisely and maturely. This reminds me of a very great saying: All our dreams can come true, if we have the courage to pursue them.

I would like to conclude with the beautiful lines : Where there is a will there is a way, have the courage to keep your fear away. Life is a game, give it your best shot, success will follow you and happiness will come to you everyday.

Author is based out of Delhi, and is a Law Graduate and Associate Member of the Institute of Company Secretaries of India.

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GROWING WITH CONCEPTS - Mathematics

BEAUTY GENERATING CONCEPTS OF MATHEMATICS

Prof. SB DHAR

Beauty cannot be defined in words. It can be felt, smelt, heard or seen only. It is an absolute thing. Beauty may relate to anything like perception, race, culture or era. It is correctly said that beauty is in the eye of the beholder. In mathematics, beauty is a reality, and not abstract.

Mathematically, *beauty = simplicity + depth*

There are so many concepts that generate beauty in mathematics. Proof of a theorem is one of these. The beautiful proof is that which

    (a) either uses minimum assumptions, or
    (b) is based on new and original insights.

In day to day life, we find a thing or another person's body more attractive. It is due to the symmetry and proportionality. This is another concept that leads to beauty. Physical attraction depends on ratio. If a face is in proportion, there is more likely to notice it. Even scientists believe that proportional bodies are also sign of good health.

Leonardo da Vinci's drawings of the human body emphasised its proportion. The ratio of the distances *(foot to navel) : (navel to head)* is very considerable for beautiful look.

Leonardo da Vinci's "Vitruvian Man", showing the golden ratio in body dimensions

We find people to be attractive because of the proportions of the length of the nose, the position of the eyes and the length of the chin all conform to some particular ratio. This particular ratio is called Golden Ratio.

Let us have a look on mathematical facts that beautify the things:

(1) **PHI (Φ): Golden Ratio:** It is also called the divine proportion. It is calculated as the ratio between A and B in the following figure.

$$\frac{A + B}{A} = 1.618 \qquad \frac{A}{B} = 1.618$$
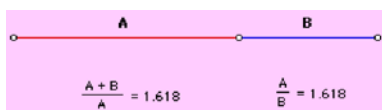
It is denoted by Φ, and pronunciated as *phi.*

Golden Ratio is generated as below too:

$$\phi = 1 + \cfrac{1}{1 + \cfrac{1}{1 + \cfrac{1}{1 + \cfrac{1}{1 + \cdots}}}}$$

(2) **Golden Rectangle :** The following figure depicts a Golden Rectangle.

$$b$$
$$a$$
$$a+b$$
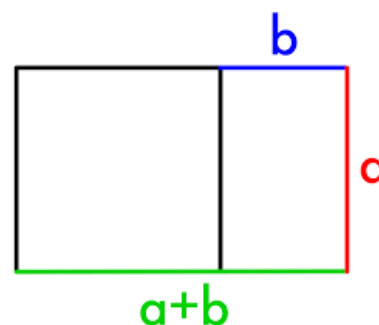
(3) Golden Spiral
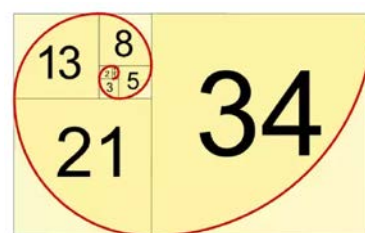
Proven fact: *Measure the length and width of your face. Divide the length by the width. If it comes nearer to 1.6, it is a beautiful person's face.*

It means beautiful face is about $1\frac{1}{2}$ times longer than it is wide.

Many beautiful things in the world are with golden ratio. The Great Pyramid of Giza

built in 2570BC exhibits the golden ratio.

The Parthenon, a temple of the Greek goddess Athena (447-432BC) or, the Tajmahal has golden ratio proportion.

THE PARTHENON
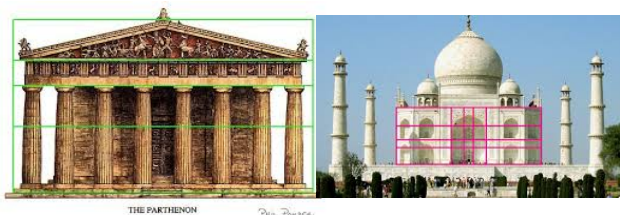
In ancient times architecture was a field of mathematics. Architects were simply mathematicians that someone would hire. Geometry is the guiding principle between the two areas. Mathematics, however, is indispensable to the understanding of structural concepts and calculations.

The logo of apple is a very good example of golden ratio.
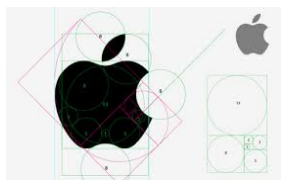
Famous Mona Lisa portrait is the best examples of golden ratio.
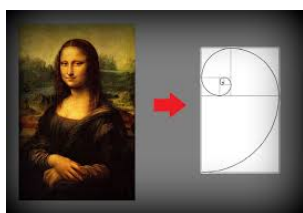
The nature is full of examples of golden ratio concepts. The following figures are self-explanatory.
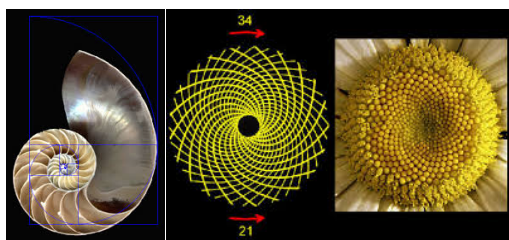
(4)   ***Fibonacci Numbers:*** Each number of this sequence is *phi* times the last. Some of the first terms of this sequence are:

0, 1, 1, 2, 3, 5, 8, 13, 21, 34, 55, 89, 144, 233, 377, 610, 987, 1597, 2584, 4181, 6765.

Let's look at the ratio of each number in this sequence to the one before it:

$$\frac{1}{1} = 1, \qquad \frac{2}{1} = 2, \qquad \frac{3}{2} = 1.5,$$

$$\frac{5}{3} = 1.666... \qquad \frac{8}{5} = 1.6 \qquad \frac{13}{8} = 1.625$$

$$\frac{21}{13} = 1.61538... \qquad \frac{34}{21} = 1.61905..$$

$$\frac{55}{34} = 1.61764.. \qquad \frac{89}{55} = 1.61861..$$

If we keep going, we reach Golden Ratio i.e., 1.618 033 988 7....

We can say that the Fibonacci sequence is encoded in the number $\frac{1}{89}$.

(5) ***Prime Numbers:*** The number that is divisible by only 1 and itself is called Prime Number. They are

2, 3, 5, 7, 11, 13, 17, 19, 23, 29, 31, 37, 41, 43, 47, 53, 59, 61, ...

The largest known prime number (as of December 2005) has 9,152,052 digits. According to Euclid (~300BC), there are infinitely many prime numbers.

(6) ***Twin primes:*** Twin primes are the primes that differ by 2. Viz. 2, *3, 5, 7,* 11, 13, 17, 19, 23, 29, 31, 37, 41, 43, 47, 53, 59, 61, ... Some twin primes are: (3,5), (5,7), (11,13), (17,19),...

(7) ***Prime Triplets:*** The set of three prime numbers of the form (p, p + 2, p + 6) or (p, p + 4, p + 6) with the exception of (2,3,5) and (3,5,7) are called prime triplets. There are infinitely many triples of primes.

(8) ***Have a fun with the following mathematical calculation:*** Give all letters from A to Z a running number.

A(1)	B(2)	C(3)	D(4)	E(5)	F(6)
G(7)	H(8)	I(9)	J(10)	K(11)	L(12)
M(13)	N(14)	O(15)	P(16)	Q(17)	R(18)
S(19)	T(20)	U(21)	V(22)	W(23)	X(24)
Y(25)	Z(26)				

then

H-A-R-D-W-O-R- K
8+1+18+4+23+15+18+11 = 98%

and

K-N-O-W-L-E-D-G-E
11+14+15+23+12+5+4+7+5 = 96%

But

A-T-T-I-T-U-D-E
1+20+20+9+20+21+4+5 = 100%

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Can we conclude mathematically, while ***Hard Work*** and ***Knowledge*** will get you close, ***Attitude*** will get you there?

It is simply a fun, for some it may be true.

(9) Patterns of numbers

(a)

7^2	49
67^2	4489
667^2	444889
6667^2	44448889
66667^2	4444488889
666667^2	444444888889
6666667^2	44444448888889

(b)

$03 \times 37 = 111$ & $1 + 1 + 1 = 03$

$06 \times 37 = 222$ & $2 + 2 + 2 = 06$

$09 \times 37 = 333$ & $3 + 3 + 3 = 09$

$12 \times 37 = 444$ & $4 + 4 + 4 = 12$

$15 \times 37 = 555$ & $5 + 5 + 5 = 15$

$18 \times 37 = 666$ & $6 + 6 + 6 = 18$

$21 \times 37 = 777$ & $7 + 7 + 7 = 21$

$24 \times 37 = 888$ & $8 + 8 + 8 = 24$

$27 \times 37 = 999$ & $9 + 9 + 9 = 27$

(c)

$987\ 654\ 321 \times 09 = 08\ 888\ 888\ 889$

$987\ 654\ 321 \times 18 = 17\ 777\ 777\ 778$

$987\ 654\ 321 \times 27 = 26\ 666\ 666\ 667$

$987\ 654\ 321 \times 36 = 35\ 555\ 555\ 556$

$987\ 654\ 321 \times 45 = 44\ 444\ 444\ 445$

$987\ 654\ 321 \times 54 = 53\ 333\ 333\ 334$

$987\ 654\ 321 \times 63 = 62\ 222\ 222\ 223$

$987\ 654\ 321 \times 72 = 71\ 111\ 111\ 112$

$987\ 654\ 321 \times 81 = 80\ 000\ 000\ 001$

(d)

$1 \times 8 + 1 = 9$

$12 \times 8 + 2 = 98$

$123 \times 8 + 3 = 987$

$1234 \times 8 + 4 = 9876$

$12345 \times 8 + 5 = 98765$

$123456 \times 8 + 6 = 987654$

$1234567 \times 8 + 7 = 9876543$

$12345678 \times 8 + 8 = 98765432$

$123456789 \times 8 + 9 = 987654321$

(e)

$1 \times 9 + 2 = 11$

$12 \times 9 + 3 = 111$

$123 \times 9 + 4 = 1111$

$1234 \times 9 + 5 = 11111$

$12345 \times 9 + 6 = 111111$

$123456 \times 9 + 7 = 1111111$

$1234567 \times 9 + 8 = 11111111$

$12345678 \times 9 + 9 = 111111111$

$123456789 \times 9 + 10 = 1111111111$

(f)

$9 \times 9 + 7 = 88$

$98 \times 9 + 6 = 888$

$987 \times 9 + 5 = 8888$

$9876 \times 9 + 4 = 88888$

$98765 \times 9 + 3 = 888888$

$987654 \times 9 + 2 = 8888888$

$9876543 \times 9 + 1 = 88888888$

$98765432 \times 9 + 0 = 888888888$

(g)

$1 \times 1 = 1$

$11 \times 11 = 121$

$111 \times 111 = 12321$

$1111 \times 1111 = 1234321$

$11111 \times 11111 = 123454321$

$111111 \times 111111 = 12345654321$

$1111111 \times 1111111 = 1234567654321$

$11111111 \times 11111111 = 123456787654321$

$111111111 \times 111111111 = 12345678987654321$

(h) Without 8

$12345679 \times 09 = 111111111$

$12345679 \times 18 = 222222222$

$12345679 \times 27 = 333333333$

$12345679 \times 36 = 444444444$

$12345679 \times 45 = 555555555$

$12345679 \times 54 = 666666666$

$12345679 \times 63 = 777777777$

$12345679 \times 72 = 888888888$

$12345679 \times 81 = 999999999$

(i) Inputs of 9

$9 \times 9 = 81$

$99 \times 99 = 9801$

$999 \times 999 = 998001$

$9999 \times 9999 = 99980001$

$99999 \times 99999 = 9999800001$

$999999 \times 999999 = 999998000001$

$9999999 \times 9999999 = 99999980000001$

$99999999 \times 99999999 = 9999999800000001$

$999999999 \times 999999999 = 999999998000000001$

(j) Input of 6

$6 \times 7 = 42$

$66 \times 67 = 4422$

$666 \times 667 = 444222$

$6666 \times 6667 = 44442222$

$66666 \times 66667 = 4444422222$

$666666 \times 666667 = 444444222222$

$6666666 \times 6666667 = 44444442222222$

$66666666 \times 66666667 = 4444444422222222$

$666666666 \times 666666667 = 444444444222222222$

(10)   0.999…. is equal to 1

X   = 0.999…

10X   =9.999…

10X-X   =9.999… -0.999…

9X   =9

X   =1

(11) The 4-colour theorem

The 4-Color Theorem was first discovered in 1852 by a man named **Francis Guthrie**, who at the time was trying to color in a map of all the counties of England (this was before the internet was invented, there wasn't a lot to do).

He discovered something interesting—he only needed a maximum of four colors to ensure that no counties that shared a border were colored the same. Guthrie wondered whether or not this was true of any map, and the question became a mathematical curiosity that went unsolved for years.

In 1976 (over a century later), this problem was finally solved by **Kenneth Appel** and **Wolfgang Haken.**

(12) Four touching spheres form a tetrahedron
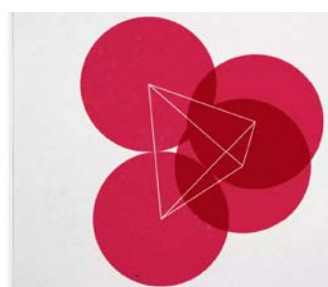
(13)   **Paul Erdös** once said, "I know numbers are beautiful. If they aren't beautiful, nothing is." Mathematics is the study of patterns, structure and regularity.

CONTENTS

1   3   5   7

1=1^2 1+3=2^2 1+3+5=3^2 1+3+5+7=4^2

It links 5 fundamental mathematical constants with three basic arithmetic operations each occurring once. $1 + e^{i\pi} = 0$.

(16) **The Basel problem**, set as a challenge by *Jakob Bernoulli* in 1689 and triumphantly solved by *Euler* in 1735. $\dfrac{\pi^2}{6} = \sum_{n=1}^{\infty} \dfrac{1}{n^2}$

(17) **Equation expressing** the connection between π and odd numbers $\dfrac{\pi}{4} = 1 - \dfrac{1}{3} + \dfrac{1}{5} - \dfrac{1}{7} + \dfrac{1}{9} - \dots$
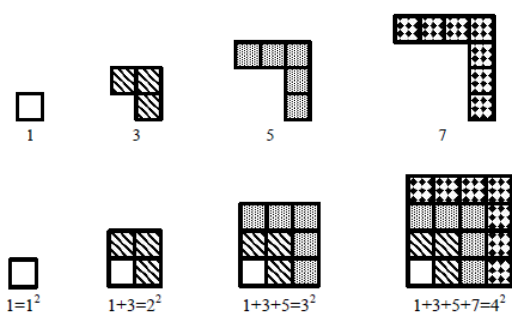
(14) **The derivative of an exponential is an exponential.** $\dfrac{d}{dx} e^x = e^x$

(18) **Sum of an infinite geometric series** $\sum_{k=0}^{\infty} ar^k = \dfrac{a}{1-r}, |r| < 1$

(15) **Euler's Identity**

Nature is a good mathematician. All its presentations are well calculated. If nature is God, then God is certainly a good mathematician. God has used beautiful mathematics in creating this world. None will hesitate in accepting the fact that without mathematics, there is nothing we can do. Everything around us is mathematics and everything around us are numbers. It is up to us how we search, study, admire after its use. The mathematical concepts are fun and it will be good for learners and mentors if they are communicated and learnt that way.

Dr S.B. Dhar, is **Editor of this Quartrerly e-Bulletin**. He is an eminent mentor, analyst and connoisseur of Mathematics from IIT for preparing aspirants of Competitive Examinations for Services & Admissions to different streams of study at Undergraduate and Graduate levels using formal methods of teaching shared with technological aids to keep learning at par with escalating standards of scholars and learners. He has authored numerous books – Handbook of Mathematics for IIT JEE, A Textbook on Engineering Mathematics, Reasoning Ability, Lateral Wisdom, Progress in Mathematics (series for Beginner to Class VIII), Target PSA (series for class VI to class XII) and many more.
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INVITATION FOR CONTRIBUTION OF ARTICLES

*Your contribution in the form of an article, story poem or a narration of real life experience is of immense value to our students, the target audience, and elite readers of this Quarterly monthly e-Bulletin **Gyan-Vigyan Sarita: शिक्षा**, and thus create a visibility of the concerns of this initiative. It gives them a feel that you care for them, and they are anxiously awaiting to read your contributions. We request you to please feel free to send your creation, by **20ᵗʰ of this month** to enable us to incorporate your contribution in next bulletin,* subhashjoshi2107@gmail.com.

We will be pleased have your association in taking forward path our plans as under-

➢ *First Quarterly e-Bulletin **Gyan-Vigyan Sarita: स्वास्थ्य** shall be brought out 1ˢᵗ Nov'16*

➢ *First Quarterly e-Bulletin **Gyan-Vigyan Sarita: पर्यावरण** shall be brought out on 1st Dec'16.*

➢ *Second Quarterly e-Bulletin **Gyan-Vigyan Sarita: शिक्षा** shall be brought out 1ˢᵗ Jan'16*

➢ *And this cucle to continue endlessly*

We believe that this quarterly periodicity of e-Bulletins shall make it possible for our esteemed contributors to make contribution rich in content, diversity and based on their ground level work.
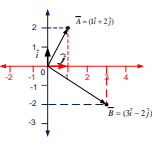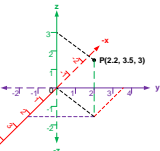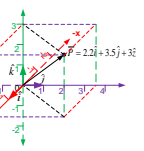
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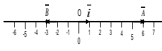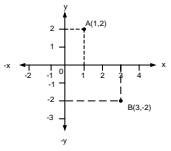
GROWING WITH CONCEPTS - Physics
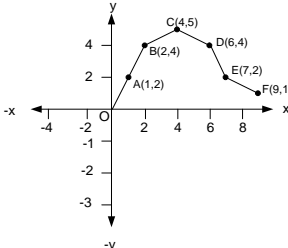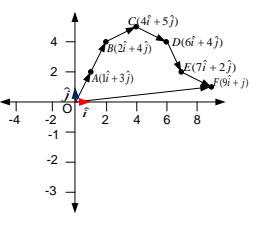
MECHANICS – Part I: Kinematics

Human eye perceives that object first which is moving w.r.t its surroundings. This becomes starting point of understanding kinematics. Kinematics is a study of motion of a particle or a body when without reference to its cause, i.e. the force or torque. When cause of motion, i.e. force or torque, is an integral part of the study it is called dynamics. Galileo, the first experimental physicist, studied kinematics.

Study of motion involves identifying ***position of an object***. It can be on a line (One Dimension), plane (Two dimensional coordinates) or space (Three dimensional coordinates). This position is expressed with the help of coordinates or vectors (1D, 2D or 3D) concurrently to create correlation in the three systems. Representations in 2D and 3D are done in Cartesian coordinate system. These vectors can also represented in polar coordinate, which is separately dealt with in Chapter III Foundation Mathematics, and shall be elaborated in Physics wherever necessary.

1D Representation		2D Representation		3D Representation	
Scale: 1 Part is equal to 1 Meter O: is the reference point A: is right of O by 6 Meter B: is left of O by 3 Meter	$\hat{i}$: Unit Vector $\bar{A}$: Vector represented by OA ($= 6\hat{i}$) $\bar{B}$: Vector represented by OB ($= -3\hat{i}$)	*Point A & B on x-y plane as:* *Point A: (1,2) where, x=1, 5=2* *Point B: (3,-2)* *Where, x=3, y=-2*	Vector $\bar{A}$ and $\bar{B}$ on $\hat{i} - \hat{j}$ plane Vector $\bar{A}$: $\hat{i} + 2\hat{j}$, is represented by $\overline{OA}$. Vector $\bar{B}$: $3\hat{i} - 2\hat{j}$ is represented by $\overline{OB}$	Point P in s-y-z space is defined as (2.3, 3,5,3) where, its resolution on three axes are x=2,3, y=3.5 and z=3	Vector $\bar{P}$ in $\hat{i} - \hat{j} - \hat{k}$ space is represented $\overline{OP}$: Vector $\bar{A}$: $\hat{i} + 2\hat{j}$, is represented by $\overline{OA} = 2.3\hat{i} + 3.5\hat{j} + 3\hat{k}$. Its resolution along three orthogonal vectors are $2.3\hat{i}, 3.5\hat{j}$ and $3\hat{k}$
Coordinates	Vectors	Coordinates	Vectors	Coordinates	Vectors

Concepts of coordinates have been correlated together; may please zoom, as required, for legibility
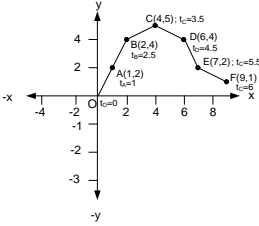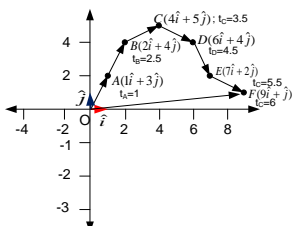
Next study is of ***change in position***. This change in position is gradual and always follows a path. Length of the path is called ***distance*** traced (***d***) and is scalar. This distance may be different for different path. But, relative change in position is called ***displacement*** ($\bar{r} = r\hat{r}$)**,** which is a vector having a magnitude *r* and direction i.e. angle *θ* in radians represented by unit vector $\hat{r} = re^{j\theta}$. Mathematically, displacement is Final Position Vector MINUS initial position vector.

Linear distance between points: $OA = \sqrt{5}$ m;: $AB = \sqrt{5}$ m; $BC = \sqrt{5}$ m; $CD = \sqrt{5}$ m; $DE = \sqrt{5}$ m; $EF = \sqrt{5}$ m Route Distance: OF: $= OA + AB + BC + CD + DE + EF$ $= 6\sqrt{5}$ m	**Displacements (in Polar form):** $\overline{OA} = \sqrt{5}e^{j63.5^0}m; \overline{AB} = \sqrt{5}e^{j63.5^0}$ m; $\overline{BC} = \sqrt{5}e^{j26.5^0}$ m; $\overline{CD} = \sqrt{5}e^{-j26.5^0}$ m; $\overline{DE} = \sqrt{5}e^{-j63.5^0}$ m; $\overline{EF} = \sqrt{5}e^{j-26.5^0}$;m $\overline{OF} = \overline{OA} + \overline{AB} + \overline{BC} + \overline{CD} + \overline{DE} + \overline{EF}$ $= \sqrt{82}e^{j7.33^0}$ m
Representation of Distance (Scalar)	Representation of Displacement (Vector)

The third is ***rate of change of position***. This rate of change position is what gets perceived; higher the rate of change, faster is the perception of the change. Having recognised the change in position in separate forms viz. scalar and vector the rate of change of position also has two forms ***speed*** (scalar) and ***velocity*** Vector). The diagram above is being used with additional information in respect of time-stamping in respect of each position to determine speed (***s***) and velocity ($\bar{v}$) for the same trajectory For a better understanding. Mathematically it is represented as under:

$s = \frac{\Delta d}{\Delta t}$; since *d* is scalar and hence Δd is also scalar, moreover *t* is scalar. Accordingly, *s* is also scalar. So long Δt is finite *s* so calculated is ***average speed*** and expressed as s_{av}. But, when $\Delta t \to 0$, i.e. infinitesimally small, it leads to ***instantaneous speed*** is expressed as $s = \frac{d}{dt}d = \frac{\Delta d}{\Delta t}\big|_{\Delta t \to 0}$. While, ***average velocity*** is $\bar{v}_{av} = \frac{\Delta \bar{r}}{\Delta t}$ and Δv at time ***t*** is

$\bar{v}_t = \frac{d\bar{r}}{dt} = \frac{\Delta\bar{r}}{\Delta t}\Big|_{\Delta t \to 0}$. Graphical representation of average velocities is shown below. It needs to be noted in the diagram below that length of the line segments OA, AB, etc. are not representative of either the speed or velocity, they are used with time stampings of terminal points to calculate speed and velocity. In general expression is $\bar{v}_t$ written as $\bar{v}$.

Position (in Meter and Time in Sec.)	Speed Between Positions	Position (in Meter) and Time (in Sec.)	Velocity Between Positions
	Speed between points: $s_{OA} = \sqrt{5}$ m/sec; $s_{AB} = \frac{2\sqrt{5}}{3}$ m/sec; $s_{BC} = \sqrt{5}$ m/sec; $s_{CD} = \sqrt{5}$ m/sec; $s_{DE} = \sqrt{5}$ m/sec; $s_{EF} = 2\sqrt{5}$ m/sec; and $s_{OF} = \sqrt{5}$ m/sec		Velocity between points: $\bar{v}_{OA} = \sqrt{5}e^{j63.5^0}$ m/sec; $\bar{v}_{AB} = \frac{2\sqrt{5}}{3}e^{j63.5^0}$ m/sec; $\bar{v}_{BC} = \sqrt{5}e^{j26.5^0}$ m/sec; $\bar{v}_{CD} = \sqrt{5}e^{-j26.5^0}$ m/sec; $\bar{v}_{DE} = \sqrt{5}e^{-j63.5^0}$ m/sec; $\bar{v}_{EF} = \sqrt{5}e^{j-26.5^0}$ m/sec; and $\bar{v}_{OF} = \frac{\sqrt{82}}{6}e^{j7.33^0}$ m/sec;
Rate of Change of Distance - Speed (Scalar)		**Rate of Change of Displacement - Vector (Scalar)**	

Next comes the ***rate of change of velocity***, and this is called ***acceleration***. We do not talk of rate of change of speed. *Reason for this will become more clear when the study the dynamics involving Newton's Law of Motion, a little later*. Like, average velocity and instantaneous velocity, acceleration is also analysed as average acceleration $\left(\bar{a}_{av} = \frac{\bar{v}_2 - \bar{v}_1}{t_2 - t_1} = \frac{\Delta\bar{v}}{\Delta t}\right)$. Here, $\Delta\bar{v} = \bar{v}_2 - \bar{v}_1$ where, $\bar{v}_2$ and $\bar{v}_1$ are velocities at instances t_2 and t_1 respectively. While, instantaneous acceleration $\bar{a}_t = \frac{d\bar{v}}{dt} = \frac{\Delta\bar{v}}{\Delta t}\Big|_{\Delta t \to 0}$. In general expression is $\bar{a}_t$ written as $\bar{a}$.

GALILEO's EQUATION OF MOTION (GEM): Galileo had studied motion of bodies and suggested three equation correlating displacement, velocity and acceleration, all of the three quantities being vectors, Velocity in a plane or in space can be expressed as Two or Three orthogonal vectors and analysed independently. Likewise, acceleration can also be analysed independently on the corresponding orthogonal unit vectors. Moreover, magnitude of acceleration in kinematics is since considered to be constant, the expression, as under, can be conveniently expressed as scalars :

$v = u + at$ ... (1) ; $s = ut + \frac{1}{2}at^2$ ... (2); and $v^2 = u^2 + 2as$ ... (3)

Note: *In most of the texts displacement, in above equations, is denoted as **s** (a scalar) . Despite use of notation **s** for displacement (a vector) is based on the basic premise of representation of the three vectors as scalars in above equations. Accordingly, the same convention is being followed for convenience of readers. **In this text these three GEM shall be referred to as GFEM, GSEM and GTEM as an abbreviations for Galileo's First, Second and Third Equation of Motion.***

An obvious question may arise, why are these vector quantities expressed as scalar? Previous discussions First Two equations can be obtained from integration of a which is considered to constant in kinematics, and Third equation is obtained from first Two Equations and is illustrated below-

$a = \frac{dv}{dt}$; or, $a\,dt = dv$, therefore, $\int_0^t a\,dt = \int_u^v dv$; $a\int_0^t dt = \int_u^v dv$; $a[t]_0^t = [v]_u^v$; $a[t - 0] = [v - u]$.

Or, $v = u + at$; **this is equation (1)**

Now, replacing $\bar{v} = \frac{ds}{dt}$ in eqn. (1) and then integrating it, $\frac{dr}{dt} = u + at$; $ds = (u + at)dt$;

On integration, $\int_0^r dr = \int_0^t (u + at)dt$; Here, u is constant since it is initial velocity at $t = 0$, and is therefore historical value, and a is also constants, the initial premise of kinematics. Accordingly, the expression get modified to $\int_0^s ds = u\int_0^t dt + a \int_0^t t\,dt$.

Or, $s = ut + a\frac{t^2}{2}$; or $s = ut + \frac{1}{2}t^2$; **this is Equation (2).**

Now substituting, $t = \frac{v-u}{a}$ from Eqn. (1) into Eqn. (2), $s = u\left(\frac{v-u}{a}\right) + \frac{1}{2}a\left(\frac{v-u}{a}\right)^2$; or, $2as = 2u(v - u) + (v - u)^2$.

Or, $2as = (v - u)(2u + v - u) = (v - u)(v + u) = v^2 - u^2$; Or, $v^2 = u^2 + 2as$; **this is Equation 3.**

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*In these equations acceleration **a** in direction of initial velocity **u** is treated as +**ve**, and will tend to give velocity at any subsequent moment, where **t** is +**ve**, time. While, acceleration when in direction opposite to that of **u** is taken as −**ve** and called **retardation or deceleration**. Further, based on initial velocity at any instant (t_1) velocity at any subsequent instant (t_2), the time is taken as $t = t_2 − t_1$. Likewise, in any attempt to determine velocity at any previous instant (t_1) based on known velocity at any point of time (t_2), the time of previous instant will be $t = t_1 − t_2 = −(t_2 − t_1)$; eventually, determination of variable at any previous instant shall use −ve value of t..*

Motion Under Gravity: *In case of motion under gravity, the equations of motion get slightly modified in respect of notations for acceleration and displacement, and instead acceleration under gravity **g** and height **h** are used. Accordingly, the equations are:*

$$v = u + gt \ \ ...(4) ; \ \ h = ut + \frac{1}{2}gt^2 \ \ ...(5); \ \ \text{and} \ \ v^2 = u^2 + 2gh \ \ ...(6)$$

In these equations for falling bodies **g** is +ve, while ascending bodies it becomes −ve. Likewise, height **h** is taken as +ve and depth is taken as −ve. Care in respect of this sign convention is essential to ensure that result are in conformity with the experimental observations.

Thus,, maximum height **h** attainted by of a particle projected vertically with a velocity **u** upwards shall be when the velocity **v** will be Zero (**v**=0) and this happen under retardation −**g.** Accordingly, as per Eqn. (6) $0 = u^2 − 2gh$, or $h = \frac{u^2}{2g}$ and time to reach the height **h** would be, from Eqn. (4) would be $0 = u − gt$; or $t = \frac{u}{g}$, Further, total time taken by the particle to reach the ground be $T = 2t = \frac{2u}{g}$. This, value of T us obtained, where $h = 0$, using Eqn. 5, $0 = ut − \frac{1}{2}gt^2$. This logical consistency in results is obtained in correct mathematical analysis.

Now comes motion under gravity on a plane, called ***Projectile Motion***, where velocity has components along horizontal direction and height, a vertical direction. Horizontal component of velocity v_x does not have any acceleration, and therefore it remains unaltered. But, vertical component of velocity v_h remains under influence of **g**. These two velocities of the particle are dealt with independently, with convergence on the point where particle is supposed to reach. Different text books have come up with different theorems, articles and/or problems. Nevertheless, basic mathematical formulations remains confined above three equations.
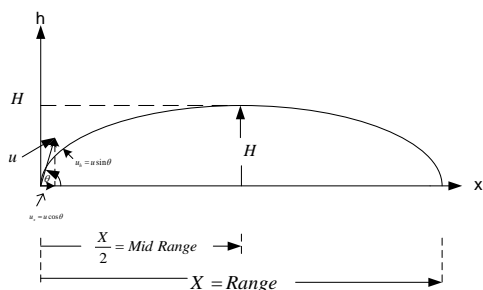
a. Maximum height (H) that is attained by the projectile with an initial velocity **u** and angle of inclination θ is: $H = \frac{u^2 \sin^2 \theta}{2g}$
b. Time of Flight is the time taken by the projectile, projected from ground, to reach back: $T = \frac{2u \sin \theta}{g}$
c. Distance from the point of projection, where the projectile shall touch the ground, Range: $X = u \cos \theta \, T = u \cos \theta \frac{2u \sin \theta}{g} = \frac{u^2 (2 \sin \theta \cos \theta)}{g} = \frac{u^2 \sin 2\theta}{g}$
d. Angle of projection (θ) for projectile, having initial velocity **u** to attain maximum height, using principle of Maxima-Minima, is $\frac{dX}{d\theta} = \frac{u^2}{2g} \cos 2\theta = 0$; since u and $\theta \neq 0$, necessary condition is $\cos 2\theta = 0$; or $2\theta = \frac{\pi}{2}$; or $\theta = \frac{\pi}{4}$ or 45^0.
Alternately, in a simple maximum span X will be when $\sin 2\theta = 1$, or $2\theta = \frac{\pi}{2}$; or $\theta = \frac{\pi}{4}$ or 45^0.

This projectile motion leads to a wide range of problems available in text books. Two typical cases are a) a range on an inclined plane and, b) projection on an inclined plane, are elaborated below. It is to highlight that each of the case requires appropriate resolution of velocity and acceleration, to reach the solution.
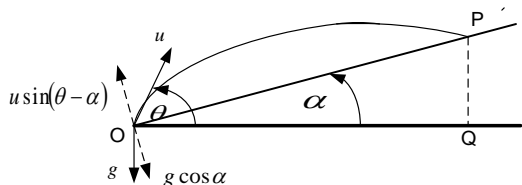
Component of Velocity of The Particle Perpendicular to the Plan: $u \sin(\theta − \alpha)$

Retardation Due to Gravity Perpendicular to the Plane: $g \cos \alpha$

Therefore, Time of Flight T for the particle to strike the inclined plane: $\frac{2u \sin(\theta − \alpha)}{g \cos \alpha}$

During T particle will continue to travel horizontally through a distance OQ with a velocity: $u \cos \theta$

Therefore, Particle will strike the plane at point P, such that: $OP = \frac{OQ}{\cos \alpha} = \frac{(u \cos \theta)T}{\cos \alpha}$

$$= \frac{u \cos \theta}{\cos \alpha} \cdot \frac{2u \sin(\theta − \alpha)}{g \cos \alpha} = \frac{2u^2 \sin(\theta − \alpha) \cos \theta}{g \cos^2 \alpha}$$

(a): Motion of a Particle Projected with Velocity **u** at an Angle θ Striking a Plane Inclined to Horizontal at an Angle α

Another case is not much different, except that motion of article is on smooth plane inclined at an angle α with the horizontal.
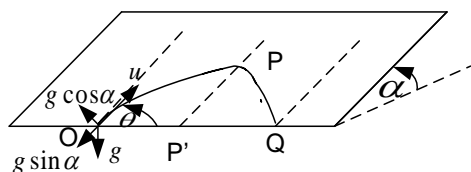
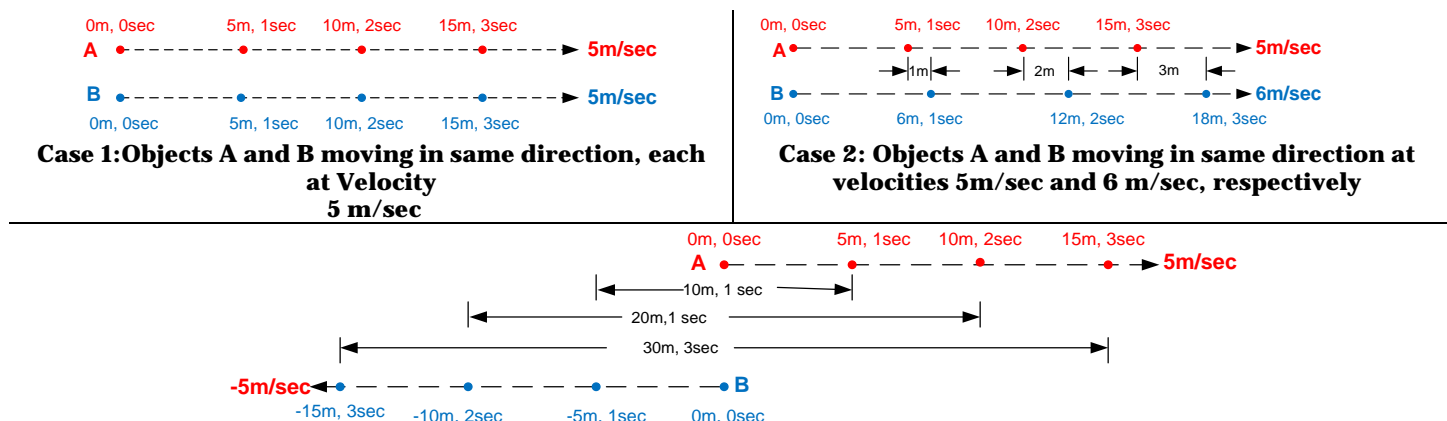Here, dotted lines represent lines of greatest slope, and isof great relevance.

Acceleration component perpendicular to the plane ($g \cos \alpha$) has no role in the motion of particle on the smooth plane.

Component of acceleration along the plane $g \sin \alpha$ and the line of greatest slope and the component of initial velocity along the line will decide the time of descend $T \left(= \frac{2u \sin \theta}{g \sin \alpha} \right)$ of the particle to the horizontal surface.

Having determined **T**, height on the inclined plane (PP') and the span (OQ) can be determined as usual.

(b) Motion of a Particle Projected at an Angle θ with the Intersecting Edge of a Plane Inclined at an Angle α with the Horizontal

Relative Velocity: In this world existence of everything is relative i.e. difference between two quantities to be compared. An an example A is elder (difference of age), taller. than B (difference of height) heavier, etc., and the antonym of the adjective applies to when B is compared to A on same parameters. Likewise, perceiving movement of an object w.r.t. its surrounding was the starting point of Kinematics, and is being analysed as relative velocity a vector quantity. Initially it is being done for Two objects having same starting point.

Case 1:Objects A and B moving in same direction, each at Velocity 5 m/sec

Case 2: Objects A and B moving in same direction at velocities 5m/sec and 6 m/sec, respectively

Case 3:Objects A and B moving in Opposite direction with velocities 5 m/sec and -5m/sec, respectively

In the above figure, velocities are expressed as scalar since they are along, parallel lines, virtually lines. Accordingly, displacement of the two objects , along the line, relative to each other is tabulated below.

Time Stamp (Sec)	Case 1; Both A and B moving in Same Direction, with same Velocities				Case 2; Both A and B moving in Same Direction, with Velocities 5m/sec and 6 m/sec, respectively				Case 3; Both A and B moving in Opposite Same Direction, with Velocities 5m/sec and -5 m/sec, respectively			
	Displacement of Particles (m)		Relative Velocity of Particles (m/sec)		Displacement of Particles (m)		Relative Velocity of Particles (m/sec)		Displacement of Particles (m)		Relative Velocity of Particles (m/sec)	
	A w.r.t B	**B w.r.t. A**	**A w.r.t B**	**B w.r.t. A**	**A w.r.t. B**	**B w.r.t. A**	**A w.r.t. B**	**B w.r.t. A**	**A w.r.t. B**	**B w.r.t. A**	**A w.r.t. B**	**B w.r.t. A**
1 sec	0	0	0	0	1	-1	1	-1	5	-5	5	-5
2 sec	0	0	0	0	2	-2	1	-1	10	-10	5	-5
3 sec	0	0	0	0	3	-3	1	-1	15	-15	5	-5

Having established quantitative feel of the relative velocity which everyone encounters while moving on road where he observes vehicles passing by either in the same direction or opposite direction.

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This concept of relative velocity is now being extended in vector form; in this the person experiencing relative velocity is called ***Observer***, and whose relative velocity is being observed is called the ***Object***. It is graphically illustrated below, taking different direction of velocities of Observer and Object, where Observer is stated in a ***frame of reference*** (FOR) from which Object is being observed.

Velocities of A - Observer, and B Object, with FOR Ground.	$\bar{v}_{AB}$: Relative Velocity of A w.r.t. B	$\bar{v}_{BA}$: Relative Velocity of B w.r.t. A

Relative velocities with $\bar{v}_{c=}\bar{v}_a$ and $\bar{v}_{d=}-\bar{v}_b$ follow similar treatment for $\bar{v}_c$ and $\bar{v}_d$, and is shown below:

Velocities of C- Observer, and D - Object, with FOR Ground	$\bar{v}_{CD}$: Relative Velocity of C w.r.t. D	$\bar{v}_{DC}$: Relative Velocity of D w.r.t. C
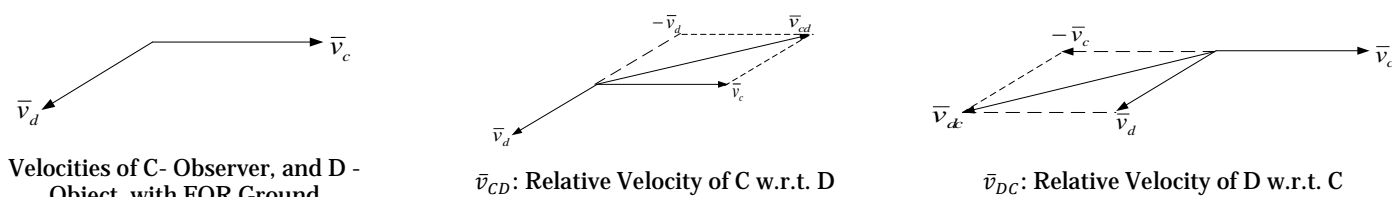
There is another situation, when FOR of Observer is moving with reference to a stationary FOR and Object is moving w.r.t FOR of Observer. This situation is similar to a man moving inside a moving train *or* a bird flying inside a train. *In such a situation, velocity of the object with stationary FOR is sum of the two velocities of Observer with stationary FOR and velocity of Object with Observer as FOR,* as shown below.
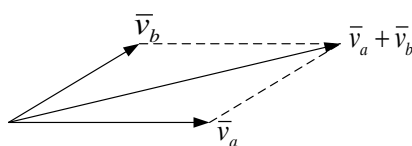
Velocity of Object B w.r.t Ground i.e. FOR of Observer A	**Velocity of Object D w.r.t Ground i.e. FOR of Observer C**
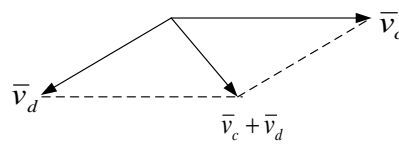
Some examples are used to illustrate the concept in real life. A simple example distance between Delhi to Mathura is 200 km, and moving forward another 100 km is Agra. Hence, distance between Agra to Delhi is 300 km. This is illustrated with a real life examples involving vectors, where sum of known velocities is required to be determined and where does the relative velocity. In case of a

swimmer, in the figure, starts from point P and tries to swim across in direction PQ with a velocity $\tilde{V}_{sw}$ w.r.t. water, taking it to be still, like that in a lake or a swimming pool, and he would reach Q. Now, the person swims in a river orienting himself

$$\overline{V}_{sw} + \overline{V}_{wg} = \overline{V}_{sg}$$

across the , with same velocity, in a river with flowing at a velocity $\tilde{V}_{wg}$ w.r.t. ground. In this case velocities of swimmer and water are with a common FOR, i.e. ground, and hence velocities would get added, accordingly, the man trying to swim right across the river reaches point R instead of point Q. An anecdote to represent cascading of vectors is given across. Thus the swimmer out of experience intuitively chooses direction of swim to reach point Q, which a student of physics can do it in one try . A simple example distance between Delhi to Mathura is 200 km, and moving forward another 100 km is Agra. Hence, distance between Agra to Delhi is 300 km.
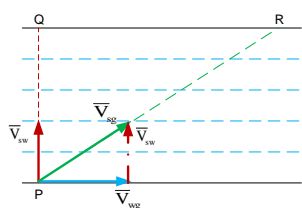
Take another case when a person travels from Delhi to Agra, a 200 lm distance, and is required to come backwards from Agra to Mathura, 100km. Then distance of the man is away from Delhi by a distance 200 km. This is illustrated with an example of direction of raindrops perceived by a person on the ground. When the person is still and wind is not blowing, the rain drop appear to be falling vertically.
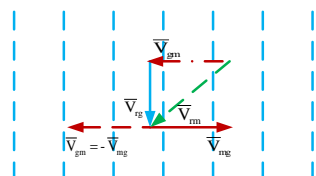
$$\overline{V}_{rg} + \overline{V}_{gm} = \overline{V}_{rm}$$

But, as the person starts moving the rain drops appear to be approaching him from forward direction, i.e. the direction of motion. The experience is same when he changes direction $0 \le \theta < 2\pi$. Here both velocities, of man $\tilde{V}_{mg}$ and rain drop $\tilde{V}_{rg}$ have a common FOR i.e. ground. But, the rain drops are seen by the man, i.e. change of FOR. This is the case where relative velocity shall have to be determined, and is illustrated in the figure. An anecdote of cascading of vectors in this case also is given across.

Third situation could be when it is raining with a velocity $\bar{V}_{rg}$, a windstorm arrives with a velocity $\bar{V}_{ws\_g}$. In this velocity raindrop with respect to ground $(\bar{V}'_{rg} = \bar{V}_{rg} + \bar{V}_{ws\_g})$ shall be determined, by cascading of vectors, as done with the swimmer. With the velocity of rain drops so determined $(\bar{V}'_{rg})$ apparent velocity of the rain drop to the man moving on the ground shall be $\bar{V}_{rm} = (\bar{V}'_{rg} - \bar{V}_{mg}) = (\bar{V}'_{rg} + \bar{V}_{gm})$. In this case necessarily rain drops may not appear to becoming from front, as shown in previous example, the experience would depend upon direction of windstorm.

Frame of Reference referred to above are those which are not accelerating i.e. either they are stationary or moving with a constant velocity and are called ***Inertial Frame of Reference (IFOR)***. This specific identity of FOR discussed above is considered essential, since soonafter this, study of Dynamics will require introduction and use of ***Non-inertial Frame of Reference (NFOR).***

Varieties of problems, representing different situation that are generally encountered in real life are covered in the books cited as Reference. Best clue to solve problems in physics is to visualize the problem statement in surrounding, and then apply the known concepts to the problem. Practice with wide range of problems is the only pre-requisite to develop proficiency and speed of problem solving, and making formulations more intuitive rather than a burden on memory.

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4. *Sears & Zemansky; University Physics with Modern Physics.*
5. *I.E. Irodov; Problems in General Physics*

Author is coordinator of this initiative Gyan-Vigyan Sarita. He had his career as a power engineer, and after superannyavtion he did his Ph.D, from IIT Roorkee. Soonafter the Ph.D. on 2012, he took a plunge into mentoring unprivileged children with Sarthak Prayashm an NGO. Thereafter for about for One Year till Sept'16 hr was Founder-cum-Chairman of Subofh Foundation.
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—OO—

MENTORS' MANUAL: This manual is devised to integrate and correlate concepts, and thus make the subject matter relevant to the surrounding of students, which they can easily visualize. Every topic in thus is contextual and based on illustration in previous chapters and sections. Mentors, who are invariably post-graduate in their respective suvject can pock any topic of immidiate concern and use it make their mentoring mire relevant

Ambitious students may like to venture into it, without getting baffled if they come across topics new to them. Such students may find illustrations out of their knowledge and understanding. Therefore they are advised to read and understand it sequentially and can seek guidance, wherever they are stuck up.

Feedback of readers to improve upon lucidity and making their learning accelerated are welcomed. We are coming up with Question Bank, Students Forum and other avenues to sypport the grooming of students conceptually driven, and oriented to just marks, ranks and admissions.

GROWING WITH CONCEPTS - Chemistry

(....Contd.) ORGANIC CHEMISTRY : BASIC PRINCIPLES AND TECNIQUES

Kumud Bala

Nomenclature of different classes of organic compounds:- compounds of carbon and hydrogen are called hydrocarbons. These are further divided into two classes (i) Saturated (ii) Unsaturated hydrocarbons

1.   Saturated hydrocarbons -------Alkanes :Hydrocarbon in which all the carbon atoms are linked to one another by only single bonds are called saturated hydrocarbons. In the IUPAC system, saturated acyclic hydrocarbons are called alkanes. Earlier, they were also called Paraffins (Latin: parum—little; affins—affinity). Since they are relatively inert towards most of the chemical reagent.

General formula: C_nH_{2n+2} where n=1, 2, 3, 4, ... etc.   Primary suffix = ane

The IUPAC name of alkanes are obtained by adding the suffix 'ane' to the word root indicating the number of carbon atoms. For example ---- The first four alkanes (CH_4 to C_4H_{10}) have their special names i.e methane , ethane, propane and butane. Names of alkanes containing five or more carbon atoms are obtain by adding prefixes such as pent (five) , hex (six), hept(seven), oct(eight) etc. indicating the number of carbon atoms in the molecule to the suffix 'ane'. The name of an individual alkane is always written as one word. For example:

n	Formula	Common name	IUPAC Name
1	CH_4	methane	methane
2	CH_3CH_3	ethane	ethane
3	$CH_3CH_2CH_3$	propane	propane
4	$CH_3CH_2CH_2CH_3$	n-butane	butane
5	$CH_3CH_2CH_2CH_2CH_3$	n-pentane	pentane
6	$CH_3(CH_2)_4CH_3$	n-hexane	hexane
7	$CH_3(CH_2)_5CH_3$	n-heptane	heptane
8	$CH_3(CH_2)_6CH_3$	n-octane	octane
9	$CH_3(CH_2)_7CH_3$	n-nonane	nonane
10	$CH_3(CH_2)_8CH_3$	n-decane	decane
11	$CH_3(CH_2)_{18}CH_3$		Icosane

Types of Alkanes:- Depending upon the structure of the carbon chain, alkanes are of the following two types

(a) Straight chain alkanes   (b)   Branched chain alkanes

(a) **Straight chain alkane** :- These alkanes contain straight chains of carbon atoms in their molecules. Alkanes in which no carbon atom is linked to more than two other carbon atoms are called straight chain alkanes.

Examples: CH_3-CH_2-CH_2-CH_3 ------------Butane (n-butane,   n=normal)

CH_3-CH_2-CH_2-CH_2-CH_2-CH_3 ---------------- Hexane   (n-hexane)

(b) Branched chain alkanes:- In these alkane the carbon atoms are not arranged in a straight chain . Alkanes in which at least one carbon atom is linked to three or four other carbon atoms are called branched chain alkanes . Examples
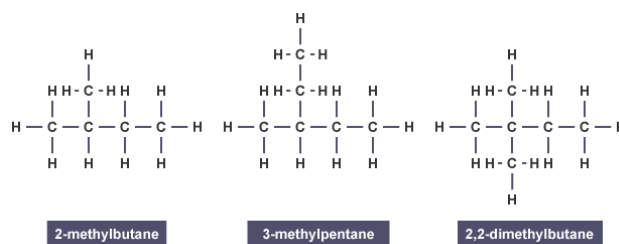
(iso-pentane)   (neohexane)   2,2,Dimethypropane
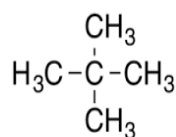
(Neo-pentane)

The prefix 'iso' is used when the second carbon of the branched chain alkanes carries one methyl group. The prefix 'neo' is used for those branched chain alkanes which contain a 'quaternary' carbon at the end of the chain.

Type of carbon and hydrogen atoms in alkanes:--- The carbon atoms in an alkane molecule may be classified into four types as

CONTENTS

(i)   Primary (1°) –A carbon atom attached to one other carbon atom is called a primary carbon atom and is designated as 1° carbon.

(ii) Secondary (2°) – A carbon atom attached to two other carbon atoms is called a secondary carbon atom and designated as 2° carbon.

(iii) Tertiary (3°)—A carbon atom attached to three other carbon atoms is called a tertiary carbon atom and (3°) carbon .

(iv) Quaternary (4°) – A carbon atom attached to four other carbon atoms is called quaternary carbon atom and designated as (4°) carbon.

The hydrogen atoms attached to 1°,2°, 3° carbon atoms are called primary , secondary and tertiary hydrogen atoms . It may be noted that there is nothing like quaternary hydrogen since a quaternary carbon does not carry any hydrogen.
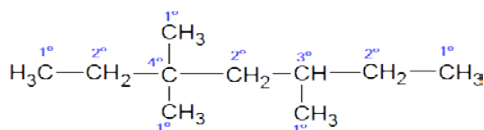
Alkyl group:--The removal of one hydrogen atom from the molecule of an alkane gives an alkyl group, represented by the letter R

Alkane--ane + yl= Alkyl

General formula for alkyl = C_nH_{2n+1} where   n =1, 2, 3, 4, etc.   for example
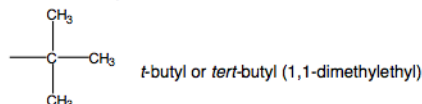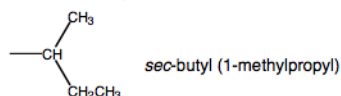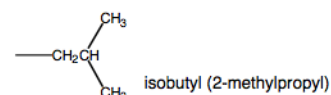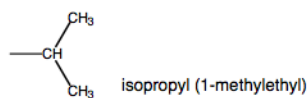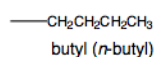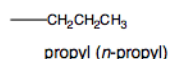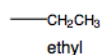
Rules for IUPAC nomenclature for branched chain alkanes

1.   **Longest chain rule**—Select the longest continuous chain of carbon atoms as the parent chain, while all other carbon atoms which are not included in the parent chain are called branched chain alkane or side chains or substituents. The branched chain alkane is then named as a derivative of the parent chain. It may be noted that the longest chain may or may not be straight but it must be continuous. For example
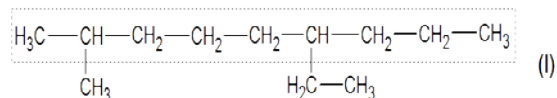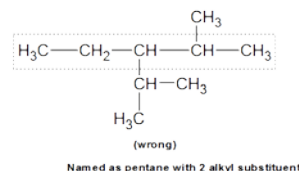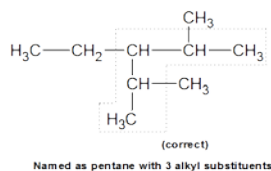

(longest chain contains nine carbon atoms and it is a derivative of nonane)
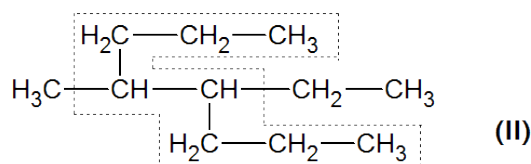
(Longest chain contains eight carbon atoms and it is a derivative of octane)

2.   **Rule for larger number of side chains** :--If two chains of equal length are possible , select the one with the larger number of side chains . For example-

3.   **Lowest number rule** :- Number the carbon atoms of the parent chain as 1, 2, 3, 4,etc.Starting from that end which gives the lowest possible number to the carbon atom carrying the substituent. For example, in the compound given below-
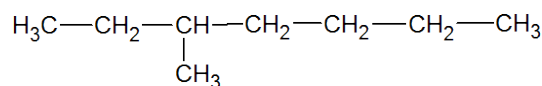

The numbering can be done in two different ways (a) and (b). The numbering of the carbon chain as given in the structure (a) is correct since it gives a lowest number i.e. 3 to the substituent i.e. methyl group while the numbering as given in structure (b) is wrong since it gives a higher number i.e. 5 to the substituent.

CONTENTS
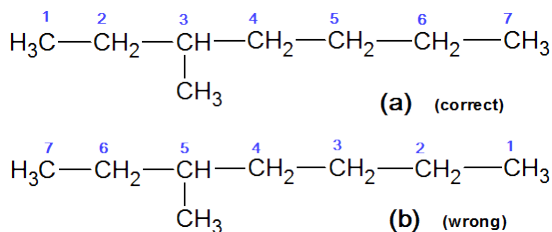
The number that indicates the position of the substituent on the parent chain is called the positional number or the locant. Thus, the correct locant for the methyl side chain in structure (a) is 3.

4. **Lowest set of locants rule**:- When two or more substituents are present , the lowest set of locants rule is applied . According to this rule , when two or more different sets of locants containing the same number of terms is possible ,then that set of locants is the lowest which when compared term by term with other sets , each in order of increasing magnitude ,has the lowest term at first point of difference. For deciding the lowest set of locants, the carbon atom of the parent chain are numbered from all possible direction and a locant assigned to each substituent from each direction. The set of locants from each direction is then compared term by term till the first point of difference is reached. That set of locants is preferred which has a lower number at the first point of difference. That is why this rule is also sometimes called as First point of difference. For example
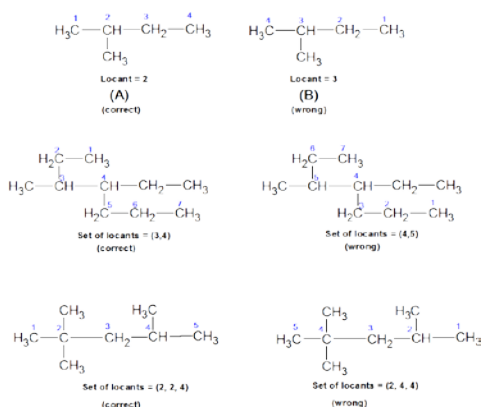

Out of two sets of locants (3,4) and (4,5) in example no.2, the first set is lower and hence preferred because the first term i.e.3 in the first set (3,4) is lower than the first term i.e.4 in the second set (4,5) .

5. **Name of the branched chain alkane**:- Prefix the name of the substituent (i.e. the alkyl groups.) to the name of the parent alkane and indicate its position (on

the parent chain) by writing before it the number of the carbon atom carrying the substituent. The name of the substituent is separated from its locant by a hyphen (-).The final name of the alkane is always written as one word. The name of the compound is written in the following sequence.

(position of substituent) as prefixes,   (word root) , primary suffix.   Example:
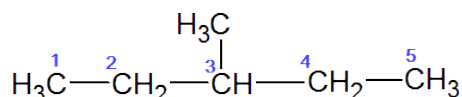

prefix is methyl and it is at carbon no. 3 in the parent chain , word root is 'pent' and primary suffix is 'ane'. Hence the name is   3-methylpentane
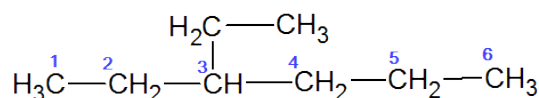

Prefix is ethyl and it is at carbon no. 3 in the parent chain, word root is 'hex' and primary suffix is 'ane' . Hence the name is 3-ethylhexane

6. **Alphabetical order of the side chain** :-When two or more alkyl groups (side chain) are present on the parent chain, each alkyl group prefixed by its positional number is arranged in alphabetical order

3-ethyl-2,3-dimethylpentane


4-ethyl-3-methylheptane
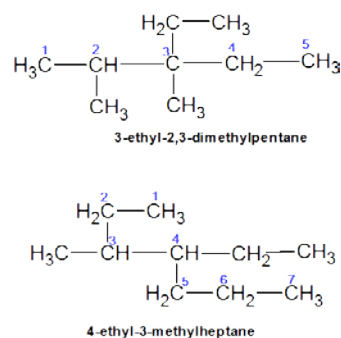
(Irrespective of its positional number) before the name of the parent alkane. For example

It may be noted here that while deciding the alphabetical order of the various alkayl groups, prefixes 'iso' and 'neo' are consider to the part of the fundamental name of the alkyl group while the prefixes 'sec' and 'tert' are not. For example:

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5-sec-butyl-4-isopropyldecane
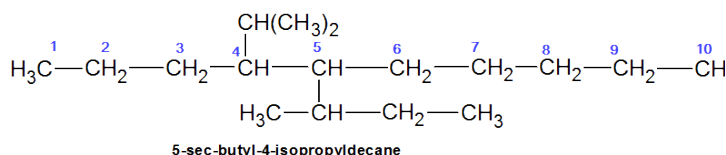
7. **Naming the same alkyl group at different position**: When the same alkyl group occurs more than once on the parent chain at different positions, the positional number of each alkyl group is separated by commas and suitable prefixes such as di (for two), tri (for three), tetra (for four), etc. are attached to the name of the alkyl group. However the prefixes di, tri, etc. are not considered while deciding the alphabetical order of the alkyl group. For example


2,3,5-trimethylhexane

3,5-diethylheptane

.
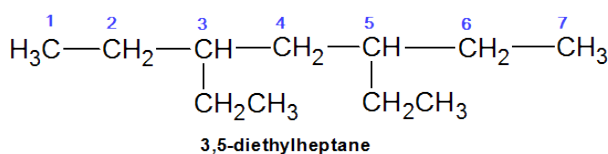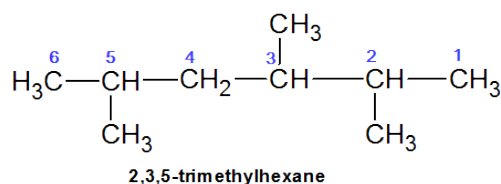
If the same alkyl group occurs twice on the same carbon atom, its positional number is also repeated twice. For example

2,2-dimethylpropane   3,3-diethylpentane
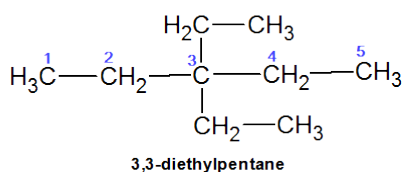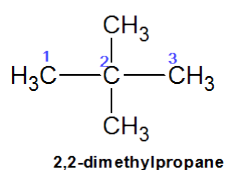
8. **Numbering of different alkyl groups at equivalent position: I**f two different alkyl groups are present at equivalent positions, the numbering of the parent chain is done in such a way that the alkyl group which comes first in the alphabetical order (written first in the name) gets the lower number.

3-ethyl-5-methylheptane

3-ethyl-4-methylhexane
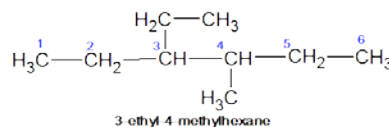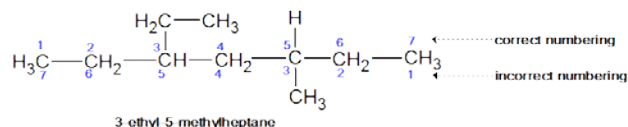
9. **Numbering of complex substituent:** In case the substituent on the parent chain is complex i.e. (it has branched chain) , it is named as a substituted alkyl group by numbering the carbon atom of this group attached to the parent chain as 1. The name of such a substituent is always enclosed in brackets to avoid confusion with the numbers of the parent chain. For example—

2,3-dimethyl-6-(2-methylpropyl)decane
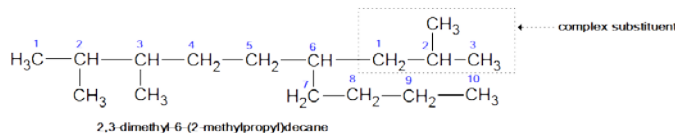
If two complex substituent are of equal length, then the complex substituent with larger number of alkyl groups forms a part of the longest carbon chain while the other one is considered the real complex substituent. For example—

5-(2-ethylbutyl)-3,3-dimethyldecane (Correct)
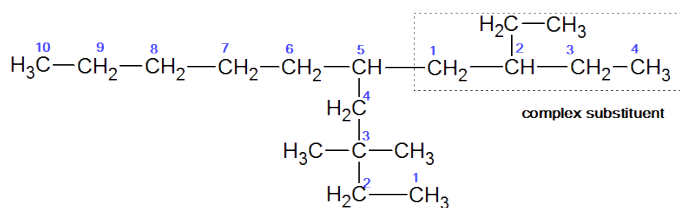
5-(2,2-dimethylbutyl)-3-ethyldecane (Incorrect)

If the same complex substituent occurs more than once on the parent chain at different positions prefixes bis (for two), tris(for three) , tetrakis(for four), pentakis(for five) etc. are used before the name of the complex substituent. For example-
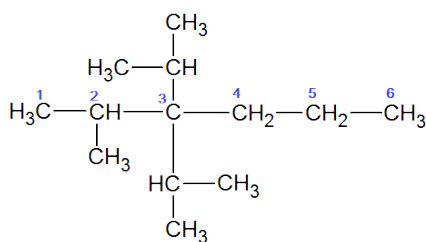
2-methyl-3,3-bis(1-methylethyl)hexane

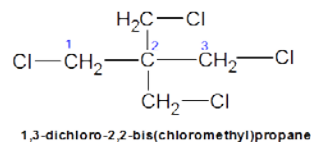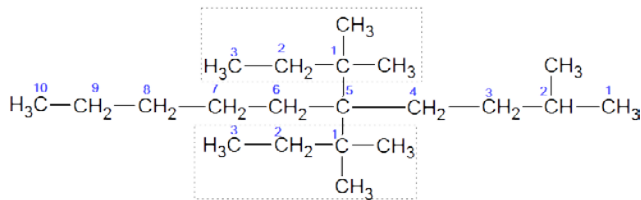1,3-dichloro-2,2-bis(chloromethyl)propane

5,5-bis(1,1-dimethylpropyl)-2-methyldecane

ASSIGNMENT

1. The common name of the compound $CH_3CH_2C(CH_2)_3$ is :
    [A] Trimethylpropane [B] Neopentane [C] Neohexane [D] 2,2-Dimethyl butane.

2. How many primary carbon atoms are present in a 2,2,4-trimethylpentane?
    [A] four   [B] one   [C] six   [D] five.

3. Which one of the following IUPAC names is correct? [A] 2-methyl-3-ethylpentane [B] 2-ethyl-3-methylpentane
    [C] 3-ethyl-2-methylpentane [D] 3-methyl-2-ethylpentane .

4. The compound having one isopropyl group is [A] 2,2,3 ,3-tetramethylpentane [B] 2,3-dimethylpentane [C] 2,2,3-
    trimethylpentane [D] 2-methylpentane.

5. What is the correct IUPAC name of the following compound?
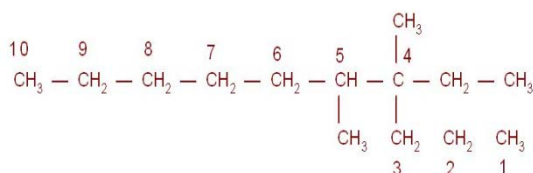
[A] 3,4-dimethyl-3-n-propylnonane   [B] 4,5-dimethyl-4-ethyldecane

[C] 6,7-dimethyl-7-n-propylnonane   [D] 6,7-dimethyl-7-ethyldecane

Answers to the above Assignment : 1. [C] 2. [D] 3. [B] 4.[D] 5. [B]

Author is M.Sc. (Chem.), M.Ed. and Advanced Diploma in German Language (Gold Medallist). She retired as a Principal, Govt. School Haryana, has 3-1/2 years' experience in teaching Chemistry and distance teaching through lectures on Radio and Videos. She has volunteered to complement mentoring of students for Chemistry through Online Web-enabled Classes of this initiative.
e-Mail ID: kumud.bala@yahoo.com

—00—

QUIZDOM – Oct'16

TOPIC:INDIAN FREEDOM MOVEMENT(Part III)

Phanindra Ivatury, Quiz Host

1. In 1905, in protest to the partition of Bengal Bal Gangadhar TIlak encouraged the "Swadeshi Movement" and the "Boycott Movement". What is the basic difference between the two?

2. What agitation was taken up Gandhi in the year 1918 to protect the interests of peasant who were forced to grow Indigo crop, the demand for which was on the decline and were forced to sell the crop to the planters at a fixed price?

3. The Non-Cooperation Movement which was started by Gandhiji in 1920 immediately after the Jallianwala Bagh incident ended in the year 1922 after it sparked off violent clashes in a town in the United Provinces? What is the name of this town?

4. The Salt Satyagraha or the Salt March undertook by Gandhiji in 1930 was undertaken from which place to which place?

5. Who were the prime forces involved in the Bombay Mutiny of February, 1946?

6. Which pioneer of the initial Indian Freedom Movement was also referred to as "Rashtra Guru" which means "Teacher of the Nation"?

7. Under what category were the Scheduled Castes and the Scheduled Tribes referred to before the Government of India Act, 1935?

8. Who first addressed Mahatma Gandhi as "Father of the Nation"?

9. What was the honorary title conferred on Jaya Prakash Narayan?

10. Which Indian Freedom Fighter was popularly referred to as "Deshbandhu" which means Friend of the Nation?

11. Who used to be referred to by Mahatma Gandhi as "Gurudev" or the "Great Sentinel"?

12. 2nd October is observed as Gandhi Jayanti all over India. The same day is also observed as an International Day for something. As what day is it observed internally as?

13. What is the name of the political agreement signed by Mahatma Gandhi with a British Viceroy on 5 March 1931 which led to lifting of ban on congress and also release of large number of political prisoners from Jail by the British?

14. In which year did Mahatma Gandhi return to India permanently from South Africa thereby leading to his rise in the Indian Independence Movement?

15. Who is widely regarded as the "political guru" of Mahatma Gandhi?

16. What are the names of Mahatma Gandhi's parents?

17. During which two successive year period was Subhash Chandra Bose, the President of the Indian National Congress before he was forced by the party to resign due to conflicting ideologies in the second year.

Quiz Host is a Post-Graduate in Public Personnel Management and Winner of Kulapati K.M.Munshi Medal in Public Relations, has quizzing as a hobby. He has so far hosted over 200 Quizzing events on various platforms all over the globe. He currently works with the Comptroller & Auditor General of India, New Delhi having worked on intra/inter-national assignments.
E-mail ID: phanindraivaturi@yahoo.com

—00—

SCIENCE QUIZ- OCT'2016

Kumud Bala

1 .Which of the following is not an oxidizing agent?

[A] Oxygen   [B] Conc. Sulphuric acid

[C] Chlorine   [D] Hydrogen

2. Which of the following is called Loss of electron?.

[A] Reduction   [B] Oxidation

[C] Oxidation or reduction [D] none of these

3. Which acid is present in bee's sting?

[A] Methanoic acid   [B] Hydrochloric acid

[C] Acetic acid   [D] Sulphuric acid

4. By which reaction metal is obtain form metal oxide?

[A] Liquefaction   [B] Reduction

[C] Calcination   [D] Roasting

5. What are the constituents of alloy solder?

[A] Copper, Zinc   [B] Copper , Tin

[C] Lead , Zinc   [D] Lead , Tin

6. Buckminsterfullerene is an example of which of the following carbon?

[A] An isomer   [B] An isotope

[C] An allotrope   [D] A functional group

7. Which of the following is called Group 18 elements?

[A] Alkali metal   [B] Alkaline earth metals

[C] Halogens   [D] Nobel gases

8. Who have the law of octaves?

[A] Mendeleev [B] Newlands   [C] Dalton   [D] Dobereiner

9. What happens to electron affinity when we move from left to right across a period?

[A] Remains the same   [B] Approaches zero

[C] Decrease   [D] Increases

10. Light travels fastest through which of the following materials ?

[A] Diamond   [B] Water   [C] Glass   [D] Air

11. **Your image in a bathroom mirror is a result of** -

[A] Diffused reflection   [B] Specular refraction

[C] Specular reflection [D] Siffuse refraction

12. Which of the following optical phenomena is used in cinematography movie projector?

[A] Accommodation   [B] Persistence of vision

[C] Interference   [D] Short sightedness

13. When light passes through a prism, the colour which deviates the least ?

[A] Red   [B] Blue   [C] Violet   [D] Green

14. What is the S I unit of electric charge?

[A] Volt [B] Ampere [C] Coulomb [D] Watt

15. By convention, what is the charge on a glass rod that has been rubbed with silk ?

[A] positive   [B] negative

[C] either positive or negative   [D] none of these

16. What way is always a voltmeter connected to measure potential difference?

[A] Series   [B] Parallel

[C] Either series or parallel   [D] None of these

17. Which one of the following organisms can live without oxygen of air ?

[A] Amoeba [B] Sheep [C] Yeast [D] Leach

18. Respiration is a process in which

[A] Energy is stored in the form of ADP

[B] Energy is used up

[C] Energy is released and stored in the   form of ATP

[D] Energy is not released at all

19. What is the namre of plant hormone essential for cell division?

[A] Auxin [B] Cytokinin [C] Ethylene [D] Gibberellin

20. A potted plant is kept in a room. It starts to bend towards the direction of light. This type of movement is known as -

[A] Photographism [B] Photopeiodism

[C] Phototropism   [D] photocynism

(Answers to this Science Quiz shall be provided in next e-Bulletin)

—00—

CROSSWORD PUZZLE : Trigonometry & Basic Algebra

Prof. S.B. Dhar
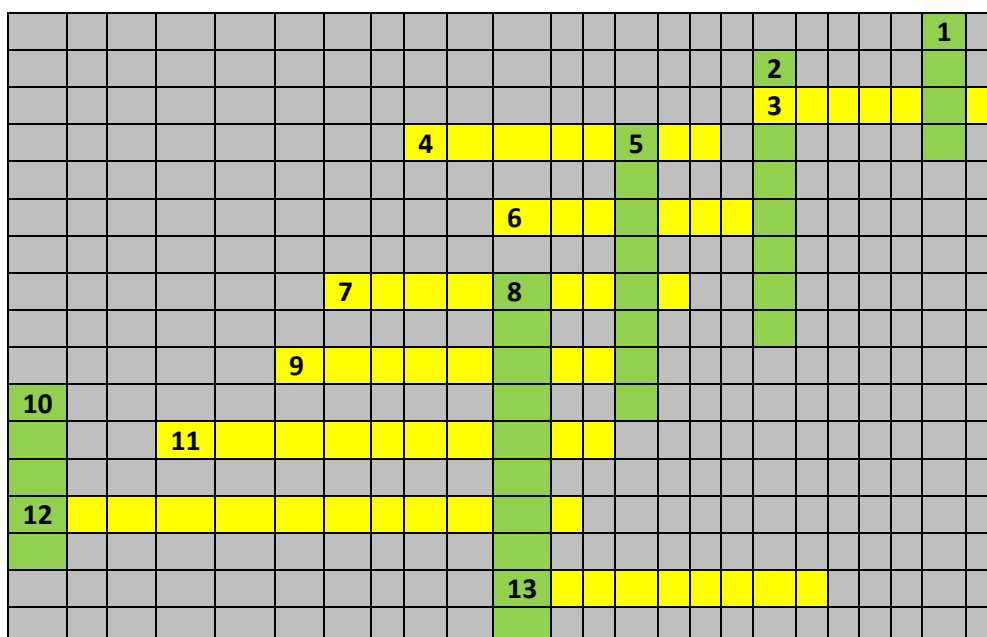
Across:

3   : Member of a set

4   : Number without bound

6   : Trigonometric ratio whose value is not defined for 0 degrees

7   : The four sections into which x-y plane is divided by x,y-axes

9   : Ratio of adjacent to the opposite side of a right angled triangle

11 : A vector of length zero

12 : Arrangements of objects in which order is material

13 : The inverse operation to exponentiation

Down:

1 : Ratio of opposite side to hypotenuse

2 : Set of ordered pairs

5 : $\sin^2 x + \cos^2 x = 1$

8 : tan x is not defined at x degrees

10 : Steepness of the line

(Answer to this Crossword Puzzle shall be provided in next bulletin)

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Together **E**ach **A**chieves **M**ore
(**TEAM**)

साइंस बनाने वाले, क्या तेरे मन में समाई?

(An effort to create a sense out of nonsense- a parady)

साइंस बनाने वाले, क्या तेरे मन में समा ♪ ई ♪♪/
काहे को साइंस बनाई तूने, काहे को साइंस बना ♪ ई ♪♪/अंतरा |

काहे बनाये तूने, न्यूटन-एडिसन,
दिए उन्होंने हमको, ढेरों समी♪करन,
अब ना रुकेगा देखो, मैक्सवेल इक्वे♪शन,
और उनकी मेहनत लायी, आ ♪ रा ♪ मी जीवन |
  - गुप-चुप तमाशा देखे, वाह रे तेरी खुदा ♪ई ♪♪,
काहे को साइंस बनाई तूने, काहे को साइंस बना ♪ ई ♪♪ |1|

Inquisitiveness of a student, unwilling ro learn science, to know as to why did GOD create it?

साइंस बनाने वाले, क्या तेरे मन में समा ♪ई ♪♪/
काहे को साइंस बनाई तूने, काहे को साइंस बना ♪ ई ♪♪/अंतरा |

ना होते भास्कर ना, पूर्व♪ फिलॉसफर,
होता ना सोक्रेट्स ना, ओ ♪ पे ♪ न है ♪ मर,
जंगल में रहकर, हम घि♪स♪ते♪ पत्थर ,
तुझसे ना हम बदले, हम रहते म♪♪ इर |
  - काहे को करता मेहनत, और हमारी रगड़ा ♪ई ♪♪,
काहे को साइंस बनाई तूने, काहे को साइंस बना ♪ ई ♪♪|2|

While discoveries by many scientists have added to his miseries, he finds that all that their painstaking and tireless efforts has made present day life much more comfortable.

All ancient philosophers, had changed pace and direction of developments, else we would have not been any way better than predators.

साइंस बनाने वाले, क्या तेरे मन में समा ♪ ई ♪♪/
काहे को साइंस बनाई तूने, काहे को साइंस बना ♪ ई ♪♪/अंतरा |

साइंस बनाके तूने, जीना सिखाया,
जियो-और-जी♪ने♪ दो, हमको रसाया,
जीना है हक से हमको, नेचर को रखके,
वर्ना कहेंगे बच्चे, हमसे अकड़के |
  - पैदा किया क्यों हमको ? दया जरासी ना आ ♪ ई,
काहे को साइंस पढा ♪ई ♪♪,
वाह रे, काहे को, साइंस बना ♪ ई ♪ |3|

Science has created an understanding of logical relationship of cause and effect, and there made us responsible to live-and-let-live, while preserving nature. Else question of child would hover on parents - Do they not have any pity to five birth to children and force upon them to learn science.

–00–

Education is the passport to the future, for tomorrow velongs to those who prepare for it today
                                                                                    – Malcolm X

IN-BOX Views

Vikas Pujari, Student Class XIth, NIOS, Rohit, Student Class XIIth : *I came to know about initiative of Sarthak Prayash, an NGO at Vasundhara, Ghaziabad, which was targeted to mentor students from Class 8th onwards from unprivileged families. At that time I did have any vision about my future. And started attending classes from Jan'12, because it was free and more as a fun. These classes have passed through many ups and downs. Now-a-days Online Classes are held since April'16.*

In these Online classes we are able to, and ask on-spot questions or raise doubts

In these classes Shri Shailendra Parolkar, from Texas, US, guides us in Physics,; Madam Kumud Bala guides us from Sec 128 Noida in Chemistry, Prof. Dhar a renowned teacher of maths guides us in Mathematics; and Dr Subhash Joshi guides us from Sec. 78, Noida in Mathematics and Physics, and has been doing it since beginning. Recently, Shailendra Sir has connected us in parallel to another class at Pune, and this gives us have a competitive advantage during learning, questions and answers.

Sarthak Prayash has created a facility in its library at Vasundhara , where through internet we are able to learn from these experienced teachers associated in this mission. There are some limitations which cause interruptions in the class due to internet connectivity. Gradually things are improving. Since we neither have computer nor internet connection nor can we pay for coaching, it is an opportunity to get guidance and raise our level to competitive examinations and I have made an aim to clear JEE.

Om Verma , Student Class XIth, Jhabua, M.P. : *I had an occasion to attend a few Online Mentoring of students of GHSS, Jhabua, an effort to reach to students of a remote tribal place, who are otherwise not able to reach out. In this I found that with the use of internet Online Class gives an advantage to raise question to the teacher and get doubts cleared then and there itself. It however requires descipline of attending the class. Teacher from a distance place can see us, our response and accordingly explain a topic, as if we are sitting in class room*

Video lectures, of high quality, are also available, some are free while there are paid also. In viewing them at our own convenience becomes a disadvantage due to more of freedom to learn. Moreover, it has some advantage in getting our doubts cleared while subject is being taught. Moreover, in classroom environment, of Online Class, we can interact with other students also, and this is sometimes very encouraging.

Bhawansh Baleja, Mount Abu School, Rohini, Delhi,Student Class IXth *: I have been taking these Online classes for about last 2 months. Though these classes focus unprivileged children, which I am certainly not, I have benefit to attend it because of my parents involvement in the inititaive. It requires discipline and we remain under observation of teacher, which is not the case with on the web-based Video Lectures. Since these classes aim at clearing of concepts, and neither to improve grades nor passing of an examination, my other friends could not find it useful.*

Here, I am made to answer Online and sometimes answer to other students sitting at some other learning centre, it requires being attentive, and helps in self-improvement both in discipline and learning of subject.

Smt. Sunita Bgasin, SSMI School, Delhi, (at SSMI few Online Mentoring sessions for students of Class Xth)

..regarding the mentoring program the students were not building up an enthusiasm towards the program despite our encouragement,.The brighter students only 2 of them could really gear up for your program, the rest felt it was a higher level and difficult for them .

We shall continue our efforts with the students and get back to you .

Our Take : *This Online Mentoring of unprivileged students, who come from diverse background and without a vision or objective in education, require to be understood and improved dynamically.The manner and scale that is envisaged is new and shall have to be moderated with each session. This is what makes it more relevant in the context. Nevertheless, association of local teacher, as coordinator, which is feasible at school level with a little extra effort, shall help to bridge gap in communication and learning, between students and mentor who is located remotely. This is a new selfless initiative, and hence it deserves a fare trial with due attention, commitment, perseverance, and also continuous efforts of improvement by mentors. An optimism in it, would may help to build an environment, which is sustainable, and promotes transfer of capability by elite and accomplished persons to students as also to coordinator, a much needed reform, in the larger interest.*

Every end, is a pause for a review, before re-continuing of a journey far beyond ...