ANNAMALAI UNIVERSITY

Special Programs for Slow Learners and Advanced Learners

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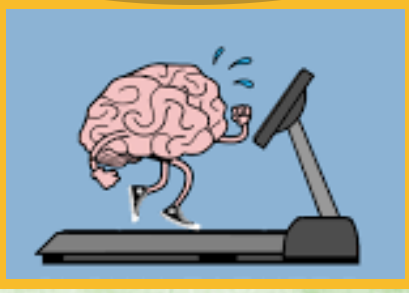
LEARNING MATERIAL FOR

SLOW LEARNERS

ADVANCED LEARNERS



A.1 Remedial Course Contents - ENGLISH (Slow Learners)

A.2. Remedial Course Contents -Quantitative Understanding (Slow Learners)

B.1. Myriad of Measures (Advanced Learners)

B.2 English Eloquence (Advanced Learners)

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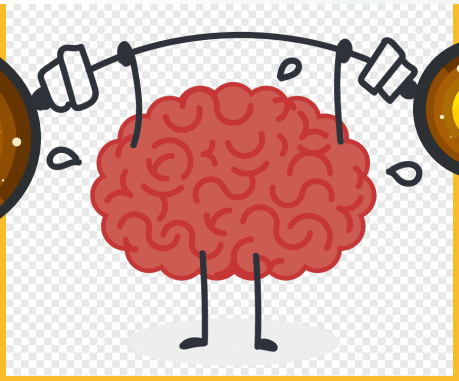
Opportunities for Advanced Learners



A. Learning Material for Slow Learners

A.1 Remedial Course Contents - ENGLISH (Slow Learners)

A.1.a Basic Grammar		
Area	**S. No.**	**Coaching Activities**
1. Parts of Speech	1.1	Nouns: Proper, Common (Collective & Abstract)
	1.2	Verbs : Transitive and Intransitive
	1.3	Adjectives & Adverbs
	1.4	Articles, Prepositions, Conjunctions & Interjections
	1.5	Types and Parts of Sentences
2. Tense Sense	2.1	Simple Present or Present Indefinite
	2.2	Simple Past or Past Indefinite
	2.3	Simple Future or Future Indefinite
	2.4	Present Continuous or Progressive Present
	2.5	Past Continuous or Progressive Past
	2.6	Future Continuous or Progressive Future
	2.7	Present Perfect
	2.8	Past Perfect
	2.9	Future Perfect
	2.10	Present Perfect Continuous
	2.11	Past Perfect Continuous
	2.12	Future Perfect Continuous
3. Types of Sentences	3.1	Direct & Indirect Speeches
	3.2	Active & Passive Voices
	3.3	Use of Articles
	3.4	Use of Clauses, Idioms and Phrases
	3.5	Simple, Complex and Compound Sentences
4. Other Nuances	4.1	ABC of 'Aim Better Communication'
	4.2	Stylish Writing
	4.3	Nuanced Writing

A.1.b ABC OF 'AIM BETTER COMMUNICATION'

We want good of everything and good in everything. Good mobile, good dress, good home, good bangles, good vehicles, good mileage, good college, good education, good relations, etc. By turn of the coin, we must also possess some 'good' and offer some 'good' to others; mustn't we? What is the minimum expected 'Good' from us? Perhaps, Good English or Good Tamil! As we choose to study/instruct in English, Good English is expected of us. How good is our English? How much good is our English? People (teachers/employers/parents) may expect a lot of us saying 'great' is our English. If we aren't that much sure, we should lift up our English Language/Communication Skill. Please note we must be good in our mother tongue too, Tamil/ Telugu/ Hindi or other language, as the case as may be. If we are good in one language, we will not find it difficult to be good in other language as well, provided some minimum requisite good learning efforts are made.

Good-2-Great

It is widely said at the moment hardly 15-25% of graduates only are readily employable. The remaining falls short of the expected level of language abilities. We wish we all belong to the employable category and not the other. If we doubt as to which category we belong to, then without wasting further time start some serious 'learning' of English now. In the emerging global order, every one of us must be 'Good in English' and 'Great in Communication'. Good-to-Great must be our mission in all, particularly Language and Communication. This will take care of all other requirements for any skill-set needed of us. Mission fulfilment requires great concern, commitment and ceaseless zeal through-out. Zeal is the diligent enthusiasm even in the face of worst consequences; it is to remain committed and concerned for the cause all the time. Learning a language is not all that difficult. But it appears it has become difficult for many of us; because we haven't done it regularly, carefully and diligently. Now back-log clearing pulls us backwards; result, no forwards! This vicious cycle must be broken. Some good beginning, even if late, will produce good-2-great results. Ultimately it benefits us, our home, our nation and the world as a whole. Knowledgeable people are performing assets that mother Earth is happy to lap-hold.

Levels of Language/Communication Skills

We can classify the language or communication skills into three levels, namely, micro (threshold), medium (talented) and macro (triumphant) levels. The **Micro-skills** in any language learning are: **Vocabulary, Pronunciation, Spelling and Grammar.** Micro-skills are necessary for good-level of communication at School level. These skills are fundamental and must be learned before one enters collegiate education. These skills are better obtained consciously and internalized quite well. Any deficiency here is ordinarily very difficult to get rectified later.

This undone deficiency will harm our ascendance in our goal pursuit. Good with micro-skill-set, we aspire for **Medium-skills** which include **Listening** ability that results in understanding oratorical presentations at ease)**, Reading** ability that results in understanding scholarly writing in any non-technical presentations)**, Comprehension** ability that results in understanding what is explicitly presented and stretch into what is to be inferred and implied) and **Intelligibility** ability that results in distinguishing between lucid & lackadaisical, profundity & petty and such bi-polar quality aspects of verbal and written communications. Medium-skills are expected of being earned from college classes and completed by the time we become post-graduates. Deficiency in medium-level- skill-set arises, generally from deficiency of micro-level skills and/or lack of proper post-school education. **Macro-skills** deal with functions of language in our social, professional, business or contextual setting. At this level we become great presenters, skilful writers, articulated speakers and able negotiators. With macro-skills we cannot be stopped from speaking, arguing, articulating and above all becoming a columnist or so. At **macro-level** we have (i) the command over language to **Speak-with-ease** in any forum, (ii) a bag full of words of choice (literary, neutral and colloquial) exhibiting **Lexical fluency,** (iii) the natural skill of **Articulation** reflected in enunciation, expression, quotation and what not, and (iv) a scholarly **Writing skill-set**. Here the person becomes a '**literary-creator**' or **'language-architect'**.

A good school education with emphasis on language is basic requirement for all the three levels of language skills. Any shortfall there would only produce un-employable-graduates later deficient both in the domain and communication paradigms. Language deficiency in collegiate education, if it is not an extension from school education, will make the person deficient in communication, though not in domain skills. Failure to provide right emphasis to language (English) education in our education system compels me to write this article. The deficiency is well exhibited by many who could not open their mouth in group discussion/ interview and also in the poor quality written communication, be it simple a leave letter or so.

Micro-level (threshold level) Language/Communication Skills

Vocabulary: First we need to build up our vocabulary. English, by the better educated, uses about 5,000 words. Even 2000 choice words are enough, it is said. Instead of knowing 20,000 words of one language, leaning important 2000 words of 10 different languages is great at the school level. Is that manageable? I know there are collegiate education which simply teaches half-a-dozen languages only. Yes, there is need for such multi-lingual people. Let us become multi-lingual. We can enjoy many a literature, and our lingual-horizon expands. At the threshold level let us learn just 10 words in English a day. In two years' time we will master the usage of English. Word-building exercise must be practiced every day, in the school. A good-dictionary helps a lot. A good teacher

can make things better and smarter. Take the word **Beauty**. How many words can we make out of this root word 'beauty'? I have made 24, a few with appropriate preceding and succeeding words, besides prefixes and suffixes. We can make words like: Beauties (Pl.), Beautify (V), *Beaut (S)*, Beautiful (Adj.), Beautifully (Adv.), Beauteous (Adj.), Beauteously (Adv.), Beauteousness (Adj.), Beautician (N), Beautification (N), Beautifier (N), etc. By adding prefix or suffix to the root word more words as Verb (V), Noun (N), Adjective (Adj.), Adverb (Adv.), Slang (S), etc are made. There are other related popular word extensions with word-additions, before or after the root word. In the case of the word 'beauty' we have: sleeping beauty, stunning beauty, sedating beauty, beauty contest, beauty parade, beauty parlour, beauty pageant, beauty queen, beauty salon, beauty sleep, beauty-show, beauty spot, beauty-sense, and so on.... Attempt synonyms and antonyms, we get: Pretty, Attractive, Cute, Charm, Sweet, etc; and Dreadful, Unbeautiful, Ugly, Horrible, etc. For these go for synonyms. From one word we can build 100 plus words or word-combines. This grows like '.in' or '.com' social-networks! Vocabulary is our word-bank account. It must have sufficient credit.

Pronunciation: While speaking pronunciation is very significant. Lips, teeth, tongue, *epiglottis*, nose, and mouth-roof are all relevant for pronunciation. It is right pronunciation makes the presentation as a flow of honey into our ears. In Tamil, we know many people could not pronounce '*Pazham*'; they do it as '*Palam*'. The unique letter of Tamil, namely, 'zha' is most ill-pronounced by present generation, by at the least 4 to 1. Unfortunately there are two other sound-alikes compounding the problem. Coming back to English, please pronounce English words as English, not as vernacular-sound-ridden English. Some Tamils/Keralites/Telugus and other regional people are bent to use vernacular-sound-rid English. We know the word 'company' is pronounced by many as, '*kampæni*'. That is the influence of Tamil on English. Colloquially people call it: ***'Tanglish'***. There are many such examples. Lack of concern, not skill, is the main cause. Don't harm a language by callousness. In some States prone to regional-tongue-rid English, a special program, MMTI, that is, Mitigating Mother Tongue Influence, on English is organized. Good, anyway. Please mitigate mother tongue influence in pronunciation of English words. Dictionaries give guidelines for pronunciation. Phonetic posts, listening to speeches, You-tubes and other audio materials, etc guide a lot.

Spelling: While writing spelling is important. We hazard different spellings for words as we think. Recently I came across the word 'carpenter' wrongly spelt as **'*Karpendar*'** by a graduate student seeking MBA admission. It is like hitting a long nail on the 'word-head' or pitilessly splitting up the word with an axe. Don't commit such murderous crimes! Perhaps had we had more of this Unbearable Killer English a century ago, we could have easily thrown off British Empire! Even at the slightest doubt about spelling, please refer the Dictionary. Don't be lazy, hazy, hasty or nasty on this score. Right pronunciation can help in getting the spelling correct for most of words. Try and learn

skill-fully and joyfully. You know the correct spelling for 12th is: **Twelfth**; **Not *'Twelth'*** or **Twelveth**', etc as many of us still think and write. It is **Grammar**, not ***Grammer*.** It is **Certainty,** not ***Certainity*.** These may appear silly. Yes, of course for the learned. But we are concerned with majority with first-generation education, rural back-ground, and such other debilitating environment. We know, computers warn of wrong spellings mostly with red-line. Why don't we take the clue?

Grammar: By VIII standard, we must be fairly comfortable with all basics of Grammar, if not the nuances. We must be fortune enough to study in good schools under a good teacher. We have to work hard. There is no substitute or short-cut for learning. Tense of Sentences is first lesson to be thorough with. The tenses of verbs must be the starting point. Be thorough with tense forms for each verb. Time sense and use of right tense of verb are of utmost importance when we write essays/letters/reports. When writing a leave letter today for yesterday's absence, How damn one would write**: *As I am suffering from fever yesterday***.....(in present continuous tense)'. Correct form is ***'As I was suffering from fever yesterday***.....(past continuous needed). Further we cannot 'stop' the writing, ***'As I was suffering from fever yesterday....'*** with a full stop. This is incomplete sentence. It may be written as: ***'As I was suffering from fever yesterday, I could not attend the classes yesterday'*.** Avoid '***Could not able to***' (many write like this); either use '***was not able to attend***' or just use ***'could not attend'*.** Learn grammar thoroughly. Buy a good Grammar Book with Exercises. Read, Cognize, Repeat and Learn. With good grammar only: we understand well; we write well; we speak well. We appreciate; otherwise, we depreciate both ourselves and the language! Avoid common mistakes like: mixing up many tenses in one- paragraph, noun-verb incompatibility, non-existent words like '*Preponement'* (right word is: Advancement), grammatical blunders like 'one of the boy or girl (right usage is: one of the boys/girls followed by a singular verb) and so on.... these mistakes are committed by people in tall positions as well. Suffice to say, don't take them as models. We are our master. We must master. That is the mind set needed and scrupulously followed.

With the micro-level language skills dealt above pretty good, we can understand lessons very well, write exercises in our own style and we will not feel fish out of water when we land up in alien soils.

Medium-level (talented level) Language/Communication Skills

Listening: Let us shut our mouths; Open our ears to learn more. A wise owl sat on an oak; The more it saw, the less it spoke; The less it spoke, the more it learned. Like that wise owl, we learn more by listening. Renowned scientist, **Albert Einstein's** formula for success is great in this context: He said: "If A is success in life, then Success = A= (x + y + z), where, 'x' is hard-work; 'y' is play; and 'z' is keeping our mouths shut". You know, here 'z' is 'silence for listening'. We have two ears and a mind to listen. Great listeners are great speakers, readers and writers too. Kids listen well and hence they

learn quickly to speak. Listen to English News over Radio and TV. Listen oratory of learned persons and debates. When you listen **you must watch for pronunciation, Pause, Posture, Pivot, Pun, Poetry, Prose, Punch, Pace** and so on. Note the usage of 'P' words here. That is also a style, worthy of being noted.

Reading: Reading makes one great. Great persons keep on reading. Their appetite for learning is insatiable. Pundit Jawaharlal Nehru, the 1st Prime Minster of India was a great reader; he could not be prevented from reading. Result he had authored 4 great books. Reading makes it easier to develop speech and language, supplies new vocabulary and pronunciation, inculcates cognition, increases attention span, stimulates imagination, fosters natural curiosity, develops ability to express more clearly and confidently in spoken and written forms and so on... Reading of books, magazines, fictions, autobiographies, biographies, epics, poetry, etc are greatly enhancing one's language skill. The debilitation in the present generation's language skill is due to the fact that it is not 'reading'. Of course certain detractive publications that abound now divert away the slender interest in reading towards that meaner stuff. Great libraries welcome readers. But visitors dwindle in number. I am afraid, whether the present generation has time or inclination to read. What a life! There is no time to Stand and Stare! But that is an excuse to not read great works. Reading exercises are important. In Tamil an adage goes as: *'Kandathai Paditthal Punditthan Ahalam'*. That is 'Reading whatever one comes by, makes one a Great Scholar'. Read a lot. Become a Pundit! Subscription to great dailies/magazines gives one lot to read. We must have a small (why not a big?) home library.

Comprehension: The ability to comprehend is the real purpose of all the learning. Quick grasp of the main themes and their contours, easy capturing of the presented concepts in the context concerned, rapid understanding of the explicitly expressed points and discerning ability to stretch the intellect to fathom out the unsaid but to be inferred message in the context in question are some important attributes of comprehension. Comprehension also draws from stock of knowledge on the issue already with us and the currently available new information. Reading between the lines, is another aspect of comprehension that only few of us can boast of. I am very sorry the comprehension ability is too much to ask for now with the students. The reason is not domain knowledge, but language problem. So, language skill must be addressed in the first place. Practice, exposure and involvement are the means to develop comprehension.

Intelligibility: By the time one comes out with a post-graduate degree or a professional degree, it is expected of the person to be able to distinguish between 'lucid and lackadaisical' lectures/writings, between 'profundity and triviality' of contents/message in popular writings, and between 'meticulousness and vagueness' of speeches/reports. We can add more such bi-polar aspects. The

intelligence of the learner in distinguishing between 'intelligent and unintelligent' works is the skill in question. That is intelligibility. A long way awaits us.

With these medium-level English skills fully acquired, English medium instruction has done well with you, for you can, not only understand any writing/speech/presentation in English, but also adduce own critical comments and convincing add-ons, supplements and complements. Compliments too! One can confidently write 'letters to the editor' to popular national dailies/magazines, now. Wow!

Macro-level (Triumphant level) Language/Communication Skills

Speaking: So far we are recipients. We got only inflows. Now we are giving back. We are creators. Outflow erupts from the learned and becomes a source for others to listen to, learn, read, assimilate, appreciate and tread. Now we are in communication with others. Verbal communication with occasional gestural communication, elevate our oratory level. The words, the sentences, the contents, the message, etc now shine and glide you up. Choice of words is important. We may glitter with your outpourings of thoughts in prose/poetry formats appropriately mixed with occasional pun, pause, pace, phrase, pomp, pageantry, punch and so on. There are many TV programs on developing Speaking skills. This may help. Participation in informal/formal group discussions will help. Works of Poets or great writers will help in mixing our delivery with 'quotable quotes', 'clichés', 'jargons', 'axioms',' maxims', etc as may be needed.

Lexical fluency: At macro level, one's lexical fluency must be swift enough to place one's thought fluency right across on time, without scratching the head for apt words. It is said, 5,000 English words are enough for good level of communication skills. But that is not enough, now for triumphant level writing. Written English uses about 10,000 words, though about 60,000 words are used by scholarly writers with pomp and style. Let us take the 60,000 words as our requirement. English language has about 500,000 words plus about 500,000 technical/scientific words, not yet catalogued. Leaving the technical/scientific words aside, the requirement for great communication is about 12% per cent of total English words. Can we make this up? Perhaps yes. How can we check this up? It's very simple. Take, for example, The Chambers 21st Century Dictionary, having 300,000 words in the latest, 13th Edition, with 1000 new words. Randomly select, in the standard international dictionary, about 100-200 pages spread over all the 26 letters in a proportionate manner. On an average say 30 words/ derivations are found in a page. Let us set our goal as knowing 60,000 words out of the 300,000 words. So, 1 in 5 words or 6 out of the 30 words in a page on average, we must know each. I think we can be quite comfortable with the target! Can't we? If one knows less than the set target, he/she must make good the deficiency. That is easy!

Articulation: The skill of articulation requires great calibre. Given the above 10 skills equal, people differ in their articulation. At times those found lesser on these 10 skills even out-smart in articulation. Articulation is expected in speech, presentation (say with PPT), negotiation, mediation and writing. Articulation finds expression in vastness of coverage and depth, meticulousness in citing and facts, lucidity of enunciation and enumeration, clarity and class in expression and authority, stylishness in pronunciation and pace, linkages in themes and times and continuity in contexts and contents. The test of articulation is that any talented reader must go with the sense of thoroughness; must say that nothing is found wanting; must they this is what I wanted. That is the test of articulation. This is acquired over a period of time. May be 10 years of columnist experience would make a person atop on the peak of articulation in writing.

Writing: The last skill, but not the least, is writing or authoring; it is the peak point. We must reach the top-slot, the pinnacle or high point, that is, **stylish writing**. Our expressed thoughts and words must not only vibrate in the universe as waves of sound, but must be available for generations to reach, read, propagate and follow. So write. Please note, the world would have been nothing without the writings of great sages, saints, poets and authors. The passed down wisdom served as seeds to generate more wisdom for the humanity to live happy. We remain wonder-struck with these treasures. Their volume, variety, valence and vividness excel. As readers and also as writers we have to salute the Heads and Hearts behind those great works. Their works are eternal and are inspirations for many to write. As we read them, a great force propels us to write as well. Induced by the desire to remain eternal, we may start writing. But whether a writer has already born in us? The answer follows.

As you read chapters in a great work, an article in a newspaper or a magazine, or a poem in a collection, if you feel that the content and contours are similar to the ones you have been thinking on, then you are a potential writer. A writer is already in you, to be just unwrapped. Without further idling away of time, start writing. Think deep and write. You may have to revise, re-write, re-paragraph, re-focus, re-orient, etc as needed. Depending on the audience you may have to add spices, niches and nuances. **Acronyms, Quotes/Verbatim/'Thus Spoke'/'Point Blanks', Idioms, Phrases, Jargons, Clichés, Literary Excerpts, Maxim, Axioms, Adages, Metaphors and other Musings** may have to be added in right measure to give a lavish degree of uniqueness to your writing. Every great writer has mark. All your accumulated vocabulary, reading, grammar, listening, articulation and learning will help you pen a great article, poem, book, treatise, report or an epic.

Sum-up: From baby to grown up adult, the journey is pretty long; so is the journey from alphabets to articulation. Eloquence and Excellence require commitment and capability. I know we all have the commitment to get that capability. The easiest way is more 'hard work' and some 'dynamic-dreaming'. Aim! Aim Better! Aim Better Communication! That is ABC!

A.1.c. STYLISH WRITING

Career Excellence is what everyone is aspiring for. Great careers are possible by eminence in relevant skills of which Language Skill is on the top. In a competitive environment Language and other relevant skills are important to make a mark in one's career. In this paper certain aspects of Language skill are touched upon so that interested and motivated learners would find some more new urges to equip them with the skill. Improved English Skill set = Fundamental Skill set + Nuanced Skills set. The first one must have been acquired in school studies level itself. The other one keeps on developing with exposures. Exposure expands as one yearns to experience new exposures by ceaseless listening and reading, writing, articulating, venturing into challenging tasks such as penning stories, novels, texts, etc.

1. Fundamental English Skill

The importance of the English language as a communication medium in the globalised world cannot be overemphasized. Comfort with English is almost a prerequisite for career excellence in the world today. We have studied English in school. But proficiency is pathetically poor with many due to regional, family, individual, educational and cultural factors. Many people hesitate to speak English because of lack of fluency and grammatical soundness. Without blaming anybody or anything, remedying the situation is necessary. However, there is no quick fix when it comes to improving your command over a particular language. It always requires a lot of time and effort. One has to go by the fundamentals.

Area	Topics	Importance
1.Vocabulary Building	Words, per se.	These are the building blocks of language ability and capacity building. One's inventory of words with usage variety spells much. Computers are of great help in leaning more words through synonym search. Knowing words by their nature, feature and specialty is important.
	Nouns: Proper, Common (Collective &	
	Verbs : Transitive and Intransitive	
	Adjectives & Adverbs	
	Articles, Prepositions, Conjunctions & Interjections	
	Types and Parts of Sentences	
2. Tense Sense	• Simple Present or Present Indefinite • Simple Past or Past Indefinite • Simple Future or Future Indefinite • Present Continuous or Progressive Present • Past Continuous or Progressive Past • Future Continuous or Progressive Future • Present Perfect • Past Perfect	Tense makes sense; otherwise results non-sense. These are only at the maximum Eighth Standard skill. But troubles are aplenty here. I am aware I don't speak about people who are born with silver (or even aluminum) spoon in their mouth. I talk about those who struggle a lot. I should say there is no quick-fix. Start fresh, one can learn in 6 to 8 months' time, provided vocabulary isn't a problem. Remedying without unlearning the wrong is simply waste of time. Here many people are stuck with. Pity. Let them, better start refreshingly fresh
	Future Perfect	
	Present Perfect Continuous	
	Past Perfect Continuous	
	Future Perfect Continuous	

3. Types of Sentences	Direct & Indirect Speeches Active & Passive Voices Use of Articles in sentences Use of Clauses, Idioms and Phrases in Simple, Complex and Compound Sentences	Variety and minimum comfort in skilled vocal or written communication needs grip over the types of sentences. Flawless communication needs at the least needs this much. Ability to navigate into other forms speaks right capacity.

2. Nuanced English Skill

If one wants one's communication stands distinctly superior, it should be nuanced. Let one's communication is mixed with appropriate use of, '**Acronyms, Authoritative Quotes, Axioms, Maxims, Clichés, Idioms, Metaphors, Phrases, Quotes, Similes, etc'**, as may be needed, keeping in mind the audience or target readers. Then the communications gets the right appreciation.

i. Acronyms: The term *acronym* is the name for a word from the first letters of each word in a series of words. If the word so formed reflects the tenor of the words, that is a great acronym. You see, there are two acronyms used in science. LASER represents **L**ight **A**mplification by the **S**timulated **E**mission of **R**adiation

Are You a 'STUPID'? Yes, I am a, 'Super Talented Unique Person In Demand'. This is a great - **'STUPID'!!!**

ii. Authoritative Quotes: Good to Great communication is spiced with an avalanche of quotes of reputed authors, statesmen, towering personalities and leaders. A communicator's skill lies in ability to pick right quotes and use them in appropriate contexts. 'A fool thinks himself to be wise, but a wise man knows himself to be a fool' a quote from **Shakespeare,** is good to depict a situation a amateur speaks much enough as though he knows everything, while a learned speaks very little. **Thomas Huxley's statement,** 'The task of a University is the creation of the Future' is a great quote addressing the functions of a University. **Mahatma Gandhi's** statement, 'Hate the sin, love the sinner, is a powerful saying in the context of forgiving somebody, without hurting the feelings of the aggrieved. Quoting **Robert Frost,** 'The woods are lovely, dark, and deep, But I have promises to keep, And miles to go before I sleep, And miles to go before I Sleep', in the context of one's commitment to go the extra-mile without bothering personal difficulties, as was done by Pundit Jawaharlal Nehru, makes rich impact on the followers to be tireless workers for the cause of nation building.

iii. Axioms: An **axiom or axiomatic statement is taken as unquestioned truth.** The word comes from a Greek word meaning 'that which is thought to be 'worthy' or fit,' or 'that which commends itself as evident. As used in modern logic, an axiom is simply a premise or starting point for reasoning. An "axiom", in classical terminology, referred to a self-evident assumption common to many branches of science. A good example would be the assertion that: When an equal amount is taken from equals, an equal amount results. Similar to the above a quote in the Sanskrit scriptures goes: *'Poornamatha, Poornamitham, Poornath*

Poornameva Udhachyathe; Poornasya Poornamadhaya Poornameva Avasishyathe'. The meaning of these lines: The Universe is full there and here and what comes out of fullness is also full. If a part is taken out from the full, the remaining part is also full. The Vedas tell us that even a fraction of the Supreme-Being is whole and complete by itself.

iv. Clichés: A Cliché is a commonplace phrase. It is an expression and the idea expressed by it is like a hackneyed theme, characterization, or situation. Phrases like 'sweaty palms' or 'twinkling eyes' don't mean somebody's palms are just sweaty or his/her eyes have a twinkle, rather these mean 'he /she is nervous' and 'something happens very quickly like the twinkling of eyes. There are thousands of clichés in the world. Clichés are often idioms. Idioms are figurative phrases with an implied meaning; the phrase is not to be taken literally. It's 'raining cats and dogs', means it is raining heavily. 'Fit as a fiddle' means, 'someone in great shape' and so on.

v. Greeks/ Latins: Spice your speech or writing with Greek and Latin Phrases: You know, in my 10th Standard 'Algebra & Geometry' classes in SRH School Thiruvaiyaru, my great teacher Late (by effect eternal) Sri N.Krishnamurthy would write 'QED' at the end of Proof and tell, *'Quod Erat Demonstrandum'*. I captured the abbreviation well, but only faintly its meaning then. I mined the real purport of the Latin Phrase while doing my Ph.D. I got that this is the phrase traditionally placed in its abbreviated form at the end of a proof or argument. But for my great teacher I would not have encountered the phrase and learnt the same. I cherish him; salute him. This is where a great teacher stands out among good teachers. Similarly when I noticed, 'RSVP' on many invitations to my Professor Late (immortal by impact) Dr.M.O.Mathew of Annamalai University during early 1980s, I searched and got the acronym as, *'Respondez S'il Vous Plait'*, meaning 'Reply, if You Please'. Every stimulus to learn must be stretched to its end. '*Ab Initio'* (from the beginning), '*Raison d'être'* (Reason for Existence), '*Quid Pro Quo'* (something in return), '*Ceteris Paribus'* (other things being equal), '*consensus ad idem'* (mutual understanding), '*Magna Carta'* (Great Charter), *'Sine Qua Non'* (indispensable/essential action), etc are some Greek and Latin phrases that add spice to your communication in English.

vi. Idiom: An idiom is a group of words in current usage having a meaning that is not deducible from those of the individual words. For example, 'over the moon' means 'extremely happy'. There are estimated to be at least 25,000 idiomatic expressions in English literature.

Idioms are either opaque or transparent:

Opaque - When you translate an opaque idiom, it will not make sense because the literal meaning is nothing like the real meaning; '**pulling** my **leg'** means 'to tease one by telling something untrue.
Transparent - A transparent idiom has similarities between the literal and the expression. For example, **'playing your cards right'** is an expression that actually came from card games but that can apply to other situations.

vii. Jargons: Using Jargons has become a sort of style or 'punch-line'. Jargons are 'idioms' and 'phrases' that are contour descriptions or otherwise.

Best of Breed: To excel in the market, we'll need to maintain our status of the 'best of breed'.

Blue Sky Thinking: Let's start with a blank sheet of paper and do some blue sky thinking and Come up with ideas.
Core Competencies: A jargon contributed by Management Guru, Late Prof. C.K. Prahalad to the world of business. The jargon means, 'what one does well, that others can't imitate easily'.
Bottom-line and top-line: Net Profit and Total Sales, respectively.
Cutting Edge: This is the most recent and versatile version giving the competitive advantage.
End to End: Let's work out the whole process; Let's visualise the process end-to-end
First Mover: Pioneer with indomitable advantage. If we launch 3G now, we'll have first mover advantage
The Big Picture: The overall situation, e.g. when working on a small aspect of a project it is helpful to remember the project as a whole.

viii. Phrase: In linguistics, a phrase is a group of words (or sometimes a single word) which forms a constituent and so function as a single unit in the syntax of a sentence. A phrase is lower on the grammatical hierarchy than a clause. The everyday understanding of the phrase is that it consists of two or more words, whereas depending on the theory of syntax that one employs, individual words may or may not qualify as phrases.

Examine the following sentence: **The house at the end of the street** is red. This phrase can be further broken down; a prepositional phrase functioning as an adjective can be identified: **at the end of the street;** Further, a smaller prepositional phrase can be identified inside this greater prepositional phrase: **of the street.** And within the greater prepositional phrase, one can identify a noun phrase: **the end of the street.** A phrase is two or more words that do not contain the **subject-verb** pair necessary to form a **clause**. Phrases can be very short or quite long. Here are two examples: i. .After lunch or Core Competence; ii. After slithering down the stairs and across the road to scare nearly to death Mrs. Philpot busy pruning her rose bushes.

ix. Metaphor: Metaphor is the concept of understanding one thing in terms of another. Metaphor is a type of analogy or figurative. In a figurative reference implied comparison is made between two unlike things that actually have something in common.

She is like a candy so sweet	He is like a refiner's fire	Her eyes twinkled like stars
He fights like a lion	Cute as a kitten	As snug as a bug in a rug
Gareth is like a lion when he gets angry	She is cute like a rose	He runs like a cheetah
She walks as gracefully as a cat	He was as hungry as a lion	He was as mean as a bull
That spider was as fat as an elephant	She wasn't as smart as Vanessa	As busy as a bee

One of the most prominent examples of a metaphor in English literature is the monologue from '**As You Like It'** of **William Shakespeare:** *All the world's a stage, And all the men and women merely players.* This quote is a metaphor because the world is not literally a stage. By figuratively asserting that the world is a stage, Shakespeare uses the points of

comparison between the world and a stage to convey an understanding about the mechanics of the world and the lives of the people within it. A metaphor as having two parts: the **tenor** and the **vehicle.** The tenor is the subject to which attributes are ascribed. The vehicle is the object whose attributes are borrowed. In ***Silapathikaram,*** the chastity of a divine woman , a Rishi Paththini, ***'Arunthathi, Rishi Vashista's*** wife is compared to **Epic Heroine *Kannaki's* Chastity reversing the poles of tenor and vehicle of metaphor in favour of the epic Heroine.**

x. Maxims: A maxim is a succinct formulation of a fundamental principle or general truth or principle, or rule of conduct or moral teaching. A close synonym to Maxim is 'Saying or Adage or Mantra, Proverb or Epithet'. Never turn your back on an enemy; everything is air-droppable at least once; only you can prevent friendly fire; your name is in the mouth of others: be sure it has teeth; that which does not kill you has made a tactical error. When the going gets tough, the tough gets going; the longer everything goes according to plan, the bigger the impending disaster; Greek or Latin, you must know.

Do you know 'A' to 'Z'? I know; to make a sentence starting with letter 'A' and ending with 'Z'. Its originality, flawlessness and fineness are tested. It is considered 67% fine by 'www.grammarly.com. **'Actually, Businesses Communicate Densely Everyday Figuring Gracious High Intents Just Kindling Lavishly Majestic Nuances Ostentatiously Positioning Quality Requirements Surpassingly Towards Ushering Vivid Willed Xenagogue Yeving Zest'** for the stakeholders to commit. You know between 'A' to 'Z' containing 26 words, articles, prepositions, conjunctions, etc, etc that are parts of speech are not used. Attempt extra-ordinary to stun!

Sum-up or Sign-out? : The list given is not exhaustive, but only inclusive. Even the stuff given under each is not exhaustive, but only inclusive. Today the world of Information Technology has given us lot more opportunities to learn and remain skilled to the contemporary world. After the 'sum-up' I 'sign-out'.

A.2. Quantitative Understanding -REMEDIAL (Slow Learners)
Arithmetic Advances: Beauty of Numbers
Algebraic Concepts and Formula
Elementary Geometry

A.2.a Arithmetic Advances: Beauty of Numbers Digit Delight!

Mathematician Ramanujam didn't have any close friends and someone asked him the reason. He replied that although he wanted to have close friends but nobody was up to his expectations. When pressed how he expected his friend to be, he replied, "like numbers 220 and 284!"

The person got confused and asked what is the connection between friendship and these numbers!

Ramanujam asked him to find the divisors of each number!

With much difficulty, the person derived and listed them as,

220 → 1,2,4,5,10,11,20,22, 44, 55,110,220

284 →1,2,4,71,142,284

Ramanujam then asked the person to exclude the numbers 220 and 284 and asked the sum of the remaining divisors.

The person was astonished to find,

220 → 1+2+4+5+10+11+20+22+44+55+110=284

284 1+2+4+71+142=220

Ramanujam explained that an ideal friendship should be like these numbers, to complement each other. Even when one is absent, the other should represent the friend !

To all my 220 & 284's..

See this Absolutely amazing Mathematics given by great Mathematician இராமானுஜம்

Nine to One Nice

1 x 8 + 1 = 9

12 x 8 + 2 = 98

123 x 8 + 3 = 987

1234 x 8 + 4 = 9876

12345 x 8 + 5 = 98765

123456 x 8 + 6 = 987654

1234567 x 8 + 7 = 9876543

12345678 x 8 + 8 = 98765432

123456789 x 8 + 9 = 987654321

Only Ones Wonder

1 x 9 + 2 = 11

12 x 9 + 3 = 111

123 x 9 + 4 = 1111

1234 x 9 + 5 = 11111

12345 x 9 + 6 = 111111

123456 x 9 + 7 = 1111111

1234567 x 9 + 8 = 11111111

12345678 x 9 + 9 = 111111111

123456789 x 9 +10= 1111111111

Enigmatic Eights

9 x 9 + 7 = 88

98 x 9 + 6 = 888

987 x 9 + 5 = 8888

9876 x 9 + 4 = 88888

98765 x 9 + 3 = 888888

987654 x 9 + 2 = 8888888

9876543 x 9 + 1 = 88888888

98765432 x 9 + 0 = 888888888

And look at this symmetry :

Strange Symmetry

1 x 1 = 1

11 x 11 = 121

111 x 111 = 12321

1111 x 1111 = 1234321

11111 x 11111 = 123454321

111111 x 111111 = 12345654321

1111111 x 1111111 = 1234567654321

11111111 x 11111111 = 123456787654321

111111111 x 111111111 = 12345678987654321

Arithmetic!! Geometry! Grandiose Trinity! Luminous Triangle! – C. de. Lautreamon

A.2.b Algebra

Elementary algebra differs from arithmetic in the use of abstractions, such as using letters to stand for numbers that are either unknown or allowed to take on many values. Algebra gives methods for solving equations and expressing formulas that are much easier than the older method of writing everything out in words.

The word *algebra* is also used in certain specialized ways. The more basic parts of algebra are called ELEMENTARY ALGEBRA and more abstract parts are called ABSTRACT ALGEBRA or MODERN ALGEBRA.

Elementary algebra is essential for any study of mathematics, science, or engineering, as well as such applications as medicine and economics. Abstract algebra is a major area in advanced mathematics, studied primarily by professional mathematicians. A mathematician who does research in algebra is called an **algebraist**.

Elementary algebra differs from arithmetic in the use of abstractions, such as using letters to stand for numbers that are either unknown or allowed to take on many values. For example, in x+2=5, the letter x is unknown, but the law of inverses can be used to discover its value: x=3. In $E=mc^2$, the letters E and m are variables, and the letter C is a constant. Algebra gives methods for solving equations and expressing formulas that are much easier than the older method of writing everything out in words.

Some Algebraic Laws with examples.

Commutative Law for Addition:

Commutative Law for Addition can be expressed as: $a + b = b + a$ *(1)*

Associative Law for Addition:

Associative Law for Addition can be expressed as: $(a + b) + c = a + (b + c)$ *(2)*

Identity Law for Addition:

Identity Law for Addition can be expressed as: $a + 0 = 0 + a$ *(3)*

Inverse Law of Addition:

Inverse Law of Addition can be expressed as: $a + (-a) = (-a) + a = 0$ *(4)*

Associative Law for Multiplication:

Associative Law for Multiplication can be expressed as: $a \cdot (b \cdot c) = (a \cdot b) \cdot c$ *(5)*

Inverse Law for Multiplication:

Inverse Law for Multiplication can be expressed as: $a \cdot (1 / a) = (1 / a) \cdot a = 1, a \neq 0$ *(6)*

Identity Law for Multiplication:

Identity Law for Multiplication can be expressed as: $(a) \cdot (1) = (1) \cdot (a)$ *(7)*

Commutative Law for Multiplication:

Commutative Law for Multiplication can be expressed as: $a \cdot b = b \cdot a$ *(8)*

Distributive Law:

Distributive Law can be expressed as; $a \cdot (b + c) = a \cdot b + a \cdot c$ *(9)*

The Identity Properties

1. **The Zero Property:** There exists a number, 0 , such that **x+0=x.** (10)
2. **The Multiplicative Identity Property:** There exists a number, 1 , such that for any number x, (x)(1)=x. Multiplying one by a number results in that number. Of course, x ≠1

Inverse Properties

The Additive Inverse: For any number, a , there exists a number x such that a + x = 0. The x must be –a.

The Multiplicative Inverse: If, a, is any number except 0, there exists a number x such that ax=1.Then x=1/a

Laws of Equality:

The Reflexive Property: X = X

The Symmetric Property: If x=y, then y=x.

The Transitive Property:

If x=y, then, x+a= y+a and ax=yx

Laws of Inequality: If x<y, then,

x+a <y+a;	If x<a and a>0, then ax<ay;	If x<y and a<0, then ax>ay.

Given, ax+b=c; Then, ax= c-b. x= (c-b)/a

Algebra is the study of the properties of numbers and the study of the things that we can do knowing those properties. Algebra is, or should be, a study in logic. Algebra is the process of using logic to draw conclusions from things we know to things that we do not know about until we apply algebraic reasoning.

Given, $ax^2+bx+c = 0$, where a, b and c are coefficients of x and x is the variable. The roots of x is computed like this:

Step 1: "Complete the Square"

Start with	$ax^2 + bx + c = 0$

Divide the equation by a	$x^2 + \frac{b}{a}x + \frac{c}{a} = 0$
Put c/a on other side	$x^2 + \frac{b}{a}x = -\frac{c}{a}$
Add $(b/2a)^2$ to both sides	$x^2 + \frac{b}{a}x + \left(\frac{b}{2a}\right)^2 = -\frac{c}{a} + \left(\frac{b}{2a}\right)^2$
*The **left hand side** is now in the **$x^2 + 2dx + d^2$** format, where "d" is "b/2a" So we can re-write it this way:*	
"Complete the Square"	$\left(x + \frac{b}{2a}\right)^2 = -\frac{c}{a} + \left(\frac{b}{2a}\right)^2$

Now we just need to rearrange the equation to leave "x" on the left

Start with $\left(x + \frac{b}{2a}\right)^2 = -\frac{c}{a} + \left(\frac{b}{2a}\right)^2$

Square root $x + \frac{b}{2a} = \pm\sqrt{-\frac{c}{a} + \left(\frac{b}{2a}\right)^2}$

Move b/2a to right $x = -\frac{b}{2a} \pm \sqrt{-\frac{c}{a} + \left(\frac{b}{2a}\right)^2}$

That is actually solved! But let's simplify it a bit:

Multiply right by 2a/2a $x = \frac{-b \pm \sqrt{-\frac{c}{a} \times (2a)^2 + \left(\frac{b}{2a}\right)^2 \times (2a)^2}}{2a}$

Simplify: $x = \frac{-b \pm \sqrt{-4ac + b^2}}{2a}$

Which is the Quadratic formula we all know and love: $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

The quadratic formula can also be derived as follows, by multiplying by 4a and re-arranging

$ax^2 + bx + c = 0$	$6x^2 - 11x + 3$
$4a^2x^2 + 4abx + 4ac = 0$	X= [- (-11) + √(-11²-4(6)(3)] / [2(6)]
$4a^2x^2 + 4abx = -4ac$	= [11) + √(121-72] / [(12)] = [11) + √(49] / [(12)]
$4a^2x^2 + 4abx + b^2 = b^2 - 4ac$	= [11+7]/[12]= 18/12= 1.5
$(2ax + b)^2 = b^2 - 4ac$	(OR)
$2ax + b = \pm\sqrt{b^2 - 4ac}$	X= [- (-11) -√(-11²-4(6)(3)] / [2(6)]
$2ax = -b \pm \sqrt{b^2 - 4ac}$	= [11) - √(121-72] / [(12)] = [11) - √(49] / [(12)] = 4/12= 1/3
$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$	If we factorise, $(2x - 3)(3x - 1)$, Putting, 2x-3 =0, we get, 2x=3; or x=3/2=1.5 & 3x-1=0, or x=1/3.

MATHEMATICAL FORMULAE

Algebra

1. $(a+b)^2 = a^2 + 2ab + b^2;\ a^2 + b^2 = (a+b)^2 - 2ab$
2. $(a-b)^2 = a^2 - 2ab + b^2;\ a^2 + b^2 = (a-b)^2 + 2ab$
3. $(a+b+c)^2 = a^2 + b^2 + c^2 + 2(ab + bc + ca)$
4. $(a+b)^3 = a^3 + b^3 + 3ab(a+b);\ a^3 + b^3 = (a+b)^3 - 3ab(a+b)$
5. $(a-b)^3 = a^3 - b^3 - 3ab(a-b);\ a^3 - b^3 = (a-b)^3 + 3ab(a-b)$
6. $a^2 - b^2 = (a+b)(a-b)$
7. $a^3 - b^3 = (a-b)(a^2 + ab + b^2)$
8. $a^3 + b^3 = (a+b)(a^2 - ab + b^2)$
9. $a^n - b^n = (a-b)(a^{n-1} + a^{n-2}b + a^{n-3}b^2 + \cdots + b^{n-1})$
10. $a^n = a.a.a \ldots n$ times
11. $a^m.a^n = a^{m+n}$
12. $\dfrac{a^m}{a^n} = a^{m-n}$ if $m > n$

    $= 1$ if $m = n$

    $= \dfrac{1}{a^{n-m}}$ if $m < n; a \in R, a \neq 0$

13. $(a^m)^n = a^{mn} = (a^n)^m$
14. $(ab)^n = a^n.b^n$
15. $\left(\dfrac{a}{b}\right)^n = \dfrac{a^n}{b^n}$
16. $a^0 = 1$ where $a \in R, a \neq 0$
17. $a^{-n} = \dfrac{1}{a^n}, a^n = \dfrac{1}{a^{-n}}$
18. $a^{p/q} = \sqrt[q]{a^p}$
19. If $a^m = a^n$ and $a \neq \pm 1, a \neq 0$ then $m = n$
20. If $a^n = b^n$ where $n \neq 0$, then $a = \pm b$
21. If $\sqrt{x}, \sqrt{y}$ are quadratic surds and if $a + \sqrt{x} = \sqrt{y}$, then $a = 0$ and $x = y$
22. If $\sqrt{x}, \sqrt{y}$ are quadratic surds and if $a + \sqrt{x} = b + \sqrt{y}$ then $a = b$ and $x = y$
23. If a, m, n are positive real numbers and $a \neq 1$, then $\log_a mn = \log_a m + \log_a n$
24. If a, m, n are positive real numbers, $a \neq 1$, then $\log_a \left(\dfrac{m}{n}\right) = \log_a m - \log_a n$
25. If a and m are positive real numbers, $a \neq 1$ then $\log_a m^n = n \log_a m$
26. If a, b and k are positive real numbers, $b \neq 1, k \neq 1$, then $\log_b a = \dfrac{\log_k a}{\log_k b}$
27. $\log_b a = \dfrac{1}{\log_a b}$ where a, b are positive real numbers, $a \neq 1, b \neq 1$
28. if a, m, n are positive real numbers, $a \neq 1$ and if $\log_a m = \log_a n$, then $m = n$

37. For an arithmetic progression (A.P.) whose first term is (a) and the common difference is (d).
    i) n^{th} term$= t_n = a + (n-1)d$
    ii) The sum of the first (n) terms $= S_n = \frac{n}{2}(a+l) = \frac{n}{2}\{2a + (n-1)d\}$ where l =last term$= a + (n-1)d$.
38. For a geometric progression (G.P.) whose first term is (a) and common ratio is (γ),
    i) n^{th} term$= t_n = a\gamma^{n-1}$.
    ii) The sum of the first (n) terms:

$$S_n = \begin{cases} \frac{a(1-\gamma^n)}{1-\gamma} & \text{if} \gamma < 1 \\ \frac{a(\gamma^n - 1)}{\gamma - 1} & \text{if } \gamma > 1 \\ na & \text{if } \gamma = 1 \end{cases}$$

39. For any sequence $\{t_n\}, S_n - S_{n-1} = t_n$ where S_n =Sum of the first (n) terms.
40. $\sum_{\gamma=1}^{n} \gamma = 1 + 2 + 3 + \cdots + n = \frac{n}{2}(n+1)$.
41. $\sum_{\gamma=1}^{n} \gamma^2 = 1^2 + 2^2 + 3^2 + \cdots + n^2 = \frac{n}{6}(n+1)(2n+1)$.
42. $\sum_{\gamma=1}^{n} \gamma^3 = 1^3 + 2^3 + 3^3 + 4^3 + \cdots + n^3 = \frac{n^2}{4}(n+1)^2$.
43. $n! = (1).(2).(3).\ldots.(n-1).n.$
44. $n! = n(n-1)! = n(n-1)(n-2)! = \ldots.$
45. $0! = 1.$
46. $(a+b)^n = a^n + na^{n-1}b + \frac{n(n-1)}{2!}a^{n-2}b^2 + \frac{n(n-1)(n-2)}{3!}a^{n-3}b^3 + \cdots + b^n, n > 1.$

If you can't simplify a number to remove a square root (or cube root etc) then it is a *surd*. Example: √2 (square root of 2) can't be simplified further so it is a **surd.**

A.2.c ELEMENTARY GEOMETRY

List of some common mathematical shapes and figures and the formulas that describe them.

Two-dimensional shapes

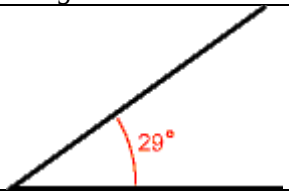
Shape	Area	Perimeter/Circumference
Square	A = side x side	P = 4 x side
Rectangle	A = l × w	P = 2l + 2w
Circle	A = π × r^2	C = 2 × π × r
Ellipse (where a is the semimajor axis & b is the semiminor axis)	A = π × a × b	
Triangle	A = ½ × b × h	P = a + b + c
Parallelogram b = base, h = height, a = side	A = b × h	P = 2a + 2b
Trapezoid (where a and b are the bases)	A = ½(a + b) × h	

Three-dimensional shapes

Shape	Volume	Surface area
Cube	$V = s^3$	$6s^2$
Rectangular Prism l = length, h = height, w = width	V = l × w × h	S = 2lw + 2l*h* + 2*wh*
Sphere	V = $(4/3)\,\pi\, r^3$	$4\pi\, r^2$
Right Circular Cylinder	V = π × r^2 × h	S = 2π rh + 2π r^2

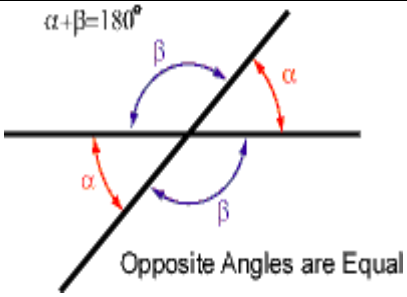
Circle [area (A) and circumference (C)]	Sphere [area (A) and volume (V)]
$C = 2\pi r$ $A = \pi r^2$ $dA = \mathrm{d}r\,\mathrm{d}\theta$	$A = 4\pi r^2$ $V = \frac{4}{3}\pi r^3$ $dA = r^2 \sin\theta\, d\theta\, d\phi;\ \mathrm{d}V = r^2 \sin\theta\, \mathrm{d}r\, \mathrm{d}\theta\, \mathrm{d}\varphi$

Angles

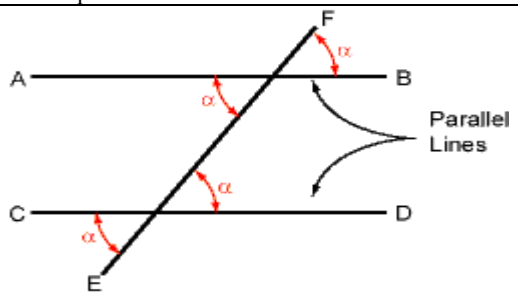
Angles can be measured in different units. Usually we express them in *degrees*:	Just as an hour can be divided into 60 minutes and a minute of time can be divided into 60 seconds, a degree can be divided into 60 *arcminutes* and an arcminute can be divided into 60 *arcseconds*:
	1° = 1 degree = 60' = 60 arcminutes 1' = 60" = 60 arcseconds, so that 1° = 3600" 2□ radians = 360□ 1 radian = 57.3□ .

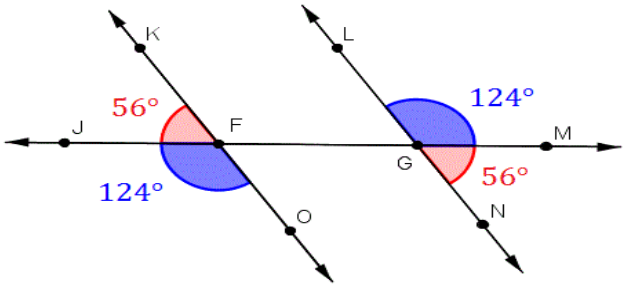
Angles and Lines

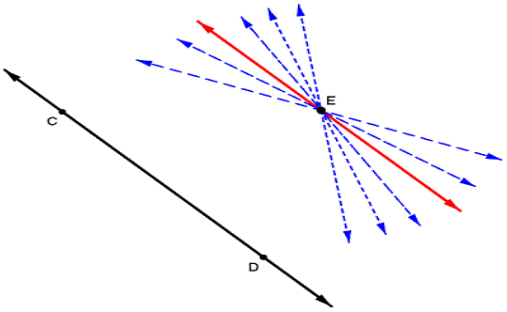
Where two lines cross 4 angles are created. Any two that are opposite eachother are equal, and any two that are adjacent sum to 180□ .



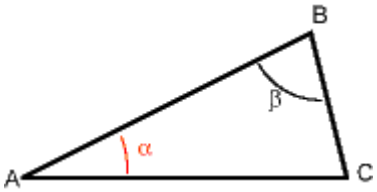
When two lines are parallel (such as *AB* and *CD* on the following figure), any line that crosses both of them (line *EF*) cuts off equal angles with the two parallel lines. Combined with the above rule, we see that all 4 angles marked in red below are equal.



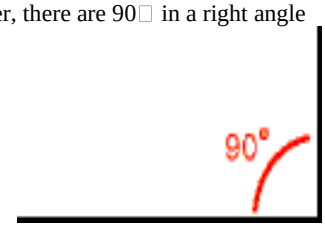




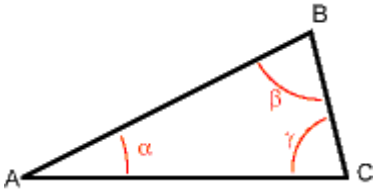
Angles can be named by different methods, too. For example, in this triangle the angle labeled □ can also be called □ BAC, and the angle labeled □ could also be called □ ABC.



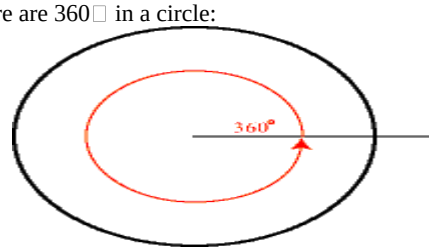
Remember, there are 90□ in a right angle



There are a total of 180□ in the three angles of a plane triangle: □ + □ + □ = 180□ :

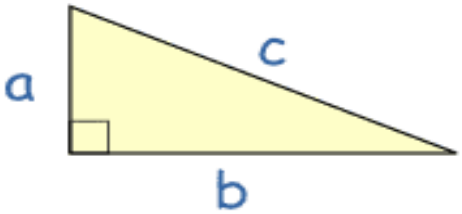


There are 360□ in a circle:



The Pythagorean Theorem sates that, *in a right triangle*, the square of a (a^2) plus the square of b (b^2) is equal to the square of c (c^2): $a^2 + b^2 = c^2$

Side 'C' is called as Hypotenuse. The longest and opposite to the right angle of the triangle.



B. SPECIAL MEASURES FOR ADVANCED LEARNERS

B.1. MYRIAD OF MEASURES

i. Special coaching classes for the progression of advanced learners to higher studies and a better job career are conducted throughout the University either centrally under the control of Director, Academic affairs or at Department levels.

ii. A UPSC training programme is offered for the students of the University through a professionally experienced training institute.

iii. UGC and CSIR NET, GATE and GRE coaching for students of Faculties of Arts, Science and Engineering are in place at various Departments.

iv. Special professional coaching classes as like Foundation Course in CA and Company Secretary ship (ACS) are also conducted.

v. A successful ICAR ARS/NET, JRF fellowship coaching to Post Graduate and Under graduate students of Faculty of Agriculture has been in vogue.

vi. The University has a long tradition of encouraging advanced learners with certificates, cash prizes and medals. Apart from this; Philanthropists are encouraged to install endowments for honouring advanced learners with medals and awards.

vii. Further, inter university level student symposiums organised by various departments (Comp Sem / InChES / MECHSEM / FENESTRA) function as a platform for showcasing the technical and soft skills of advanced learners. It further exposes them to the current research environment of the country and tones up their research acumen.

viii. The ever-enthusiastic advanced learners are encouraged by the teaching faculty to undertake research career and are guided in tuning their research aptitude. This was exemplified by the publication of many research articles in journals of repute by the advanced learners.

ix. Further, active participation in National or International seminars, conferences and workshops is always encouraged through concessional registration fees and large posse of interested students participate in these events.

x. The scientific urges of students are also met through department level forums functioning with a motto to foster their innovation.

xi. University offers ample scope to students of all faculties to plan their career building through the choice of selection of **Inter Department Electives (IDEs) and Value-Added Courses (VACs)** offered across the ten faculties of varied academic standings.

xii. Varied choice in choosing IDEs / VACs helps advanced learners to tailor make their skill set with intra disciplinary expertise and enable them to become front runners in job market.

B.2 ENGLISH ELOQUENCE

B.2.a EPOCH MAKING PRESENTATIONS

Acronyms Abundant	Authoritative Quotes Avalanche
Clichés Galore	Literary Excerpts Laminate
Designs Stun	Idioms/ Phrases Enormous
Jargons Tangle	Maxims And Axioms Alternate
Creativity Stagger	'Verbatim &Thus Spoke' Overwhelm
Metaphors Manifest	Regional Niches & Nuances Nimble
Diversity Lavish	Global Contours & Contexts Converge

Epoch making presentations: You want your works stand distinct. You can do it. Proliferate your work with appropriate '**Axioms, Maxims, Clichés, Idioms, Metaphors, Phrases, Quotes, Similes, etc'**, as may be needed, keeping in mind the audience or target readers. Quotations make one's presentation, voice or written or PPT rich and resounding.

i. ACRONYMS

The term *acronym* is the name for a word from the first letters of each word in a series of words (such as sonar, created from **SO**und **N**avigation **A**nd **R**anging. An acronym is an abbreviation formed from the initial components in a phrase or a word. These components may be individual letters (as in CEO) or parts of words (as in Benelux). There is no universal agreement on the precise definition of various names for such abbreviations) nor on written usage. In English and most other languages, such abbreviations historically had limited use, but they became much more common in the 20th century.

Acronyms are a type of world formation process, and they are viewed as a subtype of blending . Although the term *acronym* is widely used to refer to any abbreviation formed from initial letters,[4] some dictionaries define *acronym* to mean "a word" in its original sense. The distinction, when made, hinges on whether the abbreviation is pronounced as a word, or as a string of letters.

Acronyms sprout up every day. There are Popular acronyms like ASAP, FYI, KPI, OPM, etc. and Numerals Substitute Alphabets like: B2C, UP2UP, B4U.

A SAMPLE LIST OF ACRONYMS	
AOB - Any Other Business	AKA – Also Known As
ASAP - As Soon As Possible	BAU - Business As Usual
B2B - Business to Business	B2C - Business to Consumer
COB - Close of Business	DBA - Doing Business As


ETA - Estimated Time of Arrival	EOD - End Of Day
EOM - End of Message	FTE - Full Time Equivalent
FYI - For Your Information	FYIA - For Your Immediate Action
F2F - Face to Face	JAMPoJ - Just Another Mediocre Piece of Junk
KPI - Key performance indicators	MBO- Management by Objectives
MBE- Management by Exception	MOM - Minutes Of Meeting
NDA - Non-disclosure Agreement	OBE - Overtaken By Events
OPM - Other People's Money	OPR - Other People's Resources
OOO / OOTO - out of (the) office	POS - Point Of Sale
PTO - Paid Time Off	POP - Point of Purchase
QSC - Quality, Service, Cleanliness	ROI - Return On Investment
RTM - Release To Manufacturing	SBU - Strategic Business Unit
SME - Subject Matter Expert	SOB - START OF BUSINESS
SBI - Site Build It!	SFI - Six-Figure Income
SOD - Start Of Day	SOW - Statement of work
TBA - To Be Approved	TBB – To Be Brought
TBC - To Be Confirmed	TBD - To Be Delivered
TBH - To Be Hired	TQM- Total Quality Management
3PL - Third Party Logistics	USP - Unique Selling Proposition

Pronounced as a word, containing only initial letters

AIDS: Acquired immune deficiency syndrome	**Scuba**: Self-contained underwater breathing apparatus
NATO: North Atlantic Treaty Organization	**Laser:** Light Amplification by Stimulated Emission of Radiation

Pronounced as a word, containing non-initial letters

Nabisco: National Biscuit Company	**Interpol:** International Criminal Police Organization

Pronounced as a word, containing a mixture of initial and non-initial letters

Radar: Radio detection and ranging	**RFID:** Radio Frequency Identification

Pronounced as a word or as a string of letters, depending on speaker or context

FAQ: frequently asked question	SQL: Structured Query Language.

Pronounced as a combination of spelling out and a word

CD-ROM: Compact Disc read-only memory	**IUPAC:** (*i*-*u*-[pæk]) International Union of Pure & Applied Chem.

JPEG: Joint Photographic Experts Group	**SFMOMA:** (*ess-ef*-[moʊmə]) San Francisco Museum of Modern Art

Pronounced only as a string of letters

BBC: British Broadcasting Corporation	**OEM:** Original Equipment Manufacturer

Pronounced as a string of letters, but with a shortcut: AAA:

(*triple A*) American Automobile Assn.	**(*three As*)** Amateur Athletic Association
E3: (*E three*) Electronic Entertainment Exposition	**IEEE**: (*I triple E*) Institute of Electrical & Electronics Engineers

Pseudo-acronyms, which consist of a sequence of characters that, when pronounced as intended, invoke other, longer words with less typing (see also Internet slang)

CQ: *cee-cue* for "seek you", a code used by radio operators	**Q8:** *cue-eight* for "Kuwait"
K9: *kay-nine* for "canine", used to designate police units utilizing dogs	**IOU:** "I owe you" (a true acronym would be IOY)

Acronyms whose last abbreviated word is often redundantly included anyway

ATM machine: *Automated Teller Machine* machine	**HIV** virus: *Human Immunodeficiency Virus* virus
PIN number: *Personal Identification Number* number	**LCD** : *Liquid Crystal Display*

STUPID- Super Talented Unique Person In Demand

ii. AUTHORITATIVE QUOTES

- A fool thinks himself to be wise, but a wise man knows himself to be a fool - **William Shakespeare**
- Cowards die many times before their deaths;The valiant never taste of death but once- **William Shakespeare**
- Action is eloquence- **William Shakespeare**
- Be great in act, as you have been in thought. **William Shakespeare**
- How poor are they who have not patience! What wound did ever heal but by degrees. **William Shakespeare**
- Always bear in mind that your own resolution to succeed is more important than any one thing- **Abraham Lincoln**

- I don't think much of a man who is not wiser than he was yesterday. **Abraham Lincoln**
- No man has a good enough memory to make a successful liar **Abraham Lincoln**
- The task of a University is the creation of the Future - **Thomas Huxley**
- Any piece of knowledge I acquire today has a value at this moment exactly proportioned to my skill to deal with it- **Mark van Doren**
- A love for tradition has never weakened a nation, indeed it has strengthened nations in their hour of peril.-Sir **Winston Churchill**
- He has all the virtues I dislike and none of the vices I admire. **-Sir Winston Churchill**
- All great things are simple, and many can be expressed in single words: freedom, justice, honor, duty, mercy, hope. **-Sir Winston Churchill**
- No one is useless in this world who lightens the burdens of another. **Charles Dickens**
- Subdue your appetites, my dears, and you've conquered human nature- **Charles Dickens**
- Do not worry about your difficulties in Mathematics. I can assure you mine are still greater.- **Albert Einstein**
- I know not with what weapons World War III will be fought, but World War IV will be fought with sticks and stones- **Albert Einstein**
- Imagination is more important than knowledge. For while knowledge defines all we currently know and understand, imagination points to all we might yet discover and create - **Albert Einstein**
- I never teach my pupils. I only attempt to provide the conditions in which they can learn- **Albert Einstein**
- Only two things are infinite, the universe and human stupidity, and I'm not sure about the former- **Albert Einstein**
- The secret to creativity is knowing how to hide your sources- **Albert Einstein**
- A people that values its privileges above its principles soon loses both. **Dwight D. Eisenhower**
- Hate the sin, love the sinner-**Mahatma Gandhi**

- Strength does not come from physical capacity. It comes from an indomitable will- **Mahatma Gandhi**
- The weak can never forgive. Forgiveness is the attribute of the strong. **Mahatma Gandhi**
- An investment in knowledge always pays the best interest- **Benjamin Franklin**
- Anger is never without Reason, but seldom with a good One- **Benjamin Franklin**
- A hero is no braver than an ordinary man, but he is braver five minutes longer.**Ralph Waldo Emerson**
- Let us never negotiate out of fear but let us never fear to negotiate. **John F. Kennedy**
- The ancient Greek definition of happiness was the full use of your powers along lines of excellence- JF. Kennedy
- One can never consent to creep when one feels an impulse to soar- **Helen Keller**
- Everything has its wonders, even darkness & silence, I learn whatever state I am in, therein to be content- **Keller**
- In the end, we will remember not the words of our enemies, but the silence of our friends.**Martin Luther King Jr.**
- Injustice anywhere is a threat to justice everywhere **Martin Luther King Jr.**
- We do not write because we want to; we write because we have to- **Martin Luther King Jr.**
- Wise men talk because they have something to say; fools, because they have to say something- **Plato**
- Patriotism means to stand by the country. It does not mean to stand by the president.- **Theodore Roosevelt**
- To educate a man in mind and not in morals is to educate a menace to society- **Theodore Roosevelt**
- Advertising is the modern substitute for argument; its function is to make the worse appear the better- **Santayana**
- Character is the basis of happiness and happiness the sanction of character- **George Santayana**
- A life spent making mistakes is not only more honorable, but more useful than a life

spent doing nothing- **GB.Shaw**

- Shaw Democracy is a device that ensures we shall be governed no better than we deserve- **George Bernard Shaw**
- By all means marry; if you get a good wife, you'll be happy. If you get a bad one, you'll become a philosopher-**Socrates**
- Death may be the greatest of all human blessings- Thou shouldst eat to live; not live to eat- **Socrates**
- Cultivate the habit of early rising. It is unwise to keep the head long on a level with the feet- **Henry David Thoreau**
- If you would convince a man that he does wrong, do right. Men will believe what they see- **Henry David Thoreau**
- The woods are lovely, dark, and deep, But I have promises to keep And miles to go before I sleep, And miles to go before I sleep - **Robert Frost**
- Two roads diverged in a wood, and I-- I took the one less traveled by And that has made all the difference. **Robert Frost.**

iii. AXIOMS

An **axiom** or **postulate** is a premise or starting point of reasoning. As classically conceived, an axiom is a premise so evident to be accepted as true without controversy. The word comes from a Greek word meaning 'that which is thought ‘worthy’ or fit,' or 'that which commends itself as evident. As used in modern logic, an axiom is simply a premise or starting point for reasoning. Axioms define and delimit the realm of analysis; the relative truth of an axiom is taken for granted within the particular domain of analysis, and serves as a starting point for deducing and inferring other relative truths. No explicit view regarding the absolute truth of axioms is ever taken in the context of modern mathematics, as such a thing is considered to be an irrelevant and impossible contradiction in terms.

Logical axioms are usually statements that are taken to be true within the system of logic they define (e.g., (*A* and *B*) implies *A*). A non-logical axiom is not a self-evident truth, but rather a formal logical expression used in deduction to build a theory. To axiomatize a system of knowledge is to show that its claims can be derived from a small, well-understood set of sentences (the axioms). There are typically multiple ways to axiomatize a given domain. However, an axiom in one system may be a theorem in another, and vice versa.

The word ‘axiom’ comes from the Greek word, *axioma*, a verbal noun from the verb (axioein) (*axioein*), meaning "to deem worthy", but also "to require", which in turn comes from (*axios*), meaning "being in balance", and hence "having (the same) value (as)", "worthy", "proper". Among the ancient Greek Philosophers an axiom was a claim which could be seen to be true without any need for proof.

An "axiom", in classical terminology, referred to a self-evident assumption common to many branches of science. A good example would be the assertion that:

i. *When an equal amount is taken from equals, an equal amount results.*

ii. To quote in Sanskrit the scriptures, "Poornamatha, Poornamitham, Poornath Poornameva Udhachyathe; Poornasya Poornamadhaya Poornameva Avasishyathe ". The meaning of these lines: The Universe is full there and here and what comes out of fullness is also full. If a part is taken out from the full, the remaining part is also full." Sruti tells us that even a fraction of the SupremeBeing is whole and complete by itself.' It sounds mind boggling! Not really.

iii. It is possible to draw a straight line from any point to any other point.

iv. It is possible to extend a line segment continuously in both directions.

v. It is possible to describe a circle with any center and any radius.

vi. It is possible to depict a portfolio by its return and risk.

vii. It is true that all right angles are equal to one another.

viii. If equals are subtracted from equals, the remainders are equal.

ix. Things which coincide with one another are equal to one another.

x. The whole is greater than the part.

iv. CLICHÉS

A Cliché is a trite or commonplace phrase or stereotype. It is an expression and the idea expressed by it like a hackneyed theme, characterization, or situation. It is also used as an adjective. The Synonyms **are:** banality, bromide, chestnut, commonplace, groaner, homily, platitude, shibboleth, trope, truism.

A cliché can be two things: **An overused expression**, something that is said a lot that has become some common, it no longer really has any relevance or is even noticed in conversation. Phrases such as "to this day" or "next thing I knew" are examples of such a cliché, and you often say these phrases without noticing you are doing so. **An idea with a different meaning** from its literal meaning. For example, the phrases "sweaty palms" or "twinkling eyes" have come to mean more than the fact that your palms are just sweaty or that your eye's have a twinkle. When you say someone has sweaty palms, everyone knows you mean "he is nervous" because the expression has become a cliché.

There are thousands of clichés in the world. Clichés come from all over the world. They can be interpreted differently, depending on your cultural knowledge and identity. Many of them have meanings that you can obviously see, but some have meanings that are only clear if you know the context. For example, the cliché, "any port in a storm" has a hidden meaning. The obvious meaning is that, in a bad situation, anything will do. However this cliché can also be used to say that a man has many friends or lovers. Often, a cliché starts with a smart remark that ends up becoming very well known. Even if the origin is unclear, it's clear to see that clichés are a popular form of expression.

Clichés and Idioms

Clichés are often idioms. Idioms are figurative phrases with an implied meaning; the phrase is not to be taken literally. This causes difficulty when translating to another language because the meaning may not be understood by people within that culture.

Clichés can be true or not and some are stereotypes. Clichés can be figurative or literal and are overused. An example of a figurative cliché is "raining cats and dogs", meaning it is raining heavily. A literal cliché would be "to tell the truth" because you are going to do just that. A figurative idiom can become a cliché if it is used often enough in our language.

Some clichés that refer to time include:

- Time will tell: This means that something will revealed or become clear over time
- In the nick of time: This means something happened just in time
- Lost track of time: This means you stopped paying attention to the time or to how long something was taking
- Lasted an eternity: This refers to something that lasts for a very long time (or that feels like it does)
- A matter of time: This refers to something that will eventually happen or eventually become clear
- A waste of time: This refers to something that was silly or not valuable to do
- Rushed for time: This means you do not have sufficient time to do something
- In a jiffy: This means something will happen soon
- The time of my life: This refers to a really great time
- At the speed of light: This means something done very quickly.

Clichés that Describe People

Some clichés that describe people include:

- As old as the hills: This describes someone very old
- Fit as a fiddle: This describes someone in great shape
- Without a care in the world: This describes someone who is not plagued by problems or worries
- A diamond in the rough: This describes someone who has a great future.
- Brave as a lion: This describes a very brave person.
- Weak as a kitten: This describes a very weak person.

Clichés About Life, Love and Emotions

- Opposites attract: This means that people who like different things and have different views are likely to fall in love or to become friends
- Scared out of my wits: This describes being very frightened
- Frightened to death: This also describes being very frightened
- All is fair in love and war: This cliché stands for the premise that you can do whatever you have to in order to capture the heart of your lover
- All's well that ends well: This means that even if there were problems along the way, it doesn't matter as long as there is a happy ending
- Every cloud has a silver lining: This means that even when bad things happen, it may be possible to find some good in them
- Haste makes waste: This cliché stands for the premise that you will make mistakes when you

do things too quickly

- The writing on the wall: This refers to something that should be clear or apparent and that is essentially a foregone conclusion
- Time heals all wounds: This means that all pain and suffering will get better over time
- What goes around comes around: This cliché teaches the lesson that the way you treat others will eventually be the way you are treated
- When you have lemons, make lemonade: This cliché encourages you to have a positive attitude even when things are going bad.

Favorite Clichés

There are numerous examples of clichés. Some clichés can be poetic, such as Shakespeare's, "A rose by any other name would smell as sweet." This phrase became so popular and widely used, that Shakespeare created a new cliché. Other favorite English clichés include:

"All that glitters is not gold"	"Don't get your knickers in a twist"	"All for one, and one for all"

In America, clichés are commonly used as well. For example:

Having "nerves of steel"	"Tail between his legs"	
To "make up"	"Can it"	The quiet before the storm

Hidden Meanings in Clichés

Context-Driven Meanings

Some clichés can be interpreted differently based on the context.

For example:

- "Do you think I am made of money?" implies that you don't have any money.
- "I feel as if I am made of money" suggests just the opposite.

Interpretation-Driven Meanings

Not all clichés are necessarily true either. Some are a matter of interpretation.

For example:

- "In experience comes wisdom and with wisdom comes experience" is not necessarily accurate in every case.

So there are many examples of clichés, and different meanings and interpretations come into play with every cliché. As time goes on, you may interpret them differently, and even create some clichés of your own.

Cliché	A rose by any other name would smell as sweet
Explanation	Even though you call something by another name, it doesn't change what it is.
Cliché	boil the ocean
Explanation	Clearly the least efficient way to produce a pile of salt. If a member of the corporate pantheon suggests you are trying to "boil the ocean," he or she thinks you are doing something incredibly inefficiently.
Cliché	bring to the table
Explanation	Refers to what one offers or provides, especially in negotiations. Personally, I bring a fork!!
Phrase	**Peel the onion**
Explanation	To conduct a layer-by-layer analysis of a complex problem and in the process, reduce yourself to tears.
Cliché	soup to nuts
Explanation	To build every aspect of something from beginning to end. An integrated approach.
Cliché	circle back around
Explanation	A very roundabout (pardon the pun) way of saying "Let's regroup later to discuss."
Cliché	**wetware**
Explanation	That is, a human-based solution, as opposed to a hardware, or silicon-based, solution.
Cliché	win-win
Explanation	It's a win for us; it's a win for them. Everyone's happy and drinking the Kool-Aid.
Cliché	paradigm shift
Explanation	Paradigm is an extra fancy word for "model." A paradigm shift means moving from one model to a new one, generally in a grand, expensive, and ultimately disastrous manner
Cliché	At the end of the day
Explanation	"At the end of the day, it's our people that make the difference.".
Cliché	Beauty is only skin deep
Explanation	Beauty is just outward; has no interior or depth
Cliché	beggars can't be choosers
Explanation	Take whatever is available
Cliché	birds of a feather flock together
Explanation	One joins one’s group or class

i. GREEKS/ LATINS

Spice with Greek and Latin Phrases: You know, in my 10th Standard 'Algebra & Geometry' classes in SRH School Thiruvaiyaru, my great teacher Late (by effect eternal) Sri N.Krishnamurthy would write 'QED' at the end of Proof and tell, *'Quod Erat Demonstrandum'*. I captured the acronym well, but only faintly its meaning then. I mined the real purport of the Latin Phrase while doing my Ph.D. I got that this is the phrase traditionally placed in its abbreviated form at the end of a proof or argument. But for my great teacher I would not have encountered the phrase and learnt the same. I cherish him; salute him. This is where a great teacher stands out among good teachers.

Similarly when I noticed, 'RSVP' on many invitations to my Professor Late (immortal by impact) Dr.M.O.Mathew of Annamalai University during early 1980s, I searched and got the acronym as, *'Respondez S'il Vous Plait'*, meaning Reply, if You Please. Every stimulus to learn must be stretched to right end. *Ab Initio* (from the beginning), *Raison d'être* (Reason for Existence), *Quid Pro Quo* (something in return), *Ceteris paribus* (other things being equal), *consensus ad idem* (mutual understanding), *Magna Carta* (Great Charter), Sine Qua Non (indispensable/essential action), etc are some Greek and Latin phrases that add spice to your presentation in English.

- Communication uses lots of phrases from Latin/Greek languages.
- These are common in legal Dictionary.
- Earlier these were very much in vogue.
- Now the trend is in a waning phase.
- A few of them are presented now.

Ab extra	From outside/without
Ab Initio	From the beginning
Laborare est orare	Work is Prayer
Modus operandi	Mode of Operation
Quod Erat Demonstrandum (QED)	That which is to be proved
Respondez s'il vous plait (RSVP)	Reply if you please
Quid Pro Quo	Something in Return
Raison d'être	Reason for Existence
Ceteris paribus	All other things being equal
consensus ad idem	Mutual agreement
Ad litem	Court nominated Representative for a Party
Caveat emptor	Let the buyer beware
Essentialia negotii	Essential aspects
Contra proferentem	An ambiguous term in a contract will be construed against the party that imposed it.

De facto /De jure	by the fact or In reality / concerning law or as per the law
delegata potestas non potest delegari	no delegated powers can be further delegated
ex-ante/ex-post	Before the event / after the event
Duorum in solidum dominium vel possessio esse non potest	Sole ownership or possession cannot be in two persons in entirety
Contra principia negantem non est disputandum	Against one who denies the principles, there can be no debate
Ad litem	Court nominated Representative for a Party
Caveat emptor	Let the buyer beware
Habeas corpus	you should arrest/search and bring the person
In absentia	In the absence

ii. IDIOMS

An idiom is a group of words in current usage having a meaning that is not deducible from those of the individual words. For example, "to rain cats and dogs" - which means "to rain very heavily" - is an idiom; and "over the moon" - which means "extremely happy" - is another idiom. In both cases, you would have a hard time understanding the real meaning if you did not already know these idioms!

Idioms are either opaque or transparent:

- Opaque - When you translate an opaque idiom, it will not make sense because the literal meaning is nothing like the real meaning. An example of an opaque idiom is “bag of bones,” which means someone is very underweight.
- Transparent - A transparent idiom has similarities between the literal and the expression. For example, “playing your cards right” is an expression that actually came from card games but that can apply to other situations.

An **idiom** (Latin: *idioma*, "special property", f. Greek: *ἰδίωμα – idiōma*, "special feature, special phrasing", f. Greek: *ἴδιος – idios*, "one’s own") is a rendition of a combination of words that have a figurative meaning. The figurative meaning is comprehended in regard to a common use of the expression that is separate from the literal meaning or definition of the words of which it is made. Idioms are numerous and they occur frequently in all languages. There are estimated to be at least 25,000 idiomatic expressions in English literature.

The following sentences contain idioms. The fixed words constituting the idiom in each case are bolded;

a. She is **pulling** my **leg**. - *to pull someone's leg* means to tease them by telling them something untrue.

b. She **took** me **to the cleaners**. - *to take someone to the cleaners* means to cause them to lose a lot of money.

c. When will you **drop** them **a line**? - *to drop someone a line* means to phone or send a note to someone.

d. You should **keep an eye out for** that. - *to keep an eye out for something* means to watch for it.

e. I can't **keep** my **head above water**. - *to keep one's head above water* means to manage a situation.

Each of the word combinations in bold has at least two meanings: a literal meaning and a figurative meaning. *Pulling someone's leg* means either that you literally grab their leg and yank it, or figuratively, it means that you tease them by telling them a fictitious story. Such expressions that are typical for a language can appear as words, combinations of words, phrases, entire clauses, and entire sentences. Idiomatic expressions in the form of entire sentences are called proverbs], if they refer to a universal truth e.g.

f. **The devil is in the details**.	i. **Waste not, want not**.
g. **The early bird gets the worm**.	**j. Back to square one:** (If you have to go back to square one, you have to stop and start again, usually because something isn't working as well as expected)
h. **Break a leg**. (Good Luck)	

Proverbs such as these have figurative meaning. When one says "The devil is in the details", one is not expressing a belief in demons, but rather one means that things may look good on the surface, but upon scrutiny, problems are revealed.

Some idioms, in contrast, are transparent. Much of their meaning does get through if they are taken (or translated) literally. For example, *lay one's cards on the table* meaning to reveal previously unknown intentions, or to reveal a secret. Transparency is a matter of degree; *spill the beans* (to let secret information become known) and *leave no stone unturned* (to do everything possible in order to achieve or find something) are not entirely literally interpretable, but only involve a slight metaphorical broadening. Another category of idioms is a word having several meanings, sometimes simultaneously, sometimes discerned from the context of its usage.

Zero-sum game	A zero-sum game is a situation in which any gain by one side or person is at the expense of a loss to another side or person involved in the situation.
Against all odds, or against all the odds	If you do something against all odds, or against all the odds, you do it even though there were many problems and it didn't seem possible to do.
Behind the eight ball	If you're behind the eight ball, you're in a difficult or dangerous position.

Dressed up to the nines	If you are dressed to the nines, or dressed up to the nines, you are wearing very smart clothes for a special occasion.
Have forty winks	If you have forty winks, you have a short sleep, or a nap.
Have second thoughts	If you're having second thoughts about something, you're having doubts about a decision you've made.
"I owe you one"	You can say "I owe you one!" when someone has done something for you and you'd be happy to return the favour one day.
In two minds	If you're in two minds about something, you can't decide what to do, or you can't decide which option is the best.
Kill two birds with one stone	If you kill two birds with one stone, you achieve two things with the one action.
Once and for all	If you do something once and for all, you do it in a way that's final and it means you'll never have to do it again.
Once in a blue moon	If something happens once in a blue moon, it happens very rarely.
One in a million	If you say someone is "one in a million", you mean they're an exceptionally good person
Par for the course	If something is par for the course, it's what you'd expect it to be.
Put all your eggs in the one basket	If you put all your eggs in the one basket, you put all your efforts or resources into one person, one thing or one plan, and if things don't work out, you lose everything.
"The year dot", or "the year one	You can say "the year dot", or "the year one", when you're talking about a very, very long time ago.
Zero in on	If you zero in on something, you focus your attention on it.

iii. PHRASES

A **phrase** may refer to any group of words. In linguistics, a phrase is a group of words (or sometimes a single word) that form a constituent and so function as a single unit in the syntax of a sentence. A phrase is lower on the grammatical hierarchy than a clause. The everyday understanding of the phrase is that it consists of two or more words, whereas depending on the theory of syntax that one employs, individual words may or may not qualify as phrases. Examine the following sentence: The words in bold form in the following sentence is a phrase, together acting like a noun: **The house at the end of the street** is red.

This phrase can be further broken down; a prepositional phrase functioning as an adjective

can be identified: **at the end of the street;** Further, a smaller prepositional phrase can be identified inside this greater prepositional phrase: **of the street.** And within the greater prepositional phrase, one can identify a noun phrase: **the end of the street.**

Phrases can be identified by constituency test, such as proform substitution (=replacement). For instance, the prepositional phrase *at the end of the street* could be replaced by an adjective such as *nearby*: *the nearby house* or even *the house nearby*. *The end of the street* could also be replaced by another noun phrase, such as *the crossroads* to produce *the house at the crossroads*.

Heads and dependents: Most phrases have an important word defining the type and linguistic features of the phrase. This word is the head of the phrase and gives its name to the phrase category. The heads in the following phrases are in bold:

Too **slowly**: Adverb phrase (AdvP);Very **happy** - Adjective phrase (AP); A massive **dinosaur** - Noun phrase (NP) **At** lunch - Preposition phrase (PP); **Watch** TV - Verb phrase (VP) **before** that happened - Subordinator phrase (SP)

The head can be distinguished from its *dependents* (the rest of the phrase other than the head) because the head of the phrase determines many of the grammatical features of the phrase as a whole. The examples just given show the five most commonly acknowledged types of phrases. Further phrase types can be assumed, although doing so is not common. For instance one might acknowledge subordinator phrases:

This "phrase" is more commonly classified as a full subordinate clause and therefore many grammars would not label it as a phrase. If one follows the reasoning of heads and dependents, however, then subordinate clauses should indeed qualify as phrases. Most theories of syntax see most if not all phrases as having a head. Sometimes, however, non-headed phrases are acknowledged. If a phrase lacks a head, it is known as exocentric, whereas phrases with heads are endocentric.

A phrase is two or more words that do not contain the **subject-verb** pair necessary to form a **clause**. Phrases can be very short or quite long. Here are two examples: i. .After lunch; ii. After slithering down the stairs and across the road to scare nearly to death Mrs. Philpot busy pruning her rose bushes

iv. JARGONS

Using Jargons has become a sort of style or ‘punch-line’. Jargons are ‘idioms’ and ‘phrases’ that are contour descriptions or otherwise. The most important things are the hardest to say, because words diminish them. Stephen King.

Corporate Jargons Tangle
Best of Breed: To surpass in this market, we'll need to maintain our status of the ‘best of breed’. Similar: Best in class.

Big Hitter: Someone powerful within the confines of the company. Variant: Hard hitter. I'm awe struck of that Exec. He's a really Big Hitter. Like Tendulkar?
Blue Sky Thinking: Let's start with a blank sheet of paper and do some blue sky thinking and see what happens. Come up with ideas, no preconceptions, no guillotines, no dismissing, on limits.
Bottom Out: Used as a verb to indicate that something needs to be done urgently; **Also:** It has reached its bottom
Core Competencies: A jargon contributed by Prof.C.K.Prahalad to the world of business. What you/your company does well that others can't imitate easily. We need to focus on our core competencies in order to maintain our edge in the marketplace
Bottom-line and top-line: Net Profit and Total Sales, respectively.
Cutting Edge: This is the most recent and versatile version giving the competitive advantage.
End to End: Let's work out the whole process; Let's visualise the process end-to-end
First Mover: Pioneer with indomitable advantage. If we launch 3G now, we'll have first mover advantage
Going Forward: In the future. I think it's important that, going forward, you continue to manage the project pro-actively.
Go To Market: Cross your fingers; We need to update our go-to-market strategy.
Granular: Details or detail-oriented; We need to focus on the nitty-gritty and those in 'finer prints' as well
Green Shoe Option: A portion of excess subscription to shares/bonds issued that is retained by the company
Joined Up and High-level: Looking at things from the wider point of view rather than with a narrow focus/ Taking an overall view rather than looking at the nitty-gritty detail
2.0 — 'two point oh': A phrase referring to next generation ideas and processes, such as, "It's time we rolled out our 2.0 branding for this campaign" and "Web 2.0".
Leverage: Getting added value out of a certain situation for you/your project goals
Low Hanging Fruit: The bits that can be done quickly and easily but still have an effect. We started off by removing the low hanging fruit, before looking at the tougher problems
Manage Expectations: Make sure people expect realistic outcomes from a project - e.g. not too much
Seamless: Easy relationship/communication with us
State of the Art: Really good, the best, most modern solution
Take offline: Discuss the point further outside the meeting / at another time.
Take ownership: You need to get a grip and be responsible for the piece of work

Team Player: Someone who is not just out for themselves but works well with others and has a concern for their well-being
The Big Picture: The overall situation, e.g. when working on a small aspect of a project it is helpful to remember the project as a whole.

v. LITERARY EXCERPTS

- "A fool thinks himself to be wise, but a wise man knows himself to be a fool"- **William Shakespeare**
- "The task of a University is the creation of the Future"- **Thomas Huxley**
- "Any piece of knowledge I acquire today has a value at this moment exactly proportioned to my skill to deal with it"- **Mark van Doren**
- "Imagination is more important than knowledge. For while knowledge defines all we currently know and understand, imagination points to all we might yet discover and create" - **Albert Einstein**
- ***அன்பு சிவம் இரண்டு என்பர் அறிவிலார்; அன்பே சிவமாவது ஆரும் அறிகிலார்***
- ***அன்பே சிவமாவது ஆரும் அறிந்தபின்; அன்பே சிவமாய் அமர்ந்திருந்தாரே.***
- ***குருட்டினை நீக்கும் குருவினைக் கொள்ளார்; குருட்டினை நீக்காக் குருவினைக் கொள்வர் குருடும் குருடும் குருட்டாட்டம் ஆடிக்; குருடும் குருடும் குழிவிழுமாறே.***
- ***மரத்தை மறைத்தது மாமத யானை; பரத்தின் மறைந்தது மாமத யானை பரத்தை மறைத்தது பார் முதல் பூதம்; பரத்தின் மறைந்தது பார் முதல் பூதமே.***
- "Never was so much owed by so many to so few"- **British Prime Minister, Winston Churchill**
- My fellow Americans, ask not what your country can do for you, ask what you can do for your country- **John F. Kennedy**
- "Liberty, when it begins to take root, is a plant of rapid growth- **George Washington**
- "That government is best which governs the least, because its people discipline themselves.- **Thomas Jefferson**
- "The individual who refuses to defend his rights when called by his government, deserves to be a slave, and must be punished as an enemy of his country and friend to

her foe- **Andrew Jackson**

- "I pray Heaven to bestow the best of blessing on this house (the White House) and on all that shall hereafter inhabit it. May none but honest and wise men ever rule under this roof!- **John Adams**
- "The only man who makes no mistake is the man who does nothing- **Theodore Roosevelt**
- "A pessimist is one who makes difficulties of his opportunities and an optimist is one who makes opportunities of his difficulties- **Harry S. Truman**

vi. METAPHOR

Metaphor is the concept of understanding one thing in terms of another. A **metaphor** is a figure of speech that describes a subject by asserting that it is, on some point of comparison, the same as another otherwise unrelated object. Metaphor is a type of analogy and is closely related to other rhetorical figure of speech that achieve their effects via association, comparison or resemblance including **allegory, hyperbole and simile.** A figure of speech in which an implied comparison is made between two unlike things that actually have something in common. Adjective of metaphor is metaphorical.

Allegory is a device in which characters or events in a story, poem, or picture represent or symbolize ideas and concepts. Allegory has been used widely throughout the history of art, and in all forms of artwork. A reason for this is that allegory has an immense power of illustrating complex ideas and concepts in a digestible, concrete way.

Hyperboles are exaggerations to create emphasis or effect. As a literary device, hyperbole is often used in poetry, and is frequently encountered in casual speech. An example of hyperbole is: "The bag weighed a ton." Hyperbole makes the point that the bag was very heavy, though it probably doesn't actually weigh a ton.

A **simile** is a figure of speech that directly compares two different things, usually by employing the words "like" or "as" – also, but less commonly, "if", or "than". A simile differs from a metaphor in that the latter compares two unlike things by saying that the one thing *is* the other thing. Where a metaphor asserts the two objects in the comparison are identical on

the point of comparison, a simile merely asserts a similarity. For this reason a metaphor is generally considered more forceful than a simile. A simile can explicitly provide the basis of a comparison or leave this basis implicit. In the implicit case the simile leaves the audience to determine for themselves which features of the target are being predicated. It may be a type of sentence that uses 'as' or 'like' to connect the words being compared.

- She is like a candy so sweet. He is like a refiner's fire. Her eyes twinkled like stars.
- He fights like a lion. Her eyes were like two brown circles with big black dots in the center.
- Gareth is like a lion when he gets angry. She is cute like a rose. He runs like a cheetah.
- She walks as gracefully as a cat. He was as hungry as a lion. He was as mean as a bull.
- She wasn't as smart as Vanessa. That spider was as fat as an elephant.
- Cute as a kitten. As busy as a bee. As snug as a bug in a rug.

In simpler terms, a metaphor compares two objects or things without using the words "like" or "as". One of the most prominent examples of a metaphor in English literature is the *All the world's a stage* monologue from As You Like It of **William Shakespeare:** *All the world's a stage, And all the men and women merely players;*

This quote is a metaphor because the world is not literally a stage. By figuratively asserting that the world is a stage, Shakespeare uses the points of comparison between the world and a stage to convey an understanding about the mechanics of the world and the lives of the people within it.

A metaphor as having two parts: the **tenor** and the **vehicle.** The tenor is the subject to which attributes are ascribed. The vehicle is the object whose attributes are borrowed. In the previous example, "the world" is compared to a stage, describing it with the attributes of "the stage"; "the world" is the **tenor,** and "a stage" is the **vehicle**; "men and women" is a secondary tenor, "players" is the secondary vehicle. Other writers employ the general terms **ground** and **figure** to denote **tenor** and the **vehicle** and also the terms **target** and **source**, respectively.

vii. MAXIMS

A maxim is a succinct formulation of a fundamental principle or general truth or principle, especially an aphoristic or sententious one, or rule of conduct or moral teaching. A brief expression of a general truth, principle, or rule of conduct. A self-evident axiom or premise; a pithy expression of a general principle or rule. Ben Franklin is the author of many maxims, including this one: "Early to bed, early to rise, makes a man healthy, wealthy, and wise." An overused maxim of real estate is "Location, location, location." It is an expression of a general truth . Generally any simple and memorable rule or guide for living, for example 'neither a borrower nor a lender be' .Only cheaters prosper. Jerome Kern's famous aphorism "Irving Berlin has no place in American music - he is American music.

A close synonym to Maxim is ‘Saying’. A **saying** is something that is said, notable in one respect or another, to be "a pithy expression of wisdom or truth’. There are a number of specific types of saying:

- Adage – An aphorism that has gained credibility by virtue of long use.
- Aphorism – A concise definition, notably memorable.
- Bromide – A phrase or platitude that, having been employed excessively, suggests insincerity or a lack of originality in the speaker employing it.
- Cliché – An overly commonplace, hackneyed or trite saying.
- Epigram – A poetic form of comment on a particular idea, occurrence, or person.
- Epithet – A descriptive word or phrase that has become a popular formulation.
- Gnome (Greek: *gnome*, from *gignoskein*, to know). A type of saying, especially an aphorism or a maxim, that is designed to provide instruction in a compact form.
- Idiom – "…an expression whose meaning can’t be derived simply by hearing it, such as 'Kick the bucket.
- Mantra – A religious or mystical syllable or poetic phrase.
- Maxim – A principle or rule. A maxim is a wise saying, especially one intended to advise or recommend a course of conduct. In comparison to its approximate synonyms: saying, adage, saw, motto, epigram, proverb, aphorism, the term *maxim* stresses the succinct formulation of an ultimate truth, a fundamental principle, or a rule of conduct. The word derives from the Latin word *maximus*, "greatest", via an expression *maxima propositio*, "greatest premise".
- Motto – A concise expression of motivation used by a group or individual
- Platitude – A flat, insipid, trite, or weak remark.

- Proverb – An expression of practical truth or wisdom.
- Quip – A witty or funny observation.
- Saw – A saying that is commonplace, longstanding and occasionally trite.
- Witticism – A smart saying, notable for its form or style rather than its content.

Never turn your back on an enemy; Everything is air-droppable at least once. Only you can prevent friendly fire Your name is in the mouth of others: be sure it has teeth That which does not kill you has made a tactical error. When the going gets tough, the tough call for close air support. The longer everything goes according to plan, the bigger the impending disaster.

viii. NICHES, REGIONAL

A situation or activity specially suited to a person's interests, abilities, or nature. a position particularly suitable for the person occupying it *he found his niche in politics*/"he found his niche in the academic world". A species's niche includes the physical environment to which it has become adapted as well as its role as producer and consumer of food resources.

In tourism, in marketing regional niche has a great appeal to tourists/consumers. Everyone has or every place has identification with certain words, language, linguistic styles, poetic advocacy, and referent author/person and so on. So when you are in that context go by the regional niches to the extent comfortable to you. You must be 'Glocal'. You must adopt 'the infinite use of finite means through diverse mixes'. I wonder whether she knows that I know that she knows that he thinks she is interested in him.

"India is not so much a country, but more like 20 different countries with different languages and cultures bundled together," Ernst & Young's Ashish Pherwani, who issued the report, said in an email. "There are over 70,000 magazine publications. Over 125,000 newspapers. Of the top 20 selling magazines, only 3 are in English -- the rest are in regional languages. Most are still general news and current affairs, but now we are seeing more niche magazines." Pherwani added: "So yes, it's a vibrant and diverse culture in India, and the numerous magazines we have only reflect that! So, lots of opportunities for journalists!" India has the second largest population of English-speaking people in the world and the second largest consumer base. As wealth and education improves, more and more Indian consumers will fall into the premium segment and want luxury lifestyle content -- travel magazines, in particular, have done well recently.

In America Quote: Kennedy **'We are not here to curse the darkness, but to light the**

candle that can guide us through that darkness to a safe and sane future'. nd in UK quote Churchill, **'if we open a quarrel between the present and the past, we shall be in danger of losing the future'.**

ix. NUANCES, GLOBAL

We are living in a global village. Distance is conquered by internet and telecommunication in real time and @ the speed of 1000kmas by flights. Opportunities come at break-neck speed; so also threats, if we are prepared to get hold on to the opportunities. We need: Worldly Wisdom; Cloud Computing; Benchmark, Dot.com, iPod, Smartphone; yet to live in your local context. That is think global, act local; that espouse to be 'glocal'.

But I tell you the **New Frontier** is here, whether we seek it or not. **Beyond that frontier are the uncharted areas of science and space, unsolved problems of peace and war, unconquered pockets of ignorance and prejudice, unanswered questions of poverty and surplus.** It would be easier to shrink back from that frontier, to look to the safe mediocrity of the past, to be lulled by good intentions and high rhetoric--and those who prefer that course should not cast their votes for me, regardless of party. But I believe **the times demand new invention, innovation, imagination, decision. I am asking each of you to be pioneers on that New Frontier.** My call is to the young in heart, regardless of age--to all who respond to the Scriptural call: "Be strong and of a good courage; be not afraid, neither be thou dismayed."For courage--not complacency--is our need today--leadership--not salesmanship. And **the only valid test of leadership is the ability to lead, and lead vigorously – JFK.**

x. WORLD DEVELOPMENTS

Six long-term developments that are shaping our world are:

1. Emerging markets increase their global power
2. Cleantech becomes a competitive advantage
3. Global banking seeks recovery through transformation
4. Governments enhance ties with the private sector
5. Rapid technology innovation creates a smart, mobile world
6. Demographic shifts transform the global workforce

These six trends are themselves connected by three underlying drivers that have helped

establish each trend and perpetuate it.

1. **Demographic shifts.** Population growth, increased urbanization, a widening divide between countries with youthful and quickly aging populations and a rapidly growing middle class are reshaping not only the business world, but also society as a whole.
2. **Reshaped global power structure.** As the world recovers from the worst recession in decades, the rise of relationships between the public and private sectors has shifted the balance of global power faster than most could have imagined just a few years ago.
3. **Disruptive innovation.** Innovations in technology continue to have massive effects on business and society. We're now seeing emerging markets become hotbeds of innovation, especially in efforts to reach the growing middle class and low-income consumers around the globe.

Your language must mind these dynamic developments and development drivers. In this development how language has to move: We need to be multi-lingual; Clear, provable demonstrations of learning needed (TOEFL iBT); Frameworks, benchmarks and other asset-based approaches to assessment; Individualized, customizable, learner-centred approaches; Proving the value of language learning through stories and speech; Using technology for language learning; Linking language learning to leadership skills; Showing funders the impact their investment has on our students, our communities and our world.

Let’s us move; paced, not paused.

B.3 QUANTITATIVE APTITUDE

B.3. a QUIZ

TEST OF QUANTITATIVE APTITUDE

1. 0.006 divided by 0.001 is:

(A) 0.000006	(B) 0. 00006	(C) 0.6	(D) 6

2. 40% of your investment earns 10%, 20% of investment earns 12%, and the remaining part of your investment earns 14%. The overall rate of earnings on your investment is:

(A) 18%	(B) 136%	(C) 36%	(D) 12%

3. $1/100^2$ x $1/100^3$ x $1/100^{-5}$ is:

(A) -10000	(B) 10000	(C) 1	(D) -1

4. (a^a) (b^b) (c^c) (d^d) .....(p^p) (q^q) .....$(y^y)(z^z)$ $(a^{-a})(b^{-b})(c^{-c})(d^{-d})$ .....(p^{-p}) (q^{-q}) .....(y^{-y}) (z^{-z}) is:

(A). - (a)(b)(c)(d) .... (p)(p).....(y)(z)	**(B).** (a)(b)(c)(d) .... (p)(p).....(y)(z)	**(C)** 1	**(D)** 0

5. If $8/3^{rd}$ of US Dollars buy 11 Australian Dollars (AD), one US dollar gets:.

(A) 88/3 AD	(B) 33/8 AD	(C) 33 AD	(D) 88 AD

6. An eraser (E) costs Re. 1/4, a pencil (P) costs Re. 3/4 and a ball-point pen (B) costs Rs. 5. Having Rs100, with the condition that at least one unit of each must be bought, the combination with maximum number of units, irrespective of composition costing exactly Rs. 100 in all will have:

(A) 1E, 93P & 6B	(B) 50E, 40P & 10B	(C) 60E, 35P & 5B	(D) 57E, 30P & 13B

7. Every day, I and my cousin would play a game of chess. Whoever lost the game owed a pen to the other. After the last game we played (that was the day she was to leave), we counted the number of games each of us had won and lost. Wow! I had won more than her. So, she handed me 8 pens, though she herself was the winner in 11 games. How many days did my cousin spend at my place?

(A) 30 days	(B) 19 days	(C) 20 days	(D) 11 days

8. On a product the Manufacturer's margin of profit is $1/3^{rd}$ of his selling price, the Wholesaler's margin is $1/4^{th}$ of his selling price and the Retailer's margin is $1/5^{th}$ of his selling price. Then the ultimate buyer's cost of the product in terms of Manufacturer's cost is:

(A) 2.5 times	(B) 2 times	(C) 3 times	(D) 3.5 times

9. A Car Manufacturer's margin of profit is $1/3^{rd}$ of his selling price, the Distributor's margin is $1/4^{th}$ of his selling price and the Dealer's margin is $1/5^{th}$ of his selling price. The profit made by the respective parties on their respective cost is:

(A) 1/2, 1/3 & 1/4	(B) 1/2, 1/4 & 1/3	(C) 1/4, 1/5 & 1/6	(D) 1/4, 1/6 & 1/5

10. Yesterday A car started off at 60 KMs speed per hour at 6 am from Place 'A' and reached Place 'B' at 6 pm. Today it started its return journey at 12 noon and reached place A at 6 pm by the same route. The number of points en-route, the car would have crossed today the same time as it did yesterday, assuming no reverse gear application at any point of time, is:

(A) 1	(B) Impossible	(C) 0	(D) Indeterminate

11. There was a big web with spiders and flies numbering 24 in all. If there were a total of 164 legs on the web how many spiders were on the web?

(A) 14	(B) 10	(C) 12	(D) 16

12. Three strategies (S1, S1 & S3) that you can adopt, in response to 3 strategies that your competitor can adopt have the following profit or loss positions: S1: 6, -4 & 7; S2: 3, -7 & 5; S3: 8, -2 & 6. The strategy (strategies) which you will never adopt is (are):

(A) S1	(B) S2	(C) S3	(D) S1 & S3

13. If, (xyz) = 49, (x)=2, and y=1/2, find the value of the inverse of 'z'.

(A) 1/48	(B) 48	(C) 1/49	(D) 49

14. You divide a rectangle by its two diameters. The maximum possible number of triangles inside the rectangle is:

(A) 4	(B) 6	(C) 8	(D) 10

15. The a side of a Square is 1 metre and the radius of a circle is Sq. root of (22/7) metre. Then the area of the Square of is:

(A) Same as the Circle	(B) 22/7 times of the Circle	(C) Half of the Circle	(D) Twice the Circle

16. Gopal added 1.5 litres of solution (A) to 4 Kilos of paint (B) measuring 3 litres. Later he added 2 Kilos of the same paint (B) to the mixture. The proportion of A and B finally is:

(A) A: 1 & B: 3	(B) A: 1.5 & B: 7	(C) A: 1 & B: 6	(D) A: 1.5 & B: 6

17. Find the value of: (9/5) of (11/6) of (2/55) of (25/3).

(A) 1	(B) 3	(C) 1/3	(D) 11

18. First owner sold a land at a profit of 150% of his cost. The second owner sold it at 200% of her cost. The third owner sold it at Rs. 35 Lakhs, a loss of 30% on her cost. First owner's cost is:

(A) Rs. 50 lakhs.	(B) Rs. 10 lakhs	(C) Rs. 25 lakhs each	(D)Rs. 45.5 lakhs

19. The current strike-rate of a Batsman (number of runs made to number balls faced) is 150%, and on the next 6 balls he faced, he made, 0, 0, 0, 0, 6 and 3 runs. His overall strike-rate has:

(A) Increased	(B) Remained same	(C) Decreased	(D) Fluctuated

20. The polling participation rate of Women in a Constituency is 88% and that of Men is 44% of registered voters. If the overall participation rate of the Constituency is 66%, the ratio of number of Registered Women voters to that of Registered Men voters:

(A) 2:1	(B) 3:2	(C) 1:1	(D) 2:3

21. A month ago $1 was equal to £ 2/3. Now £1 is equal to $1.5. The amount of $ per £ has:

(A) Increased	(B) Decreased	(C) Remained same	(D) Fluctuated

22. A piece of land was €1 billion 2 years ago. In the last 2 years its value grew at a compound rate of 50% per semester. Its current value in Billion € is:

(A) 2.5	(B) 4.0625	(C) 3.0	(D) 5.0625

23. A work can be completed in 4 days by 10 people working 6 hours per day. If their efficiency increases to 120%, the number of man-hours saved in completing the work is:

(A) 48	(B) 240	(C) 200	(D) 40

24. The in-let pump of a tank can fill the tank in 60 minutes, but the out-let pump takes 30 minutes only to empty a full tank. With the tank full condition, both the pumps were switched on for an-hour. The water level in the tank will be reduced to:

(A) 75% capacity	(B) 50% capacity	(C) 25% capacity	(D) 0% capacity

25. In a cultural show, 14% of artists are Bharata Natya exponents, 25% are Kathak exponents, 22% are Odissi exponents, 13% are Manipuri exponents and the remaining are Western dance exponents. The ratio of the number of artists doing Bharata Natya and Kathak put together, to total number of artists who perform Manipuri and Western dance is:

(A) 1:2	(B) 1:1	(C) 78:22	(D) 39:38

26. You have to supply a food mixture of 15 kilos at minimum cost subject to the condition that component 'A' which costs Rs 450 per Kilo cannot be more than 6 Kilos and other component 'B' which costs Rs. 660 per Kg cannot be less than 7 Kilos in the mixture. Tell the right weights (in Kilos) of 'A' and 'B' in the mixture.

(A) A: 9 & B: 6	(B) A: 7 & B: 8	(C) A: 8 & B: 7	(D) A: 6 & B: 9

27. Find the value of: (5/8) of (16/33) of (11/20) of (30).

(A) 8	(B) 16	(C) 5	(D) 33

28. First owner of car sold it at $5/6^{th}$ of his cost. The second owner sold it at $4/5^{th}$ of his cost. The third owner sold it at $3/4^{th}$ of his cost. The fourth owner's cost was Rs. 6 lakhs. Find the loss of the 1^{st}, 2^{nd}

and 3rd owners respectively in Rs. Lakhs:

(A)Rs. 4, 3 & 2 lakhs.	(B) Rs. 2 lakhs each	(C) Rs. 1.5 lakhs each	(D)Rs. 2, 3 & 4 Lakhs

29. In a cricket game the current Run-rate is 6 per over, and on the next ball one run is made. The resulting new Run-rate is:

(A) 6	(B) 7	(C) 6.1	(D) 5

30. The literacy rate of Women in a state is 66% and that of Men is 44%. If the overall literacy rate of the State is 55%, the ratio of Women population to Men population is:

(A) 1:1	(B) 3:2	(C) 6:5	(D) 4:5

31. If the square-root of a number is more than that number itself, the number is:

(A) > 0	(B) + fraction	(C) - fraction	(D) ∞

32. ½ divided by ½ is:

(A) Four	(B) One-quarter	(C) One	(D) Zero

33. A work can be completed in 4 days by 10 people working 6 hours per day. If their efficiency falls to 80%, the additional number of days needed to complete the work is:

(A) Four	(B) Three	(C) Two	(D) One

34. The in-let pump of a tank can fill tank in 30 minutes, but the out-let pump takes 60 minutes to empty a full tank. With empty tank condition, both the pumps were switched on for half-an-hour. The tank will be filled up to:

(A) 50% capacity	(B) 75:% capacity	(C) 100% capacity	(D) 0% capacity

35. In a cultural show, 14% of artists play drums, 25% stage drama, 22% dance, 13% sing and the remaining play guitar. The ratio of the number of artists doing Drums and Drama put together, to total number of artists who sing and play Guitar is:

(A) 1:2	(B) 1:1	(C) 78:22	(D) 39:38

36. 0.06 divided by 0.1 is:

(A) 6	(B) 0.06	(C) 0.6	(D) 0.006

37. 1/3 of your investment earns 14%, another 1/3 earns 18%, and the remaining part of your investment earns 22%. The overall rate of earnings on your investment is:

(A) 22%	(B) 14%	(C) 54%	(D) 18%

38. $100^2 \times 100^3 \times 100^{-5}$ is:

(A) 59500	(B) 100	(C) Zero	(D) One

39. (p-a)(p-b)(p-c)(p-d) ……(p-q) (p-r) …….(p-y)(p-z) is:

(A) + Infinity	(B) - Infinity	(C) Zero	(D) p^{27}- p ^{26}a +…..

40. If 3/8th of one US Dollar buys 4.125 units of Australian Dollar (AD), one US dollar gets:.

(A) 1.1 AD	(B) 11 AD	(C) 33 AD	(D) 0.09 AD

41. To 3/4th of a number you add 1/4th of the same number. The sum total works out to what % of the number concerned:

(A) 25%	(B) 75:%	(C) 100%	(D) 1%

42. You have certain number of mangos. You distribute them @2 per head, @3 per head, @4 per head, @5 per head and @6 per head. You are left with 1 mango each time. When you distributed them @ 7 per head, there was no remainder. The number of mango you had was:

(A) 231	(B) 201	(C) 427	(D) 301

43. A train scheduled to arrive at a particular station at 9.00 AM, had arrived at 8.55AM, 9.08 AM, 9.12 AM, 8.40 AM and at 9.05 AM during last 5 days. Find the average arrival time.

(A) 9.12 AM	(B) 9.24 AM	(C) 9.00 AM	(D) 8.84 AM

44. If, (1/abc) = 48, a=0.5, and b=1/3, find the value of ‘c’.

(A) 8	(B) 1/8	(C) 0.25	(D) 24

45.If, one US dollar = Rs. 49 and one UK Pound = Rs. 84, the value of one US dollar in terms of UK Pound is: :

(A) 0.5833	(B) 1.7143	(C) 2.0408	(D) 0.0119

B.3. b. SIMPLE MATHEMATICAL MODELS

A model in the context of quantitative decision making situation is, 'a formal or informal conceptualization of the relationship of the various factors (dependent and independent variables and constants) that are relevant in a problem-solution issue to enable decision making. The relationship among the factors of the decision situation and the forecasted results are mapped (graphed, matrix-made, input-output related, equation-built and so on) in order to understand or manipulate the problem-solution issue and to predict what will happen if a certain action is taken.

- There are different types of models-Iconic and Symbolic models.
- Iconic Models are concretized. It is a physical representation of any real life object on a different scale. Think of a prototype of a plane/car/machine/globe/idol and so on.
- Symbolic models are abstract models. A cost curve, a supply curve, a marginal revenue curve, a production possibility curve, etc., is a symbolic model. A forecast profit and loss account is also symbolic model.
- Symbolic models can be classified into:
    - i) quantitative and qualitative,
    - ii) standard and customized,
    - iii) probabilistic and deterministic,
    - iv) descriptive and optimizing,
    - v) static and dynamic;
    - vi) simulative and realistic models.
- In a quantitative model all variables are expressed in numbers, while in a qualitative model some or all of the variables are given only verbal expression.
- Standard model is universalized. Computer languages and operating systems are standardized, while application programs are customized. Nowadays customized-standardization is the order, powered by enormous computing powers of computers. Mass customization is preferred.
- Probabilistic model deals with situations where the outcomes of current action are not known, but their probability distribution is known.
- Deterministic model deals with decision situations where certainty of outcomes is taken for granted.
- Descriptive model describes the basic relationship between variables. If Rs. 10 and Rs. 12 are the contribution per unit of Product A and Product B, respectively and if a units of A and b units of B are produced, total contribution is described by: 10a + 12b.
- In an optimizing model, ways to maximize the total contribution, given the resources and

consumption pattern of resources by A and B.

- Static model assumes, the set of conditions affecting the problem remains unchanged in a given time frame. Linear programming is a static model.
- Dynamic model assumes that the conditions keep changing with time. Dynamic programming is a dynamic model.
- Simulative model tries to replicate the real world situation either through a computer program or through Monte Carlo Simulation System or through such other methods.
- A realistic model is action play. An advertisement campaign is full scale on. The firm tries to evaluate the sales profit, awareness and brand equity effectiveness of the program.

1. CONSTRUCTING A MATHEMATICAL DECISION MODEL

- Mathematical model is an idealized representation expressed in mathematical symbols and expressions.
- A mathematical model of a business problem might be in the form of a set of equations and related mathematical expressions that describe the essence of the problem.
- An economic order quantity model is given by: EOQ = $\sqrt{2AO/C}$ where A - annual requirement, O - ordering cost and C - carrying cost.
- A linear programming model is given by objective function: Say Maximize Z = 10a + 12b, subject to 2a + b < = 60, 3a + 4b < = 120; a, b > = 0, where a and b are units of products A and B, respectively to be produced to maximize total contribution given individual contribution of Rs. 10 per unit of A and Rs. 12 per unit of B, the resource constraints being that resource 1 and 2 are available respectively to the extent of 60 and 120 units only.
- An internal rate of return (IRR) model is given by: $-I + CF_t/(1+k)^t = 0$, where `k' is the IRR to be found, while `I' is the initial investment, CF_t refers to periodic cash flows.
- To construct a mathematical model objective of the firm, variables, constants and constraints must be known, besides the relationship amongst the variables. The relationship may be linear or non-linear.
- The EOQ and linear programming models given above are linear relationship based, while the IRR model is non-linear relationship based as it in exponential form.

2. VARIABLES

Variables are something whose magnitude can change. These can take different values. Price, profit, revenue, cost, quantity produced, quantity sold, imports, exports, income tax, excise duty, national income, savings, consumption, investment, inflation rate, cost of living, etc., are all variables and can take different values entity to entity, time to time, place to place and so on. While variables can take

any value, we may give them particular values and `freeze' them in a given context.

- Factors (That is, Variables) may be

i) dependent or independent,
ii) stochastic, probabilistic or deterministic,
iii) endogenous or exogenous,
iv) continuous or discrete,
v) slack or surplus,
vi) choice or random,
vii) real or artificial,
viii) non-negative or unrestricted,
ix) integer or non-integer variables.
x) Constant or variable.

3. CONSTANTS IN MATHEMATICAL MODELS

- A constant can take only a specified magnitude. Hence a constant is the antithesis of a variable.
- A constant when added to a variable, it is called coefficient of that variable.
- However, a coefficient may be symbolic instead of numeric.
- Suppose let the symbol ‘C’ stand for a given constant and the use of the expression C in lieu of 6C in a model is perfectly all right and this expression permits greater level of generality. The symbol is a rather a peculiar case. It is supposed to represent a given constant. Yet since it is not assigned a specific numeric value, it can virtually take any value. In other words, it is a `constant' that is `variable'!! Such constants are known as parametric constants or parameters.
- Non-changing constants: Take the famous equation of Einstein: $E = MC^2$. Here, E - energy produced, M - mass of the object and C - velocity of light. The velocity of light, C, is a constant. In the Poisson distribution we use. `e' is a constant, whose value is corrected to four decimals at 2.7183.
- The above two constants are classical constants, never change. These are non-changing constants.
- But, the parametric constants are constants at the given time and space. If any of these is changed, the parameter also changes. Thus, a parametric constant changes with time and space.

Total cost of production for a given level of output, can be expressed as sum of: Fixed cost + Total variable cost. Let the output level be, Q, fixed cost, F, Rs. 10,00,000 and variable cost, V, Rs. 5000 per unit.

- Then Total Cost = TC = F + VQ or TC(Q) = 10,00,000 + 5000Q
- Here, total cost varies as `Q' changes.

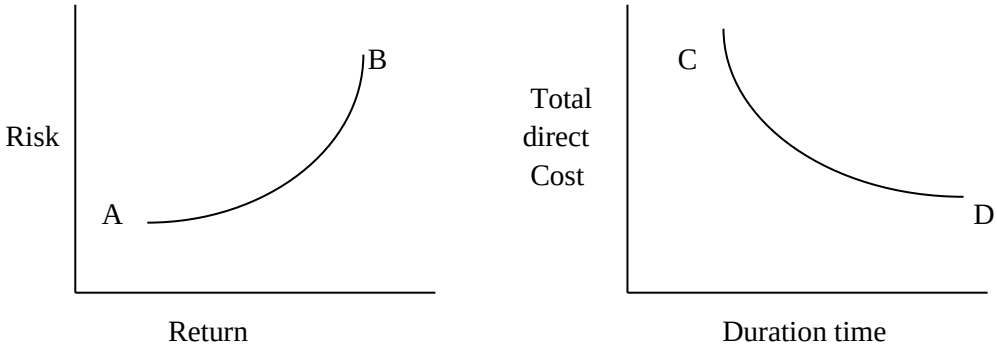
- The fixed cost in total is a constant and the unit variable cost is also a constant. But, these constants are not universal constants.
- For the time being these are constants.
- Fixed cost may change as rent, administrative and depreciation change and unit variable cost will change if costs of direct material and labour change.
- Thus there are two constants. **Universal Constants and Temporal Constants.**

4. TRADE-OFF

A mathematical model of a business problem aims to achieve the maximum gain with minimum pain. This is essentially an exercise of trade-off. Risk-Return trade off, Cost-benefit trade-off, time-cost trade-off and so on are involved.

In the case of time-cost trade-off, a project leader wants to complete a project ahead of normal time. Thus he wants a benefit. But this is accompanied by a cost, cost of spending up the work. Thus, every gain has a price-tag. The decision maker has to decide how much cost per unit or utility is optimum. And he settles for that optimum level of time-cost trade off. Similarly his goals are also risk-return trade-off, cost-benefit trade-off and so on. Above are given diagrams regarding trade-off.

Graphs 1.1and 1.2.



5. SLOPE OF THE CURVE.

In the risk-return trade-off, curve AB shows the locus of risk and return. For a unit rise in return, how much rise in risk takes place? This answer is given by the slope of the curve.

- The slope of the curve is not same throughout the length AB, as AB is not a straight line, but a curve.
- Successive unit rise in return trade-off with increasing level of risk.
- The decision maker has to decide the maximum risk per unit rise in return he is prepared to trade-off.
- When that level of return is reached, the choice of risk-return combination is made.

6. MATHEMATICAL FUNCTION

A mathematical function is called a mapping, or transformation; both words connote the action of associating one thing with another. A function is a set of ordered pairs with the property that any particular magnitude of independent variable, say x, uniquely determines the value of the dependent variable, say y,. Thus, a function implies a unique value y for each x. The converse may or may not be true.

Let the total cost (C) function of a firm per day is associated with daily output Q; C = 1500 + 80Q. The firm has a capacity limit of 100 units of output per day. Then the **domain of the function is the set of values: 0 = < Q = < 100. The range is lowest at 1500 when Q = 0 and highest at 9500 when Q = 100; or 1500 = < C = < 9500.**

By placing the domain on the x-axis and the range on the y-axis, we get the function in the form of a two-dimensional graph in which the association between x values and y values is specified by a set of ordered pairs such as, (x_1, y_1), (x_2, y_2) ... (x_n, y_n).

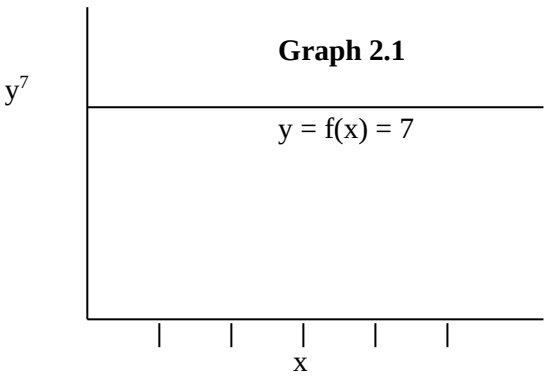
C = 1500 when Q = 0 and is 9500 when Q = 100, or 1500 = < C = < 9500.

7. DIFFERENT FUNCTIONS AND THEIR GRAPHIC EXPRESSIONS

The expression y = f(x) is a general statement of a function. The actual mapping is not explicit here.

Constant functions, polynomial functions and relation functions are one class of function.

I. Constant Function takes only one value as its range. y = f(x) = 7; or y = 7; or f(x) = 7. Regardless the value of x, value of y = 7. Value of y is, perhaps exogenously determined. Such a function, in the coordinate plane, will appear as a horizontal straight line. Graph 2.1 gives the constant function.

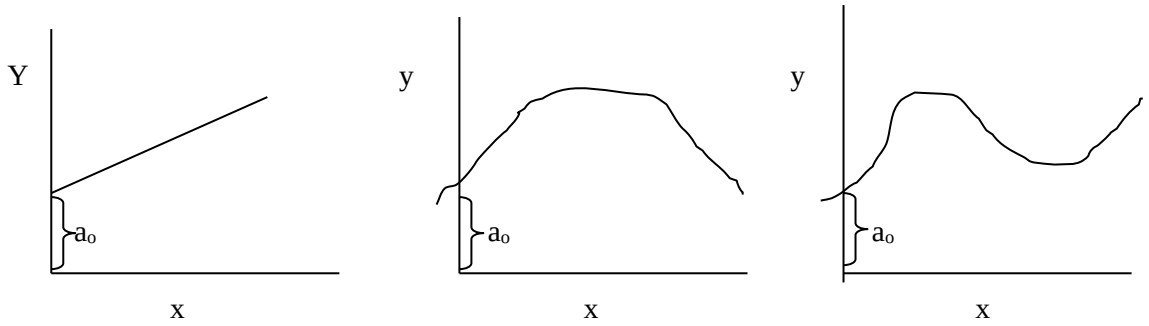


II. Polynomial Function is a multi-term function. The general form of a single variable, x, polynomial function is: $y = a_0x^0 + a_1x^1 + a_2x^2 + a_3x^3 + ... a_nx^n$. [The first two terms can be written as $a_0 + a_1x$, since, $x^0 = 1$ and x^1 is commonly written as x]. **Polynomial** is a function of the form $y = f(x) = a_nxn + a_{n-1}x^{n-1} + \ldots + a_2x^2 + a_1x + a_0$, where n is nonnegative integer and $a_0, a_1, \ldots, a_{n-1}$, and a_n are constants which are called **coefficients of polynomial**. Each form contains a coefficient as well as a

non-negative integer power of variables.

- We can proceed further assigning other values to n. The powers of x are called exponents. Graphs 2.2, 2.3 and 2.4, respectively give the linear, quadratic and cubic functions:

Graph 2.2	**Graph 2.3**	**Graph 2.4**
$Y = a_o + a_1x^1$	$Y = a_o + a_1x^1 + a_2x^2$	$Y=a_o+a_1x^1+a_2x^2+a_3x^3$
$Y = a + bx$	$Y = a + bx + cx^2$	$Y = a+bx+cx^2+dx^3$



- Depending on the value of the integer N (which specifies the highest power of x), several subclasses of polynomial function emerge:

  Case of n = 0: $y = a_0$ [Constant function]

  Case of n = 1: $y = a_0 + a_1x^1$ [Linear function]

  Case of n = 2: $y = a_0 + a_1x^1 + a_2x^2$ [Quadratic function]

  Case of n = 3: $y = a_0 + a_1x^1 + a_2x^2 + a_3x^3$ [Cubic function]

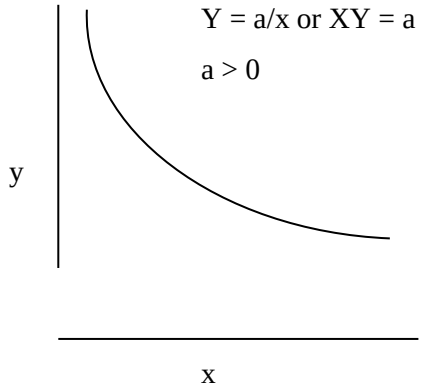
- The highest power involved i.e., the value of n, is often called the degree of the polynomial function.
- A cubic function, with n = 3, is a third-degree polynomial constant function. The constant function is also called the degenerate or polynomial of the zero degree polynomial.

III. Relational functions

A relational function is one which is expressed as a ratio of two polynomials in the variable x. A function such as is a polynomial in which y is expressed as a ratio of $x - 5$ to $x^2 + 2x + 20$ (both are polynomials), is a relational function. Any polynomial function is a relational function, because it can be always expressed as a ratio to 1, which is a constant function. $Y = (X-5)/(x^2+2X+20)$.

A special relational function that has quite an interesting application in business is the function: $y = a/x$ or $xy = a$. This function plots as a rectangular hyperbola (Graph 2.5).

Graph 2.5



- Since the product of the two terms is always a given constant, this function may be used to represent average fixed cost curve, a special demand curve where total expenditure (i.e., price x quantity) is always the same.

The rectangular hyperbola drawn for xy = 1, never meets the axes, for whatever levels of upward and sideward extensions.

8. ALGEBRAIC AND NON-ALGEBRAIC FUNCTIONS

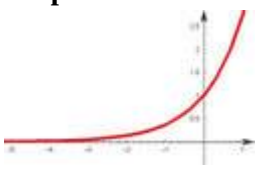
Algebraic and non-algebraic functions are another classification of functions. Any function expressed in terms of polynomials and/or roots of polynomials is an algebraic function. A function is called an **algebraic function** if it can be constructed using algebraic operations (such as addition, subtraction, multiplication, division, and taking roots) on polynomials. Any rational function is automatically an algebraic function.

Functions that are not algebraic are called **transcendental**. The set of transcendental functions includes the trigonometric, inverse trigonometric, exponential, and logarithmic functions, but it also includes a vast number of other functions that have never been named (for example, functions that are defined as sum of infinite series).

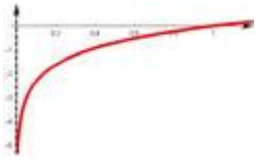
The functions so far dealt in graphs 2.1 to 2.5 are all algebraic.

The functions dealt in graphs 2.6 and 2.7 given below are the non-algebraic functions like exponential, logarithmic, trigonometric and inverse trigonometric.

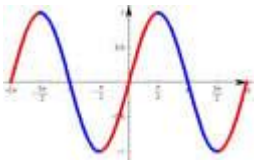
Graph 2.6



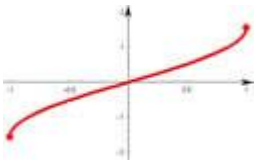
Exponential



Logarithmic function

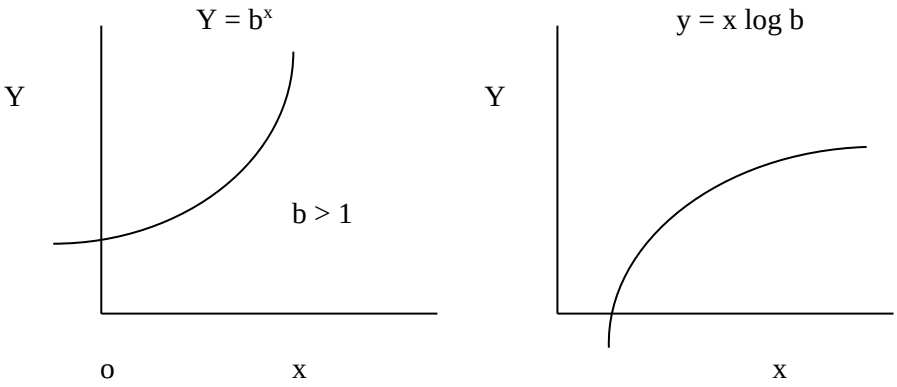


Sine function



Inverse sine function

Graph 2.7



9. FUNCTIONS OF MORE THAN ONE INDEPENDENT VARIABLE

Functions can be classified on the basis of number of independent variables. So far only one independent variable, x, was dealt by us. Instead two, three or any number of independent variables may be involved.

- We know production is a function of labour (L) and capital (K). So, a production function may be presented as: Q = f(K, L).
- Consumer utility can be given as a function of 3 different commodities and the function is y = f(u,v,w).

Functions of more than one variable can be constant, linear or nonlinear. Look at these forms:

$Y = a_1 + a_2 + a_3 + a_4 \ldots\ldots\ldots a_n$ (constant function)

$Y = a_1x_1 + a_2 x_2 + a_3 x_3 + a_4 x_4 \ldots\ldots\ldots a_n x_n$ (linear function)

$Y = a_1x_1^2 + a_2 x_1x_2 + a_3 x_2^2$ (quadratic function)

$Y = a_1x_1^3 + a_2 x_1^2x_2 + a_3 x_1x_2^2 + a_4 x_1x_2^3$ (cubic function)

As presented already, linear functions are 1st degree polynomial. These could have single or more independent variables.

- A single variable linear function runs like this. Y = a + bX.
- A two variable linear function is: $Y = a + bx_1 + cx_2$.

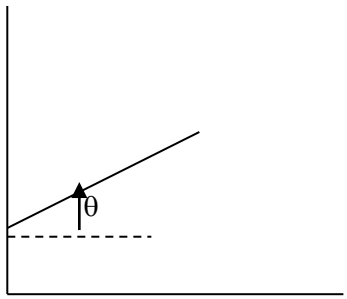
10. CONCEPT OF SLOPE OF A LINE

Slope refers to the inclination of a line to the x-axis. It gives a measure of the rate of change in dependent variable, y, for a unit change in independent variable, x. Both the direction and quantity of change produced are indicated by slope.

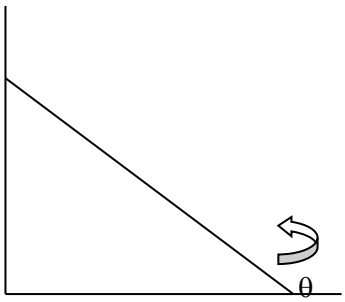
Slope of a line can be studied in five ways.

- **Slope is the tangent of the angle made by the line with the x-axis when we move anti clockwise from the x-axis to the line.** If θ is the angle that the line makes with the positive direction of x-axis, than slope of the line = tangent = opposite side/Adjacent side. See the graphs 2.8(i), 2.8(ii).

Graph 2.8 (i)



Graph 2.8 (ii)



- **(ii) Slope of a line can be measured through ordinates and coordinates.** If (x_1,y_1) and (x_2,y_2) are any two points on the line, then slope is given by: $(y_2-y_1)/(x_2-x_1)$.
- (iii) **When an equation of a line is given as, y=a+bx, then slope is given by `b' in that equation.**
- (iv) **Slope is the regression coefficient of y on x or** $b_{yx} = \Sigma x_i y_i / \Sigma x_i^2$ where $x_i = X_i - \bar{X}$ and $y_i = Y_i - \bar{Y}$
- (v) **Slope is also studied by amount of change in y,** Δy divided by amount of change in x, Δx. Slope = Δy/ Δx.

Illustrations:

i. Suppose three lines make each an angle of i) 30° , ii) 45° and 60° with the positive direction of x-axis. Then the slope of the lines are:

i) tan 30° = 1/√3 ii) tan 45° = 1; tan 60°= √3

ii. Suppose two points on a line are: 2. -4 and 1, 7. Its slope = $(y_2-y_1)/(x_2-x_1)$ = 7 - (-4)/1-2 = 11/-1 = -11. The line has negative slope.

iii. A machine costs Rs. 1,00,000. 5 years after, its value falls to Rs. 60000. If value is a linear function of time, find the depreciation function.

Solution: Let the value of the machine at year `t' be: v = a + bt. Put v = 1,00,000 at t = 0 and v = 60000 at t = 5. We get the following two equations:

(i) 1,00,000 = a + b(0) or

a = 1,00,000 …. (1)

(ii) 60000 = a + b(5) or

a + 5b = 60000 …. (2)

Solving (1) & (2) we get, 5b = -40000 or

b = -8000

The annual rate of depreciation is 8000 and the value of the machine falls by Rs. 8000 p.a.

11. LINEAR DEMAND FUNCTION AND SLOPE THEREOF

Suppose the quantity demanded and price are linearly related and the demand function is as follows:

Unit price	P	4	5	6	7	8
Quantity	Q	1400	1200	1000	800	600

We are interested in finding the rate of change in Q, for a unit change in P. You know we have made this rate as 200. We can work out it through the regression equation, as well as the differentiation route.

Illustration

First the regression model is attempted.

	Variables and Values Thereof					**Total**	**Mean**
P	4	5	6	7	8	30	6
Q	1400	1200	1000	800	600	5000	1000
P-(MeanP) =p	-2	-1	0	1	2	0	-
Q-(Mean Q=) q	400	200	0	-200	-400	0	-
pq	-800	-200	0	-200	-800	-2000	-
p^2	4	1	0	1	4	10	-

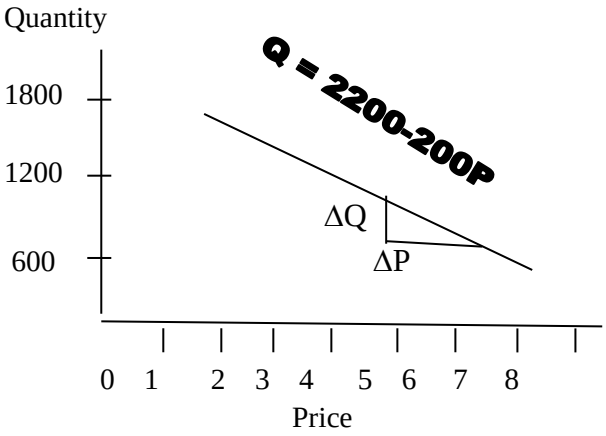
The slope or regression coefficient = b = $\Sigma pq/\Sigma p^2$ = -2000/10 = -200.

The constant = Mean Q – b (Mean P) = 1000 – (-200x6) = 1000 + 1200 = 2200

- The regression equation of the Demand function, which is an expression of Q in relation to P, is: Q = 2200 - 200P.
- The negative slope indicates that, quantity demanded in indirectly proportional with price, i.e., as ‘P’ rises ‘Q’ falls and vice versa. Now that we know: Q = 2200 - 200P; Differentiate ‘Q’ w.r.t. ‘P’, we get: dQ/dP = -200
- This is the same as regression coefficient we got earlier.

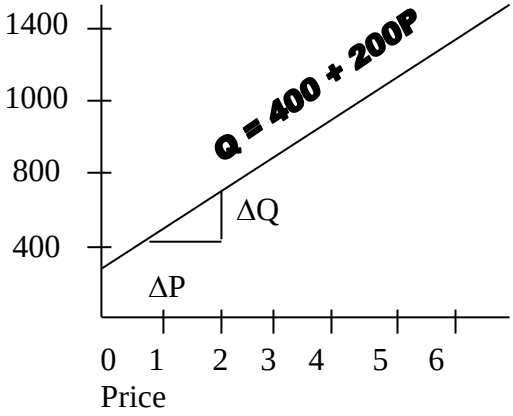
Graph 9a and 9b depict the demand and supply curve. The demand curve is downward sloping, indicating that its slope is negative. The supply curve is upward sloping, indicating that its slope is positive.

Graph 9a
Demand curve and slope negative



The slope = Change in Q / Change in P
= -ΔQ / ΔP

Graph 9b
Supply curve and slope Positive



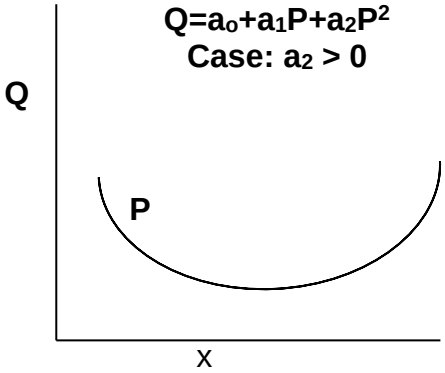
The slope = Change in 'Q' / Change in 'P'
= ΔQ / ΔP

12. NON-LINEAR FUNCTIONS

Non-linear functions are simply the 2nd or further higher degree polynomials. We know the 2nd degree polynomial is a quadratic function, the 3rd degree polynomial is a cubic function and so on. You may refer back graphs 2.3 and 2.4 for quadratic and cubic functions.

- In graph 2.3 $a_2 < 0$ and the graph appears like a `hill'. If $a_2 > 0$, then the graph will form a `Valley'. In graph 2.10, $a_2 > 0$, with a `Valley'.

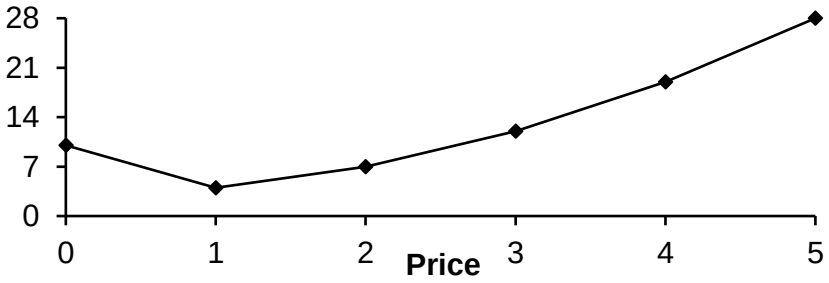
Graph 2.10
Quadratic Demand Function



Let the demand for a product be given by the quadratic function: $Q = P^2 - 7P + 10$, where P is price. We can get the graph plotted by first mapping the function in the form of a table as below. As P cannot take negative value, we take it as zero first and allow it to rise a unit at every step and relevant Q values got thus:

P	0	1	2	3	4	5
Q	10	4	7	12	19	28

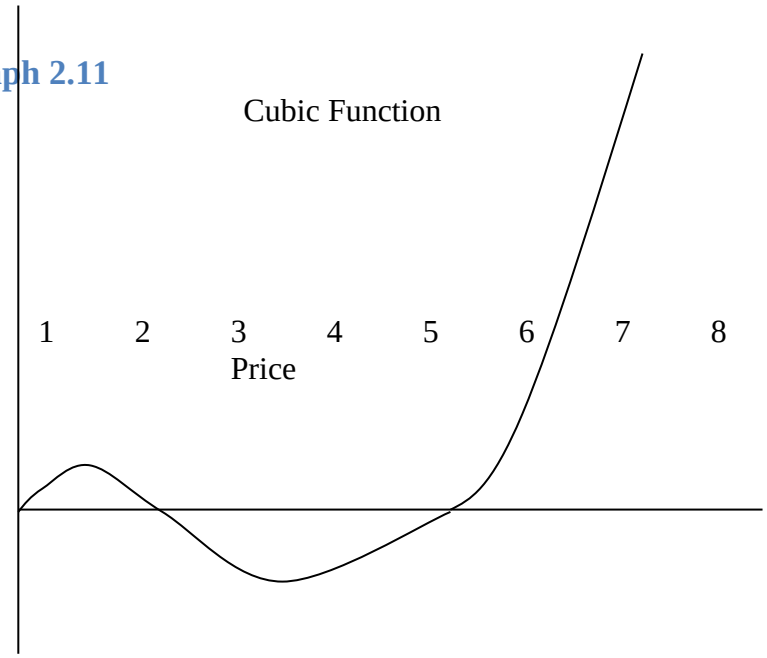
Graph 2.11
Quadratic Function
$Q = P^2 + 7P + 10$



Graph 2.11 depicts the function $Q = P^2 - 7P + 10$. The curve does not conform to normal demand curve, generally speaking. Perhaps this is vanity demand curve. A quadratic function is different from a quadratic equation. A quadratic equation results, when a quadratic function is set to zero. That is, the quadratic function, $P^2 - 7P + 10$ if made as equal to zero, i.e., $P^2 - 7P + 10 = 0$, a quadratic equation results. For the quadratic equation the roots can be worked out.

Cubic Function – Revenue Function TR = $\mathbf{a_0+a_1P+a_2P^2+a_3P^3}$

Graph 2.11



Let us continue with the quadratic function of Q = quantity demanded as a function of P = price, as: Q = P^2 - 7P + 10. From this we can get the total revenue function, TR = PQ = P (P2 - 7P + 10) = P^3 - $7P^2$ + 10P. This is a cubic function, a non-linear form of 3rd order polynomial.

We can plot the curve by assigning values to `P' and getting those of TR. The same is tabled below:

Price per unit = P =	0	1	2	3	4	5	6	7
Total revenue TR = (P^3 – $7P^2$ + 10P)	0	4	0	-6	-8	0	24	70

The first derivative of the total revenue function is the marginal revenue function. We know. That is the rate of change in total revenue for a given instantaneous change in price is $3P^2$ - 14P. This is the slope of the curve. It varies from place to place on the curve.

ii. Profit Function

E = Profit = Total Revenue - Total Cost. For the example dealt above, Profit = 125Q - $2Q^2$ - (500 + 13Q + $2Q^2$) = 125Q - $2Q_2$ - 500 - 13Q - $2Q^2$ = -$4Q^2$ + 112Q - 500. Profit for 0, 5, 10, 15 & 20 units are: -500, 40, 220, 280 and 140.

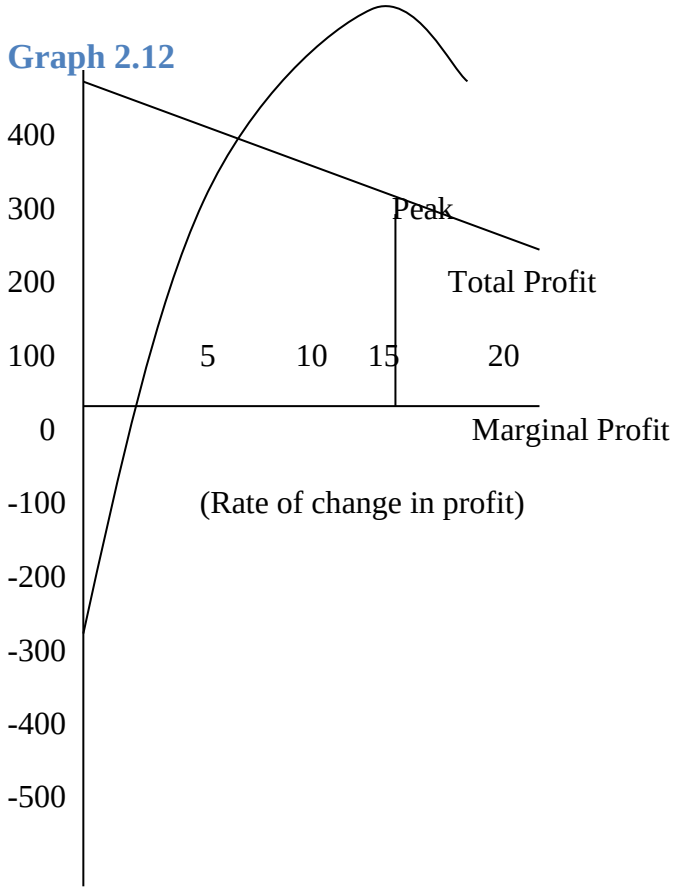
The slope of the profit curve: i.e. first order derivative with respect to e = dE/dQ of – $4Q^2$ + 112Q – 500 = -8Q + 112. At Q = 0, 5, 10, 15 and 20 the slope is: 112, 72, 32, -8 and -48. Graphs 2.18 gives the total profit and marginal profit curves.

What is the profit optimizing output level?

The profit function is: E = -4Q2 + 112Q - 500.

First derivative dE/dQ = -8Q + 112. Profit maximizing output is given by letting the first derivative equal to zero and solve for Q. So, -8Q + 112 = 0; 8Q = 112: Q = 14. At 14 units profit = 284. To ensure the correctness of the answer, the 2nd derivative must be done and if its value is negative, the answer is correct. And d2E/dQ2 = -8. So our answer is correct.

When marginal profit (i.e., slope of total profit), reaches zero, total profit is maximum. The quantity at this level of profit is profit maximizing quantity. From the graph 2.12 we read it as 14 units, the same as we got earlier algebraically.



13. ELASTICITY OF DEMAND THROUGH FUNCTIONS

Elasticity is a concept very much used in business. Elasticity of demand, supply, etc are common parlance terms in business and economics and related studies.

Elasticity of demand to price of the product, to increase in the income of the customer, to price of competitor product (known as cross elasticity of demand), to advertisement and promotion campaigns, etc are very useful concepts in businesses. All these aim to measure the rate of change of quantity demanded to a given change in price, income, price of competitor product or advertisement and proportional spending.

Price elasticity of demand

Let us now consider price elasticity of demand. Let it be denoted by 'E'. By definition E is given by: (Rate of Change in Quantity Demanded) / (Rate of Change in Price)

$= (-\Delta Q/Q)/ (\Delta P/P) = (P/Q) \times (-\Delta Q/\Delta P)$.

Where Q – is the value of initial Quantity demanded, P – is the Price at the initial stage, and ΔQ and ΔP are Change in Q and P from their original or initial values.

You must remember (-ΔQ/ΔP) is a slope function, slope of quantity w.r.t. price. So, elasticity of demand is slope of demand curve multiplied by (P/Q).

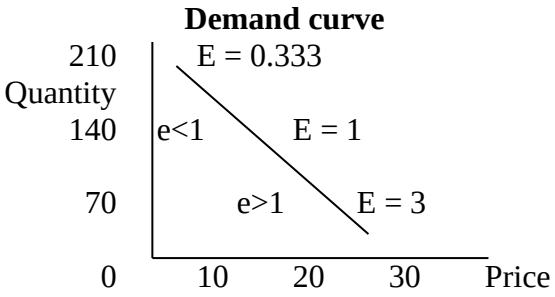
Note the negative sign is used as elasticity in both directional and dimensional and as 'Q' varies opposite to the price, the '-' sign is attenuated to the ΔQ. For all normal goods and luxury goods the price elasticity is negative, but conventionally the –ve sign ignored.

Let the demand function be Q = 280 – 7P. its elasticity is given by (P/Q) x Slope.

The slope is simply the first derivative w.r.t. P. So, dQ/dP = -7.

The value of 'E' for the different values of P are computed and given below; and the graph 2.13 gives the demand curve.

Graph 2.13



P	10	20	30
Corresponding Q	210	140	70
Slope	-7	-7	-7
Elasticity: -(P/Q) *(Slope)	0.333	1	3
Total revenue(PxQ)	2100	2800	2100

When elasticity is >1, the demand is said to be price elastic and reducing price, more volume can be sold. When elasticity is <1, the demand is inelastic. By reducing price you cannot sell more, at the same time by raising the price, your sales volume is not going to be severely pruned.

When price is reduced from Rs.30 to Rs.20, i.e., by 33%, Q i.e., the sales volume has increased by 100% from 70 to 140. that is, when elasticity was high, a reduction in P enabled the firm to enhance sales. Also, the sales revenue increased from Rs.2100 to Rs.2800. When price elasticity was less than 1 an increase in price will get good revenue. See, when price was increased from Rs.10 to Rs.20, by 100% volume of sales declined only by 33% from 210 to 140. at the same time revenue increased from Rs.2100 to RS.2800. Thus for the seller, it pays to rise prices when he has price inelastic demand curve. Similarly, when he forces an elastic demand curve, it pays to reduce price.

The price elasticity is > 1, beyond the price level of Rs.20. So, any price rise from Rs.20 will have the seller with low sales. But price reduction to Rs.20 from higher price level will benefit him. The price

elasticity is <1, below the price level of Rs.20. So, any price reduction from Rs.20 will not benefit the seller, but any price rise, movement in price towards the unit elasticity point from any previous position of elasticity pays off well the seller.

You can notice the use of slope in computing price elasticity. Price elasticity is simply slope times P/Q. you can also note, given the slope price elasticity is directly proportional to price and inversely proportional to quantity.

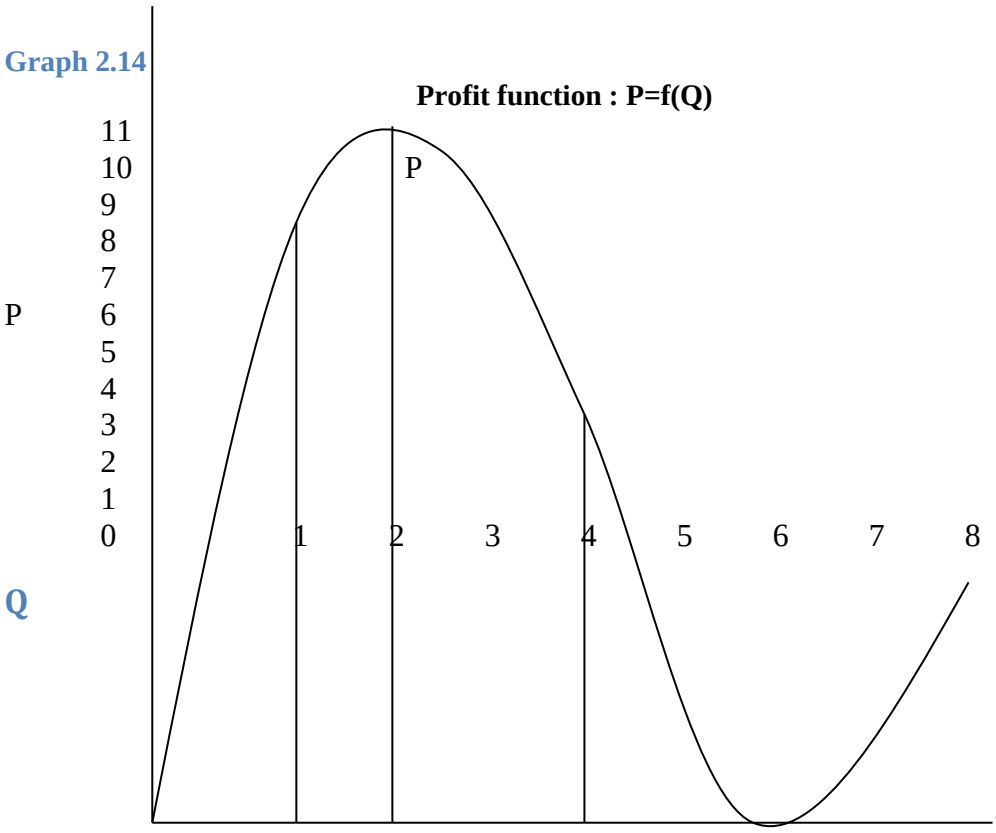
Income elasticity of demand: Income elasticity of demand throws light on the ratio of rate of rate of change in quantity demanded over rate of change in Income.

$$= (\Delta Q/Q)/ (\Delta I/I) = (I/Q) \times (\Delta Q/\Delta I).$$

14. MAXIMA AND MINIMA OF A FUNCTION

A function, especially a higher degree function, might be highest for some value of the independent variable and lowest for some value of the independent variable and there may be many `highs' and `lows'. These `highs' are called `maxima' and the `lows' are called the `minima'. Hence the need to study the maxima and minima of functions.

Graph 2.14



Suppose the profit function is, $P = Q^3/3 – 4Q^2 + 12Q$.

Find the 'Q' for which profit is maximum and the'Q' for which profit is minimum?

Solution

$P = Q^3/3 – 4Q^2 + 12Q$. So, $dP/dQ= 3Q^2/3 – 8Q^1 + 12Q^0 = Q^2– 8Q + 12Q$

Putting, $Q^2– 8Q + 12Q = 0$, we get, (Q-6)(Q-2)=0; That is either Q=2 or Q=6.

d^2P/dQ^2 of $Q^2– 8Q + 12Q = 2Q-8$.

If we put, Q=2 in $d^2P/dQ^2 = 2Q-12$, we get: (2x2) -8= -4. Less than 0. The value of Q for which the value of d^2P/dQ^2 becomes less than zero, we get maximum profit.

Put the value Q =2 in the profit function, $P = Q^3/3 – 4Q^2 + 12Q$, we get, $P = 2^3/3 – 4X2^2 + 12X2$= 8/3-16+24= 10 and 2/3.

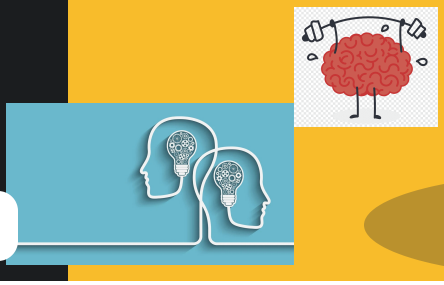
If we put, Q=6 in $d^2P/dQ^2 = 2Q-8$, we get: (2x6) -8= 4. More than 0. The value of Q for which the value of d^2P/dQ^2 becomes more than zero, we get minimum profit.

Put the value Q =6 in the profit function, $P = Q^3/3 – 4Q^2 + 12Q$, we get, $P = 6^3/3 – 4X6^2 + 12X6$= 216/3--144+72= 72-144+72=0.

ANNAMALAI UNIVERSITY

Special programs for Slow learners and Advanced learners

LEARNING MATERIAL



Opportunities for Advanced Learners

i. The Under graduate programme regulation in Engineering faculty, Post graduate programme regulation in Arts and Science faculties, Doctoral programme regulation in Agriculture faculty provide academic flexibility and scope for students to fulfill part of their credit requirement (Up to 32 /3 / 2 credits in Engineering/Science & Arts / Agriculture respectively) through “Massive Open Online Courses (MOOCs)”offered through NPTEL and SWAYAM portals.

ii. Further, the academic urge of advanced learners in few of the Departments is satisfied by allowing them to take courses available in MOOC / SWAYAM portal and addition of the marks obtained in those courses in the mark statement under the head “Extra Credit Courses”.

iii. In the Faculty of Engineering and Technology, provisions are made in the regulation to offer “One-Credit Courses”by an expert from Industry with tailor made syllabus. Students can take a maximum of two one credit courses (one each in VI and VII semesters). They can also take such courses offered in other Departments and a separate mark sheet shall be issued.

iv. Further, a student can take one of the One Credit Course through “National Skills Qualification Framework (NSQF) Courses” which provide horizontal as well as vertical pathways integrating one level of learning to another higher level with vocational training. This will enable an advanced learner to improve competency levels and make them job ready.

v. In order to cater to the knowledge hunger of advanced learners Under graduate Engineering programme has a built-in credit modification system in place. They are allowed to take up the open elective courses of eighth semester in sixth and seventh semesters one in each to enable them to pursue industrial training/project work in the entire eighth semester.

vi. Further, as a motivational reinforcement, Honours Degree concept is integrated in Under graduate Engineering programmes. To obtain Honours Degree a student must pass all the courses in the first attempt within four years. This provision apart from keeping advanced learners engaged also self-motivates students to become advanced learners.

vii. B.E Degree with additional Minor Engineering is also on offering to advanced learners if he/she completes an additional 20 credits earned from the courses offered by any one of the related Departments in the Faculty of Engineering and Technology.

viii. In the M. Pharm. regulation, provisions are incorporated to allocate credits to advanced learner activities such as participation in national and international conferences, research publications made in national and international journals indexed in Scopus / Web of Science indexed journals.