



**ARTIFICIAL INTELLIGENCE**

**INTEGRATION IN MATHEMATICS Curated with support from Intel®**

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**ABOUT THE BOOK**

Artificial Intelligence (AI) is a Cognitive Science and the history of its evolution suggests that it has grown out of the knowledge derived from disciplines such as Science, Mathematics, Philosophy, Sociology, Computing and others. Hence, it is fair for any education system to recognize the importance of integrating AI Readiness to maximize learning across other disciplines.

AI is being widely recognized to be the power that will fuel the future global digital economy; and has gained geo-strategic importance. A large number of countries are striving hard to stay ahead with their policy initiatives, to get their youth ready to function in an environment driven by AI and other emerging technologies.

India’s own AI Strategy identifies AI as an opportunity and solution provider for inclusive economic growth and social development. The report also identifies the importance of skills-based education ( as opposed to knowledge intensive education), and the value of project related work in order to “effectively harness the potential of AI in a sustainable manner” and to make India’s next generation ‘AI ready’.

CBSE has introduced Artificial Intelligence as an optional subject at Class 9 from the Session 2019-2020 onwards and has been conducting trainings for Teachers on how to use AI in the Classroom. A Training Video has also been prepared to assist the same.

CBSE has also announced AI as a multi-disciplinary integrated pedagogical approach to further enhance teaching and learning across classes 6 to 10. This document is an attempt to propose how schools may train the trainers to match relevant topics/ themes from the curricula with AI concepts. It contains details on the importance of Artificial Intelligence and Artificial Intelligence Tools as a pedagogical support for experiential learning. Guidelines for Teachers can be found in the form of Lesson Plans integrating AI in Classroom Teaching.

**How this Integration Document was created**

In keeping with the vision of CBSE to introduce and train Teachers on AI readiness, and the usage of AI in classroom teaching and learning practices; a series of online webinars were conducted with AI experts and Teachers of various Subjects from CBSE Schools. (*see Figure 1*)

Lesson Plans in each Subject were discussed and written, and a suggestive list of activities and projects integrating Artificial Intelligence into regular subject teaching was curated and compiled. An AI Glossary, relevant to each Lesson Plan was created to facilitate ease of reference and usage. At the same time a comprehensive glossary of AI Tools used by all the subject teachers has been added to each of the subject document. for reflection and necessary follow up by teachers.

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| Organized  Identified  Developed Lesson  Exhaustive four Day  Created a Working  Validated each  competent CBSE  Plans across  Group and  Webinars per  Lesson Plan and  School Teachers  Subjects and  Oriented them on  subject to  added a Glossary  with background in  Mapped them with  the AI Readiness  Brainstorm and  for Ready  different Subjects,  various Artificial  Identify Chapters  Curriculum and  Reference and Ease  AI, Integration,  Intelligence Tools  Integration Process  for Integration  of Use  Training  and Applications  from each Subject |
| --- |

*Figure 1: How this Integration Document was created*

It is important to understand that AI is one of the cognitive science disciplines that provides tools to build intelligence in contrast to other disciplines that just study and analyze the external behavior of intelligent agents. Realizing this need, it has been decided that all teachers teaching in CBSE schools should familiarize themselves with the prevalent AI knowledge and use it to make learning of their subjects more effective and student centered. It is visualized that such a step would help to build larger understanding of AI among teacher and student communities.

It is highly recommended that teachers explore the Exemplar Lesson Plans and Glossary in this document, and go beyond what has been showcased, to develop more such exemplars and teaching methodologies integrating Artificial Intelligence in day to day learning across subjects, for students.

**Disclaimer**: **Individual lesson plans have been created and edited**

**by the contributing teachers as per their respective beliefs and**

**understanding. The originality of their perception has been**

**maintained while curating this document**

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**CHAPTER 1**

**AN INTRODUCTION TO ARTIFICIAL INTELLIGENCE**

**1.1 What is Artificial Intelligence**?

Artificial Intelligence has always been a term which intrigues people all over the world. Artificial Intelligence (AI) refers to the ability of machines to perform cognitive tasks like thinking, perceiving, learning, problem solving and decision making; it is inspired by the ways people use their brains to perceive, learn, reason out and decide the action.

Various organizations have coined their own versions of defining Artificial Intelligence. Some of them are mentioned below:

**NITI Aayog**: National Strategy for Artificial Intelligence

AI refers to the ability of machines to perform cognitive tasks like thinking, perceiving, learning, problem solving and decision making. Initially conceived as a technology that could mimic human intelligence, AI has evolved in ways that far exceed its original conception. With incredible advances made in data collection, processing and computation power, intelligent systems can now be deployed to take over a variety of tasks, enable connectivity and enhance productivity.

**World Economic Forum**

Artificial intelligence (AI) is the software engine that drives the Fourth Industrial Revolution. Its impact can already be seen in homes, businesses and political processes. In its embodied form of robots, it will soon be driving cars, stocking warehouses and caring for the young and elderly. It holds the promise of solving some of the most pressing issues facing society, but also presents challenges such as inscrutable “black box” algorithms, unethical use of data and potential job displacement. As rapid advances in machine learning (ML) increase the scope and scale of AI’s deployment across all aspects of daily life, and as the technology itself can learn and change on its own, multi-stakeholder collaboration is required to optimize accountability, transparency, privacy and impartiality to create trust.

**European Artificial Intelligence (AI) leadership, the path for an integrated vision** AI is not a well-defined technology and no universally agreed definition exists. It is rather a cover term for techniques associated with data analysis and pattern recognition. AI is not a new technology, having existed since the 1950s. While some markets, sectors and individual businesses are more advanced than others, AI is still at a relatively early stage of development, so that the range of potential applications, and the quality of most existing applications, have ample margins left for further development and improvement.

**Encyclopedia Britannica**

Artificial intelligence (AI), is the ability of a digital computer or computer-controlled robot to perform tasks commonly associated with intelligent beings. The term is frequently applied to the project of developing systems endowed with the intellectual processes characteristic of humans, such as the ability to reason, discover meaning, generalize or learn, from past experience.

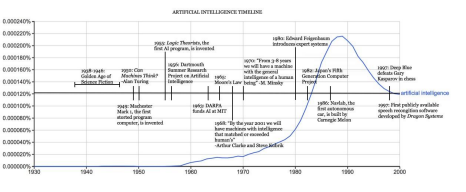
**In other words, AI can be defined as**:

**AI is a form of intelligence, a type of technology and a field of study. AI theory and development of computer systems (both machines and software) are able to perform tasks that normally require human intelligence. Artificial Intelligence covers a broad range of domains and applications and is expected to impact every field in the future. Overall, its core idea is building machines and algorithms which are capable of performing computational tasks that would otherwise require human like brain functions.**

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**1.1.1 History of AI – Live Science**

The beginnings of modern **AI** can be traced to classical philosophers' attempts to describe human thinking as a symbolic system. (see Annexure 4.5) But the field of **AI** wasn't formally founded until 1956, at a conference at Dartmouth College, in Hanover, New Hampshire, where the term "**Artificial Intelligence**" was coined. The graphic below appropriately explains why AI is a live science, what are the ups and downs in the pace of AI journey and how AI progressed in this domain from the year 1930-2000.

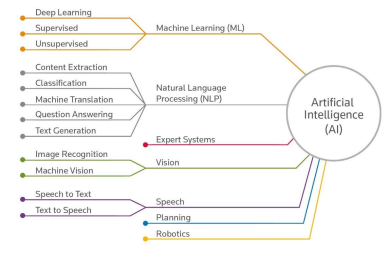
http://sitn.hms.harvard.edu/flash/2017/history-artificial-intelligence/

**1.2 What do we understand by AI in EDUCATION?**

An effective education system has the dual responsibility to develop the most critical resource (i e the human resource) of a nation.1-, that the younger generations must be educated in a way that they are ‘ready for life’ and are positive contributors to the advancement & enrichment of their nation.2- , they must be exposed to such learning environments with the help of updated tools and enlightened teachers so that their learning outcomes can be maximized and suited to the potential of every learner. In order that modern-day education achieves its goals of making its students ‘AI Ready’, it is imperative to know what K-12 learners must experience and confront in their day to day life.

AI is underlying the multitudes of its applications in the world; it encompasses and works on an array of capabilities which have universal application in different areas of study and operations. Some of the most important AI competencies with significant commonalities and connections with those of the other fields of study are shown in the graphic below.

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http://www.fullai.org/short-history-artificial-intelligence/

A careful study of the above graph would lead us to believe that many of the technologies and the underlying principles that each of these follows, have a strong correlation with the teaching learning processes at school as well as college levels. Hence it is necessary that AI should not only be introduced as a subject in the school curricula, but also should become a link to teach other subjects at all the levels. Many of the AI based applications are now available to facilitate a learner to learn in his own unique way and at his own pace.

**1.3 What is CBSE’s initiative encompassing Artificial Education?**

Making school students ‘AI Aware’ or forging ‘AI Readiness’ among students is a huge task indeed. Central Board of Secondary Education has taken a ‘***twin initiative’*** in this regard.

***First*** is to introduce AI as an elective subject in classes 8,9 and 10. To begin with, schools have to apply to CBSE and be approved to run this course. AI curriculum for classes 8 and 9 has been chalked out and a Facilitators’ Handbook has been produced. CBSE is also supporting extensive teacher training for the teaching of AI in schools.

The ***Second*** part of *CBSE* initiative deals with the premise that AI is a Cognitive Science which can be linked to various subjects that concern themselves with cognition and reasoning. Almost every one of the school subjects would fall in this domain. Be it - Mathematics, Computing, Neuro-Sciences, Psychology, Physics, Economics, Sociology, Philosophy, Languages and some others. It is, therefore, mandated by CBSE that all its schools begin to integrate AI with other disciplines from classes 1 -12.

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**1.4 What is the rationale for this Twin Initiative?**

**Initiative 1**: Artificial Intelligence permeates the length and breadth of the world we live in today. Our young generation is witnessing many uses of AI every day. While Google manages our mail accounts, it also makes suggestions about what words to use to respond to a given email and/ or project follow up reminders. Facebook not only connects us with friends but also makes suggestions about our priorities, personal needs and preferences. Today we witness smart parking spaces as well as have cars that park themselves. In many advanced countries the traffic is monitored, controlled and managed by using the data collected of moving traffic and prevalent weather conditions. Chat bots collect data for big and small businesses to assess the market requirements of their products and also support the respective business houses in interaction with the customer and resultant satisfaction. There are also AI powered devices to support households in simple tasks such as cleaning etc. All the domains of life - from medicine to manufacturing to national security and defense – are currently getting impacted by the use of Artificial Intelligence. Space missions, which extensively use unmanned space shuttles and unmanned vehicles to traverse the unknown areas of other planets, collect tremendous data not only to understand the planet they go to but also to acquire intelligence about the betterment of their own operations in future. Hence, it is essential that students of today should study this domain to understand and later be able to expand this knowledge in their own interest and in the interest of humanity.

**Initiative 2**: It is important to understand that AI is one amongst the cognitive science disciplines that provides tools to build intelligence in contrast to other disciplines that just study and analyze the external behavior of intelligent agents. Realizing this need, it has been decided that all teachers teaching in CBSE schools should familiarize themselves with the prevalent AI knowledge and use it to make learning of their subjects more effective and student centered. It is visualized that such a step would help to build larger understanding of AI amongst the teacher and student communities.

*This document is an attempt to suggest how schools may train the teachers of class 6 –10 to relate to the relevant topics/ themes from their respective curricula with technologies that AI deploys. The document will also showcase to the teachers the AI based tools that can support and augment learning across disciplines, in and out of the classrooms. The extensive AI glossary and the App Matrix is an effort to include a list of varied resources for teachers to extend the integration activity to other topics of their respective subjects.*

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**1.5 What do we mean by AI Integrated Education?**

AI integration with the other school disciplines is to be viewed from two different perspectives.

**Perspective 1**: While exploring the possibilities to integrate subjects with AI, it was felt that it can be a two-way process. The teacher may select a topic from the subject that easily lends itself to any one of the AI concepts. He/she would, then, either select the AI concept as a tool to teach the subject topic chosen by him/her or using the understanding of the topic, he/she may be able to show a linkage to AI knowledge and usage.

For example: ‘Data Collection’ is a familiar task in Mathematics and ‘Data Acquisition’ is an important basic AI concept. The teacher may use an AI based app to demonstrate Data collection in a Mathematics Class or teach the concept and functionality of the AI application through their understanding of the Data Collection operations in Mathematics.

**Perspective 2**: A practicing teacher may consider one subject +AI integration with it, which is a simpler and more functional approach.

The other approach could be to have inter disciplinary integration, in which the teacher may pick up one such topic from her own subject that has relevance to other subjects also. Then, in consultation with other teachers, the four of them could explore the same topic to achieve the learning outcomes of their respective subjects, while at the same time integrating each subject with AI. (see example 2 below)

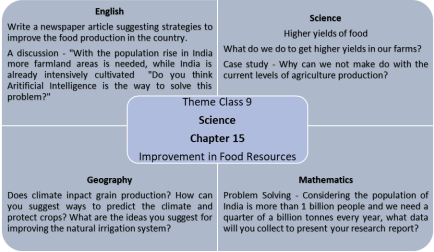
The former approach is feasible in normal classroom teaching, the later would have to take the shape of a project and would have to be conducted in large class groups over a span of time.

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**Interdisciplinary Integration with Artificial Intelligence - Class 9**

AI Integration using Google Story Speaker 

AI Integration using Computer Vision 

AI Integration using Natural 

Language ProcessingAI Integration using Data Exploration

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*Since, Artificial Intelligence is a Cognitive Science and the history of its evolution suggests, it has grown out of the knowledge systems derived from other disciplines like Science, Mathematics, Philosophy, Sociology, Computing and others, it is fair for students to see the linkages. Hence, it is fair for any education system to recognize the importance of its integration with the teaching of other disciplines, to maximize learning.*

**1.6 What would the students do in an AI integrated Class?**

A working group at CBSE has put together 7 Big Markers that may be adopted to develop a structured action plan by the teacher for K-12 learners.

# **Marker 1**. *Identifying the problem* is the *starting point of the learning cycle*; students of all levels without any exception must be exposed to the skill of scoping and identifying the problem. Having done so, the learners of all ages must learn the way to state the problem to their parents/ teachers/ themselves/ community/ team, they are working with or working for.

# **Marker 2**. *Data acquisition related to the identified problem is another big domain for learning* and it is a logical next step to proceed with. Such an exercise will prepare the students to attempt the nuances of problem solving which is also an important aspect of the AI project cycle.

# **Marker 3**. *Computers are machines which can also ‘see’, ‘hear’ and ‘speak’*. So, as such, they can be used to collect data for us. Many applications are now available which make our machines very useful for this purpose. An exposure to such capabilities of the machine needs to be explained to students of all grades. By using AI in teaching, the expectation is that the teacher will lead students to identify these tools and consequently use them to improve the learning process.

# **Marker 4**. *Learners must learn to represent the collected data in the form of identifiable models*. Once the students have the data to solve the problem, they can progressively be made to develop the skill of representing the collected data in visual presentations in the form of graphs, charts etc. The understanding and skill to build such comprehensible models is critical learning for a 21st century student. *Computers are the given machines which help store data and represent models*.

# **Marker 5**. *Computers also learn by themselves from the newer data acquired by them to build newer and better models in the future.* With interaction of inputs from the training data available to the machines, just like the human mind, the machines are able to produce entirely different models/ representations. Students of all grades need to be made aware of such capabilities which make machines “intelligent”.

# **Marker 6**. *For training the machine, it needs to interact with humans (intelligent agents); Though such interactions make the machine more and more intelligent, it can never be presumed that the machine would ever be as intelligent as humans are.* It is highly impossible for the machine to reach the capabilities of the human mind. The Robots (as these machines are sometimes called), would at their best be able to improve the efficiency of human beings and never really be able to replicate it. Such debates need to be part of discussions in the class when AI is integrated with other subjects.

# **Marker 7**. *AI applications can be beneficial or harmful in the long run*. What, when, where and to what extent should these AI applications be built? At what stage and in what ways can an AI based application be used or not used? Students of all age groups in class 1-12 should be sensitized to AI ethics through different simulations, role plays, discussions and debates.

**1.7 How can AI integrated teaching help teachers to achieve the desired learning outcomes?** While the debate regarding how much screen time is appropriate for children rages on among educators, psychologists, and parents, Artificial Intelligence and Machine Learning are additional emerging technologies that are beginning to alter education institutions and changing how education may happen in the future. Even though most experts believe the critical presence of teachers is irreplaceable, there have to be many changes to the way a teacher’s job is done and to educational best practices.

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As AI educational solutions continue to mature, the hope is that AI will help fill need gaps in learning and teaching and allow schools and teachers to do more than ever before. AI can drive efficiency, personalization and allow teachers some extra time to deploy their understanding and adaptability—uniquely human capabilities, to teach, where machines would struggle. By leveraging the best attributes of AI machines and teachers, the education system will be driven towards the best outcome for students. Since the students of today will need to work in a future where AI is no longer a notion but is the reality, it’s important that our educational institutions expose students to updated technologies and their usage. No one can deny the fact that AI capabilities would help teachers to achieve desired learning outcomes, in the following five-fold ways:



Once AI tools are in operation, the teacher will be facilitated, to have more spare time in the classroom. So, she/he can now focus on unique learning styles of her students. Having assumed the AI capabilities, she/he can also in turn, focus suitably on the challenge of developing the skills of language processing, reasoning and cognitive modelling.

**1.8 Does AI integration in Education promote ‘Effective Pedagogy’ in the classroom?** Since all cognitive domains of education relate very closely to the concept of AI, it offers ample opportunities for student engagement that cannot be found in lecturing out of the textbooks within the fixed four walls setting of the classroom. In an era termed as AI SPRING, AI and machine learning are growing dynamically, they each have the potential to propel the other forward and accelerate the learning frontiers in a synergistic fashion, along with the creation of newer innovative technologies. It is universally acknowledged that AI would be the source and the cause of improving the teaching- learning methodology in the classroom.

In many parts of the world, especially in advanced nations, Machine Learning algorithms in the education space, have already begun helping teachers fill the gaps, in the Subjects students are struggling with the most.

As of today, the list of such AI based pedagogical practices is long. A motivated and enlightened teacher would come across many such tools and practices during her research which can be profitably used by her from time to time in the interest of her students.

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**1.9 What is the role of Schools in the success of CBSE directive for AI integrated Learning**? Much of the professional world which today’s student is going to face 10 or 15 years from now, will be increasingly based on and derived from AI technologies. Hence there is dire need for the present generation of young students to be exposed and empowered enough to understand and practice AI competencies in order to remain relevant to the times they live in. In doing so, while they benefit from an AI embedded world now, later in their lives, they must also learn how to identify and perceive the challenges that extensive use of AI may pose. Taking a cue from proactive thinking of CBSE about its responsibility towards the students studying in its affiliated schools, it is high time that the leadership in CBSE schools in particular, pledge their support to the task of sensitizing their students about AI in their lives and teach them to be positive contributors towards AI development in the larger interest of the society they live in.

The outcome of the twin initiatives of CBSE would depend on the way schools perceive and implement it, the way teachers engage with it and plan some of their lessons, so that the resultant understanding about AI amongst the students is logical. Once the trigger is positive, we believe a large population of students would go on an ‘auto’ mode to explore AI domains and get sensitized to AI applications. It has been observed that some teachers suffer from a complex that anything that is technology is computer based and anything that is computer based is beyond their comprehension or reach. It is important to reiterate here that once the teacher accepts the reality of AI inevitability in modern day living and its enhanced role in the future, she/he would view this document and the suggestions made herein with an open mind. We hope that the support material and examples provided in this document will serve as a useful trigger for practicing teachers to use AI as a tool to enhance learning. With such a positive mindset, the schools and teachers would not only augment their own AI awareness, but will also be seen empowering their students with the requisite AI capabilities. They will find umpteen examples in their respective environments to connect the knowledge of individual subjects to AI technologies. It won’t be an exaggeration to state that many scenarios will be created in such a collaboration of the teachers and the learners that AI integration will be an important case in study maximizing student learning outcomes in such schools.

**AI Implementation Procedures**

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**1.10 How would this AI integrated Learning help meet the national goals**-NCF/ NCERT/ NA This thought process is completely in sync with the National Policy stipulated by NITI Aayog in ‘**Skilling for the AI Age – Getting India Ready for the AI Wave**’. Even the National Curriculum Framework developed as far back as 2005, and the Position Paper on Education Technology have echoed similar outcomes that AI integration is expected to achieve.

**NITI Aayog Vision**

“The Education sector needs to be realigned in order to effectively harness the potential of AI in a sustainable manner. In primary and secondary schools, there is a need for transition to skill-based education in subjects relevant to AI. Often criticized for being overly knowledge intensive, Indian education is in urgent need of transition in subjects relevant to STEM, or computer-based education. As jobs based on technology become prominent, so will the need to develop applied skills in a continuously changing environment.

Increased amount of project work across education levels, promoting schemes like Atal Tinkering Labs (ATL) in schools, necessary changes in curricula in schools, are some of the steps that need to be considered.”

**The National Curriculum Framework 2005**

**The aims of education as stated in the NCF** are as follows:

Seeking guidance from the Constitutional vision of India as a secular, egalitarian and pluralistic society, founded on the values of social justice and equality, certain broad aims of education have been identified in this document. These include:

• Independence of thought and action

• Sensitivity to others’ well-being and feelings

• Learning to respond to new situations in a flexible and creative manner

• Pre-disposition towards participation in democratic processes, and

• The ability to work towards and contribute to economic processes and social change.

**NCF has laid down five guiding principles for curriculum development**:

• Connecting knowledge to life outside the school

• Ensuring that learning shifts away from rote methods

• Enriching the curriculum so that it goes beyond textbooks

• Making examinations more flexible and integrating them with classroom life, and • Nurturing an overriding identity informed by caring concerns within the democratic polity of the country.

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**And for the aims of teaching, NCF** states that:

• No system of education can rise above the quality of its teachers, and the quality of teachers greatly depends on the means deployed for selection, procedures used for training, and the strategies adopted for ensuring accountability

• Teaching should aim at enhancing children’s natural desire and strategies to learn • Knowledge needs to be distinguished from information, and teaching needs to be seen as a professional activity, not as coaching for memorization or as transmission of facts.

• Activity is the heart of the child’s attempt to make sense of the world around him/her. Therefore, every resource must be deployed to enable children to express themselves, handle objects, explore their natural and social milieu, and to grow up healthy.

The NCERT Position Paper on Education Technology (**2.6) in its section 6.4.5 on** In School Education **states that:**

• “Move from a predetermined set of outcomes and skill sets to one that enables students to develop explanatory reasoning and other higher order skills.

• Enable students to access sources of knowledge, interpret them and create knowledge rather than be passive users.

• Promote flexible models of curriculum transaction.

• Promote individual learning styles.

• Encourage use of flexible curriculum content, at least in primary education, and flexible models of evaluation.”

**It further clarifies that:**

”Computers are programmable devices. This very fact makes it possible for users to make demands on these machines. This implies two things: first, that the computer ought to be capable of responding to intuitive demands, and second, that the user communicates in a language that the computer can interpret.” and that “The creative potential of the computer, and the liberating potential of the internet can only be unleashed when we actively make these kinds of demands of these technologies. The students of the future should be oriented to this possibility, allowing them to stand their ground amidst the technology mediated onslaughts of the modern world. Integrating ICT into education will require that these aspects of the technology are catered to as a whole.” It is important to note that NCF observations were made as early as 2005 when the noise about AI was not heard much, yet the ‘writing on the wall’ lends itself to endorsing the recent developments of AI in Education.

Hence, **CBSE in its Circular No 14/ 2019** dated 09-03-2019 has clearly communicated that: “Artificial Intelligence (AI) is being widely recognized to be the power that will fuel the future global digital economy. AI in the past few years has gained geo-strategic importance and a large number of countries are striving hard to stay ahead with their policy initiatives to get their country ready. India’s own AI Strategy identifies AI as an opportunity & solution provider for inclusive economic growth and Social development. The report also identifies the importance of skills-based education (as opposed to knowledge intensive education), and the value of project related work in order to “effectively harness the potential of AI in a sustainable manner” and to make India’s next generation to be ‘AI ready’.

**As a beginning in this direction, CBSE has introduced Artificial Intelligence as an optional 6th subject at Class 9 from the Session 2019-2020. To enhance the multidisciplinary approach in teaching learning and also to sensitize the new generation, it has been decided that Schools may start AI “Inspire module” of 12 hours at Class 8 itself.**

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**1.11 OPTIMISM**

It is interesting to present the following content of “Optimism” from the History of evolution of AI to add to the reader’s understanding that seemingly unimaginable and impossible events actually happen due to human effort, if a streak of positivity and optimism is maintained during the course of action.

**\***The Optimism

The first generation of AI researchers made these predictions about their work:

• 1958, H. A. Simon and Allen Newell: "within ten years a digital computer will be the world's chess champion" and "within ten years a digital computer will discover and prove an important new mathematical theorem."[57]

• 1965, H. A. Simon: "machines will be capable, within twenty years, of doing any work a man can do."[58]

• 1967, Marvin Minsky: "Within a generation ... the problem of creating 'artificial intelligence' will substantially be solved."[59]

• 1970, Marvin Minsky (in *Life* Magazine): "In from three to eight years we will have a machine with the general intelligence of an average human being."[60]

https://en.wikipedia.org/wiki/History\_of\_artificial\_intelligence

The ‘Optimism’ showcased by the researchers above, has to be simulated by the practicing teacher in terms of AI Integration in their classrooms making their pedagogy more effective and maximizing the learning outcomes of their students.

**1.12 National Education Policy 2020**

As per the National Education Policy 2020

The world is undergoing rapid changes in the knowledge landscape. With various dramatic scientific and technological advances, such as the rise of big data, machine learning, and artificial intelligence, many unskilled jobs worldwide may be taken over by machines, while the need for a skilled workforce, particularly involving mathematics, computer science, and data science, in conjunction with multidisciplinary abilities across the sciences, social sciences, and humanities, will be increasingly in greater demand

India is a global leader in information and communication technology and in other cutting-edge domains, such as space. The Digital India Campaign is helping to transform the entire nation into a digitally empowered society and knowledge economy. While education will play a critical role in this transformation, technology itself will play an important role in the improvement of educational processes and outcomes; thus, the relationship between technology and education at all levels is bidirectional.

Given the explosive pace of technological development allied with the sheer creativity of tech savvy teachers and entrepreneurs including student entrepreneurs, it is certain that technology will impact education in multiple ways, only some of which can be foreseen at the present time. New technologies involving artificial intelligence, machine learning, block chains, smart boards, handheld computing devices, adaptive computer testing for student development, and other forms of educational software and hardware will not just change what students learn in the classroom but how they learn, and thus these areas and beyond will require extensive research both on the technological as well as educational fronts

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**CHAPTER 2**

**HOW to INTEGRATE AI in SCHOOL TEACHING – A CALL TO TEACHERS**

**2.1 AI is NOT ALONE**

AI does not operate in silos nor is it a stand - alone field of study or practice. Many a times in Chapter 1, it has been said that it drives its knowledge as well as has its applications across other domains of knowledge. See below how the school domains of study (both formal and informal) interact with the concepts that Artificial Intelligence follows.

**AI CROSS BREEDS WITH OTHER SUBJECTS**

| Subject Domain | What is Common with AI domain |
| --- | --- |
| Psychology | How people perceive information, process it and build knowledge; how they behave |
| Philosophy | Mind as a physical entity, methods of reasoning, basis of learning, foundations of language, rationality and logic |
| Neuro-Science | How the basic information processing units - neurons process information |
| Mathematics | Algorithms, computability, proof, methods of representation, tractability & decidability |
| Statistics | Learning from data, uncertainty/ certainty of modelling |
| Economics | Rational economic agents, usefulness of data & models, decision theory |
| Linguistics | Grammar, syntax, knowledge representations |
| Computer Science | Building computers |
| Cognitive Sciences | Processes & things in nature, interpretation of different phenomena & their impact |

**2.2 PRINCIPLES of AI INTEGRATED LEARNING**

**AI creates some Essential Learning Experiences which are:**

• Experiences of creating through the process of problem solving

• Experiences of informed decision making

• Experiences of self-reflection, values and ethics.

• Experiences for exploring future career opportunities

• Experiences of demonstrating responsible citizenship

**2.3 OBJECTIVES of AI INTEGRATED LEARNING**

**AI integrated learning would help to develop Key Competencies for Lifelong Learning,** some of which are:

• Acquiring subject knowledge using AI as a tool

• Learning problem solving

• Innovativeness and taking initiative

• Application across key disciplines

• Developing interaction and Learning to Be

• Assuming Social responsibilities and applications

• Learning Vocational ethics

• Applying Communication skills

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**2.4 PRACTICE ‘AI+X’ PARADIGM for INTEGRATION**

So, this could be the starting point for a practicing teacher. The teacher needs to go through the following steps to integrate her normal lesson plan with AI.

***Step 1***- Identify the topic from the subject for which the subject teacher has certain teaching pedagogy; let us call it ‘X’

***Step 2-*** Research to find ‘AI’ concepts that show conceptual commonality with the subject and the topic. Research to find ‘AI’ can be done with the help of any of the four resources given below A) through online search

B) from the exemplars provided in this document

C) from the list of support material provided in this document in terms of ‘Additional Resources’ ‘AI Concepts’ and ‘Glossary’

***Step 3-*** Attach this ‘AI’ to ‘X’ in your lesson planning.

A) Discuss your lesson plan related requirement with your department colleagues or the computer faculty. This now becomes X+AI or AI +X, where X is your subject topic.

Such **“AI+X”** or **“X+AI” paradigm** is advocated in our national policy document also.

**2.5 ARTIFICIAL INTELLIGENCE CONCEPTS PERVADE MAINSTREAM DISCIPLINES** Artificial Intelligence cannot be divorced from other disciplines; its evolution and development is mutually interlinked as shown in the table given below. Hence both the fields need to be linked for mutual benefit. As educators, it is the right step to consider integration of AI with the other school disciplines where two different approaches are possible:

**a) AI as a tool to learn Mathematics, English, Science or Social Science or**

**b) Language or Mathematics and other disciplines as a tool to learn Artificial Intelligence**

**2.5.1 Skills Assessed**

After completion of each unit, the students may be evaluated for the following skills:

| **Conceptual Skills** | **Technical Skills** | **Life Skills** |
| --- | --- | --- |
| - Problem Scoping  - Problem statement  - Data Acquisition  - Data Exploration  - Graphical Representation of data/ building models  - Neural networks  - 3 domains of AI – Data,  Computer Vision & Natural  language Processing  - AI Applications | - Ability to use AI powered Tools  - Identifying linkage of AI Applications  with knowledge  systems | - Thinking skills  - Problem Solving skills  - Decision making Skills  - Social Skills- Teamwork - Leadership  - Effective Communication Skills  - Oral & Written  Presentation Skills |

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**2.5.**2 **Suggestive Assessment Approaches for AI**

AI Theme 

Project - Class 

Topic

Oral 

Feedback to 

Students & 

parents

Written

Who Will 

Assess?

Content of

the topic and

AI skills

Observations / 

Techniques **2.5.3 Assessment Rubrics**

How will AI be assessed? 

What is to be assessed? 

| **SKILLS** | **SUB SKILL**  **ASSESSED**  **(from 2.5.1 above)** | **Highly Proficient** | **Proficient** | **Beginner** | **Teacher’s**  **Comments** |
| --- | --- | --- | --- | --- | --- |
| **AI CONCEPTS** |  |  |  |  |  |
| **THINKING**  **SKILLS** |  |  |  |  |  |
| **LIFE SKILLS** |  |  |  |  |  |

**Also read Chapter 4 Appendix 6 for detailed Assessment Rubrics**

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**CHAPTER 3**

**AI Integrated Lesson Plans**

**MATHEMATICS**

CLASS 6

**3.1 Symmetry**

| **PARAMETERS** | **DESCRIPTION** | **AI CONCEPTS**  **INTEGRATED** |
| --- | --- | --- |
| **Chapter Covered** | **Chapter 13: Symmetry** |  |
| **Name of the book** | **Mathematics, Class 6, NCERT** |  |
| **Subject and**  **Artificial**  **Intelligence**  **Integrated** | Understanding the concept of Symmetry using AI Experiential Applications |  |
| **Objectives** | • To understand concept of Symmetry.  • To understand difference between symmetrical and unsymmetrical articles/ Objects using AI game.  • To identify the number of lines of symmetry in any object. (one line, two lines and more than two lines) | Autodraw.com |
| **Time Required** | 2 periods of 40 minutes each |  |
| **Classroom**  **Arrangement** | Flexible |  |
| **Material Required** | Pen, paper, Black Board chalk, Laptops/ desktops and Internet connections. |  |
| **Pre- Preparation Activity** | The Students will be asked to collect some objects and observe their pattern of symmetry. |  |
| **Previous**  **Knowledge** | The students are asked to collect any four or five objects whose halves can be mirror images and to draw the line of symmetry on the object. |  |
| **Introduction** | The teacher will introduce the concept of symmetry with the help of objects brought by students. |  |
| **Methodology** | **Divide the class into two teams.**  **Activity I: Draw the line of symmetry.**  Ask students to draw one or more lines of symmetry depending upon the nature of the object. The students will be able to identify symmetrical and unsymmetrical articles. **Activity II: Reflection and symmetry**  Ask students to look at a set of symmetrical objects in the mirror and observe that though the image shown in the mirror is inverse but the symmetry does not get affected. **Activity III: Practice Activity**  ask students to apply their understanding of Symmetry to attempt questions of 13.1 and 13.2  **Activity IV: Autodraw!**  For this activity, ask the students to go to https://autodraw.com. Once they land on this website, ask the students to select the first icon from the left side toolbar. This icon activates the AI element of the tool. Now, ask the students to draw any shape and let the AI algorithm detect and predict the possible drawings similar to it. The predictions would | Computer Vision enabled AI  application  Autodraw. |

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|  | appear in the top row. After looking at the predictions and analyzing how accurate the machine is, ask them to keep an image in mind (say of a monument or a vehicle or thing etc.) and then start drawing it roughly and see at what step the machine is able to predict the image. Once the original drawing comes into picture form, ask the students to observe the line of symmetry in it and describe it to the whole class. |  |
| --- | --- | --- |
| **Discussion on the Text** | Open discussion and presentation on:  • Symmetry and its application in real life like Road signs, patterns on Board games like Ludo, Chess etc.  More examples of Reflection and  Symmetry. |  |
| **Learning**  **Outcomes** | • The students will understand the concept of Symmetry. • Thestudents will understand the lines of Symmetry. The students will understand relationship between Reflection and Symmetry. |  |
| **Self-Evaluation and Follow-Up** | Ask students to make a chart with different figures showing symmetrical patterns and lines on symmetry.  Ask them to present to small groups.  • Let them assess how correct they are in their presentations |  |

**GLOSSARY:**

**1. AI Related Terminologies**

**Autodraw.com:** Autodraw.com is an AI enabled tool which is based on the domain of Computer Vision in which the machine identifies the pattern of your drawing and accordingly maps it with the most similar image. This tool shows various options trying to predict what the user is trying to draw. For example, if a user is trying to draw a tent and he starts with drawing a basic triangle, the machine will compare his/her drawing and show the possible outcomes for the same. The user can then select out of them which one is the most appropriate for him/her.

This gets converted to

**2. AI Activity Description**

For this activity, ask the students to go to https://autodraw.com. Once they land on this website, ask the students to select the first icon from the left side toolbar. This icon activates the AI element of the tool. Now, ask the students to draw any shape and let the AI algorithm detect and predict the possible drawings similar to it. The predictions will appear in the top row. After looking at the predictions and analyzing how accurate the machine is, ask them to keep an image in mind (say of a monument or a vehicle or thing etc.) and then start drawing it roughly and see at what step the machine is able to predict the image. Once the original drawing comes into picture, ask the students to observe the line of symmetry in it and describe it to the whole class.

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**MATHEMATICS**

CLASS 6

**3.2 Integers**

| **PARAMETERS** | **DESCRIPTION** | **AI CONCEPTS**  **INTEGRATED** |
| --- | --- | --- |
| **Chapter Covered** | **Chapter 6: Integers** |  |
| **Name of the book** | **Mathematics, Class 6, NCERT** |  |
| **Subject and**  **Artificial**  **Intelligence**  **Integrated** | • Concept of Integers  https://ncase.me/loopy/v1/?data=[[[1,312,239,0.5,%22Po sitive%22,4],[3,646,241,0.5,%22Negative%22,4],[4,800,2 41,0.5,%22Positive%22,5],[5,466,241,0.5,%22Positive% 22,5]],[[4,3,86,1,0],[3,4,82,1,0],[5,1,88,1,0],[1,5,106,1,0]],[ [310,160,%22click%2520here%250A%25E2%2586%25 93%22],[644,161,%22and%2520here%250A%25E2%25 86%2593%22]],5%5D  • Integers, Ordering of integers, representing and addition of integers on number lines. |  |
| **Learning**  **Objectives** | By the end of this lesson, learner should be able to: Define the set of integers, positive numbers, negative numbers, and signs.  Compare two integers, using the proper inequality symbol. Order a set of integers from least to greatest.  Order a set of integers from greatest to least. |  |
| **Time Required** | 6 Periods, 40 minutes each |  |
| **Classroom**  **Arrangement** | Flexible |  |
| **Material Required** | Textbooks, White boards /Smart Board, String, Scrapbook, Scissors, crayons/Sketch pens, Glue, geometry box. Smart Board, Internet, Laptop/Desktop |  |
| **Pre – Preparation Activities** | Activity to represent integers on a number line in desktop or Laptop.  Activity to add or subtract integers on number line by drawing arcs or arrows on number line.  Develop an algorithm for addition, subtraction, multiplication and divisions of integers. |  |
| **Previous**  **Knowledge** | Prior knowledge and experience of handling addition, subtraction, multiplication and division of natural numbers Addition and subtraction of natural numbers from primary school  Representing positive numbers on a number line. Addition and subtraction of simple positive numbers with the aid of a number line. |  |

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| **Methodology** | Interactive method  Understandability of students can be assessed quickly when they interact verbally.  Learning by doing-addition and subtraction using flash cards or on number line (Ordering of integers using knots on a string) gives the concept of equal spacing between the integers mutually and quick (reflexive) action for operation on integers. |  |
| --- | --- | --- |
| **Learning Outcomes** | As a result of studying this topic, students will be able to: Investigate the properties of arithmetic, commutative, associative and distributive properties and the relationships between operations including inverse operations Appreciate the order of operations, including brackets Investigate models such as the number line to illustrate the operations of addition, subtraction, multiplication and division in Integers.  Explore some of the laws that govern these operations and use mathematical models to reinforce the algorithms they commonly use. |  |
| **Follow up Activities** | Preparing Quizzes (Develop confidence in operation of integers.)  Situational analysis citing examples from daily life(Example passbook page of parents showing one month transaction, transaction details of 1-2 hours obtained from a shopping mall/Restaurant etc.) Develop the concept of positive or negative integers in practical use. (Game of Business in daily life.) |  |
| **Reflections** | Preparing videos on representation on integers and operations of Integers.  **https://youtu.be/5oHJcmYbHvA**  Display the videos in the class and discuss the positive aspects taken consideration of (Correction to be given personally) **https://youtu.be/o3kIi8g3mwI** |  |

**GLOSSARY:**

**AI Related Terminology**

**Loopy:** Loopy is an open source tool to understand the concept of system maps. A system map shows the components and boundaries of a system and the components of the environment at a specific point in time. With the help of system maps, one can easily define a relationship amongst different elements which come under a system. The map shows the cause & effect relationships of elements with each other with the help of arrows. The arrow-had depicts the direction of the effect and a sign (+ or -) shows their relationship. A + sign indicated positive relationship and a - sign indicates negative relationship between the elements. Considering the data features of any problem to be solved, a system map can be drawn.

http://ncase.me/loopy/

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**MATHEMATICS**

CLASS 6

**3.3 Mensuration - Perimeter of Polygons**

| **PARAMETERS** | **DESCRIPTION** | **AI CONCEPTS**  **INTEGRATED** |
| --- | --- | --- |
| **Chapter Covered** | **Chapter 10: Mensuration - Perimeter of Polygons** |  |
| **Name of the book** | **Mathematics, Class 6, NCERT** |  |
| **Subject and**  •  **Artificial**  **Intelligence**  •  **Integration** | Understanding the concept of perimeter of different polygons like square, rectangle, triangle, etc.  Use of AI tools to understand different shapes and figures. |  |
| **Objectives** •  •  •  •  •  • | Define polygon, triangle, rectangle, square, equilateral triangle, regular polygon, regular pentagon, regular hexagon. Describe the procedure for finding the perimeter of a polygon. Recognize that perimeter is measured in linear units. Restate the formula for the perimeter of a rectangle. Compute the perimeter for various polygons and regular polygons.  Apply perimeter concepts and formulas to complete interactive exercises |  |
| **Time Required** | 3 periods of 40 minutes each |  |
| **Classroom**  **Management** | Flexible |  |
| **Material Required** | Pen, Paper, White Board, Markers, Laptop, Internet Connection, Jodo straws, threads |  |
| **Pre-preparation**  •  **Activity**  • | Students will be asked to recall all basic concepts like Point, Line, Line segment and Ray  Students will be introduced to AI tools, Auto Draw and Quick Draw. |  |
| **Previous**  •  **knowledge**  • | Questioning will be used to check students’ previous knowledge in the form of Quiz.  Quick Draw will be used in the class to familiarize students with different shapes. Students will draw different figures and try to identify shapes used in the figure. | Quick Draw  https://quickdraw.wi thgoogle.com/ |
| **Introduction** | Students will be asked to prepare 2D shapes using JODO straws/paper folding and deduce formula of Perimeter of it. |  |
| **Methodology** | **Thread Activity**:  Students will be divided into groups of 4 or 5 and each group will make polygons using paper folding and cutting. They will then use the thread to cover the boundary of the polygon and hence find its length of the boundary and derive the formula  under the guidance of the teacher.  **Design Making Activity:**  Students will be divided into groups of 4 or 5 and using Auto Draw tool they will have to create a geometrical figure which includes all 2D shapes. It can be an animal, flower, geometrical | Autodraw.com  https://autodraw.co m |

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|  | design, etc. Then, they need to calculate the perimeter for the figure obtained.  **Quiz Activity:**  Students will be asked to search quiz in which they can see the maximum use of 2D shapes. Students will be motivated to create their own quiz which involves identification shapes and computing its perimeter using quizzes, mentimeter, padlet, etc.  **Problem Solving Activity:**  Students will be using the formula derived for the perimeter of polygons to find the perimeter of perimeter in the real life problems of NCERT exercises.  **Geoboards:**  In this follow-up activity, students use rubber bands on geoboards to create shapes with different perimeters that I have written on the board. For example, I’ll ask them to make a square with a perimeter of 16, a triangle with a perimeter of 12, etc. To wrap up this activity, I ask students to create four different polygons and record the perimeter of each on their small dry erase boards. As I walk around, it is easy to see who has grasped the idea and who needs more time and practice. |  |
| --- | --- | --- |
| **Discussion on the Text** | Open discussion for all new terms related to Perimeter of Polygons: Regular polygons, Irregular polygons, square, Rectangle, Triangle, Open curve, Closed Curve, Polygons |  |
| **Learning**  •  **Outcomes**  •  •  • | Students will be able to  Calculate the perimeter of polygons  To solve real life word problems involving perimeter of Polygons done.  Estimate length of the boundary of given shape.  To identify the regular and irregular shapes |  |
| **Self-Evaluation**  •  **and Follow up**  •  • | Peer assessment: Asking questions to each other in pairs and using peer tutoring.  Flip teaching  Use of Google form to create assessment sheet for students |  |

**GLOSSARY:**

**AI Related Terminology**

**Autodraw**: Autodraw.com is an AI enabled tool which is based on the domain of Computer Vision in which the machine identifies the pattern of your drawing and accordingly maps it with the most similar image. This tool shows various options trying to predict what the user is trying to draw. For example, if a user is trying to draw a tent and he starts with drawing a basic triangle, the machine will compare his/her drawing and show the possible outcomes for the same. The user can then select out of them which one is the most appropriate for him/her.

https://autodraw.com

**Quickdra**w: Quickdraw is a google experiment, an AI tool based on neural network in which the machine learns to recognize doodles/objects from the user's drawings. By playing this game, you will be adding your drawings to the world's largest doodling data set. After clicking on let's draw! the player will see the name of the object on the screen. While drawing the object within a timer of 20 seconds, the machine analyses the pattern and the shape of the drawing and simultaneously tries to guess the object that the player is trying to draw.

https://quickdraw.withgoogle.com/

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**MATHEMATICS**

CLASS 6

**3.4 Fractions**

| **PARAMETERS** | **DESCRIPTION** | **AI CONCEPTS**  **INTEGRATED** |
| --- | --- | --- |
| **Chapter Covered** | **Chapter 7: Fractions** |  |
| **Name of the Book** | **Mathematics, Class 6, NCERT** |  |
| **Subject and**  **Artificial**  **Intelligence**  **Integrated** | Fractions  • Fractions  • Fractions on a number line  • Proper fractions  • Improper and Mixed Fractions.  Understanding the concept of fractions using AI experiential applications. |  |
| **Learning**  **Objectives** | • To determine a part and a whole in order to label the numerator and denominator of a fraction.  • To draw equal parts between whole numbers in order to represent fractions on a number line.  • To understand the difference between Proper and Improper fractions using AI tool.  • To compare fractions. |  |
| **Time Required** | 2 periods of 40 minutes each |  |
| **Classroom**  **Arrangement** | Flexible |  |
| **Material Required** | Newspaper, Pen, Paper, White Board, Marker, Laptops/ desktops and Internet connections, 4 Chapattis/Fruits. |  |
| **Pre – Preparation Activities** | Students will be asked to draw a number line in their notebook and label 0-10.  Auto Draw AI tool will be introduced to the students and they will practice by drawing different shapes on it. | https://autodraw.co m |
| **Previous**  **Knowledge** | Students will be asked, What number comes between 1 and 2? Discuss answers and show using a number line. |  |

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| **Methodology** | Divide the class into groups.  (Learning by doing)  Activity 1: Fraction Boogie  Each student will need one piece of newspaper. Students place the piece of newspaper out as a "whole piece". The teacher plays some fun dancing music so that the student can dance along on their newspaper. When the music stops, the students must pick up their piece of paper and fold it in half. Then they start dancing on half of the newspaper.  Again, the music stops and they fold the piece of paper so that they are only dancing on eighth of the paper. They can then unfold their piece of paper to see the folds in the paper. A great discussion can take place after this game about the different fractions they created during the activity.(this activity helps students understanding proper fraction)  Activity: 2  Students will be asked to record a recipe in which they are using different ingredients using concept of fractions to get the best recipe. They will be asked to use My Story Time to record their recipe story.  https://youtu.be/rxkbIw3VlGE  Activity 2:  Each student will need 2 full chapatti and 1 half chapatti. Students place the chapatti on a table. Now teacher ask them how to write the chapattis and help students to count 2 whole chapattis as a whole number and one half chapatti as a fraction (i.e. ½).(this will help students in understanding the concept of mixed fraction) .  After that students will cut the 2 chapatti in two halves and then count these half parts now total 5 halves (4 halves of 2 chapatti and 1 half )then they will count and write these halves as 5/2. A great discussion can take place after this game about the different fractions they created during the activity.(this activity helps students understand improper fraction and mixed fraction).  https://youtu.be/iniVZ8L0BUI  Activity 3: Practice Activity  Ask students to apply their understanding of Fraction to attempt questions of 7.1 and 7.2 in the exercise given in the NCERT Math book.  Activity 4: Autodraw!  For this activity, ask the students to go to https://autodraw.com. Once they land on this website, ask the students to select the first icon from the left side toolbar and make shapes to show fractions.  This icon activates the AI element of the tool. Now, ask the students to draw any shape and let the AI algorithm detect and predict the possible drawings similar to it. The predictions will appear in the top row. | My Story Time  https://experiments .withgoogle.com/m y-storytime  Auto Draw  https://autodraw.co m |
| --- | --- | --- |

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| **Learning**  **Outcomes** | The students will:  • Understand and apply the concept of fraction in solving the problems.  • Understand the concept of proper, improper and mixed fraction.  • Know the relationship between improper and mixed fraction.  • Apply their understanding to draw images according to fraction on autodraw.com.  • Know and reason out that the machines can predict. |  |
| --- | --- | --- |
| **Follow up**  **Activities** | • Ask students to make a chart with different figures showing fraction patterns.  • Ask them to present to small groups.  • Let them assess how accurate they are in their presentations. |  |
| **Reflections** | Discuss with students:  • How do you like the site – autodraw.com?  • Do you know of any other tool/ app that can predict & draw?  • Would you be able to try this activity at home also? |  |

**GLOSSARY:**

**AI Related Terminology**

**Auto Draw:** Autodraw.com is an AI enabled tool which is based on the domain of Computer Vision in which the machine identifies the pattern of your drawing and accordingly maps it with the most similar image. This tool shows various options trying to predict what the user is trying to draw. For example, if a user is trying to draw a tent and he starts with drawing a basic triangle, the machine will compare his/her drawing and show the possible outcomes for the same. The user can then select out of them which one is the most appropriate for him/her.

https://autodraw.com

**My Storytime:** My Story time is a new Google Experiment web application which allows users to record stories to play back on Google assistant devices. Record stories from anywhere and play them back at home with Google assistant

https://experiments.withgoogle.com/my-storytime

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**MATHEMATICS**

CLASS 6

**3.5 Mensuration - Area of Polygons**

| **PARAMETERS** | **DESCRIPTION** | **AI CONCEPTS INTEGRATED** |
| --- | --- | --- |
| **Chapter Covered** | **Chapter 10: Mensuration - Area of Polygons** |  |
| **Name of the Book** | **Mathematics, Class 6, NCERT** |  |
| **Subject and**  **Artificial**  **Intelligence**  **Integrated** | Understanding the concept of Area using AI experiential applications. |  |
| **Learning**  **Objectives** | Students will able to  ● Define Area  ● List the formulae for finding Area using AI tool. ● Apply the formulae. | Microsoft math  (using Faststart technology) |
| **Time Required** | 2 periods of 40 minutes each |  |
| **Classroom**  **Arrangement** | Seating arrangement -  • Theory Sessions- pairs of 2 for peer discussions • Activities Sessions- groups of 4 |  |
| **Material Required** | Pen, paper, geoboards, Black Board chalk, Laptops/ desktops/ Tabs and Internet connections. |  |
| **Pre – Preparation Activities** | ● Students will be asked to measure the sides of their table tops, math books etc.  ● Students will be asked to draw different simple polygons on AutoDraw.  ● Students will be asked to use their measurements which they will find in activity 1 to be used in AI tool to check their results. | Autodraw : https://autodraw.c om |
| **Previous**  **Knowledge** | Students are asked to cut a smaller square and a bigger square and are asked to think which is having more perimeter or area. |  |
| **Methodology** | The teacher will introduce the concept of area with the help of cuttings brought by the students  Activity1:  Divide the class into pairs of two and tell students to make a table and note down the measurements of different objects like table top, math book, rug, etc.  Activity2:  Divide the class into groups of 4 each, and tell them to draw different polygons of the given dimensions on the AutoDraw.(teacher will ask to draw different polygons as per |  |

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|  | their choice and find their perimeters, to check their knowledge)  Activiy3:  For this activity ask students to open Microsoft math solver and tell them to use camera to find solution of their measurements noted in activity 1or enter measurements noted in activity 1 and select shape type and let AI detect related formula to find its perimeter or area. After which they can themselves will come to know about different formulae and related solutions.  Students will than solve exercise questions based on the formulae.  After this Open discussion and presentation on: • Perimeter and area and its application in real life like in fencing, in planning of construction of house, etc | Autodraw :  https://autodraw.c om |
| --- | --- | --- |
| **Learning**  **Outcomes** | • Students will be able to solve real world and mathematical problems involving perimeters of polygons.  • To find the area of the given side dimension, finding an unknown dimension, and exhibiting polygons with the same  • Students will also learn how to frame problem questions. |  |
| **Follow up**  **Activities** | Ask students to make a presentation on area and tell them to present in groups of 4 to the whole class and also tell them to prepare a formula table on A-4 size sheet.  (Teacher will assess students on the basis of their presentation; how much they understood.) |  |

**GLOSSARY:**

**AI Related Terminology**

**Auto Draw**: Autodraw.com is an AI enabled tool which is based on the domain of Computer Vision in which the machine identifies the pattern of your drawing and accordingly maps it with the most similar image. This tool shows various options trying to predict what the user is trying to draw. For example, if a user is trying to draw a tent and he starts with drawing a basic triangle, the machine will compare his/her drawing and show the possible outcomes for the same. The user can then select out of them which one is the most appropriate for him/her.

https://autodraw.com

**Microsoft Math** Solver (camera based AI app) — available on both IOS and Android — can solve various **Math** problems including quadratic equations, calculus, and statistics. ... The app can also show graphs for the equation to enhance understanding of the subject.

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**MATHEMATICS**

CLASS 6

**3.6 Playing with Numbers**

| **PARAMETERS** | **DESCRIPTION** | **AI CONCEPTS INTEGRATED** |
| --- | --- | --- |
| **Chapter Covered** | **Chapter 3 - Playing with Numbers** |  |
| **Name of the Book** | **Mathematics, Class 6, NCERT** |  |
| **Subject and**  **Artificial**  **Intelligence**  **Integrated** | Understanding the concept of Prime factorization, HCF & LCM using AI tool |  |
| **Learning**  **Objectives** | • To understand the concept of Factor of a number using AI tool  • To understand the concept of prime & composite numbers • To understand the concept of Common factor & Highest Common Factor  • To solve real life word problems |  |
| **Time Required** | 3 classes of 40 min each |  |
| **Classroom**  **Arrangement** | Seating arrangement -  • Startup activity: group activity  • Concept building: pair of two  • Follow up activity: Group activity all in a circle |  |
| **Material Required** | NCERT Class 6 Textbooks, Notebook, Pen, paper, Desktop/ laptop with good internet connection  https://www.nctm.org/Classroom  Resources/Illuminations/Interactives/Factor-Game/ | https://www.nctm. org/Classroom  Resources/Illumin ations/Interactives /Factor-Game/ |
| **Pre – Preparation Activities** | Students will be asked to revise their multiplication tables |  |
| **Previous**  **Knowledge** | Student should have previous knowledge of multiplication |  |

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| **Methodology** | **Introduction:** Previous knowledge of multiplication will be checked by dodging tables  **Activity 1:** As a startup activity, students will play kabaddi in a group of two teams each having 20 members. (**Physical Education integration)**  • Each member of the team will represent numbers from 1 to 20.  • Now raider from team A(suppose no 12) will go in the opposite teams court and will try to out all the numbers except the numbers by which it get divided exactly and the numbers by which it gets divided exactly will be left out in the court( In case of number 12 , the numbers left out in the court will be 1,2,3,4,6,12) .  • After this activity the teacher will explain that **all the numbers which divide a given number exactly are called factors of the given number.**  Students will develop their understanding of factors using given AI tool  *https://www.nctm.org/Classroom*  *Resources/Illuminations/Interactives/Factor-Game/* (How to play the game is given in the glossary below) **Activity2:** Now as the students are aware about factors of a given numbers ,they will be introduced with the concept of prime & composite numbers using sieve of Eratosthenes . **Activity 3:** Students will be explained the method to find Common Factors & Highest Common Factor(HCF) of 2 or more numbers using factors.  Step 1) Students will find out factors of given numbers Step2) They will write the factors which are common factors of all the given numbers Step3) Out of these factors , the factor which is the greatest is HCF  **Activity 4 :** Based on their understanding of factors, prime & composite numbers common factors & HCF students will solve problems in Ex 3.1, 3.2, 3.4, 3.6 & 3.7 |  |
| --- | --- | --- |
| **Learning**  **Outcomes** | • Students will understand the concept of Factors using AI tools  • Students will understand the concept of prime & composite numbers  • Students will understand the concept of common factors & HCF  • Students will analyse the situation where HCF and LCM will be useful in real life situation.  • Students will understand the importance of Artificial Intelligence to develop their concept of Prime factors. |  |
| **Follow up**  **Activities** | • Students will conduct a quiz on factors, prime & composite numbers & HCF (group activity : group of 20)  • Students will develop a game for HCF on scratch in Computer science (Subject Integration)  • Ask the students to analyze the real-life situations in their daily life and apply the concept of factors & HCF | Scratch |

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| **Reflections** | Discussion about how AI tool has been helpful in concept building of factors  https://www.nctm.org/Classroom  Resources/Illuminations/Interactives/Factor-Game/ Ask the students to explore what other available AI applications can be used as alternative |  |
| --- | --- | --- |

**GLOSSARY:**

**AI Related Terminology**

**The National Council of Teachers of Mathematics (NCTM) is Mathematics education organization in the world.**

https://www.nctm.org/Classroom-Resources/Illuminations/Interactives/Factor-Game/ **AI Activity Description**

● Player 1 chooses a number on the game board by clicking on it. The square will be colored blue, as shown for 12. Player 1 receives 12 points for this choice.

● Player 2 then clicks on all the proper factors of Player 1’s number. The *proper factors* of a number are all the factors of that number, except the number itself. For example, the proper factors of 12 are 1, 2, 3, 4, and 6. Although 12 is also a factor of 12, it is not considered a *proper* factor. All of the proper factors that Player 2 selects will be colored red. Player 2 will receive 1 + 2 + 3 + 4 + 6 = 16 points for selecting all of the proper factors.



● Players reverse roles. On the next turn, Player 2 colors a new number and gets that many points, and Player 1 colors all the factors of the number that are not already colored and receives the sum of those numbers in points.

● The players take turns choosing numbers and coloring factors.

● If a player chooses a number with no uncolored factors remaining, that player loses a turn and does not get the points for the number selected.

● The game ends when there are no numbers remaining with uncolored factors.

● The player with the greater total when the game ends is the winner.

**Scratch: scratch.mit.edu**

Scratch is a block-based visual programming language and website targeted primarily at children to help learn code. Users of the site can create online projects using a block-like interface.

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**MATHEMATICS**

CLASS 6

**3.7 Data Handling**

| **PARAMETERS** | **DESCRIPTION** | **AI CONCEPTS INTEGRATED** |
| --- | --- | --- |
| **Chapter Covered** | **Chapter 9: Data Handling** |  |
| **Name of the Book** | **Mathematics, Class 6, NCERT** |  |
| **Subject and**  **Artificial**  **Intelligence**  **Integrated** | To understand the concept of Data Handling  AI Tools of Data Acquisition and Data Exploration. |  |
| **Learning**  **Objectives** | ● To understand the concept of Data.  ● To understand the process of Data.  - Data and source of Data.  - Organization of Data.  - Pictograph.  - Bar graph.  ● To understand the process of Data Handling in real - life situations using AI Tools of Data Acquisition, Data visualization and Data Exploration. | Data Acquisition Data  visualization |
| **Time Required** | 2 periods of 40 minutes each. |  |
| **Classroom**  **Arrangement** | Flexible |  |
| **Material Required** | ● Textbook, Graph Paper, Coloured Pen or Sketches, White Board.  ● Laptops/ desktops and Internet connections. |  |
| **Pre – Preparation Activities** | The students will be asked to collect the weekly test marks of all subjects and represent the data in tabular form and draw a bar graph. |  |
| **Previous**  **Knowledge** | The students are asked to recall the knowledge about collection of data, bar graph and pictograph.  Some questions would be given to them to solve. |  |
| **Methodology** | **Divide the students into four groups.**  ● The students will be asked to collect the weekly test marks of math of all students and arrange these marks in a table using tally marks.  ● Ask the students to go on http://datavizcatalogue.com and explore various types of graphs and the way to use these. Ask them to select a representation which will suit their data best.  ● Ask students to apply their understanding of data to do questions of exercise 9.1, 9.2 and 9.3 from NCERT Math Book. | Data  Acquisition  Data  Visualization  http://datavizcat alogue.com |

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| **Learning**  **Outcomes** | ● The Students will understand the concept of Data Handling*.*  ● The Students will understand the process of Data Handling.  - Sources of Data.  - Collection of Data - Data Acquisition  - Organization & representation of Data - Data Exploration.  ● The Students will understand the process of Data Handling in real - life situations using AI Project cycle process of Data Acquisition and Data Exploration. | http://datavizcat alogue.com |
| --- | --- | --- |
| **Follow up**  **Activities** | Make a group of 4 or 5 students and ask them to collect data about the number of men and women in their village and present the data with the help of AI project cycle process of Data Acquisition and Data Visualization.  Let them assess how accurate they are in their presentation. |  |

**GLOSSARY:**

**AI Activity Description**

**Data Acquisition**

Data acquisition refers to acquiring authentic data crucial for the AI model from reliable sources. The data acquired can then be divided into two categories: Training Data and Testing Data. The AI model gets trained on the basis of training data and is evaluated on the basis of testing data.

There can be various ways in which students can collect data. Some of them are:

• Surveys

• Web Scraping - data.gov.in, kaggle.com

• Sensors

• Cameras

• Observations

• Application Program Interface

**Data Exploration**

After acquiring data comes the need to analyze the data. For this, they need to visualize the acquired data in some user-friendly format so that they can:

● Quickly get a sense of the trends, relationships and patterns contained within the data. ● Define strategy for which model to use at a later stage.

● Communicate the same to others effectively.

Data Exploration refers to visualizing the data to determine the pattern, relationships between elements and trends in the dataset that gives a clear meaning and understanding of the dataset. Data exploration is important as it helps the user to select an AI model in the next stage of the AI project cycle. To visualize the data, various types of visual representations can be used such as diagrams, charts, graphs, flows and so on.

https://datavizcatalogue.com

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**MATHEMATICS**

CLASS 6

**3.8 Practical Geometry - Constructing Angles**

| **PARAMETERS** | **DESCRIPTION** | **AI CONCEPTS**  **INTEGRATED** |
| --- | --- | --- |
| **Chapter Covered** | **Chapter 14: Practical Geometry** |  |
| **Name of the Book** | **Mathematics, Class 6, NCERT** |  |
| **Subject and**  **Artificial**  **Intelligence**  **Integrated** | Understanding the concept of constructing angles using AI Experiential Applications |  |
| **Learning**  **Objectives** | ● To understand the concept of construction  ● To understand the construction of line segments ● To understand the construction of angles  ● To understand the construction of perpendicular bisectors and angle bisectors |  |
| **Time Required** | 2 Periods of 40 minutes each |  |
| **Classroom**  **Arrangement** | Flexible |  |
| **Material Required** | Pen, paper, Black board chalk, Laptop/desktops and Internet connections |  |
| **Pre – Preparation Activities** | The students will be asked to recall how to draw the circles and arc using compass |  |
| **Previous**  **Knowledge** | A video can be shown to the students to introduce angles. https://youtu.be/aGejx2fRCHU  The students are made to recall the various types of angles and how to draw and measure by using protractor |  |
| **Methodology** | **Activity 1: Clock Activity**  Students are shown the analog clock and set the clock to different times. Ask the students some questions regarding the angles made by the hands of the clock and its degree measure. The team members will discuss themselves and answer the questions.  **Activity II: Auto Draw**  Students are asked to draw different shapes and figures involving angles using Auto Draw  **Activity III-** A video will be shared to make the students understand the construction of various angles.  https://youtu.be/wYeDgQShXq4  **Activity IV- Practice Activity**  Ask students to apply their understanding of constructing angles to attempt questions of 14.5 and 14.6 given in the exercise of NCERY Book. | Auto Draw |

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| **Learning**  **Outcomes** | The students will be able to  ● Construct line segments using compass  ● Construct and measure angles  ● Construction of perpendicular bisectors  ● Construction of angles using ruler and compass ● Construction of angle bisectors |  |
| --- | --- | --- |
| **Follow up**  **Activities** | The students will be asked to explore the angles created in their body parts while making different movements and using google experiment using AI tool.  The students will be asked to observe different types of angles in their surroundings and how they play an important role in architecture. | https://experiments. withgoogle.com/billt jonesai |

**GLOSSARY**

**3.9 Data Handling**

**AI Generated Movement/Dance**

The experiment allows user to use a web-browser and a simple camera, the experiments invite users everywhere to explore the creative possibilities of their own bodies and make new connections with Bill’s iconic solo, 21. With different posture angles one can hear different music.

Use of this tool with class 6 graders can be a fun activity in which students can explore different angles created by their body parts when various postures are created.

https://experiments.withgoogle.com/billtjonesai

**Auto Draw**

Autodraw.com is an AI enabled tool which is based on the domain of Computer Vision in which the machine identifies the pattern of your drawing and accordingly maps it with the most similar image. This tool shows various options trying to predict what the user is trying to draw. For example, if a user is trying to draw a tent and he starts with drawing a basic triangle, the machine will compare his/her drawing and show the possible outcomes for the same. The user can then select out of them which one is the most appropriate for him/her.

https://autodraw.com

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**MATHEMATICS**

CLASS 7

**3.9 Data Handling**

| **PARAMETERS** | **DESCRIPTION** | **AI CONCEPTS INTEGRATED** |
| --- | --- | --- |
| **Chapter Covered** | **Chapter 3: Data Handling** |  |
| **Name of the book** | **Mathematics, Class 7, NCERT** |  |
| **Subject and**  **Artificial**  **Intelligence**  **Integrated** | Understanding the concept of Data Handling using AI Tools of Data Acquisition and Data Exploration. |  |
| **Objectives** | • To understand concept of Data Handling.  • To understand process of Data Handing:  - Sources of Data  - Collection of Data – Data Acquisition  - Organization & Representation of Data – Data Exploration.  • To understand process of Data Handing in real-life situations using AI Tools of Data Acquisition and Data Exploration. |  |
| **Time Required** | 2 periods of 40 minutes each |  |
| **Classroom**  **Arrangement** | Flexible |  |
| **Material Required** | Graph Paper, Colored Pen, paper, Black Board chalk, Laptops/ desktops and Internet connections. |  |
| **Pre- Preparation Activity** | The Students will be asked to collect some Newspaper articles related to Air Pollution. A picture of a Graph showing the Air quality of India over the past 10 years will also be displayed |  |
| **Previous**  **Knowledge** | The students are asked to recall what they have already done with regard to collection of Data, Tabulations and Bar Graphs. Some questions would be given to them to solve. |  |
| **Introduction** | The teacher will introduce the concept of Double Bar Graph in order to understand how to make comparative Analysis of two or more Data Sets. |  |
| **Methodology** | Divide the class into two teams.  Activity I: Air Pollution in Delhi – A Case  Study.  Ask students to read articles on Air Pollution in Delhi from different Sources: Newspaper, Internet etc. Ask them to collect data on changing Air Pollution Levels in Delhi and represent it with the help of some graphical/pictorial representation.  Ask the students to go on https://datavizcatalogue.com and explore various types of graphs and the way to use these. Ask them to select representation which will suit their data best. Students will be able to recognize various patterns/trends out of their representations which can be used to represent this problem. Ask the students to explore the possibilities of using AI in addressing this problem.  Activity II: Practice Activity  Ask students to apply their understanding of Data Handling to attempt questions of 3.1 &3.2 given in the exercise of the book. | Data Acquisition  Data exploration https://datavizcatal ogue.com |

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| **Discussion on the Text** | Open discussion and presentation on:  ● Observation made by each group on the changing levels of air pollution in Delhi.  ● What are the causes?  How can the existing problem of  deterioration of air quality be solved? |  |
| --- | --- | --- |
| **Learning**  **Outcomes** | • The students will understand the concept of Data Handling. • The students will understand the process of Data Handing: - Sources of Data  - Collection of Data – Data Acquisition  - Organization & Representation of Data – Data Exploration.  The students will understand the process of Data Handing in real-life situations using AI Project cycle process of Data Acquisition and Data Exploration. |  |
| **Self-Evaluation and Follow-Up**  **Activity** | Ask students to choose some issues in their surrounding and make a presentation with the help of AI Project Cycle of Data Acquisition and Data Exploration  Ask them to present to small groups.  • Let them assess how accurate they are in their presentations. |  |

**GLOSSARY:**

**AI Related Terminology**

**Data Acquisition**: Data acquisition refers to acquiring authentic data crucial for the AI model from reliable sources. The data acquired can then be divided into two categories: Training Data and Testing Data. The AI model gets trained on the basis of training data and is evaluated on the basis of testing data. There can be various ways in which students can collect data. Some of them are:

• Surveys

• Web Scraping – data.gov.in, kaggle.com

• Sensors

• Cameras

• Observations

• Application Program Interface

Data Exploration: https://datavizcatalogue.com

After acquiring data comes the need to analyze the data. For this, they need to visualize the acquired data in some user-friendly format so that they can:

● Quickly get a sense of the trends, relationships and patterns contained within the data. ● Define strategy for which model to use at a later stage.

● Communicate the same to others effectively.

Data Exploration refers to visualizing the data to determine the pattern, relationships between elements and trends in the dataset that gives a clear meaning and understanding of the dataset. Data exploration is important as it helps the user to select an AI model in the next stage of the AI project cycle. To visualize the data, various types of visual representations can be used such as diagrams, charts, graphs, flows and so on.

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**AI Activity Description**

**Data Acquisition**: In this activity, ask the students to search for data regarding Air Pollution in Delhi through various sources. Ask them to identify authentic sources which can provide reliable information. They can go for either online or offline sources of acquiring data. After identifying reliable data sources, ask the students to get data and store it for the next activity.

**Data Exploration**: Now that the data has been acquired, ask the students to explore it through visual representations. Ask students about various visual representations that could be used to present their data in a meaningful manner. Guide the students to visit https://datavizcatalogue.com and observe various types of graphical/ pictorial representations. As soon as they land upon the website, they need to go to some of the graphs and read their descriptions and how to create them. After exploring the resource, ask the students to select the type of representation that according to them would be most appropriate for visualizing their data. Once they finalize their graph, ask them to draw the same on a chart paper using the data which they acquired. Now that the students have drawn the graph, they need to present it to the whole class in such a way that they are able to analyze some meaningful pattern out of it. The pattern or the trend recognized out of the representation should lead them towards solving the problem of Air pollution in Delhi. Finally, ask the students to discuss how AI can be leveraged in this situation.

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**MATHEMATICS**

CLASS 7

**3.10 The Triangle and its Properties**

| **PARAMETERS** | **DESCRIPTION** | **AI CONCEPTS INTEGRATED** |
| --- | --- | --- |
| **Chapter Covered** | **Chapter 6: The Triangles and Its properties** |  |
| **Name of the book** | **Mathematics, Class 7, NCERT** |  |
| **Subject and**  **Artificial**  **Intelligence**  **Integrated** | ● To understand the concept of Triangles.  ● Classify Different types of triangles on the basis of Angles. ● To understand properties of Equilateral Triangles, Isosceles Triangles, Scalene Triangles.  ● To Explain Exterior angles of Triangles, Angle sum property of Triangles, The sum of length of two sides is greater than third side (Triangle inequality). |  |
| **Learning**  **Objectives** | ● Students will be able to identify and classify the types of triangle by length of the sides.  ● Students will be able to identify and classify the types of triangle by the size of the angle.  ● Students will be apply their knowledge about triangle in solving problem related to characteristics of triangle ● Extension of triangle types to create or describes Solids. Example Triangular prism, Pyramids and Triangular models.  ● Congruency |  |
| **Time Required** | 06 Periods of 40 minutes |  |
| **Classroom**  **Arrangement** | Flexible |  |
| **Material Required** | Textbooks, White boards /Smart Board, String, Scrapbook, Scissors, crayons/Sketch pens, Glue, geometry box and Internet connections. |  |
| **Pre – Preparation Activities** | Different types of triangles (unnamed or classified figures to be given to the students and tell to measure the sides and angles as an exercise.  https://youtu.be/\_xl-j29V9x4  Students will be asked to use Autodraw and design different triangles on the basis of sides and angles.  Verified Triangle inequality.  https://youtu.be/APX7sh7\_PcU  Verify angle sum property of triangles.  https://youtu.be/Fy3OkZHX7LE | https://www.auto draw.com/ |
| **Previous**  **Knowledge** | ● It is assumed that the students know about the point, straight line, line segment, angles, equal angles, acute angles, obtuse angles and right angle.  ● Angle sum property of triangle is 180.  ● Classification of triangles on the basis of sides and angles. |  |

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| **Methodology** | Interactive method-Understandability of students can be assessed quickly when they interact verbally.  Learning by Doing-measuring the sides and angles of triangles and naming them in general and classifying as whole. Comparison of the sides to affirm triangle inequality. |  |
| --- | --- | --- |
| **Learning**  **Outcomes** | As a result of studying this topic, students will be able to: ● Name and classify the triangles on the basis of sides and angles.  ● Verify angle sum property of triangle and triangle inequality. ● Handle sums related to the properties of equilateral, isosceles and right angled triangle.  ● Know that a triangle can have only one obtuse angle or right angle.  ● Handle sums related to exterior angle property of triangle. ● Identify the triangular faces of a solids. |  |
| **Follow up**  **Activities** | Preparing Quizzes (Develop confidence in identifying and co relation of properties of triangle in doing problems.) Situational analysis –Correlating the triangular shapes from the environment (Examples-The roof top of a temple, Pyramids of Egypt ,Shapes of sweets ,half folded Kites, Diagonals of any quadrilateral divided it into two triangles. |  |
| **Reflections** | Preparing videos on the representation of different types of triangles and their properties  Provide reference of links related to the topics. |  |

**GLOSSARY**

**AI Related Terminology**

**Autodraw**: Autodraw.com is an AI enabled tool which is based on the domain of Computer Vision in which the machine identifies the pattern of your drawing and accordingly maps it with the most similar image. This tool shows various options trying to predict what the user is trying to draw. For example, if a user is trying to draw a tent and he starts with drawing a basic triangle, the machine will compare his/her drawing and show the possible outcomes for the same. The user can then select out of them which one is the most appropriate for him/her.

https://autodraw.com

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**MATHEMATICS**

CLASS 7

**3.11 Perimeter and Area - Area of Polygons**

| **PARAMETERS** | **DESCRIPTION** | **AI CONCEPTS**  **INTEGRATED** |
| --- | --- | --- |
| **Chapter Covered** | **Chapter 11: Perimeter and Area - Area of Polygons** |  |
| **Name of the book** | **Mathematics, Class 7, NCERT** |  |
| **Subject and**  **Artificial**  **Intelligence**  **Integration** | Understanding the concept of Area different polygons like parallelogram, Triangle, etc. Using AI tool to understand the shape concept of different polygons. | Autodraw.com |
| **Learning**  **Objectives** | ● Define area of different Polygons  ● To understand the concept of area of different polygons. ● To derive formulas for calculating area  ● To calculate the area of given polygons  ● To calculate the area of assorted shapes |  |
| **Time Required** | 3 periods of 40 minutes each |  |
| **Classroom**  **Management** | Flexible |  |
| **Material Required** | Pen, Paper, White Board, Markers, Laptop, Internet Connection, Jodo straws |  |
| **Pre-preparation Activity** | Students will be asked to recall all 2D shapes and their area and perimeter. |  |
| **Previous**  **knowledge** | Questioning will be used to check students previous knowledge in the form of Quiz |  |
| **Introduction** | Students will be asked to prepare 2D solids using JODO straws/paper folding. |  |
| **Methodology** | **Design Making Activity:** Students will be divided into groups of 4 or 5 and they will use Quick draw tool to draw and identify different 2D geometrical shapes. It can be an animal, flower, geometrical design, etc. Then, they need to calculate the perimeter for the figure obtained.  **Quiz Activity:** Students will be asked to search quiz in which they can see the maximum use of 2D shapes. Students will be motivated to create their own quiz which involves identification shapes and computing its area using quiz, mentimeter, padlet, etc.  **Problem Solving Activity:** Students will be using the formula derived for the area of polygons to find the area in the real life problems of NCERT exercise.  **Autodraw:** In this follow-up activity, students will use Autodraw tool to create shapes with different area that have been written on the board. For example, teacher can ask them to make different shapes | Quick Draw  https://quickdraw.wi thgoogle.com/  Auto Draw  https://autodraw.co m |

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|  | To wrap up this activity, ask students to create four different polygons and record the area of each on their small dry erase boards. As teacher walk around, it is easy to see who has grasped the idea and who needs more time and practice |  |
| --- | --- | --- |
| **Discussion on the Text** | Open discussion for all new terms related to Area : Area, Parallelogram, Triangle, Circle, pie |  |
| **Learning**  **Outcomes** | Students will be able to  ● To calculate the area of given shapes  ● To solve real life word problems involving area of the shapes done. |  |
| **Self-Evaluation and Follow up** | Peer assessment: Asking questions to each other in pairs and using peer tutoring.  ● Flip teaching  ● Google form |  |

**GLOSSARY**

**AI Related Terminology**

**Quickdra**w: Quickdraw is a google experiment, an AI tool based on neural network in which the machine learns to recognize doodles/objects from the user's drawings. By playing this game, you will be adding your drawings to the world's largest doodling data set. After clicking on let's draw! the player will see the name of the object on the screen. While drawing the object within a timer of 20 seconds, the machine analyses the pattern and the shape of the drawing and simultaneously tries to guess the object that the player is trying to draw.

https://quickdraw.withgoogle.com/

**Auto Draw**: Autodraw.com is an AI enabled tool which is based on the domain of Computer Vision in which the machine identifies the pattern of your drawing and accordingly maps it with the most similar image. This tool shows various options trying to predict what the user is trying to draw. For example, if a user is trying to draw a tent and he starts with drawing a basic triangle, the machine will compare his/her drawing and show the possible outcomes for the same. The user can then select out of them which one is the most appropriate for him/her.

https://autodraw.com

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**MATHEMATICS**

CLASS 7

**3.12 Lines and Angles**

| **PARAMETERS** | **DESCRIPTION** | **AI CONCEPTS INTEGRATED** |
| --- | --- | --- |
| **Chapter Covered** | **Chapter 5: Lines and Angles** |  |
| **Name of the Book** | **Mathematics, Class 7, NCERT** |  |
| **Subject and Artificial Intelligence**  **Integrated** | Understanding the concept of Lines and Angles using AI Experiential Applications |  |
| **Learning Objectives** | ● To understand the concept of Line, Line segment, Ray. ● To understand the concept of Angle and types of angles using an AI game.  ● To draw a transversal and intersecting line. |  |
| **Time Required** | 2 periods of 40 minutes each |  |
| **Classroom**  **Arrangement** | Flexible |  |
| **Material Required** | Pen, paper, White Board, Marker, Laptops/ desktops and Internet connections. |  |
| **Pre – Preparation Activities** | The Students would be asked to collect some objects e g, a piece of paper and color pen/pencil. |  |
| **Previous Knowledge** | The students are asked to collect any four or five objects (like pen, book, cell phone etc.) and draw lines, line segments, and ray with the help of objects. |  |

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| **Methodology** | **Activity I**  Students will take objects like matchsticks and mark a point by using the head of matchsticks. After that students will draw a line, line segment and ray by using matchsticks.  https://youtu.be/2SUIMYpWhs8  Teacher will help them understand point, ray, line, line segment. **Activity II**  Ask students to observe the objects (like wall clock/wrist watch) and observe the image and draw the lines for minute and second hand. This activity help them to understand the concept of different types of angles.  https://youtu.be/UgfSwlqi4Qg  **Activity III**  Ask students to apply their understanding of angles to attempt questions of 5.1given in the exercise of the chapter. **Activity IV**  AutoDraw - For this activity, ask the students to go to https://autodraw.com. Once they land on this website, ask the students to select the first icon from the left side toolbar. This icon activates the AI element of the tool. Now, ask the students to draw any shape of angle and let the AI algorithm detect and predict the possible drawings similar to it. The predictions will appear in the top row. After looking at the predictions and analyzing how accurate the machine is, ask them to keep an image in mind (say of a monument or a vehicle or thing etc.) and then start drawing it roughly. Ask them to notice, at what step the machine is able to predict the image. Once the correct image comes on the screen, ask the students to observe the angle in it and describe it to the whole class. | Computer  Vision enabled AI application  Autodraw  https://autodraw .com |
| --- | --- | --- |
| **Discussion on the Text** | Open discussion and presentation on lines and angles and its application in real life like walls of room, couches in home, wall clock etc. |  |
| **Learning Outcomes** | The students will:  ● Understand the line.  ● Understand and apply the concept of angles in solving the problems.  ● Know the relationship between lines and angles. ● Apply their understanding to draw angles and lines on autodraw.com.  ● Know and reason out that the machines can predict |  |
| **Follow up Activities** | Ask students to make a chart with different figures showing angles and lines of angle.  Ask them to present to small groups. Let them assess how accurate they are in their presentations. |  |
| **Reflections** | Discuss with students: How do you like the site – autodraw.com? Do you know of any other tool/ app that can predict & draw? Would you be able to try this activity at home also? |  |

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**GLOSSARY:**

**AI Related Terminology**

**Autodraw** : Autodraw.com is an AI enabled tool which is based on the domain of Computer Vision in which the machine identifies the pattern of your drawing and accordingly maps it with the most similar image. This tool shows various options trying to predict what the user is trying to draw. For example, if a user is trying to draw a tent and he starts with drawing a basic triangle, the machine will compare his/her drawing and show the possible outcomes for the same. The user can then select out of them which one is the most appropriate for him/her.

https://autodraw.com

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**MATHEMATICS**

CLASS 7

**3.13 Congruence of Triangles**

| **PARAMETERS** | **DESCRIPTION** | **AI CONCEPTS INTEGRATED** |
| --- | --- | --- |
| **Chapter Covered** | **Chapter 7: Congruence of Triangles** |  |
| **Name of the Book** | **Mathematics, Class 7, NCERT** |  |
| **Subject and**  **Artificial**  **Intelligence**  **Integrated** | Understanding the concept of congruence using AI experiential applications. |  |
| **Learning**  **Objectives** | The students will able to  ● Understand the concept of congruence using AI tools. ● Apply the congruence criterion in exercise questions. | Autodraw.com |
| **Time Required** | 2 periods of 40 minutes each |  |
| **Classroom**  **Arrangement** | Seating arrangement – group of 2 for peer discussions |  |
| **Material Required** | Pen, paper, Black Board chalk, Laptops/ desktops/tabs and Internet connections. |  |
| **Pre – Preparation Activities** | The Students will be asked to collect some objects and observe their pattern of symmetry. |  |
| **Previous**  **Knowledge** | The students are asked to collect any four or five objects whose halves can be mirror images and to draw the line of symmetry on the object. |  |
| **Methodology** | ● The teacher will introduce the concept of congruence with the help of objects brought by students and using line symmetry in a single object, in order to explain half of the congruent part to the other half.  ● Teacher will explain the criterions using presentation and will ask students to apply their understanding of congruence in the exercise questions.  ● Autodraw - For this activity, ask the students to go to https://autodraw.com. Once they land on this website, ask the students to select the first icon from the left side toolbar. This icon activates the AI element of the tool. Now, ask the students to draw any shape and let the AI algorithm detect and predict the possible drawings similar to it. The predictions would appear in the top row. After looking at the predictions and analyzing how accurate the machine is, ask them to keep an image in mind (say of a monument or a vehicle or thing etc.) and then start drawing it roughly and see at what step the machine is able to predict the image. Once the original drawing comes into picture form, ask the students to observe the line of symmetry in it and then describe it to the whole class how two parts are congruent using the criterion discussed. | Computer  Vision enabled AI application  Autodraw. |

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| **Learning**  **Outcomes** | ● Students will understand the concept of congruence using line symmetry.  ● Students will understand the congruence criterion and how to use those in questions. |  |
| --- | --- | --- |
| **Follow up**  **Activities** | ● Quiz to assess the students learning  ● Ask students to prepare presentation on congruence of triangles to explain different criterions of congruence. |  |
| **Reflections** | Discussion on importance of AI in Mathematics. |  |

**GLOSSARY:**

**AI Related Terminology**

**Auto Draw:** Autodraw.com is an AI enabled tool which is based on the domain of Computer Vision in which the machine identifies the pattern of your drawing and accordingly maps it with the most similar image. This tool shows various options trying to predict what the user is trying to draw. For example, if a user is trying to draw a tent and he starts with drawing a basic triangle, the machine will compare his/her drawing and show the possible outcomes for the same. The user can then select out of them which one is the most appropriate for him/her.

https://autodraw.com

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**MATHEMATICS**

CLASS 7

**3.14 Visualizing Solid Shapes**

| **PARAMETERS** | **DESCRIPTION** | **AI CONCEPTS INTEGRATED** |
| --- | --- | --- |
| **Chapter Covered** | **Chapter 15: Visualizing Solid Shapes** |  |
| **Name of the Book** | **Mathematics, Class 7, NCERT** |  |
| **Subject and**  **Artificial**  **Intelligence**  **Integrated** | Understanding the concept of 3-D shapes using AI tools |  |
| **Learning**  **Objectives** | To represent 3D shapes on a plane surface such as paper, blackboard etc.  To identify the nets which can be used to form a Cube /cuboid To develop the concept of solid shapes and their nets using AI tool |  |
| **Time Required** | 40-minutes Class, 2 period |  |
| **Classroom**  **Arrangement** | Seating arrangement - Groups of 4 students in a class of 40 |  |
| **Material Required** | Pen, Paper, Blackboard, Chalk, cardboard, Scissors, Paper clips, desktop/laptop with good internet connection Sites:  https://www.google.com/intl/en\_in/earth/  https://www.autodraw.com/  https://www.nctm.org/Classroom  Resources/Illuminations/Interactives/Cube-Nets/ |  |
| **Pre – Preparation Activities** | Group of Students will be asked to collect any old cuboidal cardboard box (Toothpaste/Cake)/ Cylindrical cardboard (roll no 1-20 cuboidal box & roll no 20-40 cylindrical cardboard material) |  |
| **Previous**  **Knowledge** | Students will be asked to click on the given link of google earth and visit different famous place like pyramid of Giza, Leaning tower of Pisa and then they will be asked to draw rough sketch of these places using  Students will use Quick draw and create various doodles mapping with the prompt asked in the tool. This activity will build the concept of different solid shapes in the student’s mind. Students will be asked to draw the top/side& front faces of these places. | https://www.googl e.com/intl/en\_in/ea rth/  https://quickdraw. withgoogle.com/ |

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| **Methodology** | **Activity 1 -** Students will be asked to sit in groups of 4(roll no wise), and cut the old cardboard 3-D shaped boxes along the edges. Now ask them to draw the nets of different 3D shapes. **Activity2 -** As the students have understood the nets of different 3D shapes, ask them to go on Cube Nets . Once they land on the website ask them to click on first net and submit the answer for the question ‘Can a cube be formed with the given net’ and then observe how their answer is correct or wrong by visualizing. https://www.nctm.org/Classroom  Resources/Illuminations/Interactives/Cube-Nets/  **Activity 3 -** Ask the students to apply their understanding of nets of different shapes to solve Ex 15.1 given in the exercise of the book. |  |
| --- | --- | --- |
| **Learning**  **Outcomes** | ● Students will understand how 2D shapes can be converted to 3D shapes  ● Students will analyze the real life situations where nets of solid shapes are used  ● Students will understand the importance of Artificial intelligence in developing their concept of 3D shapes and its nets |  |
| **Follow up**  **Activities** | Ask the students to analyze the real-life situations in where 3D shape are used and identify their nets and prepare a chart for it in groups and do classroom presentation |  |
| **Reflections** | Discussion about how AI tool has been useful in developing their concept of 3D shapes and their nets  Ask the students to explore any other AI tool |  |

**GLOSSARY:**

**AI Related Terminology**

**Google Earth:** Google Earth is a computer program that renders a 3D representation of Earth based primarily on satellite imagery. The program maps the Earth by superimposing satellite images, aerial photography, and GIS data onto a 3D globe, allowing users to see cities and landscapes from various angles. Users can explore the globe by entering addresses and coordinates, or by using a keyboard or mouse

**AI Activity Description**

For this activity ask the students to go to https://www.google.com/intl/en\_in/earth/ and enter a specific monument name. Once they have fed the input, they will be able to see that place from different views and hence can have a look at 3D shapes of different monuments. They can even notice the shape of the earth also.

**Quickdraw:** Quick Draw is a google experiment, an AI tool based on neural network in which the machine learns to recognise doodles/objects from the user's drawings. By playing this game, you will be adding your drawings to the world's largest doodling data set. After clicking on let's draw! the player will see the name of the object on the screen. While drawing the object within a timer of 20 seconds, the machine analyses the pattern and the shape of the drawing and simultaneously tries to guess the object that the player is trying to draw.

https://quickdraw.withgoogle.com/

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**A *net* is a two-dimensional figure that can be folded into a three-dimensional object.** Ask students to go on Cube Nets. Once they land on the website ask them to click on the first net A question will appear in the bottom ‘Can a cube be formed with the given net’, Submit the answer for the question and then observe how their answer is correct or wrong by visualizing.

https://www.nctm.org/Classroom-Resources/Illuminations/Interactives/Cube-Nets/

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**MATHEMATICS**

CLASS 7

**3.15 Symmetry**

| **PARAMETERS** | **DESCRIPTION** | **AI CONCEPTS**  **INTEGRATED** |
| --- | --- | --- |
| **Chapter Covered** | **Chapter 14: Symmetry** |  |
| **Name of the Book** | **Mathematics, Class 7, NCERT** |  |
| **Subject and**  **Artificial**  **Intelligence**  **Integrated** | To understand the concept of Symmetry using AI |  |
| **Learning Objectives** | ● To understand the concept of symmetry.  ● To understand the difference between symmetrical and asymmetrical objects.  ● To identify the number of lines of symmetry in any object. | Autodraw |
| **Time Required** | 2 periods of 40 minutes each. |  |
| **Classroom**  **Arrangement** | Flexible |  |
| **Material Required** | Pen or Sketches, paper, White Board.  Laptops/ desktops and Internet connections. |  |
| **Pre – Preparation Activities** | The students will be asked to collect some objects and observe their pattern of symmetry. |  |
| **Previous**  **Knowledge** | ● The students are asked to recall the knowledge about the line of symmetry.  ● Some examples will be asked from the students of symmetrical objects. |  |
| **Methodology** | **Divide the students into four groups**  ● Display the image of the butterfly in the class. Using the link – www.scratch.mit.edu  ● Ask the class to share some things they notice about the image. Some guiding questions would be: What are the colors of the butterfly’s wings? How are the wings shaped?  ● Once students touch on the idea that the wings match in some way introduce the word symmetry. Explain that something has symmetry if it can be split into two mirror image halves.  ● **Rotational symmetry:**  Draw two identical parallelograms, one - ABCD on a piece of paper and the other A’ B’ C’ D’ on a transparent sheet. Mark the points of intersection of their diagonals, O and O’ respectively.  Place the parallelograms such that A’ lies on A, B’ lies on B and so on, then falls on O.  Stick a pin into the shapes at the point O. |  |

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|  | Now turn the transparent shape in the clockwise direction. How many times do the shapes coincide in one full round? What is the order of rotational symmetry?  ● **Autodraw :**  ● For this activity, ask the students to go to http://autodraw.com. Once they land on this website, ask the students to select the first icon from the left side toolbar. This icon activates the AI element of the tool. Now ask the student to draw any shape and let the AI algorithm detect and predict the possible drawings similar to it. The predictions would appear in the top row. After looking at the predictions and analyzing how accurate the machine is, ask them to keep an image in mind and start drawing it roughly and see at what step the machine is able to predict the image. Once the original drawing comes into picture form, ask the students to observe the line of symmetry in it and describe it to the whole class.  ● **Scratch AI tool**  For this activity, ask to students to go to scratch.mit.edu Once they land on it. Ask the student to select the sprite list there they can draw any shape .By programming they can rotate the shape about any angle. Once they do that introduce the term rotation symmetry, angle of rotation and order of rotation. Ask to students to observe the rotation and find the order of rotation symmetry.  Ask to students to draw any shape and draw the line of symmetry. Student can also draw the line of symmetry from the list of sprite  ● Ask students to apply their understanding of symmetry to do questions of exercise 14.1, 14.2 and 14.3 given in the book. | Autodraw  http://autodraw.com  https://scratch.mit.e du |
| --- | --- | --- |
| **Learning Outcome** | The Students will understand or recognize two types of symmetry  ● Identify the shape's line of symmetry  ● Identify a shape order of rotation. |  |
| **Follow up Activities** | Make a group of 4 or 5 students and distribute drawing paper with coloured pencils, etc.  ● Tell students to find as many symmetrical objects as possible.  ● Make a sketch of each item and draw the line of symmetry of each  ● Draw any shape using Autodraw AI tool and try to find out its symmetry. |  |
| **Reflections** | Discussion on use of symmetry in real life |  |

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**GLOSSARY:**

**AI Related Terminology**

**Autodraw:** Autodraw.com is an AI enabled tool which is based on the domain of Computer Vision in which the machine identifies the pattern of your drawing and accordingly maps it with the most similar image. This tool shows various options trying to predict what the user is trying to draw. For example, if a user is trying to draw a tent and he starts with drawing a basic triangle, the machine will compare his/her drawing and show the possible outcomes for the same. The user can then select out of them which one is the most appropriate for him/her.

https://www.autodraw.com/

This gets converted to

**Scratch: scratch.mit.edu**

Scratch is a block-based visual programming language and website targeted primarily at children to help learn code. Users of the site can create online projects using a block-like interface.

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**MATHEMATICS**

CLASS 7

**3.16 Practical Geometry - Construction of Triangles**

| **PARAMETERS** | **DESCRIPTION** | **AI CONCEPTS**  **INTEGRATED** |
| --- | --- | --- |
| **Chapter Covered** | **Chapter 11: Practical Geometry - Construction of Triangles** |  |
| **Name of the**  **Book** | **Mathematics, Class 7, NCERT** |  |
| **Subject and**  **Artificial**  **Intelligence**  **Integrated** | Understanding the concept of constructing Triangles using AI Experiential Applications |  |
| **Learning**  **Objectives** | To understand the concept of construction of triangles when ● Three sides are given  ● Two angles and included side is given  ● Two sides and included angle is given  ● Hypotenuse and one side is given |  |
| **Time Required** | 4-5 Periods of 40 minutes each |  |
| **Classroom**  **Arrangement** | Flexible |  |
| **Material**  **Required** | Pen, paper, Black board chalk, Laptop/desktops and Internet connections |  |
| **Pre –**  **Preparation**  **Activities** | ● The students will be asked to recall SSS. SAS, ASA and RHS congruence criterion.  ● Students will be advised to practice the construction of angles using compass  ● An introductory video will be shown to recall the properties of triangles.  https://youtu.be/rBN\_RTGu1Jg |  |
| **Previous**  **Knowledge** | The students are made to recall how to construct angles, angle bisectors and angle sum property of triangles in order to understand the concept of construction of triangles. |  |

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| **Methodology** | **Activity 1:** The class will be divided into four groups and each group is given an A-4 size paper. The members of each group will be asked to fold the paper to form a scalene, isosceles, equilateral and right angled triangle. Later they can measure the angles and sides of the triangle.  **Activity II: Auto Draw**  Students are asked to draw different types of triangles using Autodraw tool and the tool maps the image drawn with its trained model of triangles. Visualizing them students understand different types of triangles.  **Activity III-** A video will be shared to make the students understand the construction of various types of triangles. https://youtu.be/UzNWf737nNk  **Activity IV- Practice Activity**  Ask students to apply their understanding of constructing triangles to attempt questions of 10.1. 10.2, 10.3 and 10.4 given in the exercise of the chapter. | Auto Draw  https://autodraw.com |
| --- | --- | --- |
| **Learning**  **Outcomes** | ● The students will understand to construct various types of triangles  ● The students will understand the application of triangles in real life. |  |
| **Follow up**  **Activities** | The students will be asked to observe different types of triangles in their surroundings and identify them, and how they play an important role in architecture. |  |

**GLOSSARY:**

**AI Related Terminology**

**Autodraw:**

Autodraw.com is an AI enabled tool which is based on the domain of Computer Vision in which the machine identifies the pattern of your drawing and accordingly maps it with the most similar image. This tool shows various options trying to predict what the user is trying to draw. For example, if a user is trying to draw a tent and he starts with drawing a basic triangle, the machine will compare his/her drawing and show the possible outcomes for the same. The user can then select out of them which one is the most appropriate for him/her.

https://www.autodraw.com/

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**MATHEMATICS**

CLASS 8

**3.17 Direct and Inverse Proportions**

| **PARAMETERS** | **DESCRIPTION** | **AI CONCEPTS**  **INTEGRATED** |
| --- | --- | --- |
| **Chapter Covered** | **Chapter 13: Direct and Inverse Proportion** |  |
| **Name of the book** | **Mathematics, Class 8, NCERT** |  |
| **Subject and**  **Artificial**  **Intelligence**  **Integrated** | Understanding the concept of Direct and Indirect Proportion using Google maps (AI App) |  |
| **Objectives** ● ●  ●  ● | To understand the concept of Direct Proportion. To understand the concept of Inverse Proportion. To understand the concept of Direct and Inverse Proportion using an AI App.  To understand the application of Direct and Inverse Proportion in real life. | Google map in determining real time and speed relation: Rule Based AI App. |
| **Time Required** | 2 periods of 40 minutes each |  |
| **Classroom**  **Arrangement** | Flexible |  |
| **Material Required** | Pen, paper, Black Board chalk, Laptops/ desktops and Internet connections. |  |
| **Pre- Preparation Activity** | • Observe that change in one quantity leads to change in the other quantity.  • If the number of articles purchased increases, the total cost also increases.  • The more the money deposited in a bank, more is the interest earned.  • As the speed of a vehicle increases, the time taken to cover the same distance decreases.  • For a given job, the more the number of workers, the less will be the time taken to complete the work. • Two quantities may change in such a manner that if one quantity increases, the other quantity decreases and vice versa. |  |
| **Previous**  **Knowledge** | The students are made to recall about constant and variables in order to understand the concept of Direct and Inverse Proportion. |  |
| **Introduction** | The teacher will introduce the concept of Direct and Inverse proportion with the help of real-life examples. |  |
| **Methodology** | **Activity I:**  **Google Maps.**  Inform how Google maps help us to know about the real time needed to travel from one place to another on the basis of the speed of the vehicle.  Ask students to calculate the time for the same distance if travelling by | Google maps |

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|  | • car  • bus  • walking  **Activity II:**  **Real-life Problem Solving**  Discuss to make students understand the concept and calculation of Direct and Inverse Proportion taking some real-life examples.  • Number of workers required to complete a construction task**. (Impact of change in number of workers on duration of completion of task)**  • Speed of vehicle and distance to be covered**. (Impact of change in speed on distance covered)**  • Distance to be travelled and time taken in covering that distance **(Impact of change in distance travelled on time taken keeping speed as the constant factor)** |  |
| --- | --- | --- |
| **Discussion on the Text** | Discussion and presentation on:  ● Two quantities x and y are said to be in direct proportion if they increase (decrease) together in such a manner that the ratio of their corresponding values remains constant. That is if x / y =K. [k is a positive number], then x and y are said to vary directly.  Two quantities x and y are said to be in inverse proportion if an increase in x causes a proportional decrease in y (and vice-versa) in such a manner that the product of their corresponding values remains constant. That is, if xy = k, then x and y are said to vary inversely. |  |
| **Learning**  **Outcomes** | ● The students will understand the concept of Direct Proportion.  ● The students will understand the concept of Inverse Proportion.  ● The students will understand the concept of Direct and Inverse Proportion using the AI App.  The students will understand the application of Direct and Inverse Proportion in real life. |  |
| **Self-Evaluation and Follow-Up** | Ask the students to analyze the real-life problems in their daily life and apply the concept of direct and inverse proportion.  ● Ask the students to explore what other available AI applications can be used as a Rule Based AI App. |  |

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**GLOSSARY:**

**1. AI Related Terminology**

**Google Maps:** Google Maps is a web mapping service developed by Google. It offers satellite imagery, aerial photography, street maps, 360° panoramic views of streets (Street View), real-time traffic conditions, and route planning for traveling by foot, car, bicycle and air (in beta), or public transportation. Google maps effectively use AI in calculating the estimated time of arrival with the help of real-time traffic conditions.

**2. AI Activity Description**

For this activity ask the students to go to https://maps.google.com and enter a specific source and destination. Once they have fed the input, they will get an estimated time of arrival at the destination on the basis of real-time traffic conditions. Ask the students to note down the distance shown between these 2 points and the estimated time taken for the same. Now, ask the students to check the time taken for the same distance by another means of transport. Students can change the means of transport by clicking on various icons. Ask the students to note down time taken to reach the destination by car, bike and on foot (walking). Once they have got the information, ask them to calculate the speed of the vehicle for all the three datasets. Now, ask the students to identify the proportionality between time, speed and distance.

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**MATHEMATICS**

CLASS 8

**3.18 Mensuration - Volume of Cube and Cuboids**

| **PARAMETERS** | **DESCRIPTION** | **AI Integration** |
| --- | --- | --- |
| **Chapter**  **Covered** | **Chapter 11- Mensuration - Volume of Cube and Cuboids** |  |
| **Name of the**  **book** | **Mathematics, Class 8, NCERT** |  |
| **Subject and**  **Artificial**  **Intelligence**  **Integration** | Understanding the concept of Volume different solids like cube, cuboid, using their nets, paper cutting activity and Geogebra tool.  Geogebra, Quizziz (gamified quiz), Video Games, 3D modelling software |  |
| **Learning**  **Objectives** | ● Define Volume  ● To understand the concept of Volume of a solid. ● To derive formulas for calculating Volume  ● To calculate the Volume of given solids  ● To experiment with the Volume of different solids. ● To calculate the Volume of assorted objects |  |
| **Time Required** | 2 periods 40 minutes each |  |
| **Classroom**  **Management** | Flexible |  |
| **Material**  **Required** | Pen, Paper, White Board, Markers, Laptop, Internet Connection, Jodo straws |  |
| **Pre-preparation Activity** | Students will be asked to recall all 2D shapes and their area and perimeter. Making of 3D objects using 2D shapes. Students will be asked to think creatively and compile a story thinking themselves as one of the 3D object and how they will measure their volumes using the dimensions, thus presenting the formula in creative way. | Inkle writer - Story Writing where it will be based on 3 characters L, B, H |
| **Previous**  **knowledge** | Questioning will be used to check students previous knowledge in the form of Quiz |  |
| **Introduction** | Students will be asked to prepare 3D solids using JODO straws/paper folding and deduce formula of Volume of it. |  |
| **Methodology** | **Activity-1 :**  **Use Of Geogebra Tool :** Students will be working in pairs with their partners in computer lab and individually at their home to understand the formulae of Volume and volume of solids by using geogebra tool wherein they can change measurements of the dimensions and explore the corresponding change in their Volume. This will help them to understand change in Volume in problems related to increase and decrease in dimensions. |  |

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|  | **Activity-2:**  **Video Game Activity:** Students will be asked to search the video games in which they can see the maximum use of 3D solids and shapes. Students can be motivated to create their own game which involves solids using the unity game maker or scratch or any video game maker app.  **Activity-3:**  **Quiz Activity :** Students will be asked to search quiz in which they can see the maximum use of 2D shapes. Students will be motivated to create their own quiz which involves identification shapes and computing its perimeter using quizziz , mentimeter, padlet, etc  **Activity-4:**  **Problem Solving Activity:** Students will be using the formula derived for the volume of solids to find the Volume of objects in the real life problems of NCERT exercises. |  |
| --- | --- | --- |
| **Discussion on the Text** | Open discussion for all new terms related to Volume: Volume, Cuboid. Cube, Capacity, etc. |  |
| **Learning**  **Outcomes** | Students will be able  ● To calculate the Volume of given solid.  ● To solve real life word problems involving Volume of the solids done. |  |
| **Self-Evaluation and Follow up** | Peer assessment: Asking questions to each other in pairs and using peer tutoring.  ● Flip teaching  ● Google form  Explore INSTA 3D volume measuring app to measure the volume of bulk without measuring any dimensions | INSTA 3D Volume measuring |

**GLOSSARY:**

**AI Related Terminology**

**INSTA 3D volume measurement**

INSTA 3D uses AR and AI technologies and integrates them into the HHT APP in SDK form to make HHT understand the real environment, reconstruct and recover the 3D structure of the scenario and further restore the size of the measured object.

**Inklewriter**

Inkle writer is a free tool designed to allow anyone to write and publish interactive stories. It's perfect for writers who want to try out interactivity, but also for teachers and students looking to mix computer skills and creative writing.

www.inklewriter.com

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**MATHEMATICS**

CLASS 8

**3.19 Understanding Quadrilaterals**

| **PARAMETERS** | **DESCRIPTION** | **AI CONCEPTS**  **INTEGRATED** |
| --- | --- | --- |
| **Chapter Covered** | **Chapter 3: Understanding Quadrilaterals** |  |
| **Name of the**  **Book** | **Mathematics Text book for Class 8** |  |
| **Subject and**  **Artificial**  **Intelligence**  **Integrated** | Understanding the concept of Polygon and quadrilateral using AI experiential applications. |  |
| **Learning**  **Objectives** | ● To understand the concept of Polygon..  ● To understand and identify different kinds of quadrilateral.  ● To compare and describe different kinds of quadrilateral.  ● To draw different kinds of quadrilateral. |  |
| **Time Required** | 2 periods of 40 minutes each |  |
| **Classroom**  **Arrangement** | Flexible |  |
| **Material**  **Required** | Pen, paper, White Board, Marker, Laptops/ desktops and Internet connection, Newspaper/white sheet, chart paper, color pens. |  |
| **Pre –**  **Preparation**  **Activities** | Students will be introduced to Autodraw tool and its features. | Autodraw.com |
| **Previous**  **Knowledge** | Students will be asked to draw different types of curves (e.g. closed curve, simple curve, rectangle, square etc.) |  |
| **Methodology** | Teacher will show the video to the student to understand the concept of polygon and quadrilateral.  https://youtu.be/VNRdl-cJ4wo(polygon,quadrilateral,types of quadrilateral)  Activity 1:  Each student will need a piece of newspaper/white sheet to understand the concept of quadrilateral. Now Teacher guides them to take the paper and observe the sides of the newspaper and tell them about the shape .After that teacher will tell them to join the opposite corners of the paper (diagonal concept).With the help of paper the students try to make the cutouts of different types of quadrilaterals.  Activity 2:  Each student will need a chart paper to paste all the shapes of the quadrilateral and write down all the properties of the |  |

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|  | quadrilateral and the teacher will help them in differentiating all the shapes.  Activity 3: Practice Activity  Ask students to apply their understanding of Quadrilaterals to attempt questions of 3.3 and 3.4 given in the exercise of the chapter.  Activity 4: Autodraw  For this activity, ask the students to go to https://autodraw.com. Once they land on this website, ask the students to select the first icon from the left side toolbar and make shapes to show quadrilateral.  Students shall also be asked to play a quiz on iknowit.com to make the concept clearer. Once students land on the site they should click on the search option quadrilateral and try to play it.  This icon activates the AI element of the tool. Now, ask the students to draw any shape and let the AI algorithm detect and predict the possible drawings similar to it. The predictions will appear in the top row. | Autodraw  https://autodraw.co m |
| --- | --- | --- |
| **Learning**  **Outcomes** | The students will:  ● Understand and apply the concept of quadrilateral in solving the problems.  ● Apply their Understanding in solving Quiz on iknowit.com the concept of  ● Apply their understanding to draw images on autodraw.com.  ● Know and reason out that the machines can predict. |  |
| **Follow up**  **Activities** | ● Ask students to make a chart with different figures showing Quadrilaterals  ● Ask them to present to small groups.  ● Let them assess how accurate they are in their presentations. |  |
| **Reflections** | Discuss with students:  ● How do you like the site – autodraw.com and iknowit.com?  ● Do you know of any other tool/ app that can predict & draw?  ● Would you be able to try this activity at home also |  |

**GLOSSARY:**

**AI Related Terminology**

**Autodraw:** Autodraw.com is an AI enabled tool which is based on the domain of Computer Vision in which the machine identifies the pattern of your drawing and accordingly maps it with the most similar image. This tool shows various options trying to predict what the user is trying to draw. For example, if a user is trying to draw a tent and he starts with drawing a basic triangle, the machine will compare his/her drawing and show

the possible outcomes for the same. The user can then select out of them which one is the most appropriate for him/her.

https://www.autodraw.com/

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**MATHEMATICS**

CLASS 8

**3.20 Visualizing Solid Shapes**

| **PARAMETERS** | **DESCRIPTION** | **AI CONCEPTS**  **INTEGRATED** |
| --- | --- | --- |
| **Chapter Covered** | **Chapter 10: Visualizing Solid Shapes** |  |
| **Name of the Book** | **Mathematics, Class 8, NCERT** |  |
| **Subject and**  **Artificial**  **Intelligence**  **Integrated** | Understanding the concept of Different views of solid shapes using kuki chatbot |  |
| **Learning**  **Objectives** | ● To understand the concept of solid shape ● Difference between solid and 3D shapes  ● Different views of solid shapes using AI app | Kuki chatbot |
| **Time Required** | 2 periods of 40 minutes each |  |
| **Classroom**  **Arrangement** | Seating arrangement - group of 3 each |  |
| **Material Required** | Pen, paper, Black Board chalk, Laptops/ desktops/tabs and Internet connection. |  |
| **Pre – Preparation Activities** | Ask students to see different solid shapes using Math- kit in the lab. |  |
| **Previous**  **Knowledge** | Students are able to recall about 2 D shapes in order to understand the difference between 2D and 3D shapes. |  |
| **Methodology** | **Activity1**  In lab students will able to differentiate between 2D and 3D shapes using Math - kit.  **Activity2**  Using AI app kuki chatbot to see the actual view of different solid shapes and learn to form their names using their bottom face shape.  **Activity3**  Students will solve their exercise 10.1 |  |

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| **Learning**  **Outcomes** | Student will able to learn about different solid shapes and how to name those on the basis of their bottom surface |  |
| --- | --- | --- |
| **Follow up**  **Activities** | Ask the students to analyze the different view of real life objects.  Ask the students to explore what other available AI applications can be used as a Rule Based AI App. |  |
| **Reflections** | Discussion with Students on the role of AI application Any other AI application that can be used as an alternative. |  |

**GLOSSARY:**

**AI Related Terminology**

**Kuki Chatbot:** Mitsuku, or Kuki the world's best conversational chat bot (according to folks like Google AI Research). It can be used to chat on any topic and see the visualized form of the subject.

https://www.pandorabots.com/mitsuku/

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**MATHEMATICS**

CLASS 8

**3.21 Mensuration - Surface Area of Cube, Cuboids and Cylinder**

| **PARAMETERS** | **DESCRIPTION** | **AI CONCEPTS**  **INTEGRATED** |
| --- | --- | --- |
| **Chapter Covered** | **Chapter 11: Mensuration - Surface Area of Cube, Cuboid and Cylinder** |  |
| **Name of the Book** | **Mathematics, Class 8, NCERT** |  |
| **Subject and**  **Artificial**  **Intelligence**  **Integrated** | Understanding the concept of Surface area of Cube, Cuboid , Cylinder using AI tool |  |
| **Learning**  **Objectives** | ● To understand the concept of Total & Lateral Surface area of cube, cuboid and cylinder  ● To differentiate between Lateral & Total surface area of solid shapes  ● To deduce the formula of Total & Lateral Surface area of cube, cuboid and cylinder*.*  ● To Apply the concept of Surface area in real life situations  ● To develop the concept of 3D shapes and their surface area using AI tool |  |
| **Time Required** | 2 classes 40 min each |  |
| **Classroom**  **Arrangement** | Flexible |  |
| **Material Required** | NCERT Class 8 Mathematics Textbook, notebook, Pen, Paper, Net of any old cuboidal box like toothpaste/cake, Desktop/Laptop and good internet connection Website:  https://www.nctm.org/Classroom  Resources/Illuminations/Interactives/cubes/ |  |
| **Pre – Preparation Activities** | Students should collect old boxes of cake/ toothpaste and cut them with along edges to get the nets of cubes /cuboid Students will be advised to prepare a short video, using any app from the play store, showing a photo frame of cube in which the pics of memories with their family members will  be visible on different faces of cube. (optional ) Any Play Store app for cubical video making  3D photo frame cube live wallpaper/ 3D photo frame photo editor |  |
| **Previous**  **Knowledge** | Students should have previous knowledge of nets of cubes & cuboids |  |

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| **Methodology** | **Introduction:** Divide the class into four groups (1-10, 10- 20 & so on)  • One of groups is asked to paint all the 6 faces of cuboidal net brought by them.  • Second group is asked to paint only 4 faces leaving top and bottom of the cuboidal net  • Third group will be asked to paint all the three faces of cylindrical net  • Fourth group will be asked to paint only the rectangle part of the cylindrical net leaving top & bottom. Now introduce them with the concept of total surface area and lateral surface area. Give a few real life examples like painting of four walls of a room, paint on a pipe etc. **Activity 1:** Students will be explained that the photo frame video which they prepared also pasted the pics selected by them on the surface of the cube, hence covered the total surface area of the cube.  **Activity 2:** The above activity will help students to derive the formula of Total & lateral surface area of cuboid, cubes and cylinders  **Activity 3 :**  As the students have understood the concept of surface area , ask them to go on https://www.nctm.org/Classroom Resources/Illuminations/Interactives/cubes/  1) Once they land on the website, a cuboidal net will appear on the page, ask students to count the no of squares on all the faces this will give them value of surface area 2) Also ask them to look at the top left corner of the page, the length, width, height of the cuboid will be visible. Ask them to calculate the surface area using formulae and write the value in the box given in front of the surface area and click on the tick button and check whether the surface area is correct or not.  Then click on the double arrow button in top right for the next net of cuboid.  3) Ask students to click on each of the face to check how the cuboid can be formed with the given net  **Activity 4:**  On the basis of their understanding of Surface area of Cubes, Cuboids and Cylinder students will be able to solve Ex11.3 in the chapter Mensuration. | https://www.nctm.or g/Classroom  Resources/Illuminat ions/Interactives/cu bes/ |
| --- | --- | --- |
| **Learning**  **Outcomes** | ● Students will understand the concept of Total & Lateral Surface area  ● Students will deduce the formula of total & lateral surface area of solid shapes  ● Students will understand the importance of AI tool in developing concept of 3D shapes  ● Students will apply the concept of Surface area of 3D shapes in real life situations |  |
| **Follow up**  **Activities** | Ask the students to conduct a quiz on different real life situations where surface area of solids can be calculated. Discuss AI tools that helped them develop the concept of Surface area more easily and deeply |  |

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**GLOSSARY:**

**AI Related Terminology**

**The National Council of Teachers of Mathematics (NCTM) is Mathematics education organization in the world.**

https://www.nctm.org/Classroom-Resources/Illuminations/Interactives/cubes/

**AI Activity Description**

• Once they land on the website, a cuboidal net will appear on the page, ask students to count the no of squares on all the faces this will give them value of surface area

• Also ask them to look at the top left corner of the page, the length , width, height of the cuboid will be visible. Ask them to calculate the surface area using formulae and write the value in the box given in front of the surface area and click on the tick button and check whether the surface area is correct or not.



Then click on the double arrow button in top right for the next net of cuboid.

• Ask students to click on each of the face to check how the cuboid can be formed with the given net

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**MATHEMATICS**

CLASS 8

**3.22 Introduction to Graphs**

| **PARAMETERS** | **DESCRIPTION** | **AI CONCEPTS**  **INTEGRATED** |
| --- | --- | --- |
| **Chapter Covered** | **Chapter 15: Introduction to Graphs** |  |
| **Name of the Book** | **Mathematics, Class 8, NCERT** |  |
| **Subject and**  **Artificial**  **Intelligence**  **Integrated** | To understand the concept of Line graphs using AI project cycle process of Data Visualization. |  |
| **Learning**  **Objectives** | ● To understand the concept of graphs.  - List the part of a graph.  - Application of graph.  - Visualization of graph.  ● To understand that line graph shows how two pieces of information are related and how data changes over time.  ● Visualization of graphs using AI tools- Data Visualization. | Data Visualization http://datavizcatalog ue.com |
| **Time Required** | 2 periods of 40 minutes each. |  |
| **Classroom**  **Arrangement** | Flexible |  |
| **Material Required** | Graph paper, pencil, scale, eraser, White Board. Laptops/ desktops and Internet connection. |  |
| **Pre – Preparation Activities** | **Activity**  The students will be asked to collect the data of population increases from 2011 - 2019 and observe the pattern. |  |
| **Previous**  **Knowledge** | The students are asked to recall the knowledge of the bar graph and circle graph. Some questions will be asked related to graphs. |  |

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| **Methodology** | **Activity 1**  Ask students to think of graphs that they have seen in the real world. For what purposes were they used? Have students hunt for e.g. in books, in magazines, on the internet, newspapers etc.  **Activity 2**  ● Display the image of the line graph using AI tool Data visualization.  ● Ask the students to share something about the line graph. Some guiding questions would be” what coordinate axis actually represents here?  ● Once students touch on the idea about the variation of line in coordinate plane, introduce how data changes continuously over a period of time?  ● Ask the students to apply their understanding and solve the exercises. |  |
| --- | --- | --- |
| **Learning Outcome** | Upon completion of this lesson, students will be able to ● List and Identify the parts of a graph  ○ Cartesian plane,  ○ Plotting of point  ○ Construction of graph  ● Discuss the purpose of each part of a graph. ● Visualize the graph using an datavizcatalogue.com ● Line graphs are used to analyze the nature of change in quantities. | Data Visualization. https://datavizcatalo gue.com |
| **Follow up**  **Activities** | ● Tell students to find out their math test marks of the last month.  ● Represent marks in terms of graph.  ● See their progress using AI tool Data visualization. Let them assess how accurate they are in their presentation. |  |

**GLOSSARY:**

**AI Related Terminology**

**Data Exploration:** After acquiring data comes the need to analyze the data. For this, they need to visualize the acquired data in some user-friendly format so that they can:

● Quickly get a sense of the trends, relationships and patterns contained within the data. ● Define strategy for which model to use at a later stage.

● Communicate the same to others effectively.

Data Exploration refers to visualizing the data to determine the pattern, relationships between elements and trends in the dataset that gives a clear meaning and understanding of the dataset. Data exploration is important as it helps the user to select an AI model in the next stage of the AI project cycle. To visualize the data, various types of visual representations can be used such as diagrams, charts, graphs, flows and so on.

https://datavizcatalogue.com

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**MATHEMATICS**

CLASS 8

**3.23 Linear Equations in one Variable**

| **PARAMETERS** | **DESCRIPTION** | **AI CONCEPTS INTEGRATED** |
| --- | --- | --- |
| **Chapter Covered** | **Chapter 2: Linear Equations in One Variable** |  |
| **Name of the**  **Book** | **Mathematics, Class 8, NCERT** |  |
| **Subject and**  **Artificial**  **Intelligence**  **Integrated** | Understanding the concept of Linear equations in one variable using ‘Uber App’ AI Applications and ‘Swiggy Food Graph’ | Using **data**  **analytics** |
| **Learning**  **Objectives** | ● To understand the concept of Linear equation in one variable ● To be able to solve equations.  ● To be able to set up equation based on real life situations ● To be able to solve the equations based on day to day life experiences. |  |
| **Time Required** | 5 Periods of 40 minutes each |  |
| **Classroom**  **Arrangement** | Flexible |  |
| **Material**  **Required** | Pen, paper, Black board chalk, Laptop/desktops and Internet connection |  |
| **Pre –**  **Preparation**  **Activities** | First, Teacher gives a picture related to linear equation and the students are asked to think and give the answer    Second, teacher gives the chance to the students to make a linear equation    **x + 2 = 4**  Third, the students work by themselves to determine the variable x in the give equation  **x + 2 -2 = 4 - 2**  **x = 2** |  |
| **Previous**  **Knowledge** | The students are made to recall about constants, variables and algebraic equations in order to understand the concept of linear equation in one variable  An introductory video will be shown to the students to recall how to solve the equation.  https://youtu.be/lN20VrPmxdk |  |

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| **Methodology**  ●  ●  ●  ●  ● | **Activity 1**  The teacher will introduce the concept of linear equations with the help the activity  The entire class will be divided into groups.  Each group will be given some pebbles, matchsticks to demonstrate a linear equation in one variable.  Then, they will be asked to solve it by rearranging the pebbles and matchsticks  Later each group will be advised to demonstrate the equation mathematically and write the solution.  **Activity 2- Real life Problem Solving**  Discuss to make students understand the linear equations by taking some real life examples.  i) Age related problems  ii) Perimeter and dimensions  iii) Money/denominations  iv) work and time  The students will understand the problem, Interpret it, frame the equation and solve it.  **Activity 3- Equality Explorer**  https://images.app.goo.gl/tyXheeyTnZEbqJvd8    **Activity 4- Practical Activity**  Ask the students to apply their understanding of solving linear equations to attempt questions of Ex2.1, 2.2, 2.3, 2.4 from the exercise in the chapter. |  |
| --- | --- | --- |
| **Learning**  **Outcomes** | ● The students understand the concept of linear equation in two variables·  ● The students understand the term constants, variables and algebraic equations  ● The students will be able to successfully solve the linear equations  ● The students will be able to interpret the word problems and be able to frame and solve the equations |  |
| **Follow up**  **Activities** | ● The students will be divided into groups and asked to make ‘Tarsia Puzzle’ in which each group has to demonstrate the linear equations and their solutions in the form of Jigsaw puzzle  ● Students will be asked to research how linear equations (Linear programming) plays an important role in other fields of sciences and industries. |  |
| **Reflections** | Ask the students to explore what other available AI applications can be used to integrate linear equations |  |

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**GLOSSARY:**

**AI Related Terminology**

**Swiggy Plans Food Graph to Enhance Customer Experience**

Food delivery giants Zomato and Swiggy are increasingly turning to artificial intelligence (AI) and machine learning (ML) to drive growth amid increasing protests by restaurants in the so-called Logout campaign. Leveraging this, Swiggy is currently building a concept called “food graph” which breaks down a food dish by recipe, cooking style, ingredients used, calorie value, and variations of the dish.

The food delivery major will then combine the food graph with a customer’s previous food preferences using **data analytics** to derive a personalized restaurant feed for each user. The list of restaurants will thus be according to the user’s taste and preferences, and not just their location.

Data analytics is majorly aimed at reducing wait time for consumers. However, how such data will actually help Indian consumers, who are known to be unique in their choices and have varied taste palates is yet to be seen

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**MATHEMATICS**

CLASS 8

**3.24 Data Handling - Probability**

| **PARAMETERS** | **DESCRIPTION** | **AI CONCEPTS**  **INTEGRATED** |
| --- | --- | --- |
| **Chapter Covered** | **Chapter 5: Data Handling - Probability** |  |
| **Name of the Book** | **Mathematics, Class 8, NCERT** |  |
| **Subject and**  **Artificial**  **Intelligence**  **Integrated** | Understanding the concept of Probability and apply to the real life situation  • AI – Rock Paper Scissors,  • Quiz,  • Video Games |  |
| **Learning**  **Objectives** | • To define probability  • To differentiate between sure event and impossible event  • To derive formulas for calculating Probability • To calculate the probability for a defined event • To experiment with the probability in real life situation |  |
| **Time Required** | 2 periods of 40 minutes each |  |
| **Classroom**  **Arrangement** | Flexible and Open Discussion arrangement |  |
| **Material Required** | Pen, Paper, White Board, Markers, Laptop, Internet Connection |  |
| **Pre – Preparation Activities** | • Students will be asked to recall the basic terms – Event, Favourable outcomes, Total outcomes, Sure event, Impossible event  • Students will also be introduced to AI based game of Rock, Paper & Scissors | https://www.afiniti.c om/corporate/rock paper-scissors |
| **Previous**  **Knowledge** | Questioning will be used to check students previous knowledge in the form of Quiz |  |
| **Methodology** | **Activity-1** : Rock, Paper, Scissors – Students will be asked to play the game of Rock, Paper, Scissors online and note down the note the total number of chances they have played, number of times they have won, number of times they have lost and number of times it was a tie. They will be then asked to find the probability for all situation by applying the formula of Probability.  **Activity-2**: Playing Cards Game: It is probability game as a whole class. This game pits the teacher against the whole class. Students first choose a suit, either heart, diamond, club, or spade. Then, you let them choose a card. If they get a card with the suit they guessed they get a point. If they don’t match the suit, then the teacher gets a point. You repeat this 10 times.  **Activity-3**: Video Game Activity: Students will be asked to search the video games in which they can see the maximum use of Probability. Students can be motivated to create their own game which involves Probability using the unity game maker or scratch or any video game maker app.  **Activity-4:** Quiz Activity : Students will be asked to search quiz or they will be motivated to create their own quiz which involves questions based on Probability. | https://www.afiniti.c om/corporate/rock paper-scissors |

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|  | **Activity-5**: Problem Solving Activity: Students will be using the formula of Probability to find the Probability in the real life problems of NCERT exercises. |  |
| --- | --- | --- |
| **Learning**  **Outcomes** | Students will be able to  • Calculate the probability of a defined event • Solve real life word problems involving Probability of an event. |  |
| **Follow up**  **Activities** | • Peer assessment: Asking questions to each other in pairs and using peer tutoring.  • Flip teaching  • Google form |  |

**GLOSSARY:**

**AI Related Terminology**

**Rock, Paper & Scissors:** In this game, an artificially intelligent system learns to identify patterns of a person's behaviour by analyzing their decision strategies in order to predict future behaviour. This game is based on the AI domain "Data" where the machine collects and analyses data to predict future outcomes. Click on play the game to get started!

https://www.afiniti.com/corporate/rock-paper-scissors

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