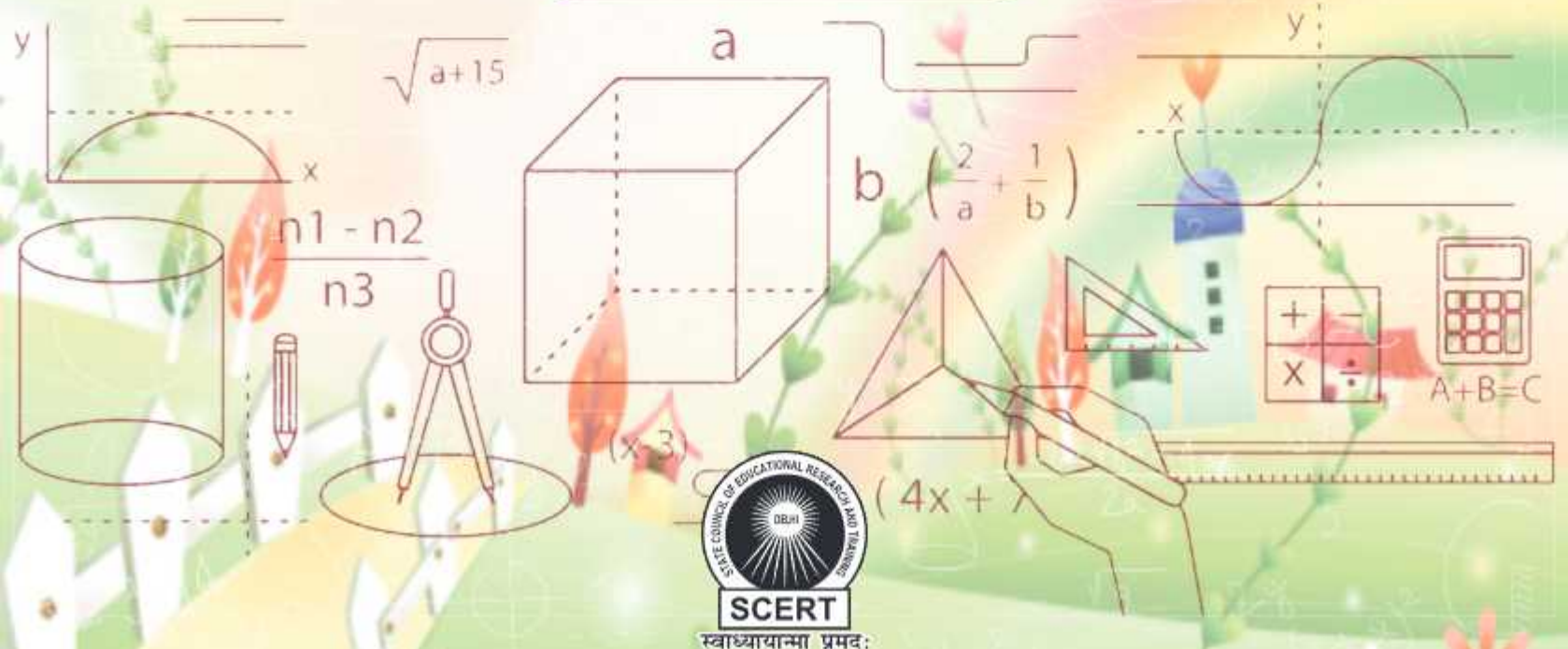
समग्र शिक्षा
सबको शिक्षा, अच्छी शिक्षा

UTKARSH

MY VOYAGE OF MATHEMATICS

Class - VIII



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स्वाध्यायान्मा प्रमदः

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MESSAGE

The Government of Delhi has been putting up various efforts to provide universal access to quality education to the children studying in the schools of the Directorate of Education, Delhi. We have implemented many programs to ensure equitable and inclusive education in our schools.

The corona virus pandemic has affected the school education immensely in the last two years. Due to the closure of the schools, the students were confined to their homes. We introduced and managed online learning successfully. The teachers were constantly connected with the students through online classes and kept assessing their progress. But during this time, children who had continuously been in difficult circumstances could not join online classes, lagged behind and a great need was felt to connect them to the mainstream school education.

Taking these aspects into account, to encourage children for learning and to ensure their active participation in learning, **'Utkarsh'** book series has been created with the joint effort of State Council of Educational Research and Training, New Delhi and Samagra Shiksha to bridge the gap in education.

This series contains activities based on practical learning which will enable the students to read, write, and perform basic numerical operations and to develop basic competencies in school subjects. The books in this series will also act as an effective medium for their physical, cognitive, social, emotional, moral and cultural development.

The books are based on the concept of play-based, multi-dimensional and discovery-based learning for Hindi, English, Social Science, Science, Urdu, Punjabi, and Mathematics books of activities have been designed for Classes 6 to 8 (Middle Level). Social Science, Science and Mathematics books have been created in both Hindi and English language for achievement of better learning outcomes. Students will learn about human sensitivities, group work, mutual cooperation, courtesy through play and activities and will be able to imbibe these qualities in them to become ideal citizens. It is hoped that a new educational revolution will be ushered in through these books. Students will develop conceptual understanding and the tendencies of creative and logical thinking. Based on empirical pedagogy, these books incorporate diversity of local contexts, multilingualism and respect for the local environment.

I am sure that these books will provide a strong foundation to the students for equitable and inclusive education, and will prove to be a milestone in the world of education.

(MANISH SISODIA)

H. RAJESH PRASAD
IAS

सत्यमेव जयते

प्रधान सचिव (शिक्षा/प्रशिक्षण व तकनीकी शिक्षा/ उच्च शिक्षा)
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MESSAGE

Recent times have been extremely challenging for people all over the world. Now, after two formidable years of corona times, we are again moving towards normal life.

In the field of education in Delhi, though various successful efforts were made to keep students engaged in learning through online teaching, worksheets and online assessment for the last two years, but due to the lack of face-to-face mode of teaching- learning process or a direct contact and communication with students or due to some family and financial reasons there was a gap in the process of learning.

Keeping this new scenario in mind, **'Utkarsh'** book series has been prepared under the Learning Enrichment Program to rise up from the challenge of this learning gap. There are many activity sheets in these books which have been developed on the basis of context specific learning outcomes. Activities have been designed around the social context of learning, taking into account the culture, multilingualism, and environment of the students. These activities are designed according to the emotional and intellectual level of the students so as to ensure active participation of the students in the learning process.

We aim to initiate the all-round development of the students through our efforts.

We hope that the students will become active participants in the process of knowledge creation through these activities.

With best wishes,

(H. Rajesh Prasad)

HIMANSHU GUPTA, IAS
Director, Education & Sports

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MESSAGE

"It is said that when the going gets tough, the tough get going."

COVID Pandemic was one such trying time. Although as country, India, tried to deal with this time in a multipronged manner, we are still trying to rise above its negative effects in various aspects of life.

Education sector also saw its negative impact especially in school education. So it has become extremely important to bridge the gap of expected learning outcomes and the current status of learning outcomes. To achieve the goal of providing high quality education to all students we have developed **'Utkarsh'** series. These books have been created for students of classes 6 to 8 and have interesting activities which will develop curiosity, zeal to search, experience and create various opportunities for dialogue, which in turn will provide them a strong foundation for all aspects of life.

In the changing situations it is really important for students to master 21st century skills along with ethics, rationality, empathy and sensitivity so that in future they move towards an enriched life ahead. The 'Utkarsh' series books written on subjects of Mathematics, Science, Hindi, English, Social Science, Urdu and Punjabi will develop the creative abilities of the students and they will be able to connect to their environment and establish coordination.

These books have been designed keeping in view the goal of multidisciplinary and holistic education, in which ample opportunities for learning have been provided. Self-instructional activities like colourful pictures, songs, poems, puzzles, stories, cartoons, posters, games, puppets will attract the attention of the students and motivate them for self-assessment and will further pave the way for effective learning.

I firmly believe that learning difficulties of the students will be catered to and desired learning outcomes will be achieved through the 'Utkarsh' series. These books will prove to be an effective medium in the attainment of desired goals and will contribute directly to build an inclusive, egalitarian and just society.

With best wishes.

(HIMANSHU GUPTA)

Rajanish Singh
Director

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Date : 20|12|2021

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MESSAGE

Dear students,

The last two years have been challenging due to the COVID pandemic for all of us. This pandemic impacted nearly every dimension of life, be it health, employment, economy or livelihood of human life. Even the education sector has not been left untouched by it because of the closure of schools. It not only affected the teaching-learning process, it also had a formidable impact on the possibilities of learning for students, limiting the opportunities of peer learning and directs guidance of teachers. Although online classes helped to maintain the continuity of the teaching-learning process but there were numerous challenges related to the accessibility of online education for students studying in the government schools of Delhi.

This context led to the development of the **'Utkarsh'** series to cater to the new learning needs of the students. This series is a compendium of the worksheets which aim to provide opportunities to the students for self-learning. These worksheets are child-centered and activity-based and they reflect regional, social and cultural domains of the students. These worksheets help the students to explore their environment as a learning resource, as they have many activities that require them to interact with and learn from family members, neighbours, community members, locality and nature.

I am hopeful that this initiative of State Council of Educational Research and Training would play a significant role in inspiring the students of classes 6 to 8 to take ownership of their learning process and to provide the opportunity of accessing quality education.

With best wishes.

(Rajanish Singh)

Dr. Nahar Singh
Joint Director

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Message

It is said that the trying times test out mettle the best. The corona period brought many challenges for us, but these challenges also changed our perspective and inspired us to adopt patience, indomitable courage and self-reliance. During the lockdown for some time, school education could not be done smoothly, due to which the learning process of the children was hampered. In this context, it is important to ask whether children studying online at home are able to acquire knowledge, skills and competencies according to their prescribed class and development level? In the present context, it is relevant that meaningful efforts should be made in the direction of reducing this gap of learning.

To bridge this gap in the level of learning, special course material, in the form of **Utkarsh** series, has been created for students with the combined effort of State Council of Educational Research and Training, New Delhi and Samagra Shiksha. This text material is interesting, responsive, informative and engaging for students. I am hopeful that it will be effective for self-development and will provide students the required competencies. These activities are designed to engage students in observation, critical thinking, creative thinking, questioning, problem- solving, effective communication, decision making, empathy and contemporary problems using play- based, story-based, art integrated and child- centered learning methods.

With best wishes for the bright future of our students.

(Dr. Nahar Singh)

Message for Teachers

Respected fellow educators,

Mathematics deals with logic of quantities, numbers and arrangements. Mathematics has it's own language. Mathematics is precise and concise. This COVID pandemic time has revolutionized the system of education. NEP 2020 opens the gateways of shifting the focus from teaching to facilitating children to observe, explore and reflect in their own unique ways. The digital divide leaves a great number of children aloof in the era of online education.

At this crucial time, these Mathematics sessions, developed under Learning Enhancement Programme humbly include the excluded children who left behind in their learning trajectory due to unavailability of mobiles or laptops to attend online classes. To bridge that gap amongst children due to the digital divide, these sessions are developed.

The idea is to develop sessions to not only engage each and every child but also to support her/him to explore and enhance her/his learning. Each child will enjoy learning the basic concepts of Mathematics with her/his own pace independently.

The objective is to enable each child to construct knowledge and develop understanding essential to learn mathematics in higher classes.

These sessions are written in simple and day to day language including examples from the surroundings. These self explanatory sessions provide space to the child to observe, express, drill, reflect and enrich her/his learning. Sessions cover contextual experiences to develop as well as enhance children's interest in Mathematics. We are sure and confident that these sessions will touch the head and heart of the last child who lags behind in the course of teaching-learning process. Let's hope that this self-paced learning material will boost the morale of each and every child and opens the doors of opportunities to learn mathematics joyfully .

All the very best to all of you.

Mathematics Coordinator

Message for Students

Dear Students,

This book has been developed to enhance your learning in Mathematics through your daily life experiences; and also to make you learn Mathematics easily and independently. Connecting with your teacher /facilitator is the key to succeed in Mathematics. Ask a lot of questions to clear your doubts then and their in the class, in this way Mathematics will become an interesting subject for you. Keep participating in classroom conversations with the teacher. Grab opportunities to attempt problems on the board in front of your class. These sessions will help you to learn and explore mathematics joyfully.

This book will support you to solve problems independently. This book will enhance your observation skills and this will help you a lot in understanding situations of your daily life. The whole book is designed to create a Mathematics friendly learning rather than forced learning for you.

Mathematics Coordinator

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Contents

Session - 1
Rational Numbers

Learning outcome:-
Demonstrates the understanding of the need of inclusion of fractions in number system.

Dear student!

How are you feeling today? Tick (✓) the emoji that matches your mood today.

Let us observe situations where we need numbers in our day to day activities. Relax for a few minutes and write your observations.

Student's response:

I will share my observations with you. I observed that we use numbers, as we wake up (time), go to school (distance), keep our books and notebooks in our bag (counting), have our lunch (amount), spend on our evening snacks (money) and so on……

Review your observations and write here.

Student's response:

What can you say about the type of numbers?

Student's response:

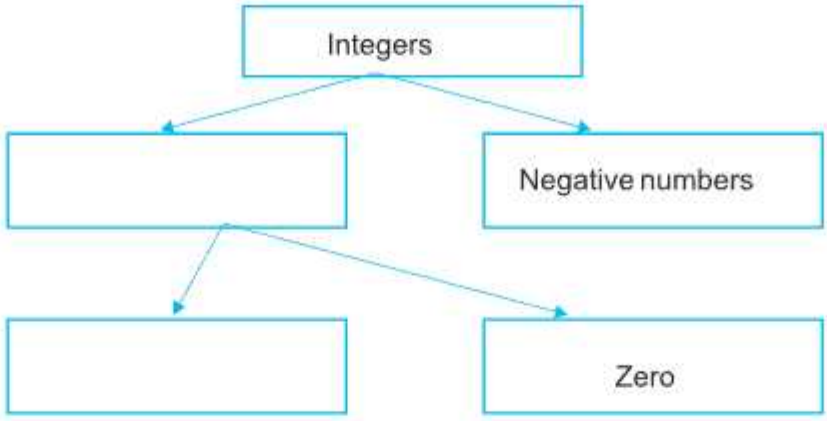
I observed that the distance of my home to school is 1.5 km and I have 1/3rd of lunch box full of vegetable during my lunch period.

What do you observe?

Student's response:

Let us make a family tree of numbers and analyse, what we need more to understand numbers.

I hope you can help me out in this.



How are you feeling?

Student's response : .....

What do you observe?

I will share my observations.

I observed that numbers like 1.5 and 1/3 are not included in any type of numbers in our number tree.

What do you think? What can we do?

Student's response :

Do you think we need another family member of numbers which includes integers and numbers like 1.5 and 1/3?

Student's response :

Do you want to explore further?

Student's response : .....

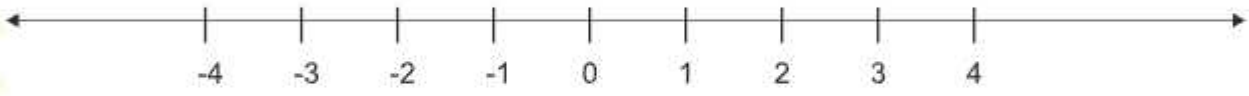
We already know about a number line. Right?

Student's response :

Now, let us draw a number line.

Student's response :

I have drawn my number line.



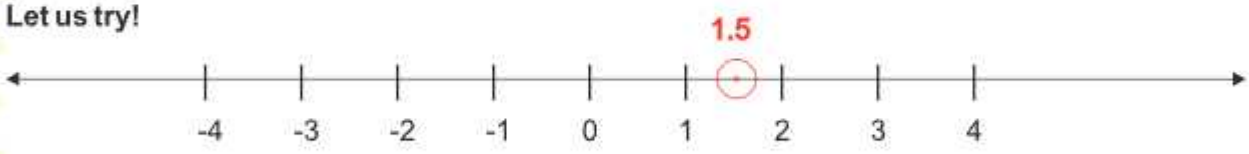
What type of numbers are marked on this number line?

Student's response : .....

Can we mark 1.5 and 1/3 on this number line?

Student's response : .....

Let us try!

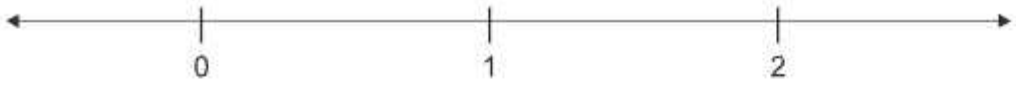


We see that 1.5 comes in between 1 and 2 of the number line.

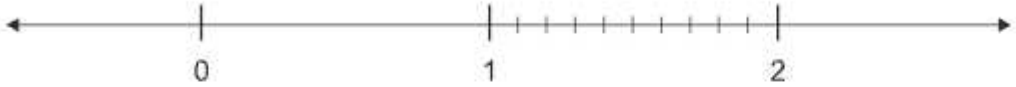
How can you mark it accurately?

Student's response : .....

Let us remake our number line with giving stress to 1 and 2.



Can you divide the number line between 1 and 2 in equal parts?



Student's response : .....

In how many parts have you divided your number line?

Student's response : .....

I have divided my number line between 1 and 2 in 10 equal parts.

What do you observe?

Student's response :

Now how can you mark 1.5 easily on the number line?

Student's response : .....

Can you now mark 1/2 or 5/10 on this number line?

Student's response : .....

What do you observe?

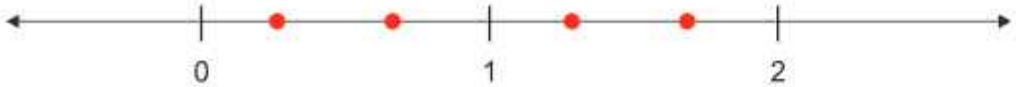
Student's response : .....

What other numbers can you mark in between 1 and 2?

Student's response : .....

Let us explore more with our number line.

Here is a number line.



Let us make stars on 1/3 and 5/3 on this number line.

I hope you could make your stars.

How do you feel?

Student's response : .....

Now, make your own number line.

Draw trees on 2/10, 5/10, 7/10 and 11/10 of your number line.

Student's response :

How are you feeling?

Student's response : .....

Do you think we should plant more trees?

Student's response : .....

Can you make your trees on a number line such that they are equidistant at a distance of 1/5?

Student's response :

You may now share your learning with you parents.

Good luck and happy learning!

Session - 2
Rational Numbers

Learning outcome:-
Demonstrates the understanding of the need of inclusion of negative fractions in number system.

Dear student!

How are you feeling today? Select emoji according to your mood.

How was your initial session?

Did you learn something new in the last session?

We had played with number line in our initial session.

Let us recapitulate.

Let us make the following numbers on different number lines.

(a) 1/5 (b) 3/7 (c) 5/8

What do you observe?

Student's response:

Now mark 4/3, 6/5, 9/7 on three different number lines.

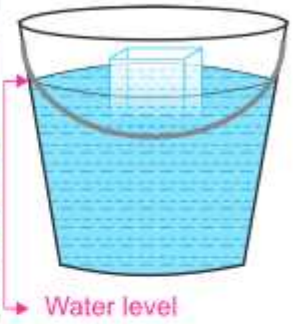
What do you observe?

Student's response:

What other numbers, can you mark in between 1 and 2?

Can you think of situation where negative fractions are used? Write your observation here.

I will share my observations.
I have a wooden toy. I want to play with it.
I kept my toy in a bucket full of water to clean it.
I observed some part of the toy was above the water level and some was below level.



Do you have any such wooden toy or wooden log?

Put it in the bucket of water and observe.

How much portion of the toy is immersed in water?

I will share my observation. I observed that 1/3rd of the toy was in the water.

Review your observations and write here.

How much portion of your toy was above water?

How can we represent 1/3rd of the toy that is under the water?

Let me share my observations.
I observed that if 1/3 part of the toy is below the water then 2/3 part is above the water.

Then, we can represent,

Portion of toy below water as (-1/3)

And Portion of toy above water as (2/3)

Can you think of some other situations, where negative fractions are involved?

You may discuss with your parents and siblings about such situations, and write here.

Now, let us name these numbers.

We observe that the situation we have discussed above are all logical.

Let us discuss another situation.
There are 33 students in our class. Mohit has brought 100 chocolates.
Why would have Mohit brought these chocolates?

Student's respons:

Do you also bring sweets/Candies/Chocolates for your classmates?

Today is Mohit's birthday.
Now, he needs to distribute equal portion of chocolates to each of the student.
How will he distribute 100 chocolates equally to 33 students?

Great!

He will give 3 chocolates to each of 33 students.

Will he be left with any chocolates?

Yes! you are right.

He is left with one chocolate. What will he do now?

I will share my observation.

Mohit will be left with 1 small part of the chocolate.

As, he will repeat his division further, I observed that one part will be left again and again.

Have you ever faced such a situation?

Great!

When we need to divide 4 cubes of chocolate to 3 children?

Are these situation logical ?

Do you face such situation in you life?

State two situations wherein we use fractions like $\frac{1}{7}$ and $\frac{22}{7}$.

How are you feeling?

What did you learn in this session?

Did you enjoy your learning?

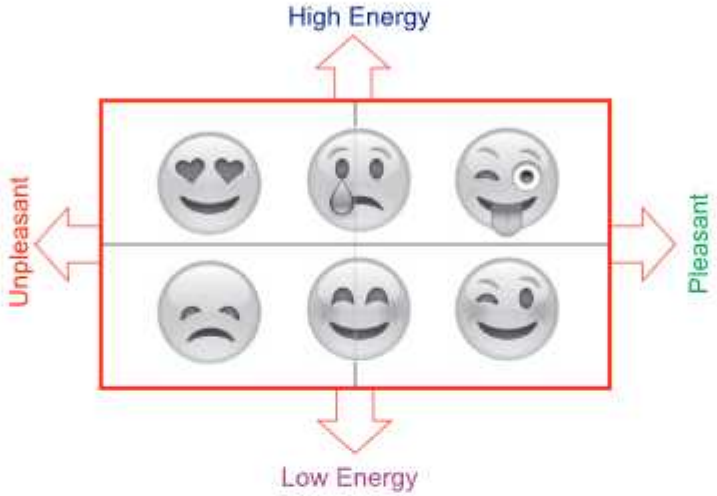
Do you want to explore further?

Session - 3
Rational Numbers

Learning outcome: -
Demonstrate the understanding of division of zero.

Dear Student!

Let us colour the smiley that best represents our mood today on the mood meter.



Great!

How did you feel being vocal about your mood?

Student's response: _____

You can share your feelings / mood with your friends/ siblings/parents/teachers.

We are on our third session of Rational Numbers.

What did you learn in your first two sessions?

Student's response: _____

We explored about some situations where fractions like $\frac{100}{33}$, $\frac{22}{7}$, $\frac{1}{3}$ etc., were involved.

What did you observe?

Student's response: _____

We learnt that numbers involved in such situations are logical and can be seen in our daily lives.

What is you observation?

Student's response: _____

Let us name these numbers.

Can we call the numbers involved in these situations as logical or rational numbers?

Student's response: _____

Yes! These numbers are called Rational Numbers.

We call rational numbers as we make 'rational' decisions and work with numbers that come in our daily life situations.

Can we say that numbers that can be represented as fractions are '"Rational numbers"?

Student's response: _____

Are integers included in rational numbers?

Student's response: _____

Let us explore!

5 is an integer. So is -12.

Can we write 5 as $\frac{5}{1}$?

Student's response: _____

Similarly, can we write -12 as - $\frac{12}{1}$?

Student's response: _____

What about 0?

Student's response: _____

Great!

So, $5 = \frac{5}{1}$

$-12 = -\frac{12}{1}$

And $0 = \frac{0}{1}$

Are all rational numbers?

Student's response: _____

Let us explore about some more fractions.

We all know division of numbers.

Let us complete the task below:

$\frac{15}{15}$ = 1

$\frac{15}{14}$ = 1.011

$\frac{15}{13}$ = 1.153

$\frac{15}{12}$ = ☐

$\frac{15}{10}$ = ☐

$\frac{15}{8}$ = ☐

$\frac{15}{5}$ = 3

$\frac{15}{2}$ = ☐

$\frac{15}{1}$ = ☐

$\frac{15}{0.1}$ = ☐

$\frac{15}{0.01}$ = 1,500

$\frac{15}{0.001}$ = 15,000

$\frac{15}{0.0001}$ = ☐

What do you observe?

Student's response: _____

We started dividing 15 by 15 and as we moved forward, the denominator was reduced.

Student's response: _____

Review your observation and write your reflections here.

Student's response: _____

I will share my observations.

As, we reduced the denominator, the result increased.

Let us observe again.

$\frac{15}{0.00001}$ = ☐

$\frac{15}{0.0000001}$ = ----------

What do you observe?

Student's response: _____

Can we reduced the denominator to minimum?

Student's response: _____

What will happen if the denominator is reduced to minimal?

Student's response: _____

What will we get if we divide 15 by 0 i.e., $\frac{15}{0}$?

Student's response: _____

Can we say 15/0 is logical?

Student's response: _____

Can any other number be divisible by 0?

Student's response: _____

What will we get if a negative number is divisible by 0?

Student's response: _____

Great! You have done marvellous!

Any number when divided by 0 given us an undefined answer.

Even technology cannot define this. You can check for yourself. Write $\frac{15}{0}$ in your calculator and see the result.

What do you observe?

Student's response: _____

Is $\frac{15}{0}$ a rational number?

Student's response: _____

Yes! You are right!

This is not a rational number.

But why?

Student's response: _____

I will share my observations.

$\frac{15}{0}$ has a numerator and a denominator, but that alone isn't enough.

Both 15 and 0 are integers, but can the denominator be 0?

Student's response: _____

Great!

Dividing by 0 gives us an undefined answer.

Can we call this ($\frac{15}{0}$ or any number divided by 0) as logical?

Great!

I too feel that any number when divided by 0 does not represent a logical situation. So, can we say any number divisible by 0 is not a rational number?

Student's response: _____

How are your feeling in this session?

Student's response: _____

Share your learning with your siblings and enjoy.

Session - 4
Rational Numbers

Learning outcome: -
Demonstrate the understanding of representation of rational numbers in decimals form.

Dear Students,

How are you feeling today? Select the emoji according to your mood.

What have you learnt in previous 3 sessions on Rational Numbers?

Student's response: _____

Let us recapitulate.

Make a circle if you think the given number is a rational number.

0	-2
$-\frac{1}{3}$	$\frac{3}{5}$
$\frac{27}{7}$	-8
$\frac{2}{0}$	$-\frac{3}{0}$

Let us explore with another example. Is $\frac{\pi}{4}$ a rational number?

Here 4 is a non-zero integer in the denominator.

But the number at numerator is π. Is the value of π logical?

What is the value of π?

Student's response: _____

Does it have any pattern?

Student's response: _____

Yes!

The digits after decimal in π never terminate and have no pattern. π = 3.14159265359 ----------.
So, can we say $\frac{\pi}{4}$ is not a rational number?

Student's response: _____

Let us explore numbers that are in decimal form.

Here are some types of decimal formats.

1.8

3.33333 ----- or $3.\overline{3}$

Can we convert these into fractions?

Student's response: _____

$1.8 = \frac{18}{10}$

Here, 18 and 10 are integers and 10 is a non-zero, denominator.

So, can we call 1.8 as a rational number?

Student's response: _____

Also, $3.\overline{3}$ or 3.3333 ----------

Can we write as $3\frac{1}{3}$ as $\frac{10}{3}$?

Here 10 and 3 are integers and 3 is a non-zero denominator.

So, can we call $3.\overline{3}$ as a rational number?

Student's response: _____

Let us now explore about another important property of rational number; its density on the number line.

What do you understand by density of numbers on a number line?

Student's response: _____

Great!

Density of numbers on a number line refers to how closely packed are the numbers on the number line. In other words, rational numbers can be called dense if the space between two numbers on the number line is really small.

So, what do you observe? Are rational numbers dense on the number line?

Student's response: _____

Yes! Rational numbers are dense. Between any two rational numbers we can find another rational number.

Can you explain this with examples?

Student's response: _____

You are doing great!

How are you feeling?

Student's response: _____

How many rational numbers can you find between two integers?

Student's response: _____

Let us try?

The temperature on first Monday of January was 8°C. The temperature of first Thursday was 2.5°C less than the temperature on Monday.

Let us mark both the temperatures on the number line – temperature on Monday and temperature on Thursday.

How do you feel?

Student's response: _____

Do you find any relation between a fraction number and a rational number?

Student's response: _____

Let us take some examples.

$\frac{1}{4}$, $\frac{5}{7}$, $\frac{3}{8}$, $\frac{7}{9}$, $\frac{2}{5}$, ----------

Are these fractions?

Student's response: _____

Can we call them rational numbers?

Student's response: _____

You have done a marvellous job!

What have you learned?

Student's response: _____

Did you like to learn new things?

Student's response: _____

You may now share your learning with your friends.

Enjoy exploring new things!

Session - 5
Rational Numbers

Learning outcome: -
Demonstrates the understanding of rational numbers on number tree.

Dear Student,

Let us colour on the mood meter according to your mood today.

Wow!

How did you feel being vocal about your mood?

Student's response: ----------

You can share your feelings / mood with your friends/ siblings/parents/teachers.

What did you learn in your previous sessions of rational numbers?

Do you want to explore further about the new member of numbers family tree – rational numbers.

Student's response: ----------

Great!

Now, let us observe some numbers in decimal format.

1.5, 2.166, 3.727, 4.33333 ----------

Can you write these numbers in fractional form?

Student's response: ----------

Can we call them rational numbers?

Student's response: ----------

What form of decimals are these?

Student's response: ----------

I observed that these decimals: 1.5, 2.166, 3.727 are terminating decimals.

What do you observe about 4.33333 ----------?

Student's response: ----------

I will share my observations.

4.33333 ---------- have non-terminating but repeating decimal.

Do we have some other forms of decimals?

Student's response: ----------

That's right!

Let us observe these numbers,

2.123450176 ---------- 3.291047 ----------

We observe that these numbers have non-terminating and non-repeating decimals.

Can we mark such numbers on the number line we had drawn?

Student's response: ----------

Can these numbers be written in a fractional form?

Student's response: ----------

What do you conclude from the above discussion?

Student's response: ----------

I will share my observation. I observed that any number that can be written in the form of p/q, $q \neq 0$ and is terminating or non-terminating, but repeating decimal is a rational number.

Do you agree with me?

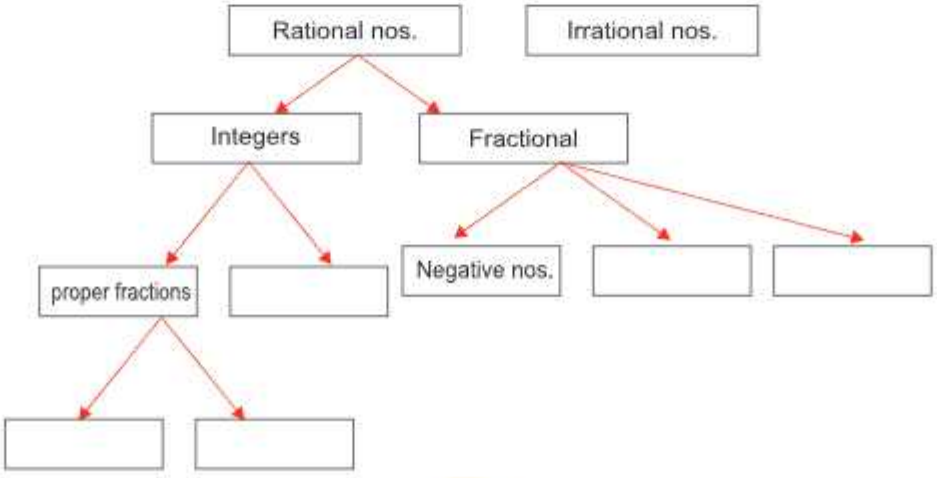
Student's response: ----------

What name can you suggest for numbers that are not rational?

Student's response: ----------

Great!

Mathematically, we call those numbers which are not rational numbers as irrational numbers. Let us now remake our number family tree.



How do you feel?

Student's response: ----------

I enjoyed completing my number family tree.

Let us explore further.

Student's response: ----------

Sanjay Uncle loves feeding the birds. The bird feeder bowl he uses, holds 9/10 of a cup of bajra seeds. Uncle is filling the bird feeder with a scoop that holds 3/10 of a cup. How many scoops of bird seed will Sanjay uncle put into the feeder bowl?

Let us use our number line to find the answer?

Student's response:

Do you think Sanjay uncle is doing a good job?

Student's response: ----------

What good deeds you did today?

Student's response: ----------

Let us now design our own situations. I love going to a nearby picnic spot on my cycle. I cycle for _____ km and stop for a brunch. Then I cycle again for _____ km. How many kilometres did I cycle altogether? Use your numbers and calculate. You may also use your number line to calculate.

Student's response:

You may now play with as many situations you face in your daily life.

You may ask your parents about their daily spendings and calculate the total spendings of the month. How can you help your parents in reducing the expenditure and increasing the saving? Do you think savings are important in life?

How are you feeling?

Student's response: ----------

What was your learning?

Student's response: ----------

Now, you may share your learning with your friends and enjoy!

Good luck and keep exploring!

Session - 6
Rational Numbers

Learning outcome: -
Demonstrates the properties of Rational Numbers & understanding of representing situation in the form of Rational Numbers.

Dear student!

I hope all is well at your end.

How was your last session?



What was your learning in your previous session?

Student's response: ----------

I will share my learning.

I learnt that the number family has rational numbers at the top which includes integers, fractions, whole numbers and natural numbers.

Let us check our understanding.

Here are some numbers.

-4, 7.5, 3.1234, 4.1111 ----------

5/6, 2/3, 9/4, 6, -3/5, -2.9

Draw an orange coloured star around a natural number, red coloured rhombus around an integer and a blue cloud around a rational numbers.

One is done for you.

, ----------

Student's response: ----------

How did you fell about this activity?

Student's response: ----------

Let us think about following statements and state whether they are True or False.

(a) 0 is a natural number _____

(b) $\frac{-2}{5}$ is an integer _____

(c) 6 is a rational number _____

(d) 0 is an integer _____

(e) $\frac{-19}{5}$ is a rational number _____

Great!

You have done marvellous!'

You can now clearly categorise the numbers.

Let us try and represent the following situations using rational numbers.

(a) My mother goes to the bank and withdraws Rs 1000/- from it, _____

(b) Rajan received Rs 500/- as cash prize for his painting. _____

(c) We experience $2^{\circ}C$ less than $0^{\circ}C$ temperature in January _____

(d) Sangeeta loves under water swimming. She can go upto 3 metres below the water as she swims. _____

(e) The mountain peak is 2197 m, above sea level. _____

(f) Meenu loves doing science practical. She is often seen in the Physics lab that is on the third floor of the school building. _____

(g) The lunch time is due, but Mohan was not that hungry. He ate only half of the parantha. _____

You are doing great!

I loved analysing these situations and relating them with rational numbers.

How are you feeling?

Student's response: ----------

Can you make your own situations, when rational numbers are given?

Student's response:

You can use any units (metres, km, litres, kilograms, °C or ₹) You may discuss with your friends.

(a) -7

(b) $\frac{2}{3}$

(C) -940

(d) $\frac{-1}{3}$

(e) 274

You are doing absolutely great!

What was your learning?

Student's response: ----------

I learnt that we use rational numbers every day in our lives.

How are you feeling?

Student's response: ----------

Share some situations where rational numbers are used by your parents and you!

Enjoy !

Session - 7
Rational Numbers

Learning outcome: -

Demonstrates the understanding of the application of operations on rational numbers.

Dear student,

Put Tick (✓) according to your mood from mood meter chart below.

Great!

We have already studied about the rational numbers.

Let us revisit our concepts.

Let us Colour the boxes which have rational numbers written in them

$\frac{1}{2}$	$\frac{2}{0}$	1.111	1.28	π
3.3	4.14	3.13	7.14	$\frac{1}{14}$
$\frac{1}{224}$	$\frac{5}{5131}$	$\frac{-7081}{2}$	2.123	-17

Student's observations:

I will share my observations.

I observed that any number that can be written in the form $\frac{p}{q}$ where $q \neq 0$ and the number that is in the form of a terminating or non-terminating, but repeating decimal is called a rational number.

Do you agree with me?

Student's response:

.....

In case of doubt, you may revisit the earlier session on Rational Numbers.

Let us today plan further about Rational Numbers.

As the schools re-opened, four friends Rahul, Ramya, Rishi and Rekha decided to go out to a nearby restaurant and enjoy their lunch.

Each of them took permission from their parents and took some money for the get - together.

Do you also face such a situation, when you go out with your friends?

Student's response: .....

Rahul suggested, "I will pay the entire amount and then we will divide among us all".

All were Okay with this suggestion.

What do you do, when you go out with your friends?

Student's response:

.....

Great!

As the four friends reached the restaurant, Veg. burger was all - time favorite of all friends, so, they ordered 4 burgers and 4 cold drinks.

What is your favorite meal when you go to a restaurant?

Student's response:

.....

All four friends enjoyed the meal. Rekha wanted to have an ice-ream cone also.

Ramya also accompanied her friend in this. Rahul and Rishi proposed to have nothing more.

Rekha went to the counter and ordered two ice-cream cones.

Do you like ice-creams?

Student's response: .....

After their meal was over, now was the time to divide the bill. They had 02 bills in hand.

Can you tell me how or why they had 02 bills?

Student's response: .....

Thats right!

One bill was for 4 cold-drinks and the other bill was for 2 ice-cream cones.

Rakha suggested - " Please divide the bill such that Rahul and Rishi need not pay the bill of ice-cream cones".

Rishi said - Oh! Its fine! we have come together. We will add the two bills and divide the total amount by 4.

Which method do you opt for, when you go out with your friends?

Student's response: .....

Let us explore both the methods

The bills they got were:

Bill one	
4 Burgers	= ₹134.00/-
4 Cold Drinks	= ₹106.80/-
Total	₹240.80/-

Bill two	
2 Ice-cream cones	= ₹50.80/-
Total	₹50.80

Rekha said, " Ramya and myself will calculate according to my method and Rahul and Rishi, you calculate according to your method."

Ramya said, "yes!! This will be fun!

"Let us see how much difference it makes with the two methods"

What do you think, will there be huge difference in the amount?

Student's response: .....

Let us help the friends with Bill one

Rekha's Calculations

Student's response: .....

.....

Bill one includes meal for 4.

So,

240.80/- needs to divided by 4

How will you calculate this?

Student's response: .....

My calculation for this -

$\frac{240.80}{4}$ = ₹ 60.20/-

Is, your answer matching with mine?

Student's response: .....

What more needs to be calculated?

Student's response: .....

That's right!

We need to take Bill two into account.

What is the total amount of Bill two?

Student's response: .....

According to Rekha, in how many parts should the Bill two has to be divided?

Student's response: .....

Great!

Let us keep Rekha and Ramya! 

How will you calculate the required amount of Bill two for a single Friend?

Student's response: .....

You are great!

My answer for this is:

$\frac{50.80}{2}$ = ₹ 25.40/-

Is your answer matching with me?

Student's response: .....

What are your observations according to the calculations done by Rekha and Ramya?

Student's response: .....

Let us now help Rahul and Rishi!

They want that the total amount needs to be divided into friends.

What should be their first step?

Student's response: .....

That's right!

They need to add the amount of the two bills.

Let us help them

Amount on bill one = ------

Amount on bill two = ------

Total Amount = ------

Which operation did you use to find the total amount?

Student's response: .....

What will happen if they added the amount on Bill Two first and Bill One later?

Student's response: .....

According to my calculations, Total amount is

240.80/- + 50.80/- = 291.60

Does your answer match with mine ?

Student's response: .....

What should be the next step?

Student's response: .....

Great !

They need to divide the total amount by 4

How will we calculate this?

I will share my calculations

$\frac{291.60}{4}$ = 72.90/-

Is, your answer matching with mine?

Student's response: .....

You have done great!

How did you feel helping the four friends?

Student's response: .....

Let us now compare the calculations of Rekha and Ramya with Rahul and Rishi.

What is the amount to be paid per friend according to Rekha and Ramya?

Student's response: .....

.....

Name of the Friends : Amount to be paid

Rekha :

Ramya :

Rahul :

Rishi :

What do you observe?

What is the difference between the amount to be paid by Ramya and Rishi?

Ramya's Amount = ...

Rishi's amount = ...

Which operation did you use to find the difference in their amount ?

Student's response: .....

Great!

What is the amount to be paid per friend according to Rahul and Rishi?

Rekha : ----------

Ramya: ----------

Rahul : ----------

Rishi : ----------

What do you observe?

Student's response: .....

What is the difference between the amount to be paid by Rahul according to him and according to Rekha?

Student's response: .....

Amount to be paid by Rahul

According to Rahul = ...

According to Rekha = ...

Difference = ...

Which operation did you use to find the difference in the amount ?

Student's response: .....

What will we get if we write the amount according to Rekha in the first column?

Student's response: .....

Let us explore!

Amount to be paid by Rahul

Acccording to Rekha = ...

Acccording to Rahul = ...

Difference = ...

What did you observe?

Student's response: .....

Let us now see your situation in terms of numbers.

Let us write the mumbers involved in the situation?

Great!

All these are rational numbers.

Do you face such situations in your daily life?

Student's response: .....

Do you use operations like addition, subtraction, multiplication and division in your daily life?

Student's response: .....

What new did you learn today?

Student's response: .....

Share your learning with your parents and discuss with them some more situations where they use different operations on rational numbers.

You may write any two situations here:

Student's response: .....

.....

.....

I will share with you my observations.

(a) We use operations on rational numbers when we go for shopping and there is a discount on items.

(b) When we follow a recipe and we need to make the dish according to the members of our family.

You may share your learning with your friends.

How are your feeling now?

Student's response: .....

Enjoy learning!

Session - 8
Rational Numbers

Learning outcome: -
Demonstrates the understanding of different properties of rational numbers over addition.

Dear student!

Colour the emoji that best suits your mood today.


Cheerful


Happy


Nervous


Calm


At case

Great!

Do you want to explore further about operations on rational numbers?

Student's response: .....


We studied about different situations we see in our daily life, where we use different operations.

The schools have re-opened after the pandemic, Covid-19.

We all need to follow a renewed time-table to adjust our regular studies.

Do you like making time-table of your daily routine?

Student's response: .....

Did you miss coming to school during pandemic?

Student's response: .....

What was the most important thing you noticed about your home-chores during lookdown?

Student's response: .....

I will share my observations. I observed that my mother worked hard doing different home-chores.

I promised myself that I will always try helping her as and when I get time.

Rehman and Rabiya also decided the same.

What are your renewed observations?

Student's response: .....

I will share with you the time-tables made by Rehman and Rabiya.

Rehman's time-table	Rabiya's time-table
7:00 - 9:00 AM → Morning daily routine	7:00 - 12:30 PM → School
9:00 - 11:30 AM → Study	12:30 - 2:00 PM → Rest time
11:30 - 12:30 PM → Helping Mother	2:00 - 5:00 PM → Study
12:30 - 6:30 PM → School	5:00 - 6:30 PM → Helping Mother
6:30 - 7:30 PM → Play time	6:30 - 7:30 PM → Play time
7:30 - 9:30 PM → Study	7:30 - 8:30 PM → Study
9:30 - 10:30 PM → T.V.	8:30 - 10:30 PM → T.V.

What do you observe?

Student's response: .....

What do you think was the best time for you during the day?

Student's response: .....

Great!

Rehman studies for 4 hours and 30 minutes.

Can we write this as 4.5 hours or $4\frac{1}{2}$ hours?

Student's response: .....

You are doing good!

Similarly, we observe that Rabiya spends 4 hours to study.

Let us check who studies more?

Hours studied by Rehman : 4.5 hours

Hours studied by Rabiya : 4.0 hours

Rehman studies more.

How did you calculate the hours studied by Rehman and Rabiya?

Student's response: .....

Yes! We added the hours together.

For Rehman!

9:00 AM - 11: 30 AM	=	2 hours, 30 minutes
	=	2.5 hours
	or	$2\frac{1}{2}$ hours
7.30 PM - 11:30 PM	=	2 hours
Let us add:		2.5 hours
	+	2.0 hours
Total	=	4.5 hours

Similarly, we can calculate the hours spent by Rabiya to study.

2:00 PM - 5 PM	=	hours
7:30 PM - 8:30 PM	=	hours
Total	=	

Let us talk in the terms of rational numbers.

For Rehman, 2.5 and 2 are rational numbers.

Is the total of these two also a rational number?

Student's response: .....

Great!

Now consider the numbers involved in Rabiya's time.

What are the two numbers?

Are these two numbers, rational numbers?

Student's response: .....

What is the total of these two rational numbers?

Student's response: .....

Is this also a rational number?

Student's response: .....

What do you observe? Can you generalise something for addition of rational numbers?

.....

You are doing great!

I will share my observation.

I observed that rational numbers follow the closure property under addition.

Let us explore other properties of rational numbers over addition.

Let us consider the numbers involved in Rehman's time to study.

What are the two numbers?

Student's response: .....

I will share my calculations.

$$\begin{array}{r} 2.5 \\ +\ 2.0 \\ \hline =\ 4.5 \end{array}$$

Can we add these two rational numbers in different order?

Student's response: .....

What do you observe?

Student's response: .....

I will share with you my observation.

Observed that irrespective of the order of the numbers, the answer is same.

i.e. $\begin{array}{r} 2.5 \\ +\ 2.0 \\ \hline =\ 4.5 \end{array}$ and $\begin{array}{r} 2.0 \\ +\ 2.5 \\ \hline =\ 4.5 \end{array}$

You may now revisit your observations and share here.

Student's response: .....

So, rational numbers follow the commutative property under addition.

Let us explore with some more examples.

Let us verity, if commutative property holds true for the following pairs of rational numbers.

(a) -7 and -2.5

$$\begin{array}{r} -7.0 \\ (+)\ -2.5 \\ \hline -9.5 \end{array} \quad = \quad \begin{array}{r} -2.5 \\ (+)\ -7.0 \\ \hline -9.5 \end{array}$$

I observed that commutative property over addition holds true for the given pair of Rational numbers.

Now please you try:

(b) -2.13 and 4.05

.....

(c) $\frac{1}{2}$ and $\frac{3}{4}$

.....

(d) $\frac{9}{5}$ and $\frac{-3}{4}$

.....

(e) 4 and -7

.....

You are doing good!

Let us explore associative property over addition in rational numbers.

Let us consider any three rational numbers.

	,		,	

Let us add the three rational numbers.

In how many ways can you add the three rational numbers?

Student's response: .....

What do you observe?

Student's response: .....

I will share my observations.

I took the three rational numbers as,

$\frac{-3}{4}$, 4 and $\frac{-7}{4}$

I could add the three rational numbers

As;

(a)

$$\frac{-3}{4} + 4 + \left(\frac{-7}{4}\right) = \frac{-3}{4} + \frac{16}{4} + \left(\frac{-7}{4}\right)$$

$$= \frac{-3+16}{4} + \left(\frac{-7}{4}\right)$$

$$= \frac{13}{4} + \left(\frac{-7}{4}\right) = \frac{13+(-7)}{4}$$

$$= \frac{6}{4}$$

(b)

$$\frac{-3}{4} + 4 + \left(\frac{-7}{4}\right) = \frac{-3}{4} + \frac{16}{4} + \left(\frac{-7}{4}\right)$$

$$= \frac{-3}{4} + \frac{16 + (7)}{4}$$

$$= \frac{-3}{4} + \frac{9}{4}$$

$$= \frac{-3 + 9}{4} = \frac{6}{4}$$

Can you add these three rational numbers in any other order?

Student's response:

What do you observe?

Student's response: .....

Can you generalize your observations?

Student's response: .....

I will share my observations -

Rational numbers follow the associative property under addition.

Do you want to explore further about operation of addition on rational numbers.

What will happen if we add 0 (zero) to any rational numbers?

Student's response: .....

Let us explore

$\frac{1}{2} + 0 =$ ☐

$\frac{-3}{4} + 0 =$ ☐

$1.13 + 0 =$ ☐

$\frac{7}{15} + 0 =$ ☐

$-2.44 + 0 =$ ☐

Great!

What is your observation?

Student's response: .....

I will share my observation

When we add zero (0) to any rational number, we get the same number.

So, rational numbers do not change by adding zero (0).

What was your learning today?

Student's response: .....

Share your learning with your friends and enjoy.

Session - 9
Rational Numbers

Learning outcome: -
Demonstrates the understanding of the properties of subtraction of rational numbers.

Dear student,

How are you feeling today?

We often find discounts and schemes offered by shopkeepers during festivals.

I found three attractive schemes at a nearby shop.

		
3 Chocolates for ₹ 20/-	4 packs of Biscuits for ₹ 25/-	2 packs of Juice for ₹ 30/-

I want to buy something for the guests visiting us on the festival.

Do you find such discounts and schemes offered by shopkeepers near your place?

Student's response: .....

What will you plan buying for the guests?

Student's response: .....

I have ₹ 100/- with me. I want to buy 6 chocolates.

Will I be left with some amount?

Student's response: .....

Let's calculate!

Total Amount I have = ...

Amount spend on 6 chocolates = ...

Amount left over = ...

Which operation did you use?

Student's response: .....

Since I am left with some amount.

I want to buy 8 packs of biscuits.

What do you think, Can I buy 8 packs of biscuits?

Student's response: .....

Let us check.

Amount, I am left with = ₹ 60/-

Amount spent on 8 packs of biscuits = ...

What are your observations?

Student's response: .....

Good!

Yes, I can buy 8 packs of biscuits.

Will I be left with some money now?

Student's response: .....

Let us check!

Amount I have = ₹ 60/-

Amount spent on biscuits = ₹ 50/-

Amount, I am left with = ----------

Which operation, did you use?

Student's response: .....

Great!

What will happen if we change the order of numbers?

Student's response: .....

Let us explore!

Amount spent on biscuits = ₹ 60/-

Amount I have = ₹ 50/-

Amount, I am left with = ----------

What did you observe?

Student's response: .....

I will share my observations.

I observed that, 60 - 50 = 10

Whereas, 50 - 60 = -10

I observed that, the answers are different.

You may now renew your observations and write here.

Student's response: .....

Let us explore with some other rational numbers.

Let us check what will happen if we change the order of numbers in the following pairs.

One is done for you.

Student's response: .....

(a)

$\frac{-1}{2}$, $\frac{3}{4}$

I order

$-\frac{1}{2} - (\frac{3}{4})$

$= \frac{-2}{4} - \frac{3}{4}$

$= \frac{-2 \ -3}{4}$

$= \frac{-5}{4}$

II order

$\frac{3}{4} - (\frac{-1}{2})$

$= \frac{3}{4} + \frac{1}{2}$

$= \frac{3}{4} + \frac{2}{4}$

$= \frac{3+2}{4}$

$= \frac{5}{4}$

We know that:

$\frac{-5}{4}$ and $\frac{5}{4}$ are different

(b) 1.74, 3.5

Student's response:

(c) -2.14 , -3.47

Student's response:

Can we generalise any property of rational numbers under subtraction?

Student's response:

Let us understand!

When we subtract two rational numbers, Which type of number do we get as an answer?

Student's response: .....

Yes!

We get a rational number.

Which property is reflected here?

Student's response: .....

Great!

We can say that rational numbers satisfy closure property under subtraction.

Do you observe anything else?

Student's response: .....

I will share my observations.

I observed that if order of numbers is changed then we do not get same results.

What property of rational numbers under subtraction is reflected here?

Student's response: .....

Yes!

We can say that rational numbers do not satisfy commutative property under subtraction.

What was your learning?

Student's response: .....

Will you like to explore the associative property of rational numbers under subtraction?

Write any three rational numbers.

I will share the rational numbers I have chosen.

$\frac{7}{2}$, $\frac{-3}{4}$, $\frac{-1}{2}$

Let us explore:

I Order	**II Order**
.....	.....
.....	.....
.....	.....
.....	.....

What do you observe?

I will share my observation.

I observed that subtraction of Rational Numbers is not associative.

What was your learning today?

Student's response: .....

Share your learning with your parents.

How are you feeling now?

Session - 10
Rational Numbers

Learning outcome: -
Generalises properties of multiplication over rational numbers.

Dear student,

What was the best part of the previous session of rational number?

Student's response: .....

How are you feeling today? Draw an emoji with your name in front of the mood that match your's.

I 'm Great! _____

I'm Okay! _____

I'm Curious! _____

I am having hard times _____

What was the most challenging part of the past sessions of Rational Numbers?

Student's response: .....

You may revisit the initial sessions or consult your teacher for more clarity.

Let us move forward!

Raghuveer and Rehnuma love to play near the pond. Yesterday, was birthday of Rehnuma's mother. Rehnuma's father gifted her mother a metallic and engraved bangle box. Rehnuma loved it and wanted to show it to Raghuveer.

Rehnuma brought the bangle box and showed it to him.

Raghuveer said, "This is very beautiful. Even you can use it with your mother."

"Yes!" exclaimed Rehnuma, "Let us now keep this near the tree and play."

What do you think would have happened?

Student's response: .....

.....

Do you think Rehnuma did a good thing in bringing her mother's bangle box to the playing area?

Student's response: .....

A dog come and it started playing with the attractive bangle box. Soon, the bangle box was in the pond. Rehnuma rushed to save it, but.....

What do you think should Rehnuma and Raghuveer do?

Student's response: .....

Should they inform their parents?

Student's response: .....

Rehnuma's parents were not at home. She got into tears. Raghuveer's father is a diver. They rushed to him for help.

What do divers do?

Student's response: .....

Hari Ram, Raghuveer's father came to the spot with all his equipments.

What equipments do the divers need?

Student's response: .....

He brought his diver's suit and an oxygen cylinder. He knew that the pond was about 8 meters deep.

This oxygen cylinder had five litres of oxygen that would last for about 15 minutes.

How much time can Hari Ram go under water?

Student's response:

Good!

Let me share my calculations.

1 lt. of O_2 lasts = 15 minutes

= $\frac{1}{4}$ hours

5 lt of O_2 will last = $5 \times \frac{1}{4}$ hours

= $\frac{5}{4}$ hours

= $1\frac{1}{4}$ hours

= 1 hr. 15 minutes.

You may compare your calculations with mine.

Will Hari Ram be able to search the bangle box in this time ?

Student's response: .....

Hari Ram is a smart diver. He knew that it, may take more time to search the bangle box, as the pond will be full of other things.

How many litres of oxygen is more required?

Student's response:

Great!

Le me share my calculations

For 15 minutes

Or $\frac{1}{4}$ hours, we need = 1 litre of O_2

For 2 hours we will need = 4 x 2 litre of O_2

= 4x2 litre of O_2

= 8 litres of O_2

Hari Ram has = 5 litres of O_2

He required = 8 litres of O_2

More required = 3 litres of O_2 (How did I calculate this?)

You may compare your calculations with mine.

Complete the above story now. What would have happened next?

Student's response:

Let us now talk in terms of mathematics.

Can we call 5 and $\frac{1}{4}$ as rational numbers?

Student's response: .....

Great!

What is $5 \times \frac{1}{4}$ = ----------

And $\frac{1}{4} \times 5$ = ----------

Which property of rational numbers over multiplication is reflected here?

Student's response: .....

Yes!

Since $5 \times \frac{1}{4} = \frac{1}{4} \times 5 = \frac{5}{4}$

So, rational numbers are commutative over multiplication.

What are your observations?

Student's response: .....

Let us explore further!

$5 \times \frac{1}{4} = \frac{5}{4}$

Is $\frac{5}{4}$ a rational number?

Student's response: .....

Great!

So, 5 is a rational

$\frac{1}{4}$ is a rational

And their product $\frac{5}{4}$ is also a rational number.

Which property of rational numbers over multiplication is reflected here?

Student's response: .....

Yes!

That's right!

Rational numbers satisfy the closure property over multiplication.

What have you leant till now?

Student's response: .....

Is there any other property over multiplication in rational numbers that you want to explore?

Student's response: .....

I want to explore if multiplication in rational numbers is associative.

Let us consider any three rational numbers.

Student's response:

I took three rational numbers as

$\frac{1}{2}$, 4 , $\frac{-7}{2}$

Check the associativity under multiplication.

Case I

$\frac{1}{2} \times [4 \times (\frac{-7}{2})]$

= ----------

Case II

$(\frac{1}{2} \times 4) \times (\frac{-7}{2})$

= ----------

What did you observe?

Student's response:

Can we say,

$\frac{1}{2} \times [4 \times (\frac{-7}{2})] = (\frac{1}{2} \times 4) \times (\frac{-7}{2})$

Student's response: .....

Which property over multiplication on rational number is satisfied here?

Student's response: .....

Great!

We find that rational numbers are associative over multiplication.

How are you feeling now?

Student's response: .....

What was your learning?

Student's response: .....

Let us explore further!

Let us multiply the following pairs and observe the pattern.

2 x 1 = ----------

2 x 0.1 = ----------

2 x 0.0 1 = ----------

2 x 0.00 1 = ----------

2 x 0.0001 = ----------

2 x 0.00001 = ----------

What do you observe?

Student's response:

I will share my observation.

I observed that my first multiplicand is same and the second multiplicand is reducing.

Do you observe any pattern in the product?

Student's response: .....

I observed that the product is reducing in each case.

Now,

What will happen if

$2 \times 0 =$ ----------

Great!

The product will be minimum. The product will be zero (0).

Let us explore for other numbers!

$-2 \times 0 =$ ----------

$\frac{-1}{2} \times 0 =$ ----------

$1.7419 \times 0 =$ ----------

$3.33 \times 0 =$ ----------

$9999 \times 0 =$ ----------

$\frac{1}{9990} \times 0 =$ ----------

Can you generalize your observation?

Student's response: .....

I observed that all rational numbers, when multiplied by zero (0) give the product as zero(0)

How was learning today?

Student's response: .....

You may share your learning with your friends.

How are your feeling now?

Student's response: .....

Enjoy learning!

Session - 11
Comparing Quantities

Learning outcome: -
Applies the understanding of ratio & proportion in daily life. (Part - 1)

Dear student, how are you!

I am _____. (Good/Happy/Excited/fine)

Come, Let us enjoy an activity today.
Get ready to see, think, explore and share.

Let us prepare one glass of lemon drink.

Student's response:

Now, Taste it.

- How are feeling? Share with us. _____
- I have tasted and found it soothing and yummy.

My observations:

I took a glass of water
$\frac{1}{2}$ lemon
$\frac{1}{4}$ spoon of black salt
$\frac{1}{4}$ spoon of sugar
Mix it well

Now let us prepare the drink for our family with same taste.
You can share the number of glasses you have prepared for your family.

Student's response:

My response:
I have prepared 5 glasses for my family members.

Which ingredients did you use?

Student's response :

My response:
I have used same ingredients as used for the one glass of lemon drink.

Is there any change in the amount of the ingredients?

Student's response :

Yes, I need to increase the amount 5 times as compare to one glass of lemon drink.
5 glasses of water
$2\frac{1}{2}$ lemons
$1\frac{1}{4}$ spoon black salt
$1\frac{1}{4}$ spoon sugar

Now, let us try to compare combination of lemon and black salt in one glass of the drink with 5 glasses of the drink.

Student's response :

I have compared these as follows:-

Combinations	1 glass lemon drink	5 glasses lemon drink
Water : lemon	1 glass of water : $\frac{1}{2}$ lemon 1: $\frac{1}{2}$ or 2:1	5 glasses of water: $2\frac{1}{2}$ lemon 5:2 $\frac{1}{2}$ or 2:1
Lemon : Black salt	2 spoons= 8 times of $\frac{1}{4}$ spoons : $\frac{1}{4}$ spoons 2 spoons= $\frac{1}{4} \times 8$: $\frac{1}{4} X 1$ 8:1	10 spoons= 40 times $\frac{1}{4}$ spoons : $1\frac{1}{4}$ spoon 10 spoons= $\frac{1}{4} X 40$: $\frac{1}{4} \times 5$ 40:5 = 8:1
Sugar : Black salt	1/4th spoon : 1/4th spoon 1:1	$1\frac{1}{4}$ spoon black salt : $1\frac{1}{4}$ spoon sugar 1:1

What similarities you find while comparing ingredients for one glass and _____ glasses of lemon drink?

Student's response : .....

What differences you find while comparing the ingredients for one glass and 5 glasses of lemon drink?

Student's response : .....

My response:

I have noticed the increase in the amount of the ingredients but in same ratio.

40 : 5 :: 8 : 1

As 40 is 5 times of 8.

This relation of comparing the ratios of quantities is known as **Proportion.**

What willl happen if the ingredients of the lemon drink will not be in same ratio?

Student's response : .....

How can you help your family and friends by today's learning ?

Student's response : .....

You have actively participated.

Well done!

Let us explore

- Amount of milk required for 10 cups of tea, if 30 cups milk is required for 50 cups of tea.
- Number of mangoes in 20 glasses of mango shakes if 5 mangoes are used in 8 glasses of the shake.
- Price of 35 dozen banana if price of 15 dozen is ₹ 450.
- Do you find yourself able to help others also by today's learning?

- How are you feeling now: I am _____. **(Good/Happy/Excited/fine)**

I need to learn again

I need help yes,

I have done it

Great, we have done it.

Session - 12
Comparing Quantities

Learning outcome: -
Distinguishes quantities that are in proportion (Part - 2)

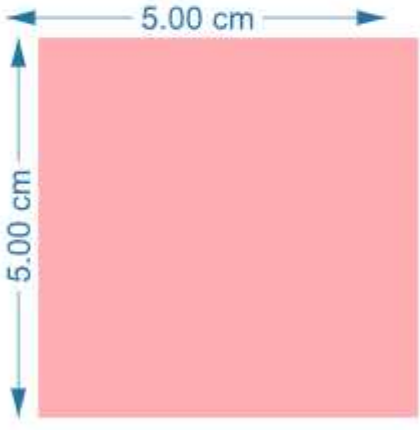
Dear student, how are you!

I am _____. (Good/Happy/Excited/fine)

Come, Let us enjoy an activity today.
Get ready to see, think, explore and share.

Let us collect things around us which are of same shape at our home and see these carefully. You can also draw the things in the box.

Student's response:



I have collected the things shown in the picture and observed that the top of all these objects is square shaped which are similar but their sizes are different.

Origamy sheet is of the size 5cm×5cm

Top of a refreshment box is of 14cm×14cm

Packet is of size 24cm×24cm

Share your observations about the objects you have collected?

Student's response:

How are you comparing the shapes of the objects?

Student's response:

These are looking similar. Number of sides and angles are same in all the objects.

What are the ideas that came to your mind while comparing these objects? Why?

Student's response:

How are you comparing the sizes? Explain.

Student's response:

I can see the difference in size, so I measured the dimensions of the objects using scale and compare.

I found that sides are in ratio 1:1.

Ratio of sides of all the objects' top face which is a square shape are equal.

This relation of comparing the ratios of quantities is known as **Proportion.**

How many similar shapes can be there for any shape?

Student's response:

You have actively participated.

Well done

Let us explore

Please look at different sizes of our National flag.

Can you guess and share the length and breadth of different sizes of the flag you have ever seen.

Also try to explore -

1. The relation in the sizes of Maps of world and Maps of India.
2. Variation in the sizes of shadows of an object with change in distance.
3. Sizes of shadows of same thing that a Torch light makes from different distances.
4. A carpenter preparing similar table and book shelves.

- Share with your family and friends how is learning about proportion going to help you?

Student's response:

- Ask your family and friends if they apply proportion in their day-to-day work.

Student's response:

- Do you find yourself able to help others also by today's learning?

How are you feeling now: I am _____. (Good/Happy/Excited/fine)

I need to learn again	**I need help yes,**	**I have done it**
★	★★	★★★

Great, we have done it.

Session - 13
Comparing Quantities

Learning outcome:-
Calculate profit and loss.

Dear student, how are you?

Student's Response: I am ----------(Fine, excited, good, happy)

I am excited about today's discussions.

Observe the following pictures and record your observations.

Student's Response:

Milk packet	

Milk bottle, milk packet, ice cream, candle stand, cake.

From where do we get these things?

Student's Response: ----------

Teacher: on shops, why the shopkeeper sell these articles?

Student's Response: ----------

Are you saying Profit, what do you mean by profit ?

Student's Response: ----------

When a person gets more on some investment.

Do shopkeepers get profit on each and every transaction?

Student's Response: ----------

Teacher : If it is not profit then what is it?

Student's Response: ----------

Teacher: Loss, what do you mean by loss?

Student's Response: ----------

Teacher: when a person gets less amount on some investment.

Can a person get a profit more than 100%? (You can discuss with parents/friends/ teachers)

Student's Response: ----------

Some Shopkeepers are at a risk of loss, who are these shoppers ?

Student's Response:

Teacher : Why these are at risk of loss ?

Student's response: ----------

Teacher : Why all sweets prepared are not sold?

Student's Response: ----------

Limited days (Sweets get spoiled after 2-3 days)	

Teacher : Raju's father has a toy shop. He sold a teddy bear for rupees 150 to Sana . Let us discuss about this price 150 . What is it for Sana and what is it for Raju's father ?

Student's response:

Teacher : Okay, Rs 150 is the selling price for Raju's father and cost price for Sana.

How can 'one price' Rs 150 is different for two persons ?

Student's response:

One is selling and other is purchasing price	

Let us think for the example of Teddy bear which Raju's father purchased for RS 120 and sold to Sana for RS 150? What are these Rs 120 and 150 for Raju's father and Sana?

Student Think :

Teacher think : Rs. 120 = Cost price of Teddy for Raju's father
Rs. 150 = selling price of Teddy for Raju's father
Rs. 150 = cost price of Teddy for Sana

Observe the following situations and record your observations

1 An ice cream of Rs. 8 is sold at 10
2 A candle stand of Rs. 20 is sold for Rs. 15.
3 A pencil of Rs. 5 is sold at Rs. 8.
4 A cake of Rs. 100 is sold at Rs. 80.
5 Uniform cloth at the rate of Rs.100 / metre is sold at Rs. 120/metre.

Student's response:

Situation	Cost price	Selling price	Profit or loss
1	Cost price=Rs8	Selling price=Rs10	

Pat yourself for your efforts.

Express the criteria of profit or loss

Student expression:

Comparison of cost price and selling price.	

If the selling price of an article is greater than the cost price, then there will be profit.

Profit = selling price - cost price

How is loss calculated?

Student's response: ----------

If the selling price of an article is less than the cost price then there will be loss.

Loss = cost price - selling price.

How did you learn today ?

Student's response: ----------

I also enjoyed discussion on cost price and selling price.

Exploration :

1. Raju's father sold a toy for Rs200 which costs him for Rs 240. What should he do cover up his money ?
2. Which transaction is a better deal and why?
   A) Candle stand of Rs. 200 is sold for Rs. 220.
   B) A flower pot of Rs. 250 is sold for Rs. 290.

Session - 14
Comparing Quantities

Learning outcome:-
Calculates profit percent and loss percent

Hello dear student, how are you feeling today?

Student: ----------(Eager, excited, relaxed, powerful, happy)

Share the points discussed In previous session.

Student's response:

In the previous session we discussed about cost price, selling price, profit and loss.

Help Raju's father to know which Deal is better and why?

1) A toy teddy of Rs. 320 is sold Rs. 360.

2) A toy car of Rs. 400 is sold for Rs. 440.

Student's response:

Profits can be calculated at equal cost prices	

We can compare profit percent in the two cases

Are Profit and profit percent (%) same or different?

Student's response: ----------

Profit and profit % are different because, profit means total profit but profit percent means profit on hundred.

How can you calculate profit or loss percent?

Student's response:

Profit % = (Profit /cost price) × 100

Loss% = (loss/ cost price) × 100

Why profit or loss calculated on cost price ? (you can discuss with parents, friends, teachers, siblings)

Student's response:

Total profit or total loss depends on the cost price.

Kajal purchased a cycle for ₹ 2400 and spent ₹ 400 on its transportation. She sold it for ₹ 2500. What to do of amount of ₹ 400? How to know about profit / loss?

Student's expression:

Teacher expression : Since ₹ 400 spent from Kajal, it will be added to cost price and then total cost price will be compared with selling price.

Now calculate profit % or loss %?

Student's response:

Reflections:

What do you learn today?

Student's response:

How did you learn?

Student's response:

Let us explore :

1. Which of the following two situations is better option to purchase articles.

Situation A :

Situation B:

2 : Salary of Vani's father increased by 25% at the beginning then decreased by 25% at the end of the month. Is the salary same or different?

Celebrate your learning.
Pat yourselt

Session - 15
Comparing Quantities

Learning outcome:-
Calculates simple interest and rate percent in simple interest.

Dear student, how are you feeling today. (Select the emoji and draw)

Student's response: ----------

Observe the following pictures and write your observations.

Student's response:

I find these places as to keep the surplus money.

Which place is better and why?

Student's response:

Great!

Why people deposit money in the bank?

Student's response: ----------

I think, banks are better place to invest surplus money because we get more money than investment/ principal.

What is this more money?

Student's response: ----------

Interest

What is the interest ?

Student's response: ----------

The extra money than the investment/principal is interest.

How to calculate the interest ?
(You can discuss with parents /friends /teachers).

Student's response:

$$\text{Simple Interest} = \frac{\text{Principal} \times \text{Rate} \times \text{Time}}{100}$$

If we have to calculate rate percent, how to calculate it?

Student's response:

We can use the same formula by shifting the terms.

$$\text{Rate \%} = \frac{\text{Simple Interest} \times 100}{\text{Principal} \times \text{Time}}$$

Let us try

S.N.	Principle	Rate of interest	Time period	Simple interest
1	Rs 5000	5%	6 years	
2	Rs 8000		5 years	Rs 2000
3	Rs 2600	5.5%	4 years	
4	Rs 15000	5.8%	5 years	
5	Rs 7500		12 months	Rs 300

Reflections: What did you learn today?

Student's response:

Great!

Let us celebrate by a good clap. I have enjoyed discussion with you.

Exploration:

1. At what rate of interest a sum of money will be doubled in 5 years?
2. Discuss with your parents / teachers/bankers about the rate of interest calculations in a bank?
3. Prepare a worksheet for your fellow classmates.

Good Day!

Session – 16
SYMMETRY

Learning outcome:-
Demonstrates an understanding of rotational symmetry and applies it in daily life situations.

Dear student, I am fine.

Hope you all are healthy and safe. How are you feeling? Select your emoji and draw.

Student Response:

Let's recall symmetry that we had discussed in class 6th. Look at these figures and draw line/lines of symmetry.

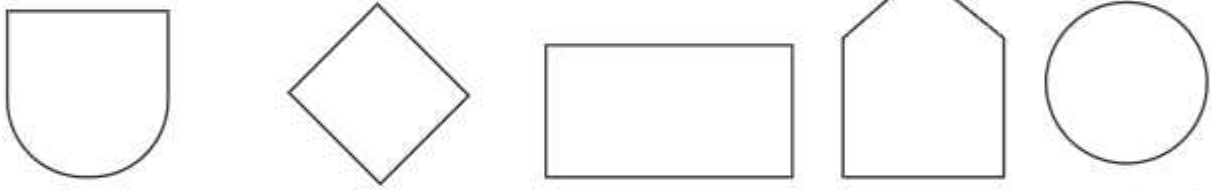
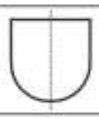


Fig. 1 **Fig. 2** **Fig. 3** **Fig. 4** **Fig. 5**

Could you do it easily?

Student's response:



Great, in symmetrical figures there is a line of symmetry that divide the figure into two identical parts. Can you think another type of symmetry?

Look at the given picture.

What do you observe?

Student's response:

What do you say, when the hands of clock go forward.

Student's response:

We say these rotate. How do these rotate?

Student's response:

These rotate in one direction, or two directions?

Student's response: _____

The hands of clock can rotate in two directions.

We will think this later.

Look at this picture. What do you observe?

Direction of movement of minute hand.

Student's response:

_____, _____, _____, _____

I observed, one hand is on 12 and the other in between 3 and 6.

Very nice. The rotation like movement of hands of clock is called clockwise direction.

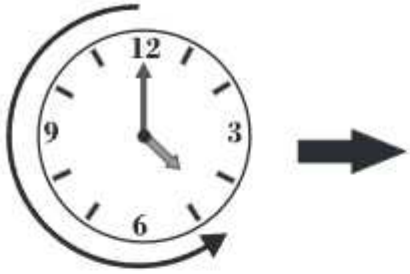
(Movement of hands of clock is clock wise)

You can also draw a clock and show clock wise movement of the hour and minute hands.

Student's response: _____

Great going!

Now look at this picture and observe. Write your observation.



After movement by Teacher Manually.

Student's response:

_____

In which direction are the hands of the clock moving ?

Student's response:

_____, _____

This time, rotation of hands is in the reverse direction of movement of hands of clock. This is called anti-clock wise movement.

Have you observed hands of clock moving in reverse direction?

Student's response: _____

Look at the moving ceiling fan. Observe its rotation and write if it is clockwise or anti-clock wise, when the fan rotates. Write Yes/No in the blank space.

Does the shape changes = _____

Does the size change = _____

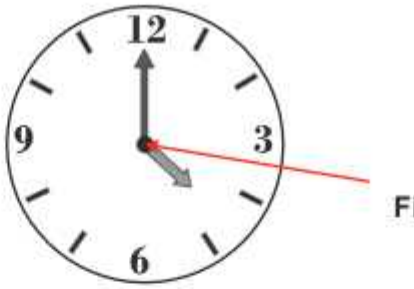
Well done!

When an object rotates, its shape and size does not change. But how does the object rotate? Explain.

Student's response:

_____, _____, _____

Fan



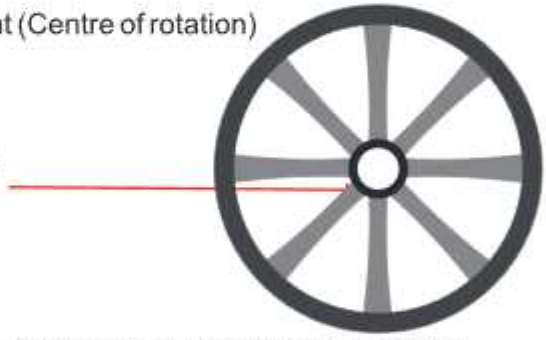
Clock

Rotation turns an object about a fixed point called centre of rotation. Draw an object which moves around one fixed point.

Student's response:

Wow, you are doing awesome !

This picture of wheel of a cycle shows its fixed point (Centre of rotation)



You can also draw a picture of wheel or any other object and show its clock wise rotation.

Student's response:

Now draw another wheel or any other object and show anti-clock wise rotation.

Student's response:

Dear students, today has been a beautiful learning day. Share your learning experience here.

Also draw an object showing clock wise direction.

Student's response:

Wow!! Great going.

Here are few examples. Also confirm, which of them have Rotational symmetry or linear symmetry.

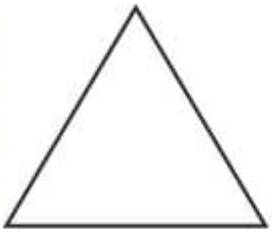


Figure 1

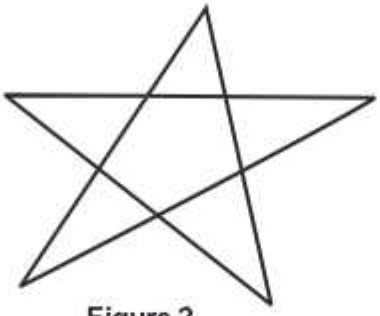


Figure 2

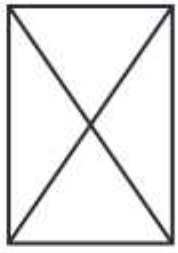


Figure 3

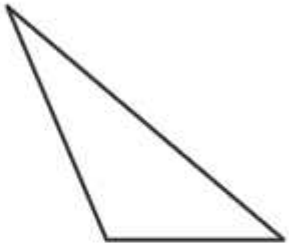


Figure 4

Student's response:

We noticed Linear Symmetry – lines of symmetry and Rotational Symmetry – rotation involved which is more important?

Student's response: _____

Both are equally important. Share one example of Rotational symmetry here.

Student's response:

Please observe the rotation of water tap and write.

Student's response: _____

Wow! you did well.

Have a happy learning.

Session – 17
SYMMETRY

Learning outcome:-
Demonstrates an understanding of rotational symmetry and applies it in real life situations.

Dear student, how are you feeling today?

Student's response:

Cheer up and show a thumbs up.

Student's response:

We have discussed rotation of minute hand of a clock in the previous worksheet. Now look at these pictures and show (✓) according to the clock wise/anti-clock wise movement of the minute hand.

			Clockwise	Anti-clockwise
(1)		=	_____	_____
(2)		=	_____	_____
(3)		=	_____	_____

Very good. Now look at this Picture. What is your observations?

Student's response:

_____, _____

I observed two hands of clock overlapping each other. Did you observe any other thing.

Student's response:

_____, _____

Did you observe in which direction it is moving?

Student's response:

_____, _____, _____

Yes, it is moving in clockwise direction.

What else did you observe?

Student's response:

Now you can compare your observations with mine. I observed it has completed one round. What is the angle formed when an object takes complete round along a fixed point?

Student's response:

_____, _____, _____

A complete angle means an angle of 360°.

Complete angle

One complete angle = 360° = 1 complete revolution.

Now observe this picture and share.

Student's response:

Angle between 12 and 3_, _____, _____

What else did you observe?

Student's response:

Not complete angle, _____, _____, _____

I observed it took a small turn and which type of angle did you notice?

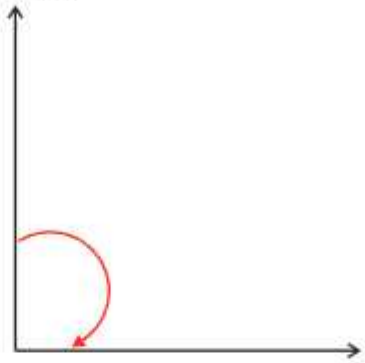
Student's response:

Small angle, _____, _____, _____

It is a right angle in clockwise direction.

I noticed a one fourth rotation in clockwise direction.

Complete rotation



¼ rotation = angle of 90°

Sharing with you this clock Tell the angle between the two hands.

S t u d e n t ' s r e s p o n s e :

I noticed a straight angle (180°) and I also noticed one half rotation.

Complete rotation

half rotation

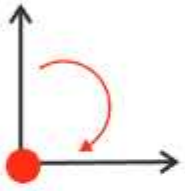
Now you show/draw hour hand on 12 and minute hand on 9 in your clock.

Student's response:

This is my clock with hour hand on 12 and minute hand on 9 showing its angle and angle of rotation.

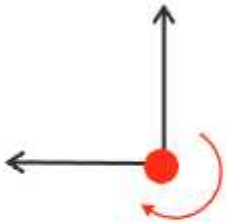
Student's response:

It is 3/4 th rotation



1/4 Rotation

1/2 Rotation



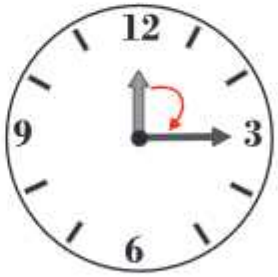
3/4th Rotation.

Now show the figures. Showing complete half and 1/4th turn.

I did this way

Complete turn
Or making angle of 336°

Half turn or
making an angle of 180°

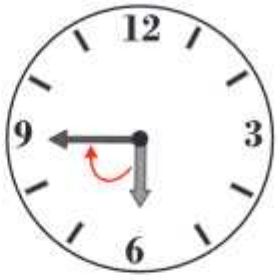


Quarter turn or
making angle of of 90°

Well done. How are you feeling now?

Student's response:

Sharing you the pictures, please fill in the blank . (Please insert right or cross tick). Also give reason in the box



(1) Complete turn = _____ Complete turn = _____

(2) Half turn = _____ Half turn = _____

(3) Quarter turn = _____ Quarter turn = _____

Student's response:

Beautiful, how was your session today?

Record it in your voice or write below and share with your friends.

Student's response:

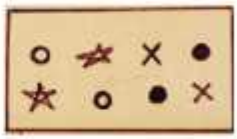
Happy learning!

Session - 18
CONGRUENCY

Learning outcome: -
Demonstrates an Understanding congruency and applies it in real life situations.

Dear student,

Look at the given picture and match the same things . How do you feel?



Student's response:

Observe any two same things from your surroundings. Take five minutes to observe and reflect.

Student's response:

I observed two window panes in my room

These window panes seem same. Compare these window panes. What is your observation?

Student's response:

I compared these on the basis of length and breadth.

My observations:

1. The length of panes looks same.
2. Their breadth looks same.
3. Handles also look same. Do you observe any other thing?

How did you compare?

Student's response:

Let's search/draw more such things from our surroundings

Student's response:

Observe any two things that can be placed one over another? What do you feel while placing one figure over the other?

Student's response:

I have put my one hand over another

I found these two exactly cover each other. What do you feel?

Student's response:

.....

I found these are of the same size and shape. What were your findings?

Student's response:

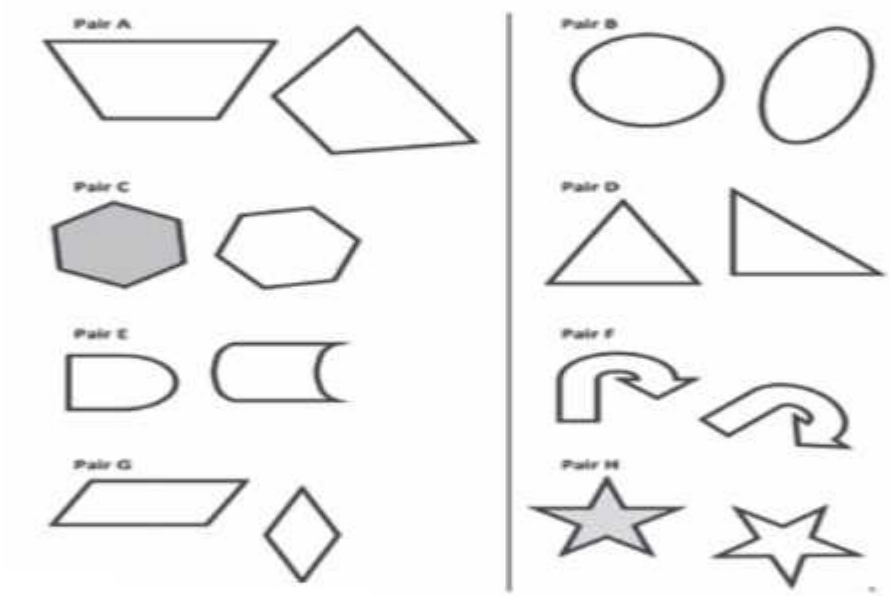
.....

I noticed that two things of the same shape and size/dimension cover each other exactly. What did you notice?

Student's response:

.....

Two same things of same shape and size cover each other. So these things are congruent to each other. Now Put a tick mark on the pair of same/congruent figures in the given images ?



Wow, You have done a great job.

Please share your learning with your siblings.

Student's response:

Enjoy learning!

Session – 19
CONGRUENCY

Learning outcome: -
Applies knowledge of congruency of line segment in daily life situation.

Dear student, Good wishes!

Hope you are doing well. Express your mood by showing the emojis.

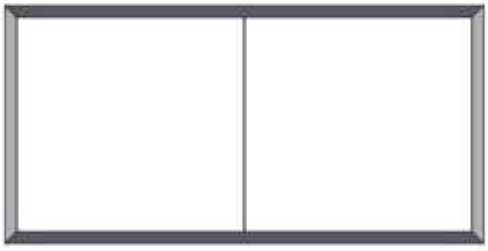
Student's response:

We had discussed the application of congruency in daily life. Please share any example of congruency from your surrounding.

Student's response:

Great, here is a picture of window pane. These window panes seem to be same.

Did you also notice this?



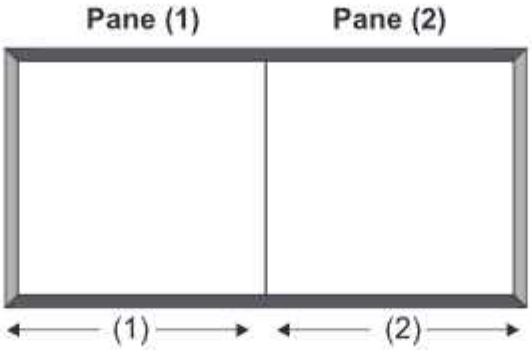
Student's response:

Well done!

The breadth of two window panes looked same. Let's measure these.

How can we measure these?

Student's response:



I measured pane (1) Using a thread. You can also do this.

Student's response:

Now I measured pane (2) Using the same piece of thread. You can also do and what are your findings? Measure the length also writ.

Student's response:

Wow! You are doing a marvellous job. I measured the breadth of pane (1) and pane (2) using a thread. I found that same/equal length of thread was used for the pane (1) and pane (2).

What does this mean?

Student's response:

Good, great going!

This means breadth of pane (1) and pane (2) are same.

Now look at these line segments. Find which of them are of same or equal size.

Student's response:

How can we measure these?

Student's response:

by hand, _____, _____, _____

How can we measure these four segments easily?

Student's response:

Can we make pair of these line segments?

Student's response:

Let's make pair of line segments.

(1)

(2)

Student's response:

Let's measure and compare the line segments of pair (1)

Student's response:

I measured line segment AB with thread and measured line segment CD using same thread. You may also do this.

What is your finding?

Student's response:

I noticed, I could measure the segment AB and CD using the same thread of equal length. What did you notice?

Student's response:

This means line segment AB and CD are of equal length. We can repeat this for pair (2). Let's do.

Student's response:

Now we measure PQ and RS using a thread. What is your finding?

Student's response:

You are doing excellent work. I measured PQ and RS. I noticed for measuring PQ, I required more thread then RS.

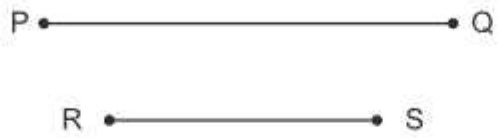
Let's measure pair (1) and pair (2) using scale. I measured this. You can also do. What did you notice?

AB = _____ cm

CD = _____ cm

Student's response:

I found: In pair (1) length of AB matched with CD. Let us check pair (2).



Student's response:

PQ = _____ cm RS = _____ cm

I found PQ and RS are of different length. Let's complete this table.

Student's response:

	Pair (1)	Pair (2)
(1)	Length AB = _____	PQ = _____
	CD = _____	RS = _____

Great effort!

Here, we noticed pair of line segment in fig (1) matched with each other. So AB=CD. What was your finding in pair (2)?

Student's response:

We noticed pair of line segment in fig (2) did not match with each other, so PQ ≠ RS.

Here we concluded that CD covers AB with 'C' on ' A' and 'D' on 'B'. Hence line segments are congruent to each other. Please try to define the congruent line segments.

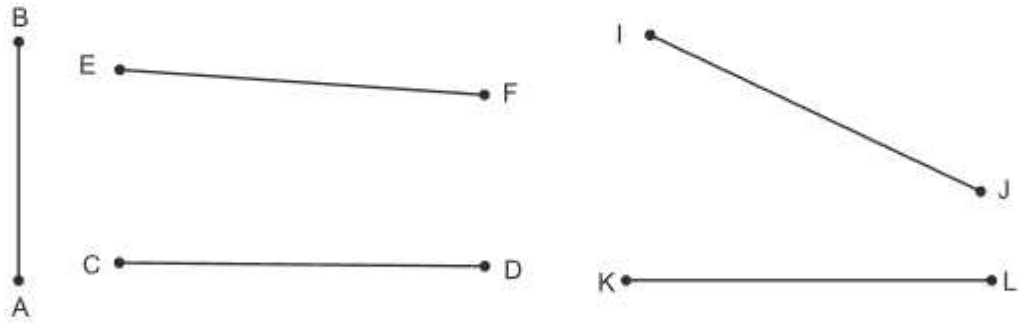
Student's response:

If two line segments are equal in length these are congruent to each other.

Which pair is congruent?

Student's response:

Find the pair of equal line segments by a method of your choice.



Student's response:

Great, you have done an excellent job. Share your experience with your friends.

Student's response:

Who helped you in your learning? Please draw a pair of line congruent line segments & write their lengths.

Student's response: .

Please draw a pair of line segments which are not congruent and write their length.

Student's response:

How are you feeling now?

Session - 20
CONGRUENCY

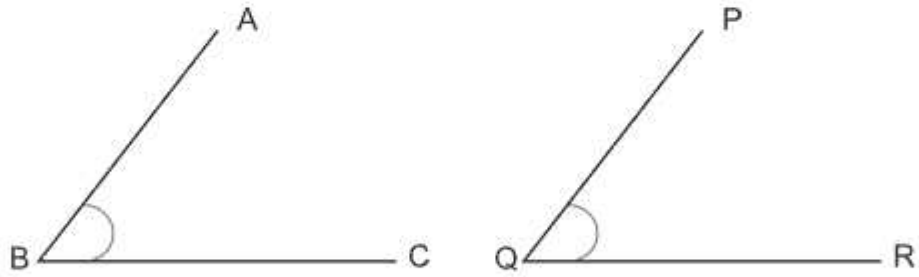
Learning outcome:-
Demonstrates an understanding of congruency of Triangles.

Dear Student, Tick the emoji according to your mood.

We discussed congruency of line segments in the previous worksheet now please show a pair of equal angles in the space given below:

Student's response:

I have also drawn a pair of equal angles. What will you do to check their congruency. Please recall from previous session.



Student's response:

Good!

Let's put one angle over another. What do you observe?

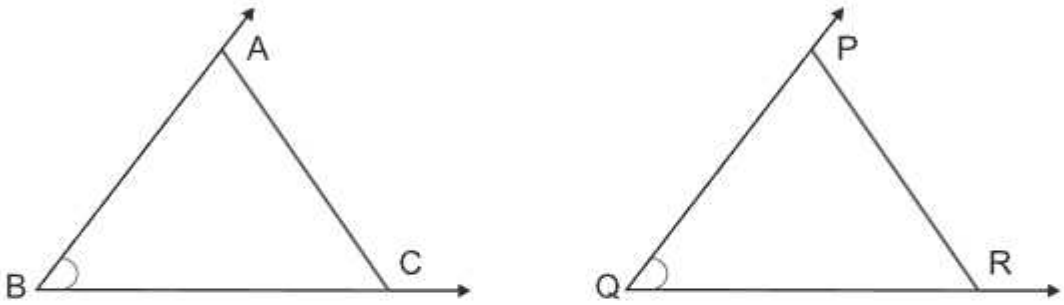
Student's response:

This pair of angles cover each other so these are congruent to each other. Now Let's drawn/Join AC in the ∠ABC and PR in the ∠PQR. Which figure do we get?

Student's Response: ....., ...,

Great, you are doing well!

We get this figure (triangle)



What do you observe in these figures?

Student's Response: ....., ..., ...,

Initially ∠ABC and ∠PQR were congruent. Now the new formed figures are △ABC and △PQR Congruent to each other.

If these cover each other exactly then these will be congruent to each other.

How can we check this?

Student's Response:

Let's do an activity

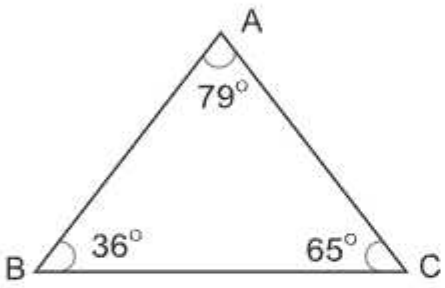
1. Take cut outs of △ABC on blue colour sheet.

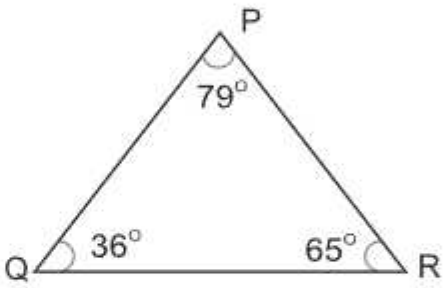
2. Take cut outs of △PQR on Red colour sheet.

Keep both cut outs in the given space.

Student's response:

Now Put cut out of △ABC over cut out of △PQR !





Keeping in mind.

(a) P will cover .....A.....

(a) Q will cover .....

(a) R will cover .....

Student's response:

Great!

Yes, P will cover A

Q will cover B

and

R will cover C

Now observe which side will cover the other side completly.

$\overline{PQ}$ will cover $\overline{AB}$

$\overline{QR}$ will cover .....

$\overline{PR}$ will cover .....

Please check and respond.

Student's response:

Now observe that $\triangle PQR$ covers $\triangle ABC$ exactly and share how?

Student's response:

Great going. You are doing marvelous job.

We noticed two triangles cover each other exactly. Did you notice other parts of triangles?

Student's response:

Yes, triangles have other parts that cover each other.

Corresponding vertices	(1)	A and P
	(2)	B and Q
	(3)	C and .....
Corresponding sides	(1)	AB and PQ
	(2)	BC and .....
	(3)	AC and .....

Corresponding angles (1) $\angle$ A and $\angle$ P

(2) $\angle$ B and .....

(3) $\angle$ C and .....

Student's response:

Wow, you did well!

We noticed, in congruency of triangles

(1) The corresponding vertices overlap.

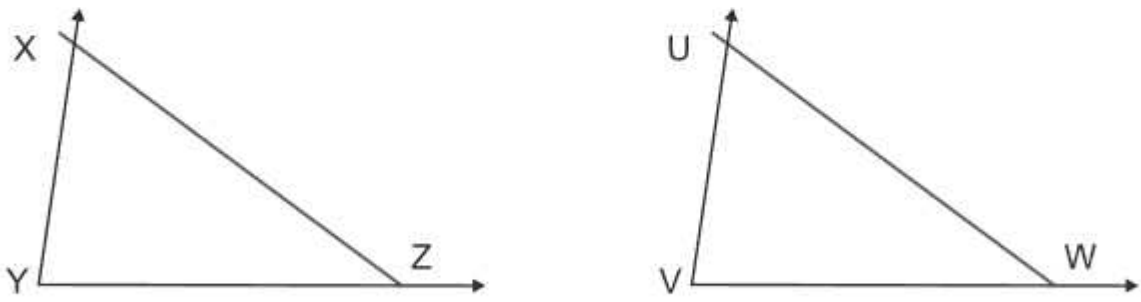
(2) measure of corresponding angles is the same.

(3) measure of corresponding sides is the same.

What do you notice?

Student's response:

These are two triangles.



Now take cut outs equal to their size and check their congruency.

For △XYZ and △UVW, let us place one figure over the other and check. And complete this table.

	Angle	Sides	Vertex
(1)	∠ X = ...	XY = ...	X = ...
(2)	∠ Y = ...	YZ = ...	Y = ...
(3)	∠ Z = ...	ZX = ...	Z = ...

Record you experience here. Are these two triangles congruent. Why?

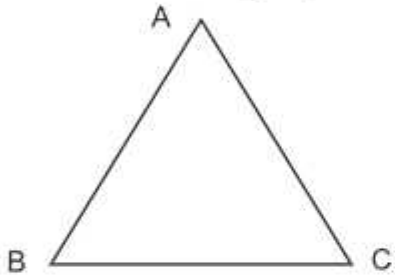
Session - 21
CONGRUENCY (SSS)

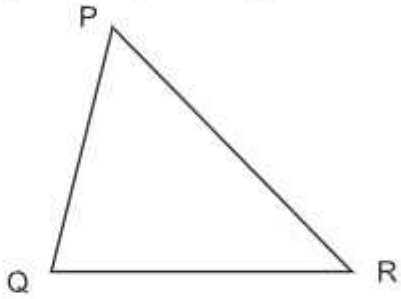
Learning outcome:-
Applies the concept of SSS congruency rule for triangles.

Dear Student, How are you feeling today? Put a tick (✓) on the given emojis.

We have discussed congruency of triangles in the previous worksheet. Let's recall that.

Here are the cut outs of triangles, check the congruency and complete the given table.





Did you put one triangle over another triangle.

Student's response: Complete this table

Sides	Angle	Vertex
(1) AB= _____	∠A = ∠P	Vertex A Covers --------
(2) BC= _____	∠B = ----------	Vertex B Covers Q
(3) QA= _____	∠C = ----------	Vertex C Covers --------

Great, you are doing well

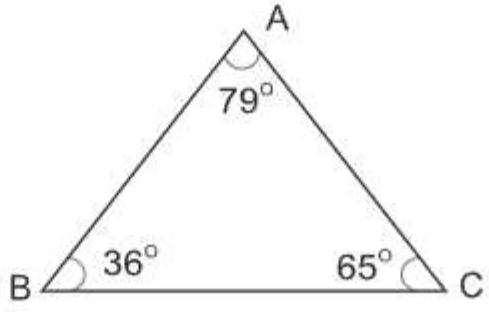
It was very easy to put one cutout over the other. But when we draw a triangle on a paper.

How can we check these points?

Student's response:

Let's Play a game of Triangle.

I am showing you a Triangle.



I want to draw the replica of triangle. Can you draw this easily?

Student's response: We can try, -----

But the game is that we will use minimum information to make this, what do you feel?

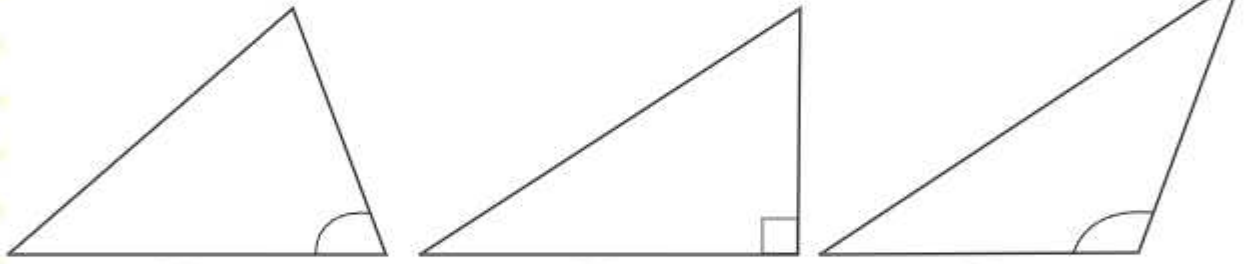
Student's response: _____

Let's try to make triangle with minimum Information.

Now draw a triangle with one side 5.5cm

Student's response :

I could make these triangle of side 5.5cm.



5.5cm | 5.5cm | 5.5cm

Acute Angled Triangle | Right Angled Triangle | Obtuse Angled Triangle

Could you draw? Please try.

Student's response:

I could make these three triangles, did any one of these look similar to ΔABC. Do any one of these seems same?

Student's response:

I felt, I need more information. Let's take other side 3.4 cm.

Now you also draw.

Student's response:

I could draw this

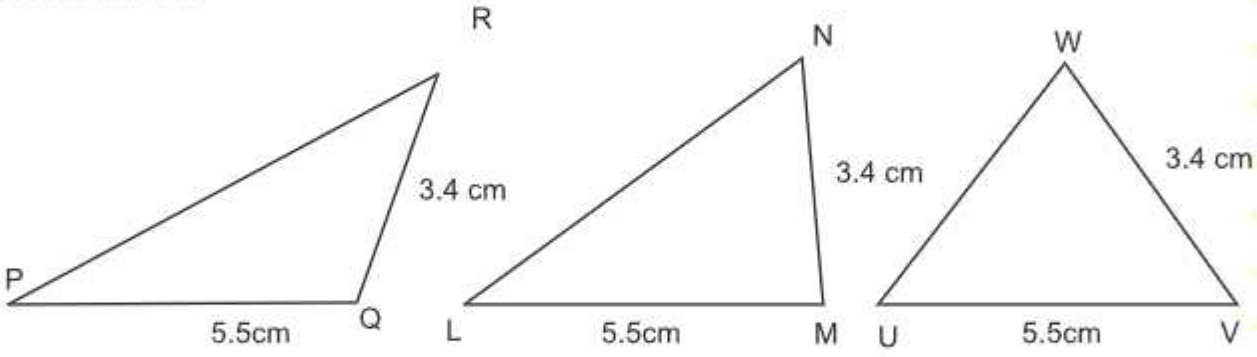


Fig. 1 Fig. 2 Fig. 3

Do any one figure appears same as $\triangle ABC$?

Student's response:

No figure seems exactly same. But which part looked same-

Write your response. Mark a tick (✓) in ☐

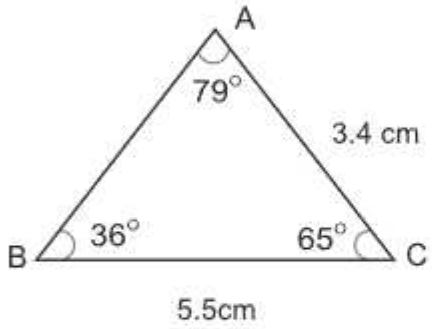
Student's response:

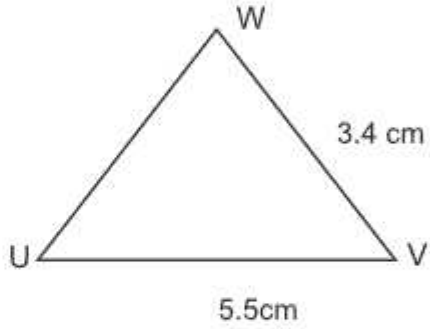
Fig. 1	Fig. 2	Fig. 3
☐	☐	☐
appeared same/different to △ABC	appeared same /different to △ABC	appeared same/different to △ABC

Student's Response:

I found, fig. 3 appeared same,

Let's discuss which part looked same.





What did you observe?

Student's response:

I observed three sides of △ABC equal to the corresponding sides of △WUV

What did you notice?

Student's response:

You are doing awesome. Now can we draw this triangle with compass and scale.

Student's response :

I draw a line segment 5.5 cm. You also draw.

Student's response:

I noticed :

In △ABC and △WUV

AB = 5 cm

WU = 5 cm

BC = UV = 5.5 cm

AC = WV = 3.4 cm

What did you notice?

Student's response:

I noticed two sides of Δ ABC and Δ WUV are equal.

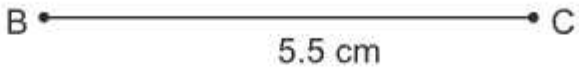
Let us measure UW. What is your finding?

Student's response:

I measured side UW = 5 cm, What do you observe? Please share.

Student's response :_____

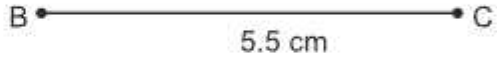
Now open a compass of 3.4cm and draw an arc from vertex C as I did.



Student's response :

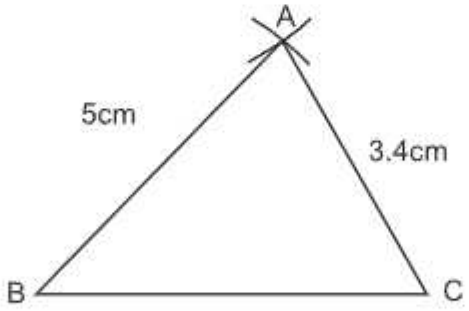
Now open a compass of 5 cm and draw an arc from vertex B, as I did.

What are your findings?



Student's response:

Now join AB and AC



I could draw a ΔABC
when dimensions of the three sides are given. What do you say?

Student's response:

We could prepare a triangle when three sides were given and a unique triangle formed. Was it the replica of △ABC?

Student's response:

We conclude when three sides of one triangle are equal to the corresponding three sides of other triangle. They are congruent to each other. And we call it as SSS Congruency. Now you could draw triangle with SSS Congruency.

Student's response:

Great experience with you.

Now you write your experience here.

Student's response:

Enjoy learning.

Session - 22
Quadrilaterals

Learning outcome: -
Explores the sum of angles of a quadrilateral is equal to 360° and solves related problems.

Dear student,

How are you feeling today?

We have already learnt about the four sided polygons in previous classes.

What are four – sided polygons called?

Student's response: ----------

Can you find some quadrilaterals in your surroundings?

Student's response: ----------

Let us draw some things you can see in your surroundings that have faces with four sides.

Student's response:

We have already explored the sum of angles of a triangle.

Do you remember?

Student's response: ----------

What is the sum of angles of a triangle?

Student's response: ----------

Great!

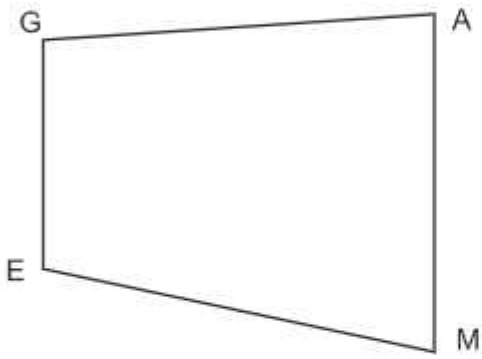
The sum of angles of a triangle is 180°.

Let us explore further about the sum of angles of a quadrilateral.

Are you ready for exploration?

Let us draw a quadrilateral on a paper/newspaper/magazine paper.

I have drawn a quadrilateral.



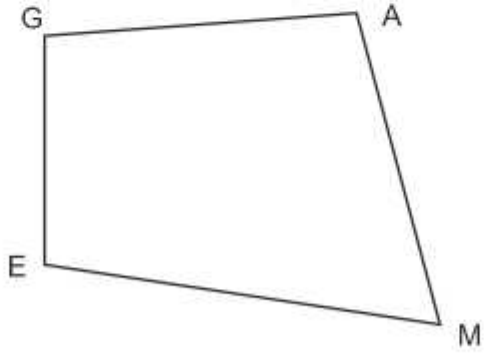
Let us name our quadrilateral. I have named my quadrilateral as GAME.

What is the name of your quadrilateral?

Student's response: ----------

Let us cut our quadrilateral now.

I have cut my quadrilateral



Yes! You have got it right!

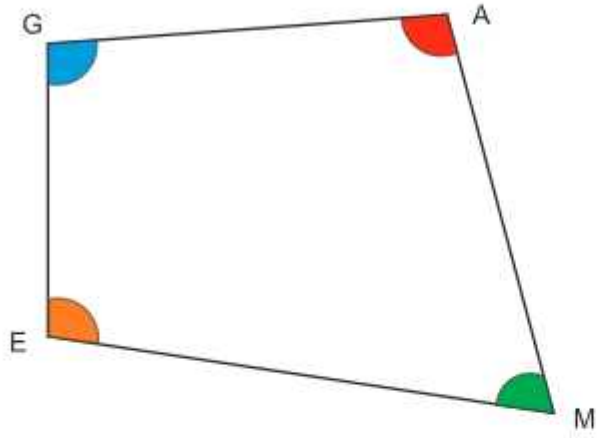
How are you feeling?

Great!

Let us move forward with our activity.

Mark the angles of your quadrilateral.

I have marked my angles.



I have coloured my angles with different colours. What's your experience?

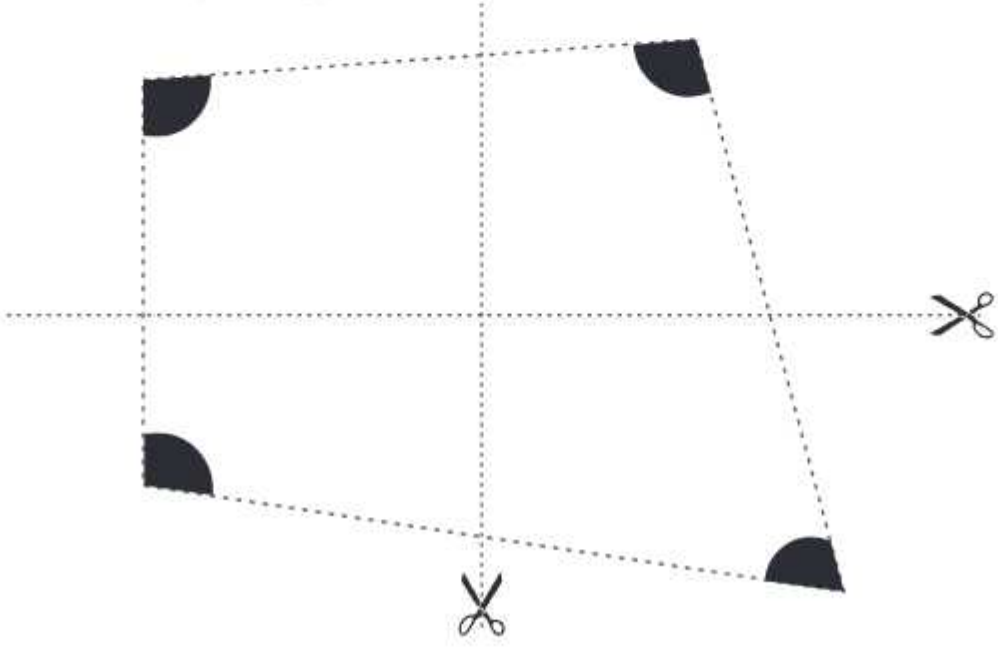
Student's response: ----------

Let us now cut the angles of our quadrilateral.

What do you observe?

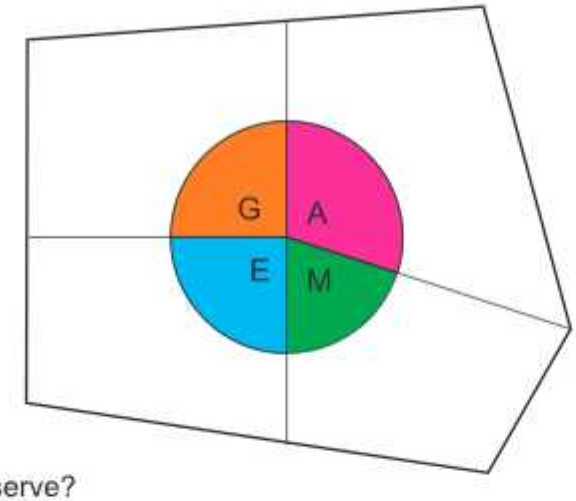
Student's response: ----------

I have also cut the angles of my quadrilateral.



Great!

Let us now place our cutouts of angles together.



What do you observe?

Student's response: ----------

You may now paste your angles here.

What can you conclude from this activity?

Student's response: ----------

What is the sum of angles of your quadrilateral?

Student's response: ----------

Let us make quadrilaterals with the following measurements of angles.

(a) $120^\circ, 140^\circ, 60^\circ, 40^\circ$

(b) $100^\circ, 80^\circ, 100^\circ, 60^\circ$

(c) $70^\circ, 80^\circ, 30^\circ, 20^\circ$

(d) $180^\circ, 30^\circ, 20^\circ, 40^\circ$

(e) $80^\circ, 70^\circ, 150^\circ, 60^\circ$

(f) $160^\circ, 90^\circ, 60^\circ, 50^\circ$

What did you observe? Could you make all quadrilaterals?

Student's response: ----------

Why were you not able to make some of the quadrilaterals?

Student's response: ----------

Let us now make a few quadrilaterals of different measurements.

Let us measure the angles of all these quadrilaterals and find the sum of angles of each quadrilateral.

What do you observe?

Student's response: ----------

Yes!

We observe that sum of angles of all quadrilaterals in 360°.

What was your experience during this activity?



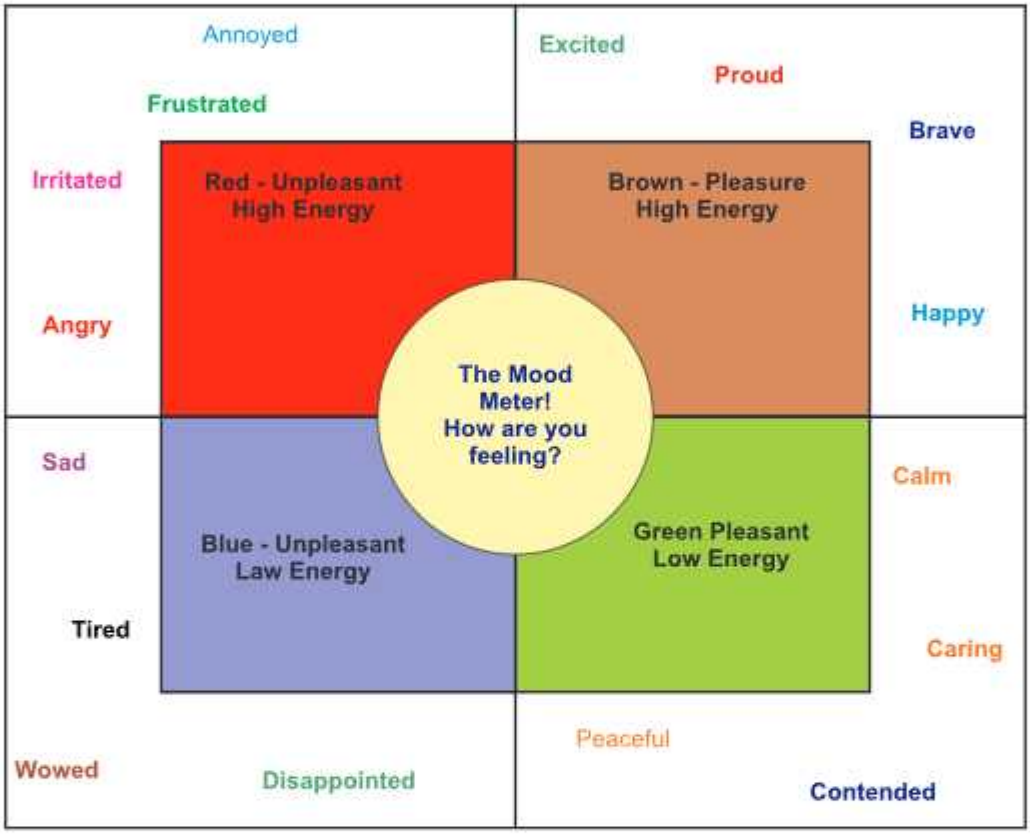
You may now share your learnings with your friends!

Session - 23
Quadrilaterals

Learning outcome:-
Understands and explore the properties of different quadrilaterals.

Note: Please complete your initial sessions on quadrilaterals before this session.

Dear student!



Where are you on the mood meter? What word best describes your current mood?

Student's response: ----------

We had learned about quadrilaterals being four sided closed figures.

Also, we made a few quadrilaterals on the newspaper.

We segregated two types of quadrilaterals – Square and Rectangle.

Can you write the properties of a square ?

Student's response:

Now, write how a square is different from a rhombus.

Student's response:

Let us draw square shape and rhombus shape here.

Square Shape

Rhombus Shaped

Now, let us observe our quadrilaterals – made from newspaper.

Do you find  and  as distinct?

Great!

has all angles equal and each angle is 90°,

Whereas

does not have all angles equal.

Let us now name these types of quadrilaterals.

is a _____

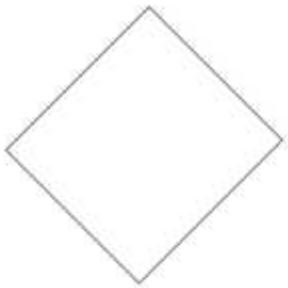
is a _____

Good!

We have learnt names of four types of quadrilaterals.

These are :

A Square



A Rhombus

A Rectangle

A Parallelogram

Let us now observe the square and the rectangle again, and write your observations here.

Student's response: ----------

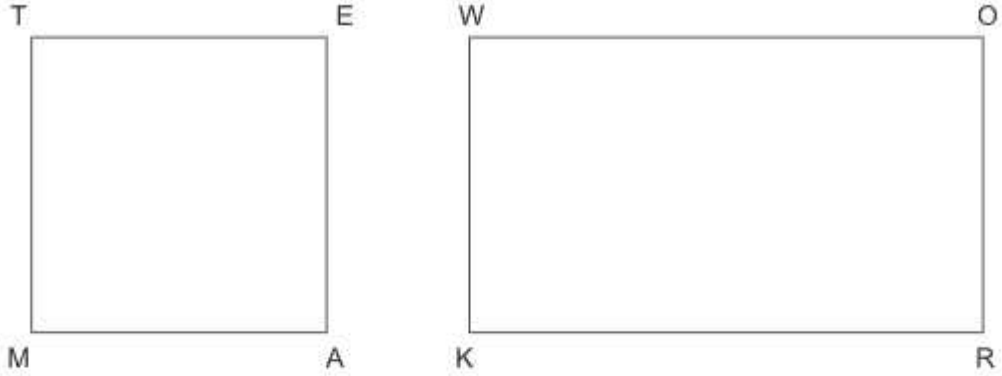
Let us draw a square named TEAM and a rectangle WORK here.

Student's response:

What do you observe ?

Student's response: ----------

I will share my observations.



What do you observe about the sides of these two quadrilaterals ?

Student's response: ----------

Great !

You are right!

The square has equal sides. The rectangle has its opposite sides as equal. Are opposite sides parallel in the square and the rectangle?

Yes!

Both pairs of opposite sides are parallel in the square and the rectangle.

What do you observe about the angles in both the quadrilaterals?

Student's response: ----------

Good!

We observe that all angles in both the quadrilaterals – square and rectangle are equal.

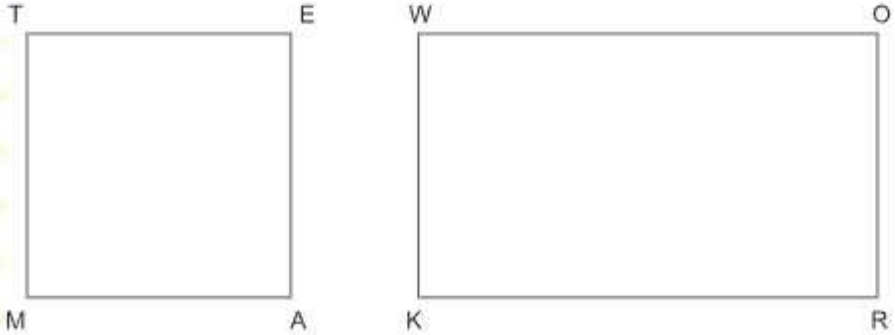
What more can you observe about the angles of these quadrilaterals?

Student's response: ----------

Great!

We observe that all angles of the square and the rectangle are equal to 90^{0}.

Now reflect on your observation and synthesize the result.



Square **Rectangle**

_____ _____

_____ _____

_____ _____

Square, Rhombus and Rectangle belong to the family of parallelogram.

Can you comment on this statement.

Which property did you find common in all these types of quadrilateral – a square, a rectangle, a rhombus and a parallelogram.

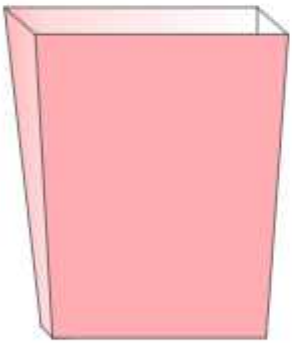
Student's response: ----------

Let me share my observation with you. All these quadrilaterals have their both pairs of opposite sides equal and parallel.

You may now reflect and write your renewed observations.

Student's response: ----------

Let us observe objects whose faces are like quadrilateral.



Popcorn Box

Flower Pot

Tumbler

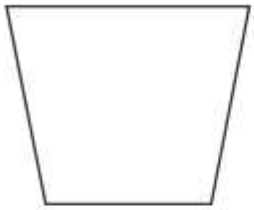
Let us try drawing imprint of these objects on our sheet.

What do you observe?

Student's response: ----------

I observe that in  we have only one pair of sides as parallel. (observe face)

Let us name this type of quadrilateral. (observe face)



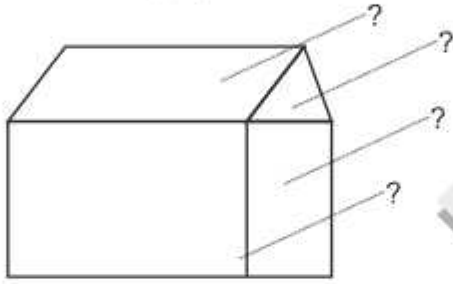
Is a _____

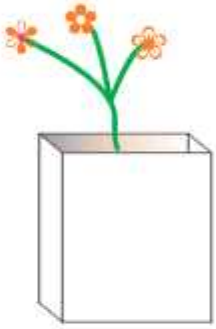
Great!

You are right!

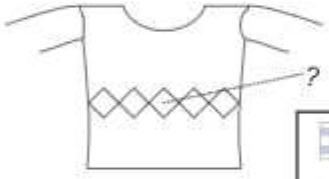
We call this type of quadrilateral, a trapezium. Let us categorize the following objects in the table given below. (observe faces and Identify figures and write the name).

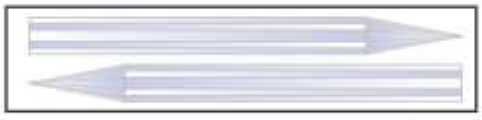
Wall Clock



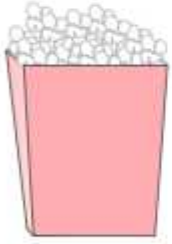


Flower pot

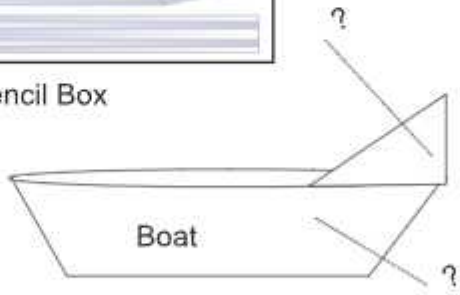




Pencil Box



Popcorn Box



Student's response: ----------

Parallelogram	:	.....
Trapezium	:	.....
Square	:	.....
Rectangle	:	.....
Rhombus	:	.....

Let us now draw at least 3 quadrilaterals of different measurements for mentioned quadrilaterals:

Student's response:

Parallelogram			
Trapezium			
Square			
Rectangle			
Rhombus			

How are you feeling now?

Make a collage of different types of quadrilaterals you have see all around and show it to your parents and siblings.

Session - 24
Quadrilaterals

Learning outcome: -
Move about Quadrilaterals.

Dear Student!

How are you feeling today?

Let us look around us.

What do you observe?

Student's response: ----------

Let me share my observations with you.

I Observed.

A table

A Book

A TV

Write your reviewed observations here

Student's response: ----------

As discussed in our last session, the face of such things are four sided polygons.

What are four – sided polygons called?

Student's response: ----------

Good!

Can you see any similarity in the type of quadrilaterals in a table, a TV and a book?

Student's response: ----------

That's right!

The opposite side are equal.

Review your observations and write here.

Student's response: ----------

What more properties can you see in these quadrilaterals?

Student's response: ----------

Yes!

The opposite sides are parallel.

Can you name such quadrilaterals which have opposite sides as equal and parallel?

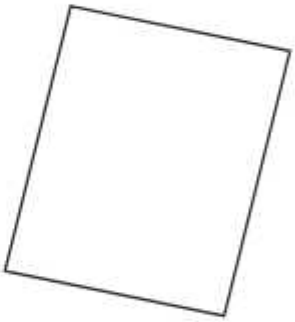
Student's response: ----------

Yes!

Since the opposite sides are equal and parallel, we call these quadrilaterals as parallelogram.

Let us draw 2 different parallelograms here.

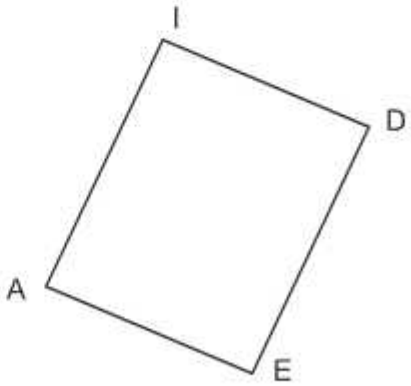
I have also drawn my parallelograms.



You may now name your parallelograms.

I have named my parallelograms as:

ABLE and IDEA



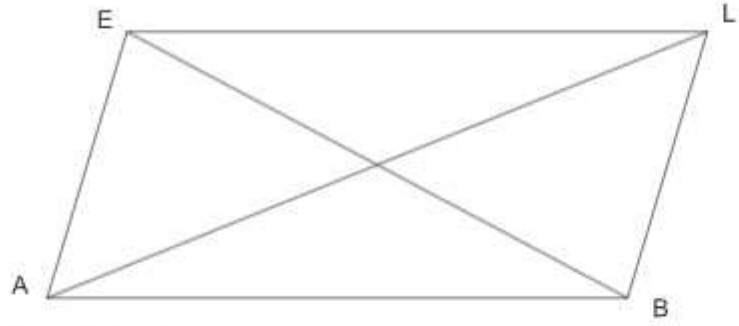
How have you named your parallelograms?

Student's response: ----------

Let us join the two pairs of opposite vertices.

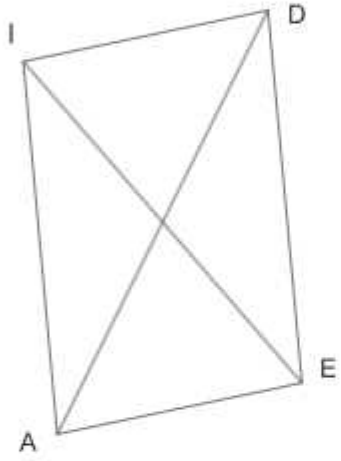
I joined AL and EB in parallelogram ABLE and AD and IE in parallelogram IDEA.

What do you observe?



In parallelogram (ABLE)

AL and EB are the diagonals.



Similarly, in second paraallelogram (IDEA), AD and IE are the diagonals.

Draw your quadrilaterals here, name them and draw their both pair of diagonals.

Name the diagonals of your quadrilaterals.

Student's response: ----------

What do you observe?

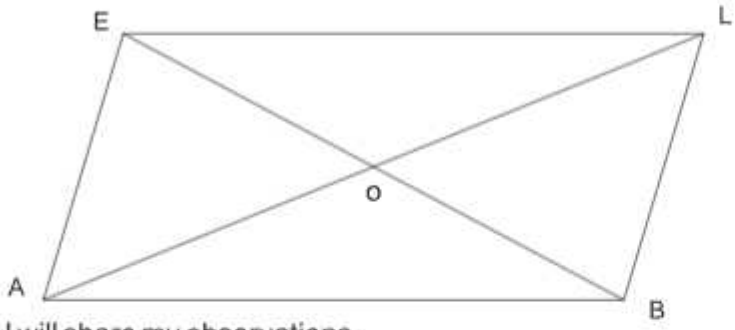
Student's response: ----------

Do you observe anything special about the diagonals?

Student's response: ----------

Measure the diagonals from the centre.
What do you observe?

Student's response: ----------



I will share my observations.

I marked the point of intersection of the two diagonals as O

I measured EO and OB
Similarly, I measured AO and OL.
Could you measure also?

Student's response: ----------

What do you observe?

Student's response: ----------

I will share my observations.
I observed that in my quadrilateral ABLE, EO = OB and AO = OL.
What do you infer from your observations?

Student's response: ----------

That's right!

Diagonals of a parallelogram bisect each other.

Let us explore about the special type of parallelograms.

Name the following parallelograms.

(i)  ----------

(ii)  ----------

(iii)  ----------

Let us check the property of diagonals of these special parallelograms.

(I)

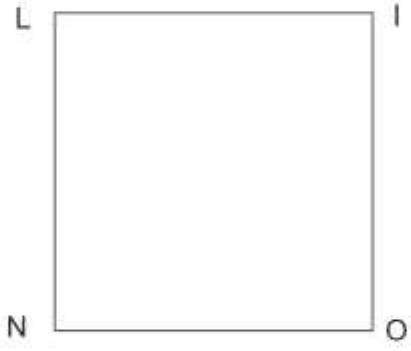
ECHO is a rectangle

Let us draw the diagonals and explore their property in a rectangle.

What do you observe?

Student's response: ----------

(ii)



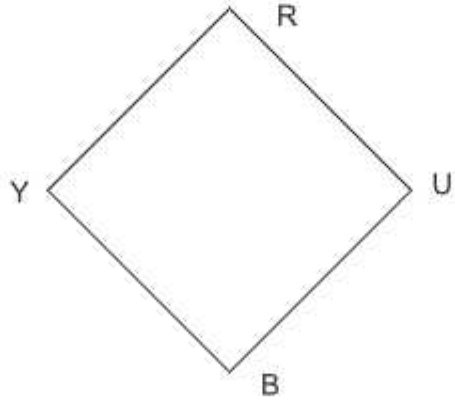
LION is a Square

Let us draw the diagonals and explore their property in a square.

What do you observe?

Student's response: ----------

(iii)



RUBY is a rhombus.

Let us draw the diagonals and explore their property in a rhombus.

What do you observe?

Student's response: ----------

Let us synthesize our results and write here.

(I) Diagonals of a parallelogram ----------

(ii) Diagonals of a rectangle are ----------

(iii) Diagonals of a square are ----------

(iv) Diagonals of a rhombus are ----------

Great!

You have done a good job!

How are you feeling?



You may now make a collage of all types of parallelograms and fill them with different colours.

Share your learning with your friend and enjoy!

Session - 25
AREA

Learning outcome:-

Estimates the area of shapes like trapezium and other polygons by using square grids/graph sheet and verifies using formulas.

Dear student,

How are you feeling? Choose one of the fruits from the tree below which represents your feelings today-

Is there any tree which can produce more than one type of fruit?

Dear children, look around you and find different shapes you come across. Observe for diverse variety of shapes.

Student's response:

Now let's extend our learnings about shapes.

Dear students name the shapes you can recognize from following figures-

Student's response:

I can see red rectangles, blue triangles and yellow trapezium. Look carefully and write your observations.

Student's response:

I can see green triangles, peach parallelograms, blue rhombus, red trapezium, orange squares and yellow hexagons.

Now look around you and try to find some objects having different shapes –

Student's response:

Object	Name the Shape of the Object	Draw its figure

Let me share what I found -

Object	Shape	Image
Door mat	Rectangle	
Curtains	Rectangle	
Floor tiles	Square	
Bread pakora	Triangle	

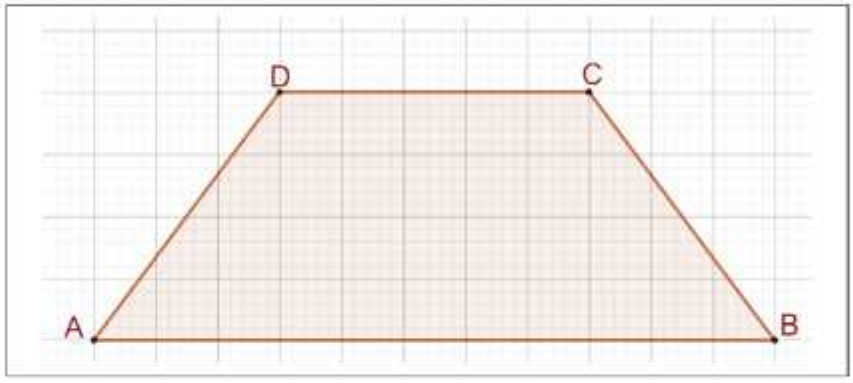
Let's find Trapezium in the following -

Student's response:

How can we find the surface occupied by a trapezium?

Student's response:

I think for that we have to find area of the trapezium.



let's find out area of following trapezium-

How do we use these small unit squares to find area of this shape?

Student's response:

For that

We count the number of unit squares lying inside the trapezium as –

- Complete unit squares
- More than half unit squares

Ignore the unit squares which are less than half, then area of trapezium will be total number of unit squares.

Then what should be the area of this trapezium –

Student's response:

Great !

When I counted, I found –

- Complete unit squares = 26
- More than half unit squares= 6

So, Area of trapezium = 32 square units.

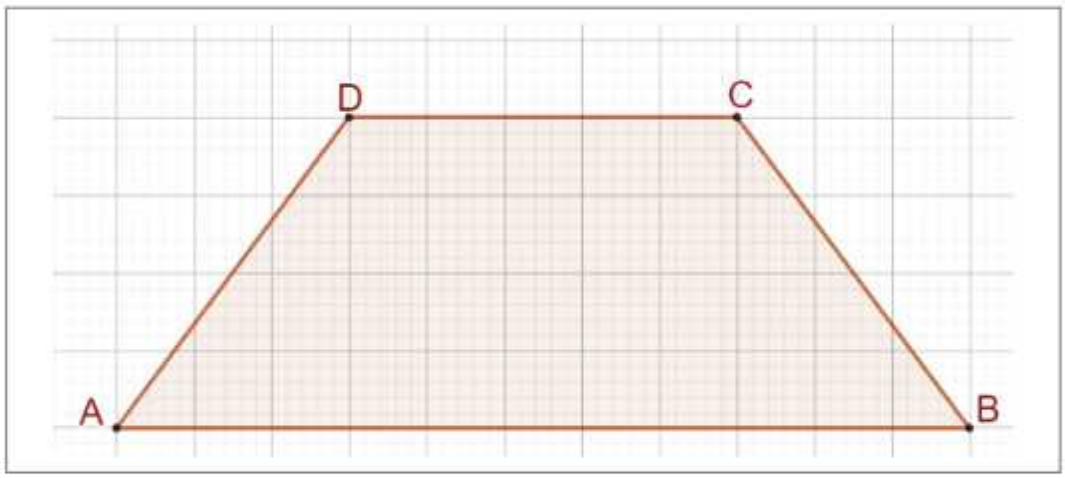
Activity 1: cut some trapeziums of different sizes from a transparent plastic sheet and put them on a graph paper. Now find their areas.

Do we have any other method of finding area of a trapezium?

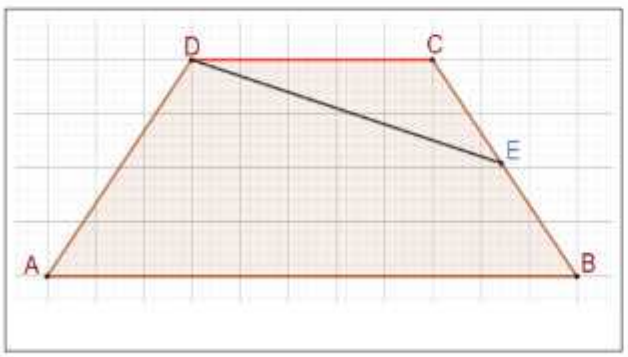
Student's response:_____

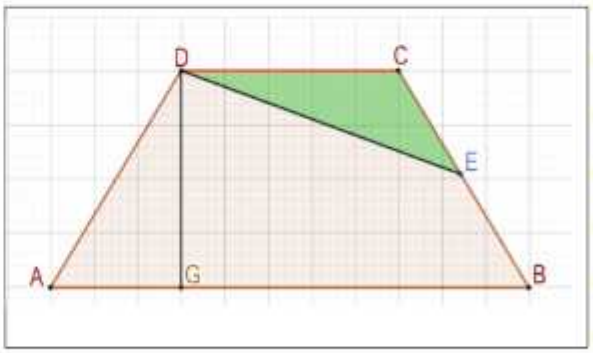
Let's explore it further-

Cut the above trapezium on a graph paper.

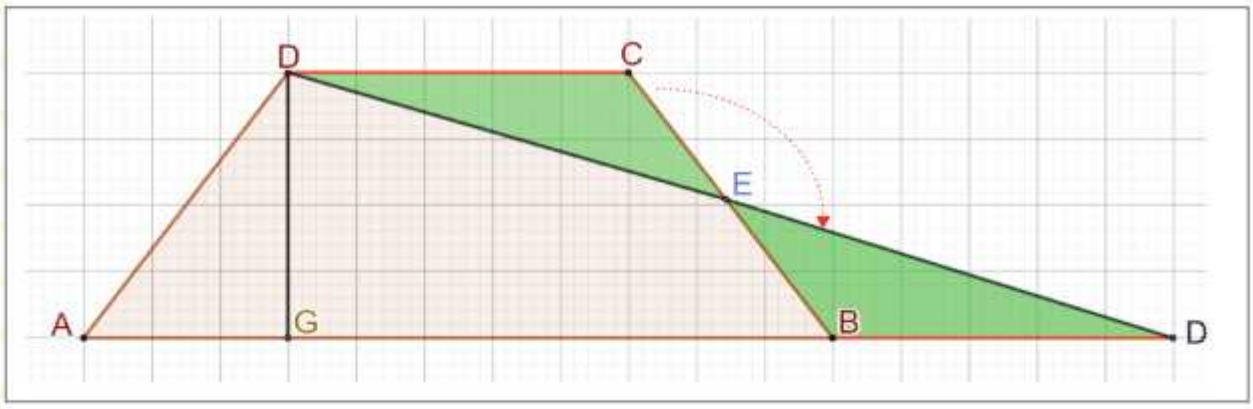


Mark the mid- point of BC as E . Join DE.





Now cut from DE and join it as –



What do you observe?

Student's response:

I can see that

Area of trapezium ABCD = Area of triangle ADD'

How can we find area of triangle ADD'

Student's response:

Area of triangle ADD' = $\frac{1}{2}$ (base)(height)

Area of Δ ADD' = $\frac{1}{2}$ (AD')(DG)

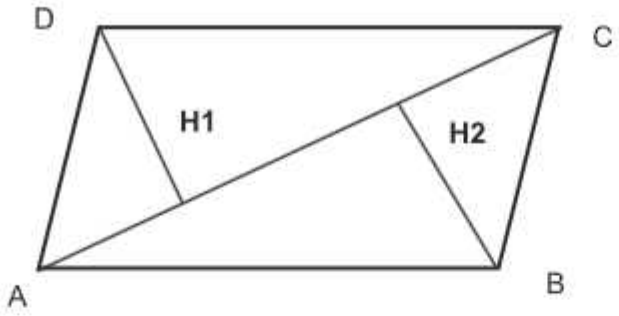
But AD' = AB + BD' = AB + CD

Area of trapezium ABCD = Area of triangle ADD' = $\frac{1}{2}$ (AB + CD)(DG)

So the formula to find area of a trapezium = $\frac{1}{2}$ (sum of parallel sides) × (height)

Find areas of the plastic sheets trapeziums using this formula and compare with the previous values of area you found using graphs.

Now try to find area of



Student's response:

I can find area of quadrilateral ABCD as

Area of triangle ABC+ Area of triangle ADC

$\frac{1}{2}$ (AC) (H1) + $\frac{1}{2}$ (AC) (H2)

$\frac{1}{2}$ (AC) (H1 + H2)

Draw some quadrilaterals and find their areas.

Share your learnings with your friends and pat your back for the above learnings and for the way you have turned into a self- learner.

Session - 26
Surface Area

Learning outcome:-
Demonstrates the understanding of area and finds surface area of cuboidal objects.

Note: Before working on these sessions go through session on area of plane figures.

Dear student !

Encircle the picture which best describes your mood to learn today.



Great! You know to express your mood.

Now let us revisit areas.

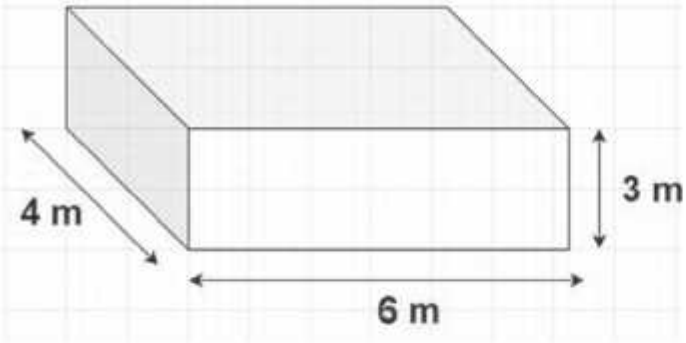
Use unit squares and try to built shapes that have 24cm^2 area.

1	2	3	4	5	6	7	8
9							
10							
11	12	13	14	15	16		
17	18	19	20				
21	22						
23	24						

Now try to draw as many rectangles as possible with 24cm^2 area

Great!! You have done a nice job.

Observe the shape below. You must have seen this before. Relax, take 5 minutes to observe it and then try to find area of all of its surfaces below.



It has ___ surfaces/ faces.

l= 6m

b= ___

h=___

Student's response:

	Area in m^2	Dimensions used
Front face	18	l ,h'
Back face		
Top face		
Bottom face		
Right side face		
Left side face		

Sum of areas of all the faces of this cuboid= Area of front Face + _____ +

_____ + _____ + _____ + _____

= (l×h)+ (l×h)+(l×b)+ (l×b)+ (b×h)+ (b×h)

Thus, Total surface area of cuboid =2(l×h)+2(l×b)+ 2(b×h)

Can you think of the situations where we need to find the total surface area of cuboid?

I can think of a situation,

when I want to calculate cardboard needed to make a box.

Now you write a situation of yours.

Student's response:

Wow!! Going great.

Now let us try

If the face of a cube has area 12 cm^2, what is the surface area of the cube?

Area of 1 face = 12 cm^2

Number of faces of the cube are =

So, area of 6 faces =

Total surface area =

Find the total surface area of two cubes with sides 4 cm and 8 cm.

Student's response:

Cube-1	Cube-2

Observe the relation between their edge lengths and surface areas. What can you say about the surface areas of two cubes when edge length gets doubled?

Each side of second cube is double of side of first cube.

But, Surface area is _____ of the first cube.

So, we can say if side of cube gets doubled, its Surface area gets 4 times.

How are you feeling?

Student's response: _____

Collect different cuboidal boxes with same capacity.

Measure their dimensions.

Calculate the total surface area of each.

Which box can be made using the least amount of card board?

My collection of boxes is as below:

Show your working here

Student's response:

Amazing!!

A room has a rectangular floor which is 5m long and 4 m wide. The room is 3 m in height.

What is the area of walls in the room?

Student's response:

How was your day?



Share your learning with your parents.

Session - 27
VOLUME

Learning outcome: -
Demonstrates the concept of volume.

Dear student!

Pick the emoji that matches with your current mood.

Great !!

Let us observe the Images given below. Have you seen this before.

Student's response:

Thirsty crow, pebbles,	

Water rose up as he put stones in the jug, he drank and flew away.

But let us **reflect** on the following questions—

Was there more water in the jug after the crow had dropped stones in the jug?

Why did the water rise in the jug?

If the crow kept on adding stones what would happen to water?

Student's response: _____

Yes, you are right the water rose up as stones took some space at the bottom of the jug.

The amount of space that a substance or object occupies, or that is enclosed within a container is called its volume.

Anything which occupies space has volume.

Collect any four things. Do these things have same volume?

Try to think of a way to find volume of these things.

Student's response:

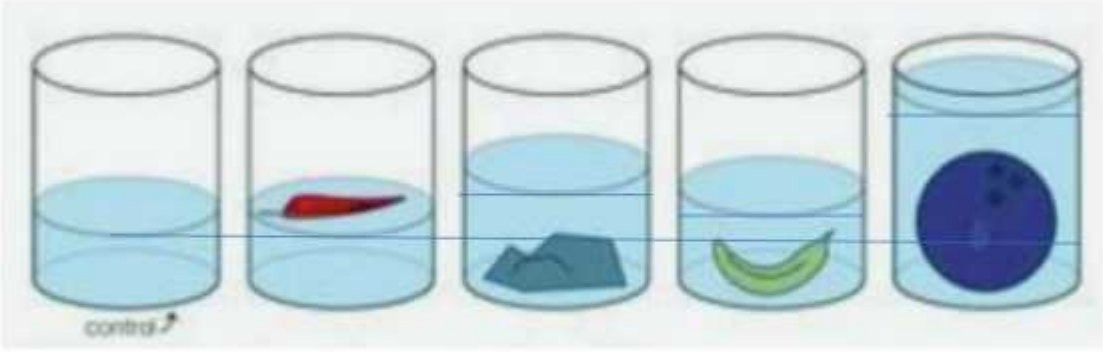
My working is as follow -

I collected a feather, a rock, a banana, and a ball.

I took 5 containers with same amount of water.

Put one object into each of the containers.

The difference between the original water level and the new water level (line) is the volume of the object.



Student's response:_____

Which object has the most volume? _____

Which object has the least volume? _____

Arrange the objects in increasing order of volume.

Student's response:_____

Look around your house and collect clean, empty food containers, such as cans, jugs, cartons and buckets.

Can you observe an object whose volume is less than volume of bucket and one with having greater volume than bucket.

	Student's response:
For example: **Book** has lesser volume while **almirah** has more volume than bucket	

Recognise your feeling now.

Share your learning with your parents and try to explore various units of volume.

Celebrate it by giving a high five to your friend.

Session - 28
VOLUME

Learning outcome:-
Describes volume and finds volume of cuboidal objects.

Dear student!

How are you?

Select the colour on the mood meter which matches with your current mood.

What did you learn in the last session?

Student's response:

You are right, we came across a way to find estimated volume of an object by dropping it in a liquid. Displacement in the liquid tell us the volume of the object.

What if, we cannot drop an object in the liquid?

Let's try to get another way of measuring volume.

Let us revisit the concept of Area.

Write first alphabet of your first name using straight line segments only.

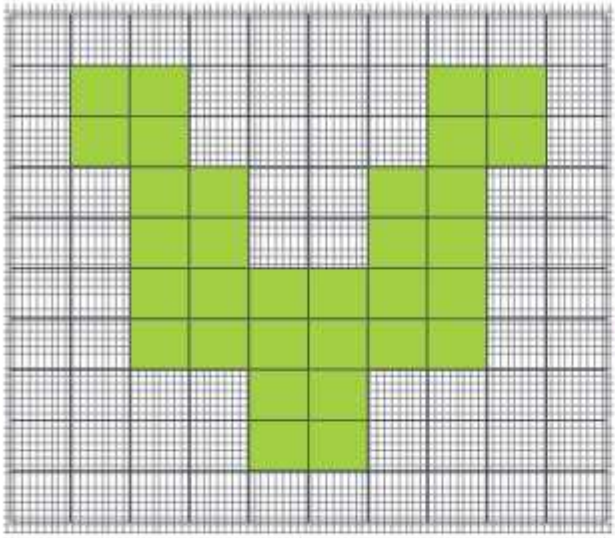
Try to find the area of this alphabet.

How will you find the area of this alphabet?

Take graph paper.

Student's response:

My working is



Area is number of squares of the graph paper that can be fitted into a given shape

My alphabet is "V".

My alphabet took 32 cm^2 area on the paper.

Which basic unit you took for finding area? _____

It's Length _____ Breadth (</>/=)

Absolutely correct!!

On similar pattern, if we want to find volume, what basic unit can we take?_____

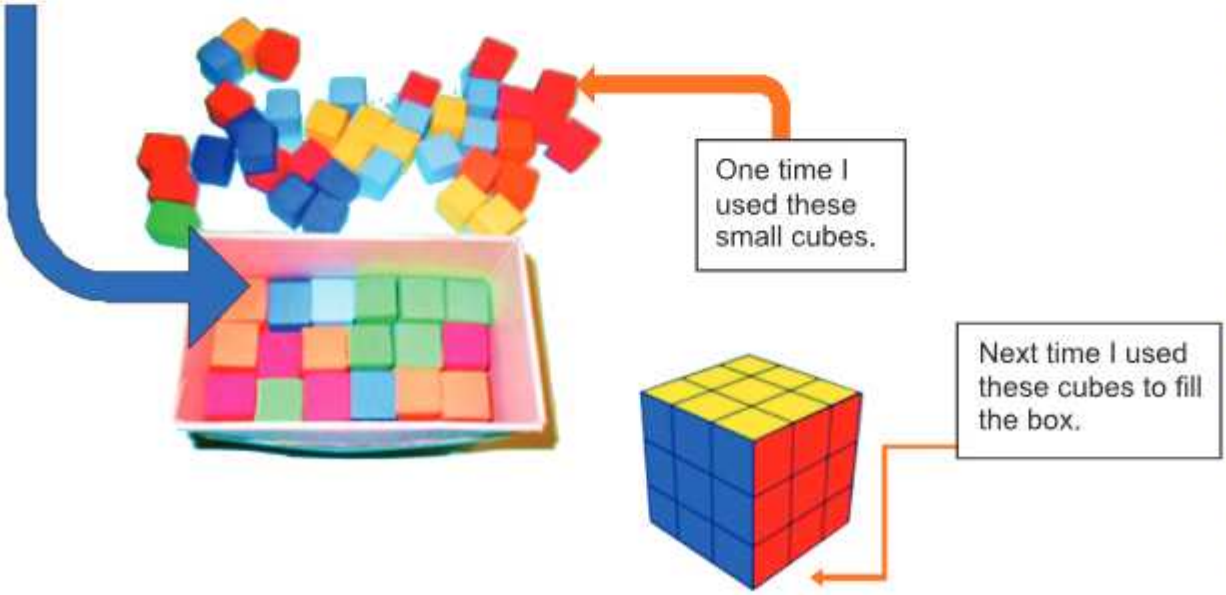
What point you consider while choosing this unit?

Student's response: _____

Great!! Basic unit to measure volume is a cube. It is convenient to use cubes as they pack together without gaps and overlapping.

Volume is number of cubes that can fix into that space.

To find the volume of this box



Both time I got different volume.

Can you help me to find the reason?

Student's response:

Hmmmm...

I used cubes of different sizes. Then what can be the possible solution?

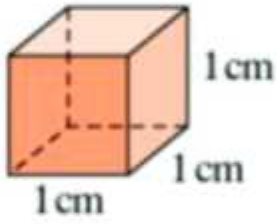
Student's response:

To make sure everyone uses the same cubes for measuring volume, special sized cubes need to be chosen. One of these is the cube with edge 1 centimeter.

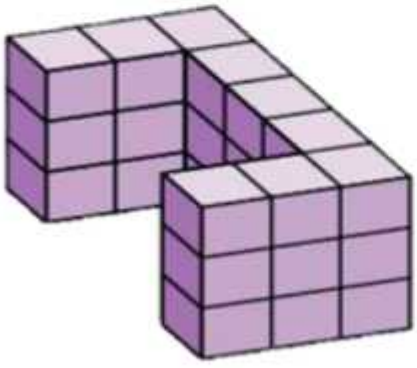
It has volume 1 cubic cm written as 1 cm^3.

This cuboid is made up of 10 cubes of edge 1 cm.

It has a volume of 10 cm^3

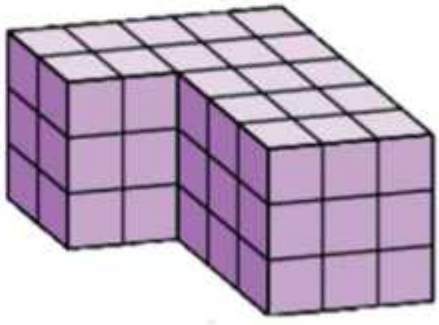


Observe the following shapes, if these are made up of 1 cubic cm, then what will be the volume?



Number of cubes = _____

Volume of shape = _____ cm^3



Number of cubes = _____

Volume of shape = _____ cm^3

Now, what if we have to find the volume of room?

Think of other bigger units, you can use for measuring area of bigger objects.

Student's response: _____

Exactly, we can use cube of edge 1 m to find volume of large spaces.

Now guess the volume of following objects and units you will choose.

Object	Volume	Unit used
Pencil box		
Bed		
Cupboard		
Classroom		

Share and compare your answers with your friends.

How are you feeling now? Mark in the mood meter.

It was a great learning day for me!

What do you say?_____

How was your day? _____

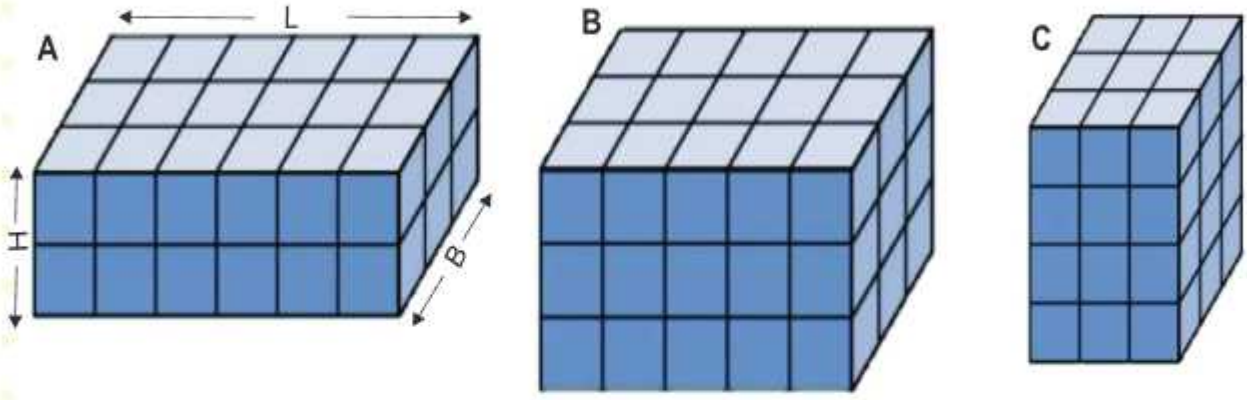
Share your learning with your parents.

Session - 29
VOLUME

Learning outcome: -
Calculates volume of cuboid and cube using formula.

Let us revisit what we learnt in previous session on volumes.

Observe the following shapes and try to fill the following table.



Object	Number of cubes in a row along length L	Number of cubes in a row along width B	Number of cubes in a row along height H	L×B×H	Volume= Total number of cubes
A	6	3	2	6 ×3×2 =36	
B					
C					

Observe the last two columns of the table.

Did you notice about the last two columns?

Student's response: _____

I observed that volume is the number of cubes of these objects and is same as product of Length, breadth and height.

Now compare my observation with yours, relax and observe again. Now reflect.

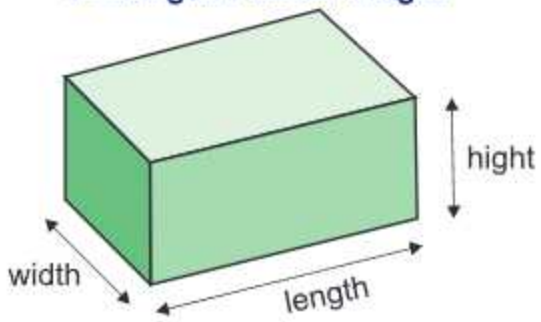
Student's response:

If you find a cardboard box of dimensions 5cm, 4cm and 3cm. How many centimeter cubes you can place in it?

Student's response:

So can we say volume V of a cuboid is given by

V = length × width × hight



Try to find out the volume of the box of macaroni with measure12cm by 20cm by 4 cm.

Which method of measuring volume of cuboidal shaped objects is easy and time saving for you?

Placing cubes or using above worked out formula?

Student's response: _____

Try to apply the formula to find out the volume of cuboids.

Length(cm)	Breadth(cm)	Height(cm)	Volume (cm^3)	
4	1	2		
5	3	2		
2	1	3		

Do you think Volume = **L× B×H** can be used for cubes also?

Why do you think so? Write reason in the box below.

Student's response:

You are correct!

Cubes are special type of cuboids with equal length, breadth and height. So we apply same formula.

A box of biscuits has volume of $36cm^3$. Draw and show the measurements of possible boxes with this volume.

Student's response:

Reema made a box with length 1cm, width 1cm and height 20 cm. Is this a good design? Why do you think so?

Student's response:

Explore why we put ^{3} in cm^3 or m^3 in the unit of volume?

Happy learning!

Session - 30
DATA HANDLING

Learning outcome:-
Organizes data and represents data using a grouped frequency distribution table to draw conclusions (Part - 1)

Dear student, how are you feeling today?

Select an emoji that is according to your mood.

Sometimes we have to deal with large data in which repetition of entries is also very less.

For example, Consider the following marks (out of 50) obtained in Mathematics by 50 students of class VIII.

21, 10, 30, 22, 33, 5, 37, 12, 25, 42, 15, 39, 26, 32, 18, 27, 28, 19, 29, 35, 31, 24, 36, 18, 20, 38, 22, 44, 16, 24, 10, 27, 39, 28, 49, 29, 32, 23, 31, 21, 34, 22, 23, 36, 24, 36, 33, 47, 48, 50, 39, 20, 7, 16, 36, 45, 47, 30, 22, 17

Now, try to organize the data in the given table

Marks	Tally marks	Number of students

Table Contd...

Marks	Tally marks	Number of students

Observe, think and share

What type of difficulty do you face in the organization of above data?

Example: - Form a very large table.

Student's response:

My observations are: -

- Data is very large
- The repetition of data is very less
- Very time consuming
- Very lengthy
- Not convenient in summarizing or analyzing of the data
- Form a very large table

Kindly suggest the technique or approach which is more convenient in the organization of data.

Student's response:

If we make a frequency distribution table for each observation, then the table would be too long. So, for convenience, we can make groups of observations, say 0-10, 10-20, 20-30 and so on and obtain a frequency distribution of the number of observations falling in each group.

Then the frequency distribution table for the above data can be formed like given below table

Groups	Tally marks	Number of students (frequency)
0-10	||	2
10-20	𝍸 𝍸	10
20-30	𝍸 𝍸 𝍸 𝍸 |	21
30-40	𝍸 𝍸 𝍸 ||||	19
40-50	𝍸 |||	8

Data presented in this manner is said to be grouped and the distribution obtained is called group frequency distribution.

Each of the groups 0-10, 10-20, 20-30,...etc is called Class Interval (or a class)

Every class interval has a lower class limit and upper-class limit.

For example, in the interval 20-30

20 is called lower limit and

30 is called the upper limit.

The difference between upper class limit and lower-class limit is called the width or size of the class interval.

In 20-30, the size of class interval is 30-20 = 10

Reflection: - What new is added in your learning?

Write in the given space.

My reflection	I learnt to organize large data.
Student's reflection	

Great job!

Session - 31
DATA HANDLING

Learning outcome:-

Organizes data and represents data using a grouped frequency distribution table to draw conclusions (Part - 2)

Note: Complete previous session before starting this session.

Dear student,

How are you feeling today?

Select an emoji that is according to your mood.

Now, observe the group frequency distribution table and try to answer the following questions.

Groups	Tally marks	Number of students (frequency)
0-10	||	2
10-20	𝍸 𝍸	10
20-30	𝍸 𝍸 𝍸 𝍸 |	21
30-40	𝍸 𝍸 𝍸 ||||	19
40-50	𝍸 |||	8

Data presented in this manner is said to be grouped and the distribution obtained is called grouped frequency distribution.

Share and discuss with your friends and teacher / facilitator.

Why does the teacher take group size 10 in the above table?

Student's response:

Suggest any other group size that also can be used in the formation of group frequency distribution table.

Student's response:

10, 20, 30, 40 and 50 occur in two classes.

For example, 10 occurs in 0-10 as well as 10-20.

To avoid repetition, what method is adopted in the above group frequency distribution table?

Student's response:

What meaningful inferences you draw from the group distribution table?

Student's response: _____

Most of the students score between _____ and _____.

Eight students have scored more than _____ marks.

Try to construct a grouped frequency distribution table of group size 5 i.e., 0-5, 5-10, 10-15... so on.

Group	Tally marks	Frequency
0-5		
5-10		
10-15		
15-20		
20-25		
25-30		
30-35		
35-40		
40-45		
45-50		
Total		

Try to draw meaningful inferences from the above table.

Student's response:

Reflection: - What new is added in your learning?

Write in the given space.

My reflection	Able to interpret and represent data using a grouped frequency distribution table.
Student's reflection	

Construct a grouped frequency distribution table for the data on weights (in kg) of 30 students of VIII class.

36, 51, 39, 43, 52, 44, 47, 36, 31, 41, 53, 40, 42, 48, 33, 37, 36, 40, 50, 46, 34, 45, 49, 44, 39, 49, 48, 54.

You have done a great job in today's session.

Thank you very much.

Session - 32
DATA HANDLING

Learning outcome: -
Organizes data, interprets and draw conclusion, represents grouped data in Histogram

Dear student,

How are you feeling today?

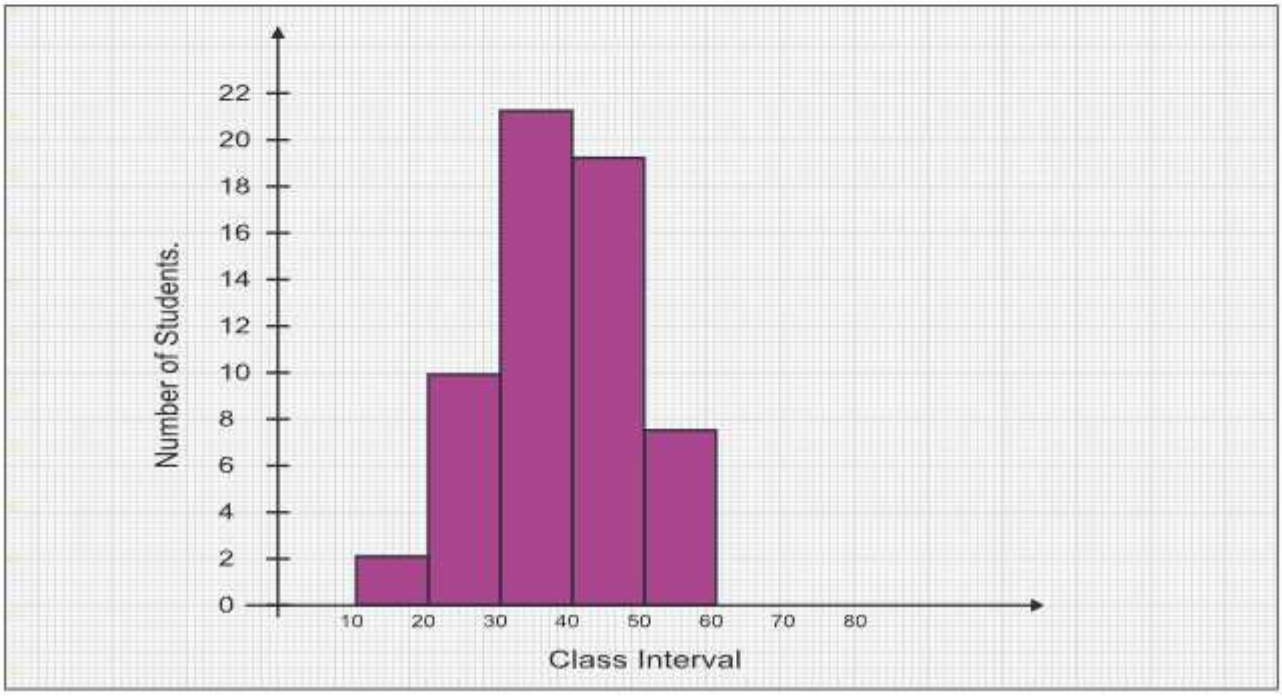
Select the word that is according to your mood.

joyful **Thankful** **Celebration** **Hopeful** **Powerful**

Let's consider the grouped frequency distribution of marks obtained by 60 students in Mathematics.

Groups	Tally marks	Number of students (frequency)
0-10	||	2
10-20	𝍸 𝍸	10
20-30	𝍸 𝍸 𝍸 𝍸 |	21
30-40	𝍸 𝍸 𝍸 ||||	19
40-50	𝍸 |||	8

This is displayed graphically below: -



Think, share and discuss

Is this graph any way different from the bar graphs which you studied in the previous session?

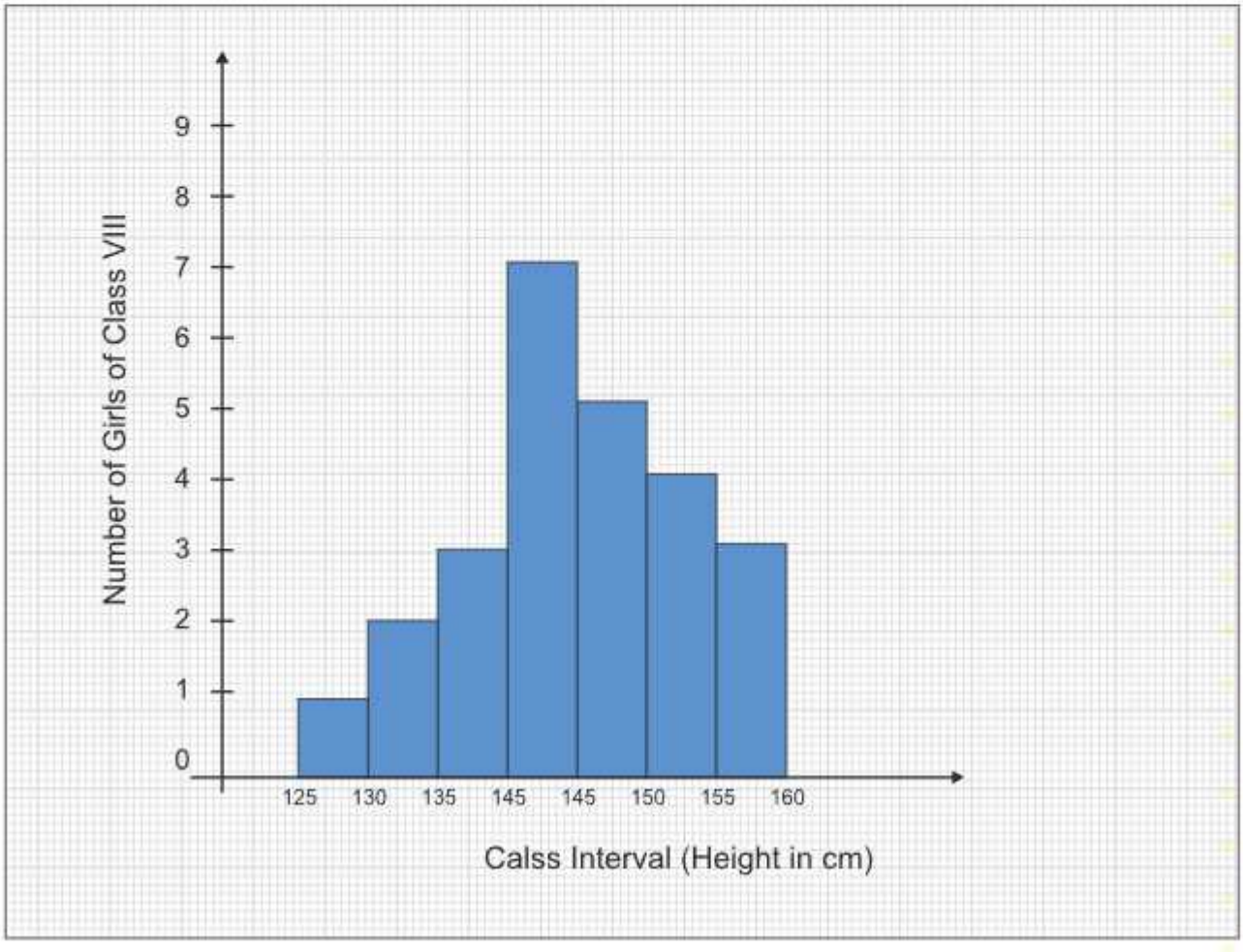
Student's response:

Here, we have represented the group of observations (class interval) on the horizontal axis.

The height of the bars shows the frequency of the class interval. Also, there is no gap between the bars as there is no gap between the class interval.

The graphical representation of the data in this manner is called a Histogram.

Now, observe the histogram



Answer the following questions

What information is being given by the histogram?

Student's response: _____

_____

Which group (class interval) contain maximum girls?

Student's response: _____

How many girls have height more than 145 cm?

Student's response: _____

A random survey is done on the number of children belonging to different age groups who play in government parks and the information is tabulated in the table given below: -

Age (in years)	Frequency
0-3	8
3-6	10
6-9	15
9-12	20
12-15	22
15-18	5
Total	80

Draw a histogram representing the data.

Student's response: _____

Reflection: - What new is added in your learning?

Write in the given space.

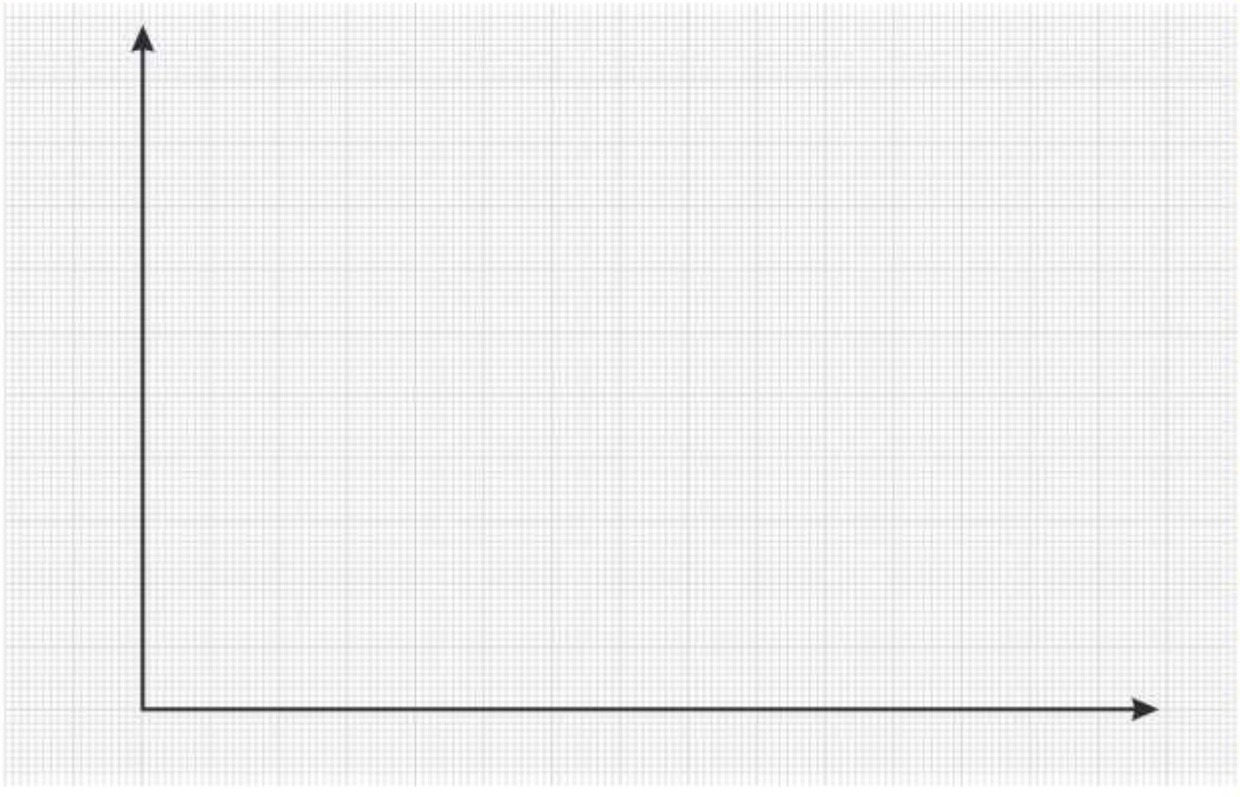
My reflection	able to interpret and represent the data through histogram.
Student's reflection	

You have done a great job.

Think, share, discuss and explore with your friends

Select one situation, try to collect the data related to that situation and represent using histogram.

Student's response:



Session - 33
DATA HANDLING

Learning outcome:-
Applies arithmetic mean in finding the central tendency.

Dear student, how are you feeling today?

Select an emoji that is according to your mood.

The average temperature of Delhi in the month of February 2021 at 4 am was 8°C.

What does the above statement tell you?

Student's response :

My observations are : -

The climate is very cold.
The average temperature of Delhi in the month of February at 4 am tells that the temperature at this time is around 8°C.

You can add or suggest your agreements or disagreement on the teacher's response.

Is the temperature of Delhi in the month of February at 4 am, always 8°C?

Student's response:

In the year 2021, the temperature of Delhi in the month of February at 4 am was not always 8°C. The temperature varies. Sometimes it may be less than 8°C and on other days it may be more than 8°C.

You can add or suggest your agreements or disagreement on the teacher's response.

What does the term average temperature tell you?

Student's response:

The average value in a set of numbers is the middle value, calculated by dividing the total of all the values by the number of values.

The average is a number that represents or shows the central tendency of a group of data. In data handling we use the term arithmetic average in place of average.

You can add or suggest your agreements or disagreement on the teacher's response.

What is the meaning of central tendency?

Central tendency is a single value that describes a set of data by identifying the central position within that set of data.

What will be the process to find the average temperature of Delhi in the month of February at 4 am?

Student's response:

The temperature of Delhi in the month of February at 4 am was not 8°C on all days.

The temperature varies. Sometimes it may be less than 8°C and on other days it may be more than 8°C.

When we consider all the 28 observations of February month in 2020, to find average temperature we can adjust the temperature which is greater than 8°C by adding the excess temperature (the temperature more than 8°C) to the temperature which is less than 8°C.

As there are 28 days in the month of February 2020, so first we have to add all days temperature of Delhi at 4 pm. Then equally divide the total in 28 days.

$$\text{Average temperature} = \frac{\text{Sum of all days temperature at 4am}}{\text{Total Number of days}}$$

Reflection: - What new is added in your learning?

Write in the given space.

My reflection	Able to find mean value of various data.
Student's response:	

Let's explore

Q. A batsmans score in four innings in a T20 cricket match is given below: -

0, 10, 5, 145

Calculate the average runs scored by him in an inning.

Student's response:

Q. What does the mean tell us in the above example?

Student's response:

In the above example, mean or average is 40 which tells us that the player scored 40 runs per match.

In the above example to find the performance of a player we tried to find mean or average runs scored by the cricketer.

Is finding the mean or average score a good criteria to judge the performance of a player? Why or why not?

Student's response:

In the above example mean or average is 40 which tells us that the player scored 40 runs per match. But the player did not score well in 3 matches and scored good only in 1 match.

So, in my point of view the above example of mean or average score is not a good criteria to judge the performance of a player.

Reflections

My reflection	Able to understand the limitations of mean
Student's reflection	

Q. The marks (out of 100) obtained by a student in annual exam in five subjects are

70, 80, 75, 75, 50

Calculate the average (mean) marks obtained by the student. What does the mean tell us?

Student's response:

Think, discuss and write.

Q. Is the mean bigger than each observation?

Student's response: _____

Q. Is the mean smaller than each observation?

Student's response: _____

Try to frame situational question of mean and find mean.

Congratulations for successful completion of the session.

Session - 34
DATA HANDLING

Learning outcome: -
Applies mode in finding the central tendency as representative value.

Dear student, how are you feeling today?

Select an emoji that is according to your mood.

Try to understand the following example.

To find out the weekly demand of fruits, a fruits seller kept records of sales of different fruits.

Fruit	Orange	Apple	Papaya	Pomegranate	Pears
Fruit sales (in kg)	60	100	40	70	30

On the basis of above data, how do you decide what amount of fruit you will keep in next week's stock?

Student's response:

Ruhi's observations: -

I will find the mean (average) of the fruit sold.

$$\text{Mean or average of total fruit sold} = \frac{\text{Total amount of fruit sold}}{\text{number of fruits}} = \frac{60+100+40+70+30}{5} = \frac{300}{5}$$

$$= 60$$

I will keep the stock of 60 kg of each fruit.

Do You agree or disagree with Ruhi's method? Why?

Student's response:

I disagree with Ruhi's method. and
We keep stock on the basis of maximum number of sales.
This is another method to find representative value of the data.
The highest occurring event is the sales of Apple.
So, we will keep the maximum stock of Apple.

You can share your agreements or disagreements with the teacher's response.

The mode is the set of observations that occurs most often.

Can a set of numbers have more than one mode? If yes, give an example.

Student's response:

There can be more than one mode in a set of given observations or numbers.
Example: The wickets taken by a bowler in five matches one day international series was 1, 3, 5, 3, 5
Here, the mode of the given data is 3 and 5 because 3 and 5 repeated the same number of times.

Sometimes, there is no mode at all.
For example: The height of 5 persons is 150 cm, 152 cm, 149cm, 170 cm, 165 cm
Here, there is no mode because no number is repeated.

You can share your agreements or disagreements with the teacher's expression.

Reflections: What new is added in your learning?

Write in the given space.

My reflection	Able to apply mode in finding the central value of the data.
Student's response:	

The shoe size of 25 students of VIII class are given below:

6, 6, 7, 7, 8, 7, 6, 6, 6, 7, 8, 6, 9, 6, 7, 6, 8, 6, 6, 9, 8, 6, 6, 8, 8

What is the mode of their shoe size? What does the mode tell us?

Student's response:

In the given set of observations, the shoe size 6 is repeated most. So, the mode of the above data is 6.

The mode tells us that the majority of students wear shoe size 6.

The shoe size of 25 students of VIII class are given below:

6, 6, 7, 7, 8, 7, 6, 6, 6, 7, 8, 6, 9, 6, 7, 6, 8, 6, 6, 9, 8, 6, 6, 8, 8

What is the mean of their shoe size? What does the mean tell us?

Student's response:

$$\text{The mean} = \frac{6+6+7+7+8+7+6+6+6+7+8+6+9+6+7+6+8+6+6+98+6+6+8+8}{25} = \frac{173}{25} = 6.92$$

The mean tells us that the average shoe size is 6.92.

In the above question which method is best suited? Why?

Student's response:

In my point of view, finding mode is best suited. On behalf of the above data, if we have to make any decision related to the purchase of shoes for the same or likely population, mode provides us with the right direction in decision making because it tells us the most commonly used shoe size.

You can share your agreements or disagreement with teacher's expression.

Reflection: - What new is added in your learning?

Write in the give space.

My reflection	Able to understand the situations where finding mode is best suited.
Student's response:	

Let's explore

Think, share and discuss.

In which situations, can we use the mode as a good estimate?

Example: A shopkeeper selling shirts has decided to replenish his stock.

Student's response:

The height (in cm) of 25 students are given below:

168, 150, 155, 165, 162 165, 170, 162, 155, 156, 165,166, 159, 160, 168, 153, 170, 160, 132, 162, 170, 162, 169, 157, 159

What is the mode of their heights? What do you understand by mode here?

Student's response:

Congratulations!

You have done a great job.

Session - 35
DATA HANDLING

Learning outcome: -
Applies median in finding the central tendency (part-1)

Dear student,

How are you feeling today?

Select word that is according to your mood.

Happy **thankful** **celebration** **hopeful** **powerful**

We have seen that in some situations, arithmetic mean is an appropriate measure of central tendency whereas in some other situations, mode is the appropriate measure of central tendency.

Let's understand another method to find the central tendency.

Let's observe the height of class VIII students.

The height (in cm) of 35 students are given below: 168, 150, 165, 165, 162 165, 170, 162, 155, 156, 165,166, 159, 160, 168, 153, 170, 160, 132, 162, 170, 162, 140, 157, 159, 165, 150, 155, 165, 162 165, 178, 162, 155, 156

What do you observe?

Example: - The height of the shortest student is 132 cm.

Student's response:

My observations are:

- The height of the shortest student is 132 cm.
- The height of the tallest student is 178 cm.
- The most frequently occurring height of the students is 165 cm.
- Only two students of the class are below 150 cm (5 feet).

The teacher arranged the heights of the students in increasing (ascending) order.

132, 140, 150, 150, 153, 155, 155,155, 156, 156, 157, 159, 159, 160, 160, 162, 162,162, 162, 162, 162, 165, 165, 165, 165, 165,165, 165, 166, 168, 168, 170, 170, 170, 178

Now, what more can you infer from above data?

Student's response:

- The height measure 132 cm, 140 cm, 153 cm, 157 cm, 166 cm, 178 cm are not repeated.
- Half of the students' height is below 162 cm and the other half is above 162 cm.

What you infer from the statement, **"Half of the student's height is below 162 cm and the other half is above 162 cm".**

Student's response: _____

162 cm is the central value of the data.

Median refers to the value which lies in the middle of the data (when arranged in an increasing or decreasing order) with half of the observations above it and another half below it.

Reflection: - What new is added in your learning?

Write in the give space.

My reflection	Able to find the middle value of the given data.
Student's response:	

The weight (in kg) of 25 students of a class are

38, 42, 53, 28, 37, 39, 40, 50, 38, 42, 56, 39, 60, 58, 55, 47, 40, 43, 50, 49, 38, 57 48, 60, 59

Find the median of the data.

Student's response:

Well done!

Keep on learning.

Session - 36
DATA HANDLING

Learning outcome:-
Applies median in finding the central tendency (part-2)

Note : Complete previous session before starting this session.

Dear student, how are you feeling today?

Select the word that is according to your mood.

Happy **thankful** **celebration** **hopeful** **powerful**

Let's observe the monthly salary (in Indian rupees) of 15 employees of a company.

15000, 15000, 18000, 20000, 20000, 25000, 25000, 30000, 40000, 70000, 90,000, 100000, 132000, 200000, 1000000

What do you observe? Write minimum and maximum salery.

Student's response:

My observations:

- The lowest salary paid to the employee is ₹ 15,000 and highest salary paid is ₹ 10,00,000.
- The difference between lowest and highest salary is very high.
- 14 out of 15 observations fall within a normal income range but the last person earns a lot more money.

Try to find the mean (average) salary of the employees.

Student's response:

Sum of all the observations is

15000+15000+18000+20000+20000+25000+25000+30000+40000+70000+90,000+100000 +132000+200000+1000000 = 1800000

$$\text{Mean} = \frac{1800000}{15} = 1,20,000$$

What does the mean amount of ₹ 1,20,000 tells us?

Student's response:

The average salary of the employees is ₹ 1,20,000

It is true that average salary of the employees is ₹ 1,20,000.

Is ₹ 1,20,000 is the correct representation of the salaries of employees? Why or why not?

Student's response :

In my point of view, ₹ 1,20,000 is not the correct representation of the salaries of employee because out of 15, 13 employees receive less than ₹ 1,20,000 salary.

The monthly salary (in Indian rupees) of 15 employees of a company.

15000, 15000, 18000, 20000, 20000, 25000, 25000, 30000, 40000, 70000, 90000, 100000, 132000, 200000, 1000000

Now, try to find median (middle value) of the given data.

Student's response:

All the observations are written in ascending order.

15000, 15000, 18000, 20000, 20000, 25000, 25000, 30000, 40000, 70000, 90,000, 100000, 132000, 200000, 1000000

Total observations are 15

Middle observation is $\frac{15+1}{2}$ th = $\frac{16}{2}$ th = 8^{th}

So, the 8th observation is our middle value.

The median (middle value) of the above observations is ₹ 30,000

What does the middle amount ₹ 30,000 tell us?

Student's response:

Half of the employees get a salary below ₹ 30,000 and another half get above ₹ 30,000.

Is ₹ 30,000 the correct representation of the salaries of employees?

Why or why not?

Student's response:

₹ 30,000 may be the correct representation of the salaries of employee because most of the employees salary comes in the range of ₹ 30,000.

You can share your agreement or disagreement with the teacher's expression.

Reflection: - What new is added in your learning?

Write in the given space.

My reflection	When few observations distort our mean i.e., too large or too small from mean then it is best to consider the median.
Student's response	

It is easy to find a middle value of the number of observations is odd.

How do you calculate the middle value of the number of observations is even?

Student's response: -

The calculation of the median value varies for an odd or even number of values. If there is an odd list of numbers, the midpoint of the list is the median. However, in the case of an even count of numbers, the two numbers in the middle of the list are considered. The examples will help you to understand better.

Suppose the set has an even count of numbers for example, 8,1, 3, 5, 22,17,12,13.

It is a set of 8 numbers.

The list when sorted in ascending order 1, 3, 5, 8, 12, 13, 17, 22. **8** and **12** are the two middle numbers here.

Therefore, adding 8 and 12 and dividing the result by 2 $= \frac{8+12}{2}$

$= 10$

The median value of the data is 10.

Reflection: - What new is added in your learning?

Write in the give space.

My reflection	Able to find the median when total number of observations are even.
Student's response:	

Practice questions

The ages (in years) of 30 employees of a company are given below

30, 35, 62, 25, 38, 65, 69, 49, 56, 51, 43, 49 20, 26, 22, 43, 39, 38, 36, 46, 49, 48, 60, 65, 59, 58,24, 26, 25, 28, 27, 30, 35, 50, 51

Find the median of the data.

Student's response: -

Congratulations for successful completion of the session.

Session - 37
ALGEBRA

Learning outcomes: -
Able to express formation of expressions.

Dear student, how are you feeling today?

(✓) Tick the smiley according to your mood.

Observe the following expressions:-

1. x^2 2. $3y^2$ 3. $2x^2 + 5$ 4. $y^2 - 1$ 5. xz 6. $\frac{x}{y} + 3$

Write your observations in the given space.

Hint: - the expressions is obtained from the variables x, y and z.

- The expressions are obtained from the variables x, y and z.
- Operations of addition, subtraction, multiplication and division is used in the formation of expression.
- The above expressions were obtained by combining variables with constants.
- Expressions are obtained by combining variables with themselves or with other variables.

You can extend or reflect on teacher's observations in the given space.

Look at how the following expressions are obtained:-

1. x^2 2. $3y^2$ 3. $2x^2 + 5$ 4. $y^2 - 1$ 5. xz 6. $\frac{x}{y} + 3$

Let's start with expression x^2

Share your observations as how the expression x^2 is formed.

Student's response:

The expression x^2 is obtained by multiplying the variable x by itself; $x \times x = x^2$

Just as 3×3 is written as 3^2, we write $x \times x = x^2$. It is commonly read as x square.

You can extend or reflect on teacher's observations in the given space.

Share your observations regarding how the expression $3y^2$ is formed.

Student's response:

The expression $\mathbf{3y^2}$ is obtained by multiplying the variable y by itself and then we multiply $\mathbf{y^2}$ by the constant 3.

$\mathbf{3y^2 = 3 \times y \times y}$

You can extend or reflect on teacher's observations in the given space.

Share your observations regarding how the expression $2x^2 + 5$ is formed.

Student's response:

My observations:

The expression $2x^2 + 5$ is obtained by multiplying the variable x by itself and then we multiply x^2 by the constant 2. **From $2x^2$, we can add 5 to finally get $2x^2 + 5$.**

$2x^2 + 5 = 2 \times x \times x + 5$

You can extend or reflect on teacher's observations in the given space.

Share your observations regarding how the expression $y^2 - 1$ is formed.

Student's response:

The expression $y^2 - 1$ is obtained by multiplying the variable y by itself and we get y^2. **From y^2, we can subtract 1 to finally get $y^2 - 1$.**

$y^2 - 1 = y \times y - 1$

You can extend or reflect on teacher's observations in the given space.

Share your observations regarding how the expression xz is formed.

Student's response:

The expression xz is obtained by multiplying the variable x by z.
$xz = x \times z$

You can extend or reflect on teacher's observations in the given space.

Share your observations regarding how the expression x $\frac{x}{y}$ + 3 is formed.

Student's response:

The expression $\frac{x}{y} + 3$ is obtained by dividing the variable x by y. **To $\frac{x}{y}$, we can add 3 to finally get $\frac{x}{y} + 3$.**
$\frac{x}{y} + 3 = x \div y + 3$

You can extend or reflect on teacher's observations in the given space.

Reflection : - What new is added in your learning?
Write in the give space.

My reflection	able to express formation of expressions.
Student's reflection	

Let's explore.

Describe how the following expressions are obtained:

x^3 $4xyz$ $y^2 - x^2$ $x - z$

Student's response:

Share learning work with your friends, parents and teachers.
Appreciate each other's work.

Very good !
You done a wonderful job.

Session - 38
ALGEBRA

Learning outcome: -
Identifies terms of an expression.

Dear student, how are you feeling today?

(✓) Tick smiley according to your mood.

In previous session, we discussed the formation of the expressions .
Now, observe following expressions

1. 7 2. $5x$ 3. $3y^2$ 4. $-2x^2$ 5. $2xy^2$ 6. xz

Student's response:

Hint: 5 x is obtained by multiplication of variable by a constant.

- **Numerical expression 7** is obtained by a constant 7.
- **$5x$** is obtained by multiplication of variable by a constant 5.
- **xz** is obtained by multiplication of variable x by a variable z.
- **$3y^2$** is obtained by multiplication of variable y by itself and then we multiply y^2 by 3.
- **$-2x^2$** is obtained by multiplication of variable x by itself and then we multiply x^2 by -2.
- **$2xy^2$** is obtained by multiplication of y^2 by x and then we multiply $x\,y^2$ by 2.

You can extend or reflect on teacher's observations in the given space.

The above expressions are formed in following ways:
As a number or
as a variable or
as a product of two or more variables or
as a product of number and a variable.

The expression which is a number or a variable or a product of two or more variables or product of number and a variable is called the **term** of an expression.

Reflection: - What new is added in your learning?
Write in the give space.

Teacher's reflection	able to define and identify term of an expression.
Student's reflection	

Let's explore: -

1) Let us form three terms that have only one variable.

_____, _____, _____

2) Let us form three terms that have product of two variables.

_____, _____, _____

3) Let us form three terms that have product of two variables along with one constant.

_____, _____, _____

4) Let us form three terms that have product of variable by itself.

_____, _____, _____

5) Let us form three terms that have only constants.

_____, _____, _____

Share your learning with your friends, parents and teachers.
Appreciate each other's work.

Congratulations!

You have done a great job.

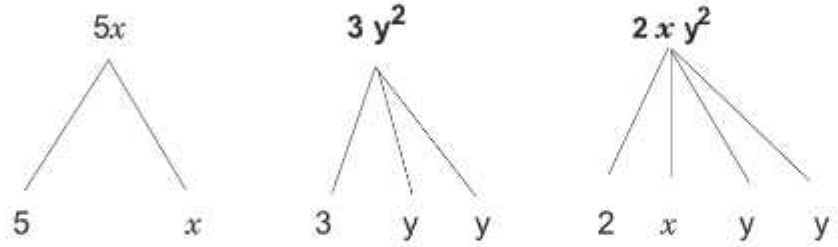
Session - 39
ALGEBRA

Learning outcome: -
Identifies factors and coefficients of terms.

Dear student, how are you feeling today?

(✓) Tick smiley according to your mood.

Now, observe the given tree diagram: _



Student's response:

Hint: The term $5x$ is a product of 5 and x.

- The term $5x$ is a product of 5 and x.
- The term **3 y^2** is a product of 3, y and y.
- The term **2x y^2** is a product of 2, x, y and y.

You can extend or reflect on teacher's observations in the given space.

As the term $5x$ is a product of 5 and x. We can say that 5 and x are the factors of term 5x.

As the term $\mathbf{3y^2}$ is a product of 3, y and y. We can say that 3, y and y are the factors of term $\mathbf{3y^2}$.

As the term $\mathbf{2xy^2}$ is a product of 2, x, y and y. We can say that 2, x, y and y are the factors of term $\mathbf{2xy^2}$.

Share your observations related to the factors of the term or expression.

Student's response:

Hint: The factors may be numeric and algebraic (variables).

A term is a product of all of its factors.

You can extend or reflect on teacher's observations in the given space.

Reflection: - What new is added in your learning?
Write in the give space.

My reflection	able to identify factors of a term or expressions. Able to express term as a product of its factors. The factors may be numeric and algebraic (variables).
Student's reflection	

Explore: -

Complete the given table

Term or expression	Factors of term	Numeric factor	Algebraic factors
$5xz$	$5, x, z$	5	x, z
$3xy^2$			
$2x^2y^2$			

The numeric factor is said to be the numerical coefficient or simply the **coefficient** of the term.

Complete the given table

Term or expression	Coefficient	Algebraic factors
$9xy^2$		
$3y^2$		
$-10x^2y$		
xy		

Share your learning with your friends, parents and teachers.
Appreciate each other's work.

Very good!
You have done a wonderful job.

Session - 40
ALGEBRA

Learning outcome: -
Identifies like and unlike terms.

Dear student, how are you feel ing today?

(✓) Tick smiley according to your mood.

Observe the given table: -

Term or expression	Factors of term	Numeric factor or coefficient	Algebraic factors
$7xz$	$7, x, z$	7	x, z
$8xy^2$	$8, x, y, y$	8	x, y, y
$12xy^2$	$12, x, y, y$	12	x, y, y
$2xz$	$2, x, z$	2	x, z
$7x$	$7, x$	7	x
x	x	1	x

Student's response:

Hint: The term $7xz$ and $7x$ have same numeric factor or coefficient.

- The term **$7xz$** and **$2xz$** have same algebraic factors.
- The term **$8xy^2$** and **$12xy^2$** have same algebraic factors.
- The term **$7x$** and **x** have same algebraic factors.

You can extend or reflect on teacher's observations in the given space.

When the terms have the same algebraic factors, they are **like** terms.

When the terms have different algebraic factors, they are **unlike** terms.

Fill the blanks:

Student's response:

The like terms in the above table are _____ and _____, _____ and _____, _____ and _____

The like terms in the above table are **7xz** and **2xz**, **8 x y^2** and **12 x y^2**, **7x** and **x**

Are the terms **8 x y^2 and 4 x^2 y like terms? Justify your answer.**

Student's response:

The terms 8 x y^2 and 4 x^2 y are not like terms because the terms have different algebraic factors.

You can extend or reflect on teacher's response in the given space.

Are the terms 8 x y and 4 y x like terms? Justify your answer.

Student's response: -

The terms 8 x y and 4 y x are like terms because the terms have same algebraic factors as x y = y x

You can extend or reflect on teacher's response in the given space.

Reflection: - What new is added in your learning?
Write in the give space.

Teacher's reflection	able to identify like and unlike terms.
Student's reflection	

Explore: -

Give example of two like terms and two unlike terms. Justify your answer.

Share your learning with your friends, parents and teachers.
Appreciate each other's work.

Very good!
You have done a wonderful job.

Session - 41
ALGEBRA

Learning outcome:-
Distinguishes like and unlike terms.

Dear student, how are you feeling today?

(✓) Tick smiley according to your mood.

Today we are going to explore addition and subtraction of like terms.

Try to write any two unlike terms.

Student's response:

The terms $2x$ y and $4x$ z

You can extend or reflect on teacher's response in the given space.

Try to add your unlike terms.

Student's response:

The addition of $2x$ y and $4x$ z is $\mathbf{2x\ y + 4x\ z}$

You can extend or reflect on teacher's response in the given space.

Write number of terms in the expression 2 x y + 4 x z.

Student's response:

The number of terms in the expression **2 x y + 4 x z is 2.**

The terms of the expression are separated by + sign.

You can extend or reflect on teacher's response in the given space.

Can the expression 2 x y + 4 x z be converted into a single term? Why or why not?

Student's response:

I am not able to convert the expression **2 x y + 4 x z** into single term because the terms are not like.

You can extend or reflect on teacher's response in the given space.

Let us write any three unlike terms.

Student's response:

The terms are 2 x, 5 y and -3 x y

You can extend or reflect on teacher's response in the given space.

Try to add your unlike terms.

Student's response:

The addition of is 2 x, 5 y and -3 x y are 2 x + 5 y +(- 3 x y) or 2 x + 5 y - 3 x y

You can extend or reflect on teacher's response in the given space.

Write number of terms in the expression 2 x + 5 y - 3 x y.

Student's response:

The number of terms in the expression **2 x + 5 y - 3 x y is 3.**
The terms of the expression are separated by + sign or - sign.

You can extend or reflect on teacher's response in the given space.

Is the expression 2 x + 5 y - 3 x y can be converted into single or smaller number of term?
Why or why not?

Student's response:

I am not able to convert the expression 2 x + 5 y - 3 x y into single term or a smaller number of terms because the terms are not like or we can say these are unlike terms

You can extend or reflect on teacher's response in the given space.

Reflection: - What new is added in your learning?
Write in the give space.

My reflection	able to form expression using addition of unlike terms.
Student's reflection	

Session - 42
ALGEBRA

Learning outcome:-
Able to add terms.

Dear student, how are you feeling today?

(✓) Tick smiley according to your mood.

Try to write any two like terms.

Student's response:

The terms 5 x y and 3 x y

You can extend or reflect on teacher's response in the given space.

Try to add your unlike terms.

Student's response:

The addition of 5 x y and 3 x y is **5 xy + 3xy**

You can extend or reflect on teacher's response in the given space.

Write number of terms in the expression 5 x y + 3 x y.

Student's response:

The number of terms in the expression **5 xy + 3 xy is 2.**
The terms of the expression are separated by + sign.

You can extend or reflect on teacher's response in the given space.

Is the expression 5 x y + 3 x y can be converted into single term? Why or why not?

Student's response:

I am able to convert the expression **5 x y + 3 x y** into single term because the terms are like.
5 x y + 3 x y = 8 x y

You can extend or reflect on teacher's response in the given space.

Let us write any three like terms.

Student's response:

The three like terms are 2xy, 5 x and -3 x

You can extend or reflect on teacher's response in the given space.

Try to add your like terms.

Student's response:

The addition of is 2 x, 5 x and -3 x are 2 x + 5 x + (-3 x) or 2 x + 5 x - 3x.

You can extend or reflect on teacher's response in the given space.

Write number of terms in the expression 2 x + 5 x - 3 x.

Student's response:

The number of terms in the expression 2 x + 5 x - 3 x **is 3.**

The terms of the expression are separated by + sign or - sign.

You can extend or reflect on teacher's response in the given space.

Is the expression 2 x + 5 x - 3 x can be converted into single or smaller number of terms? Why or why not?

Student's response:

I am able to convert the expression **2 x + 5 x - 3 x** into single term or a smaller number of terms because the terms are like.

2 x + 5 x - 3 x = 4 x

You can extend or reflect on teacher's response in the given space.

Now, observe the response of teacher:

$$2x + 5x - 3x = 4x$$

Student's observations:

The algebraic factor of all the terms in the given expression is x.

To find total of algebraic factor x, I added the coefficient of the given terms.

$$2x + 5x - 3x = (2 + 5 - 3)x$$

$$= (7 - 3)x = 4x$$

You can extend or reflect on teacher's response in the given space.

Let us to add the expressions $5x + 3$ and $-2x^2 - 4x + 2$

Student's response:

The sum of expressions $5x + 3$ and $-2x^2 - 4x + 2$

is $(5x + 3) + (-2x^2 - 4x + 2) = 5x + 3 - 2x^2 - 4x + 2$

$$= -2x^2 + 5x - 4x + 3 + 2$$

$$= -2x^2 + x + 5$$

You can extend or reflect on teacher's response in the given space.

Now, observe the response of teacher:

$(5x + 3) + (-2x^2 - 4x + 2) = 5x + 3 - 2x^2 - 4x + 2$

$= -2x^2 + 5x - 4x + 3 + 2$

$= -2x^2 + x + 5$

Student's observations:

Hint: The total number of terms after addition of two expressions is 5.

The total number of terms after addition of two expressions is 5.

The algebraic factors in the terms are x and x^2. The numeric expression is 3 and 2. $5x$ and $-4x$ are the like terms, 3 and 2 are numeric expressions.

$(5x + 3) + (-2x^2 - 4x + 2) = 5x + 3 - 2x^2 - 4x + 2$

$= -2x^2 + 5x - 4x + 3 + 2$ (first we put like terms together)

$= -2x^2 + x + 5$ (add the like terms and we get the answer)

You can extend or reflect on teacher's response in the given space.

Reflection:- What new is added in your learning?
Write in the give space.

My reflection	able to add like terms.
Student's reflection	

Explore: -

Let us add the given expressions:

(1) $5x + 3y, -4x + 9y, -2x^2 + x - y$

(2) $3y^2 + 2xy^2 + 8, -4y^2 - 5xy^2 - 10x - 10$

(3) $-3xz + 7y + 1, 3y^2 - 5xz + 8y - 9$

Share your learning with your friends, parents and teachers.
Appreciate each other's work.

Very good!
You have done a wonderful job

Session - 43
ALGEBRA (Terms of an expressions)

Learning outcome:-
Able to subtract like terms.

Dear student, how are you feeling today?

(✓) Tick smiley according to your mood.

Let us write any two like terms.

Student's response:

The terms 7 y and 3 y

You can extend or reflect on teacher's response in the given space.

Try to subtract your like terms.

Student's response: -

The subtraction of 7 y and 3 y is **7 y - 3 y = 4 y**

You can extend or reflect on teacher's response in the given space.

Now, observe the response of teacher: 7 y - 3 y = 4 y

Student's response:

The algebraic factor of all the terms in the given expression is y.

To find subtraction of algebraic factor y, I subtracted the coefficient of the given terms.

7 y - 3 y = (7 - 3) y

= 4 y

You can extend or reflect on teacher's response in the given space.

Try to subtract the expressions $6x + 3$ from $-2x^2 - 3x + 5$.

Student's response:

The subtraction of the expressions $6x + 3$ from $-2x^2 - 3x + 5$ is

$(-2x^2 - 3x + 5) - (6x + 3) = -2x^2 - 3x + 5 - 6x - 3$ (open bracket)

$= -2x^2 - 3x - 6x + 5 - 3$ (place like terms together)

$= -2x^2 - 9x + 2$ (simplification)

You can extend or reflect on teacher's response in the given space.

Reflection: - What new is added in your learning?
Write in the give space.

My reflection	able to subtract like terms.
Student's reflection	

Explore: -

Subtract:

(1) $5x$ from $-4x$

(2) $3y^2 + 2xy^2$ from $-4y^2 - 5xy^2$

(3) $-3xz + 7y$ from $-5xz + 8y - 9$

Share your learning with your friends, parents and teachers.
Appreciate each other's work.

Very good!
You have done a wonderful job

Session - 44
ALGEBRA

Learning outcome: -
Able to define, interpret and form equation.

Hello students, how are you feeling today?

Select smiley that is according to your mood.

Again, we are going to make different patterns through paper straws.

Roshan and Rita are making some patterns using paper straws.

Observe the given pattern.

Student's observations:

- The pattern of L is formed.
- To form L, we need 2 straws.
- In 1st step of pattern, we have only 1 L, in 2nd step we have 2 L's and in 3rd step we have 3 L's and so on.

Observe how many straws will be required in every step and then extend these patterns.

On the basis of your observation, fill the given table.

Step	1	2	3	4	5	6	7	8	9	10
Straws used	2	4								

Can you observe any relation between number of straws required in every step?

Student's observations:

- I observed number of straws required in every step is two times number of L's.

Fill in the given blanks on the basis of above pattern.

Number of straws required in every step = _____ × number of L's formed.

For convenience, let us write the letter m for the number of L's formed

So, Number of straws required in every step = 2 × =____

Teacher of Roshan and Rita given a task.

Value of m is not fixed.
It can take any values 1,2,3,... m is an example of variable.

Students, try to form a mathematical statement that shows relation between number of L's formed and number of straws used in every step is given.

Student's response: -

Hint: number of straws required in every step = **2m** where m represent number of L's.

We have an expression for number of straws required in every step = 2m

If number of straws required in a step is given that means we get value of the expression 2m. For example: -

If number of straws used in a step is 4.

Then to find number of L's formed we can equate 2m with 4 i.e, 2m = 4

What you understand about 2m = 4 in teacher's expression?

Student's response:

2m is an algebraic expression which represents number of straws required in every step. 4 is a given condition that represent number of straws used in a step is 4.

The algebraic expression and given condition are same therefore we put equal (=) sign between them.

What is equation?

Student's response:

An equation is a mathematical statement consisting of an equal symbol between two algebraic expressions that have the same value.

So, we can call the mathematical statement 2m = 4 is an equation.

Note that an equation has an equal sign (=) between its two sides. The equation says that the value of the left-hand side (LHS) is equal to the value of the right-hand side (RHS). If the LHS is not equal to the RHS, we do not get an equation.

Now, let us observe the given mathematical statement: **8 – 3 = 5**

Student's observations:

There is an equal sign between the LHS and RHS. Neither of the two sides contain a variable. Both contain numbers. We may call this a **numerical equation**.

Usually, the word equation is used only for equations with one or more variables.

Reflection: - What new is added in your learning?

Write in the give space.

My reflection	An algebraic equation must contain one or more variables and equality sign.
Student's reflection	

Let's explore: -

Try to understand the given mathematical statements

$x = 70$	$20 + 10 = 30$
$8 \times 3 = 24$	$p - 3 = 7$
$2p > 30$	$3n = 21$
$n - 4 = 100$	$2m = 5$
$20b = 80$	$2l > 7$

Separate algebraic equation, numerical equation and non-equation mathematical statements.

Box containing algebraic equation	Box containing numerical equation

Box containing non-equation

If number of straws used in a step is 10 where 2m is an algebraic expression which represents number of straws required in every step.

Try to form an equation.

Student's response:

Congratulations!!

You done a wonderful job.

Session - 45
ALGEBRA

Learning outcome: -
Able to form an equation using given conditions.

Hello students, how are you feeling today?

Select the word that is according to your mood.

Happy **thankful** **celebration** **hopeful** **powerful**

My friend Kalaam was talking to me.

He shared difference of ages of his two family members.

He shared | My father is 3 years older than my mother.

He challenged me to form an algebraic expression by supposing age of mother or father.

Help me in the formation of algebraic expression.

Student's response:

First, we suppose that age of Kalaam's mother is y years.
Now age of his father is y + 3
So, the algebraic expression is y + 3

Now, you talk to one of your classmates.

Share with him/her difference of age of two of your family members.

Student's response:

The difference between my father's and mother's age is 3 years.

Help your friend in the formation of an algebraic expression by supposing age of one member from his family.

Student's response:

I suppose my mother's age as x years.
Now, my father's age will be (x + 3)

You have done a great job.

Congratulations!!

Kalaam confirmed that his father is actually 65 years old.

He challenged me to form an equation using given details.

Let's try to form an equation.

Student's response:

Algebraic expression showing Kalaam fathers age is y+3

As father's age is 65 years.

So, the equation is y + 3 = 65

In a similar way, tell your friend to confirm the age of the person whose age is expressed in the algebraic form.

Write the confirmed age of the person

Student's response:

The age of my father is 67 years.

Now, challenge your friend to form an equation on the basis of given details.

Help your friend in the formation of an equation.

Student's response:

The age of my father is x+3 = 67

Again, you have done a great job.

Reflection: - What new is added in your learning?

Write in the give space.

Teacher's reflection	able to form an equation using given conditions
Student's reflection	

Let's explore: -

Try to understand the given conditions and fill the blanks accordingly.

Situation (described in ordinary language)	**Variable**	**Statements using expressions**	**Given conditions**	**Equation**
1. Sangeeta has 15 more marbles than Ameena.	Let Ameena have x marble	Sangeeta has (x + 10) marbles.	Sangeeta has 15 marbles.	x + 10 = 15
2. Seema is 3 years younger than Raheem.	Let Raheem's age be x years.	Seema's age is ---------years.	Seema's age is 19 years.	
3. Bablu is twice as old as Raju.	Let Raju's age be x years.	Bablu's age is---------- years.	Bablu's age is 14 years.	_____
4. Raju's income is Rs. 2,000 more than Ramu's income.	Let Ramu's income be Rs. x	Raju's income is Rs.----------	Raju's income is Rs. 20,000	_____

Session - 46
ALGEBRA

Learning outcome: -
Able to verify solution of an equation.

Hello students, how are you feeling today?

Select smiley that is according to your mood.

Hello students
How are you?

Let us know age of your family members

Student's response:

Write down name, relation and age of your family members in the given table.

Name of family member	Relation with you	Age

Now try to understand the given situation.

Bittu is 2 years younger than his sister Shilu.

What do you understand from the term 'younger' ?

Write in the given space.

The term younger means: Bittu's age is less than Shilu's age.

Your reflection (What new is added in your understanding)

What means: Bittu is 2 years younger than his sister Shilu.

Student's response:

The difference between Shilu's age and Bittu's age is 2 years.

or

Bittu's age is 2 years less than Shilu's age

or

Shilu's age is 2 years more than Bittu's age

Reflection: - What new is added in your learning?
Write in the give space.

My reflection	able to interpret mathematical statement and its components.
Student's reflection	

Session - 47
ALGEBRA

Learning outcome: -
Able to verify solution of an equation.

Hello student, How are you feeling today?
Select smiley according to your mood.

In the given situation | Bittu is 2 years younger than his sister Shilu.

Is Bittu's and Shilu's ages are known to us? Yes or No

To form an algebraic expression of the above statement, what will be our first step?

Student's response:

We do not know the ages of Bittu and Shilu. Both the ages are unknown to us.
We have to let (suppose) one of the age.
Suppose, Shilu's age is x years.

Suppose, Shilu's age is x years.

Now, form an expression showing Bittu's age.

Student's response:

Bittu's age is x-2

Their mother told us the age of Bittu.

She confirmed that Bittu is 11 years old.

Now, prepare an equation using above informations.

Student's response:

My observations:

Algebraic expression showing Bittu's age is x-2
and mother said that the age of Bittu is 11 years.
So, our required equation is x - 2 = 11

Now try to find age of Shilu by using the above equation.

Student's response:

Hint: you can substitute values in place of x which satisfies the equation x - 2 = 11

I am using substitute and calculate method to find the value of x (Shilu's age)

First, I check for taking value of x as 10 i.e, x = 10

and substitute the value at the place of x in the equation x – 2 = 11

LHS $\Rightarrow$ x – 2 = 10 – 2 = 8 where RHS = 11

RHS $\neq$ LHS (LHS is not equal to RHS)

So, x = 10 is not a solution (Shilu is not 10 years old)

Next, I check for taking value of x as 11 i.e, x = 11

And substitute the value in place of x in the equation $x - 2 = 11$

LHS $\Rightarrow$ $x - 2 = 11 - 2 = 9$ where RHS = 11

RHS $\neq$ LHS (LHS is not equal to RHS)

So, x = 11 is not a solution (Shilu is not 11 years old)

Student, please help me in finding value of x (Shilu's age).

Next, we check for taking value of x as 12 i.e, x = 12

Next, we check for taking value of x as 12 i.e, x = 13

x = 13 satisfies the equation x = 13 (LHS = RHS)

So, age of Shilu is 13 years old.

Reflection: What new is added in your learning?

Write in the give space.

My reflection	able to verify solution of an equation
Student's reflection	

Let's explore

Complete the table and by substitution and calculation, find the solution to the equation $x + 2 = 11$

x	1	2	3	5	6	7	8	9	10
x-2	-1	0							

Pick out the solution from the values given in the bracket next to each equation.

(a) $5m = 60$ (10, 5, 12, 15)

(b) $n + 12 = 20$ (12, 8, 20, 0)

(c) $y - 5 = 5$ (0, 10, 5, –5)

(d) $t = 7$ (7, 2, 10, 14)

(e) $r - 8 = 0$ (4, –4, 8, 0)

(f) $x + 1 = 2$ (–2, 0, 2, 1)

Congratulations!!

You done a wonderful job.