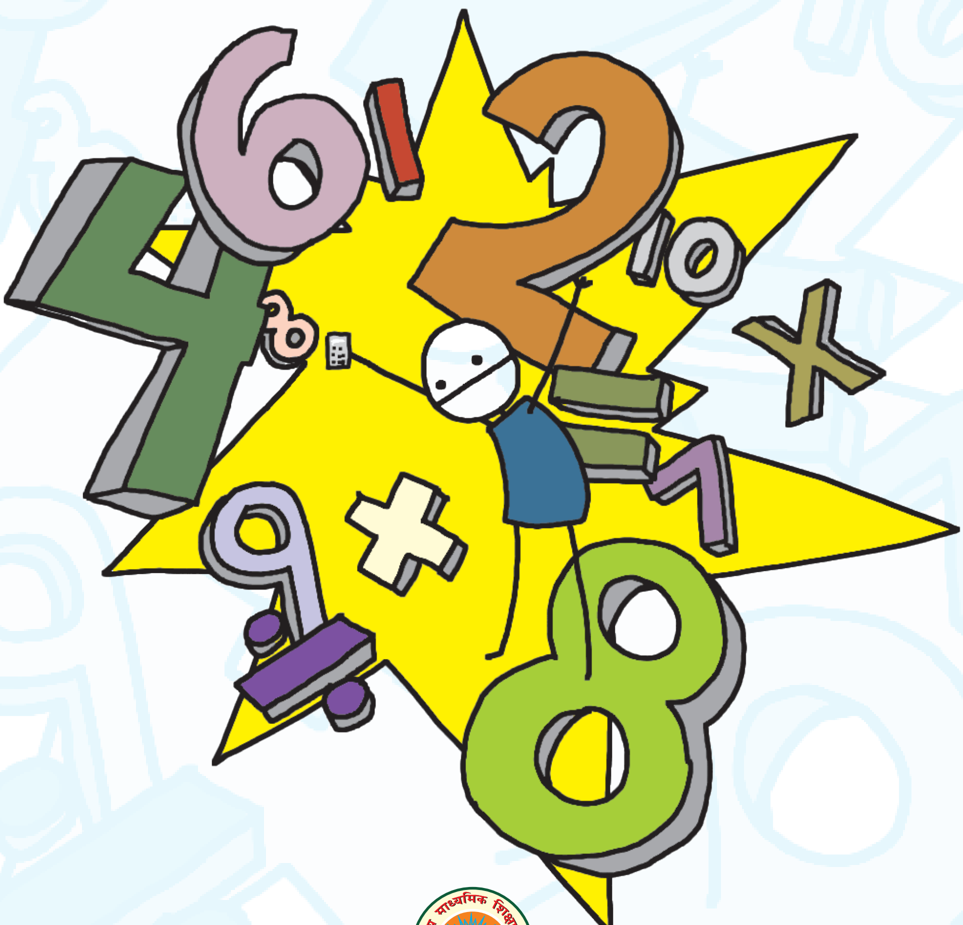
CLASS X

UNIT-1

CBSE-*i*

MATHEMATICS

REAL NUMBER (CORE)



CENTRAL BOARD OF SECONDARY EDUCATION

Shiksha Kendra, 2, Community Centre, Preet Vihar, Delhi-110 092 India

CBSE - International

"Let Noble thoughts come to us from every side"

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PREFACE

The Curriculum initiated by Central Board of Secondary Education -International (CBSE-i) is a progressive step in making the educational content and methodology more sensitive and responsive to the global needs. It signifies the emergence of a fresh thought process in imparting a curriculum which would restore the independence of the learner to pursue the learning process in harmony with the existing personal, social and cultural ethos.

The Central Board of Secondary Education has been providing support to the academic needs of the learners worldwide. It has about 11500 schools affiliated to it and over 158 schools situated in more than 23 countries. The Board has always been conscious of the varying needs of the learners in countries abroad and has been working towards contextualizing certain elements of the learning process to the physical, geographical, social and cultural environment in which they are engaged. The International Curriculum being designed by CBSE-i, has been visualized and developed with these requirements in view.

The nucleus of the entire process of constructing the curricular structure is the learner. The objective of the curriculum is to nurture the independence of the learner, given the fact that every learner is unique. The learner has to understand, appreciate, protect and build on values, beliefs and traditional wisdom, make the necessary modifications, improvisations and additions wherever and whenever necessary.

The recent scientific and technological advances have thrown open the gateways of knowledge at an astonishing pace. The speed and methods of assimilating knowledge have put forth many challenges to the educators, forcing them to rethink their approaches for knowledge processing by their learners. In this context, it has become imperative for them to incorporate those skills which will enable the young learners to become 'life long learners'. The ability to stay current, to upgrade skills with emerging technologies, to understand the nuances involved in change management and the relevant life skills have to be a part of the learning domains of the global learners. The CBSE-i curriculum has taken cognizance of these requirements.

The CBSE-i aims to carry forward the basic strength of the Indian system of education while promoting critical and creative thinking skills, effective communication skills, interpersonal and collaborative skills along with information and media skills. There is an inbuilt flexibility in the curriculum, as it provides a foundation and an extension curriculum, in all subject areas to cater to the different pace of learners.

The CBSE has introduced the CBSE-i curriculum in schools affiliated to CBSE at the international level in 2010 and is now introducing it to other affiliated schools who meet the requirements for introducing this curriculum. The focus of CBSE-i is to ensure that the learner is stress-free and committed to active learning. The learner would be evaluated on a continuous and comprehensive basis consequent to the mutual interactions between the teacher and the learner. There are some non-evaluative components in the curriculum which would be commented upon by the teachers and the school. The objective of this part or the core of the curriculum is to scaffold the learning experiences and to relate tacit knowledge with formal knowledge. This would involve trans-disciplinary linkages that would form the core of the learning process. Perspectives, SEWA (Social Empowerment through Work and Action), Life Skills and Research would be the constituents of this 'Core'. The Core skills are the most significant aspects of a learner's holistic growth and learning curve.

The International Curriculum has been designed keeping in view the foundations of the National Curricular Framework (NCF 2005) NCERT and the experience gathered by the Board over the last seven decades in imparting effective learning to millions of learners, many of whom are now global citizens.

The Board does not interpret this development as an alternative to other curricula existing at the international level, but as an exercise in providing the much needed Indian leadership for global education at the school level. The International Curriculum would evolve on its own, building on learning experiences inside the classroom over a period of time. The Board while addressing the issues of empowerment with the help of the schools' administering this system strongly recommends that practicing teachers become skillful learners on their own and also transfer their learning experiences to their peers through the interactive platforms provided by the Board.

I profusely thank Shri G. Balasubramanian, former Director (Academics), CBSE, Ms. Abha Adams and her team and Dr. Sadhana Parashar, Head (Innovations and Research) CBSE along with other Education Officers involved in the development and implementation of this material.

The CBSE-i website has already started enabling all stakeholders to participate in this initiative through the discussion forums provided on the portal. Any further suggestions are welcome.

Vineet Joshi
Chairman

ACKNOWLEDGEMENTS

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Content

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Syllabus for Unit- I

REAL NUMBERS (CORE)

Revisit the Number System	Recapitulation of all types of numbers in Real number system- Natural Numbers, Whole Numbers, Integers, Rational Numbers, Irrational Numbers, Real Numbers
Expression of integers as product of prime integers	Euclid's Division Lemma, Euclid's Division Algorithm to find HCF (highest common factor) of two given positive integers.
Prime factorization of composite number	Composite numbers, Prime numbers, Prime factorization, HCF and LCM of numbers using prime factorization. Fundamental Theorem of Arithmetic. Application problems.
Decimal expansion of a rational number	Express a rational number as either terminating decimal or non-terminating recurring decimal.

SCOPE DOCUMENT

Concepts

1. Euclid's Division Lemma
2. Euclid's Division Algorithm
3. Prime Factorization
4. Fundamental Theorem of Arithmetic
5. Decimal expansion of rational numbers

Learning objectives

1. To express the division of numbers as dividend = (divisor x quotient)+ remainder and generalise this relation for any positive integers a and b
2. To understand Euclid's Division lemma.
3. To understand the difference between Euclid's Division Lemma and Euclid's Division Algorithm
4. To be able to find out HCF of two given numbers using Euclid's Algorithm.
5. To be able to find HCF and LCM using prime factorization
6. To be able to use the formula HCF X LCM = Product of two numbers
7. To be able to understand Fundamental Theorem of Arithmetic.
8. To be able to express every composite number as product of prime numbers.
9. To be able to define rational numbers on the basis of their decimal expansions.
10. To be able to segregate rational numbers from irrational numbers on the basis of their decimal expansions.
11. To be able to tell whether the given rational number is terminating decimal or non-terminating decimal by looking at its denominator.

LESSON TEMPLATE
REAL NUMBERS

Steps to be followed	Tool/Activity used	Description
Warm-up	W1 Card Activity	W1 is to be used to gear up the students to gain more knowledge about the real numbers by refreshing the previous knowledge. Teacher can draw 6 columns on the black-board with headings Natural, Whole, Integers, Rational, Irrational and Real numbers. Now, call the students one by one; ask them to write number picked up by him/her in as many columns as he /she feels are suitable for that number.
Pre-Content	P1 Oral Questioning	Teacher can write all concepts on black-board or can show them on slide. Afterwards oral questions based on these facts can be asked from the students. Questions can be in the form of fill-ups, true-false, justify the statement........

Content work- sheet	CW1 Task1: Count Marbles Watch video: http://www.youtube.com/watch?v=4xANqGj7nnI&feature=related Task2: Understanding Euclid's Division Lemma Task3: Euclid's division algorithm http://www.youtube.com/watch?v=AJn843kplDw&feature=related http://www.youtube.com/watch?v=YRojnL00o8c&feature=related	Task1 is designed to help the students observe that Dividend= Divisor x Quotient + Remainder. Thought provoking question: Can you express the activity performed mathematically? Further the students should be encouraged to explore Euclid's Division Lemma (as Task 2) as a result of brainstorming discussion and generalisation of Task1. Note: video referred here can be played in parts. As the topic picks up in class, required part can be played. In Task 3 process of finding HCF can be explained with the help of Flow Chart. The series of steps known as ALGORITHM can further be elaborated through mentioned video. Lots of examples and exercise should be done to master the skill of finding HCF. Brainstorming session could

	Task 4:Hands on activity on Visualising Euclid's Division Lemma	be conducted to see the practical application of HCF in daily life. For Task 4, teachers should give proper instruction sheet to the students for recording observations and drawing inferences.
	CW2 TASK1:Factorisation using Factor Tree Task 2 Brainstorming: Task 3: Watch Video on Prime factorisation http://www.youtube.com/watch?v=_953gpZp-gY Task 4: Watch Video: How to find HCF by prime factorisation method? http://www.youtube.com/watch?v=KhW9P9Zn_HU Task 5: Watch Video HCF and LCM by prime factorisation http://www.youtube.com/watch?v=mGwgYVtyseY&feature=related	In Task 1, factor tree is explained and the students are asked to complete the factor tree. Task2 is guessing the numbers if the prime factors are known. Task3 is watching video to understand the process of prime factorisation clearly, followed by practice. Task 4 is to learn to find HCF by prime factorisation method from mentioned video, followed by practice. Task 5 is to learn finding of HCF and LCM by prime factorisation method from mentioned video, followed by practice

	CW3 Task 1: Discussion on prime numbers and composite numbers http://www.youtube.com/watch?v=o2arL7fFkNY&feature=related http://www.youtube.com/watch?v=iqwivWZda9A&feature=related Task 2: Fundamental Theorem of Arithmetic	In Task1, students are provoked to think whether all natural composite numbers can be expressed as product of prime numbers or not? Task2 is to consolidate their observations and understand Fundamental Theorem on Arithmetic.
	CW4 Task: to express rational numbers as decimal	By actually dividing the students can find that rational numbers can either be expressed as terminating decimal or non-terminating recurring decimal. Further through lots of examples they can establish that the decimal is terminating if its denominator can be written as either 2^m or 5^n or 2^m5^n.
Post content		Post content worksheet Contains 3 tasks. These tasks can be used either for giving the practice to students or for formative assessment.

Warm up (W I)

Card Activity

Cut out the given number slips and place them on a table. Call each student one by one and ask them to write the number in as many columns according to the type of number. Ask why?

Natural . number	Whole number	Integer	Rational number	Irrational number	Real number

2	$\sqrt{5}$	$\sqrt{16}$	0.56
$\sqrt{25}$	5/3	16	- 0.75
0.222	- 27	$\sqrt{45}$	768
.67	.6777	3/5	7.58
32	100	4.45	0
6	25	$\sqrt{36}$	0.999

Pre-Content (P1)

Basic concepts learnt:

1, 2, 3, ….are natural numbers

0, 1, 2, 3… are whole numbers

….-3, -2, -1 ,0, 1 2, 3,… are integers

Numbers of the form p/q, q $\neq$ o , p and q are integers are rational numbers

All natural numbers are whole numbers but not vice versa

All natural numbers are rational numbers but not vice versa

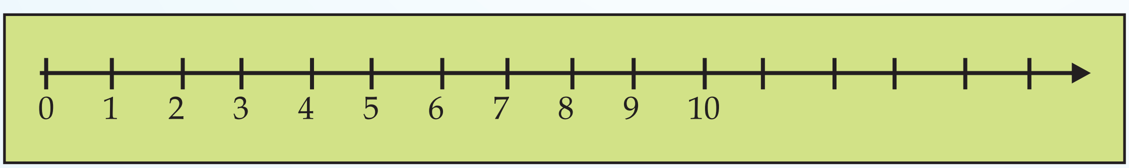
All whole numbers are rational numbers but not vice versa

All integers are rational numbers but not vice versa

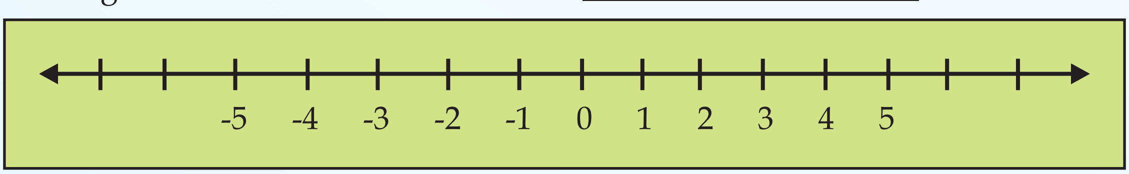
Rational numbers and irrational numbers together form Real numbers.

Ask oral questions based on previous knowledge.

1. This figure shows the numbers known as ____________________.



2. This figure shows the numbers known as ______________________.



3. 0.1010010001….. is a _____________ number.

4. $\sqrt{2}, \sqrt{3}$ etc are ______________ numbers.

5. 7 is a natural number, a whole number, a rational number as well. Yes/No

Content Worksheet - CW I

Task 1: Watch Video

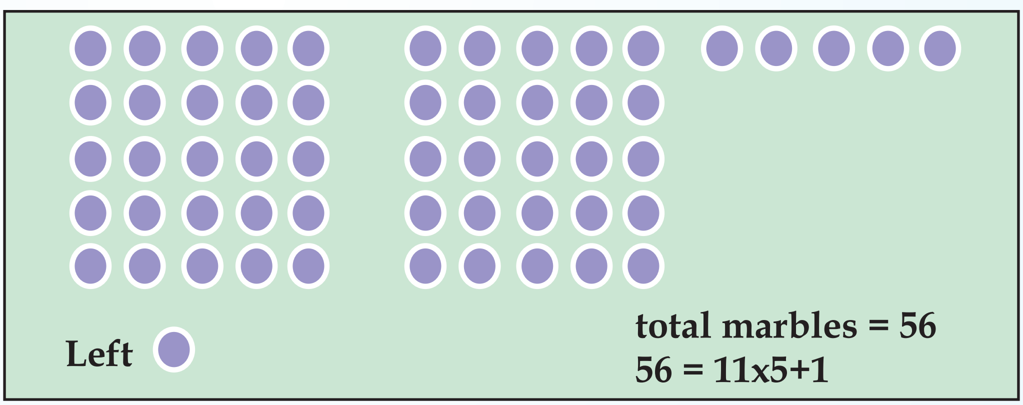
http://www.youtube.com/watch?v=4xANqGj7nnI&feature=related

Note to the teacher: After showing the video, students can be asked to perform the following activity individually.

Take 56 marbles

Ask the students to make counts of 5. How many are left?

After arranging 56 marbles in counts of 5, we get 11 counts of 5



Ask the students to make counts of 6. How many are left?

Ask the students to make counts of 9. How many are left?

Observations:

Task 2: Euclid's Division Lemma

A lemma is a proven statement used for proving another statement.

Learning Objective: To establish Euclid's division lemma:

For each pair of positive integers a and b, we have found whole numbers q and r, satisfying the relation:

$a = bq + r, \; o \leq r < b$

Activity for students:

Form relations between following pairs of numbers using division process.

1. 23, 7
2. 32, 9
3. 15, 2
4. 90, 4
5. 126, 12

Pair of numbers	Relation

Write the statement for Euclid's division lemma.

____

____

____

Task 3: How to find HCF of two given numbers using Euclid's division algorithm?

An algorithm is a series of well defined steps which gives a procedure for solving a type of problem.

What is Euclid's division algorithm?

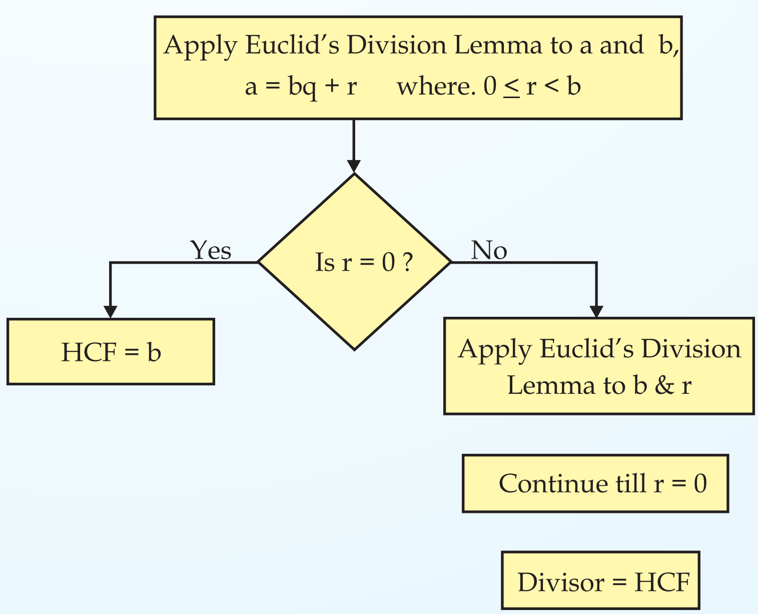
Steps to obtain the HCF of two positive integers, say x and y, with $x > y$....

Step 1: Apply Euclid's division lemma, to x and y. So, we find whole numbers, q and r such that $x = yq + r$, $o \leq r < y$.

Step 2: If $r = 0$, y is the HCF of x and y. If $r \neq 0$, then apply the division lemma to y and r

Step 3: Continue the process till the remainder is zero. The divisor at this stage will be the required HCF.

Students can be asked to make a flowchart of Euclid's division algorithm.



Watch Video: http://www.youtube.com/watch?v=AJn843kplDw&feature=related

http://www.youtube.com/watch?v=YRojnL00o8c&feature=related

Exercise:

Using Euclid's algorithm, find the HCF of following pairs of numbers.

1. 280, 12

2. 288, 120

3. 867, 254

Brainstorming:

A shopkeeper has to arrange 420 black scarfs and 130 red scarfs on a table. He wants to arrange them in such a way that each stack has the same number, and they take up the least area of the table. What is the maximum number of scarfs that can be placed in each stack?

Task 4: Hands on activity -Euclid's Division Algorithm

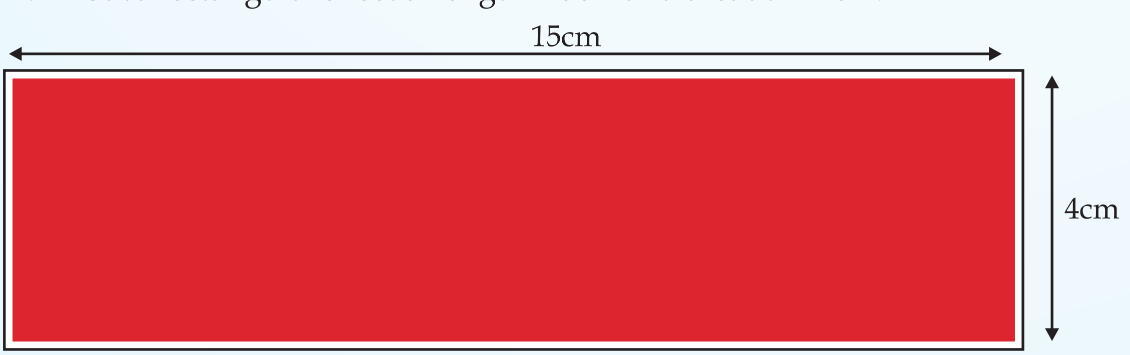
Aim: By paper cutting and pasting to understand the application of Euclid's division algorithm for finding the HCF of two given positive integers 15 and 4.

Material required: Coloured sheet of paper, pair of scissors, glue, marker and ruler.

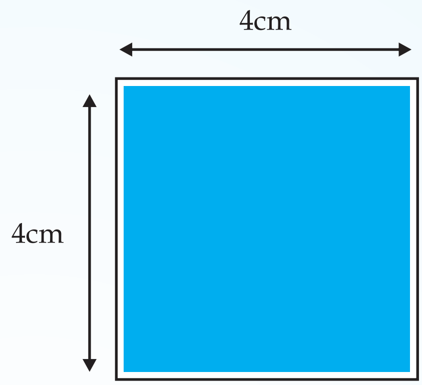
Procedure:

1. Take any two positive integer a and b (a>b). For example a=15 and b=4.

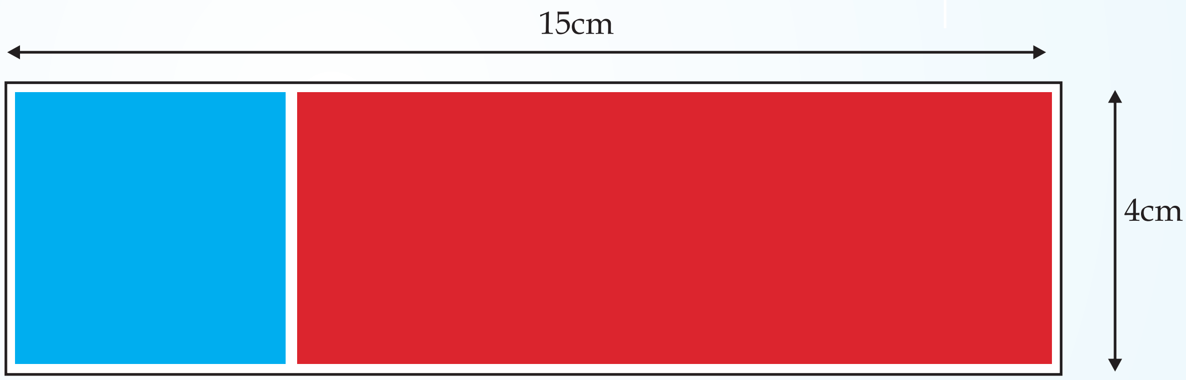
2. Cut a rectangular sheet of length=15cm and breadth =4cm.



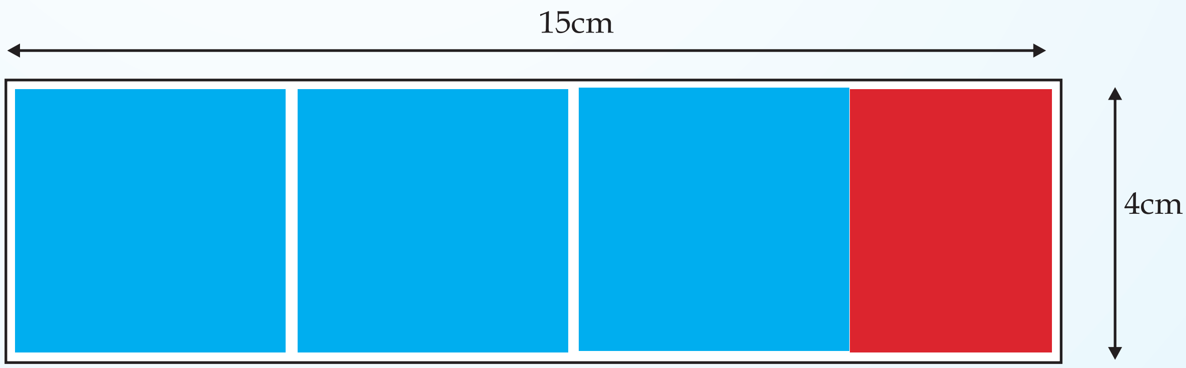
3. What isthe maximum length of square that can be fitted in the given rectangular sheet. In this case length = 4cm as the breadth of rectangle is 4cm. Cutout a square of side 4cm from another sheet of paper.



4. Paste this square on rectangle as shown below.



5. How many squares of side 4cm can be fitted in a rectangle of dimension 15cmX4cm?



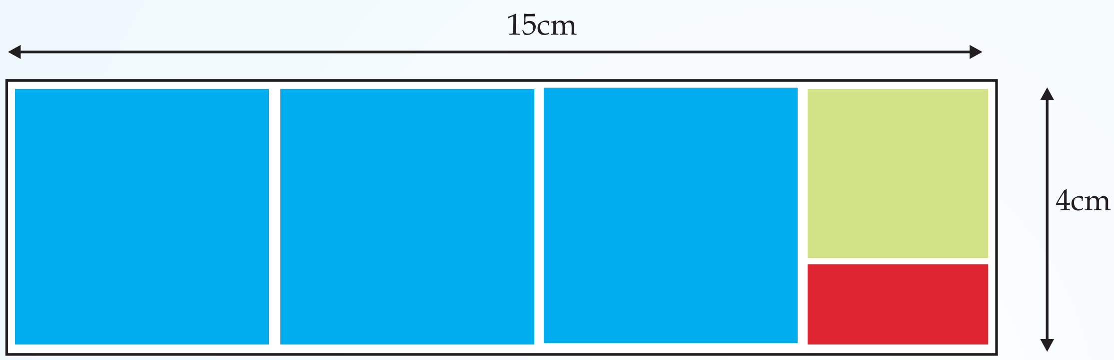
It is observed that 3 squares can be fitted.

6. After pasting 3 square which shape is left? It is observed that a rectangle of dimension 3cm by 4cm is left.

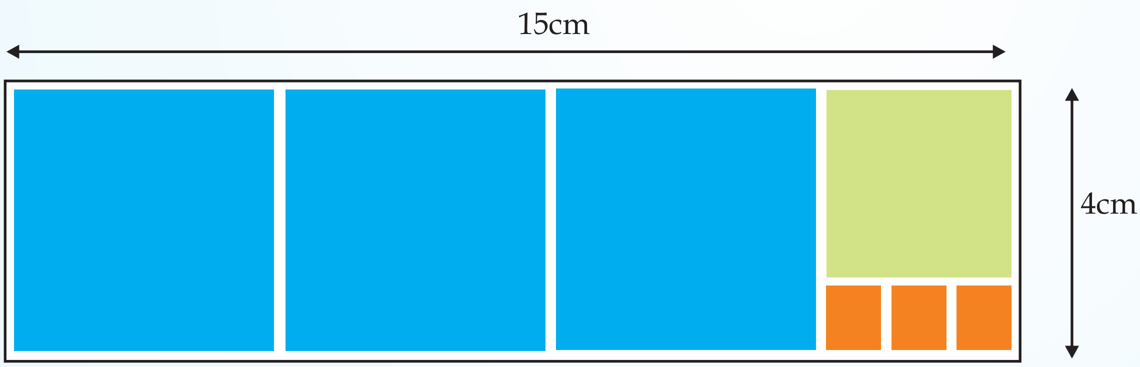
7. Write a mathematical expression for the shape obtained.

$15 = 3 \times 4 + 3$

8. Now consider the rectangle of dimension 3cm by 4cm. Repeat the same procedure in this rectangle.



9. Keep on filling the rectangle with squares till the initial rectangle is completely covered.



10. The length of last square is the HCF of given positive integers.

Observations: We observe that:

1. In mathematical form we get the following expressions:

   $36 = 2 \times 15 + 6$

   $15 = 1 \times 6 + 3$

   $6 = 2 \times 3 + 0$

2. Here the length of last square is 3. So, HCF (36,15) = 3.

Conclusion: By paper cutting and pasting we find the HCF of two given positive integers by applying Euclid's division algorithm.

Note for teachers: Teachers are suggested to ask students to verify the same activity by taking some others pair of integers.

Content Worksheet - CW2

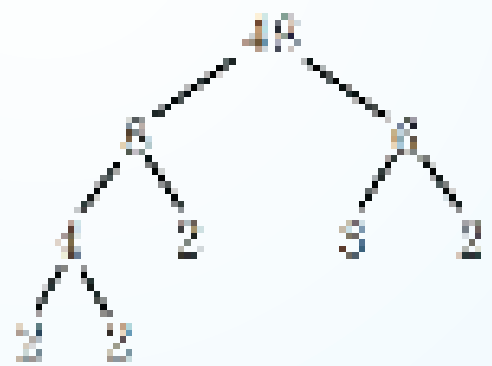
Task 1: Making Factor trees using prime factorisation

What is a factor tree?

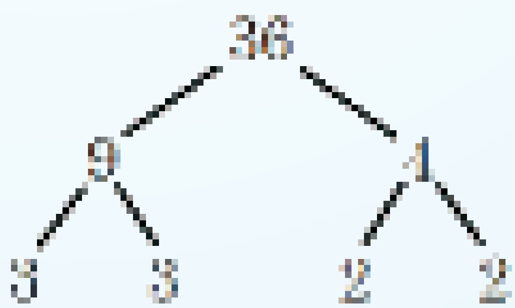
A factor tree can be used to help find the prime factors of a number.

The tree is constructed for a particular number by looking for pairs of values which multiply together to give that number. These pairs are added as "leaves" below the original number. If a leaf is prime, then it can be circled as it is a prime factor. Leaves which are not prime can be broken down in the same way as the original number, until all the leaves are prime.

Observe the given factor tree and write the factors of 48.



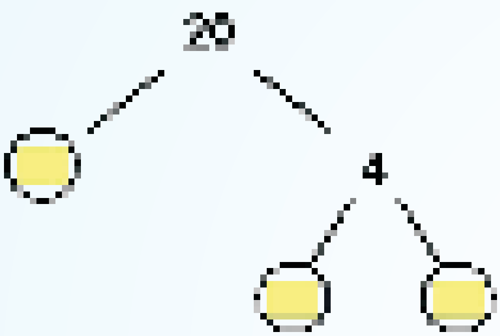
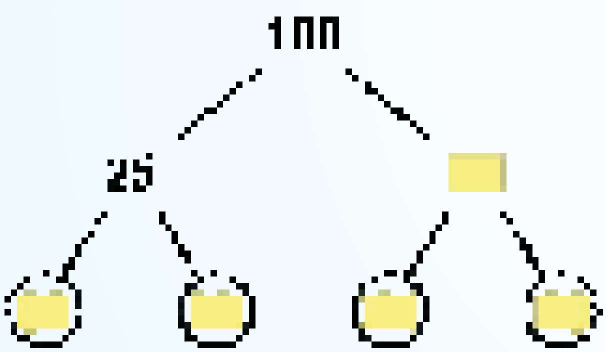
Observe the given factor tree and write the factors of 36.



Visit the link http://nlvm.usu.edu/en/nav/frames_asid_202_g_3_t_1.html

Practice the concept of prime factorisation.

Exercise: Fill the gaps and justify your answer :

Task 2 : Brainstorming:

1. A number is expressed as a product of its prime factors as: $2^3 \times 3 \times 5^2$

   what is the number?

2. A particular number has prime factors 2, 3 and 7. What are the 3 smallest values the number could be?

Task 3: Watch Video on Prime factorisation

http://www.youtube.com/watch?v=_953gpZp-gY

Exercise:

Find prime factors of the following numbers:

1. 236
2. 1072
3. 448
4. 1000

Task 4: Watch Video:

How to find HCF by prime factorisation method?

http://www.youtube.com/watch?v=KhW9P9Zn_HU

Exercise:

1. 882, 300
2. 150, 220
3. 2500, 155
4. 196, 1096

Task 5: Watch Video

HCF and LCM by prime factorisation

http://www.youtube.com/watch?v=mGwgYVtyseY&feature=related

Example:

Find the LCM and HCF of 6 and 20 by the prime factorisation method.

$6 = 2^1 \times 3^1$

$20 = 2 \times 2 \times 5 = 2^2 \times 5^1$

HCF is the product of the smallest power of each common prime factor in the number.

So, HCF $= 2^1 = 2$

LCM is the product of the greatest power of each prime factor in the numbers.

So, LCM $= 2^2 \text{ x } 3^1 \text{ x } 5^1 = 60$

Exercise:

Find LCM and HCF of the following pairs of numbers.

1. 26, 91
2. 336, 45
3. 12, 21
4. 9, 25

Content Worksheet - CW3

Task 1: Discussion on Prime numbers and Composite numbers

http://www.youtube.com/watch?v=o2arL7fFkNY&feature=related

Watch Videos:

http://www.youtube.com/watch?v=iqwivWZda9A&feature=related

Brainstorming:

Any natural number can be written as a product of its prime factors. What do you think? Can we express all composite numbers in the same way?

Do you think that there may be a composite number which is not the product of powers of primes?

Task 2: Fundamental Theorem of Arithmetic

Statement: Every composite number can be expressed as a product of primes, and this factorisation is unique, apart from the order in which the prime factors occur.

Consider the number 45.

$45 = 3 \times 3 \times 5$

We can write this as 3x5x3 or 5x3x3. The prime factors will remain the same, apart from the order of factors.

Justify with 5 more examples.

Consider $7 \times 11 \times 5 + 5$.

$7 \times 11 \times 5 + 5$

$= 5(77 + 1)$

$= 5 \times 78$

$= 5 \times 2 \times 39$

$= 5 \times 2 \times 3 \times 13$

We observed that the given expression is represented as product of prime factors, which is unique. So, it is a composite number.

Brainstorming: What do you think?

Is $3 \times 5 \times 7 + 7$ is a composite number? Justify your answer.

Content Worksheet - CW4

Decimal expansion of rational numbers:

Consider performing the division $\frac{x}{y}$, where x and y are natural numbers. At each step in the division, we are left with a remainder. This remainder, of course, will always be a value between 0 and (y-1), both inclusive. The remainder either becomes 0 after a certain stage or start repeating themselves.

If the remainder is zero, the decimal representation terminates.

If we do not get zero as a remainder, the fact that there are only a finite number of possible remainders means that at some point, we must get a remainder that we already got before. But this means that the quotient will now repeat, since we are only bringing down zeros from the dividend, the remainder exactly determines the next digit in the quotient, which determines the next remainder, and so on.

As an example, consider finding the decimal expansion of the rational numbers $\frac{10}{3}$, $\frac{7}{8}$ and $\frac{3}{7}$

$$\begin{array}{r|l} & 3.\ 33\ldots\ldots \\ \hline 3 & 1\ 0 \\ & \ \ 9 \\ \hline & \ \ 1\ 0 \\ & \ \ \ \ 9 \\ \hline & \ \ \ \ 1\ 0 \\ & \ \ \ \ \ \ 9 \\ \hline & \ \ \ \ \ \ 1 \end{array}
\qquad
\begin{array}{r|l} & 0.\ 875 \\ \hline 8 & 7.\ 0 \\ & 6\ 4 \\ \hline & \ \ 6\ 0 \\ & \ \ 5\ 6 \\ \hline & \ \ \ \ 4\ 0 \\ & \ \ \ \ 4\ 0 \\ \hline & \ \ \ \ \ \ 0 \end{array}
\qquad
\begin{array}{r|l} & 0.\ 428571\ldots\ldots \\ \hline 7 & 3.\ 0\ 0 \\ & -\ 2\ 8 \\ \hline & \ \ \ \ 2\ 0 \\ & \ \ -\ 1\ 4 \\ \hline & \ \ \ \ \ \ 6\ 0 \\ & \ \ \ \ -\ 5\ 6 \\ \hline & \ \ \ \ \ \ \ \ 4\ 0 \\ & \ \ \ \ \ \ -\ 3\ 5 \\ \hline & \ \ \ \ \ \ \ \ \ \ 5\ 0 \\ & \ \ \ \ \ \ \ \ -\ 4\ 9 \\ \hline & \ \ \ \ \ \ \ \ \ \ \ \ 1\ 0 \\ & \ \ \ \ \ \ \ \ \ \ -\ \ \ 7 \\ \hline & \ \ \ \ \ \ \ \ \ \ \ \ \ \ 3 \end{array}$$

It should be clear from the example $\frac{3}{7}$ that after reaching a remainder of 3 for the second time, the quotient will start repeating: $3/7 = 0.428571428571428571\ldots$

Therefore, the decimal representation of any rational number will be either terminating or non-terminating recurring.

Morever, a number whose decimal expansion is terminating or non-termainating recurring is rational.

Note: **Irrational numbers have decimal representation as non- terminating and non-repeating. If a number has its decimal expansion as non-terminating non-recurring, then the number will be irrational.**

Self exploratory task:

Express the following rational numbers as a fraction.

Find prime factors of the denominator

Do you observe any pattern?

Rational number	Fraction in simplified form	Factors of denominator	Pattern observed
0.25	25/100 1/4	$4 = 2x2 = 2^2$	
.375	375/1000 =75/200 =15/40 =3/8	$8 = 2x2x2 = 2^3$	
0.0875	875/10000 =7/ 80	80 = 2x2x2x2x5 $= 2^4 x 5$	
0.20	20/100 =1/5	5= 5	

Result: We have converted a real number whose decimal expansion terminates into a rational number of the form p/q where p and q are coprime, and the prime factorisation of the denominator (that is, q) has only powers of 2, or powers of 5, or both.

Post Content

Task 1: Fill in the blanks

1. The sequence of well defined steps to solve any problem is known as________.
2. Numbers having non-terminating, non-repeating decimal expansion are known as _________
3. A proven statement used as a stepping stone towards the proof of another statement is known as ___________.
4. Fundamental theorem of Arithmetic states______________________________.
5. Decimal expansion of 1/35 is ___________ .
6. The prime factorization of composite numbers is ____________.
7. The algorithm which is used to find the HCF of two positive numbers is ....
8. For any two numbers, HCF X LCM = _________ of numbers.

Task 2 Assignment:

1. Given that HCF(306,657)=9,Find LCM(306,657)
2. State the following numbers as prime or composite with justification
   (i) 5x11x13+13
   (ii) 6x5x4x3x2x1 + 3x2x1
   (iii) 1x2x3x4x5 + 7x11
3. Find the HCF of 26 and 91 using Euclid's division lemma.
4. Find the HCF and LCM of the following using fundamental theorem of Arithmetic.
   (i) 6, 72,120
   (ii) 448, 10008 and 168

5. The length of longest rod that can be fit in the box of dimension 192cm, 180cm,144 cm is

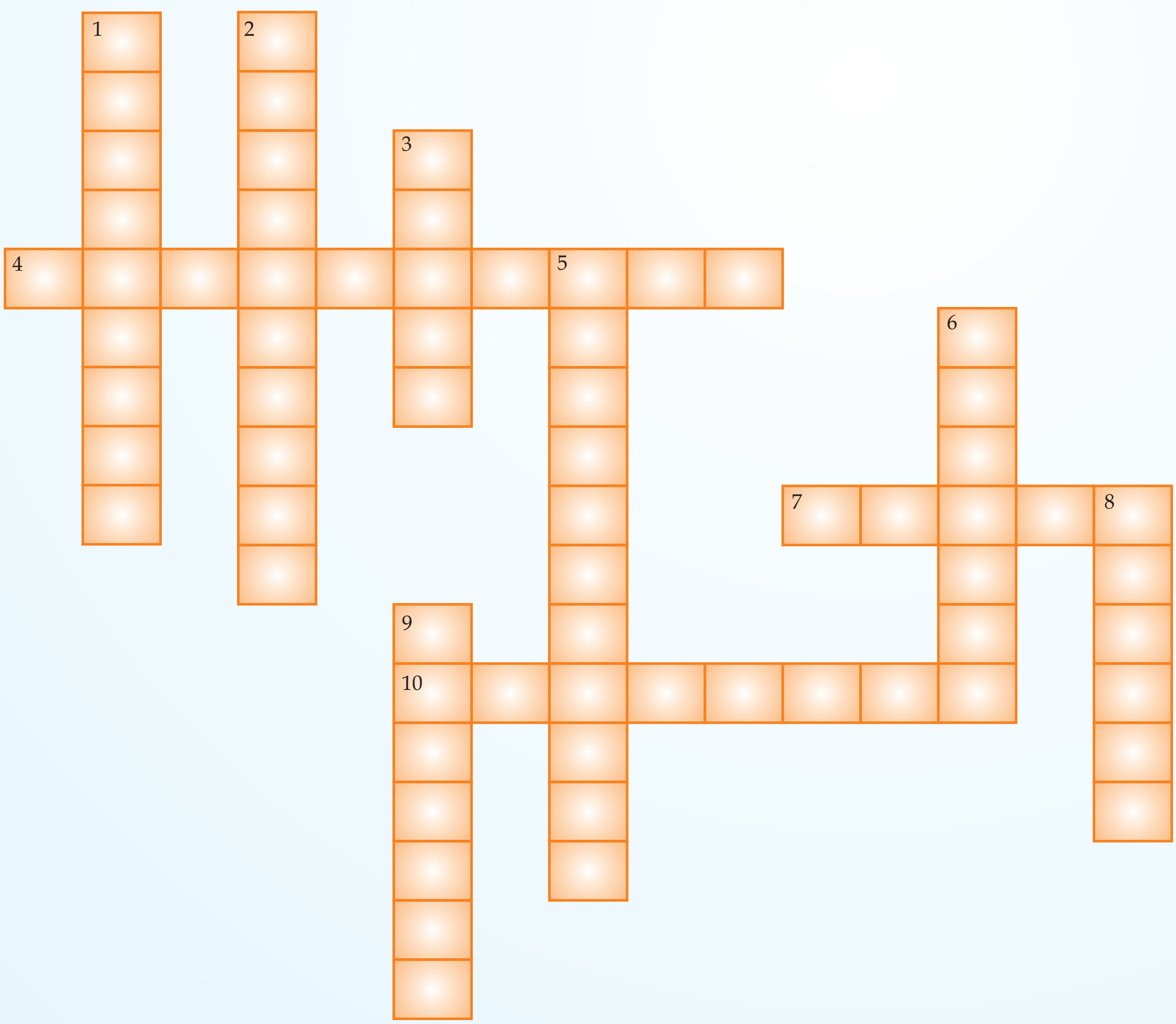
a) 12 b) 2880 c) 6 d) 2520

6. The HCF of the smallest composite number and the smallest prime number is

a) 1 b) 2 c) 3 d) 4

Task 3: Given below is a crossword sheet. Using the clues solve it.

Crossword Puzzle Sheet



Across

4. Fundamental theorem of _________ states that every composite number can be uniquely expressed as a product of primes.

7. The _______ factorization of composite numbers is unique.

10. _________ numbers have either terminating or non-terminating repeating decimal expansion.

Down

1. __________ is a sequence of well defined steps to solve any problem.

2. Numbers having non-terminating, non-repeating decimal expansion are known as

3. A proven statement used as a stepping stone towards the proof of another statement is known as

5. Decimal expansion of 3/35 is

6. The ________ expansion of rational numbers is terminating if the denominator has 2 & 5 as its only factors.

8. __________ division algorithm is used to find the HCF of two positive numbers.

9. For any two numbers, HCF X LCM = _________ of numbers.

SAMPLE RUBRIC (ASSESSMENT)

Parameter	5	4	3	2	1
EUCLID'S DIVISION LEMMA	• Can state Lemma accurately • Can explain the difference between lemma and algorithm • Can use Euclid's Division Algorithm to find HCF correctly				• Cannot state Lemma accurately • Cannot explain the difference between lemma and algorithm • Cannot use Euclid's Division Algorithm to find HCF correctly
Prime factorisation	• Can make factor tree of given number • Can find the HCF given numbers accurately using prime factorisation • Can find LCM of given numbers with accuracy using prime factorisation • Can use the formula HCF x LCM= Product of two Numbers correctly				• Cannot make factor tree of given number • Cannot find the HCF given numbers accurately using prime factorisation • Cannot find LCM of given numbers with accuracy using prime factorisation • Cannot use the formula HCF x LCM= Product of two Numbers correctly

Parameter	5	4	3	2	1
Funda-mental Theorem of Arithmetic	• Can state the Theorem accurately • Can express every composite number as product of prime numbers correctly				• Cannot state the Theorem accurately • Cannot express every composite number as product of prime numbers correctly
Decimal expansion of rational numbers	• Can define rational numbers with reference to its decimal expansion correctly • Can define irrational numbers with reference to its decimal expansion correctly • Can segregate rational numbers from irrational numbers correctly • Can express rational numbers as decimals and vice-versa, with accuracy • Can recognize the rational number as terminating decimal or non terminating, recurring decimal on the basis of its denominator correctly				• Cannot define rational numbers with reference to its decimal expansion correctly • Cannot define irrational numbers with reference to its decimal expansion correctly • Cannot segregate rational numbers from irrational numbers correctly • Cannot express rational numbers as decimals and vice-versa, with accuracy • Cannot recognize the rational number as terminating decimal or non terminating, recurring decimal on the basis of its denominator correctly

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