

MATHEMAGIC ACTIVITY BOOK

CLASS - VIII

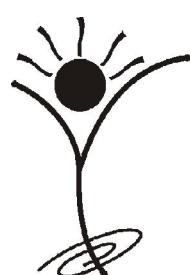
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SYLLABUS GUIDELINES

CLASS - VIII

Based on CBSE, ICSE & GCSE Syllabus

Number System

(i) Rational Numbers:

- Properties of rational numbers. (including identities). Using general form of expression to describe properties.
- Consolidation of operations on rational numbers.
- Representation of rational numbers on the number line.
- Between **any** two rational numbers there lies another rational number (Making children see that if we take two rational numbers then unlike for whole numbers, in this case you can keep finding more and more numbers that lie between them.)
- Word problem (higher logic, two operations, including ideas like area)

(ii) Powers

- Integers as exponents.
- Laws of exponents with integral powers

(iii) Squares, Square roots, Cubes, Cube roots.

- Square and Square roots
- Square roots using factor method and division method for numbers containing (a) no more than total 4 digits and (b) no more than 2 decimal places
- Cubes and cubes roots (only factor method for numbers containing at most 3 digits)
- Estimating square roots and cube roots. Learning the process of moving nearer to the required number.

(iv) Playing with numbers

- Writing and understanding a 2 and 3 digit number *in generalized form* ($100a + 10b + c$, where a, b, c can be only digit 0-9) and engaging with various puzzles concerning

this. (Like finding the missing numerals represented by alphabets in sums involving any of the four operations.) Children to solve and create problems and puzzles.

- Number puzzles and games
- Deducing the divisibility test rules of 2,3,5,9,10 for a two or three-digit number expressed in the general form.

Algebra

(i) Algebraic Expressions

- Multiplication & division of algebraic exp. (Coefficient should be integers)
- Some common errors

$$2 + x \neq 2x, 7x + y \neq 7xy$$

- Identities

$$(a \pm b)^2 = a^2 \pm 2ab + b^2, a^2 - b^2 = (a - b)(a + b)$$

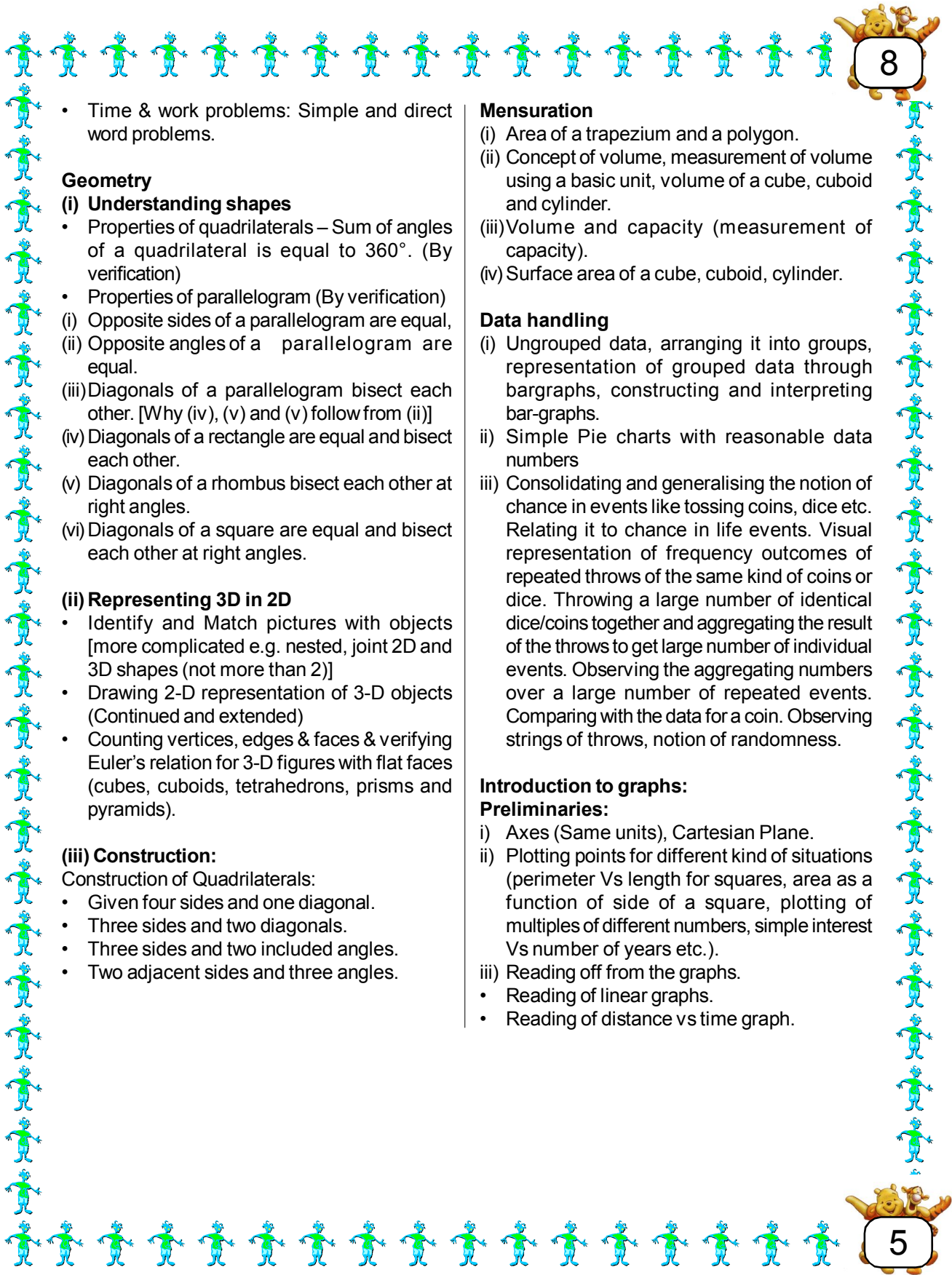
Factorisation (simple cases only) as examples of the following types

$$a(x + y), (x \pm y)^2, a^2 - b^2, (x + a)(x + b)$$

- Solving linear equations in one variable in contextual problems involving multiplication and division (word problems) (avoid complex coefficient in the equations).

Ratio and Proportion

- Slightly advanced problems involving applications on percentages, profit & loss, overhead expenses, Discount, tax.
- Difference between simple and compound interest (compounded yearly up to 3 years or half-yearly up to 3 steps only), Arriving at the formula for compound interest through patterns and using it for simple problems.
- Direct variation : Simple and direct word problems.
- Inverse variation : Simple and direct word problems.



- Time & work problems: Simple and direct word problems.

Geometry

(i) Understanding shapes

- Properties of quadrilaterals – Sum of angles of a quadrilateral is equal to 360° . (By verification)
- Properties of parallelogram (By verification)
- (i) Opposite sides of a parallelogram are equal,
- (ii) Opposite angles of a parallelogram are equal.
- (iii) Diagonals of a parallelogram bisect each other. [Why (iv), (v) and (v) follow from (ii)]
- (iv) Diagonals of a rectangle are equal and bisect each other.
- (v) Diagonals of a rhombus bisect each other at right angles.
- (vi) Diagonals of a square are equal and bisect each other at right angles.

(ii) Representing 3D in 2D

- Identify and Match pictures with objects [more complicated e.g. nested, joint 2D and 3D shapes (not more than 2)]
- Drawing 2-D representation of 3-D objects (Continued and extended)
- Counting vertices, edges & faces & verifying Euler's relation for 3-D figures with flat faces (cubes, cuboids, tetrahedrons, prisms and pyramids).

(iii) Construction:

Construction of Quadrilaterals:

- Given four sides and one diagonal.
- Three sides and two diagonals.
- Three sides and two included angles.
- Two adjacent sides and three angles.

Mensuration

- (i) Area of a trapezium and a polygon.
- (ii) Concept of volume, measurement of volume using a basic unit, volume of a cube, cuboid and cylinder.
- (iii) Volume and capacity (measurement of capacity).
- (iv) Surface area of a cube, cuboid, cylinder.

Data handling

- (i) Ungrouped data, arranging it into groups, representation of grouped data through bargraphs, constructing and interpreting bar-graphs.
- ii) Simple Pie charts with reasonable data numbers
- iii) Consolidating and generalising the notion of chance in events like tossing coins, dice etc. Relating it to chance in life events. Visual representation of frequency outcomes of repeated throws of the same kind of coins or dice. Throwing a large number of identical dice/coins together and aggregating the result of the throws to get large number of individual events. Observing the aggregating numbers over a large number of repeated events. Comparing with the data for a coin. Observing strings of throws, notion of randomness.

Introduction to graphs:

Preliminaries:

- i) Axes (Same units), Cartesian Plane.
- ii) Plotting points for different kind of situations (perimeter Vs length for squares, area as a function of side of a square, plotting of multiples of different numbers, simple interest Vs number of years etc.).
- iii) Reading off from the graphs.
 - Reading of linear graphs.
 - Reading of distance vs time graph.



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Activity work sheet



Math Needs Something Special

Studying Math is Different from Studying Other Subjects

- Math is learned by **doing** problems. Do the homework. The problems help you learn the formulas and techniques you need to know, as well as improve your problem-solving prowess.
- A word of warning: Each class builds on the previous ones. You must keep up with the teacher, attend class, read the text and do homework every day. Falling a day behind puts you at a disadvantage. Falling a week behind puts you in deep trouble.
- A word of encouragement: Each class builds on the previous ones. You're always reviewing previous material as you do new material. Many of the ideas hang together. Identifying and learning the key concepts means you don't have to memorize as much.

The higher the math class, the more types of problems. In earlier classes, problems often require just one step to find a solution. Increasingly, you will tackle problems which require several steps to solve them. Break these problems down into smaller pieces and solve each piece - divide and conquer!

Basically problems can be categorized into different types which needs different approaches. The most problematic is the word problems.

Problem types:

- Problems testing memorization ("drill"),
- Problems testing skills ("drill"),
- Problems requiring application of skills to familiar situations ("template" problems),
- Problems requiring application of skills to unfamiliar situations (you develop a strategy for a new problem type),
- Problems requiring that you extend the skills or theory you know before applying them to an unfamiliar situation.

The term "word problem" has only negative connotations. It's better to think of them as "applied problems". These problems should be the **most interesting** ones to solve. Sometimes the "applied"



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Activity work sheet

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problems don't appear very realistic, but that's usually because the corresponding real applied problems are too hard or complicated to solve at your current level. But at least you get an idea of how the math you are learning can help solve actual real-world problems.

How to Solve Applied Problem

- First convert the problem into mathematics. This step is (usually) the most challenging part of an applied problem. If possible, start by **drawing a picture**. **Label** it with all the quantities mentioned in the problem. If a quantity in the problem is not a fixed number, **name** it by a **variable**. **Identify** the goal of the problem. Then complete the conversion of the problem into math, i.e., find equations which describe relationships among the variables, and describe the goal of the problem mathematically.

Solve the math problem you have generated, using whatever skills and techniques you need.

As a final step, you should convert the answer of your math problem back into words, so that you have now solved the original applied problem.



Did You Know That ..

- Everything you can do with a ruler and a compass you can do with the compass alone.
- Among all shapes with the same perimeter a circle has the largest area.
- Much as with people, there are irrational, perfect, complex numbers
- You are wrong if you think Mathematics is not fun.
- Some numbers are square, yet others are triangular.
- $12+3-4+5+67+8+9=100$ and there exists at least one other representation of 100 with 9 digits in the right order and math operations in between.
- One can cut a pie into 8 pieces with three movements.
- Among all shapes with the same area circle has the shortest perimeter.

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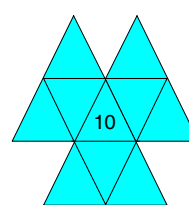
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Activity work sheet

Numbers Puzzle

Magic Triangles

★ Using the numbers 1 to 9, place one in each of the smaller triangles of the figure below so that the sum of the numbers in each of the four larger triangles is 25.



VANISHING NUMBERS

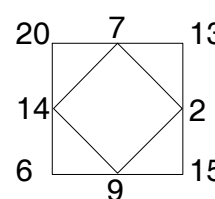
★ Draw a square and write numbers in the corners, any four numbers.

Subtract the smaller number from the larger number on each side and place the answers at the middle of the sides.

Now make another square inside the first square by joining the mid-points :

Do the same with the figures of this square, and continue doing it until....? What happens ? It finally comes to zero.

Try it again with different starting numbers, and see how it always comes down to 0. Try it on your friends. Let them choose the numbers.



RAMANUJAM'S NUMBER

★ It is not everyone who has a number named after them. But the number 1729 is known as Ramanujam's number.

The numbers we use today are known as arabic numerals, or more properly as Hindu-Arabic numerals. The Arabs spread the system across the Mediterranean Sea to Europe. But they learned the numbers from India, where they probably originated some 2,000 years ago.



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Activity work sheet



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A Ramanujam was lying ill in a cambridge hospital when a colleague at the university, Professor Hardy, came to visit him. They naturally discussed numbers, and the professor said that he'd come in a taxi with "a very boring number – 1729". Ramanujam's eyes lit up. "That's not a boring number at all," he said. "It's the only number that is the sum of two cubes in two different ways."

Can you work out the two sets of cubes that each add up to 1729?

Number 1089

For this trick, you will need a pencil and two pieces of paper. First write down your number on one of the sheets of paper. Fold your paper so that your friend can't see it. Now give a sheet of paper to your friend. Tell him or her to think of a number and then write it down. But before he or she writes it down, tell him or her to have a three-digit number and have the largest number first then the smaller number and then the smallest number. For example: 742 or 971.

- Tell him not to let you see his number.
 - Next tell him or her to reverse the number
- Now tell him or her to subtract the smallest number from the largest one.
- Now ask your friend to reverse that number around.
 - Now add them both together.
 - This would be 1089. Now give him or her your paper and then watch his face when he sees that your number was 1089. The answer is always going to be 1089 so always write that number down.

1. Let the number be 861
2. Reverse the number 168
3. $861 - 168 = 693$
4. Reverse of 693 is 396
5. $693 + 396 = 1089$



These are the party trick which can amaze you friends and can make you famous among your friends.



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Activity work sheet



A quick way to square numbers that end in 5 using the formula
3Y ONE MORE THAN THE ONE BEFORE.

$$75^2 = 5625$$

75^2 means 75×75 .

The answer is in two parts : 56 and 25.

The last part is always 25.

the first part is the first number, 7, multiplied

by the number "one more", which is 8 :

$$\text{so } 7 \times 8 = 56$$

$$75^2 = 56 \times 25$$

Similarly $85^2 = 7225$

because $8 \times 9 = 72$

Mathemagic Quickies

TRY THESE

1. 45^2 , 2. 65^2 , 3. 95^2 ,
4. 35^2 , 5. 15^2 , 6. 55^2 ,
7. 85^2 , 8. 25^2 , 9. 105^2 ,
10. 115^2

Method for multiplying number where the first figures are the same and the last figures add up to 10.

$$32 \times 38 = 1216$$

Both numbers here start with 3 and the last figures (2 and 8) add up to 10.

So we just multiply 3 by 4 (the next number up) to get 12 for the first part of the answer.

And we multiply the last figures : $2 \times 8 = 16$ to get the last part of the answer.

Diagrammatically :

$$2 \times 8 = 16, \quad 3 \times 4 = 12$$

$$32 \times 38 = 1216$$

$$\text{And } 81 \times 89 = 7209$$

we put 09 since we need two figures as in all the other examples.

Practice Time

1. 43×47 , 2. 24×26 ,
3. 62×68 , 4. 17×13 ,
5. 59×51 , 6. 77×73 ,
7. 42×48 , 8. 37×33 ,
9. 91×99 , 10. 64×66 .



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Activity work sheet



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Squaring a 2-digit number beginning with 1

1. Take a 2-digit number beginning with 1.
2. Square the second digit (keep the carry) $_ _ \times$.
3. Multiply the second digit by 2 and add the carry (keep the carry) $_ \times _$
4. The first digit is one (plus the carry) $\times _ _$.

Example :

1. If the number is 16, square the second digit. $6 \times 6 = 36$. $_ _ 6$
2. Multiply the second digit by 2 and add the carry:
 $2 \times 6 + 3 = 15$. $_ 5 _$
3. The first digit is one plus the carry : $1 + 1 = 2$. $2 _ _$
4. So $16 \times 16 = 256$.

See the pattern?

1. For 19×19 , square the second digit : $9 \times 9 = 81$. $_ _ 1$
2. Multiply the second digit by 2 and add the carry:
 $2 \times 9 + 8 = 26$. $_ 6 _$
3. The first digit is one plus the carry :
 $1 + 2 = 3$. $3 _ _$
4. So $19 \times 19 = 361$.

TRY THESE

1. 14, 2. 15,
3. 17, 4. 18,
5. 12

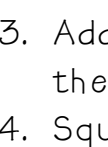


Squaring a 2-digit number beginning with 5

1. Take a 2-digit number beginning with 5.
2. Square the first digit.
3. Add this number to the second number to find the first part of the answer.
4. Square the second digit: this is the last part of the answer.

Example :

1. If the number is 58, multiply $5 \times 5 = 25$ (square the first digit).



Example :

1. If the number is 58, multiply $5 \times 5 = 25$ (square the first digit).

TRY THESE

1. 54, 2. 57,
3. 59, 4. 56,
5. 56



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