ππ DAY IN HIGH SCHOOLS

THE MATHEMATICAL CONSTANT PI (ππ) can be approximately written as **22/7 or 3.14**. Many educational institutions in the world observe **22/7** i.e. **22nd of July as π DAY**. Some others, mostly in the USA do the same on 14th of March. July date is the only choice for our [state] school system. On that date all the students could be included without any pressure of exams or syllabus deadlines.

INFO ON π

Detailed information on the definition, value, calculation and historical aspects of this mathematical subject is available in **WIKIPEDIA**. Even though the article is lucid [= easily understandable] I do not recommend it for high school students [even if they are in English medium]. Hence I recommend that the teachers could draw from this article and any other sources and give a brief summary. [If a guest lecturer could be found, it is even better]. The Wikipedia article is good from the point of view of historical aspects including the contribution of Indian astronomers and mathematicians. Teachers could use the info to motivate students. But there are ways by which children can be made to participate. I give below some of them.

Determination of the value of π – Hands-on methods

1.. Draw **circles of known radii**- measure the circumferences**[[c]]-** tabulate the ratio **c/2r** --find the mean value - use a sharp pencil and keep a steady hand to draw the circles- use a string [or twine, or silken thread] to measure the c.- no rubber bands, no elastic ones. Use pins if necessary during the measurement of c----- r is already chosen – do at least three times using different r values,

2 In 1 above, **use a graph paper-----** draw at least three circles on the graph paper . ------ measure the **area[A]** by actually counting the small squares. ------- CALCULATE r square [i.e. rxr] - tabulate – for each circle [i.e. Each row in the table] ----find the **ratio A/[rxr]** - find the average- teachers may ask the students about counting the squares on the graph paper. There is a lot to learn in this activity. --- The circles can be away from one another or even concentric.

3. In method 1 above, a variation can be made. -------Instead of drawing a circle, take a number of **circular objects** ordinarily available – either use them as they are OR draw a neat outline - measure the diameter **{d} and circumference {c}-----** make a table . **Calculate π= c/d-** --------find the mean value. –the objects selected could be a plate, bangles, lids, wheels, drums etc. – for measuring c , string method can be used – if the object is a tin or wheel even a tailor's tape is ok. ----- For measuring d, use a vernier caliper ---- a handmade version of calipers is two blocks [bricks or tiles or books or setsquares] –

4 In 2 above, instead of drawing circles, we can use readily available circular objects. See 3 above- measure the area by counting the squares. - For a circle which is already drawn, finding the diameter is easier than radius. – d is found as in 3 above. Use formula: **π = 4A/[dxd]** ------- this needs 2 more columns in the table A, d, 4A, [dxd], 4a/[dxd] - take the average of the last column.

5. Do by volume measurement ----- use the formula **V= {π] [rxr} [h]** for a **cylinder**. —--use perfectly cylindrical objects like old-fashioned rice-measurer—Or oil measurer [in this case even the volume in litres is known]------ or use cylindrical portion of objects e.g. Water bottle, some dubbas [containers[, measuring jar, beakers [from the lab], long pipes etc.

Other methods are more abstract and very difficult and therefore less fun. For high school students all or one or two of the above methods may be sufficient and interesting. There are fall-out benefits of this activity. One is that multiple measurements should be made to get at one value for a parameter. Second is that if you do an experiment by varying the variables , you can find the mean value of the results. Thirdly, the simple act of tabulating data itself is of value to the learner.

6. There is a cut-and-paste activity given in text books. Make a circle on cardboard. Cut it into 16 or more EQUAL PARTS by cutting along the diameters. You can then arrange the pieces in the shape of a rectangle. The length of this rectangle will be [π]x[R] and the breadth will be [R] . This observation assumes that circumference **{c} = {2x(πx[R]}.** Knowing that the area of a rectangle = [length[x[breadth] one can show that area of a circle = (π x{rxr} [experimentally!] . Whether this activity was done earlier or not, now is an occasion to do this also. A group of students could take this idea and pretend that they do not know either the value of π or the relevant formulas. This may be fun for the top percentile students.

How to tabulate is left to the teachers or volunteers. If anyone needs help in this or any item discussed above write to **engoneforall@gmail.com**