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COMPETENCY BASED QUESTIONS ON S.A. & VOLUME

(1) A pond is in the shape of a trapezium whose parallel sides are 40 m and 20 m respectively, and the depth of the pond is 5 m at the middle. The width of the pond is 60 m. During the rainy season, when the pond is completely filled with water, it is decided to clean the pond by transferring all the water into a nearby cylindrical municipal tank. The cylindrical tank has a base area of 300 m^2 and a height of 40 m.

Will the tank overflow if all the water from the pond is transferred into it?
If not, what part of the tank will remain unfilled with water?
To fill the tank up to the brim, how many spherical balls of radius 21 cm must be dropped into it?
If the volume of water displaced by these spherical balls is converted into a cube of ice, what will be the length of the diagonal of that cube?

(2) What will be the surface area of a cube when the largest possible right circular cylinder is scooped out from it, if the side of the cube is 14 cm? Also find the volume of the cube when the cylinder is scooped out from the cube.

(3) A 3×3 Rubik's cube is made up of smaller cubes, each having an edge length of 1.5 cm. If all the corner cubes are removed from the Rubik's cube, determine the changes (if any) in the total surface area and volume of the cube. Give reasons for your answer.

(4) Why are houses with verandahs all around, like those seen in old zamindar houses, rarely found in modern times? Explain the reasons for your answer.

(5) A cone having the same radius and height as a cylinder is placed inside the cylinder. The radius of the cylinder is half of its height, and the height is the second multiple of 7 feet. The remaining space in the cylinder (after placing the cone) is filled with water. This water is then poured into a rectangular parallelepiped having a base of dimensions 150 inches × 800 inches. Find the height of the water level in the rectangular parallelepiped.