Prince Rupert's Cube

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B.Sc. III (Mathematics)

Prince Rupert's cube is named after Prince Rupert of the Rhine, who asked whether a cube could be passed through a hole made in another cube of the same size without splitting the cube into two pieces.

In geometry, **Prince Rupert's cube** is the largest cube that can pass through a hole cut through a unit cube without splitting it into two pieces. Its side length is approximately 1.06, 6% larger than the side length 1 of the unit cube through which it passes.

Solution :

Place two points on two adjacent edges of a unit cube, each at a distance of 3/4 from the point where the two edges meet, and two more points symmetrically on the opposite face of the cube. Then these four points form a square with side length

(By the Pythagorean Theorem)

Applications :

*   A polyhedron P is said to have the *Rupert property* if a polyhedron of the same or larger size and the same shape as P can pass through a hole in P. All five Platonic Solids- the cube, regular tetrahedron, regular octahedron, regular dodecahedron, and regular icosahedron- have the Rupert property. Out

1

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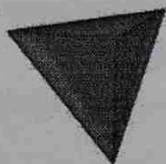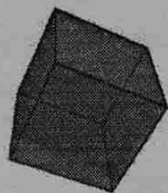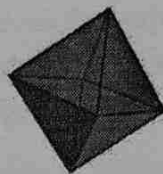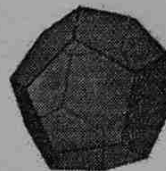
| Tetrahedron | Cube | Octahedron | Dodecahedron | Icosahedron |
| Four faces | Six faces | Eight faces | Twelve faces | Twenty faces |

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- The tetrahedron, cube, and octahedron all occur naturally in crystal structures.

- Many viruses such as the herpes virus, have the shape of a regular icosahedron.

- Platonic solids are often used to make dice, because dice of these shapes can be made fair, 6-sided dice are very common, but the other numbers are commonly used in role-playing games.

- These shapes frequently show up in other games or puzzles. Puzzles similar to a Rubik's cube come in all five shapes.

2