Kresge Auditorium

- Designed by Eero Saarinen
- Dedicated in May 1955
Plan of Kresge
Now and Then
Construction

• Initially, Kresge was designed to be supported at three points only – the three points where the spherical shell meets the ground.
• But the shell showed significant deflections after the construction support was removed. So engineers added nine columns for additional exterior support.
• Because the building is an auditorium, no internal supports were added (so that the stage is visible from all places in the auditorium).
Look Familiar?
An Eighth of a Sphere

Source: http://tech.mit.edu/V118/N33/science.33a.html
Math Tourist

- Designed by Eero Saarinen, MIT's Kresge Auditorium has a horizontal cross section that resembles an equilateral triangle with curved sides, close to the geometry of a Reuleaux triangle.

- The Mathematical Tourist
Reuleaux triangle

- A Reuleaux triangle is a shape formed from the intersection of three circular disks, each having its center on the boundary of the other two. Its boundary is a curve of constant width.
- Because all its diameters are the same, the Reuleaux triangle is one answer to the question "Other than a circle, what shape can a manhole cover be made so that it cannot fall down through the hole?"
- They are named after Franz Reuleaux, a 19th-century German engineer who pioneered the study of machines for translating one type of motion into another, and who used Reuleaux triangles in his designs.
- Other applications of the Reuleaux triangle include giving the shape to drill bits for drilling square holes.
The rotor of a Wankel engine is similar in shape to a Reuleaux triangle with sides that are somewhat flatter.
The most basic property of the Reuleaux triangle is that it has constant width, meaning that for every pair of parallel supporting lines (two lines of the same slope that both touch the shape without crossing through it) the two lines have the same Euclidean distance from each other, regardless of the orientation of these lines.
Check it out Yourself

- By the Blaschke–Lebesgue theorem, the Reuleaux triangle has the smallest possible area of any curve of given constant width. This area is

\[ \frac{1}{2} (\pi - \sqrt{3}) s^2 \approx 0.70477 s^2 \]

- where \( s \) is the constant width.
Egg Shell

- The dome-shaped concrete roof of the auditorium is an eighth of a sphere that rests on three points of an equilateral triangle is a mere nine centimeters thick at its thinnest point, making it proportionally thinner than an eggshell.

- Since domes have notoriously poor acoustics, the interior was hung with acoustic panels to reflect sound throughout the auditorium.