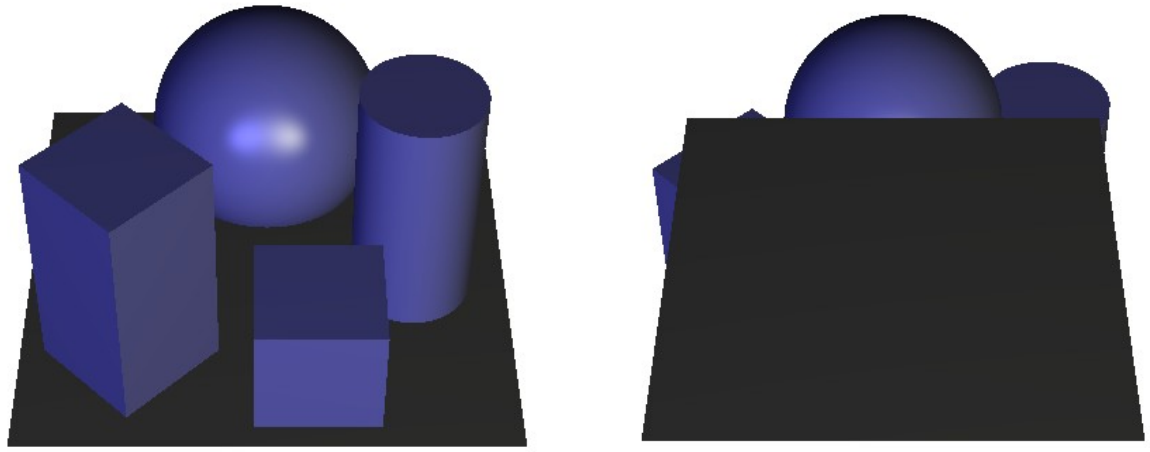
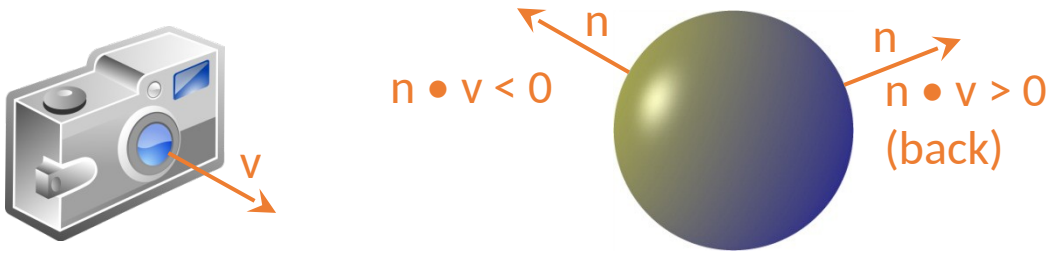
Hidden Surface Removal: Motivation

- Model parts independently processed by rendering pipeline: show front parts only
- Avoid unnecessary processing



Back Face Culling

- Back faces (usually) not visible
- Reduction of computation *for closed objects*
- Removal early in the pipeline
- Reduction of polygon count by approx. ½ of the total polygon number
- Computation: discard polygons where the dot product of the surface normal with the view direction > 0



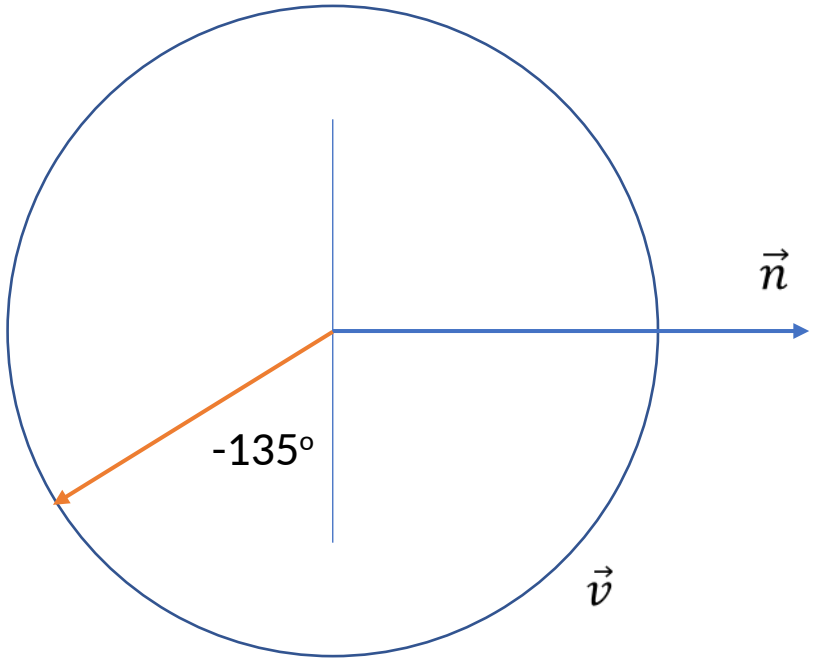
Why dot product works…

- Recall: dot product involves cosine

$$\mathbf{A} \cdot \mathbf{B} = \|\mathbf{A}\| \, \|\mathbf{B}\| \cos\theta$$

- Cosine is +ve from -90° to 90°

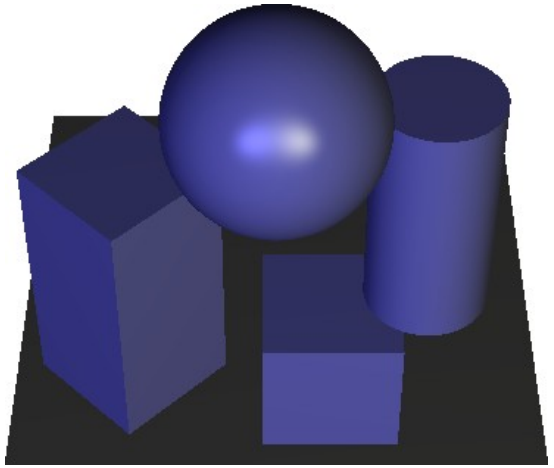
Let's translate v and n to the origin to compare the angles…



Cosine is < 0 – looking at the front

Back Face Culling

- Back face culling as HSR technique?
  - (usually) not sufficient due to partial overlaps of several objects in the scene
  - would work reliably only if no overlaps occur
  - e.g., if only one convex object is shown
- Order of depicted objects (overlapping) with only back face culling still depends on rendering sequence
  → idea for real HSR technique



Back Face Culling

- What's it good for?
- It eliminates approximately half the triangles in the model, the ones of the back side
- We don't need to draw these triangles
- Used as part of the pipeline to reduce the number of triangles that need to be drawn
- Can reduce rendering time by ½