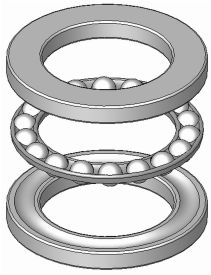
Question 1:

- The outer, inner race, and the retainer seem to be made of plastic. The metallic balls are made of metal (might be stainless steel).
- Certainly, the plastic will suffer more wear. The common bearing failure will occur during lubrication failure. I think the outer race will suffer the most wear because there is surface-surface contact between the balls and the outer race. That causes friction and wear during rolling motion, so the wear pattern will also cycle around the inner surface of the outer race. The retainer will keep the balls "stable" with the surface of the inner race, so there will not be significant wear compared to the outer race. As a result, the outer race will fail first.

Question 2:

- Yes, bearings are designed to handle both radial and axial loads. Radial loads are loads acting perpendicular to the x-axis and axial loads are loads acting along the x-axis. However, bearings will tend to tolerate radial loads. The reason simply is our ball bearings are radial bearings. Rsial bearings will support mainly radial loads with a minimal thrust load endurance/capacity. On the other hand, thrust bearings should not be mainly used to endure radial loads.



Thrust Bearings

Radial Bearings

Question 3:

- High load or excessive load can cause permanent deformation in the bearings, especially when we press on the inner race with high force while rotating the race.
- Fatigue failure: any fractures in the running surface, denting, or scratches of raceways due to wear.
- False brinelling: wear marks on the axial direction at each ball position often due to lubrication issues when the bearings cannot be in motion.
- Misalignment: the ball wear path is not aligned with the raceway's edges causing temperature rises when trying to put bearings in motion.
- Fits: either loose fits or tight fits.

Question 4:

- From the lecture, because our ball bearings were made of mainly plastic material, which is cheap, and best suited for low-speed and low to moderate load. The material itself is

destined to be highly worn and short life if exposed to high motion, force, and stress conditions.

Question 5:

	Measurement 1	Measurement 2
Ball 1	4.75 mm	4.75 mm
Ball 2	4.76 mm	4.73 mm
Ball 3	4.75 mm	4.74 mm
Ball 4	4.75 mm	4.77 mm
Ball 5	4.73 mm	4.75 mm

Question 6:

- Measurement variances are subjected to a degree of uncertainty regardless of human and instrument accuracy. There are a couple of factors that can cause the slightly different data collected from the two measurements above:
    - Equipment quality: the caliper that our group got might not be accurate compared to other groups due to long-term use, with low resolution. Dirt can also build up and slowly change the measured values over time.
    - Procedural errors: Rough handling of the object because it was hard to measure the ball within the outer race, while my other hand had to hold the caliper and adjust it.
    - Workspace interference: When one of us needs to concentrate and remain “stable” to measure the notch of the retainer, a suddenly loud noise can affect the precision and accuracy of the measurement.
    - Environmental disturbances: the room was hot causing the hands to sweat, resulting in inaccuracy of measurements when carried out.
    - The objects themselves: in the lecture, we learned that plastic material is subjected to slippery and skidding.