We studied the physics of black-body radiation and the application of black-body radiation and pyroelectric detectors in non-contact thermometry. Cylindrically-shaped samples were mounted in a temperature-controlled tube furnace and the thermal radiation generated by these targets was focused on a pyroelectric detector by a Si lens. An optical chopper produced the modulation of the thermal radiation needed to operate the pyroelectric detector. As expected, the signal produced by the detector scales as $1/f$ at high frequencies, where f is the chopper frequency; the signal reaches a shallow maximum near 10 Hz. We used a hollow graphite cylinder to approximate a black-body and found that the pyrometer signal is approximately proportional to T^4-T_0^4 as predicted by the Planck radiation law. The signal decreases and the calibration curve becomes steeper when the BaF_2 window in front of the detector is replaced with fused-quartz window that blocks infrared radiation with wavelengths $\lambda>4$ μm. We measured the emissivity of polished and rough Al surfaces by taking the ratio of the data measured using the Al targets to the data measured using the graphite target. The emissivity of polished Al is small, <0.1, and difficult to determine accurately because of stray radiation from hot surfaces at the front of the tube furnace. The emissivity of the rough aluminum surface is approximately 0.3 and decreases slightly with increasing temperature.