

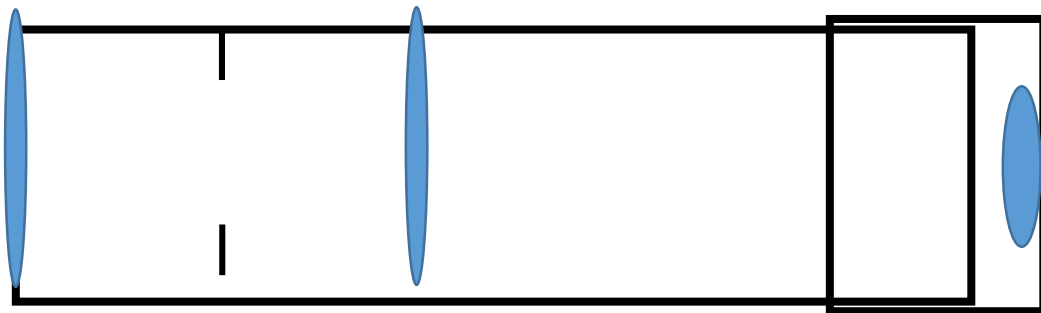
## WORKSHEETS FOR PUPILS

Activity name	Expected duration	Difficulty of the activity	Age of children for which the activity is suitable	Tools and material used	Objective of the activity
<b>Practical Exercise 1:</b>	1 lesson	medium	14 – 15 years	drawing supplies	Deepening the knowledge of geometrical optics.
<b>Practical Exercise 2:</b>	1 lesson	higher	12 – 14 years	small and large magnifying glass, ruler, tube for drawings, saw, scissors, glue gun, calculator	Deepening the knowledge of geometrical optics and the principle of telescope construction.
<b>Practical Exercise 3:</b>	1 lesson	higher	12 – 14 years	small and large magnifying glass, ruler, tube for drawings, quarter sheet of paper, saw, scissors, glue gun, calculator	Deepening the knowledge of geometrical optics and the principle of telescope construction.
<b>Practical Exercise 4:</b>	1 lesson	medium	12 – 14 years	scissors, ruler, calculator	Understanding the principle of mirror construction from segments.
<b>Practical Exercise 5:</b>	1 lesson	medium	12 – 14 years	two quarter sheets of paper, aluminium foil, pin, drawing supplies, scissors, adhesive tape	The principle of a pinhole camera.

### Practical Exercise 3: ENHANCED KEPLER-TYPE TELESCOPE

The colour error of the objective lens can be partially compensated without the use of lenses with a different refractive index. The construction described is based on a symmetrical Gray objective lens used in periscopes and cameras around 1890. The objective lens consists of two identical converging lenses positioned at a distance of  $0.8 f$ . The result of the construction described below is a fairly decent 42/420 mm telescope with only slight optical defects.

1. Glue two identical lenses, medium or large, with a suitable paper tube at a distance of  $0.8 f$ . If the focal length of the medium lens is 14 cm, prepare the objective lens in a way that the lenses are 11.2 cm away.
2. In the centre of the objective lens (exactly between the lenses), glue a diaphragm whose diameter is one-tenth smaller than the diameter of the lenses used. That means, for medium lenses with a diameter of 6.5 cm, in the centre of the lens glue a circle cut out from hard paper with a hole and diameter of about 5.9 cm.



3. Attach the created objective lens to one end of the tube with a glue gun, then glue the ocular lens to the opening in the paper stopper that closes the tube. The telescope can be focused by moving the stopper at the end of the tube.
4. With the telescope, you can easily observe craters on the Moon, the Andromeda Galaxy, the Orion Nebula, without much detail of the planet (for that you need a real telescope).