

## Applications of reflection by plane mirrors

### Principle and equipment

#### Principle

Using two plane mirrors, show how the law of reflection can be applied in optical devices (optical square, (reflex) reflector, periscope).

#### Equipment

Position No.	Material	Order No.	Quantity
1	Demo Physics board with stand	02150-00	1
2	PHYWE Multitap transformer, DC: 2/4/6/8/10/12 V, 5 A / AC: 2/4/6/8/10/12/14 V, 5 A	13533-93	1
3	Lamp, halogen, mag. held, 12V/50W	08270-20	1
4	Opt. block, triangular, magnet held	08270-06	1
5	Plane mirror, magnet held	08270-13	2

## Set-up and procedure

### Optical square experiment:

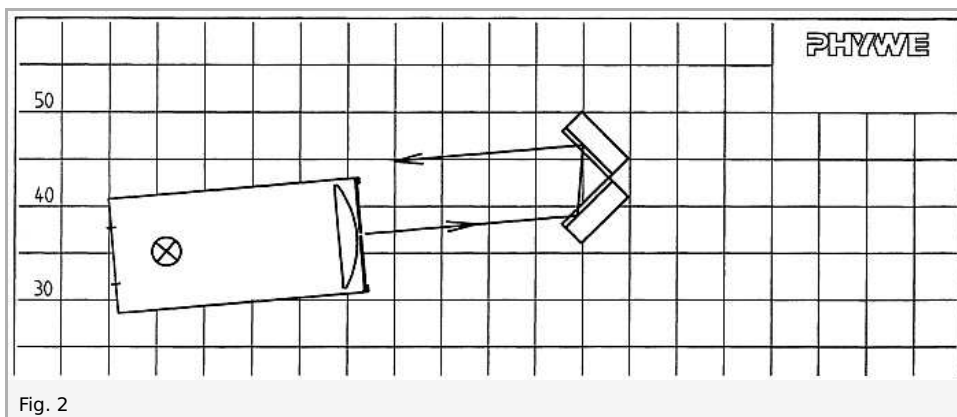
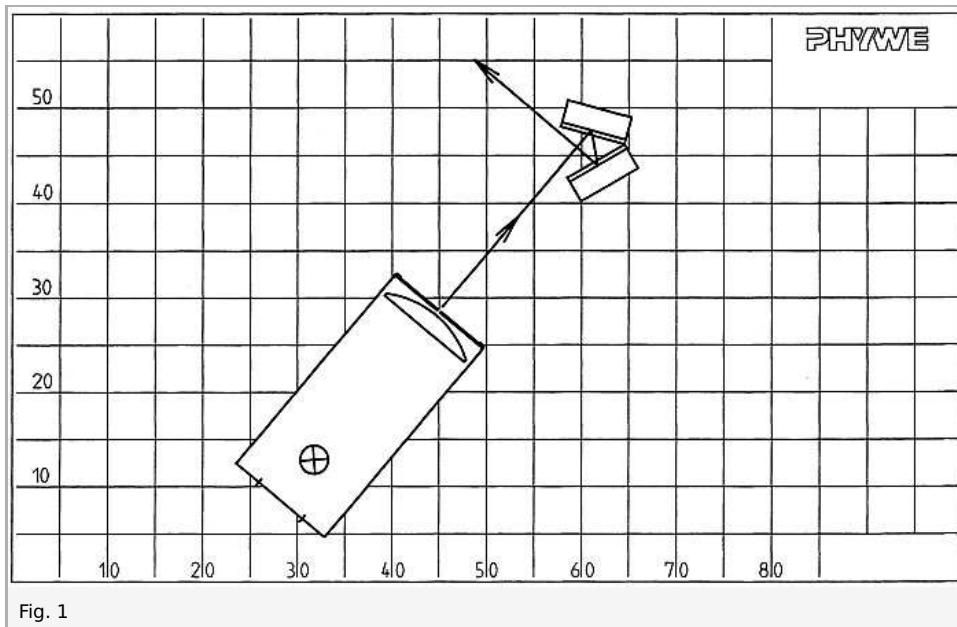
- Place the triangular optical block on the magnetic optics panel.
- Position the plane mirrors so that the mirrored sides touch at one end and form an angle of  $45^\circ$ .
- Remove the optical block. Position the magnet-held lamp with a one-slit diaphragm so that the light beam is reflected by both mirrors (Fig. 1).
- Change the direction of the lamp's light beam several times.

### Reflex reflector experiment:

- Place the triangular optical block on the magnetic optics panel.
- Position the plane mirrors so that the mirrored sides touch at one end and form an angle of  $90^\circ$ .
- Remove the optical block.
- Position the magnet-held lamp with a one-slit diaphragm so that the light beam is reflected by both mirrors (Fig. 2).
- Change the direction of the lamp's light beam several times.

### Periscope experiment

- Place the magnet-held lamp with a two-slit diaphragm on the magnetic optics panel.
- Place the first plane mirror in the light beam in such a way that the light beam is deflected by  $90^\circ$ .
- Place the second plane mirror parallel to the first one in such a way that the light beam is again deflected by  $90^\circ$  (Fig. 3).



# Student's Sheet

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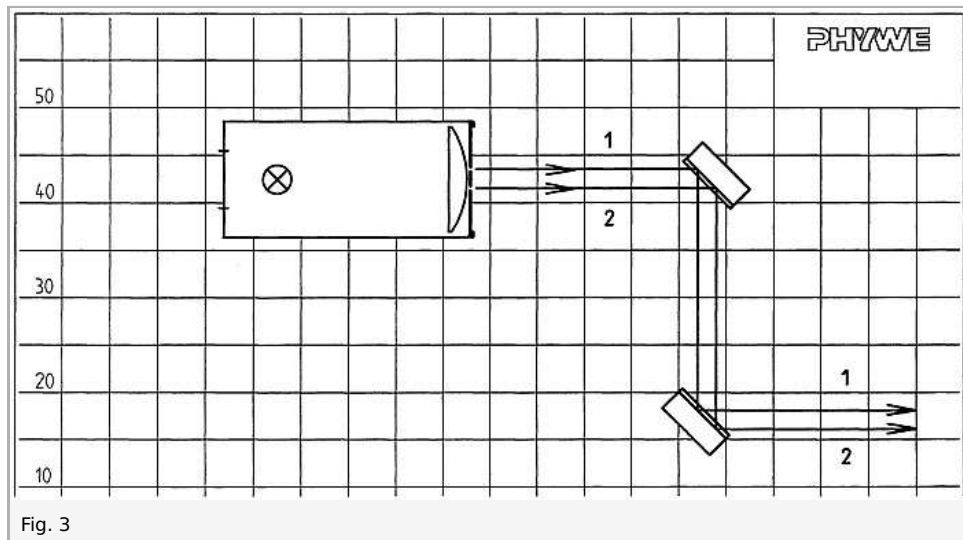


Fig. 3

## Observation and evaluation

### Observation

If the two plane mirrors form an angle of  $45^\circ$ , a light beam will be reflected twice and then travel perpendicular to its original direction.

If the two plane mirrors form an angle of  $90^\circ$ , a light beam will be reflected twice and then travel parallel to and in the opposite direction as the original beam.

If two plane mirrors are placed parallel to each other in such a way that the light reflected by the first mirror strikes the second one, then the beam travels parallel to but displaced from the original light path.

### Evaluation

The two plane mirrors which form an angle of  $45^\circ$  represent a model for a optical square (corner reflector). This can be used by field surveyors to fix right angles. The two plane mirrors which form an angle of  $90^\circ$  represent a plane model for a reflex reflector.

The two parallel plane mirrors represent a model of a periscope with which one can see over trench edges, walls, etc. It is primarily used in submarines.

#### Remark

To better differentiate the light paths in the periscope, it is advisable to insert a small, flat piece of glass or a filter from the Color Filter Set (09807.00) in one of the light beams using the Diaphragm with Holder (08270.1 0). This procedure should also be employed when one uses two parallel beams in the other applications.