

Geometrical reasoning study units: Problems

Set 3: Problems requiring more extended investigation

Contents

Introduction

Extended problems to investigate

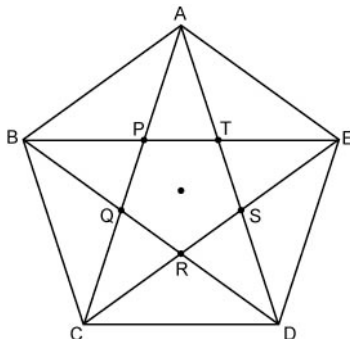
Introduction

This is the final of three sections that present a series of geometrical reasoning problems for classroom use. The problems presented here all require a somewhat more extended investigation of a situation involving geometrical reasoning. (The problems in the previous sections are all quite short, and use simple diagrams that were provided in the questions or constructed by the pupils.)

It can be difficult to judge the appropriate amount of guidance to provide when pupils are tackling more open-ended problems such as those provided here. You will need to think carefully about where work of this kind should be located within the sequence of learning in a section of work. For example, you may choose to design activities to build and practice the required skills and knowledge before introducing an applied task like those presented here.

Extended problems to investigate

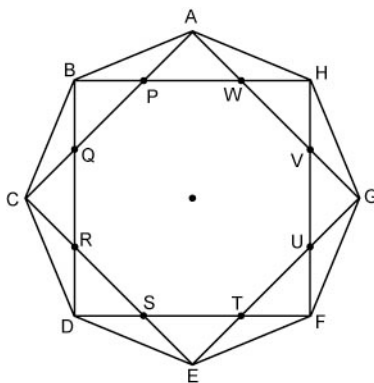
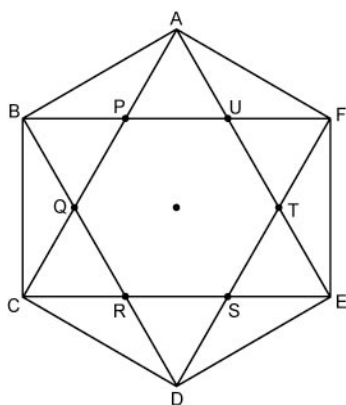
1. Pentagrams



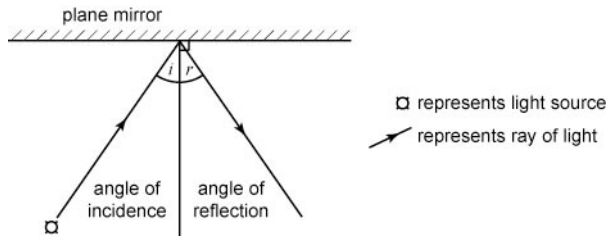
ABCDE is a regular pentagon. A regular pentagram has been formed, and the intersections marked as P, Q, R, S, T.

- How many pairs of parallel lines can you find?
- How many pairs of perpendicular lines?
- Can you find all the angles in the diagram?
- How many different types of triangle can you find?
- How many different types of quadrilateral?

Be prepared to explain your reasoning. Repeat for regular hexagrams and octogams.



2. Applying properties of parallel lines to problems with plane mirrors

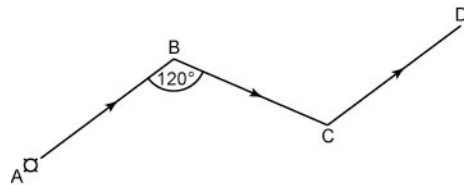


You may already know from your work in science that the angle of incidence (i) is equal to the angle of reflection (r).

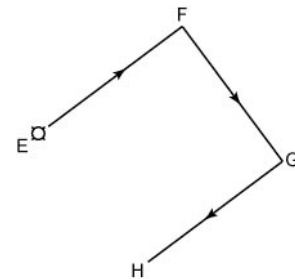
Take this as given in the following problems.

Given: $i = r$

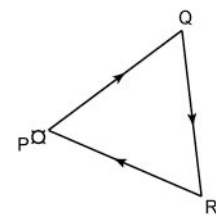
- 1 Position two plane mirrors so that AB is parallel to CD .



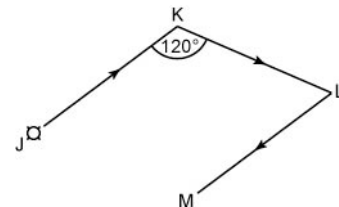
- 2 Position two plane mirrors so that $\angle EFG = \angle FGH = 90^\circ$.



- 3 Position two plane mirrors so that triangle PQR is equilateral.



- 4 Position two plane mirrors so that JK is parallel to LM .



What is the angle between the two mirrors in each question? Are there any general rules for placing the mirrors so that the last light ray is parallel to the first?