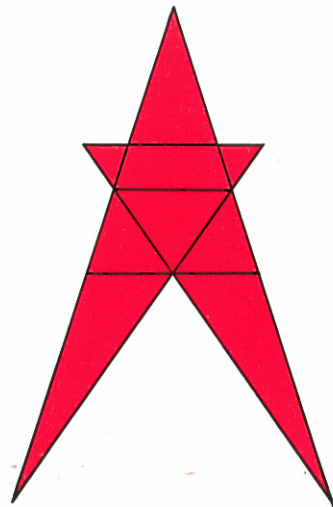


Geometry and Structures Study Kit

Notes and Suggestions for Teachers



Educational Productions Ltd.

Produced in collaboration with Meccano Ltd.

Introduction

The aim of this series of discovery cards is to introduce children to Geometry and to give them the opportunity to develop geometric concepts involved with shape and size. All work should as far as possible be related to the children's environment extending the discoveries of the classroom to the world around.

These notes for teachers are deliberately brief, aiming simply to suggest some ideas for further study in relation to the work on each card.

The typographical design has been arranged so that the teacher's observations can be added alongside the note to each Discovery card.

Discovery card 1

This card introduces the idea that an angle is a measurement of rotation about a fixed point. The right angle is the only basic measurement used to avoid introducing work with the protractor at this stage. However, parts of a right angle can easily be found by simple folding, and children's discoveries from this can provide opportunities to introduce work concerned with the number of degrees in a circle, and the measurement of angles with a protractor as well as work with a pair of compasses. The idea of using a protractor to measure such angles could be developed through the use of a filter paper cut in two.

Teacher's own notes

Discovery card 2

Facts which it is hoped children will discover here are :-

- a) where two lines cross
 - (i) opposite angles are equal
 - (ii) if one angle is a right angle, the others will be right angles also ;
 - b) where one line crosses two parallel lines alternate angles and corresponding angles are equal.
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Discovery card 3

Work is designed to introduce the polygon and to lead to the discovery that shapes can be similar even though of different sizes. Questions encourage the pupil to relate the number of sides to the number of interior angles of the shapes and consider the idea of a reflex angle.

Discovery card 4

This card presents work on the three types of triangle :-

scalene

isosceles

equilateral

and the principle that the angles of a triangle are equal to two right angles, 180° . Children can be led to discover that triangles can be arranged so that they form other shapes, such as :-

squares

rectangles

regular hexagons

octagons

This could be a useful lead to the further study of these shapes at a later date. It would be particularly useful if pupils could keep these for future reference, i.e., glued on to a sheet or page of an exercise book.

Work should extend to finding that if a triangle is cut through the apex it forms two further triangles, and other related factors.

Teacher's own notes

Discovery cards 5 and 6

Both cards deal with quadrilaterals and special quadrilaterals. It is hoped that children will find, for instance, that diagonals of a square are equal and bisect each other at an angle of 90° . Work will extend to rectangles and other quadrilaterals. It is recognised that the teacher may very well have to assist the pupils with the consolidation of the material contained in the tables.

Folding special quadrilaterals made from card or paper could be used as a lead to symmetry.

Discovery card 7

Children are introduced to various regular polygons and in particular to the relationship between the number of sides and the sum of interior angles. Pupils should be encouraged to try and formulate this relationship and similar ones in their own words.

The pattern of work suggested here on regular shapes could lead to studies on area and the measurement of area, which shape occupies the greatest area.

Discovery card 8

This is the first card in the series to introduce rigidity and the fact that the triangle is the only true rigid structure. Examples of this in the environment are numerous: cranes, the five-barred gate, fencing, 'open' girders and heavy man-hole covers. Children should be encouraged to draw and make notes of shapes such as these. A rewarding study can be made of the angles formed in them.

Discovery card 9

The pupil here is encouraged to design his own rigid structure using the knowledge which he has gained from Card 8. He should be encouraged to list, or draw examples from 'real life' where his type of structure is used.

In the example given rigidity is obtained either by a support from the base of the triangular supports or by constructing a triangular framework on to the four cross pieces. When pressure is applied on a beam bridge, the bridge will tend to twist. If the bridge is long it will need pile supports to prevent sagging.

Discovery card 10

This card also deals with bridges and introduces the idea of stresses in bridges and the directions in which they act. It is possible for the pupil to measure how the load of a bridge is distributed.

a) Arch bridge

If a weight is placed in the centre, how much weight will be needed at the end of each arch just to prevent the bridge from collapsing?

b) Cantilever bridge and suspension bridge

The weight is supported by the pillar and the ends of the bridge are in tension. When weight is applied the ends will tend to rise.

[Following discovery card work on the suspension bridge it is possible to build one sufficiently large for children to walk on using simply ropes and poles].

Pulleys, Gears and Levers Study Kit.

The second kit published in collaboration with Meccano Ltd. comprises eleven discovery cards with teaching notes and introduces friction, loads and pulleys, gear systems, tension, balances and weighing. The models are made from plastic Meccano parts supplied with the kit.

