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Start Up MATHEMATICS Activity Book

NEP-Aligned
Skill Development and Practice

Effective NEP implementation tools for learning mathematics

- Discovery, discussion and analysis-based learning
- Interdisciplinary and co-curricular strategy
- HOTS, critical thinking and problem solving
- Life skills
- Experiential learning promoting exchange of ideas
- Case studies to promote investigative thinking
- Precisely mapped with Start Up Mathematics coursebook

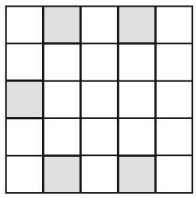
VIVA EDUCATION

13 Reflection and Rotational Symmetry

Picture Study

Skills Covered: • Problem solving • Creativity • Logical and critical thinking • Observation • Decision making

Riya has drawn a square grid and has shaded some squares in it as shown.

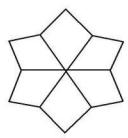
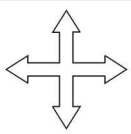
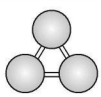
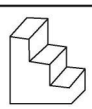


1. Take any one diagonal as a line of symmetry and shade a few more squares to make the figure symmetric about it.
2. Is there more than one way to do that?
3. Will the figure be symmetric about both the diagonals?

Data Study

Skills Covered: • Problem solving • Logical and critical thinking • Observation • Decision making

Observe the given figures to complete the table. Write the number of lines of symmetry in each figure. Also, check if the figure has rotational symmetry to write the order of rotational symmetry.

Figure	Number of Lines of Symmetry	Rotational Symmetry (Yes/No)	Order of Rotational Symmetry
			
			
			
			

Life Skills

Skills Covered: • Problem solving • Logical and critical thinking • Decision making • Analytical skills • Communication skills • Interpersonal skills • Teamwork • Social and emotional skills

Some objects that we use in our daily life are given below. Find the number of lines of symmetry in each object.

1. 
2. 
3. 
4. 
5. 

Time To Investigate

Skills Covered: • Creativity • Teamwork • Problem solving • Observation • Logical and critical thinking • Mathematical aptitude • Investigation • Data recording

Have you ever noticed the word AMBULANCE written in reverse on ambulances as ƎƆNA⅃UᙠMA. This is because the other drivers would see the word in a right way in rear-view mirror of their vehicles and give a freeway to it.

Look at the following definitions of mathematical terms and try to match them with the correct mirror image. You may use a small mirror.

YЯTƎMMYƧ	NOITA⅃ƧNAЯT
ƎNI⅃ ЯOЯЯIM	ЯUOᖷ
NOITATOЯ	⅃AƆITЯƎV

1. It is the circular movement of a point about a point.
2. It is line of symmetry's other name.
3. The letter M has this line of symmetry.
4. In this symmetry every point of the figure moves the same distance in a specific direction along a straight line.
5. It is the order of rotational symmetry of a square.

Integrated Learning (Biology)

Skills Covered: • Problem solving • Logical and critical thinking • Cultural awareness • In-depth learning

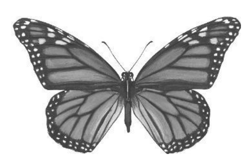
Biological symmetry refers to a balanced distribution of duplicate body or shapes within the body of an organism. On a basic level of classification, true animals can be divided into three groups based on the type of symmetry of their body plan.

1. **Radial Symmetry**

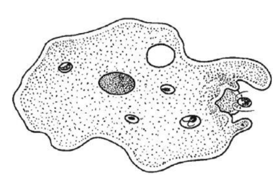
   Radial symmetry is the arrangement of body parts around a central axis. Animals with radial symmetry have no right or left sides, only a top or bottom. These species are usually marine organisms like star fish, jellyfish and corals.

2. **Bilateral Symmetry**

   In bilateral symmetry the body parts are arranged in such a way that the animal is divisible into roughly mirror image halves through one plane. This plane passes through the axis of the body to separate the two halves which are referred to as the right and left halves. Bilateral symmetry is characteristic of the vast majority of animals, including insects, fishes, amphibians, reptiles, birds, mammals and most crustaceans.

3. **Asymmetrical Symmetry**

   In some animals there are no body axis and no plane of symmetry, hence the animals are called asymmetrical. The amoeboid forms (e.g. Amoeba) and many sponges have irregular growth pattern of the body and cannot be divided into equal halves.

   Use the above data to answer the following questions.

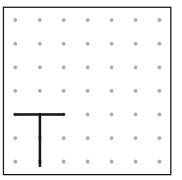
   1. Which type of symmetry is found in more complex animals?

2. What is the meaning of the word 'bilateral'?
3. Which type of symmetry is seen in human body?

Apply Your Learning

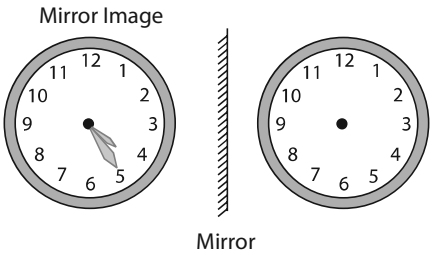
Skills Covered: • Observation • Critical and logical thinking • Experiential learning • In-depth learning

1. Can you help Kavya to complete an unfinished symmetrical design. To accurately complete the design, you must use a horizontal line, a vertical line and two oblique lines. Decide the position of your line of symmetry.



(**Hint:** Consider the line as a mirror and think how will the reflection look like?)

2. The mirror image of a clock show a time of 4:25. Draw the hands of the clock to show the real time.



Identify and Rectify

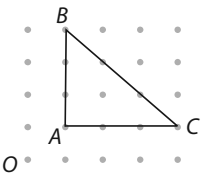
Skills Covered: • Observation • Critical and logical thinking • Analytical reasoning

1. Vishal says that a circle has infinite lines of symmetry so a semicircle also has infinite lines of symmetry. Is he correct? If not, explain why.
2. Manav says that a capital letter and its corresponding small letter in English alphabet have equal number of lines of symmetry. Is he correct? If not, explain it by giving an example.

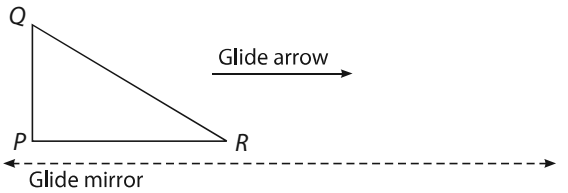
Higher Order Thinking Skills

Skills Covered: • Problem solving • Logical and critical thinking • Analytical skills • Reasoning • Creativity and judgement

1. Sketch the image of ΔABC under a 90° anticlockwise rotation about O.



2. A glide reflection is a composition of transformations. In a glide reflection, a translation along glide arrow is first performed on the figure and then it is reflected over the glide mirror line. Draw the following images of ΔPQR.



(a) The image of ΔPQR under the glide translation along glide arrow.

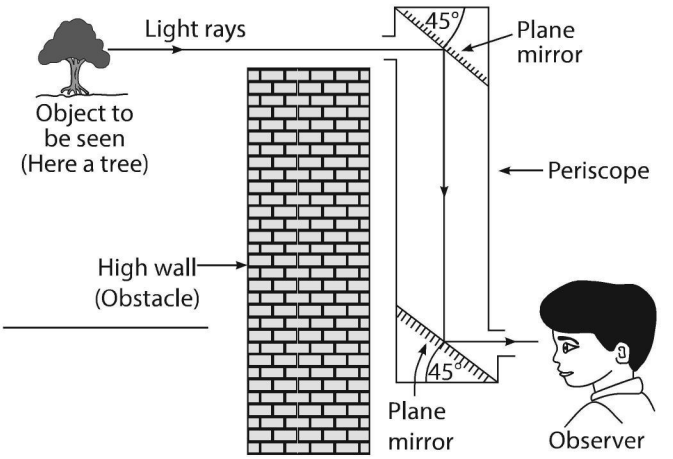
(b) The image of ΔPQR under the glide reflection through glide mirror line.

Case Study

Skills Covered: • Logical and critical thinking • Observation • Comprehension skills • Analytical skills • Computation • Problem solving

Periscope

The periscope is an optical instrument that allows viewing those objects which are not in direct line of sight of view. It works on the basis of the laws of reflection of light. The simplest type of periscope consists of a tube which has two mirrors at its end, parallel to each other but at 45° to the axis of the tube. The working of a periscope is shown in the diagram.



Now, answer the following questions.

1. Write the various uses of periscope.
2. Explain the working of periscope.
3. Explain the nature of image formed in a periscope.
4. Which type of mirror is used in a periscope?