Activity 12

Title : Areas of Sectors formed at the Vertices of a Triangle

Objective

To verify that sum of areas of three sectors of the same radii 'r' formed at the vertices of any triangle is $\frac{1}{2}\pi r^2$ by paper cutting and pasting.

Prerequisite Knowledge

1. Concept of different types of triangles.
2. Definition of a sector.
3. Area of circle $= \pi r^2$, $r \rightarrow$ radius.

Materials Required

Glazed paper, sketch pens, fevicol, a pair of scissors, pencil, geometry box.

Procedure

1. Draw three different types of triangles on a glazed paper as shown in fig. (*i*).
   (*i*) Equilateral ΔABC (*ii*) Isosceles ΔPQR (*iii*) Scalene ΔXYZ

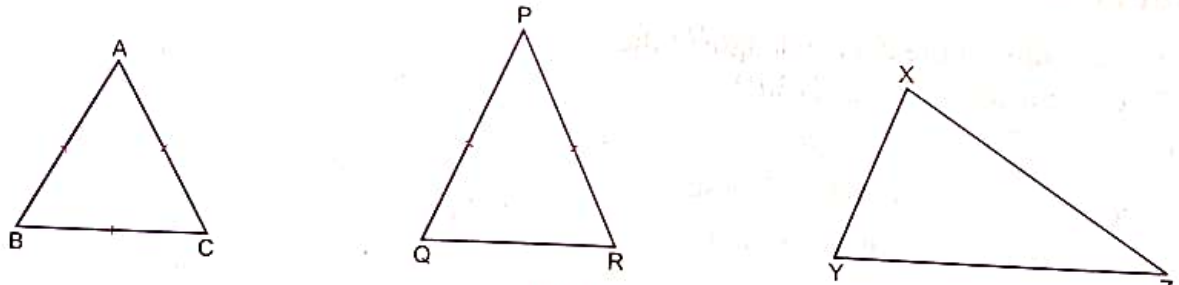


Fig. (*i*)

2. Cut an equilateral ΔABC as shown in fig. (*ii*)

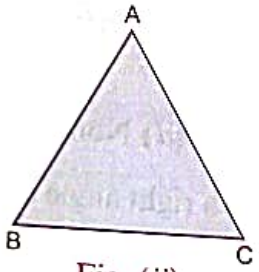


Fig. (*ii*)

3. Taking vertices A, B and C as centres of ΔABC, draw three sectors of same radii r.

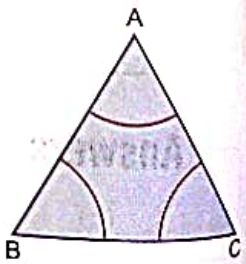


Fig. (*iii*)

4. Cut these three sectors and marked them as 1, 2, 3 and fill different colours.

Fig. (*iv*)

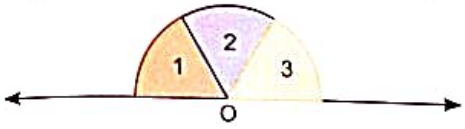


Fig. (*v*)

5. Draw a straight line and mark any point 'O' on it. Place three sectors 1, 2, 3 adjacent to each other so that the vertices A, B, C coincide with 'O' without leaving any gap as shown in fig. (*v*).

6. The same process (steps 1–5) can be taken up with isosceles triangle and scalene triangle in fig. (*i*).

Observation

The shape formed on the straight line is a semi circle.

$\therefore$ area of circle $= \pi r^2$

$\therefore$ area of semicircle $= \frac{1}{2}\pi r^2$

Result

It is verified that the sum of areas of three sectors of same radii 'r' formed at the vertices of any triangle is $\frac{1}{2}\pi r^2$.

Learning Outcome

The students are able to understand the concept of this activity through paper cutting. It is clear to them that a semicircle is always obtained, whatever be the type of a triangle.

Activity Time

Title : Probability 23

Objective

To set the idea of probability of an event through a double colour cards experiment.

Prerequisite Knowledge

1. Sample space and event.
2. Total number of possible outcomes.
3. Favourable outcomes.
4. Probability of an event = Number of favourable outcomes/Total possible outcomes.

Materials Required

A cardboard of size 18 cm × 18 cm, two colour papers say pink and blue, pair of dice, empty box, pair of scissors, sketch pens, fevicol, etc.

Procedure

1. Paste different colour papers, blue and pink on both sides of the board. (such that pink on one side and blue on another side)
2. Divide the board into 36 small squared cards.
3. Write all 36 possible outcomes obtained by throwing two dice, e.g., for the outcome (4, 5), write 4 on the blue side and 5 on pink side.
4. Cut and put all the cards into a box.
5. Now take out each card one by one without replacement and write the observation in appropriate column.

Observation

1. Total number of possible outcomes =
2. Total number of favourable outcomes of sum 2 =
3. Total number of favourable outcomes of sum 3 =
4. Total number of favourable outcomes of sum 4 =
5. Total number of favourable outcomes of sum 5=
6. Total number of favourable outcomes of sum 6 =
7. Total number of favourable outcomes of sum 7 =
8. Total number of favourable outcomes of sum 8 =
9. Total number of favourable outcomes of sum 9 =

10. Total number of favourable outcomes of sum 10 =

11. Total number of favourable outcomes of sum 11 =

12. Total number of favourable outcomes of sum 12 =

13. Total number of favourable outcomes (sum ≥ 11) =

14. Total number of favourable outcomes (sum > 12) =

15. Total number of favourable outcomes (sum < 7) =

Using formula calculate the required probability of each event.

(1, 1)	(1, 2)	(1, 3)	(1, 4)	(1, 5)	(1, 6)
(2, 1)	(2, 2)	(2, 3)	(2, 4)	(2, 5)	(2, 6)
(3, 1)	(3, 2)	(3, 3)	(3, 4)	(3, 5)	(3, 6)
(4, 1)	(4, 2)	(4, 3)	(4, 4)	(4, 5)	(4, 6)
(5, 1)	(5, 2)	(5, 3)	(5, 4)	(5, 5)	(5, 6)
(6, 1)	(6, 2)	(6, 3)	(6, 4)	(6, 5)	(6, 6)

Sample space
(when two dice are thrown)

Example: Number of favourable outcomes of sum of numbers 2 = 1

Total outcomes = 36

$\therefore$ Probability of sum of numbers is 2 = $\frac{1}{36}$

Similarly find other probabilities for different outcomes of sum.

Result

Probability of an event = $\frac{\text{No. of favourable outcomes}}{\text{Total no. of possible outcomes}}$

Learning Outcome

Activity 5

Title : Basic Proportionality Theorem for a Triangle

Objective To verify the basic proportionality theorem by using parallel lines board, triangle cut outs.

Basic Proportionality Theorem

If a line is drawn parallel to one side of a triangle, to intersect the other two sides at distinct points, the other two sides are divided in the same ratio.

Prerequisite Knowledge

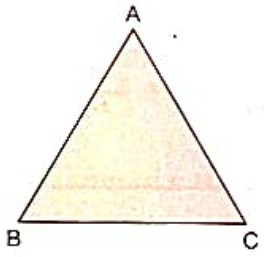
1. Statement of Basic Proportionality theorem.
2. Drawing a line parallel to a given line which passes through a given point.

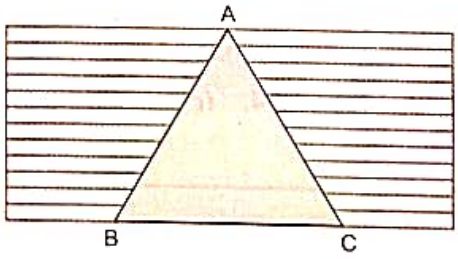
Materials Required

White chart paper, coloured papers, geometry box, sketch pens, fevicol, a pair of scissors, ruled paper sheet (or Parallel line board).

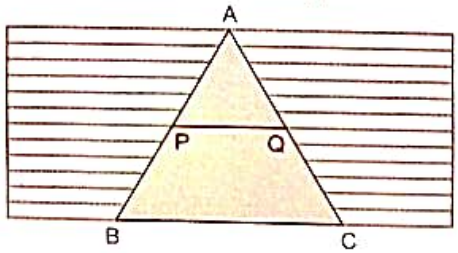
Procedure

1. Cut an acute-angled triangle say ABC from a coloured paper.
2. Paste the ΔABC on ruled sheet such that the base of the triangle coincides with ruled line.





3. Mark two points P and Q on AB and AC such that PQ||BC.



4. Using a ruler measure the length of AP, PB, AQ and QC.
5. Repeat the same for right-angled triangle and obtuse-angled triangle.
6. Now complete the following observation table.

Observation

Triangle ABC	Length of the segments				$\frac{AP}{PB}$	$\frac{AQ}{QC}$	Equal/Not equal
	AP	PB	AQ	QC			
Acute							
Obtuse							
Right							

Result

In each set of triangles, we verified that $\frac{AP}{PB} = \frac{AQ}{QC}$.

Learning Outcome

Students will observe that in all the three triangles the Basic Proportionality theorem is verified.

Activity Time

Activity 2

Title : Arithmetic Progression I

Objective

To verify that the given sequence is an arithmetic progression by paper cutting and pasting method.

Arithmetic Progression

A sequence is known as an arithmetic progression (sequence) if the difference between the term and its predecessor always remains constant.

Prerequisite Knowledge Understanding the concept of an arithmetic progression.

Materials Required Coloured papers, a pair of scissors, fevicol, geometry box, sketch pens, drawing sheets.

Procedure

1. Take a given sequence of numbers say A_1, A_2, A_3 ...
2. Cut a rectangular strip from coloured paper of width 1 cm and length A_1 cm.
3. Repeat the procedure by cutting rectangular strips of same width 1 cm and lengths A_2, A_3...cm.
4. Take a graph paper and paste these rectangular strips adjacent to each other in order on graph paper.

[A] Consider a sequence 1, 4, 7, 10, 13.

(*i*) Take different colour strips of lengths 1 cm, 4 cm, 7 cm, 10 cm, 13 cm and all of the same width 1 cm (say).

(*ii*) Arrange and paste these strips in order on a graph paper as shown in fig. (*i*).

[B] Consider a sequence 1, 4, 8, 10, 11.

(*i*) Take different colour strips of lengths 1 cm, 4 cm, 8 cm, 10 cm, 11 cm and all of the same width 1 cm (say).

(*ii*) Arrange and paste these strips in order on a graph paper as shown fig. (*ii*).

[A] For sequence 1, 4, 7, 10, 13

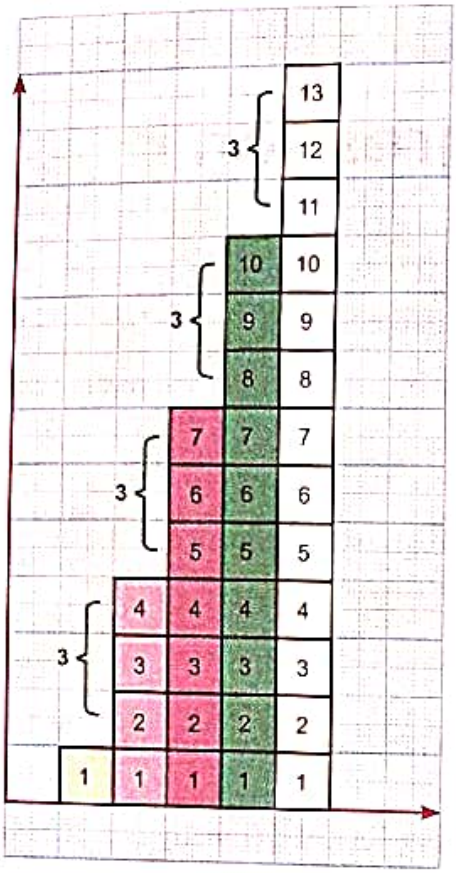


Fig. (*i*)

[B] For sequence 1, 4, 8, 10, 11

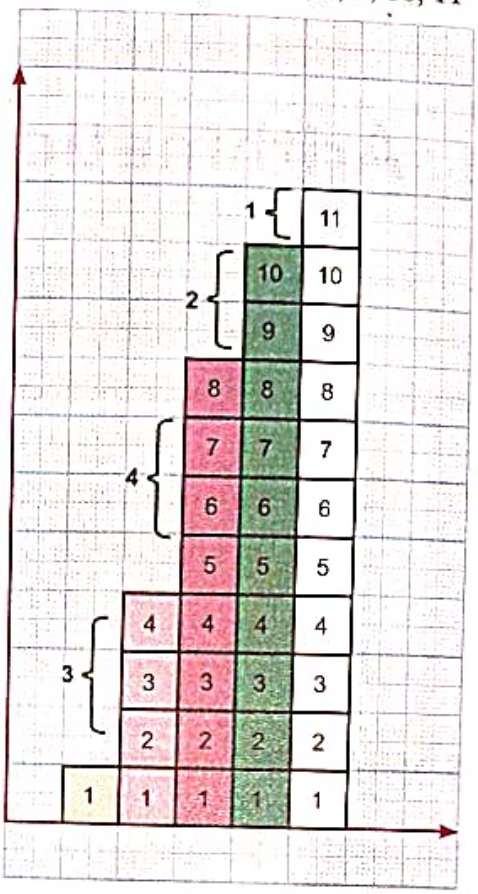


Fig. (*ii*)

Observation

We observe from fig. (*i*) that the adjoining strips have a common difference in heights i.e. 3 cm and a ladder is formed in which the adjoining steps are constant. Hence it is an arithmetic progression.

In fig. (*ii*) the adjoining strips don't have a common difference in heights and thus the adjoining steps of ladder are not constant. Hence it is not an arithmetic progression.

	Fig. (*i*)	Fig. (*ii*)
Observation	There is a common difference in heights i.e. 3 cm	Don't have common difference in heights
Result	It is an AP.	Not an AP.

Result

Sequence [A] is an AP because common difference between the term and its predecessor remains constant.

Sequence [B] is not an AP because common difference between the term and its predecessor does not remain constant.