

Areas of Shapes between Parallel Lines

Introduction

In this learning unit, we will explore some properties of shapes between parallel lines.

Task 1

1. Draw a line l and choose a point P not on l .

a) How many lines can pass through P ? _____

b) Out of these how many lines will be (i) parallel to l ? (ii) perpendicular to l ? _____

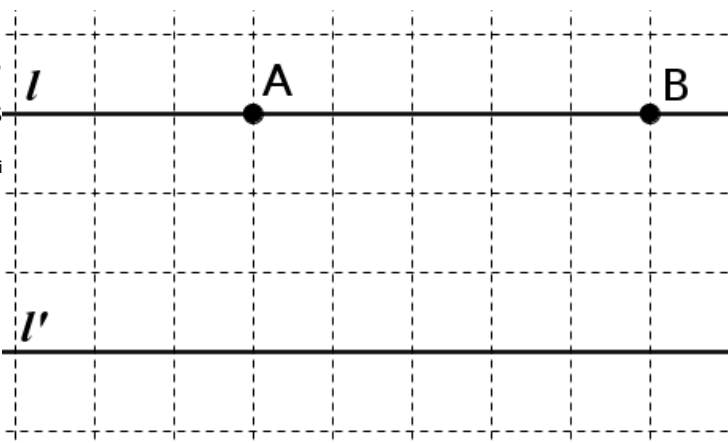
2. Draw a line l' through P parallel to l .

Given l and P , what are the steps required to construct l' ?

Compare your steps of construction with those of your friends. Why do you think these steps give you a parallel line? Justify the steps of construction.

Task 2

Given parallel lines l, l' and points A and B on l : Construct at least 3 parallelograms $ABC_1D_1, ABC_2D_2, ABC_3D_3$, etc with points C_i and D_i on l' for $i = 1, 2, 3, \dots$



Note: All the points have to be grid points.

Calculate the area of each of the parallelograms constructed by you.

Parallelogram	Base (unit) (AB)	Side (unit) (BC _i)	Area (unit ²)	Perimeter (units)
ABC ₁ D ₁				
ABC ₂ D ₂				
ABC ₃ D ₃				

Compare the area of the parallelograms with those of the parallelograms drawn by your friends. What do you observe? What can say on the basis of your observations?

If we were to construct more parallelograms ABC_iD_i , what can say about their heights and areas? Would you need to measure its height or calculate its area? Discuss your reasons with your friends.

Task 3A

Now calculate the perimeter of each of the parallelograms that you drew and enter it in the appropriate column in the table above. What is your observation about the perimeters of the different parallelograms drawn? What is the smallest possible perimeter?

Task 3B

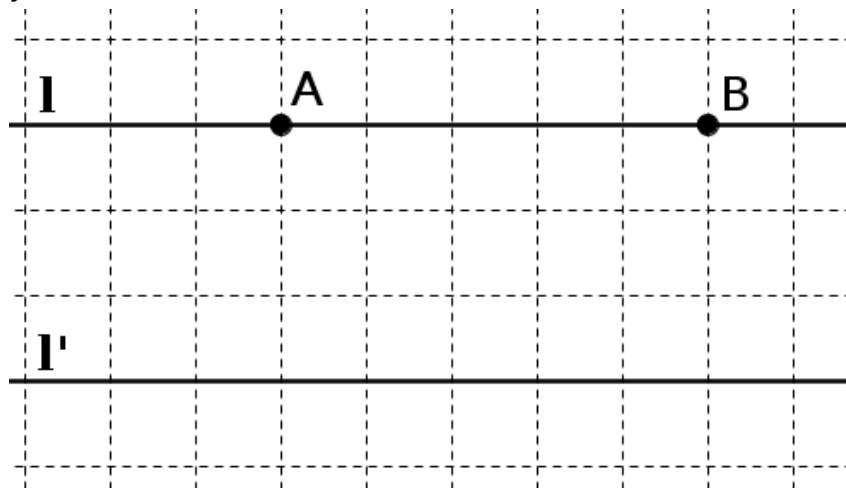
If you have a cabbage patch in the shape of a parallelogram of area 24 square metres. What are the possible lengths of the sides of the patch? How much fencing will be needed for each of these patches? When will the fencing material needed be minimum?

Task 4

What is the minimum information needed to construct a unique parallelogram? (That is all of you get only congruent parallelograms)?

Task 5

a) Draw three triangles with base AB, and the third vertex on l' . How do their areas compare? Justify your observation.



b) Draw three trapeziums with base AB and the opposite side on l' . Compare their areas. What can you say about the areas?

c) Can you draw two different trapezia such that their base is AB and the opposite side is on l' but the areas are the same? Justify your construction

References :

<https://www.mathopenref.com/constparallelrhombus.html>

<https://www.mathopenref.com/constparalleltt.html>