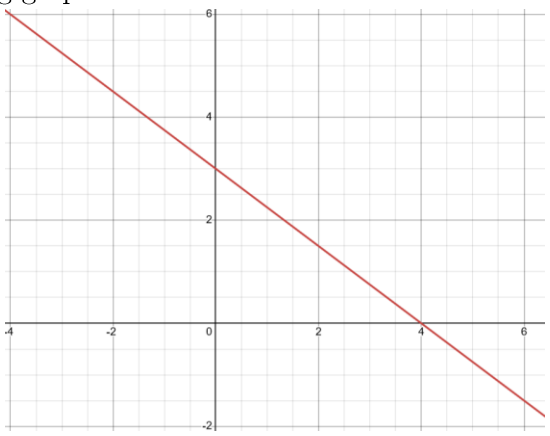
Lesson 2 Homework: Equation of straight lines (2) + Geometry of lines

1. Consider the following graph



a. Line l_1 (in red), cuts the x axis at (4,0) and the y axis at (0,3). Find the equation of l_1.

b. Line l_2 is perpendicular to l_1 and the two lines intersects at (0,3). Find the equation of l_2.

c. The following two straight line equations are given:

$$\begin{cases} y = \frac{4}{3}x - 3 \\ y = -\frac{3}{4}x - 3 \end{cases}$$

Sketch the 4 lines on a graph and hence describe the shape formed by the 4 lines.

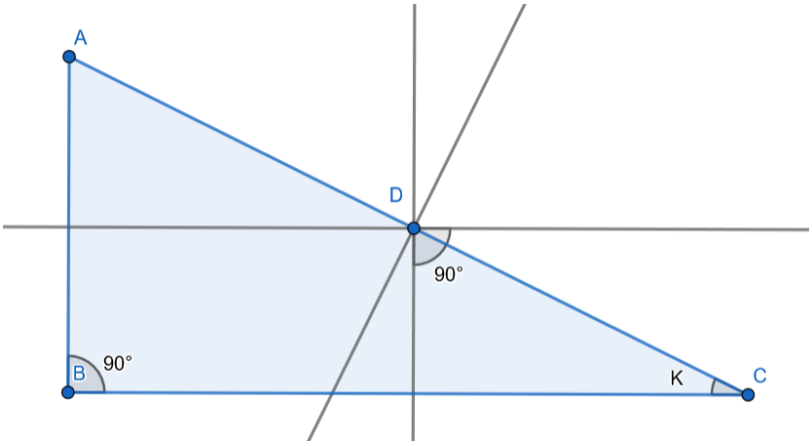
2. The perpendicular bisector of two points A and B is defined as the line which passes through the mid-point of A and B, and is perpendicular to the line AB.

   a. Given that A = (12, 0) and B = (24, 10), first find the mid-point of AB, which we will call C.

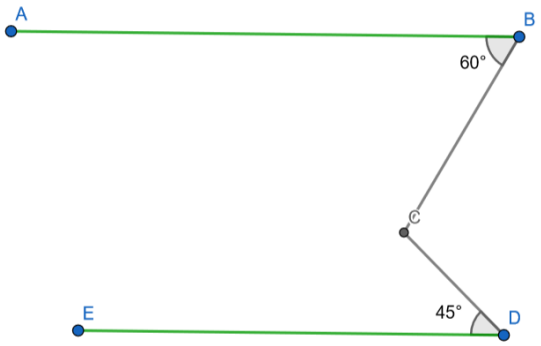
   b. Then find the slope of AB. Hence calculate the equation of the perpendicular bisector denoting it as L_p.

   c. L_p intersects the x axis at point D. Find the area of the triangle ACD. You may assume that each unit of the x-y plane corresponds to 1cm. (i.e. each small square is 1 cm^2)

3. Highlight all angles which are the same with the marked angle k.



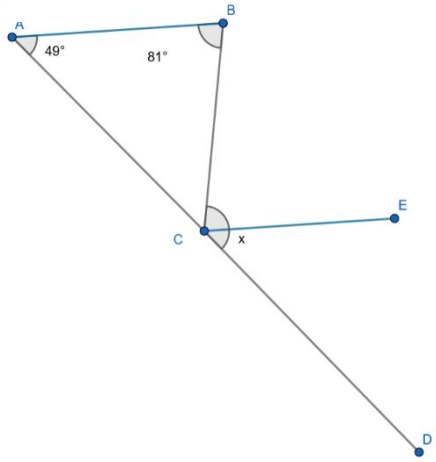
4. Find $\angle BCD$ in the figure below: (AB//ED)



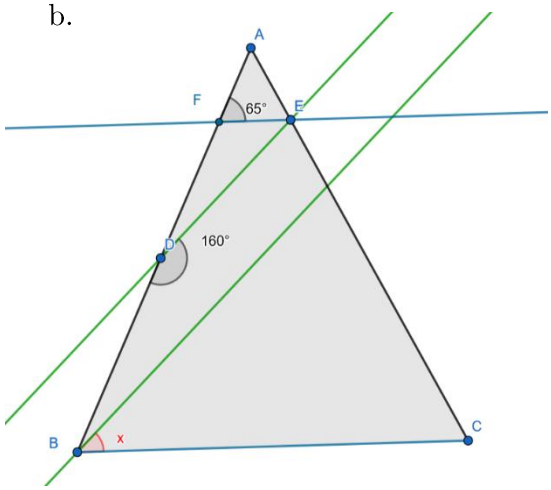
Hint: You may want to start off by adding a line CF with CF // AB and CF// ED

5. Find the value of angle x in the following figures.
Non-black lines of the same colour are parallel.

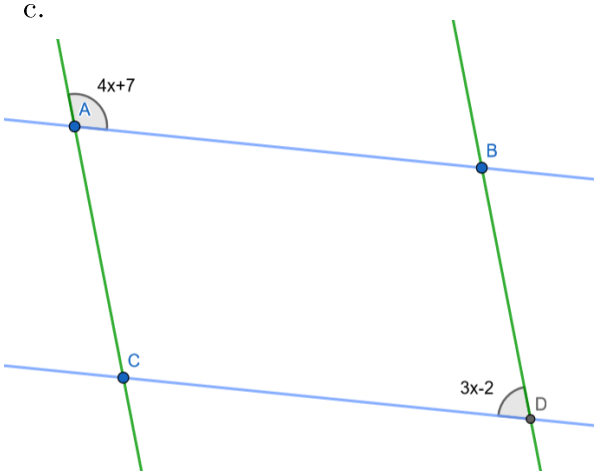
a.



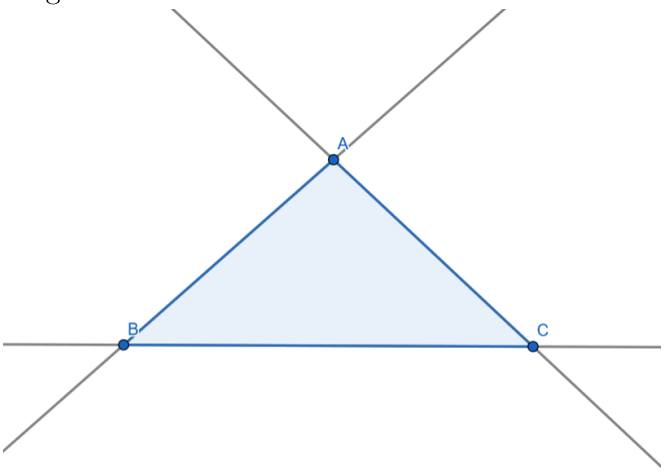
b.



c.



6. In this problem we will find the sum of interior angles of any n-sided polygon, but first, let's consider the triangle.

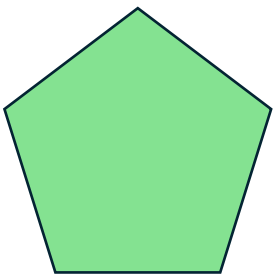


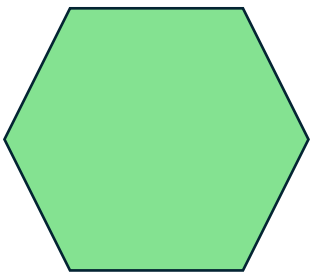
a. Using the external lines provided, justify why the sum of interior angles of a triangle is 180^{o}. You may want to add an additional line passing through B for the proof.

b. Now let's look at a rectangle (for the quadrilateral case):

Can we separate or split a rectangle into triangles by adding a line through two of its vertices? If so, what is the sum of angles inside a rectangle?

c. Now we look at the case of a pentagon and a hexagon.





How many triangles can we split the two shapes into? You should see a pattern emerging, can you figure out a formula for the sum of interior angles for an m-sided polygon?