EXERCISE 5.4

Read the following statement:
An equilateral triangle is a polygon made up of three line segments out of which two line segments are equal to the third one and all its angles are 60° each. Define the terms used in this definition which you feel necessary. Are there any undefined terms in this? Can you justify that all sides and all angles are equal in an equilateral triangle.
Solution:

The terms need to be defined are.
i: Polygon: Polygon is a closed figure bounded by three or more-line segments.
ii: Line segment: A line segment is a part of line having two end points.
Undefined terms are:
i: Line: undefined term
ii: Point: undefined term
Let us see why line and point are undefined terms.
Angle: Angle in a figure is formed by two rays with one common initial point.
Acute angle: Acute angle is an angle whose measure is between 0° to 90°.
Hence, the undefined terms are line and point.
According to the question,
All the angles of equilateral triangle are 60° each (given)
Two-line segments are equal to third one (given)
Applying to Euclid's axiom, things which are equal to the same thing are equal to one another.
Therefore, all three sides of an equilateral triangle are equal.

1. Study the following statement:
"Two intersecting lines cannot be perpendicular to the same line".
Check whether it is an equivalent version to the Euclid's fifth postulate.
[Hint: Identify the two intersecting lines *l* and *m* and the line *n* in the above statement.]
Solution:

Two equivalent version of Euclid's fifth postulate are:

- For every line l and for every point p not lying on l, there exists a unique line m passing through p and parallel to l.
- Two distinct intersecting lines cannot be parallel to the same line.

From these two statements, it is clear that the statement "two intersecting lines cannot be perpendicular to the same line" is not an equivalent version to the Euclid's fifth postulate.