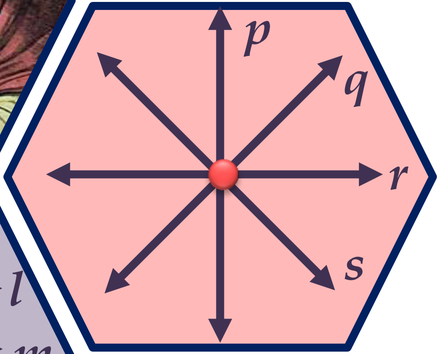
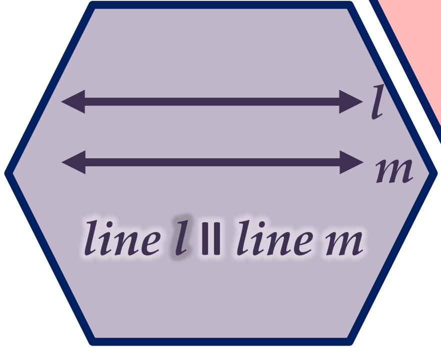
Module 1

Introduction to Euclid's Geometry

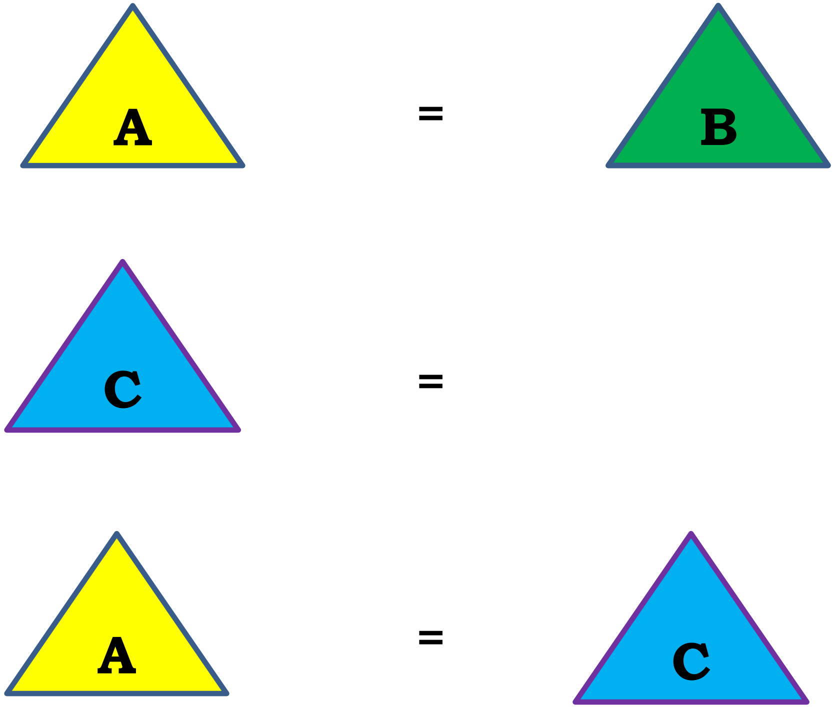




EUCLID'S AXIOMS

EUCLID'S AXIOM

Things which are equal to the same thing are equal to one another.



A = B

C = B

A = C

EUCLID'S AXIOM

If equals are added to equals, the wholes are equal

A = B

C = D

Let us have another two squares equal to each other

C = D

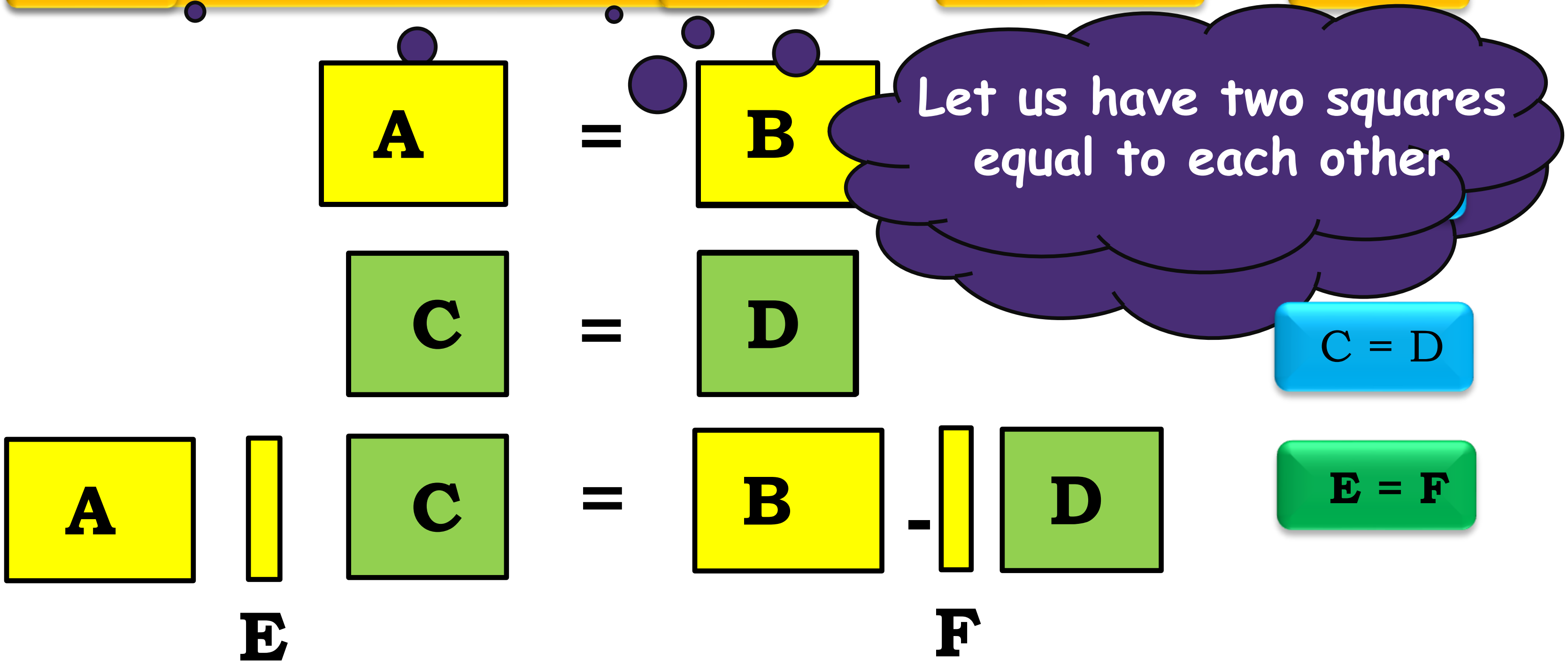
E **F**

A + C = B + D

E = F

EUCLID'S AXIOM

If equals are subtracted from equals, the remainders are equal



Module 2

EUCLID'S AXIOM

Things which coincide with one another are equal to one another.

Let us consider a circle

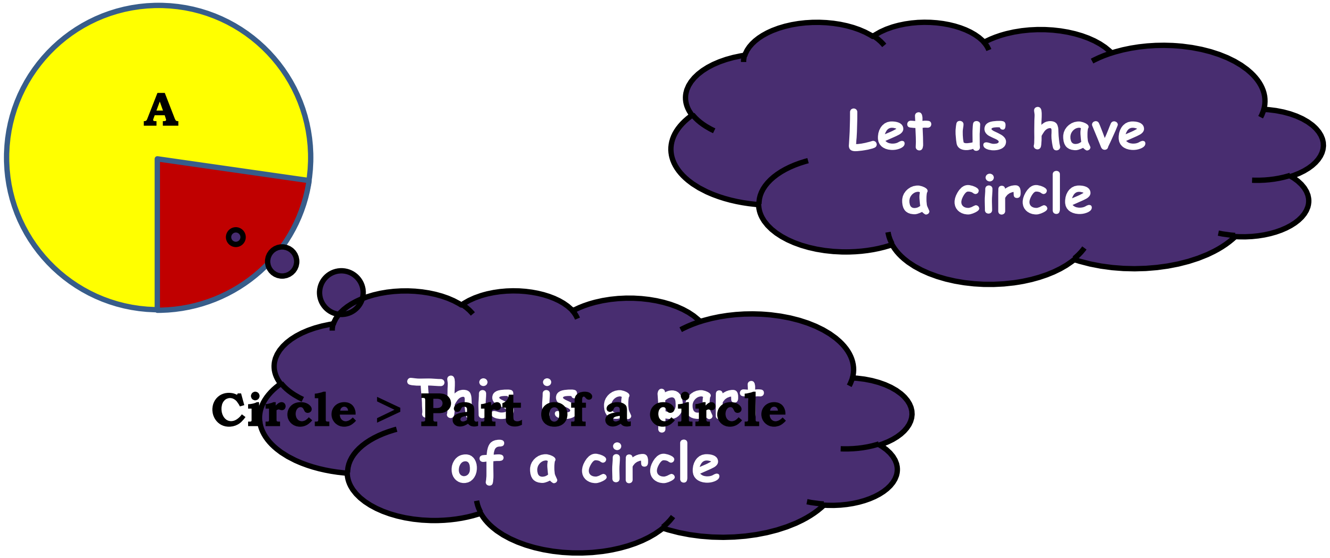
Let us consider another circle

Let us see if circle A coincide with circle B

$\therefore$ **Circle A = Circle B**

EUCLID'S AXIOM

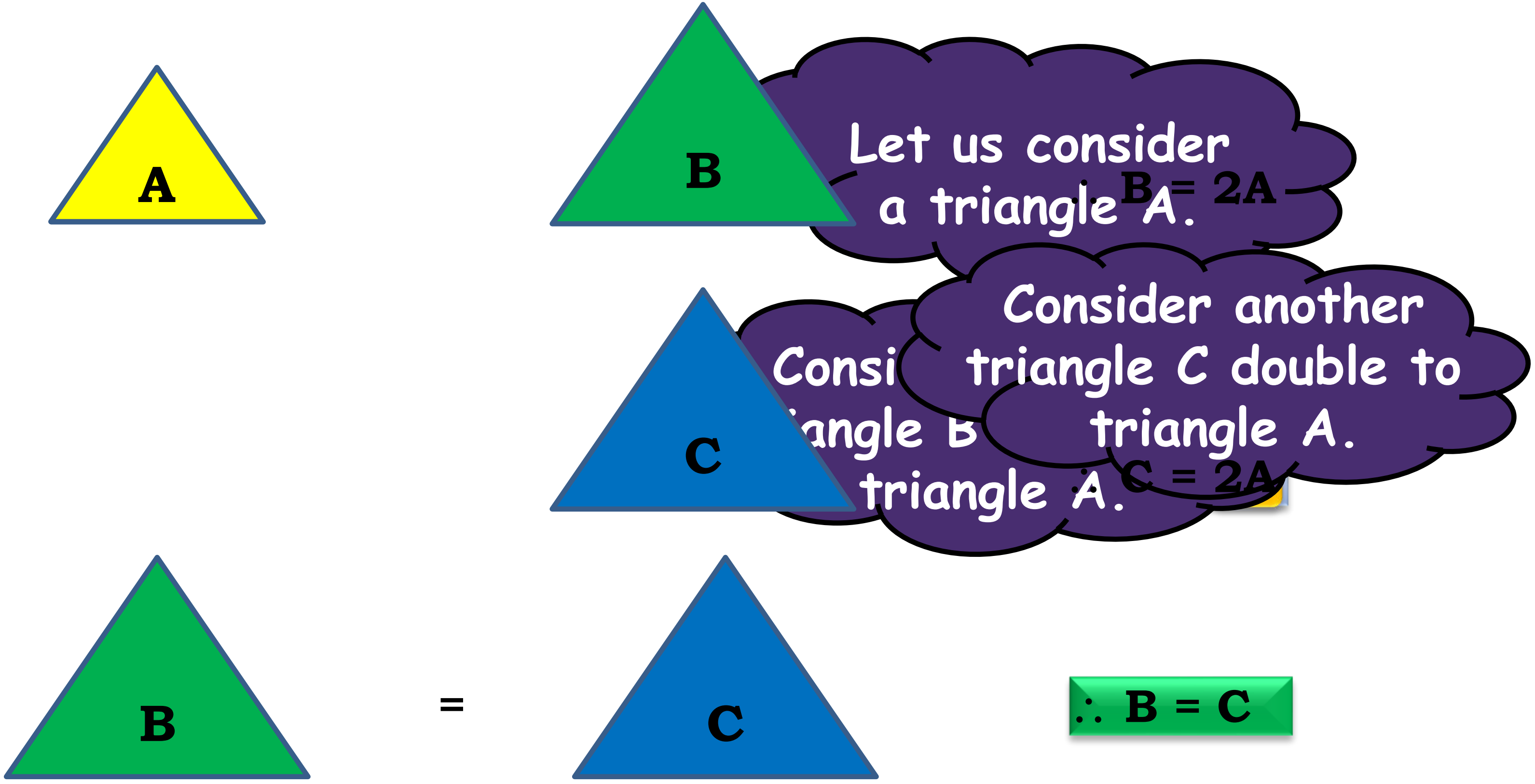
The whole is greater than the part



Circle > Part of a circle

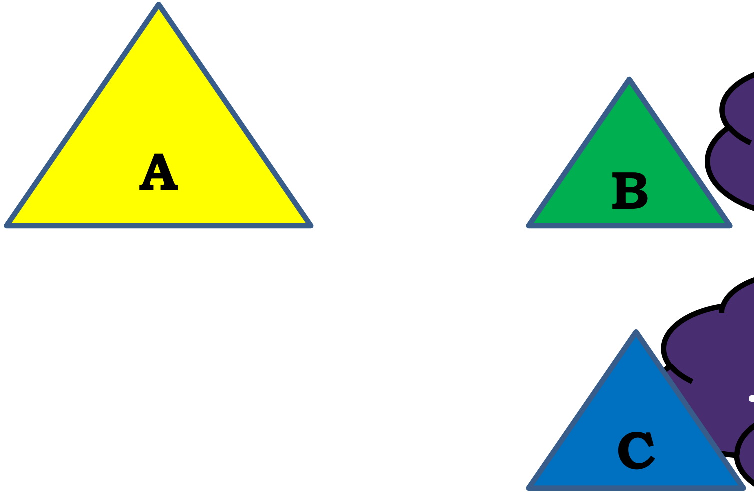
EUCLID'S AXIOM

Things which are double of the same things are equal to one another.



EUCLID'S AXIOM

Things which are halves of the same things are equal to one another.



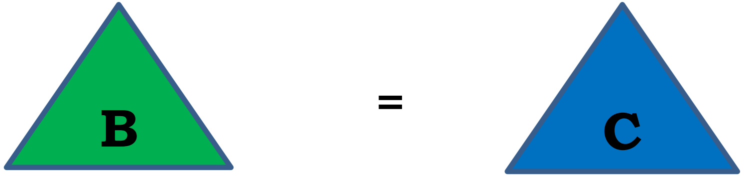
Let us consider a triangle A.

$\therefore B = \frac{1}{2} A$

Consid
triang
triang

Consider another triangle C half to triangle A.

$\therefore C = \frac{1}{2} A$



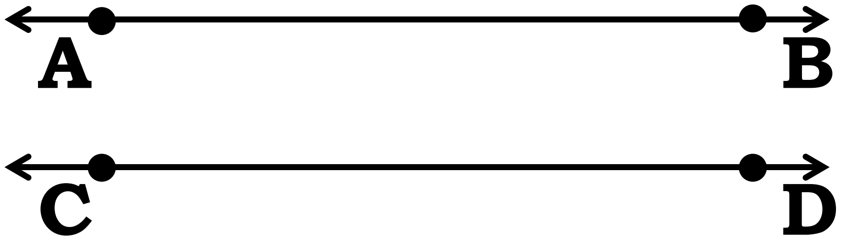
$\therefore$ **B = C**

Module 3

EUCLID'S POSTULATES

Postulate 1

So, we can conclude, from any point a straight line can be drawn to another point



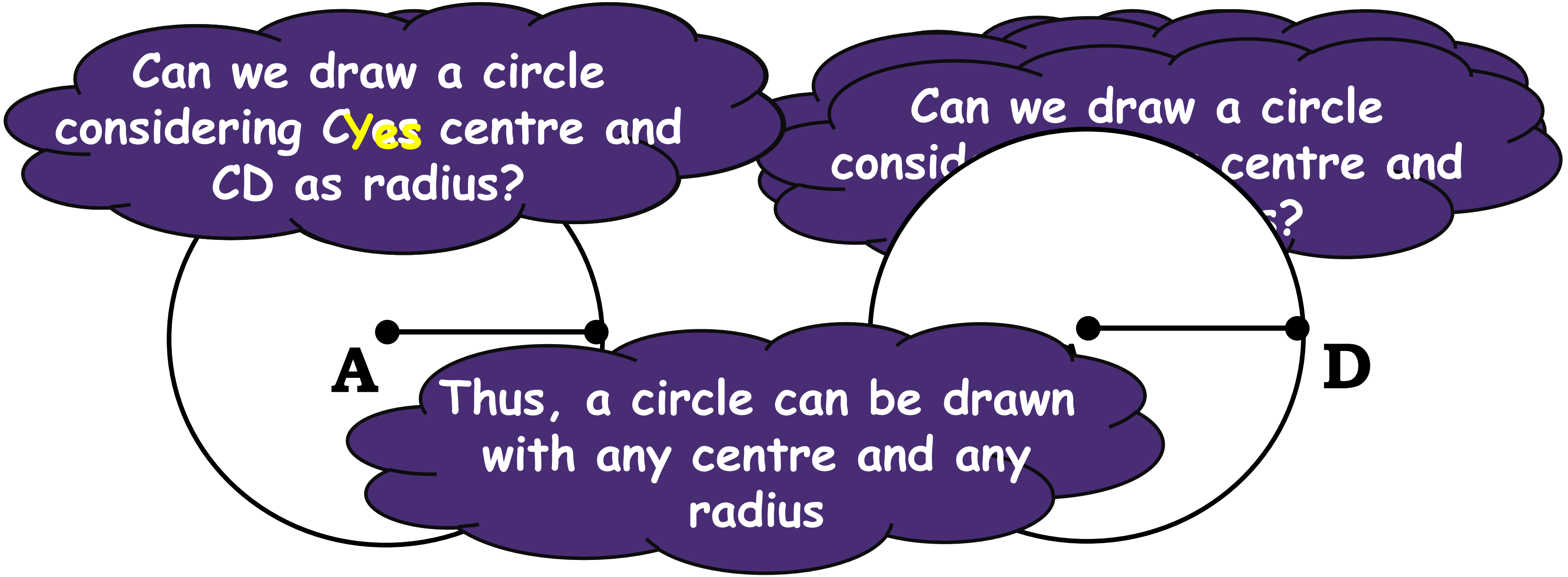
A straight line may be drawn from any one point to any other point.

Postulate 2

A **terminated line** **can be produced indefinitely**

Segment AB can be extended infinitely on both sides

Postulate 3

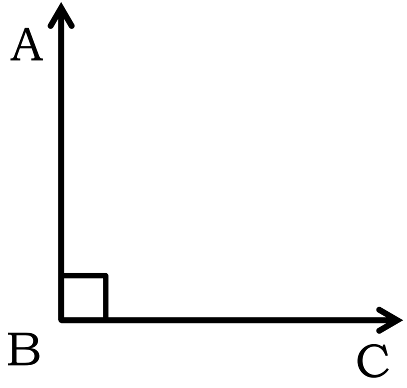


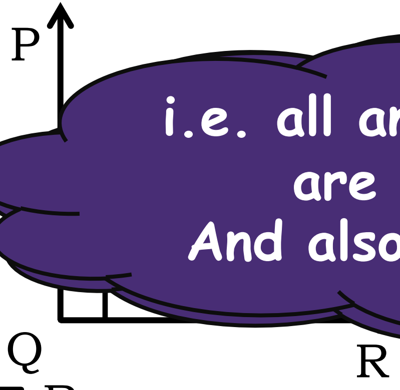
A circle can be drawn with any centre and any radius.

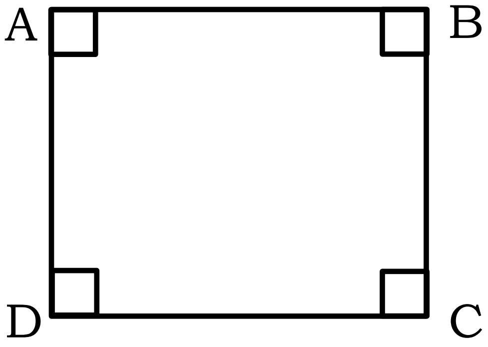
Module 4

Postulate 4

All right angles are equal to one another.







i.e. all angles of a square
are right angles
And also they are equal

e of $\angle Q$?

$\angle Q = 90^0$

$\angle B = \angle Q$

$\angle A = \angle B = \angle C = \angle D$

i.e. All right angles are equal

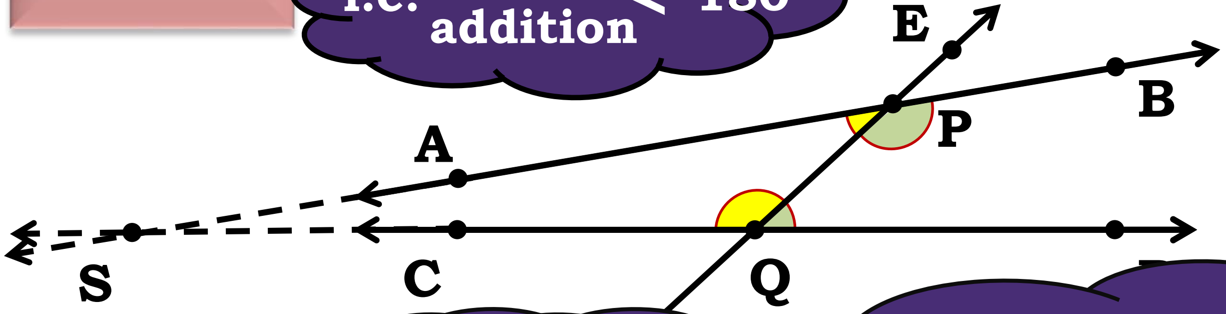
Postulate 5

If a straight line falling on two straight lines makes the interior angles on the same side of it taken together less than two right angles, then the two straight lines, if produced indefinitely, meet on that side on which the angles are less than two right angles.

Addition

180^0

i.e. Angles addition $< 180^0$



Lines AB and CD meet at point 'S'

As we can see ∠APQ and ∠PQC are interior angles with sum less than 180^0

Module 5

Q. Which of the following statements are true and which are false? Give reasons for your answers?

(i) Only one line can pass through a single point.

- Take a point P on the plane. draw a line l passing through it
- Draw another line passing through
- Continuing this process, we ca
  as we can, each passing through
- Thus, an infinite number of lines can be drawn passing through a given point.

Continuing this
lines can we draw
passing through po
P ?

Infinite

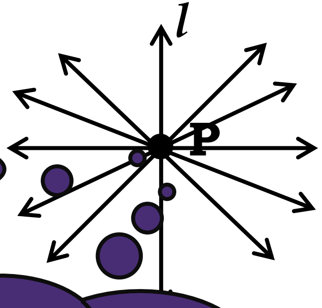
Let us consider a

Thus, infinite lines
can pass through a
single point.

The given
statement is
FALSE

Yes

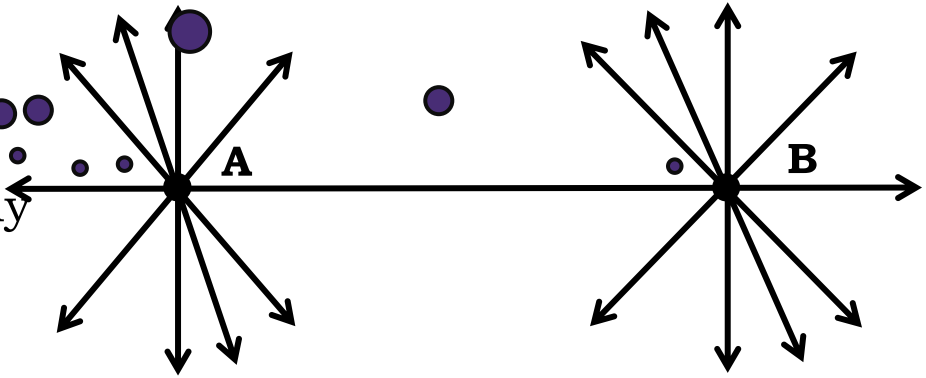
passing through P ?



∴ It is a FALSE statement.

(ii) There are infinite number of lines which pass through two distinct points.

- Mark two poin … lane.
- Infinite l … through po … nu … f lin … ug … p …
- We … e that there is one and only one l … which passes through both poin … and B .



Thus, through any two points in a plane, exactly one line can be drawn.

$\therefore$ **It is a False statement.**

Module 6

(iii) A terminated line can be produced indefinitely on both the sides.

- ✓ Note that what we call a line se... ...what Euclid calle...
- ✓ A line se...
- ✓ Since a li... ...ns, a line segment can ... both the sides.

Thus, this is a TRUE statement.

A line extends indefinitely ... both sid...

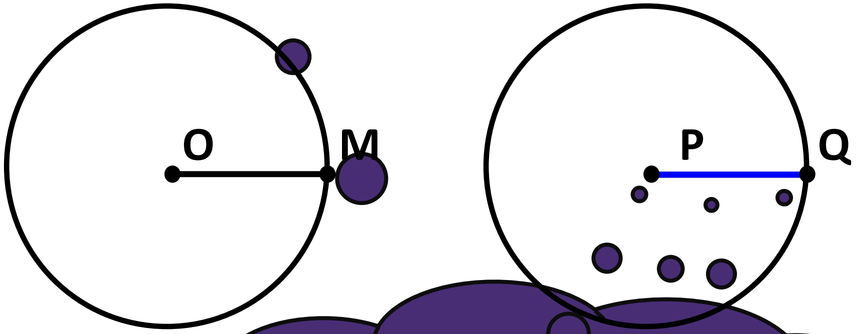
Line segment is a part of a li...

Terminat... d line is nothing but

Thus, a terminated line can be produced indefinitely on both the sides

∴ The given statement is **TRUE**.

(iv) If two circles are equal, then their radii are equal.



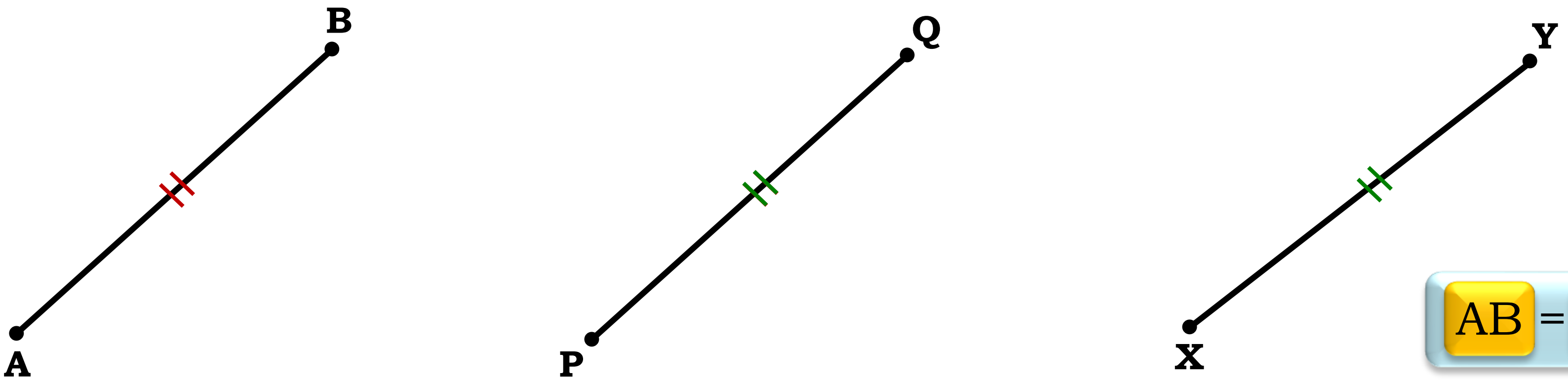
Radius is the segment joining the centre of a circle to any point on the boundary of the circle

- ✓ On superimposing t... on the other circle if the circles coincide, ...aries coincide.

  Therefore, their ...

Thus, this is a ...

(v) In Figure, if AB = PQ and PQ = XY, then AB = XY.



AB = PQ

PQ = XY

Things which are eq ... ual to one another.

∴ **Thus, this is a tru**

∴ AB = XY

Thus, the given statement is TRUE

Thank You

Module 7

Q. Give a definition for each of the following terms.

Are there other terms that need to be defined first?

What are they, and how might you define them?

(i) parallel lines **(ii) perpendicular lines** **(iii) line segment**

(iv) radius of a circle **(v) square**

Soln. For the desired definitions, we need the following terms :

(a) Point

A small dot made by a sharp pencil on a sheet paper gives an idea about a point.A point has no dimensions, it has only a position.

• A

The two arrow heads indicate that the line can be extended indefinitely

n see there is no

n of this point

(b) Line

The basic concept abou

should extend indefinitely in bo

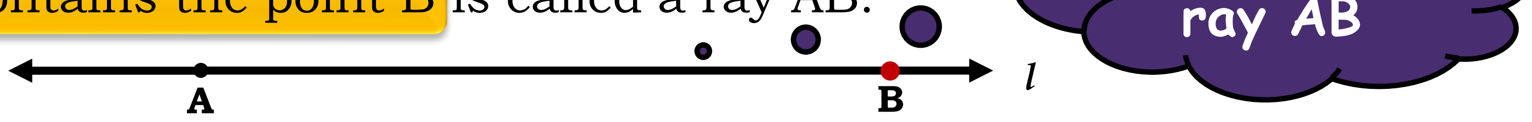
As, we can see line AB is straight

(c) Plane

The surface of a smooth wall or the surface of a sheet of paper are close examples of a plane.

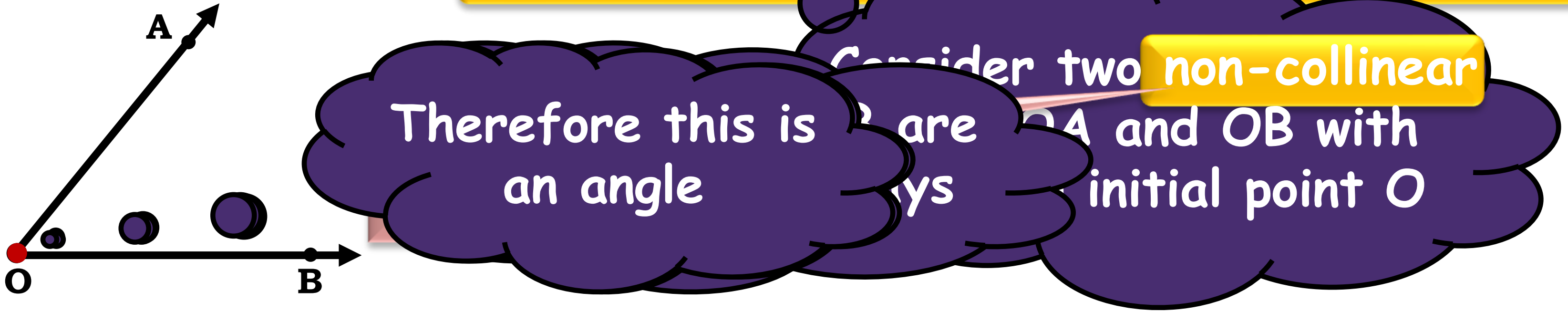
(d) Ray

A part of line l, which has only one end point and contains the point B is called a ray AB.



(e) Angle

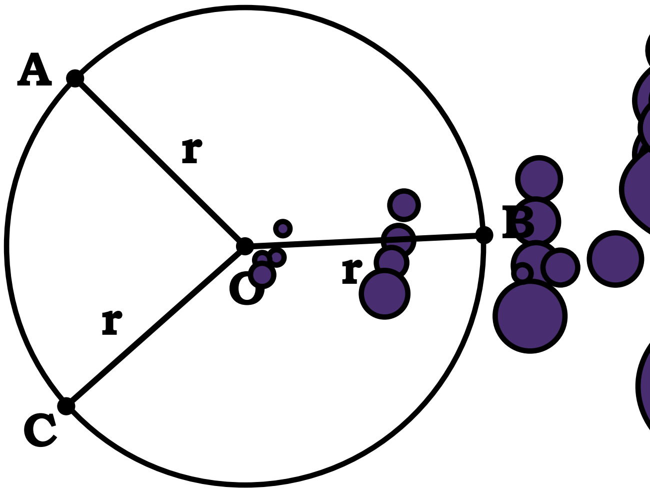
An angle is the union of two non-collinear rays with a common initial point.



Module 8

(f) Circle

A circle is the set of all those points in a plane whose distance from a fixed point remains constant. The fixed point is called the centre of the circle.

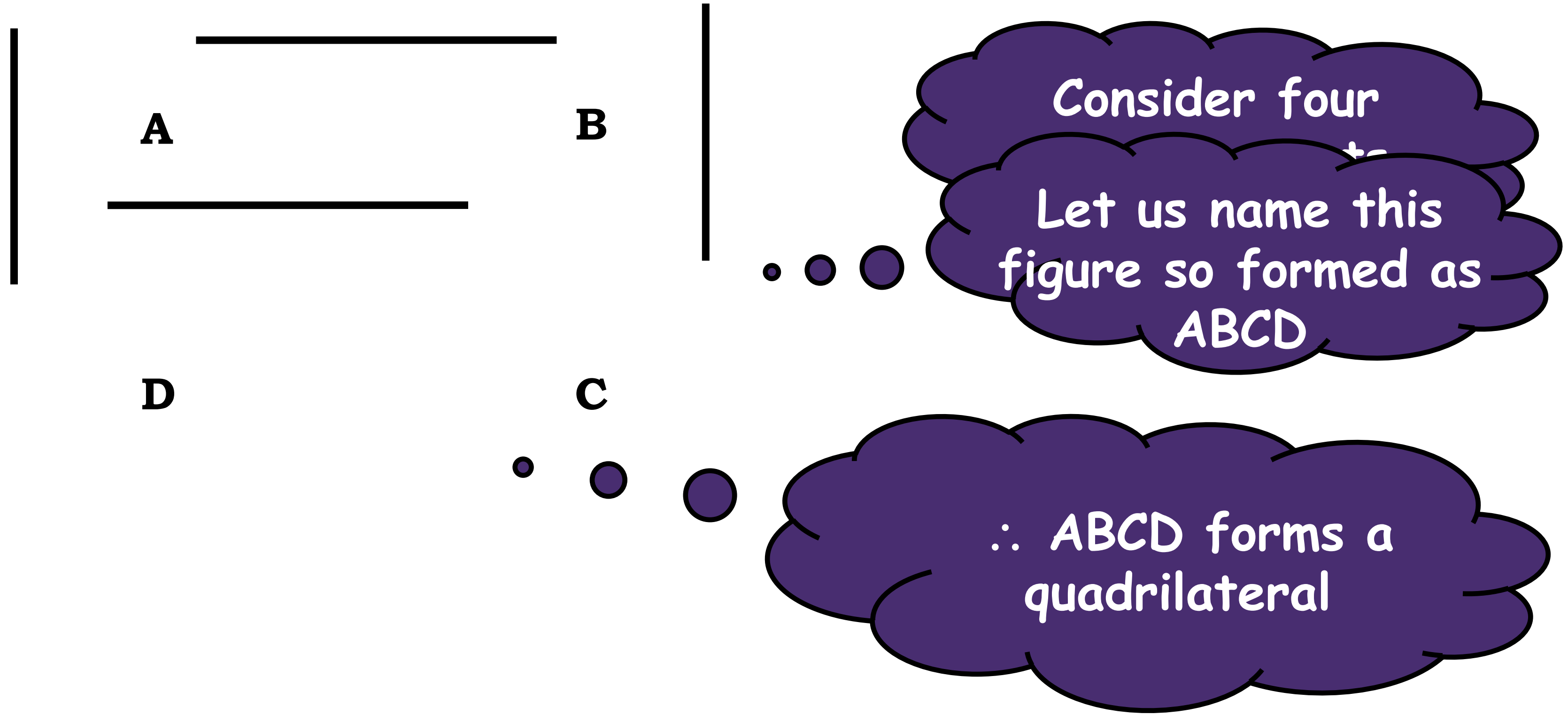


Thus we can consider many such points at a distance ‘r’ from point O

∴point ‘O’ is the centre of the circle

(g) Quadrilateral

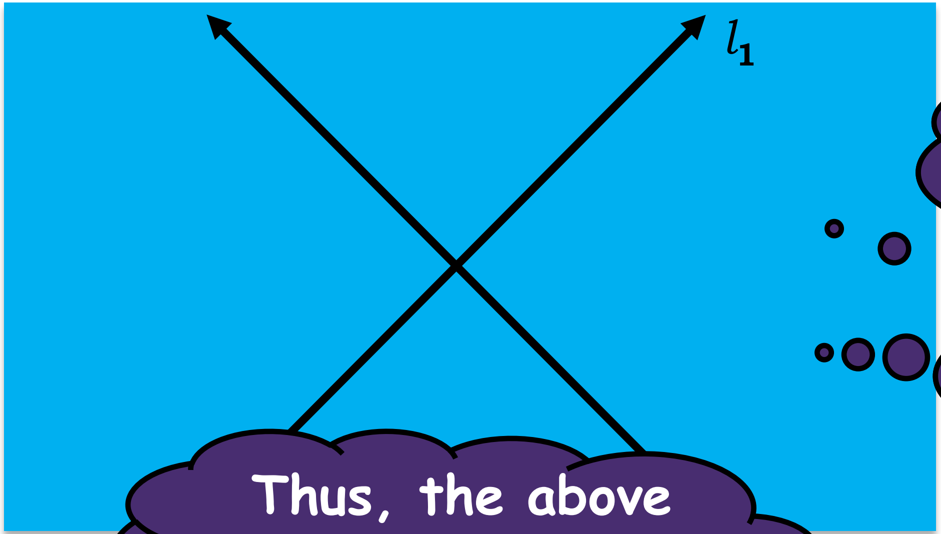
A closed figure made up of four line segments is called quadrilateral.



Module 9

(i) Parallel Lines :

- Two lines are said to be parallel when
  (a) they are non-intersecting (b) they are coplanar



It means line l_1 and l_2 belongs to same plane

That means lines l_1 and l_2 are parallel

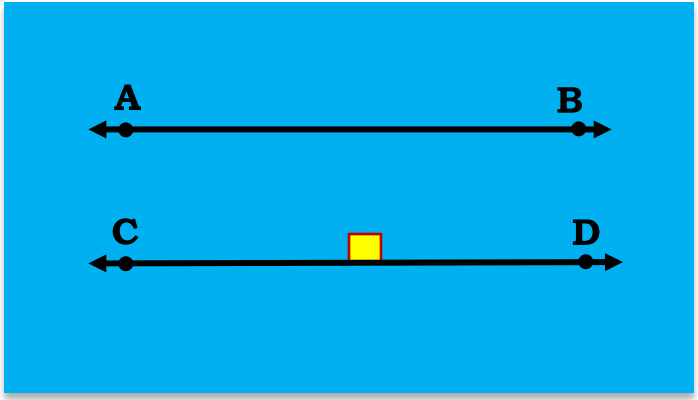
In figure, parallel.

Thus, the above lines are called parallel lines.

(ii) Perpendicular Lines :

Two lines AB and CD lying in the same plane are said to be perpendicular, if they form a right angle.

We write AB ⊥ CD.



∴ Line AB is perpendicular to line CD

Module 10

(iii) Line segment :

A line segment is a part of line. When two distinct points, say A and B on a line are given, then the part of this line with end-points A and B is called the line segment.

This is a line segment AB

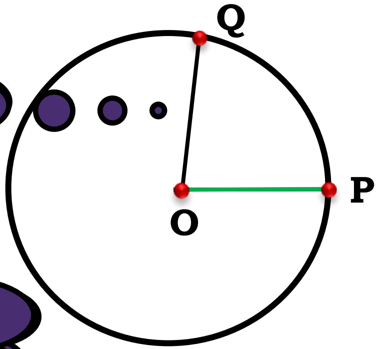
It is named as AB and
BA denote the same line segment.

(iv) Radius :

- The distance from the c
point on the circle is called
radius of the circle.
- OP is the radius.
- OQ is the radius.

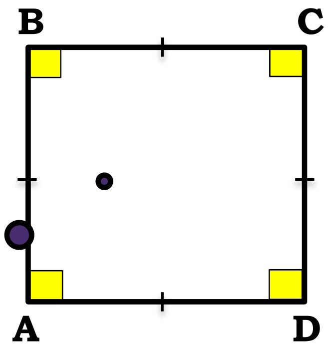
What is OQ
Radius
for circle ?

Let us consider
point 'P' on the circle



(v) Square :

- A quadrilateral in which all the four angles are right angles and four sides are equal is called a square.
- ABCD is a square.

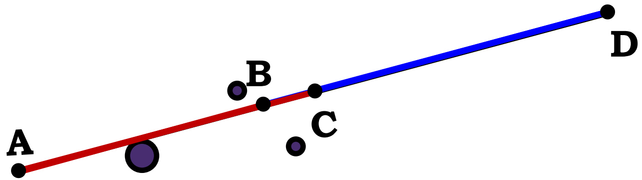


us consider
□ ABCD

∴ ABCD is
a square

Module 11

Q. In Figure, if AC = BD, then prove that AB = CD.



Soln.

$AC = BD$ …(i)

Also, $AC = AB + BC$ …(ii)

[Point B lies between A and C]

and, $BD = BC + CD$

B and D]

'C' is the point between B and D

BD = BC + CD

Substituting for AC and BD from (ii) and (iii) in (i), we get

$$AB + \cancel{BC} = \cancel{BC} + CD$$

$$\therefore \quad \mathbf{AB = CD}$$

Thank You