

## ANALYTICAL GEOMETRY II

05 AUGUST 2013

## Lesson Description

In this lesson, we:

- Revise the concepts from grade 11
- Include circles, tangents and translation of circles

## Key Concepts

$$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$

$$y = mx + c$$

$$y - y_1 = m(x - x_1)$$

$$m = \tan \theta$$

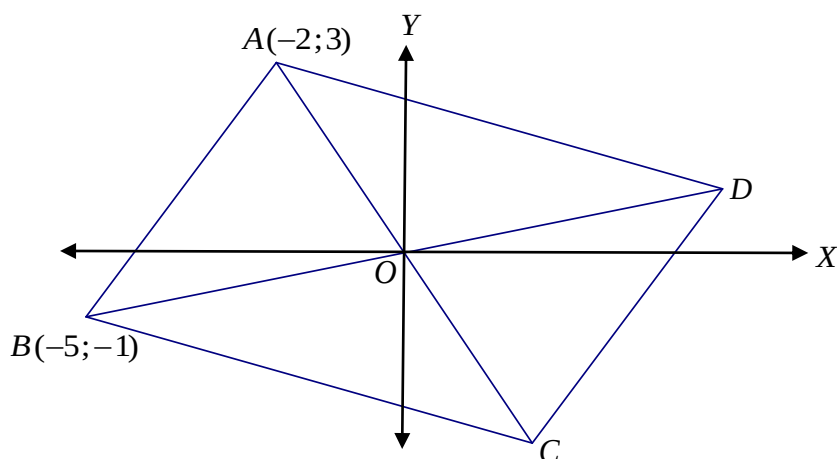
$$m = \frac{y_2 - y_1}{x_2 - x_1}$$

$$(x - a)^2 + (y - b)^2 = r^2$$

## Questions

## Question 1

The diagonals of parallelogram  $ABCD$  intersect in the origin. The co-ordinates of  $A$  are  $(-2; 3)$  and of  $B$  are  $(-5; -1)$ .



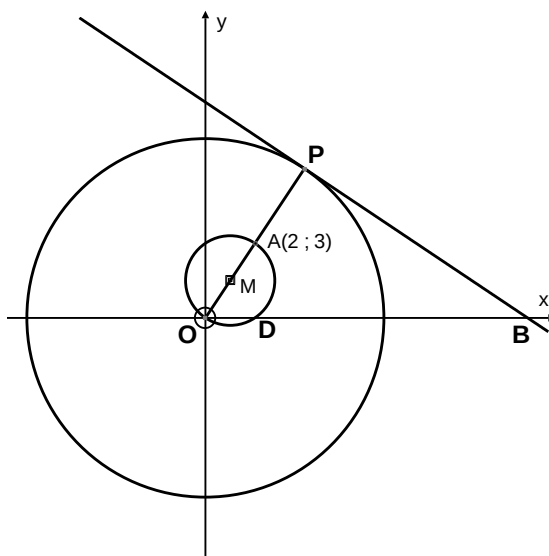
- Determine the co-ordinates of  $D$  and  $C$ .
- Give the transformation in the form  $(x; y) \rightarrow \dots\dots\dots$  that moves  $A$  to  $C$ .
- Prove that the size of  $\angle ABD$  is  $41,8^\circ$
- Determine the lengths of  $AB$  and  $BD$ . Leave your answers in surd form if necessary.

e.) Hence determine the area of  $ABCD$ .

f.)  $A'B'C'D'$  is an enlargement of  $ABCD$  by a factor of  $\frac{1}{2}$ . What is the area of  $A'B'C'D'$ ?

## Question 2

$A(2; 3)$ , the midpoint of radius  $OP$ , lies on the circumference of the smaller circle with diameter  $OA$ .



Write down:

- The co-ordinates of P.
- The equation of the larger circle.
- The equation of the smaller circle.

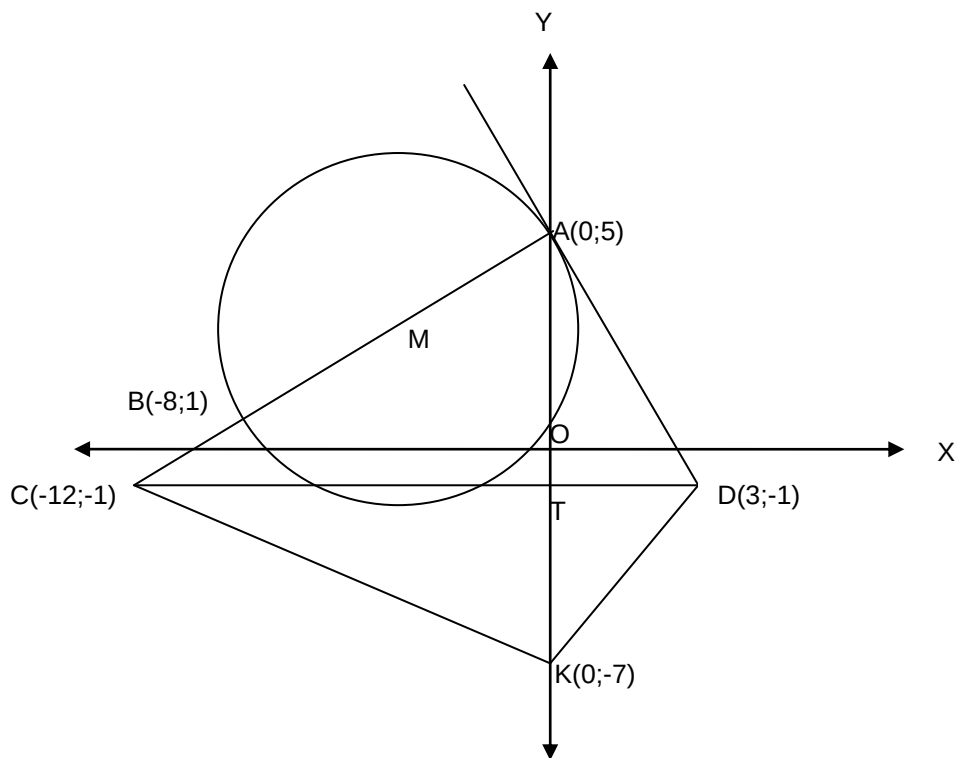
## Question 3

A circle is represented by the equation:  $x^2 + 2x + y^2 - 4y - 5 = 0$

- A transformation moves every point 2 units to the left and 4 units up. Determine the equation of the new circle after the transformation.
- Does the origin lie within the new circle? Give a reason for your answer.

### Question 4

$A(0; 5)$  and  $B(-8; 1)$  are two points on the circumference of the circle centre  $M$ , in a Cartesian plane.  $M$  lies on  $AB$ .  $DA$  is a tangent to the circle at  $A$ . The coordinates of  $D$  are  $(3; -1)$  and the coordinates of  $C$  are  $(-12; -1)$ . Points  $C$  and  $D$  are joined.  $K$  is the point  $(0; -7)$ .  $CTD$  is a straight line.



- Show that the coordinates of  $M$ , the midpoint of  $AB$ , are  $(-4; 3)$ .
- Determine the equation of the tangent  $AD$ .
- Determine the length of  $AM$ .
- Determine the equation of the circle with centre  $M$  in the form:  

$$ax^2 + by^2 + cx + dy + e = 0$$
- Quadrilateral  $ACKD$  is one of the following: parallelogram, kite, rhombus or rectangle. Which one is it? Justify your answer.