KABARAK UNIVERSITY

UNIVERSITY EXAMINATIONS

2009/2010 ACADEMIC YEAR

FOR THE CERTIFICATE OF PRE – UNIVERSITY

MATHEMATICS

COURSE CODE: PMATH 021

COURSE TITLE: VECTORS AND GEOMETRY

STREAM: SEMESTER TWO

DAY: THURSDAY

TIME: 9.00 – 11.00 A.M.

DATE: 25/03/2010

INSTRUCTIONS:

Answer **ALL** questions in **SECTION A** and any **TWO** in **SECTION B**

PLEASE TURN OVER

SECTION A (30 marks)

1. Distinguish between
   a) Gradient and y intercept of a line. [2 marks]
   b) Sector and segment [2 marks]
2. Find an equation of the line through P(5, - 7) that is parallel to the line $6x + 3y = 4$ [2 marks]
3. Suppose a major league baseball player has hit five home runs in the first 14 games and he keeps up this pace throughout the 162-game season
   i. Express the number y of the home runs in terms of the number x of games played. [1 mark]
   ii. How many home runs will the player hit for the season? [2 marks]
4. Three of the points given lie on a circle whose centre is at the origin, State which points and the radius of the circle. A(-1, 7), B(5, -5), C(-7, 5) and d97, -1) [4 marks]
5. O (0, 0) is the centre of the circle which passes through A(5, 0). [4 marks]
   i. Find the equation of the circle
   ii. The point P on the circle has coordinates (4, k) find k
6. Given that $90^0 < \theta < 270^0$, find θ when
   a) $\tan\theta = \sqrt{3}$ [3 marks]
   b) $\cos\theta = -\sqrt{3}/2$ [3 marks]
7. Two boats leave the harbor at 9.00 A.M. Boat A sails north at 20km/h. Boat B sails east at 15Km/h. How far apart are the two boats at noon? [4 marks]
8. In triangle PQR, p = 5 cm, q = 7 cm and r = 9 cm. Find the area of the triangle. [3 marks]

SECTION B 40 Marks

9.

a) Define the terms scalar and vector and hence state which of the following are scalars and vectors; momentum, magnetic field intensity, calorie and specific heat. [5 marks]

b) Solve the equation $\tan\theta = 2\sin\theta$ for the values of $0 \le \theta \le 360^0$ [5 marks]

c) A line is drawn through the point (2, 3) making an angle of 45^0 with the positive direction of the x–axis and it meets the line x = 6 at P. Find the

i. Distance of P from the origin [5 marks]

ii. The equation of the line through P perpendicular to OP [5 marks]

10.

a) In triangle ABC a = 5 cm , b = 7 cm and c = 9 cm. Calculate angle B and the area of the triangle. [5 marks]

b) Given A(-3, 1) and B(5, 4), find the equation of the perpendicular bisector of the line segment AB. [5 marks]

c) Use the slope-intercept form to find the slope and the y-intercept of the given lines.

i. $2x = 15 - 3y$

ii. $4x - 3y = 9$ [4 marks]

d) Simplify the following without using tables..

i. $\sin 30^0 \cos 30^0$

ii. $\tan 45^0 + \cos 45^0 \sin 45^0$ [6 Marks]

11.

a) Show that the following two circles given by the equations

$x^2 + y^2 - 6x - 8y + 9 = 0$, $x^2 + y^2 = 9$ are orthogonal. [6 Marks]

b) P, Q, R are the points (5, -3), (-6, 1), (1, 8) respectively. hence

a. Show that triangle PQR is isosceles [4 marks]

b. find the coordinates of the mid point of the base. [4 marks]

c) AB is a chord of a circle centre O and radius 14 cm. If the angle AOB is 80^0, calculate the perpendicular bisector of the chord AB to the minor arc AB.

[6 marks]

12.

a) Given the vectors find $\underline{a} = 2\hat{i} - \hat{j} + 3\hat{k}$, $\underline{b} = 3\hat{i} + 2\hat{j} - 4\hat{k}$ and $\underline{c} = -\hat{i} + 3\hat{j} - 2\hat{k}$ determine

i. $\underline{a} + \underline{b}$ [2 marks]

ii. $2\underline{a} + 3\underline{b} - 2\underline{c}$ [4 marks]

b) Suppose X lies on ST such that SX:XT = 2:5, express the position vector in terms of the vectors $\underline{s}$ and $\underline{t}$ [4 marks]

c) Determine the angle between the two vectors $\underline{a} = 4\hat{i} + 3\hat{j}$ and $\underline{b} = 8\hat{i} - 6\hat{j}$

[6 marks]

d) If $\vec{a} = 2\hat{i} - 3\hat{j}$; $\vec{b} = 4\hat{i} - 2\hat{j}$; Find $\left|2\vec{a} - 3\vec{b}\right|$ [4 marks]