KABARAK **UNIVERSITY**

UNIVERSITY EXAMINATIONS

2008/2009 ACADEMIC YEAR

FOR THE CERTIFICATE OF BRIDGING MATHEMATICS

COURSE CODE: BMATH 001

COURSE TITLE: VECTORS AND GEOMETRY

STREAM: BRIDGING

DAY: **MONDAY**

TIME: **8.30 – 10.30 A.M**

DATE: **08/12/2008**

INSTRUCTIONS TO CANDIDATES:

1. Attempt **QUESTION ONE** and ANY **OTHER TWO (2) QUESTIONS**
2. Show all your workings

PLEASE TURN OVER

QUESTION ONE (30 MARKS)

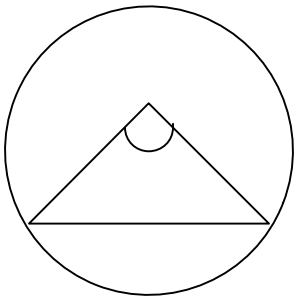
(a) Show that :

i. $\text{Sin } 60 = \frac{\sqrt{3}}{2}$

ii. $\text{Tan } 30 = \frac{1}{\sqrt{3}}$ using a suitable triangle (4 marks)

(b) Find the general equation of a line that is perpendicular to line AB given that AB passes through A (6, 1) and B (8, 5) (4 marks)

(c) Determine the area of the shaded region in the figure below:



(3 marks)

(d) Given that $\vec{A} = \begin{pmatrix} 2 \\ -3 \end{pmatrix}$ and $\vec{B} \begin{pmatrix} -1 \\ 4 \end{pmatrix}$ Determine

i. $2\vec{A} + \vec{B}$ (3 marks)

ii. $\left|\vec{A} + \vec{B}\right|$ (3 marks)

(e) Express the following obtuse angles in terms of acute angles and hence find their values

(i) sin 170

(ii) cos 160^0

(iii) tan 320 (6 marks)

(f) Determine the center and radius of a circle whose equation is

$2x^2 + 2y^2 + 4x + 8y + 6 = 0$ (4 marks)

(g) Show that (secΘ- tan Θ) (Cosec Θ + 1) = Cot Θ (3 marks)

QUESTION TWO (20 MARKS)

(a) Without drawing the lines determine which of the following lines are perpendicular :

(i) $y = 2x + 7$

$y = -\frac{1}{2}x + 3$

(ii) $y = 2x + 7$

$y = -2x + 5$ (4marks)

(b) Find the equation of a line that passes through (-1, 3) and is parallel to the line

$2x + 7y - 8 = 0$ (4 marks)

(c) Find the equation of a circle whose centre is (5, 4) and passes the point (0, 5) and (4, 1) (5 marks)

(d) The wiper of a Volvo is 30 cm long. It sweeps through an angle of 120^0 on a flat windscreen. Calculate the distance covered by the tip y of the wiper in one sweep. (Take Π = 3.14) (3 marks)

(e) Simplify the following trigonometrical expression

i. $\frac{\sqrt{\cos ec^2\theta - 1}}{\cos ec\theta}$

ii. $\frac{\tan\theta}{\sqrt{1+\tan^2\theta}}$ (4 marks)

QUESTION THREE (20 MARKS)

(a) Show that the addition of vectors is commutative (3 marks)

(b) If $\vec{A} = \begin{pmatrix} 5 \\ 6 \end{pmatrix}$, $\vec{B} = \begin{pmatrix} -3 \\ 4 \end{pmatrix}$

i. $\vec{A} + \vec{B}$

ii. $\vec{A} + \vec{B}$ (4marks)

(c) (i) State the cosine rule for any triangle (1 Mark)

(ii) In triangle PQR, q = 3cm, r = 5cm, and p $=120^0$. Determine the value of p and the area of the triangle (4 marks)

(d) Given that $\cos x = \frac{5}{13}$,where $0 \leq x \geq 90^0$

Find without using tables or electronic calculators

i. Sin x

ii. Tanx

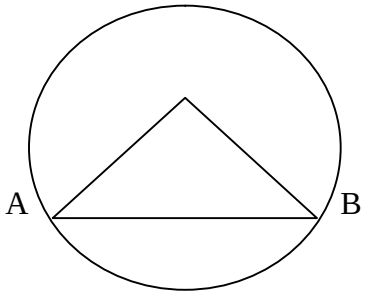
iii. Sec (180 + x) (6 marks)

(e) In triangle ABC, A $=120^0$, BC = 20cm and AC = 8cm. Find B. (2 marks)

QUESTION FOUR (20 MARKS)

(a) State any two properties of a chord of a circle. (2 marks)

(b) Consider the circle below:



If the radius of the circle is 5cm and ON is 3cm. Determine

i. The angle OAN (2 marks)

ii. The length of the chord AB (3marks)

iii. The length of the shaded region (4 marks)

(c) Given that $\vec{A}$ = 2i + 3j and $\vec{B}$ = 5i + j. Determine

i. $\vec{B} \cdot \vec{A}$ (2 Marks)

ii. $\left|\vec{A}\right|$ (1 Mark)

iii. $\left|\vec{B}\right|$ (1Mark)

iv. The angle between $\vec{A}$ and $\vec{B}$ (2 Marks)

(d) Verify that the scalar product of two vectors is commutative. (3marks)

QUESTION FIVE (20 MARKS)

(a) State and prove the ratio theorem. (5 marks)

(b) A point X divides AB in the ratio 2:5.

Express X the position vector of A and B respectively: (3marks)

(c) State the gradient and y intercept of the following lines:

i. $2y = 6x + 4$ (2 marks)

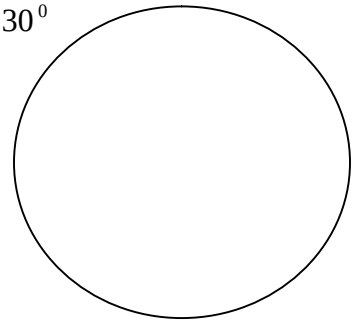
ii. $3y - 15x + 3 = 0$ (2 marks)

(d) Draw a line segment AB and show the position of X on AB such that AX: XB is

i. 2:7

ii. -3:5

(e) Find the values of X, Y and Z in the figure below given that 0 is the centre of the circle and <ABC = 30^0



(3marks)

(c) Prove the following trigonometrical identity

$$\frac{1}{1+\sin x} + \frac{1}{1-\sin x} = 2\sec^2 x$$

(3marks)