

KABARAK



UNIVERSITY

UNIVERSITY EXAMINATIONS

BRIDGING CERTIFICATE COURSE IN MATHEMATICS

COURSE CODE: BMATH 001

COURSE TITLE: VECTOR AND GEOMETRY

STREAM: BRIDGING

DAY: MONDAY

TIME: 2.00 - 4.00 P.M.

DATE: 24/08/2009

INSTRUCTIONS:

Attempt question **ONE** and any other **TWO** questions

PLEASE TURN OVER

QUESTION ONE (30 MARKS)

(a) A line passes through the points A (5, 7) and B (4, 9). Determine its equation in the form $ax + by = c$ (3 mks)

(b) Given that vector $\vec{a} = \begin{pmatrix} 2 \\ 3 \end{pmatrix}$, $\vec{b} = \begin{pmatrix} 4 \\ -1 \end{pmatrix}$ and $\vec{c} = \begin{pmatrix} 3 \\ 5 \end{pmatrix}$, find

(i) $\vec{a} + \vec{b}$

(ii) $\vec{a} + \vec{c}$

(iii) $\vec{a} + \vec{b} + \vec{c}$

(6 mks)

(c) In a triangle ABC, $\angle A = 60^\circ$, BC = 10 cm and AC = 4 cm. Find $\angle B$ (2 mks)

(d) Given that $x^2 + 4x + 4 + 8x + 16 + 12 = 0$ is an equation of a circle, determine its centre and radius.

(4 mks)

(e) If $\vec{OP} = 4\vec{a} + 3\vec{b}$, express OP as a column vector and hence determine the modulus of OP. (3 mks)

(f) Find the angle subtended at centre of a circle of radius 14 cm by an arc of length 12.1 cm. (3 mks)

(g) A chord AB subtends an angle of 60° at the centre O. If the radius of the circle is 10cm, calculate:

(i) The length of the major arc AB (2 mks)

(ii) The area of the minor segment cut off by AB take $(\pi = 3.14)$ (3 mks)

(h) Simplify $\frac{\sqrt{a^2 + b^2}}{a^2 + b^2}$ given that $\tan \theta = \frac{b}{a}$. (4 mks)

QUESTION TWO (20 MARKS)

(a) A line L_1 is $9x - 6y - 18 = 0$. Determine the equation of a line

(i) L_2 which is perpendicular to L_1 and passes through (6, -3). (4 mks)

(ii) L_3 which is parallel to L_1 and passes through (9, -3). (4 mks)

(b) The wiper of a Datsun car is 14 cm long. It sweeps through an angle of 100° on a flat Windscreen. Calculate the distance moved by tip of the wiper in one sweep. (3 mks)

(c) Express the following ratios in terms of ratios of acute angles and hence find their

Values:

(i) $\sin 390^\circ$

(ii) $\cos 160^\circ$

(iii) $\tan 320^\circ$

(6 mks)

(d) Show that (i) $\tan 45^\circ = 1$

(ii) $\cos 45^\circ = 1/\sqrt{2}$ using a suitable triangle.

(3 mks)

QUESTION THREE (20 MARKS)

(a) Express the following in terms of $\tan 80^\circ$

(i) $\tan 620^\circ$ **(2 mks)**

(ii) $\tan 460^\circ$ **(2 mks)**

(iii) $\tan -80^\circ$ **(1 mks)**

(b) Simplify

(i) $\frac{\sqrt{\theta}}{\theta}$ **(2 mks)**

(ii) $\frac{\theta}{\theta}$ **(3 mks)**

(c) Verify that $\vec{a} \cdot \vec{a} = \vec{a} \cdot \vec{a}$ **(4 mks)**

(d) Given that $\vec{a} = 2\vec{i} + 3\vec{j}$ and $\vec{b} = 5\vec{i} + \vec{j}$, Find

(i) $\vec{a} \cdot \vec{b}$ **(2 mks)**

(ii) $\vec{a} \times \vec{b}$ **(1 mk)**

(iii) \vec{a}

(1 mk)

(iv) The angle between \vec{a} and \vec{b}

(2 mks)

QUESTION FOUR (20 MARKS)

(a) State the gradient and y – intercept of the following lines;

(i) $8x + 24y = 8$ (2 mks)

(ii) $6x - 30y + 6 = 0$ (2 mks)

(b) Without drawing the lines, determine which of the following pairs of lines are perpendicular;

(i) $y = 8x + 7$, $y = -x + 3$

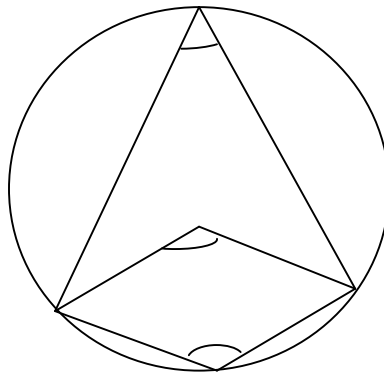
(ii) $y = 3x + 7$, $y = -x - 1$

(iii) $y = -x - 1$, $y = -\frac{1}{2}x - 1$

(iv) $y = \frac{3}{2}x - 1$, $y = -x - 4$ (4 mks)

(c) Determine the equation of a circle that circumscribe the triangle vertices (1, 0) (2, 1) and (0, 2) (4 mks)

(d) In the figure below, O is the centre of the circle. Using the angles provided, find a, b, c and d



(4 mks)

(e) Show that $\sec \theta + \sec \theta \cos \theta = \sec \theta \operatorname{cosec}^2 \theta$ (4 mks)

QUESTION FIVE (20 MARKS)

(a) A point P divides AB internally in the ratio 2:5, taking any point as the origin, find the position vector of P in terms of a and b the position vectors of A and B respectively.

(5 mks)

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

(i) 4:7 (ii) -2:5 (iii) 3:-1 **(3 mks)**

(c) A chord is 4 cm away from the centre of a circle of radius 5 cm. Determine the length Of the chord. **(3 mks)**

(d) Show that $\frac{\theta}{\theta} - \frac{\theta}{\theta} = 2 + \sec \theta \cos \theta$

(e) State and prove the ratio theorem **(4 mks)**

(5marks)