

KABARAK



UNIVERSITY

UNIVERSITY EXAMINATIONS

2009/2010 ACADEMIC YEAR

FOR THE CERTIFICATE OF PRE-UNIVERSITY MATHEMATICS

COURSE CODE: PMATH 021

COURSE TITLE: GEOMETRY AND VECTORS

STREAM: SEMESTER TWO

DAY: MONDAY

TIME: 9.00 – 11.00 A.M.

DATE: 09/08/2010

INSTRUCTIONS:

- Answer **All** questions in section A and any **Two** in section B

PLEASE TURN OVER

SECTION A (30 marks)

1. Define the following terms
 - a) Gradient of a line. [2 marks]
 - b) abscissa [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. A and B are the points (-1,-6) and (5,-8) respectively. Test whether any of the following 2 points lie on the perpendicular bisector of AB.
P (3,-4) C (-7, 5) [3 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 D(7, -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 $90^{\circ} < \theta < 270^{\circ}$, find θ when
 - a) $\tan \theta = \sqrt{3}$ [3 marks]
 - b) $\cos \theta = -\frac{\sqrt{3}}{2}$ [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 ABC, $c = 4.85$ cm, $B = 32^{\circ}$ and $A = 76^{\circ}$. Find the length b [3 marks]

SECTION B 40 Marks

9.
 - a) Solve the equation $\tan \theta = 2 \sin \theta$ for the values of $0 \leq \theta \leq 360^{\circ}$ [5 marks]
 - b) P, Q, R are the points (5, -3), (-6, 1), (1, 8) respectively.
 - i. Show that triangle PQR is isosceles [3 marks]
 - ii. Find the coordinates of the mid point of the base. [2 marks]
 - c) A line is drawn through the point (2, 3) making an angle of 45° 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 [4 marks]

ii. The equation of the line through P perpendicular to OP [6 marks]

10.

a) 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]

b) Simplify the following without using tables.

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

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

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

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

11.

a) Find the equation of a circle that passes through (0, 2) (8,-2) and (9, 5). Verify that it also passes through the point (2, 6). [14 marks]

b) What is a tangent? [2 marks]

c) Find the equation of the tangent at the point (2,6) above [4 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 $|2\vec{a} - 3\vec{b}|$ [4 marks]