

KABARAK



UNIVERSITY

UNIVERSITY EXAMINATIONS

2010/2011 ACADEMIC YEAR

FOR THE CERTIFICATE OF PRE-UNIVERSITY MATHEMATICS

COURSE CODE: PMATH 021

COURSE TITLE: GEOMETRY AND VECTORS

STREAM: SEMESTER TWO

DAY: THURSDAY

TIME: 9.00 – 11.00 A.M.

DATE: 09/12/2010

INSTRUCTIONS:

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

PLEASE TURN OVER

SECTION A (30 marks)

1. Distinguish between
 - a) A scalar and a vector. [2 marks]
 - b) Cosine rule and sine rule of a triangle [3 marks]
2. Find an equation of the line through P(5, - 7) that is parallel to the line $6x + 3y = 4$ [2 marks]
3. Without drawing the lines determine whether the following pair of lines are parallel or perpendicular [4 marks]
 - i. $3y + 3 = 2x$ and $2y + 3x + 8 = 0$
 - ii. $2x - y = 7$ and $y - 2x - 3 = 0$
4. The points $A(-7,-7), B(8,-1), C(4,9)$ and D are the vertices of a parallelogram ABCD. Find the coordinates of D [4 marks]
5. Find the equation of a circle whose center is at the point (2,1) and which passes through the point [3 marks]
6. Solve the equation $\tan \theta = 2 \sin \theta$ for the values of $0 \leq \theta \leq 360^\circ$ [3 marks]
7. In triangle PQR, $p = 5$ cm, $q = 7$ cm and $r = 9$ cm. Find the area of the triangle.
8. The vectors $\underline{a}, \underline{b}$ and \underline{c} are defined as $\underline{a} = 2\hat{i} - \hat{j}$, $\underline{b} = 3\hat{i} + 2\hat{j}$ and $\underline{c} = -\hat{i} + 3\hat{j}$ determine $2\underline{a} + 3\underline{b} - 2\underline{c}$ [3 marks]
9. Determine the angle between the two vectors $\underline{a} = 4\hat{i} + 3\hat{j}$ and $\underline{b} = 8\hat{i} - 6\hat{j}$ [3 marks]

SECTION B 40 Marks

10.

- a) Find the coordinates of the $M(x, y)$ point which divides the line segment joining points $A(2,3)$ $B(6,13)$ in the ratio 1: 3 from A to B [4 marks]
- b) A sheep is tethered at the corner of a fenced square grazing plot each of side 20 cm. long, if the length of the rope is 14 cm, what is the of the of the plot not grazed by the sheep ? [3 marks]
- c) 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]
- d) 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 [5 marks]
- ii. The equation of the line through P perpendicular to OP [5 marks]

11.

- 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) Given that $A(-3, 1)$ and $B(5, 4)$, find the equation of the perpendicular bisector of the line segment AB . [5 marks]
- d) Find the height of a fig tree which is observed from two points A and B , 30 metres apart on the opposite sides of the tree with angles of elevation from the top of the tree as 37° from A and 56° from B [5 marks]

12.

- 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) Two parallel chords of a circle are each 8 cm long. If the radius of the circle is 5 cm long, what is the perpendicular distance between the chords? [5 Marks]
- c) AB is a chord of a circle centre O and radius 14 cm. If the angle AOB is 80° , calculate the perpendicular bisector of the chord AB to the minor arc AB. [6 marks]

13.

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