

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: WEDNESDAY

TIME: 9.00 – 11.00 A.M.

DATE: 03/12/2009

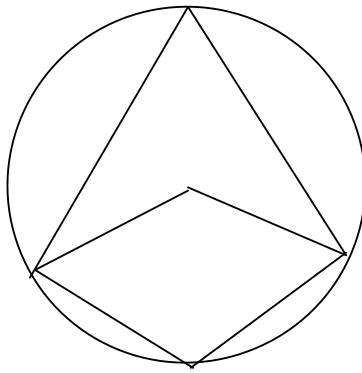
INSTRUCTIONS:

- Attempt **ALL** questions in section A and
- Any other four in section B.

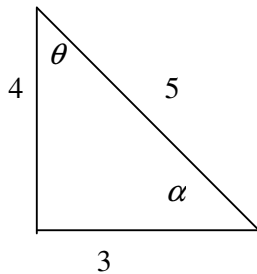
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SECTION A (30 marks)

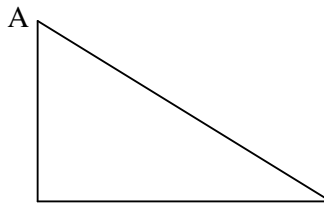
1. Plot the point A(3,4) and find which is symmetric to part A relative to
 - i. The x- axis
 - ii. The origin [2 marks]
2.
 - i. Find the equation of the line with slope $k = 5$ and passing through the point M(3, 4) [2 marks]
 - ii. Find the equation of a circle whose centre is at the origin and passes through the point A(5, 0) [2 marks]
3. Find the values of the angles x , y and z in the figure below if O is the centre of the circle and given that angle A is 50° . [2 marks]



4.
 - i. Find the distance between the points M(2,4) and N(- 4, 6) [2 marks]
 - ii. Find the cosine and the sine of the marked angles [2 marks]



5. Find the value of x and y in the figure given. [2 marks]



6.
 - i. Compute the midpoint of the segment joining the points A(5, -4) and B(-1, 6) [2 marks]
 - ii. Given that $\vec{a} = \begin{pmatrix} 2 \\ 3 \\ -4 \end{pmatrix}$ and $\vec{b} = \begin{pmatrix} -1 \\ 2 \\ 1 \end{pmatrix}$ find the value of $5\vec{a} + 2\vec{b}$ [2 marks]

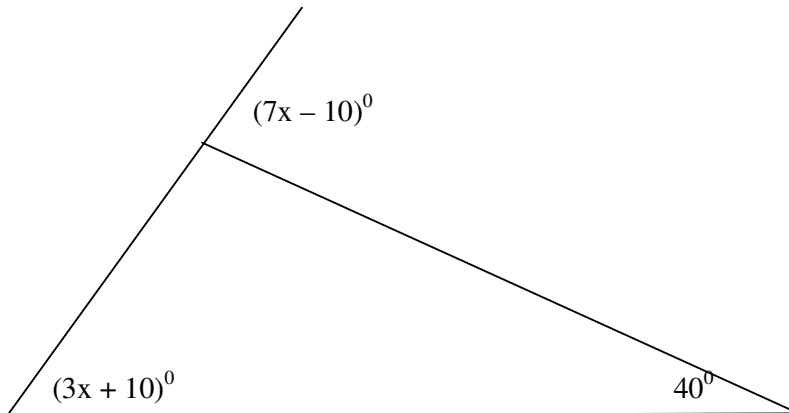
7. Given that $\sin \theta = \frac{4}{5}$ find

- i. $\cos \theta$
- ii. $\tan \theta$

[2 marks]

8. Find the value of x given the diagram below and state the nature of the triangle.

[3 marks]



9. Two boats leave the harbour at 9.00 a.m. Boat A sails north at 20 km/h. Boat B sails east at 15 km/h. How far apart are the two boats at noon? [3 marks]

10.

- i. Find the area of the sector containing an angle 80° in a circle of radius 3 cm. [2 marks]
- ii. The radius of a circle centre O is 5 cm. Find the perpendicular distance from O to a chord whose length is 6 cm. [2 marks]

SECTION B (40 marks)

11.

- 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) If $\vec{a} = 2\hat{i} - 3\hat{j}$; $\vec{b} = 4\hat{i} - 2\hat{j}$; Find $|2\vec{a} - 3\vec{b}|$

[5 marks]

12.

- a) Find all the angles between 0° and 360° which satisfy the equation

$$1 + 2 \sin 2\theta = 0 \quad [5 \text{ marks}]$$

- 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 area of the plot not grazed by the sheep ? [5 marks]

13.

- a) The vertices of a triangle are A(-3, 0), B(-3, 3) and C(3, 4). Find the area of the triangle. [5 marks]
- b) The vertices of a parallelogram are P(-3, 1), Q(3, 0), R(2, 4) and S(x, y). Find x and y. [5 marks]

14.

- a) Find the coordinates of the point where each of the following lines cut the x-axis

i. $y = -(3x + 2)$

ii. $y + 0.8x = 0.5$. [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]

15.

- a) 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? [4 Marks]
- b) In triangle ABC, a = 5 cm, b = 7 cm and c = 9 cm. Calculate angle B and the area of the triangle. [6 Marks]

16.

- a) Town B is 4.6 km N.E of town D, town C is 4 km North of town B and town T is 7.4 km S. 75° W of town C. What is the distance and bearing of town T from town D. [6 marks]
- b) O (0, 0) is the centre of the circle which passes through A(5, 0). The point P on the circle has coordinates (4, k) find k. [4 marks]