

CONFIDENTIAL*/SULIT*
954/2
MATHEMATICS T
Paper 2
2006
3 Hours

**PERSIDANGAN KEBANGSAAN PENGETUA-PENGETUA
SEKOLAH MENENGAH MALAYSIA
CAWANGAN MELAKA.**

**PENILAIAN PENGESANAN PEPERIKSAAN
SIJIL TINGGI PELAJARAN MALAYSIA 2006**

**MATHEMATICS T
PAPER 2
(3 HOURS)**

Instructions to candidates:

Answer **all** questions. Answers may be written in either English or Malay.

All necessary working should be shown clearly.

Non-exact numerical answers may be given correct to three significant figures, or one decimal place in the case of angles in degrees, unless a different level of accuracy is specified in the question.

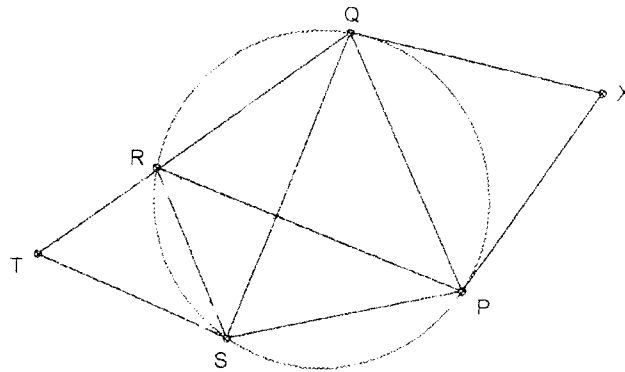
(This question paper consists of 5 printed pages .)

STPM 954/2

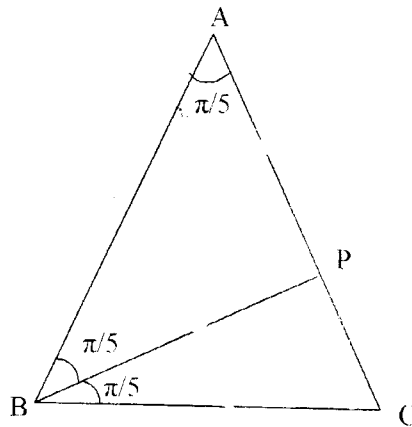
*This question paper is **CONFIDENTIAL** until the examination is over.

CONFIDENTIAL

[Turn over]



- Q PQRS is a cyclic quadrilateral in which $SP = PQ$.
- (a) If T is the point on QR produced such that ST is parallel to PR, prove that $\angle RTQ = \angle SRQ$ [4]
- (b) If the tangents at P and Q to the circle PQRS meet at X, prove that $\angle PXQ = \angle SRT$ [3]



Q In the Figure above, the points A, B, C and P are coplanar; $BC = BP = AP$ and the angles BAC, ABP, and PBC are each $\pi/5$ radians

- (a) Show that $\triangle ABC$ and $\triangle BPC$ are similar triangles, hence deduce that [3]
- (b) i) $BC^2 = (CP).(CA)$ [2]
- ii) $\cos(\pi/5) = \frac{1}{4}(\sqrt{5} + 1)$ [5]

- 3 (a) Prove that $(2\cos 3\theta + 2\cos 2\theta + 2\cos\theta + 1)\sin\frac{\theta}{2} = \sin\frac{7\theta}{2}$ [3]
 (b) Express $\cos 3\theta$ and $\cos 2\theta$ in terms of $\cos\theta$, deduce that

$$(8\cos^3\theta + 4\cos^2\theta - 4\cos\theta - 1)\sin\frac{\theta}{2} = \sin\frac{7\theta}{2}$$

Hence deduce that $\cos\frac{2\pi}{7}$ is one of the roots of the equation $8x^3 + 4x^2 - 4x - 1 = 0$ [6]

- 4 At 1700 hours, a pirate's ship Q is 25 nautical miles west of a police boat P. Q is sailing in the direction $N10^\circ E$ at 20 knots and P is moving at 30 knots. Find to the nearest degree, the direction P should be travelling in order to catch Q. Determine the time when the interception takes place. [7]

- 5 Prove that $\frac{d}{dx} \left[\frac{2+x}{2-x} \right] = \frac{2}{(2-x)^{3/2}(2+x)^{1/2}}$ [2]

Given that $\frac{dy}{dx} = \frac{e^x}{(2-x)^{3/2}(2+x)^{1/2}}$ and that $y = 0$ when $x = 1$, express y in terms of x . [4]

- 6 For all positive values of x , the gradient of normal of a curve at the point (x, y) is $-\frac{x^2 + x}{y}$. The point $(3, 6)$ lies on this curve. Find the equation of the curve in the form $y = f(x)$ [6]

- 7 A listed company bids for two government projects to build highways. The person in charge estimates that the probability of winning the first project is 0.6, the probability of winning the second project is 0.4 and the probability of winning both projects is 0.25. Find the probability that

(a) the company does not win any project, [2]

(b) the company wins exactly one project. [1]

(c) Given that the company does not win the first project, find the probability that he wins the second. [3]

(d) Determine whether or not, winning the first contract and winning the second contract are independent events [2]

- (c) Whenever an amateur acrobat performs a certain routine, the probability that she will do so faultlessly is 0.85. Find to three decimal places, the probability that she will perform the routine faultlessly on at least four occasions out of six. [3]

- (d) The door frames provided by a housing contractor are of a standard height, 1.90 m. The height of men are normally distributed with mean 1.75 m and standard deviation 0.08 m.
- (a) Find the proportion of men who are taller than the door frame. [2]
- (b) If the contractor wishes to alter the frame height, in such a way that forty nine men out of fifty are not taller than the frame height, find to two decimal places, the new height of the door frame. [3]

The door frames are to be used in a department store. It is known that women outnumber men in the ratio 15 : 1 in the store and that the proportion of women taller than the door frame is 0.005. Find, to 4 decimal places, the proportion of people for whom a frame height of 1.90 m would be too low. [3]

- (e) (a) A random sample of 200 rubber trees yields the following information concerning their trunk diameters, in centimetres.

Minimum	Lower quartile	Median	Upper quartile	Maximum
13	27	32	35	42

Use this data summary to draw a cumulative frequency curve. Hence determine the interpercentile range. [6]

- (b) The following table shows the daily expenses (RM) of 80 college students

Expenses, (RM x)	20 –	25 –	30 –	35 –	40 –	$45 \leq x < 50$
Frequency	5	10	17	26	18	4

Draw a histogram for the above data. Use your histogram to determine the value of x given that the probability of the diameter greater than x is 0.1. [6]

- 11 A fairground game involves hitting a moving target with a gunshot. A round consists of three shots. Ten points are scored if a player hits the target at each shot, but the round is over if the player misses the three shots. Fiona has a constant probability of 0.8 of hitting the target at each shot and the shots are independent of one another. The random variable X is the score Fiona obtains in a round. Find

- (a) the probability distribution of X . [3]
 (b) the mean and the standard deviation of X . [5]

A game consists of 2 rounds, find the probability that Fiona scores more points in round 2 than in round 1. [3]

Under the new rule, the score Y is given as $\frac{1}{2}x - 1$, find the mean and the standard deviation of Y . [4]

- 12 The cumulative distribution function of X is given by

$$F(x) = \begin{cases} 0 & \text{for } x \leq 0 \\ 1 - e^{-5x} & \text{for } x > 0 \end{cases}$$

Find the probability density function of X , hence find the mean of X . [4]

If the continuous random variable Y is denoted by $Y = 3X + 2$. Find

- (a) $P(Y < y)$ and state the range of y clearly, [4]
 (b) the probability density function of Y , [1]