SULIT
3472/2
Matematik
Tambahan
Kertas 2
September
2005

2½ jam

3472/2

MAKTAB RENDAH SAINS MARA

**PEPERIKSAAN PERCUBAAN
SIJIL PELAJARAN MALAYSIA 2005**

MATEMATIK TAMBAHAN

Kertas 2

Dua jam tiga puluh minit

JANGAN BUKA KERTAS SOALAN INI SEHINGGA DIBERITAHU

1. *Kertas soalan ini adalah dalam dwibahasa*

2. *Soalan di halaman kiri adalah dalam bahasa Melayu. Soalan di halaman kanan adalah yang sepadan dalam bahasa Inggeris.*

3. *Calon dibenarkan menjawab keseluruhan atau sebahagian soalan sama ada dalam bahasa Melayu atau bahasa Inggeris.*

4. *Calon dikehendaki membaca maklumat di halaman 2 atau halaman 3.*

5. *Calon dikehendaki menceraikan halaman 31 dan ikatkan bersama-sama dengan kertas jawapan, sebagai muka hadapan.*

Kertas soalan ini mengandungi 29 halaman bercetak dan 3 halaman tidak bercetak

Section A

[40 *marks*]

Answer **all** *questions in this section.*

1.	Solve the following simultaneous equations : $\dfrac{1}{x-1} - \dfrac{1}{y} = 1$ *and* $x - 2y = 2$ [5 marks]

2.	(a) Solve the equation $2^{x+4} = 2^{x+2} + 96$.
	
	                                                          [3 marks]
	
	(b) Given $\log_p 2 = h$ and $\log_p 3 = k$, find $\log_p \left(\dfrac{\sqrt{p}}{48} \right)$ in terms of h and of k.
	
	                                                          [4 marks]

3.	Table 1 shows a set of numbers and it's frequency.
	
	<table><tr><td>Number</td><td>5</td><td>10</td><td>15</td><td>20</td><td>25</td></tr><tr><td>Frequency</td><td>4</td><td>1</td><td>2</td><td>n</td><td>2</td></tr></table>
	TABLE 1
	
	Given that the median of the set of numbers is 17.5.
	
	(a) Determine the value of n and hence find the mean.
	
	                                                          [3 marks]
	
	(b) Another number, x, is added to the above set of numbers without changing the value of the mean.
	
	  (i) State the value of x.
	
	  (ii) Find the standard deviation of the new set of numbers.
	
	                                                          [3 marks]

4.	Diagram 1 shows a triangle ABC where point E is on AB, point F is on AC and point D is on the straight line CE.

DIAGRAM 1

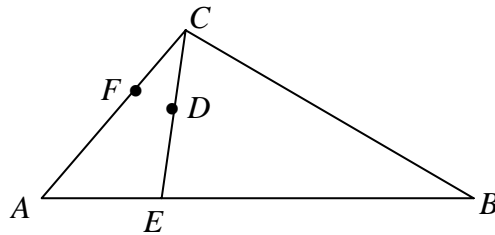Given that 5AE = 2AB, CE = 4CD, AC = 6CF, $\overrightarrow{CF} = \underline{x}$ *and* $\overrightarrow{AB} = 5\underline{y}$.

(a) Find

     (*i*) $\overrightarrow{CE}$

     (*ii*) $\overrightarrow{FD}$

     (*iii*) $\overrightarrow{DB}$

[5 marks]

(b) Hence, prove that F, D and B are collinear.

[2 marks]

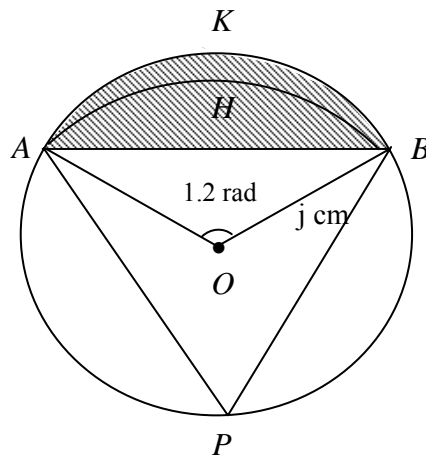|	
5.	Diagram 2 shows a circle AKBP centred at O, with radius j cm and a sector APBH centred at P with radius 15 cm.

DIAGRAM 2

Given that the ratio of the arc AHB to the arc AKB is 6:7 and $\angle AOB$ = 1.2 radian.
Calculate

(a) the value of j   [3 marks]

(b) the area of shaded region.   [4 marks]

6.   (a)   The radius of a sphere decreases at constant rate of 0.3 cms^{-1} . Find the rate of change of the surface area of a sphere when the radius is 5 cm.

(Use surface area of a sphere $= 4\pi j^{2)}$

[3 marks]
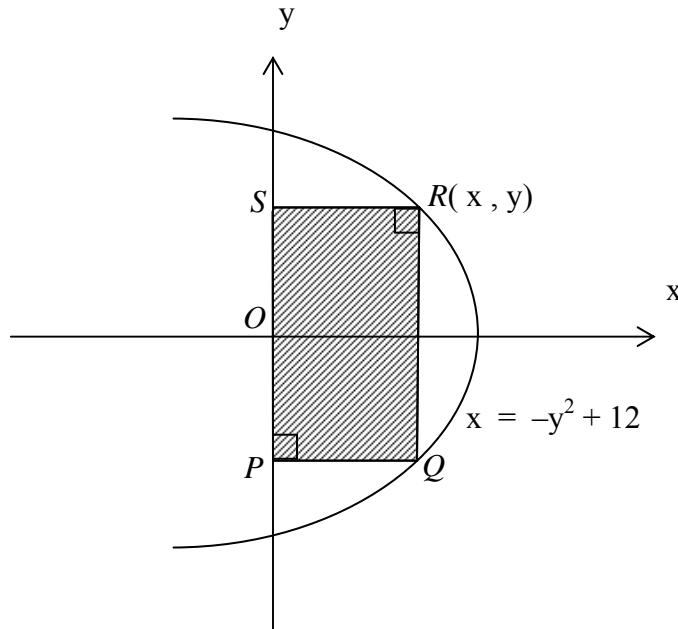
(b)   Diagram 3 shows the curve $x = -y^2 + 12$.

DIAGRAM   3

Point P and point S lies on the y-axis and point Q and point R lies on the curve where PQRS is a rectangle.

(i)   Show that the area of the shaded region, L unit^2 , is given by $L = 24y - 2y^3$.

(ii)   Find the maximum area of the shaded region.

[5 marks]

Section B

[40 *marks*]

Answer **four** *questions from this section.*

7.   *Use the graph paper provided to answer this question*

Table 2 shows the values of two variables, x and y obtained from an experiment. Variables x and y are related by the equation $py = x^2 + pqx,$ where p and q are constants.

x	2	3	4	6	7	8
y	45	78	120	225	294	360

TABLE 2

(a) Plot $\dfrac{y}{x}$ against x using a scale of 2 cm to 1 unit on the x-axis and 2 cm to 5 unit on the

$\dfrac{y}{x}$-axis.

Hence, draw the line of best fit.   [4 marks]

(b) Using your graph from (a) to find

(i)   The value of y when x = 5

(ii)   The value of p and of q.

                                                                                          [6 marks]

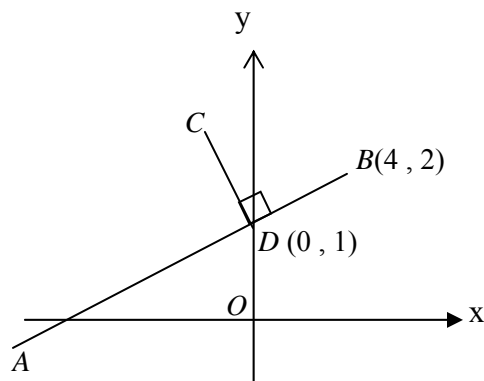| 8	Diagram 4 shows a straight line AB intersecting a straight line CD at D.

DIAGRAM 4

(a)   Given $AB = 3\,DB$, find the coordinates of point A.   [3 marks]

(b)   (i) Find the equation of CD.

      (ii) If point C lies on the straight line $y = 3x + 8$, find the coordinates of point C.
                                                                              [4 marks]

(c)   If $P(x,y)$ is a moving point where the ratio of the distance from point A to point B is 1:2 ,
      find the equation of locus P.
                                                                              [3 marks]

9	(a) Prove the following identity:

$$\frac{1}{kos\,\theta - \sin\theta} - \frac{1}{kos\,\theta + Sin\,\theta} = \frac{\tan 2\theta}{kos\,\theta}$$ [4 marks]

(b)   Given that $5\cos 2x = 7 (\cos x - \sin x)$ where $\sin x \neq \cos x$ and x is an acute angle.

      (i)   Shows that $\cos x + \sin x = \dfrac{7}{5}$ [2 marks]

      (ii) Hence, solve the equation $5\cos 2x = 7(\cos x - \sin x)$.   [4 marks]

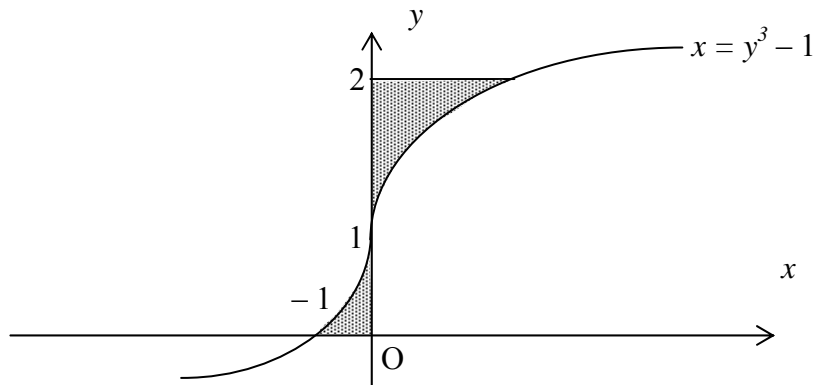**10.** (a) Diagram 5 shows a section of the curve $x = y^3 - 1$.

DIAGRAM 5

Calculate the area of the shaded region. [5 marks]

(b) Diagram 6 shows a region bounded by part of the curve $x^2 + y^2 = a$, the line $x = 1$ and the line $x = 3$.
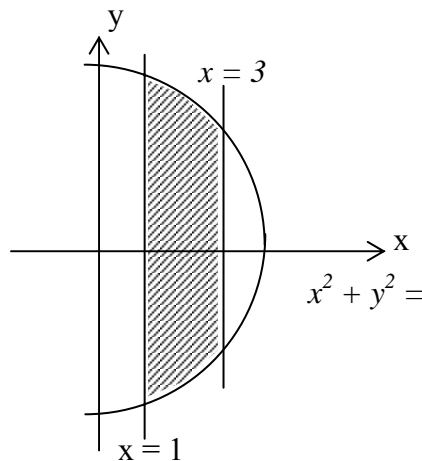

DIAGRAM 6

When the shaded region is rotated through 180° about the x-axis, the volume generated is $\dfrac{70\pi}{3}$ unit^3. Find the value of a.

[5 marks]

11. (a) An experiment found that 3% of mobile phone produced by a factory do not meet the standard. A sample of 8 mobile phone has been choose randomly from the factory. Calculate the probability

   (i) The exactly one mobile phone from the sample not meeting the standard,

  (ii) at least 2 mobile phone from the sample not meeting the standard.

[4 marks]

(b) The height of male students in a college is normally distributed with a mean of 165 cm and a standard deviation of 15 cm.

  (i) A male student from the college is selected at random. Calculate the probability that his height is less than 168 cm.

  (ii) If 15% of the tallest among the male students are selected to undergo a basketball training program, calculate the minimum height of the male students selected.

[6 marks]

Section C

[20 *marks*]

Answer **two** *questions from this section.*

12. A particle X moves in a straight line and passes through a fixed point O with velocity 9 ms^{-1}. Its acceleration, a_x ms^{-2}, is given by $a_x = 6 - 6t$ where t seconds after a particle X passes through point O. A particle X changes its direction of motion at point A.

(a) Find

    (i) the time when a particle X is at point A,   [3 marks]

    (ii) the total distance traveled by a particle X during the first 5 second.
           [4 marks]

(b) A particle Y moves in a same straight line with velocity, v_y ms^{-1}, at t seconds is given by $v_y = t^2 - 7t + 10$. Determine whether a particle X and Y move in the same or opposite marks direction when a particle Y attained its minimum velocity.
           [3 marks]

| 13. | A type of liquid is formed by mixing three types of raw materials *A*, *B* and *C* in the ratio of *A*:*B*:*C* is 2:3:5. Table 4 shows the price indices of the raw materials for the year 2003 based on the year 2001. |

Raw Material	Price Index
A	100
B	110
C	130

TABLE 4

(a) If the price of 1 liter of raw material C for the year 2003 is RM6.50, calculate the price corresponding for the year 2001.

[2 marks]

(b) Calculate the composite index for raw material in the year 2003 using the year 2001 as the base year.

[2 marks]

(c) The composite index number for raw materials increases by 20% from the year 2003 to the year 2005. Calculate

(i) the composite index number for raw materials in the year 2005 based on the year 2001,

[2 marks]

(ii) the cost of raw materials to produce 1 bin of the liquid for the year 2005 if the cost corresponding for the year 2001 is RM500.

[2 marks]

(d) If the price index of raw material B for the year 2002 based on the year 2001 is 112, calculate the price index of raw material B for the year 2003 based on the year 2002.

[2 marks]

14. | *Use the graph paper provided to answer this question.*

A sport club offers two types of fitness activities are swimming activity and aerobic activity. The payment rate imposed for swimming activity and aerobic activity are RM20 and RM10 per hour respectively.

A competitor wishes to join x hours of swimming activity and y hours of aerobic activity every month based on the following constraints:

  I   The maximum total time for both activities is 20 hours.

  II   The total payment for both activities do not exceed RM280.

  III :   The time for swimming activity must be more than the time for aerobic activity by not more than 2 hours.

(a) Write down three inequalities other than $x \geq 0$ and $y \geq 0$ that satisfy all the above conditions.

[3 marks]

(b) Hence using a scale of 2 cm to 2 hours for both axes, construct and shade the region R that satisfies all the above conditions.

[4 marks]

(c) If the average energy that been use for swimming activity and aerobic activity are 5000 calories and 3500 calories every hour respectively, calculate the maximum total energy that been use for both activities per month.

[3 marks]

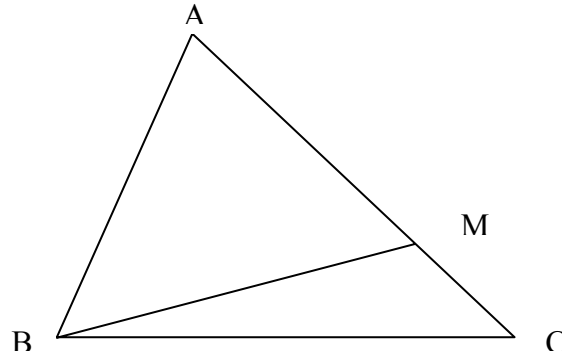| 15.	(a) Diagram 7 shows a triangle ABC where AB=15 cm, AC=18 cm and ∠ BAC = 52°. A point M lies on AC there for 3AM = 2AC.

DIAGRAM 7

Calculate
  (i)   The length of BC
  (ii)   ∠ ACB
  (iii) the area of triangle ABM

[7 marks]
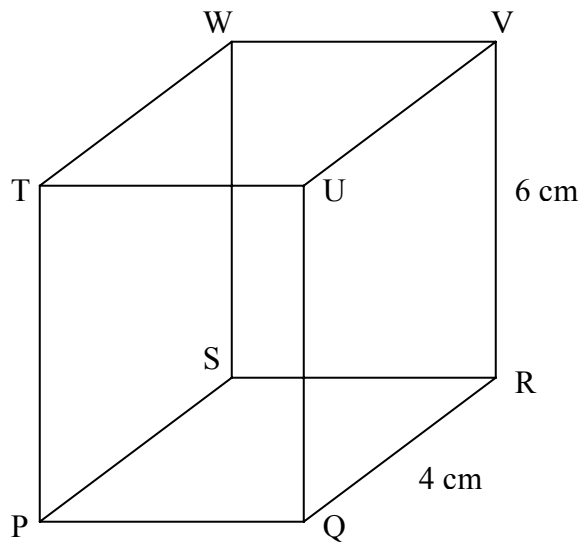
(b) Diagram 8 shows a cuboid with a base of square PQRS.

DIAGRAM 8

Given the point M is a midpoint of TW and point N lies on VR where VN = $\frac{1}{3}$ VR.

Calculate ∠ QMN.

[3 marks]

END OF QUESTION PAPER