3472/2
Matematik
Tambahan
Kertas 2
Mei
2007
2 ½ jam

SEKTOR SEKOLAH BERASRAMA PENUH
BAHAGIAN SEKOLAH
KEMENTERIAN PENDIDIKAN MALAYSIA

PEPERIKSAAN PERTENGAHAN TAHUN 2007
TINGKATAN 5

MATEMATIK TAMBAHAN

Kertas 2

Dua jam tiga puluh minit

JANGAN BUKA KERTAS SOALAN INI SEHINGGA DIBERITAHU

1. *This question paper consists of three sections* : **Section A**, **Section B** *and* **Section C**
2. *Answer* **all** *questions in* **Section A, four** *questions from* **Section B** *and* **two** question from **Section C.**
3. *Give only* **one** *answer/solution to each question.*
4. *Show your working. It may help you to get marks.*
5. *The diagrams in the questions provided are not drawn to scale unless stated.*
6. *The marks allocated for each question and sub-part of a question are shown in brackets*
7. *A list of formulae is provided on pages* 2 *to* 3.
8. *A booklet of four-figure mathematical tables is provided.*
9. *You may use a non-programmable scientific calculator.*

Kertas soalan ini mengandungi **10** halaman bercetak

The following formulae may be helpful in answering the questions. The symbols given are the ones commonly used.

ALGEBRA

1 $x = \dfrac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

2 $a^m \times a^n = a^{m+n}$

3 $a^m \div a^n = a^{m-n}$

4 $(a^m)^n = a^{nm}$

5 $\log_a mn = \log_a m + \log_a n$

6 $\log_a \dfrac{m}{n} = \log_a m - \log_a n$

7 $\log_a m^n = n \log_a m$

8 $\log_a b = \dfrac{\log_c b}{\log_c a}$

9 $T_n = a + (n-1)d$

10 $S_n = \dfrac{n}{2}[2a + (n-1)d]$

11 $T_n = ar^{n-1}$

12 $S_n = \dfrac{a(r^n - 1)}{r - 1} = \dfrac{a(1 - r^n)}{1 - r}$, $(r \neq 1)$

13 $S_\infty = \dfrac{a}{1-r}$, $|r| < 1$

CALCULUS

1 $y = uv$, $\dfrac{dy}{dx} = u\dfrac{dv}{dx} + v\dfrac{du}{dx}$

2 $y = \dfrac{u}{v}$, $\dfrac{dx}{dy} = \dfrac{v\dfrac{du}{dx} - u\dfrac{dv}{dx}}{v^2}$,

3 $\dfrac{dy}{dx} = \dfrac{dy}{du} \times \dfrac{du}{dx}$

4 Area under a curve

$= \displaystyle\int_a^b y \, dx$ or

$= \displaystyle\int_a^b x \, dy$

5 Volume generated

$= \displaystyle\int_a^b \pi y^2 \, dx$ or

$= \displaystyle\int_a^b \pi x^2 \, dy$

GEOM ETRY

1 Distance $= \sqrt{(x_1 - x_2)^2 + (y_1 - y_2)^2}$

2 Midpoint

$(x , y) = \left(\dfrac{x_1 + x_2}{2} \; , \; \dfrac{y_1 + y_2}{2} \right)$

3 $|r| = \sqrt{x^2 + y^2}$

4 $\hat{r} = \dfrac{xi + yj}{\sqrt{x^2 + y^2}}$

5 A point dividing a segment of a line

$(x, y) = \left(\dfrac{nx_1 + mx_2}{m + n}, \dfrac{ny_1 + my_2}{m + n} \right)$

6 Area of triangle =

$\dfrac{1}{2}\left|(x_1 y_2 + x_2 y_3 + x_3 y_{1_1}) - (x_2 y_1 + x_3 y_2 + x_1 y_3)\right|$

STATISTICS

1 $\bar{x} = \dfrac{\sum x}{N}$

2 $\bar{x} = \dfrac{\sum fx}{\sum f}$

3 $\sigma = \sqrt{\dfrac{\sum (x-\bar{x})^2}{N}} = \sqrt{\dfrac{\sum x^2}{N} - \bar{x}^2}$

4 $\sigma = \sqrt{\dfrac{\sum f(x-\bar{x})^2}{\sum f}} = \sqrt{\dfrac{\sum fx^2}{\sum f} - \bar{x}^2}$

5 $m = L + \left[\dfrac{\frac{1}{2}N - F}{f_m}\right]C$

6 $I = \dfrac{Q_1}{Q_0} \times 100$

7 $\bar{I} = \dfrac{\sum w_1 I_1}{\sum w_1}$

8 ${}^nP_r = \dfrac{n!}{(n-r)!}$

9 ${}^nC_r = \dfrac{n!}{(n-r)!\,r!}$

10 $P(A \cup B) = P(A) + P(B) - P(A \cap B)$

11 $P(X=r) = {}^nC_r\, p^r q^{n-r}$, $p + q = 1$

12 Mean, $\mu = np$

13 $\sigma = \sqrt{npq}$

14 $z = \dfrac{x-\mu}{\sigma}$

TRIGONOMETRY

1 Arc length, $s = r\theta$

2 Area of sector, $A = \dfrac{1}{2}r^2\theta$

3 $\sin^2 A + \cos^2 A = 1$

4 $\sec^2 A = 1 + \tan^2 A$

5 $\text{cosec}^2 A = 1 + \cot^2 A$

6 $\sin 2A = 2 \sin A \cos A$

7 $\cos 2A = \cos^2 A - \sin^2 A$
$= 2\cos^2 A - 1$
$= 1 - 2\sin^2 A$

8 $\tan 2A = \dfrac{2\tan A}{1 - \tan^2 A}$

9 $\sin (A \pm B) = \sin A \cos B \pm \cos A \sin B$

10 $\cos (A \pm B) = \cos A \cos B \mp \sin A \sin B$

11 $\tan (A \pm B) = \dfrac{\tan A \pm \tan B}{1 \mp \tan A \tan B}$

12 $\dfrac{a}{\sin A} = \dfrac{b}{\sin B} = \dfrac{c}{\sin C}$

13 $a^2 = b^2 + c^2 - 2bc \cos A$

14 Area of triangle $= \dfrac{1}{2}ab \sin C$

Section A
[40 *marks*]

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

1 Solve the simultaneous equations $2x + y = 5$ and $x^2 + y^2 = 10$

[5 *marks*]

2 Diagram 1 shows the mapping of x to y under $f(x) = \dfrac{p}{3-4x}, x \neq \dfrac{3}{4}$ and the mapping of y to z under $g(y) = py - q$.

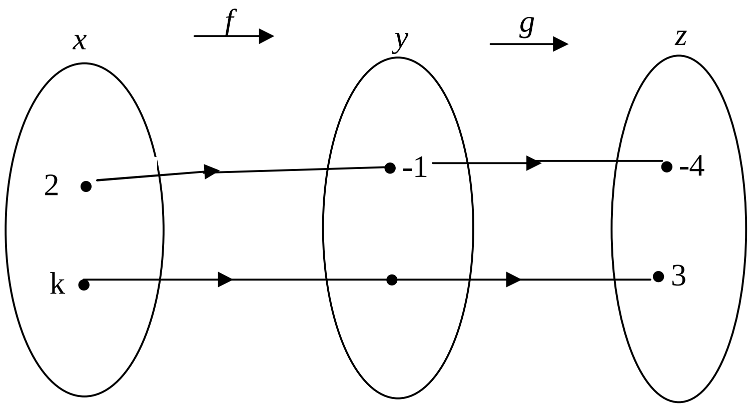

DIAGRAM 1

Find

(a) the values of p and q , [3 *marks*]

(b) the function that maps x to z , [2 *marks*]

(c) the value of k . [2*marks*]

3 It is given that the equation of a curve is $y = x^2 - 6x$.

Find

(a) the turning point of the curve. [3 *marks*]

(b) the value of x if $y\dfrac{d^2y}{dx^2} + x\dfrac{dy}{dx} + 8 = 0$ [4 *marks*]

4 *Solution to this question by accurate drawing will not be accepted .*

Diagram 2 shows a triangle *PQR* with vertices *P*(3 , – 2) ,*Q* (-2 , 3) and *R* (*k*, 6) and *PQ* is perpendicular to *QR* . The point *S* lies on the x-axis and *PS* is parallel to *QR*.

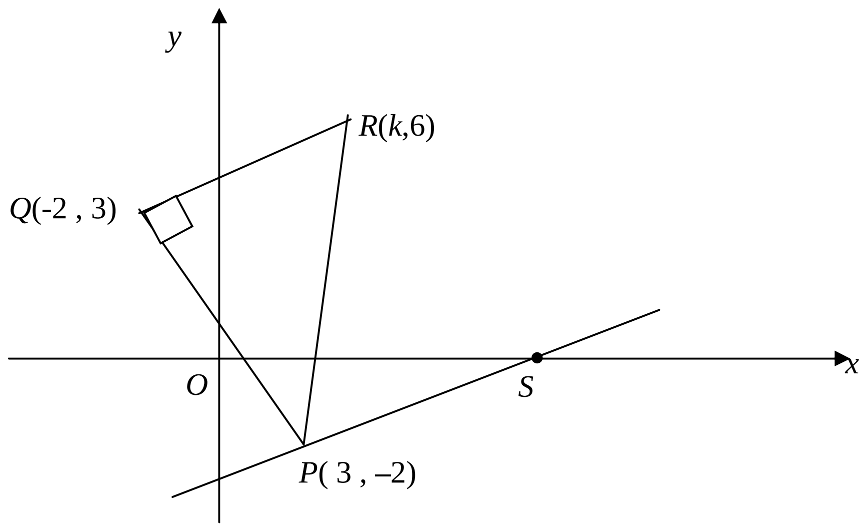

DIAGRAM 2

Find

(a) the value of *k*, [2 *marks*]

(b) the area of triangle *PQR* , [2 *marks*]

(c) the equation of *PS* and the coordinates of *S*. [3 *marks*]

5 Table 1 shows the marks scored by a group of students in a mathematics test.

Marks	Number of students
6 - 10	2
11 -15	5
16 - 20	18
21 - 25	10
26 - 30	7
31 - 35	4
36 - 40	2

TABLE 1

(a) Using a scale of 2 cm to 5 marks on the horizontal axis and 2 cm to 2 students on the vertical axis, draw a histogram to represent the frequency distribution of the marks. Find the mode marks. [4 *marks*]

(b) Without drawing an ogive, calculate the median marks. [3 *marks*]

6 Diagram 3 shows a circle with centre *O* of radius 10 cm. The line *AC* is a tangent to the circle at *A* and the line *OC* intersects the circle at *B*.

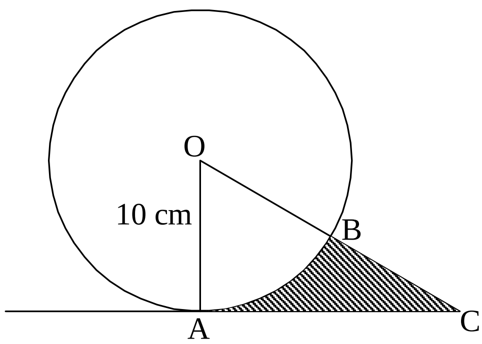

DIAGRAM 3

It is given that $\angle OCA$ is 0.5 radian.
Calculate

(a) the length of *AC*, [2 *marks*]

(b) the area of the shaded region. [5 *marks*]

Section B
[40 *marks*]
Answer **four** *questions from this section.*

7 *Use the graph paper 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 $y = px + kx^2$, where p and k are constants .

x	1	2	3	4	5	6
y	$3 \cdot 8$	$11 \cdot 2$	$20 \cdot 5$	$33 \cdot 2$	$50 \cdot 6$	$70 \cdot 8$

TABLE 2

(a) Plot $\frac{y}{x}$ against x, using a scale of 2 cm to 2 units on the x-axis and 2 cm to 1 unit on the $\frac{y}{x}$-axis . Hence, draw the line of best fit.

[4 *marks*]

(b) Use the graph in (a) to find the value of
(i) p,
(ii) k,
(iii) x when $y = 5x$

[6 *marks*]

8 (a) A company employed 200 workers on the first day of a project and the number is increased by 5 every day until the project is completed. The project operated 6 days a week and took 6 weeks to be completed. Every worker is paid RM 30 a day .
Calculate
(i) the number of workers on the last day.

(ii) the total wages paid by the company .

[5 *marks*]

(b) The sum of the first three terms of a geometric progression, $S_3 = 0.875 \times S_\infty$.
(i) Find the common ratio of the progression.

(ii) Given the sum of the first three terms is 350, find the first term.

[5 *marks*]

9 Diagram 4 shows a triangle *POQ*. Point *M* lies on the line *OP* such that *OM = 2MP*. Point *N* is the mid point of *OQ* and point *X* is the midpoint of *MN*.

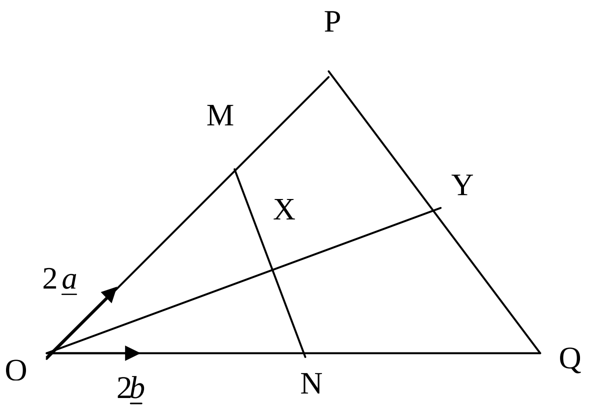

DIAGRAM 4

It is given that $\overrightarrow{OM} = 2\underset{\sim}{a}$ and $\overrightarrow{ON} = 2\underset{\sim}{b}$.

(a) Express in terms of $\underset{\sim}{a}$ and /or $\underset{\sim}{b}$

(i) $\overrightarrow{PQ}$

(ii) $\overrightarrow{MN}$ [3 *marks*]

(b) If $PY = h\,PQ$, show that $\overrightarrow{OY} = 3(1-h)\underset{\sim}{a} + 4h\underset{\sim}{b}$ [2 *marks*]

(c) Given that $\overrightarrow{OY} = k\overrightarrow{OX}$, express $\overrightarrow{OY}$ in terms of $k, \underset{\sim}{a}$ and $\underset{\sim}{b}$ [2 *marks*]

(d) Hence, find the value of h and of k. [3 *marks*]

10 (a) Prove that $\tan x + \cot x \equiv \dfrac{1}{\sin x \cos x}$.

Hence solve the equation $\tan x + \cot x = 2$ for $0 \le x \le 2\pi$ [4 *marks*]

(b) (i) Sketch the graph of $y = 2\sin 2x$ for $0 \le x \le 2\pi$

(ii) Hence, using the same axes, draw a suitable straight line to find the number of solutions to the equation $2\pi \sin 2x = x - \pi$ for $0 \le x \le 2\pi$.
State the number of solutions.

[6 *marks*]

11 (a) Diagram 5 shows a curve $y = x^2$ and straight lines $x = -2$ and $y = 16$.

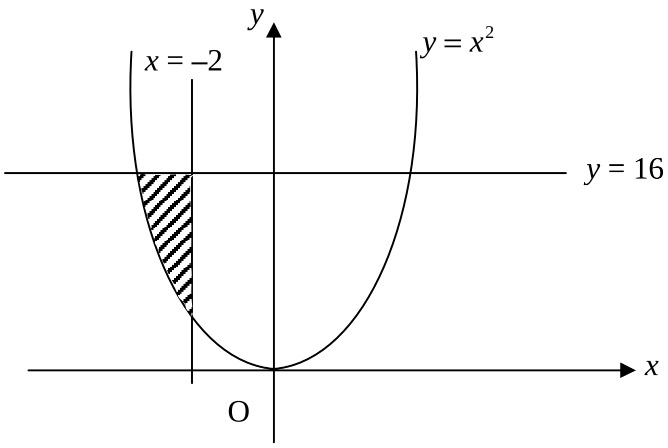

DIAGRAM 5

Find the area of shaded region. [6 *marks*]

(b) Diagram 6 shows a curve $y^2 = 4x + 1$ and the shaded region that is bounded by the curve, the x-axis and straight lines $x = 2$ and $x = p$.

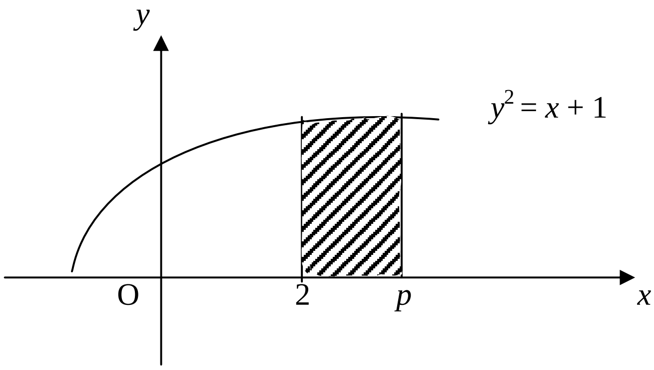

DIAGRAM 6

Given that the volume generated when the shaded region is revolved through 360^0 about x-axis is 20π unit^3.
Find the value of p.

[4 *marks*]

Section C
[20 *marks*]

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

12 Diagram 7 shows a triangle *ABD*. Point *C* lies on the straight line *BD* such that *BC* is 3.5 cm and *AC* = *AD*.

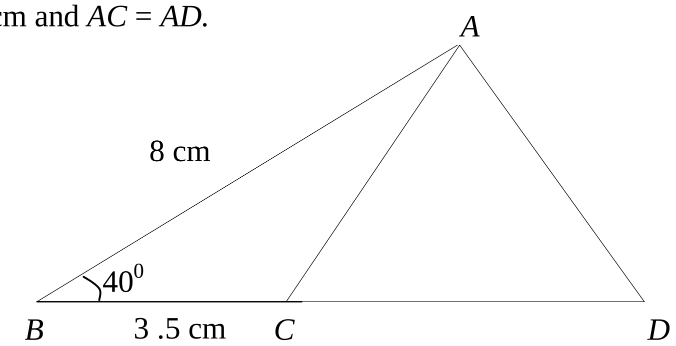

DIAGRAM 7

It is given that *AB* = 8 cm and $\angle ABC = 40^0$. Calculate

(a) the length of *AD*, [3 *marks*]

(b) $\angle ACB$, [4 *marks*]

(c) the area of triangle *ABD*. [3 *marks*]

13 An electrical item consists of only four parts, *A* , *B*, *C* and *D* . Table 3 shows the unit price and the price indices of the four parts in the year 2005 based on the year 2003 and the number of parts used in producing the electrical item.

Part	Price in 2003 (RM)	Price in 2005 (RM)	Price Index in 2005 based 2003	Number of parts
A	25	35	140	*m*
B	*p*	18	120	2
C	32	*q*	125	6
D	30	33	*r*	5

TABLE 3

(a) Find the value of *p* , *q* and *r*. [4 *marks*]

(b) Find the value of *m*, if the composite index for the year 2005 taking the year 2003 as the base year is 123.53. [3 *marks*]

(c) Find the unit price of the electric item in 2005 if the unit price of the item in 2003 is RM 425 . [3 *marks*]

END OF QUESTION PAPER