



**SEKTOR SEKOLAH BERASRAMA PENUH
BAHAGIAN SEKOLAH
KEMENTERIAN PENDIDIKAN MALAYSIA**

**PEPERIKSAAN PERCUBAAN
SIJIL PELAJARAN MALAYSIA 2007**

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 question in Section A , four questions from Section B and two questions 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 diagram 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 11 halaman bercetak

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

ALGEBRA

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

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

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

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

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

$$6 \quad \log_a \frac{m}{n} = \log_a m - \log_a n$$

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

$$8 \quad \log_a b = \frac{\log_c b}{\log_c a}$$

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

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

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

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

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

CALCULUS

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

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

$$3 \quad \frac{dy}{dx} = \frac{dy}{du} \times \frac{du}{dx}$$

4 Area under a curve

$$= \int_a^b y \, dx \text{ or}$$

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

5 Volume generated

$$= \int_a^b \pi y^2 \, dx \text{ or}$$

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

GEOMETRY

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

2 Midpoint

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

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

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

5 A point dividing a segment of a line

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

6. Area of triangle =

$$\frac{1}{2} |(x_1 y_2 + x_2 y_3 + x_3 y_1) - (x_2 y_1 + x_3 y_2 + x_1 y_3)|$$

STATISTICS

$$1 \quad \bar{x} = \frac{\sum x}{N}$$

$$2 \quad \bar{x} = \frac{\sum fx}{\sum f}$$

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

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

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

$$6 \quad I = \frac{P_1}{P_0} \times 100$$

$$7 \quad \bar{I} = \frac{\sum w_1 I_1}{\sum w_1}$$

$$8 \quad {}^n P_r = \frac{n!}{(n-r)!}$$

$$9 \quad {}^n C_r = \frac{n!}{(n-r)!r!}$$

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

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

$$12 \quad \text{Mean, } \mu = np$$

$$13 \quad \sigma = \sqrt{npq}$$

$$14 \quad z = \frac{x - \mu}{\sigma}$$

TRIGONOMETRY

$$1 \quad \text{Arc length, } s = r\theta$$

$$2 \quad \text{Area of sector, } A = \frac{1}{2} r^2 \theta$$

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

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

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

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

$$7 \quad \begin{aligned} \cos 2A &= \cos^2 A - \sin^2 A \\ &= 2 \cos^2 A - 1 \\ &= 1 - 2 \sin^2 A \end{aligned}$$

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

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

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

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

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

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

$$14 \quad \text{Area of triangle} = \frac{1}{2} ab \sin C$$

SECTION A

[40 marks]

Answer all questions in this section .

1. Solve the simultaneous equations $4x + y + 8 = x^2 + x - y = 2$.

[5 marks]

- 2 (a) Given that $\int_0^1 (15x^2 + 8kx + k^2) dx = 2$, where k is a constant. Find the possible values of k .

[3 marks]

- (b) Given that $\frac{d^2y}{dx^2} = 12x + 5$, when $x = -1$, $y = -2$ and $\frac{dy}{dx} = 1$, find y in terms of x .

[5 marks]

- 3 *Solution to this question by scale drawing will not be accepted.*

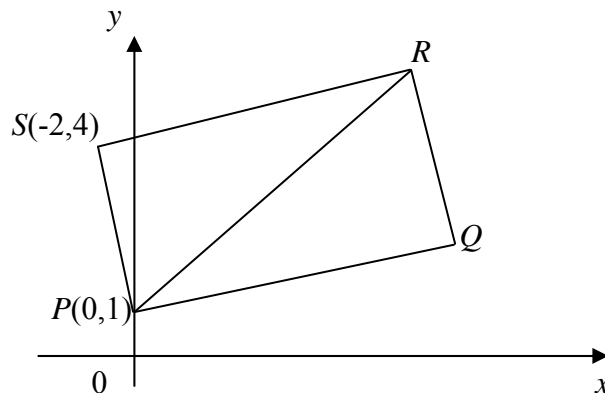
Diagram 1 shows a rectangle $PQRS$.

DIAGRAM 1

Given that the equation of the line PR is $4y = 4 + 7x$, find

- (a) the equation of the line SR ,

[3 marks]

- (b) the coordinates of points R and Q ,

[3 marks]

- (c) the area of rectangle $PQRS$.

[2 marks]

4 If $m = \cos 25^\circ$ and $n = \sin 15^\circ$, express in terms of one or both m and n ,

(a) $\cos 40^\circ$,

[3 marks]

(b) $\sin 50^\circ$,

[2 marks]

(c) $\cos 12\frac{1}{2}^\circ$

[2 marks]

5 The table 1 shows the marks acquired by a group of students in a competition.

Marks	1	2	3	4	5
Number of students	4	6	2	x	1

TABLE 1

Find,

(a) the maximum value of x if the mode mark is 2,

[1 mark]

(b) the minimum value of x if the mean mark is greater than 3,

[2 marks]

(c) the range of value of x if the median mark is 2.

[2 marks]

6

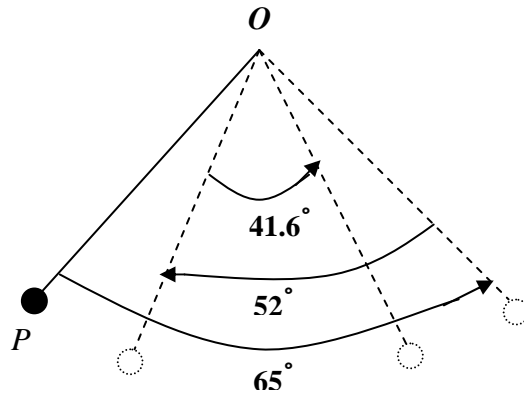


DIAGRAM 2

(a) The above diagram shows a pendulum released from the position OP . It swings freely through the angle of 65° , 52° , 41.6° and so on. Calculate the total angle it covers in 8 swings.

[3 marks]

(b) The sequence $-11, -5, 1, \dots$ is an arithmetic progression. State the three consecutive terms of this arithmetic progression where the sum of these three terms is 93.

[4 marks]

SECTION B

[40 marks]

Answer **four** questions from this section.

7 Use graph paper to answer this question.

Table 2 shows the values of two variables, x and y , obtained from an experiment. The variables x and y are related by the equation $y = \frac{p^x}{q}$, where p and q are constants.

x	42.50	38.50	32.01	25.50	13.00	7.98
y	1.40	1.60	2.00	2.50	3.80	4.50

TABLE 2

(a) Plot $\log_{10} y$ against x , by using a scale of 2 cm to 5 units on the x -axis and 2 cm to 0.1 unit on the y -axis. Hence, draw the line of best fit.

[5 marks]

(b) Use the graph from (a) to find the value of

(i) p ,

(ii) q ,

(iii) y when $x = 15.5$

[5 marks]

8 Diagram 3, shows a semicircle ABC with centre O . Given that $\angle AOB$ is 1.2 radian and the length of OA is 5 cm.

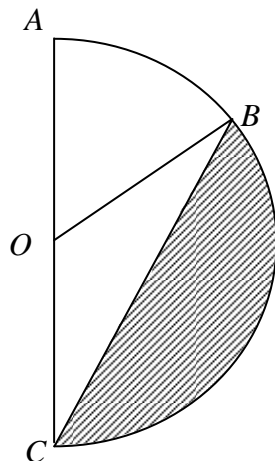


DIAGRAM 3

Find,

- a) $\angle BOC$ in degrees and minutes, [1 mark]
- b) the shortest distance between the centre O to the straight line of BC , [2 marks]
- c) the perimeter of the shaded region, [4 marks]
- d) the area of the shaded region. [3 marks]

- 9 Diagram 4 shows parallelogram $OABC$. The midpoint of AB is P and CP meets OB at Q . It is given that $\overrightarrow{OA} = \underline{a}$, $\overrightarrow{OC} = \underline{c}$, $\overrightarrow{OQ} = \lambda \overrightarrow{OB}$ and $\overrightarrow{CQ} = \mu \overrightarrow{CP}$.

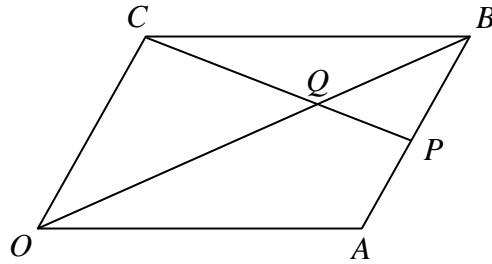


DIAGRAM 4

- (a) Express \overrightarrow{OP} in terms of \underline{a} and \underline{c} , [1 mark]
- (b) Express \overrightarrow{OQ}
- (i) in terms of λ , \underline{a} and \underline{c} ,
- (ii) in terms of μ , \underline{a} and \underline{c} , [3 marks]
- (c) Hence, find the value of λ and μ , [3 marks]
- (d) Given that area of triangle OQC is 18 cm^2 , find the area of the parallelogram $OABC$. [3 marks]

- 10 Diagram 5 shows part of the curve $y = x^2 + 3$ and straight line $2y + 3x = 20$.

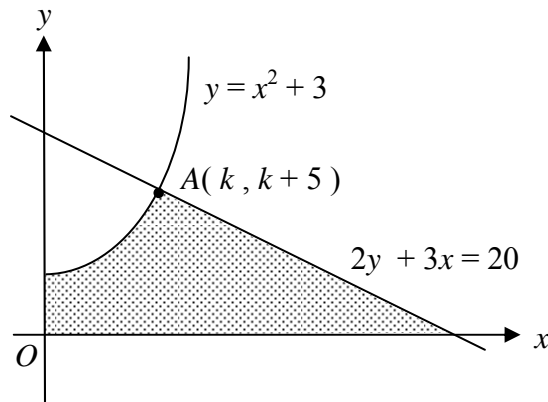


DIAGRAM 5

- (a) Show that $k = 2$. [2 marks]
- (b) Find the area of the shaded region. [4 marks]
- (c) Find the volume generated, in terms of π , when the region bounded by the y -axis, the curve $y = x^2 + 3$ and straight line $2y + 3x = 20$ is revolved through 360° about the y -axis. [4 marks]
- 11 (a) X is a discrete random variable such that $X \sim B(n, p)$. Given that the mean and variance of X are 6 and 2.4 respectively, find
- (i) the value of p and n ,
- (ii) $P(X \leq 2)$. [5 marks]
- (b) The life-span of a type of battery produced by a factory is normally distributed with mean 325 hours and standard deviation 25 hours. Find
- (i) the probability that a unit of battery chosen at random, has a life-span between 280 hours and 350 hours,
- (ii) the percentage of battery that has a life-span of more than 320 hours. [5 marks]

SECTION C

[20 marks]

Answer two questions from this section.

- 12 A particle moves along a straight line and passes a fixed point O , with a velocity of 10 ms^{-1} . Its acceleration, $a \text{ ms}^{-2}$, $t \text{ s}$ after passing through O is given by $a = 2t - 7$. (Take the direction to the right as the positive direction)
- (a) Find the constant velocity of the particle. [3 marks]
- (b) Find the range of time for which the particle moves to the left. [3 marks]
- (c) Find the total distance travelled by the particle in the first 5 seconds. [4 marks]
- 13 Table 3 shows the price indices in the year 2007 based to the year 2006, of four different materials A , B , C and D , in the production of a type of a shampoo. It also includes the division of the usages of the materials in the production of the shampoo.

Material	Price Index 2007 (2006 = 100)	Weightage
A	125	4
B	120	p
C	80	5
D	150	$p + 3$

TABLE 3

- (a) If the price of material A is RM 50 in the year 2007, calculate its price in 2006. [2 marks]
- (b) If the composite index for the year 2007 based to the year 2006 is 120, find the value of p . [2 marks]

- (c) Find the price of the shampoo in 2007 if its price in 2006 was RM 15.00
[2 marks]
- (d) Given that the price of material C is estimated to increase by 15 % from the year 2007 to 2008, while the others remain unchanged. Calculate the composite index of the shampoo in the year 2008, based on the year 2006.
[4 marks]

14 Use the graph paper provided to answer this question.

A private college offers two diploma courses, information technology and business studies. The enrolment of students is based on the following conditions :

- I : The capacity of the college is 170 students.
- II : The minimum total number of students enrolled is 80.
- III : The number of students enrolled for business studies exceeds twice the number of students enrolled for information technology at least by 20 students.

Given that there are x students enrolled for information technology course and y students enrolled for business studies course,

- (a) write three inequalities, other than $x \geq 0$ and $y \geq 0$, that satisfy the above conditions.
[3 marks]
- (b) by using a scale of 2 cm to 10 students on x-axis and 2 cm to 20 students on y-axis, construct and shade the region of feasible solutions of x and y .
[3 marks]
- (c) based on your graph,
 - (i) find the maximum amount of fees collected per month if the monthly fees for information technology and business studies courses are RM 100 and RM 80 respectively.
 - (ii) find the range of the number of students enrolled for business studies if the number of students enrolled for information technology is 20.
[4 marks]

- 15 (a) Diagram 6 shows triangle ABC and triangle AED . AEC is a straight line.

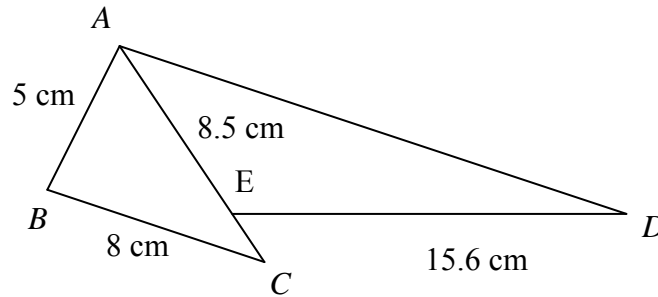


Diagram 6

Given that $\angle BAC = 60^\circ$, $AB = 5$ cm, $BC = 8$ cm, $AE = 8.5$ cm and $ED = 15.6$ cm. Calculate

- (i) the length of EC , [3 marks]
- (ii) $\angle AED$, if the area of triangle AED is 54 cm². [2 marks]
- (b) Diagram 7 shows a right prism with an isosceles triangular base where $DE = DF = 10$ m, $FE = 8$ cm and $AD = 7$ cm.

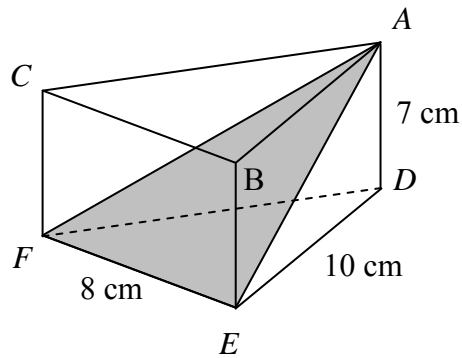


Diagram 7

Calculate,

- (i) the angle between the line of AE and the base FED , [2 marks]
- (ii) $\angle FAE$. [3 marks]

END OF QUESTION PAPER