



SEKTOR SEKOLAH BERASRAMA PENUH
BAHAGIAN PENGURUSAN
SEKOLAH BERASRAMA PENUH / KLUSTER
KEMENTERIAN PELAJARAN MALAYSIA

PEPERIKSAAN PERCUBAAN
SIJIL PELAJARAN MALAYSIA 2008

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 **13** halaman bercetak

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

ALGEBRA

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

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

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

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

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

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

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

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

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

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

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

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

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

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 | = | 7 | |
| 2 | = | 8 | |
| 3 | $\sigma =$ | 9 | |
| 4 | $\sigma =$ | 10 | $P(AB) = P(A) + P(B) - P(AB)$ |
| 5 | $M =$ | 11 | $p(X=r) = , p + q = 1$ |
| 6 | | 12 | Mean , $= np$ |
| | | 13 | |
| | | 14 | $z =$ |

 TRIGONOMETRY

- | | | | |
|---|---|----|---|
| 1 | Arc length, $s = r$ | | |
| 2 | Area of sector , $A =$ | | |
| 3 | $\sin^2 A + \cos^2 A = 1$ | | |
| 4 | $\sec^2 A = 1 + \tan^2 A$ | 9 | $\sin (AB) = \sin A \cos B - \cos A \sin B$ |
| 5 | $\operatorname{cosec}^2 A = 1 + \cot^2 A$ | 10 | $\cos (AB) = \cos A \cos B - \sin A \sin B$ |
| 6 | $\sin 2A = 2 \sin A \cos A$ | 11 | $\tan (AB) =$ |
| 7 | $\cos 2A = \cos^2 A - \sin^2 A$
$= 2 \cos^2 A - 1$
$= 1 - 2 \sin^2 A$ | 12 | |
| 8 | $\tan 2A =$ | 13 | $a^2 = b^2 + c^2 - 2bc \cos A$ |
| | | 14 | Area of triangle $=$ |

SECTION A

[40 marks]

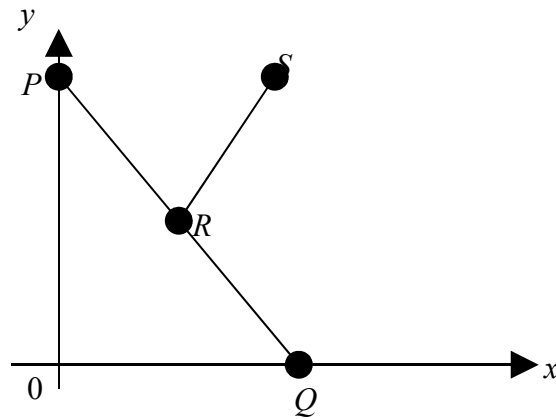
Answer all questions in this section .

1. Solve the simultaneous equations $h + 2k = 5$ and $k^2 - 3h = 7$.
Give your answers correct to three decimal places.

[5 marks]

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

Diagram 1 shows a straight line PRQ

**Diagram 1**

The points P and Q intersect the y -axis and the x -axis. R is the midpoint of line PQ .
The equation of line PR is $3x + 2y - 12 = 0$

(a) Find

- (i) the coordinates of R .

[2 marks]

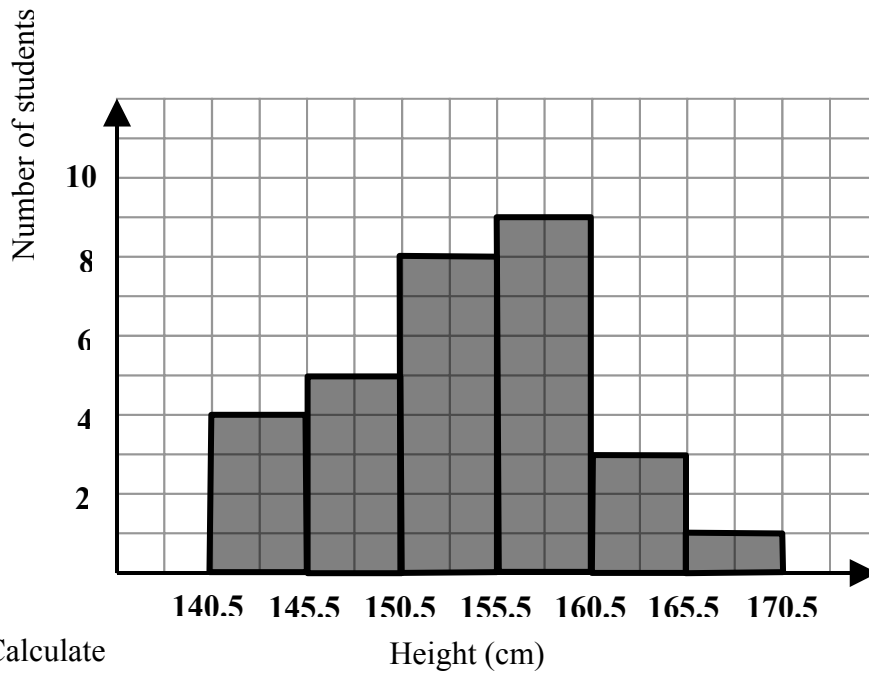
- (ii) the area of triangle OPS if SR was extended to the origin and PS is parallel to the x -axis.

[2 marks]

- (b) A point X moves such that its distance from P is always $\frac{1}{2}$ of its distance from Q

[3 marks]

- 3 Diagram 2 shows a histogram representing the distribution of the heights of 30 students in a class.



Calculate

Diagram 2

- (a) the value of $\sum fx$ [3 marks]
- (b) the value of $\sum fx^2$ [2 marks]
- (c) the standard deviation of the number of patients visiting the clinic. [3 marks]

4. Diagram 3 shows the particles A and B are projected simultaneously towards each other from the opposite end of a straight tube, 9 m long.

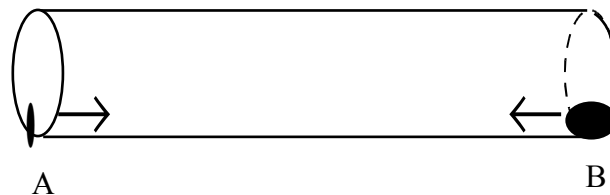


Diagram 3

Particle A travels 47 cm in the 1st second, 45 cm in 2nd second, 43 cm in the 3rd second, etc. Particle B travels 25 cm in the 1st second, 24 cm in 2nd second, 23 cm in the 3rd second, etc. Find how long it takes for both particles to meet.

[6 marks]

5. (a) Find the equation of the normal to the curve $y = x^3 - 2x^2$ at the point (1, -1).
[3 marks]
- (b) A cylindrical tank with a circular base of radius 0.5 m is filled with h m of turpentine. If the turpentine is evaporating at a uniform rate of $0.001 \text{ m}^3 \text{ s}^{-1}$, find the rate of change in the level of turpentine. Leave your answer in terms of π .
[3 marks]
6. (a) Prove the identity $\cos^4 \theta - \sin^4 \theta = \cos 2\theta$. [3 marks]
- (b) By sketching the graph of $y = 2\sin^4 \theta - 2\cos^4 \theta$ and a suitable straight line on the same axis for $0 \leq \theta \leq \pi$, state the number of solutions for the equation $2\sin^4 \theta - 2\cos^4 \theta = 1 - \frac{x}{\pi}$. [5 marks]

SECTION B

[40 marks]

Answer **four** questions from this section.

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

Table 1 shows the values of two variables, x and y , obtained from an experiment. Variables x and y are related by an equation $y = pk^{x-1}$, where p and k are constants.

x	2.0	3.0	4.0	5.0	6.0	7.0
y	8.2	11.8	16.7	23.9	34.8	50.2

Table 1

- (a) Plot $\log_{10} y$ against $(x - 1)$, by using the scale of 2 cm to 1 unit on the x -axis and 2 cm to 0.2 unit on the y -axis. Hence, draw the line of best fit. [5 marks]
- (b) Use the graph in 7 (a) to find the value of
- (i) p , [5 marks]
 - (ii) k

8. In the Diagram 4, $\overrightarrow{OP} = 8\underline{p}$, $\overrightarrow{OQ} = 10\underline{q}$ and $\overrightarrow{PS} = 4\underline{q}$.

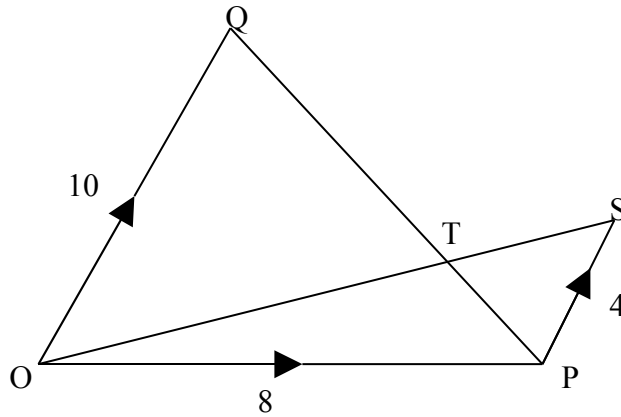


Diagram 4

- (a) Express each of the following vectors in terms of \underline{p} and/or \underline{q} .
- (i) \overrightarrow{OS}
 - (ii) \overrightarrow{QP} [4 marks]
- (b) Given that $\overrightarrow{OT} = a\overrightarrow{OS}$ and $\overrightarrow{QT} = b\overrightarrow{QP}$, express \overrightarrow{OT} in terms of
- (i) a , \underline{p} and \underline{q}
 - (ii) b , \underline{p} and \underline{q} [3 marks]
- (c) Hence, find the values of a and b . [3 marks]

9. Diagram 5 shows sector AOB and sector OED with centre O and E respectively. OCE is a right angle triangle. (Use $\pi = 3.142$).

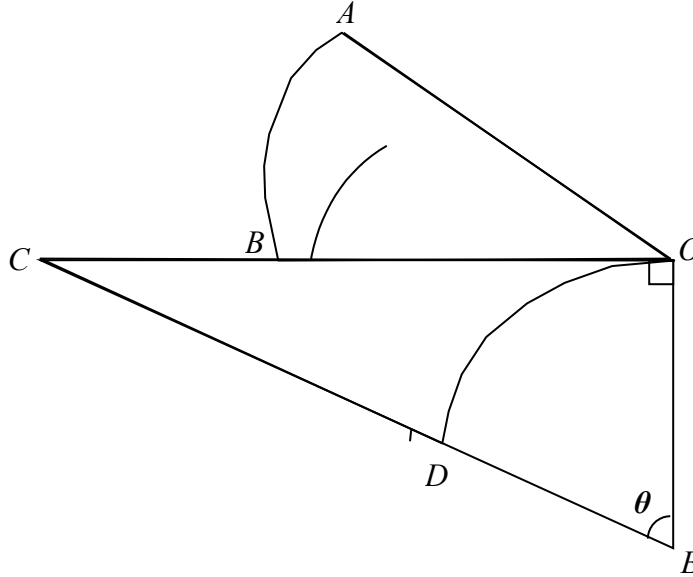
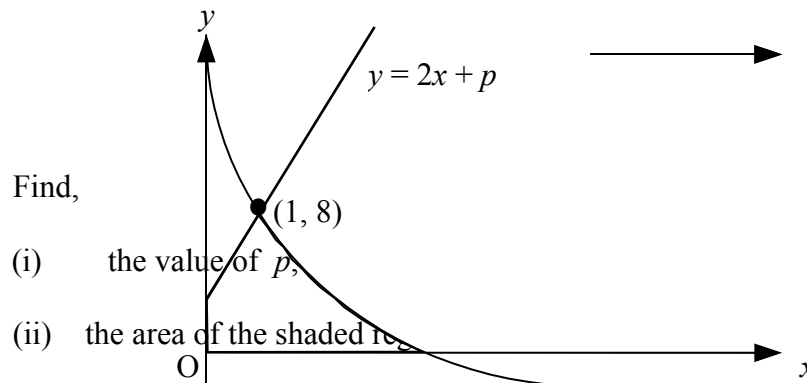


Diagram 5

Given that $\angle AOB = 50^\circ$, $OA = 10$ cm, $OE = 8$ cm and $OB : BC = 2 : 1$.
Calculate

- (a) θ in radian, [2 marks]
- (b) perimeter of the shaded region in cm, [4 marks]
- (c) area of the shaded region in cm^2 . [4 marks]

10. (a) Given $y = (t - 2)(t + 1)$ and $x = 2t + 1$, find $\frac{dy}{dx}$ in terms of x . [2 marks]
- (b) Diagram 6 shows the curve $y = (x - 3)(x - 5)$ intersects with a straight line $y = 2x + p$ at the point $(1, 8)$.



Find,

- (i) the value of p , [5 marks]
- (ii) the area of the shaded region, [5 marks]
- (iii) the volume generated when the region bounded by the straight line $x = 1$, $y = 2x + p$, the x and y -axes is revolved 360° on the x -axis. [3 marks]

11. (a) In one housing area, 20% of the residents are senior citizens.
- i) If a sample of seven persons is chosen at random, calculate the probability that at least two of them are senior citizens. [3 marks]
- ii) If the variance of the senior citizens is 128, find the number of residents in the housing area. [2 marks]
- b) In a field study, it is found that the mass of a student is normally distributed with a mean of 50 kg and standard deviation 15 kg.
- i) If a student is selected randomly, calculate the probability that his mass is less than 41 kg. [2 marks]
- ii) Given that 12% of the students have a mass greater than m kg, find the value of m .

[3 marks]

SECTION C

[20 marks]

Answer two questions from this section.

12. A particle moves along a straight line from a fixed point O . Its velocity, $V \text{ ms}^{-1}$, is given by $V = 15t - 3t^2$, where t is the time, in seconds, after leaving the point O . (Assume motion to the right is positive)
Find

- a) the maximum velocity of the particle, [3 marks]
 b) the distance travelled during the fourth second, [3 marks]
 c) the value of t when the particle passes the point O again, [2 marks]
 d) the time between leaving O and when the particle reverses its direction of motion.

[2 marks]

13

Food	Price Index, I	Weightage, w
Fish	110	3
Chicken	m	2
Rice	130	5
Meat	105	n
Prawn	115	1

Table 2

Table 2 shows the price indices and weightage of 5 types of food consumed in the year 2007 using 2006 as the base year. The composite index of these 5 items in the year 2007 using 2006 as the base year is 117 and $\sum w = 13$.

- a) Calculate the values of m and n . [4 marks]
 b) Find the price of a kilogram of rice in the year 2007 if its price in the year 2006 is RM 12.50. [2 marks]

- c) Given that the projected rate of change in the prices of all the foods from 2007 to 2008 is the same as that from 2006 to 2007. Find
- (i) the composite index number of these foods in the year 2008, using the year 2006 as the base year.
 - (ii) the amount to be paid for these foods in the year 2008 if the amount paid for these items in 2006 was RM650.

[4 marks]

14. An institution offers two types of Mathematics courses, Calculus and Statistic. The number of students taking Calculus course is x and the number of students taking Statistic course is y . The number of students taking the Mathematics courses is based on the following constraints:

I : The ratio of the number of students taking Calculus course to the number of students taking Statistic course is not more than 80 : 20.

II : The total number of students taking Mathematics courses is less than or equal to 80.

III : The number of students taking Statistic course is at least 10

IV: The number of students taking Calculus course is more than 20.

- (a) Write four inequalities, other than $x \geq 0$ and $y \geq 0$, which satisfy all the above constraints.

[4 marks]

- (b) Using a scale of 2 cm to 10 students on both axes, construct and shade the region R which satisfies all of the above constraints.

[3 marks]

- (c) By using your graph from (b), find

(i) the range of the number of students for Calculus course if the number of students for Statistics course is 20.

(ii) the maximum examination fee that can be collected if the examination fees for Calculus and Statistics courses are RM 200 and RM 400 respectively.

[3 marks]

15.

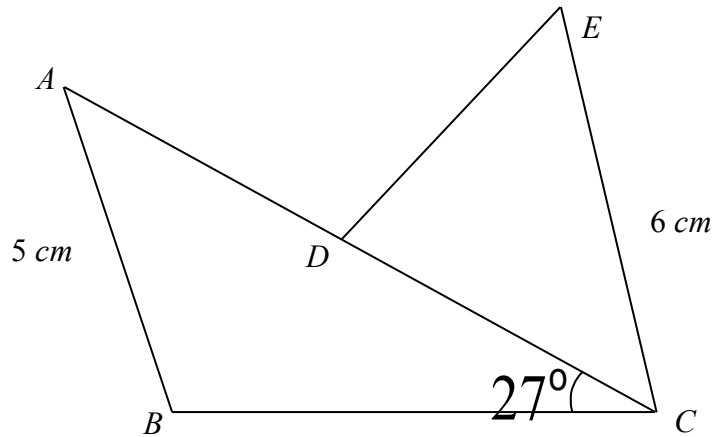


Diagram 7

Diagram 7 shows the triangle ABC, where D is a midpoint of the line AC and $\angle ABC$ is an obtuse angle. Triangle CDE is an isosceles triangle such that $CD = DE$. Given that the length of $AC = 10\text{ cm}$, $EC = 6\text{ cm}$, $AB = 5\text{ cm}$ and $\angle ACB = 27^\circ$.

- Calculate the $\angle ABC$ [3 marks]
- Find the area of triangle ABC [3 marks]
- If the line CB is extended to point F, find the length of the shortest distance from point A to line CF. [2 marks]
- Calculate the $\angle CDE$ [2 marks]

END OF QUESTION PAPER