Section A

[40 *marks*]

Answer **all** questions.

1 Solve the following simultaneous equations.

$x^2 - 2y + y^2 = 24$

$x + y = 8$ (5 *marks*)

2 The sum of the first 20 terms of an arithmetic progression is 110. Given that the eighth term is -2, find

(a) the first term and the common difference, (2 *marks*)

(b) the sum from the seventh term to the fifteenth term. (3 *marks*)

3 The table below shows the frequency distribution of the scores of a group of students in a test.

Scores	Frequency
10 - 19	5
20 - 29	4
30 - 39	8
40 - 49	15
50 - 59	43
60 - 69	20
70 - 79	5

Find the

(a) mean score, (3 *marks*)

(b) standard deviation of the scores,
of the distribution. (4 *marks*)

4 (a) Integrate the following with respect to x:

(i) $\int \frac{2}{(4 - x)^3}\, dx$

(ii) $\int \frac{(x + 2)(x - 1)}{x^4}\, dx$ (4 *marks*)

(b) Find the equation of the curve that passes through P (1, 4) and its tangent at P is $15x^4 - 12x^2$.
(3 *marks*)

5 (a) Sketch the graph of $y = |2\cos x + 1|$ for $0 \le x \le 2\pi$ (4 *marks*)

(b) Hence, using the same axes, sketch a suitable straight line to find the number of solutions to the equation $2\pi|2\cos x + 1| = 2\pi - x$ for $0 \le x \le 2\pi$. State the number of solutions

(3 *marks*)

6 (a) In diagram 1, $\overrightarrow{AB} = 3\underset{\sim}{a}$ and $\overrightarrow{AD} = \underset{\sim}{b}$

If $\overrightarrow{DC} = \frac{4}{3}\overrightarrow{AB}$ and E is a point on DB such that $\overrightarrow{DE} = k\overrightarrow{DB}$ and $\overrightarrow{AE}$ is parallel to $\overrightarrow{BC}$, find the value of k.

If F is a point on BC such that $\overrightarrow{EF}$ is parallel to $\overrightarrow{AB}$ and $\overrightarrow{BF} = m\overrightarrow{BC}$, find the value of m.

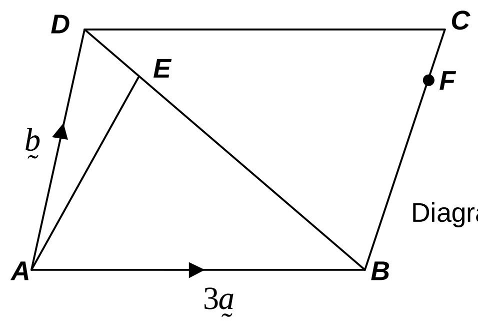


Diagram 1

(4 *marks*)

(b) It is given that the vector $\overrightarrow{AB} = \begin{pmatrix} -3 \\ 5 \end{pmatrix}$ and $\overrightarrow{OB} = \begin{pmatrix} 2 \\ -7 \end{pmatrix}$, where O is the origin.

Find

a) the position vector of A,

b) $\left|\overrightarrow{OA}\right|$ (4 *marks*)

Section B

[40 *marks*]

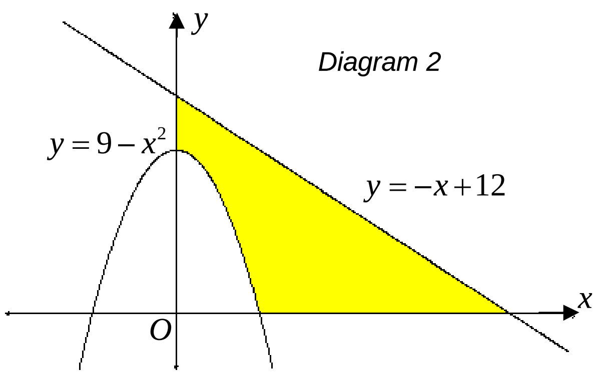
Answer **four** questions from this section.

7

(a) Evaluate $\int_{-4}^{0} \frac{4}{\sqrt{1 - 2x}}\, dx$.

(2 *marks*)

(b) *Diagram 2* shows the curve $y = 9 - x^2$ and the straight line $y = -x + 12$.



Find

(i) **the area** bounded by the curve $y = 9 - x^2$ and the x-axis, (4 *marks*)

(ii) **the volume** generated when the shaded region is revolved through 360° about the ***y*-axis**. (4 *marks*)

8 The mass of bars of chocolates retailed by a shop are normally distributed with a mean of 100 grammes and standard deviation of 5 grammes.

a) A bar of chocolate is selected at random from the shop. Find the probability that its mass is not more than 110 grammes. (3 *marks*)

b) The chocolates are packed into boxes, with each box containing 6 bars.

(i) If a box is selected at random, find the probability that less that 5 bars of chocolates are of mass not more than 110 grammes. (4 *marks*)

(ii) If four boxes are selected at random, find the probability that exactly one box has less than 5 bars of mass not more than 110 grammes. (4 *marks*)

9 The table below shows the values of two variables x and y. The variables are related by the equation $y = \frac{p}{x} + qx^2$, where p and q are constants.

x	1	1.5	2	2.5	3	3.5
y	5.5	11.6	20.3	31.5	45.2	61.4

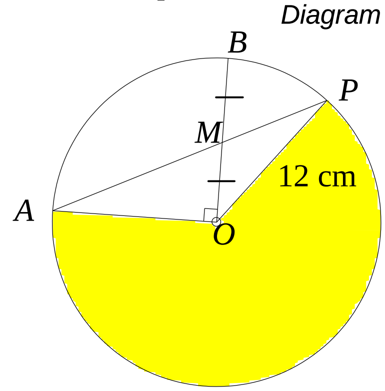
(a) Using suitable scales, plot $\frac{y}{x^2}$ against $\frac{1}{x^3}$. Then, draw the line of best fit. (5 *marks*)

(b) Based on your graph, estimate the values of p and q. (5 *marks*)

10 *Diagram 3* shows a circle with centre O and two radii which are perpendicular to each other, OA and OB. The chord AP passes through point M, which is the midpoint of OB.

Given that the radius of the circle is 12 *cm*, find

Diagram 3



(a) $\angle PAO$ in radians, (2 *marks*)

(b) $\angle AOP$ in radians, (2 *marks*)

(c) the area of the shaded region, (2 *marks*)

(d) the perimeter of the segment ABP (4 *marks*)

11 A hollow right circular cone has base radius 4 cm and vertical height 20 cm. It is held upside down with its axis vertical, and contains water. Water is being added at the constant rate of 1.5 $cm^3\ s^{-1}$ and leaks away through a small hole in the vertex at the constant rate of 2 $cm^3\ s^{-1}$. At what rate is the depth of the water changing when the depth is 12 cm? (10 *marks*)

Section C

[20 *marks*]

Answer **two** questions from this section.

12. A ball is thrown vertically upwards from a tall building, 96 m above the ground level. Its displacement, s m from top of the tall building is given by $s = 40t - 4t^2$, where t is the time in seconds after the ball is thrown. Find

(a) the initial velocity of the ball. (2 *marks*)

(b) the range of time when the object is moving upwards, (2 *marks*)

(c) the maximum height reached by the object from the ground level, (3 *marks*)

(d) the time when the object touches the ground and its velocity at that moment. (3 *marks*)
[*Consider the upwards direction as the positive direction*]

13 A company produces 2 kinds of goods *A* and *B*. It is given that it produces *x* units of goods *A* and *y* units of goods *B*. The production time and packing time as well as the selling cost for each unit of goods *A* and *B* are as follow:

Goods	Production time (in minute)	Packing time (in minute)	Selling costs
A	4	3	RM8
B	6	3	RM4

The company spends at the most RM4 000 for selling cost. The production machine cannot operate for more than 40 hours, whereas the packing time must be at least 10 hours.

(a) Write three inequalities, other than $x \geq 0$ and $y \geq 0$, which satisfy the above conditions. (3 *marks*)

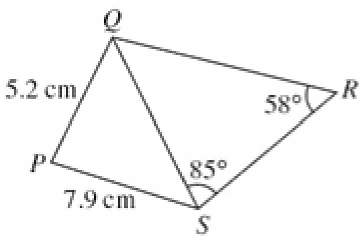
(b) Using a scale of 2 cm to 100 units for both axes, draw the graph and shade the region, *R*, that satisfies the above conditions. (3 *marks*)

(c) Based on the graph, find

(i) the maximum number of units of goods *A* produced if 200 units of goods *B* are produced,

(ii) the number of units of goods *A* and *B* required to be sold to obtain the maximum profit if the profits from selling a unit of goods *A* and *B* are RM5 and RM8 respectively. (4 *marks*)

14 The diagram below shows a quadrilateral *PQRS*.



Given that the area of triangle *PQS* is 18.6 cm^2, calculate

(a) $\angle QPS$, (2 *marks*)

(b) the length of *QS*, (2 *marks*)

(c) the length of *SR*, (3 *marks*)

(d) the area of triangle *QSR*. (3 *marks*)

15 (a) The table above shows the price of a product in 1996 and its price index in 1998 using 1996 as the base year.

Price in 1996	Price index in 1998 using 1996 as the base year
RM1.30	110

Calculate the price index of the product in the year 1996 using 1998 as the base year.
(3 *marks*)

(b) The table below shows the price indices of three items in the year 2000 using 1997 as the base year and their respective weightages.

Item	Price index	Weightage
A	110	*x*
B	*y*	4
C	120	5

Given that the composite price index of the three items in the year 2000 using 1997 on the base year is 100, express *y* in terms of *x*.
(4 *marks*)

(c) The price of a badminton racquet in the year 2000 is RM *x*. The price of the racquet increases by 30% in 2002. Find the price index of the racquet in the year 2002 using 2000 as the base year.
(3 *marks*)

END OF QUESTIONS