

SMJK KATHOLIK PETALING JAYA
 SPM TRAIL EXAMINATION 2008
 ADDITIONAL MATHEMATICS FORM 5
 PAPER 2 (2 hours and 30 minutes)

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Instructions : This paper consists of three sections. **Section A, Section B** and **Section C**. Answer **all** questions in **Section A**, **four** questions from **Section B** and **two** questions from **Section C**. Give only one answer / solution for each question. All the working steps must be written clearly. Scientific calculator that are non-programmable are allowed.

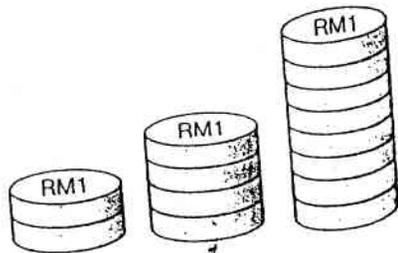
Section A [40 marks]
 Answer **all** questions.

1. Solve the simultaneous equations

$$\frac{x}{2} - \frac{y}{3} + 1 = 0 \quad \text{and} \quad \frac{2}{x} + \frac{3}{y} - \frac{5}{6} = 0$$

[6 marks]

2.



Li Shawn piles up RM1 coins as shown in the figure. The sequence of the number of coins in each pile forms a geometric progression. Calculate

a) the number of coins in the 7th pile. [2 marks]

b) the number of complete piles that can be obtained if Li Shawn has 1500 RM1 coins. [4 marks]

3. Given the points P(6, 0) and Q(0, -8). The perpendicular bisector of PQ intersects the axes at A and B. Find

a) the equation of AB [3 marks]

b) the area of $\triangle AOB$, where O is the origin. [3 marks]

4. a) Prove that $\operatorname{cosec} \theta + \cot \theta + \tan \theta = \frac{1 + \cos \theta}{\sin \theta \cos \theta}$. [2 marks]

b) Sketch the graph of $y = -2 \cos x$ for $0 \leq x \leq 2\pi$.

Hence, using the same axis, sketch a suitable graph to find the number of solutions to the

equation $\frac{\pi}{x} + 2 \cos x = 0$ for $0 \leq x \leq 2\pi$. State the number of solutions. [6 marks]

5. A set of eight numbers 4, 7, 5, 10, 6, 12, y , and $3y$ has a mean μ . When 3 is added to each number, the mean becomes $\frac{5}{4}\mu$. Find
- the value of y , [3 marks]
 - the variance of the eight numbers in the set. [3 marks]
6. A vessel is in the shape of an inverted cone. The radius of the top is 16cm and the height is 24cm. The level of the water in the vessel is x cm.
- Show that the volume of the water, V , in the cone is given by $V = \frac{4}{27}\pi x^3$. [2 marks]
 - If water is poured into the vessel with a rate $32\text{cm}^3\text{s}^{-1}$, calculate the rate of increase of the water level when $x = 6$. [3 marks]
 - Water leaks through a hole at the vertex of the vessel. Find the approximation decrease in the volume of water when x decreases from 4cm to 3.98cm. [3 marks]

Section B [40 marks]

Answer 4 questions.

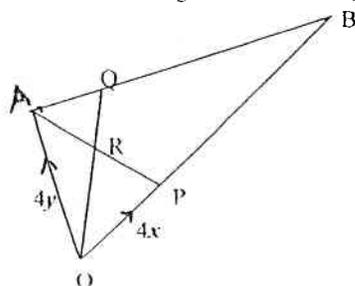
7. In an attempt to produce a vaccination to treat AIDS, a scientist discovered that the rate of the growth of the AIDS virus, y , can be slowed down by a type of medication with a concentration of x gram per litre of water. The table below shows the values of x and y .

x	1	2	3	4	5	6
y	1.22	1	0.91	0.87	0.84	0.82

The variables x and y are related by the equation $y = \sqrt{a\left(\frac{1}{x} + b\right)}$, where a and b are constants.

- Draw the graph of y^2 against $\frac{1}{x}$. [5 marks]
 - From your graph,
 - find the values of a and b [4 marks]
 - find the value of y when $x = 3.6$. [1 mark]
8. The diagram below shows $\triangle OAB$. The straight line AP intersects the straight line OQ at R.

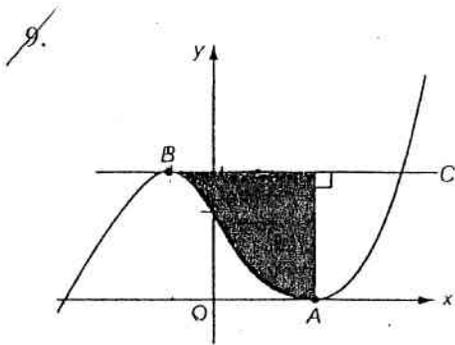
It is given that $OP = \frac{1}{3}OB$, $AQ = \frac{1}{4}AB$, $\overrightarrow{OP} = 4x$ and $\overrightarrow{OA} = 4y$.



(a) Express in terms of \overrightarrow{OA} and/or \overrightarrow{OB} :

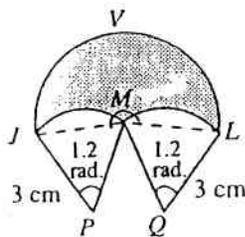
- \overrightarrow{AP}
- \overrightarrow{OQ} [4 marks]

- (b) (i) Given that $\vec{AR} = h\vec{AP}$, state \vec{AR} in terms of h , p and q . [1 mark]
- (ii) Given that $\vec{RQ} = k\vec{OQ}$, state \vec{RQ} in terms of k , p and q . [1 mark]
- (c) Using $\vec{AQ} = \vec{AR} + \vec{RQ}$, find the value of h and the value of k . [4 marks]



- The diagram shows the graph of $y = f(x)$ that has two turning points, A and B. The point A lies on the x-axis and $f'(x) = 3x^2 - 4x - 4$. The straight line BC is parallel to the x-axis.
- Find
- the coordinates of point A [2 marks]
 - $f(x)$ [2 marks]
 - the coordinates of point B [2 marks]
 - the area of shaded region. [4 marks]

10.



- The diagram shows a sector MJVL of a circle with centre M and two sectors, PJM and QML, of two circles with centre P and Q respectively. Given the angle of major sector JML is 4.0 radian,
- find
- the radius of sector MJVL [2 marks]
 - the perimeter of the shaded region [2 marks]
 - the area of sector PJM [2 marks]
 - the area of the shaded region [4 marks]

11. a) A survey conducted by the Resource Department in SMK Sri Tanjong reveals that 2 out of 5 students read more than 3 storybooks in a month.
- If 8 students are chosen at random from the school, find the probability that at least 2 students read more than 3 storybooks in a month. [2 marks]
 - The number of students in SMK Sri Tanjong is 1850. Find the mean and the standard deviation of the number of students who read more than 3 storybooks in a month. [2 marks]
- b) The Mathematics test marks of the Form 5 students in a certain school are normally distributed with a mean of 42 marks and a variance of 16 marks.
- If a Form 5 students in the school is chosen at random, find the probability that the student obtained more than 52 marks in the Mathematics test. [3 marks]
 - Find the percentage of the Form 5 students who obtained marks between 36 and 48. [3 marks]

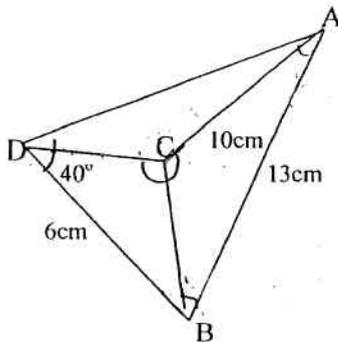
Section C [20 marks]

Answer 2 questions.

12. A particle starting from a fixed point O , moves along a straight line. Its velocity, $v \text{ ms}^{-1}$, is given as $v = 35t + mt^2$ where m is a constant and t denotes the time in seconds after passing through the point O . The particle is instantaneously at rest after 5 seconds.

- a) find the value of m [2 marks]
- b) with the value of m obtained in part (a), calculate
 - (i) the time at which the particle returns to O [3 marks]
 - (ii) the maximum displacement of the particle [3 marks]
 - (iii) the time at which the acceleration is equal to zero
- c) sketch a velocity-time graph of the particle for $0 \leq t \leq 6$. [2 marks]

13.



In the diagram, $\angle ACB$ and $\angle DCB$ are both obtuse. It is given that $DB=6\text{cm}$, $AB=13\text{cm}$, $AC=10\text{cm}$ and $\angle BDC = 40^\circ$. If the area of $\triangle ABC$ is 22cm^2 , calculate

- a) $\angle BAC$ [2 marks]
- b) the length of CB [2 marks]
- c) the length of DA [6 marks]

14. A factory produces two types of products, P and Q. The factory produces x units of product P and y units of product Q daily. The cost for producing a unit of P and Q are RM4 and RM1 respectively. The total cost to produce the products P and Q daily are at least RM80. 10ml of catalyst is used to produce a unit of P whereas 30ml of catalyst is used to produce a unit of Q. The amount of catalyst used daily is at least 750ml. The number of units of P produced daily is not more than 50 and the number of unit of Q produced daily is at most 60.

- a) State the four inequalities other than $x \geq 0$ and $y \geq 0$, that satisfy the condition above. [4 marks]
- b) Using the scale of 2cm to 10 units on each axis, draw and shade the region R that satisfies the condition above. [3 marks]
- c) Based on your graph, find
 - (i) the maximum daily profit made if the profit for a unit P and Q are RM5 and RM2 respectively. [2 marks]
 - (ii) the minimum units of P produced daily if 40 units of Q are being produced daily. [1 marks]

15. A particular kind of cake is made by using four ingredients, P, Q, R and S. Table below shows the prices of the ingredients.

Ingredient	Price per kilogram (RM)	
	Year 2004	Year 2005
P	5.00	w
Q	2.50	4.00
R	x	y
S	4.00	4.40

- a) The index number of ingredient P in the year 2005 based on the year 2004 is 120. Calculate the value of w . [2 marks]
- b) The index number of ingredient R in the year 2005 based on the year 2004 is 125. The price per kilogram of ingredient R in the year 2005 is RM2.00 more than its corresponding price in the year 2004. Calculate the value of x and y . [3 marks]
- c) The composite index for the cost of making the cake in the year 2005 based on the year 2004 is 127.5. Calculate
- (i) the price of a cake in the year 2004 if its corresponding price in the year 2005 is RM30.60, [2 marks]
- (ii) the value of m if the quantities of ingredients P, Q, R and S used are in the ratio of 7 : 3 : m : 2. [3 marks]

END OF QUESTION PAPER