

# ADDITIONAL MATHEMATICS

## Format of Additional Mathematics Paper SPM Level

NO	ITEM	PAPER 1 (3472/1)	PAPER 2 (3472/2)
1	Type of instrument	Subjective Test ( Short questions)	Subjective Test (Limited response and structured )
2	Number of questions	25 questions ( Answer all )	<u>Section A</u> 6 question ( Answer all ) <u>Section B</u> 5 questions ( Choose 4 ) <u>Section C</u> 4 questions (Choose 2 ) ( 2 questions from application Package for Science and Technology and 2 questions from application Package for Social Science )
3	Total marks	80 marks	<u>Section A</u> Total marks: 40 <u>Section B</u> Total marks: 40 ( Each question 10 marks) <u>Section C</u> Total marks: 20 (Each question 10 marks)  Overall total marks: 100
4	Duration of test	2 hours	2 hours 30 minutes
5	Context coverage	Covers all the learning areas from form 4 and 5	Covers all the learning areas from form 4 and 5
6	Level of difficulty	Low : Moderate : High 6 : 3 : 1	Low : Moderate : High 4 : 3 : 3
7	Construct requirement	Knowledge : 20 % Application skill : 80 %	Application skill : 60 % Problem- solving skill : 40 %
8	Additional instrument	1. Scientific calculator 2. Mathematical tables 3. Geometrical instrument	1. Scientific calculator 2. Mathematical tables 3. Geometrical instrument

### Analysis of Additional Mathematics Paper SPM Level

NO.	Additional Mathematics (3472) SPM	PAPER 1				PAPER 2			
		2003	2004	2005	2006	2003	2004	2005	2006
1	Functions	1,2	1,2,3	1,2,3	1,2	-	-	-	2
2	Quadratic Equations	3	4	4,5	3	-	-	-	-
3	Quadratic Functions	4	5,6	6	4,5	2	-	-	-
4	Simultaneous Equations	-	-	-	-	1	1	1	1
5	Indices and Logarithms	5,6	7,8	7,8,9	6,7,8	-	-	-	-
6	Coordinate Geometry	9,11	14,15	14	12	11	2	9	9
7	Statistics	-	-	23	24	5	4	4	6
8	Circular Measure	19	19	18	16	4	9	10	10
9	Differentiation	15,16	20,21	19,20	17,18, 19	3b,9a	5b,10a	2a,8a	-
10	Solution of Triangles	-	-	-	-	15	13	12	13
11	Index Number	-	-	-	-	13	12	13	15
12	Progressions	7,8	9,10, 11,12	9,10	-	-	6	3	3
13	Linear Law	10	13	11	7	7	7	7	7
14	Integration	17,18	22	21	20,21	3a,9b	5a,10b	2b,8b,8c	8
15	Vectors	12,13,14	16,17	15,16	13,14	6	8	6	5
16	Trigonometric Functions	20,21	18	17	15	8	3	5	4
17	Permutations and Combinations	22,23	23	22	22	-	-	-	-
18	Probability	-	24	24	23	-	-	-	-
19	Probability Distributions	24,25	25	25	25	10	11	11	11
20	Motion Along A straight Line	-	-	-	-	12	15	15	12
21	Linear Programming	-	-	-	-	14	14	14	14
	<b>TOTAL</b>	25	25	25	25	15	15	15	15

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# ADDITIONAL MATHS

PAPER 1

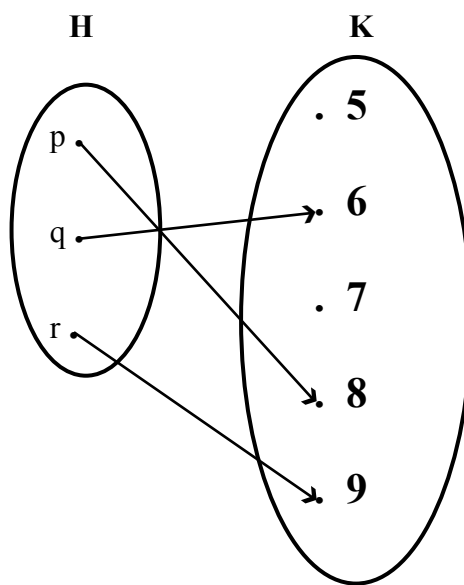
TWO HOURS

This question paper consists of 25 questions.

Answer all question

[80 marks]

1. The arrow in the diagram below shows the relation between set H and set K.



State

(a) the codomain

(b) the range of the relation.

[2 marks]

2. The sum of the first  $n$  terms of an arithmetic progression is given by  $S_n = n^2 - 11n$ . Calculate the eighth term.

[2 marks]

3. Given that  $\frac{h}{k} = 0.8888\dots$  is a recurring decimal, find the values of  $h$  and  $k$ .

[2 marks]

4. Given that the straight lines, with respective equation  $y = mx + n$  and  $ny = 3x - 2m$ , are perpendicular to each other. Express  $m$  in terms of  $n$ .

[2 marks]

5. The function  $f$  is defined as  $f: x \rightarrow 3x + m$ , where  $m$  is a constant. If 2 is the image of  $m$ , find the value of  $m$ .

[2 marks]

6. Solve the equation  $2 \tan 2\theta = \sqrt{3}$  for  $0^\circ \leq \theta \leq 180^\circ$  [2 marks]
7. Given that the function  $f(x) = -2\left(x - \frac{k}{4}\right)^2 + \frac{k^2}{8} - h$  has a maximum value of  $-10$  when  $x = 2$ , find the value of  $h$  and of  $k$ . [3 marks]
8. Given that  $2m$  is the root of the quadratic equation  $x^2 - mx + 2m - 4 = 0$ , calculate the values of  $m$ . [3 marks]
9. How many five-digit numbers can be formed from the digits 2,3,4,5,6, 7, 8 and 9 without repetition? [3 marks]
10. In diagram 1, OKL is the sector of a circle. The length of arc KL is 4.5 cm and the perimeter of the sector is 16.5 cm. Find  $\angle KOL$ , in radians.

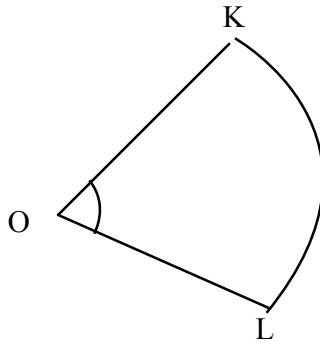


Diagram 1

- [3 marks]
11. Given that  $\int_4^6 f(x) dx = 5$  and  $\int_4^6 [(3f(x) - kx)] dx = 10$ , find the value of  $k$ . [3 marks]
12. Solve the equation  $2 \log_2 3 - \log_2 4x = 2 - \log_2 (5 - x)$  [3 marks]

13. Solve the equation  $\cos^2 \theta - \sin^2 \theta = \sin \theta$  for  $0^\circ \leq \theta \leq 360^\circ$ .

[3 marks]

14. In a Mathematics test, the probability that Saadiah will pass is 0.56. The probability she will get credit is 0.25 and the probability she will get distinction is 0.07. Find the probability that Saadiah will

(a) fail in the Mathematics test

(b) get credit or distinction

[3 marks]

15. Given that  $f(x) = 2x^2 + 12x + p$  has a minimum value of -8. Find

(a) the value of  $p$

(b) the value of  $x$  corresponding to this minimum value.

[3 marks]

16. A point  $P(x,y)$  moves such that its distance from a fixed point  $Q(1,2)$  is two times its distance from another fixed point  $R(-1,1)$ .

Find the equation of the locus of  $P$ .

[4 marks]

17. If the equation of the normal to the curve  $y = 3x + \frac{1}{x}$  at  $(1,4)$  is  $y = mx + c$ , find the values of  $m$  and  $c$ .

[4 marks]

18. The position of the points  $P, Q$  and  $R$  are given by the vectors  $\overrightarrow{OP} = \begin{pmatrix} 3 \\ 5 \end{pmatrix}$ ,  $\overrightarrow{OQ} = \begin{pmatrix} m \\ 4 \end{pmatrix}$  and  $\overrightarrow{OR} = \begin{pmatrix} 0 \\ 2 \end{pmatrix}$

If  $PQR$  is a straight line, find the value of  $m$ .

[4 marks]

19. Given that the gradient of the curve  $y = 4x + \frac{k}{x}$  at the point  $x = 1$  is 2, find

(a) the value of  $k$

(b) the equation of the tangent to the curve at the point where  $x = 1$

[4 marks]

20. Given  $\sin P = \frac{3}{5}$  and  $\cos Q = -\frac{12}{13}$ . If both the angle  $P$  and  $Q$  are at the same quarter, find the value of

(a)  $\sin (P + Q)$

(b)  $\tan (P - Q)$

[4 marks]

21. Simplify  $\frac{4^{k+1} \times 8^{2k-4}}{2^{14k-7} \times 64^{-k}}$

[4 marks]

22. Haikal is among the 15 participants chosen to represent the school in a singing contest. If Haikal is chosen, the probability that he will win the contest is  $\frac{3}{7}$ .

Find the probability that

(a) Haikal is not chosen

(b) Haikal is chosen and wins the contest.

[4 marks]

23.  $X$  is a random variable of a normal distribution with a mean of 4.2 and a variance of 1.69.

Find

(a) the  $Z$  score if  $X = 5.7$

(b)  $P(4.2 < X < 5.7)$

[4 marks]

24. Figure 1 shows a straight line graph of  $\log_{10} y$  against  $\log_{10} x$ .

Given  $y = \frac{x^{2m}}{p}$  where  $m$  and  $p$  are constants. Calculate the value of  $m$  and of  $p$ .

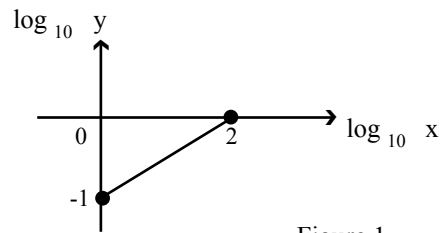


Figure 1

[4 marks]

25. Solve the equation  $5 - 13 \sin x = 2 \cos 2x$  for  $0^\circ \leq x \leq 360^\circ$

[4 marks]

END OF QUESTION PAPER

## PAPER 2

## TWO HOURS AND THIRTY MINUTES

This question paper consists of 3 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**.  
 Show your workings. It may help you to get marks.

**SECTION A**

[40 marks]

Answer **all** questions in this section.

1. Solve the simultaneous equations:

$$\begin{aligned} 3x + 2y &= 10 \\ \frac{9}{x} - \frac{5}{2y} &= -2 \end{aligned}$$

[7 marks]

2. In diagram 1, straight line PQR meets the straight line QS at point Q on the y-axis.

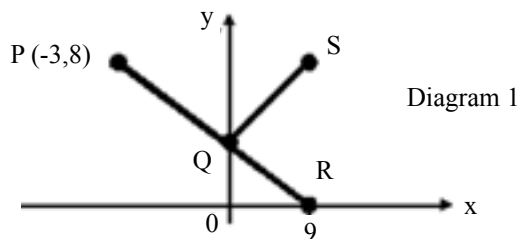


Diagram 1

- (a) Find the equation of straight line PQR [2 marks]
- (b) Determine the coordinates of Q [1 mark]
- (c) If QS is perpendicular to PQR, find the equation of QS. [3 marks]
3. (a) Without using a calculator, show that  $\cos 75^\circ = \frac{\sqrt{2}}{4}(\sqrt{3} - 1)$
- (b) Solve the equation  $\frac{1}{2} \cos^2 2\theta \sec \theta \csc \theta - \sin 2\theta = 1$  [7 marks]
4. Given the function  $f: x \rightarrow 2x - 1$  and the composite function  $kf: x \rightarrow 4x^2 - 8x + 7$   
 Find
- (a) the function k in similar form [3 marks]
- (b) the values of x such that  $fk(x) = -x + 9$  [3 marks]
- (c)  $kf^{-1}(-3)$  [3 marks]
5. (a) The sum of the first n terms of a geometric progression 1, 2, 4, ..... is 1 023.  
 Find
- (i) the common ratio of the progression
- (ii) the value of n

[4 marks]



(b) A circle is divided into 18 sectors such that the angles subtended at the centre forms an arithmetic progression. Given the angle of the smallest sector is  $11.5^\circ$

Find

- (i) the common difference
- (ii) the angle of the biggest sector

[4 marks]

6. In a mathematics test, 60 % of the student passed. If 5 students were picked at random, find the probability that

(a)

- (i) 3 of the students passed the test
- (ii) at least 4 students passed the test

(b) Find the minimum number of students to be picked at random such that the probability that a student passing the test is greater than 0.95 .

[7 marks]

## SECTION B

[40 marks]

Answer **four** questions in this section.

7. Use the graph paper to answer this question.

Table 1 shows the values of two variables,  $x$  and  $y$ , obtained from an experiment. The variables of  $x$  and  $y$  are related by the equation  $y = hx + kx^2$ , where  $h$  and  $k$  are constants.

$x$	1	2	3	4	5	6
$y$	19.1	31.7	39.3	39.8	35.2	24.5

Table 1

(a) Plot  $\frac{y}{x}$  against  $x$  by using a scale of 2 cm to 1 unit on the  $x$ -axis and 2 cm to 2.5 units on the  $\frac{y}{x}$ -axis.

Hence, draw the line of best fit.

[5 marks]

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

- (i)  $h$   
(ii)  $k$

[5 marks]

8. Solutions to this question by scale drawing will not be accepted.

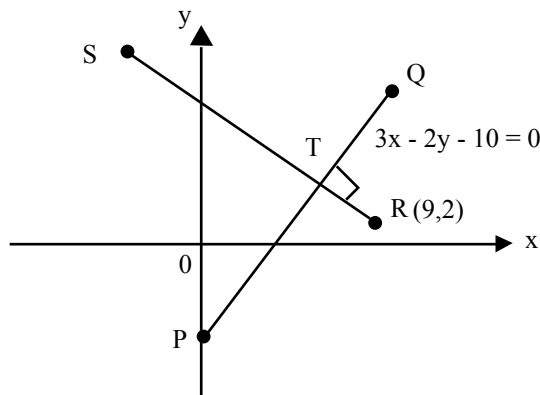


Diagram 2

In diagram 2, the equation of the straight line  $PQ$  is  $3x - 2y - 10 = 0$ . The straight line  $RS$  is perpendicular to the straight line  $PQ$  and  $T$  is the point of intersection of the two straight lines.

(a) Find

- (i) the equation of the straight line  $RS$   
(ii) the coordinates of point  $T$

[5 marks]

(b) Given that  $RT : TS = 1 : 3$ , find the coordinates of point S

[2 marks]

(c) A point H moves such that the ratio of its distance from points P and T is  $2 : 1$ .  
Find the equation of the locus of point H.

[3 marks]

9. Use the graph paper to solve this question.

Marks	Frequency
50 - 54	5
55 - 59	7
60 - 64	11
65 - 69	12
70 - 74	5

Table 2

Table 2 shows the distribution of marks of 40 students in a test.

(a) Without drawing the ogive, estimate the lower quartile.

[3 marks]

(b) Compute the  
(i) mean

(ii) standard deviation  
for the marks of the students.

[7 marks]

10.

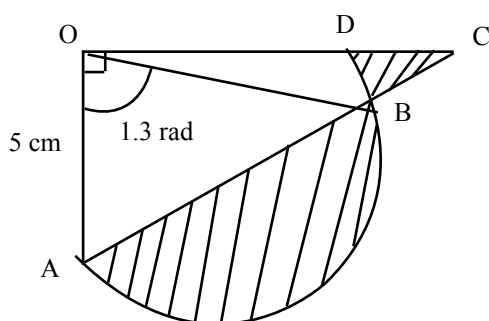


Diagram 3

Diagram 3 shows a right-angled triangle  $OAC$  and sector  $OAD$  with centre  $O$ . Given that  $\angle AOB = 1.3 \text{ rad}$ ,  $OA = 5 \text{ cm}$  and  $OC = 7 \text{ cm}$ . Find

(a) the perimeter of the shaded region

[4 marks]

(b) the area of the shaded region

[6 marks]

11. In the diagram 4, OPQ is a triangle. OTS and PTR are straight lines.

$$\vec{OP} = 4\vec{x}, \vec{OR} = 6\vec{y}, OR : RQ = 4 : 1, \frac{OS}{SP} = 3, RT = h RP \text{ and } OT = k OS.$$

(a) Express vector  $\vec{RT}$  in terms of  
(i)  $h$ ,  $\vec{x}$  and  $\vec{y}$

(ii)  $k$ ,  $x$  and  $y$

(b) Hence, find the values of  $h$  and  $k$ .

[10 marks]

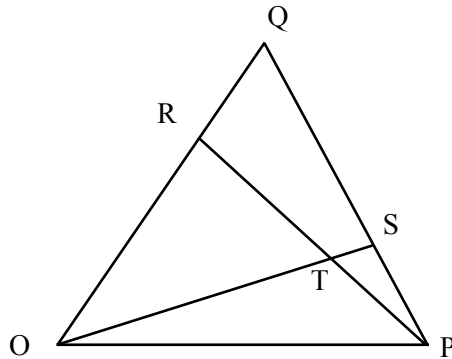


Diagram 4

## SECTION C

[20 marks]

Answer **two questions** from this section.

12. Use the graph paper to answer this question.

Given that  $x$  and  $y$  are two positive integers with the following conditions.

- I : The value of  $x$  is 10 times more than the value of  $y$
- II : The maximum value for  $x + 4y$  is 60
- III : The maximum value for  $2x + y$  is  $\frac{2}{3}$  times the maximum value for  $x + 4y$

(a) Write an inequation for each of the above.

[2 marks]

(b) Draw a graph for the in equation above. Mark and shade the satisfactory area  $F$  above.

[2 marks]

(c) Based on the graph, answer all the questions

- (i) Find the minimum for  $x - 2y$
- (ii) Find the maximum for  $k$  if  $x = ky$  when  $y = 10$
- (iii) Find the maximum value for  $3x + y$

[5 marks]

13. A particle K moves along a straight line and passes through a fixed point O.

Its displacement,  $s$  metres, is given by  $s = t^3 - 6t^2 + 9t$  where  $t$  is the time, in seconds, after leaving the point O.

Find...

- (a) the initial velocity of particle K
- (b) the value of  $t$  when particle K changes its direction of motion
- (c) the acceleration of particle K after 4 s
- (d) the maximum velocity of particle K

[10 marks]

14.

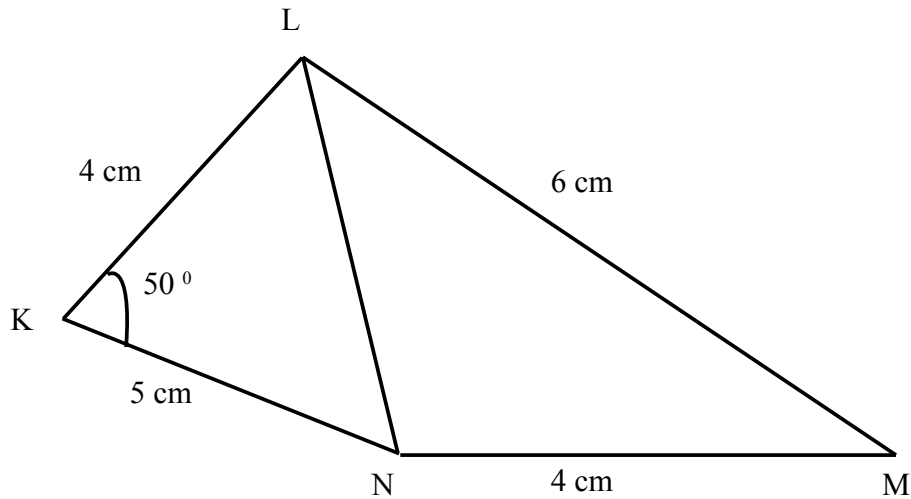


Diagram 5

Diagram 5 shows a quadrilateral KLMN. Given  $KL = 4 \text{ cm}$ ,  $LM = 6 \text{ cm}$ ,  $MN = 4 \text{ cm}$ ,  $NK = 5 \text{ cm}$  and  $\angle NKL = 50^\circ$ . Calculate

- (a) the length of LN, correct to 3 decimal [2 marks]
- (b)  $\angle LMN$  [3 marks]
- (c) the area of the whole diagram [4 marks]

15.

Item	Price in 2000	Price in 2002	Price Index in 2002 based on 2002	Weight
P	RM 1	RM 1.25	m	5
Q	RM 0.40	n	115	1
R	k	RM 2.40	120	4

**Table 3**

Table 3 shows the price of four commodities P,Q, and R in year 2000 and 2002, the price index in year 2002 was based on 2000. Calculate

(a) the value of k , n and m

[4 marks]

(b) the composite index number of the cost of the item production of the four commodities in year 2002 is based on year 2000.

[3 marks]

(c) the unit price of the item in 2002 if the unit price of the item in 2000 is RM3.50

END OF QUESTION PAPER