

# MATHEMATICS

## Format of Mathematics Paper SPM Level

| NO | ITEM                     | PAPER 1 (1449/1)   | PAPER 2 (1449/2)  |
|----|--------------------------|--|---|
| 1  | Type of instrument       | Objective Questions  | Subjective Questions  |
| 2  | Type of item             | Multiple choices   | Limited response and structured   |
| 3  | Number of questions      | 40 questions<br>( Answer all )   | <u>Section A</u><br>11 questions ( Answer All )<br><br><u>Section B</u><br>5 questions ( Choose 4 )                                     |
| 4  | Total marks              | 40 marks   | <u>Section A</u><br>Total mark : 52<br><br><u>Section B</u><br>Total mark : 48<br>( Each question 12 marks )<br><br>Overall total : 100 |
| 5  | Duration of test         | 1 hour 15 minutes  | 2 hours 30 minutes  |
| 6  | Construction requirement | Knowledge : 45 %<br>Skill : 55 %   | Knowledge : 25 %<br>Skill : 70 %<br>Value : 5 %   |
| 7  | Difficulty level         | Low : Medium : High<br>5 : 3 : 2   | Low : Medium : High<br>5 : 3 : 2  |
| 8  | Context coverage         | - Learning scope of lower secondary which has continuation in upper secondary<br><br>- All learning scopes from form 4 and 5 | - Learning scope of lower secondary which has continuation in upper secondary<br><br>- All learning scopes from form 4 and 5            |
| 9  | Additional tools         | 1. Scientific calculators<br>2. Mathematical tables<br>3. Geometrical instruments  | 1. Scientific calculator<br>2. Mathematical tables<br>3. Geometrical instrument   |

### Analysis of Mathematics Paper SPM Level

|               | TOPICS |                                     | PAPER 1   |           |           |           |
|---------------|--------|-------------------------------------|-----------|-----------|-----------|-----------|
|               |        |                                     | 2003      | 2004      | 2005      | 2006      |
| FORM<br>1 - 3 | 1      | Polygon 1,11                        | 7,8       | 7         | 6,7       | 7         |
|               | 2      | Transformations 1, 11               | 16,17,18  | 19,10     | 9,10      | 9,10      |
|               | 3      | Trigonometry 1                      | 11        | 13        | -         | -         |
|               | 4      | Algebraic Expressions 1,11,111      | 19        | 20        | -         | 19,20     |
|               | 5      | Algebraic Formulae                  | 22        | 21        | 21        | 21        |
|               | 6      | Algebraic Fractions                 | 21        | 19        | 20        | -         |
|               | 7      | Linear Equations 1,11               | 20        | 22        | 22        | 22        |
|               | 8      | Indices                             | 23,24     | 23,24     | 23,24     | 23        |
|               | 9      | Linear Inequalities                 | 25,26     | 25,26     | 25        | 24        |
|               | 10     | Graph of Functions 1                | -         | -         | -         | -         |
|               | 11     | Solid Geometry 1,11,111             | -         | -         | -         | -         |
|               | 12     | Circles 1,11                        | -         | -         | -         | -         |
|               | 13     | Statistics 1,11                     | 39,40     | 27,28     | 27        | 25,26     |
| FORM<br>4     | 1      | Standard Forms                      | 1,2,3,4   | 1,2,3,4   | 1,2,3     | 1,2,3,4   |
|               | 2      | Quadratic Expressions and Equations | -         | -         | 19        | -         |
|               | 3      | Set                                 | 32,33,34  | 30,31,32  | 29,30,31  | 29,30,31  |
|               | 4      | Mathematical Reasoning              | -         | -         | -         | -         |
|               | 5      | The Straight Lines                  | 31        | 33,34     | 32,33     | 32,33     |
|               | 6      | Statistics III                      | -         | -         | 26        | 27        |
|               | 7      | Probability I                       | -         | -         | -         | 34,35     |
|               | 8      | Circles III                         | 9         | 8         | 8         | 8         |
|               | 9      | Trigonometry II                     | 12        | 11,12     | 11,12,13  | 11,12,13  |
|               | 10     | Angles of Elevation and Depression  | 10        | 15,16     | 15        | 15,16     |
|               | 11     | Lines and Plane in 3-Dimension      | 13        | 14        | 14        | 14        |
| FORM<br>5     | 1      | Number Base                         | 5,6       | 5,6       | 4,5       | 5,6       |
|               | 2      | Graph of Functions II               | 30        | 28        | 28        | 28        |
|               | 3      | Transformations III                 | -         | -         | -         | -         |
|               | 4      | Matrices                            | 27,28,29  | 40        | 39,40     | 39,40     |
|               | 5      | Variations                          | 35,36     | 38,39     | 36,37,38  | 36,37,38  |
|               | 6      | Gradient and the Area under a Graph | -         | -         | -         | -         |
|               | 7      | Probability II                      | 37,38     | 35,36,37  | 34,35     | -         |
|               | 8      | Bearing                             | 14        | 18        | 16        | 17        |
|               | 9      | The Earth as a Sphere               | 15        | 17        | 17,18     | 18        |
|               | 10     | Plan and Elevation                  | -         | -         | -         | -         |
| <b>TOTAL</b>  |        |                                     | <b>40</b> | <b>40</b> | <b>40</b> | <b>40</b> |

|               | TOPICS |                                     | PAPER 2   |           |           |           |
|---------------|--------|-------------------------------------|-----------|-----------|-----------|-----------|
|               |        |                                     | 2003      | 2004      | 2005      | 2006      |
| FORM<br>1 - 3 | 1      | Polygon 1 ,11                       |           |           |           |           |
|               | 2      | Transformations 1, 11               |           |           |           |           |
|               | 3      | Trigonometry 1                      |           |           |           |           |
|               | 4      | Algebraic Expressions 1,11,111      |           |           |           |           |
|               | 5      | Algebraic Formulae                  |           |           |           |           |
|               | 6      | Algebraic Fractions                 |           |           |           |           |
|               | 7      | Linear Equations 1,11               | 2         | 5         | 2         | 4         |
|               | 8      | Indices                             |           |           |           |           |
|               | 9      | Linear Inequalities                 |           |           | 3         |           |
|               | 10     | Graph of Functions 1                |           |           |           |           |
|               | 11     | Solid Geometry 1,11,111             | 6         | 2         | 6         | 5         |
|               | 12     | Circles 1,11                        | 7         | 9         | 7         | 8         |
|               | 13     | Statistics 1,11                     |           |           |           |           |
| FORM<br>4     | 1      | Standard Forms                      |           |           |           |           |
|               | 2      | Quadratic Expressions and Equations | 1         | 7         | 1         | 3         |
|               | 3      | Set                                 |           | 1         |           | 1         |
|               | 4      | Mathematical Reasoning              | 8         | 4         | 8         | 6         |
|               | 5      | The Straight Lines                  | 5         | 6         | 5         | 10        |
|               | 6      | Statistics III                      | 14        | 14        | 14        | 14        |
|               | 7      | Probability I                       |           |           |           |           |
|               | 8      | Circles III                         |           |           |           |           |
|               | 9      | Trigonometry II                     |           |           |           |           |
|               | 10     | Angles of Elevation and Depression  |           |           |           |           |
|               | 11     | Lines and Plane in 3-Dimension      | 4         | 3         | 4         | 2         |
| FORM<br>5     | 1      | Number Base                         |           |           |           |           |
|               | 2      | Graph of Functions II               | 3,12      | 12        | 12        | 13        |
|               | 3      | Transformations III                 | 13        | 13        | 13        | 12        |
|               | 4      | Matrices                            | 11        | 8         | 11        | 11        |
|               | 5      | Variations                          |           |           |           |           |
|               | 6      | Gradient and the Area under a Graph | 10        | 11        | 10        | 9         |
|               | 7      | Probability II                      | 9         | 10        | 9         | 7         |
|               | 8      | Bearing                             |           |           |           |           |
|               | 9      | The Earth as a Sphere               | 16        | 16        | 16        | 16        |
|               | 10     | Plan and Elevation                  | 15        | 15        | 15        | 15        |
| <b>TOTAL</b>  |        |                                     | <b>16</b> | <b>16</b> | <b>16</b> | <b>16</b> |

# CONTOH KERTAS SOALAN MATHEMATICS

PAPER 1

ONE HOUR FIFTEEN MINUTES

*Answer all question*

1. Round off 0.060372 correct to three significant figures.

- A. 0.06037                      B. 0.0604                      C. 0.060                      D. 0.06

2. Express 382 000 as a number in the standard form.

- A.  $3.82 \times 10^{-5}$                       B.  $3.82 \times 10^5$                       C.  $382 \times 10^{-5}$                       D.  $382 \times 10^3$

3.  $\frac{4 \times 10^3}{0.0016} =$ 

- A.  $2.5 \times 10^5$                       B.  $2.5 \times 10^4$                       C.  $2.5 \times 10^6$                       D.  $2.5 \times 10^7$

4.  $1100011_2 + 111010_2 =$ 

- A.  $11111010_2$                       B.  $11011011_2$                       C.  $10011101_2$                       D.  $10001010_2$

5. The value of the digit 3, in base ten, in the number  $6307_8$  is

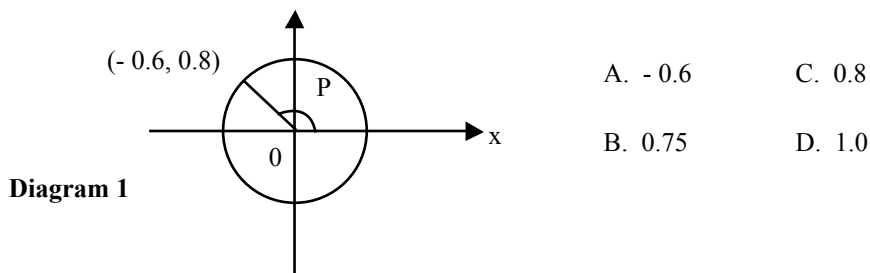
- A. 24                      B. 64                      C. 192                      D. 300

6. Given that  $94_{10} = 1k6_8$ , find the value of k.

- A. 2                      B. 3                      C. 4                      D. 5

7. Given the location of X is  $(35^\circ \text{N}, 125^\circ \text{W})$  and XY is the diameter of the parallel of latitude. The location of Q is

- A.  $(35^\circ \text{S}, 126^\circ \text{W})$                       B.  $(35^\circ \text{N}, 125^\circ \text{E})$                       C.  $(35^\circ \text{N}, 55^\circ \text{E})$                       D.  $(35^\circ \text{S}, 55^\circ \text{W})$

8. Diagram 1 shows a unit circle. Find the value of  $\cos P =$ 9.  $\frac{3-m}{12m^2} - \frac{1}{4m} =$ 

- A.  $\frac{3-2m}{12m^2}$                       B.  $\frac{3-2m}{12m^3}$                       C.  $\frac{3-4m}{12m^2}$                       D.  $\frac{3-4m}{12m^3}$

10. Given that  $\frac{h}{h-3} = \frac{3}{k}$  express  $h$  in terms of  $k$ .

A.  $\frac{9}{k+3}$

B.  $\frac{9}{k-3}$

C.  $\frac{9}{3-k}$

D.  $\frac{9}{3+k}$

11.  $(k+1)(k-2) - k^2 + 2k =$

A.  $k+2$

B.  $3k+2$

C.  $k-2$

D.  $3k-2$

12. Given that  $5m+3=9-(2-m)$ , find the value of  $k$ .

A.  $-2$

B.  $1$

C.  $3$

D.  $4$

13. The distance between P ( $20^\circ$  S,  $110^\circ$  E) and Q ( $40^\circ$  N,  $110^\circ$  E) in nautical miles is

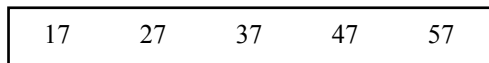
A. 2 600

B. 2 800

C. 3 000

D. 3 600

14. The diagram shows some number cards



A card is picked at random. State the probability that a prime number is picked.

A.  $\frac{3}{5}$

B.  $\frac{1}{5}$

C.  $\frac{9}{25}$

D.  $\frac{3}{7}$

15. In Diagram 2, BCD is a straight line. Find the value of  $\cos y^\circ$ .

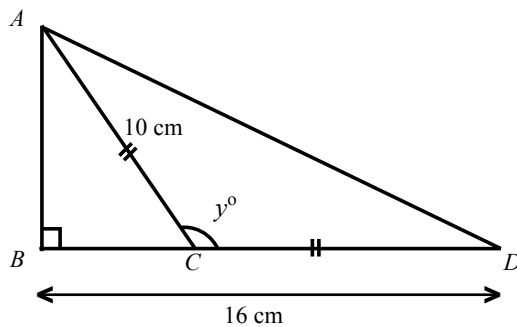


Diagram 2

A.  $-\frac{5}{3}$

C.  $\frac{3}{5}$

B.  $-\frac{3}{5}$

D.  $\frac{5}{3}$

16. A box contains five cards which are labeled with letters M, A, T, H and S. Two cards are drawn at random from the box. What is the probability of getting the letters A and H?

A.  $\frac{1}{10}$

B.  $\frac{2}{7}$

C.  $\frac{3}{8}$

D.  $\frac{7}{10}$

17. Table 1 shows a cumulative frequency table.

| Class   | Cumulative frequency |
|---------|----------------------|
| 10 - 14 | 4                    |
| 15 - 19 | 11                   |
| 20 - 24 | 21                   |
| 25 - 29 | 26                   |

**Table 1**

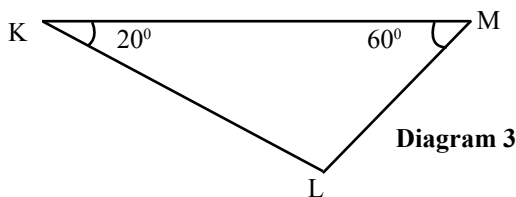
What is the frequency of the class 15 – 19 ?

- A. 4                                      B. 7                                      C. 10                                      D. 11

18. Given that  $\tan \theta = -0.7107$  and  $180^\circ < \theta < 360^\circ$ . Find the value of  $\theta$

- A.  $229^\circ 24'$                               B.  $234^\circ 36'$                               C.  $324^\circ 36'$                               D.  $346^\circ 24'$

19. In the diagram 3, L is due south of M. The bearing of K from L is



- A.  $080^\circ$                                       C.  $240^\circ$   
 B.  $100^\circ$                                       D.  $260^\circ$

20.

|                  |   |   |   |   |   |
|------------------|---|---|---|---|---|
| Score            | 1 | 2 | 3 | 4 | 5 |
| Number of pupils | 4 | 7 | 8 | k | 4 |

**Table 2**

A group of pupils entered a competition. Their scores are given in the above table. If the modal score is 3, find the maximum value for k.

- A. 3                                      B. 4                                      C. 7                                      D. 8

21. Find the y-intercept of the straight line  $x - 3y = 18$

- A. -6                                      B. -3                                      C. 6                                      D. 18

22. Diagram 4, P, Q, R and T are four successive vertices of a regular polygon. How many sides does the polygon have?

- A. 8  
B. 10  
C. 9  
D. 12

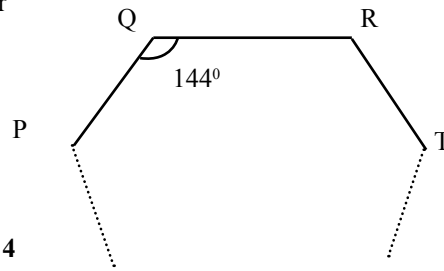


Diagram 4

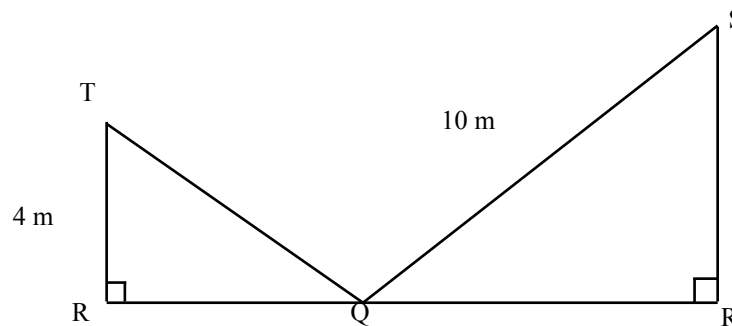
23.  $6^{3k} \div 9^k =$

- A.  $3^{2k}$   
B.  $6^k$   
C.  $12^k$   
D.  $24^k$

24. Diagram 5, P, Q and R are three points on horizontal ground. PT and RS are two vertical poles. The angle of elevation of T from Q is  $45^\circ$  whereas the angle of depression of Q from S is  $35^\circ$ . Find the distance, in m, between the two poles.

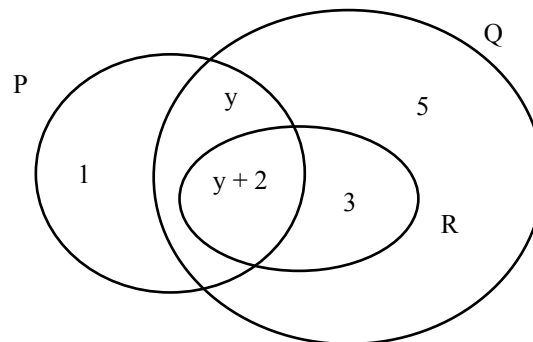
- A. 8.19  
B. 9.74  
C. 11.00  
D. 12.19

Diagram 5



25. Diagram 6 is a Venn diagram which shows the number of elements in set P, set Q and set R.

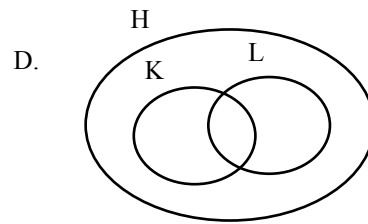
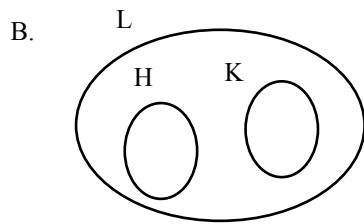
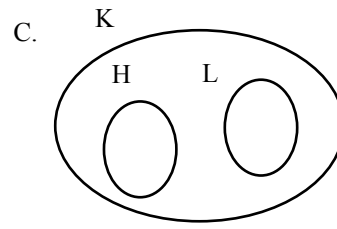
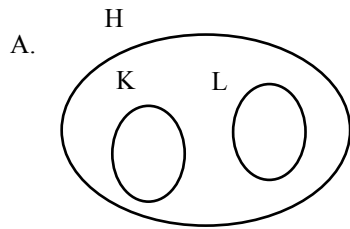
Diagram 6



Given that the universal set  $\xi = P \cup Q \cup R$ , find the value of  $y$  if  $n(P) = n(R)$

- A. 1  
B. 2  
C. 3  
D. 5

26. Given the universal set  $\xi = H \cup K \cup L$ , where sets H, K and L satisfy the following conditions:  
 $H \cup K = K$ ,  $K \cap L = L$  and  $H' \cap L = L$ . The Venn diagram which represents the relationship is



27.  $m^{-3} n^5 \times (m^2 n^4)^3 =$

A.  $m^2 n^{12}$

B.  $m^3 n^{17}$

C.  $m^3 n^9$

D.  $m^5 n^{69}$

28. List all the integers  $x$  that satisfy the inequalities  $6x + 5 \leq 7y - 2 < 6y + 8$ .

A. 6,7,8,9,10,11

B. 7,8,9,10

C. 7,8,9

D. 8,9

29. Diagram 7 shows a straight line HK on a Cartesian plane.

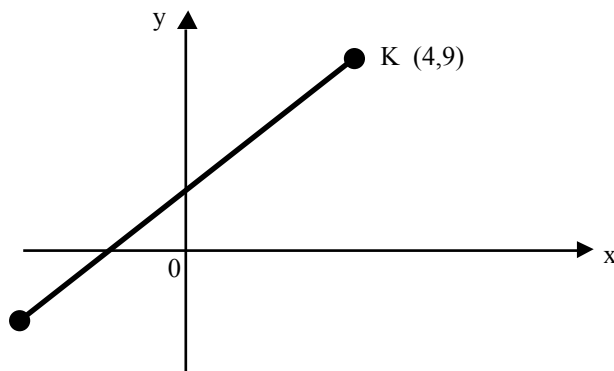


Diagram 7

The gradient of HK is  $\frac{3}{2}$ . Find the x-intercept of HK.

A. - 8

B. - 6

C. - 4

D. - 2

30. Given that  $H$  varies directly as  $K$  and inversely as the square root of  $L$  and  $H=15$  when  $K=5$  and  $L=16$ , express  $H$  in terms of  $K$  and  $L$ .

A.  $H = \frac{3K\sqrt{L}}{4}$       B.  $H = \frac{12K}{\sqrt{L}}$       C.  $H = \frac{48K}{L}$       D.  $H = \frac{75\sqrt{L}}{4K}$

31. Given  $p$  varies directly as the square root of  $m$  and  $p=5$  when  $m=9$ . Express  $p$  in terms of  $m$ .

A.  $p = 15\sqrt{m}$       B.  $p = \frac{5}{3}\sqrt{m}$       C.  $p = \frac{3}{5}\sqrt{m}$       D.  $p = \frac{5}{9}\sqrt{m}$

32.

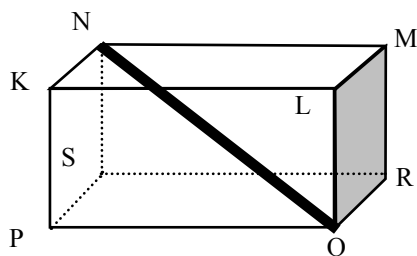


Diagram 8

Diagram 8 shows a cuboid with a horizontal base PQRS. The angle between the line NQ and the plane LQRM is

- A.  $\angle NQR$       B.  $\angle NRQ$       C.  $\angle NQM$       D.  $\angle NMQ$

33.

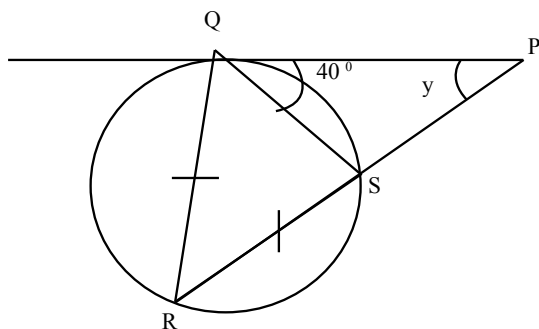


Diagram 9

In Diagram 9,  $PQ$  is a tangent to the circle  $QRS$  at  $Q$  and  $RSP$  is a straight line. The value of  $y$  is

- A.  $15^\circ$       B.  $30^\circ$       C.  $45^\circ$       D.  $70^\circ$

34.

|        |        |       |        |
|--------|--------|-------|--------|
| Object | (2,-1) | (0,4) | L      |
| Image  | (3,-3) | K     | (-4,0) |

The table above shows some objects and their images under a certain translation. Find the coordinates of points  $K$  and  $L$

- A.  $K(1,2)$ ,  $L(-5,-2)$       B.  $K(1,6)$ ,  $L(-5,-2)$       C.  $K(1,2)$ ,  $L(-5,2)$       D.  $K(1,6)$ ,  $L(-5,2)$

35. In diagram 10, B and D are two points on a horizontal ground. AB and CD are two vertical poles with  $CD = 4.8$  m and  $AB = 48.43$  m. The angle of elevation of A from C is  $40^\circ$ . Find the distance, in m, between B and D



Diagram 10

- A. 48                      B. 50                      C. 52                      D. 54
36. Diagram 11 shows a straight line OL and a point T on a Cartesian plane. Find the coordinates of image of point T under a reflection in the line OL.
- A. (-1,7)                      C. (-2,6)  
B. (2,6)                      D. (-1,9)

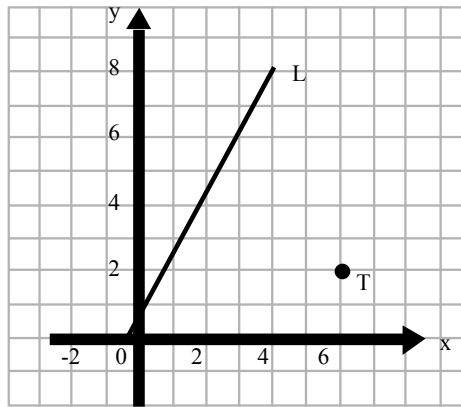


Diagram 11

37. Diagram 12 shows a straight line OP and a point K on a Cartesian plane. The coordinates of the centre of rotation are
- A. (5,1)                      C. (2,4)  
B. (4,2)                      D. (0,5)

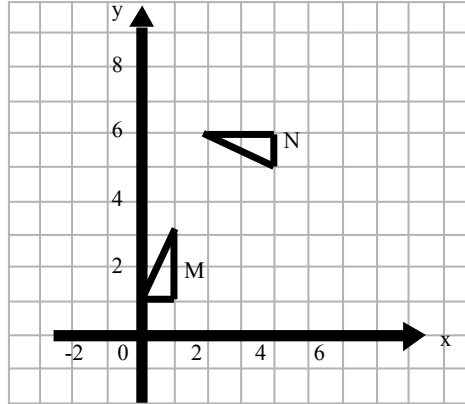


Diagram 12

38. Given that  $\begin{pmatrix} 3 \\ p \end{pmatrix} \begin{pmatrix} -2 & 1 \end{pmatrix} = \begin{pmatrix} -6 & 3 \\ 10 & p \end{pmatrix}$ , calculate the value of p.
- A. -6                      B. -5                      C. -4                      D. -3
39. If  $\begin{pmatrix} k & 4 \\ 3 & -2 \end{pmatrix}$  has no inverse, then k =
- A. -6                      B. -4                      C. 4                      D. 6
40. Given  $\begin{pmatrix} 1 & 3 \\ 2 & -4 \end{pmatrix} - 2K = \begin{pmatrix} 3 & -5 \\ 4 & -2 \end{pmatrix}$ , find the matrix K.
- A.  $\begin{pmatrix} -2 & 8 \\ -2 & -2 \end{pmatrix}$                       B.  $\begin{pmatrix} -1 & 4 \\ -2 & 1 \end{pmatrix}$                       C.  $\begin{pmatrix} -1 & 1 \\ -1 & -1 \end{pmatrix}$                       D.  $\begin{pmatrix} -1 & 4 \\ -1 & -1 \end{pmatrix}$

## PAPER 2

## TWO HOURS AND THIRTY MINUTES

This question paper consists of two sections: Section A and Section B.  
Answer all the questions in section A and four questions in Section B.

## SECTION A

Answer all the questions in this section.

[52 marks]

1. Solve the equation  $\frac{20 - k^2}{k} = 3 + k$  [4 marks]

2. Calculate the values of  $p$  and  $q$  that satisfy the following simultaneous linear equations:

$$p + \frac{1}{3}q = 6$$

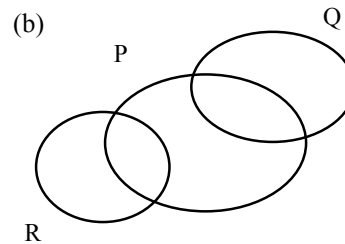
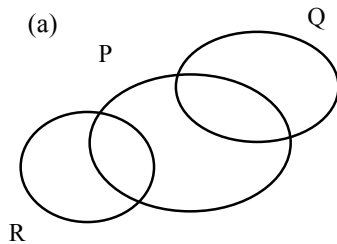
$$3p - q = 6$$

[4 marks]

3. The Venn diagrams in the answer space show sets  $P$ ,  $Q$  and  $R$ . The universal set,  $\xi = P \cup Q \cup R$   
On the diagrams provided in the answer space, shade

(a)  $P \cap Q'$

(b)  $(P' \cap R) \cup Q$



[3 marks]

Diagram 1

4. (a) State whether the following sentence is a statement.

$$\text{`` } (k + 3)(k - 3) = 9 - k^2 \text{ ``}$$

(b) Complete the premise in the following argument.

Premis 1 : If  $y$  is divisible by 4, then  $y^2$  is divisible by 4

Premis 2 : \_\_\_\_\_

Conclusion :  $y$  is not divisible by 4.

(c) Write two implications from the following sentence.

$$\text{`` } (x + 1)(x - 4) = 0 \text{ if and only if } x = -1 \text{ or } x = 4 \text{ ``}$$

5.

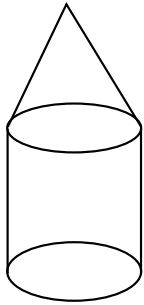


Diagram 2

Diagram 2 shows a solid consisting of a cylinder and cone. The diameter of the base of the cylinder is 18 cm. The height of the cylinder and the cone are 12 cm and 9 cm respectively. By using  $\pi = \frac{22}{7}$ , calculate the volume, in  $\text{cm}^3$ , of the solid.

[4 marks]

6.

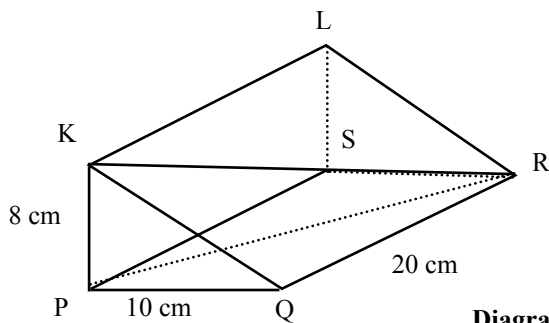


Diagram 3

Diagram 3 shows a right triangular prism with a horizontal rectangular base, PQRS.

- (a) Find the length of KR  
(b) Calculate the angle between plane PRK and plane PQK

[4 marks]

7.

| STUDENT     | PROBABILITY OF ATTEMPTING QUESTION |               |
|-------------|------------------------------------|---------------|
|             | MATRICES                           | VARIATIONS    |
| HAFIZ       | $\frac{4}{7}$                      | $\frac{3}{4}$ |
| NOR SHAMEEM | $\frac{1}{2}$                      | $\frac{6}{7}$ |

Table 1

Table 1 shows the probability of Hafiz and Nor Shameem attempting the questions from two chapters in a test. Calculate the probability that

- (a) Hafiz did not answer matrices  
(b) Hafiz and Nor Shameem answered the questions on variations  
(c) Nor Shameem answered questions from one of the chapters out of the two.

[3 marks]

8. (a) Given that  $\frac{1}{k} \begin{pmatrix} 4 & -5 \\ 1 & -2 \end{pmatrix} \begin{pmatrix} -2 & 5 \\ -1 & h \end{pmatrix} = \begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix}$ , find the value of h and of k.

(b) hence, using matrices, solve the following simultaneous equation:

$$\begin{aligned} 4x - 5y &= 30 \\ x - 2y &= 9 \end{aligned}$$

[6 marks]

9.

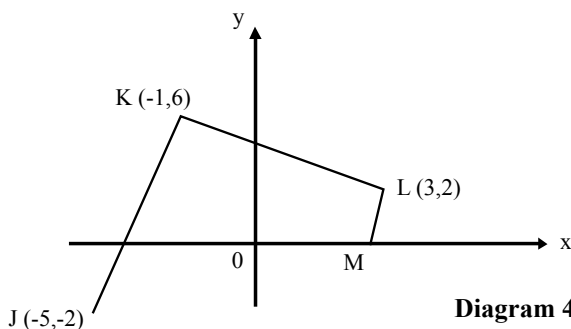


Diagram 4

Diagram 4, the straight line JK is parallel to the straight line ML and O is the origin. Find

- (a) the gradient of the straight line JK  
(b) the equation of the straight line ML  
(c) the coordinates of the point M

[6 marks]

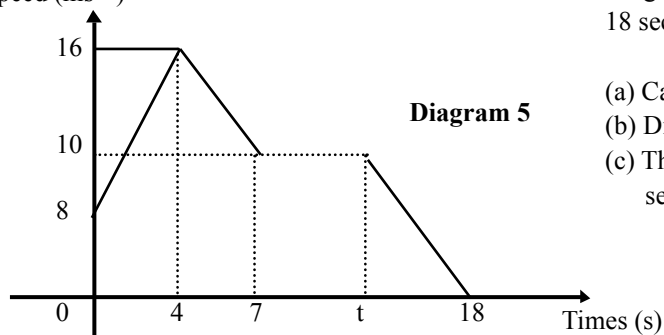
10. Speed ( $\text{ms}^{-1}$ )

Diagram 5 shows the speed-time graph of an object over a period of 18 seconds.

- Calculate the rate of change of speed, in  $\text{ms}^{-2}$ , in the first 4 s.
- Distance travelled during the first 7 s
- The value of  $t$ , given that the rate of change of speed in the last  $t$  seconds is  $\frac{5}{3} \text{ m s}^{-2}$ .

[6 marks]

11.

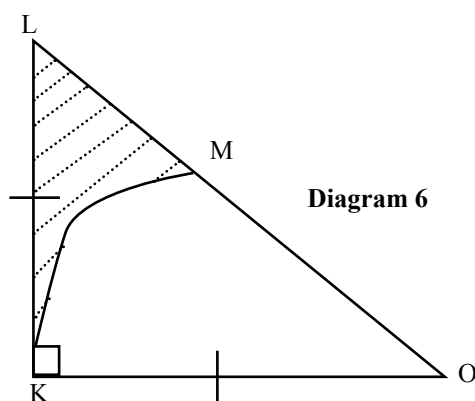


Diagram 6 shows an isosceles triangle.  $KM$  is an arc of the circle that centred at  $O$  and  $OML$  is a straight line.

Given that  $KO = KL = 12 \text{ cm}$ .

Using  $\pi = 3.142$ , calculate

- the perimeter of the shaded region
- the area of the shaded region

[6 marks]

## SECTION B

[48 marks]

Answer **four questions** in this section.

12. (a) Table 2 shows values of
- $x$
- and
- $y$
- which satisfy the equation
- $y = -2x^2 + 8x - 11$

|     |    |     |     |    |    |    |     |   |     |
|-----|----|-----|-----|----|----|----|-----|---|-----|
| $x$ | -2 | -1  | 0   | 1  | 2  | 3  | 4   | 5 | 6   |
| $y$ |    | -21 | -11 | -5 | -3 | -5 | -11 |   | -35 |

Table 2

[2 marks]

- (b) For this part of the question, use the graph paper. You may use a flexible curved ruler.

By using a scale of 2 cm to 1 unit on the  $x$ -axis and 2 cm to 5 units on the  $y$ -axis, draw the  $y = -2x^2 + 8x - 11$  for  $-2 \leq x \leq 6$ 

[3 marks]

- (c) From your graph, find

(i) the value of  $y$  when  $x = 3.5$ 

[1 mark]

(ii) the value of  $x$  when  $y = -15$ 

[2 marks]

- (d) Draw a suitable line on your graph to find the value of
- $x$
- which satisfies the equation
- $-2x^2 + 3x + 9 = 0$
- for
- $-2 \leq x \leq 6$
- . State this values of
- $x$
- .

[4 marks]

13. (a) Transformation P represents a translation
- $\begin{pmatrix} 3 \\ -1 \end{pmatrix}$
- and Q represents anticlockwise rotation of
- $90^\circ$
- about the centre
- $(0,2)$
- . State the coordinates of point
- $(4,3)$
- under the transformations

(i) P

(ii) Q

(iii) PQ

[5 marks]

- (b)

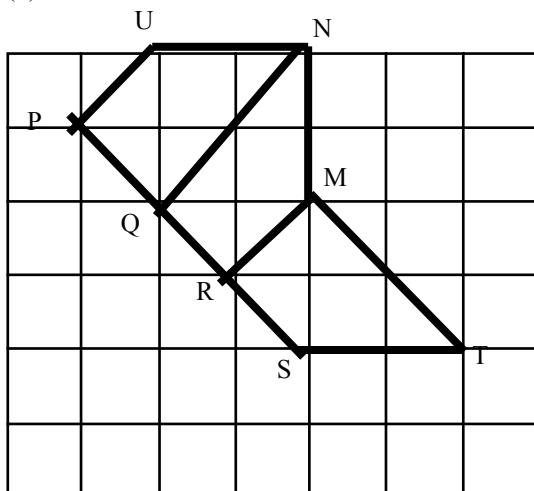


Diagram 7 shows trapezium  $RMNQ$  is the image of trapezium  $PUNQ$  under transformation  $X$  and trapezium  $RSTM$  is the image of trapezium  $RMNQ$  under transformation  $Y$ . Describe, in full, transformation  $X$  and transformation  $Y$ .

Diagram 7

[7 marks]

14. The daily distances, in km, travelled in 40 days by a salesman are shown in Diagram 8.

|    |    |    |    |    |
|----|----|----|----|----|
| 42 | 53 | 68 | 64 | 36 |
| 62 | 45 | 58 | 63 | 56 |
| 51 | 54 | 57 | 57 | 50 |
| 37 | 27 | 65 | 59 | 57 |
| 70 | 70 | 21 | 70 | 73 |
| 14 | 76 | 18 | 19 | 75 |
| 12 | 91 | 22 | 41 | 13 |
| 93 | 72 | 87 | 55 | 39 |

**Diagram 8**

[1 mark]

- (a) State the range of the data
- (b) Using data in Diagram 8 and a class interval of 10 km, complete Table 3 in the answer space.

| Distance (km) | Midpoint | Frequency |
|---------------|----------|-----------|
| 11 – 20       | 15.5     | 5         |
| 21 – 30       |          |           |
|               |          |           |
|               |          |           |
|               |          |           |
|               |          |           |
|               |          |           |
|               |          |           |
|               |          |           |

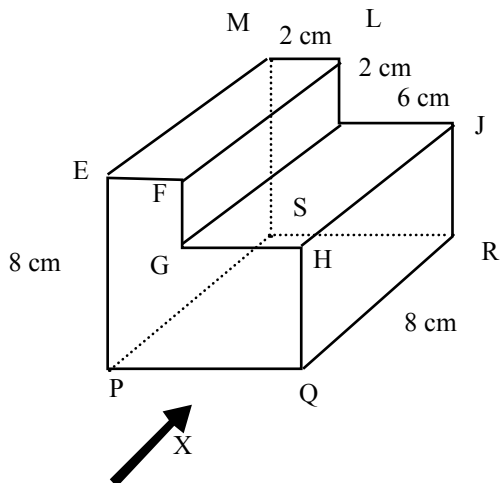
**Table 3**

[4 marks]

- (c) From the Table 3, calculate the estimated mean distance travelled. [3 marks]
- (d) *For this part of the question, use the graph paper.*  
Using a scale of 2 cm to 10 km on the horizontal axis and 2 cm to 1 day on the vertical axis, draw a frequency polygon for the data above. [4 marks]

15. (a) Diagram 7(i) shows a solid right prism with a rectangular base, PQRS, on a horizontal table. The surface, EFGHQP, is the uniform cross-section of the prism. EFLM and GHJK are horizontal planes. Given that  $EF=ML=FG=LK=2$  cm, and  $EP = QR = 8$  cm.

Draw to full scale, the elevation of the solid on a vertical plane parallel to PQ as viewed from X.



**Diagram 7 (i)**

[3 marks]

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- (b) An inverted solid right prism with the uniform cross section, TMU, is removed from the solid in Diagram 7(i). The remaining solid is shown in Diagram 7(ii). GQMT is an inclined plane.  $TK = UJ = 4 \text{ cm}$ . Draw to full scale

(i) the plan of the remaining solid

[5 marks]

(ii) front elevation of the remaining solid on a vertical plane parallel QR as viewed from Y.

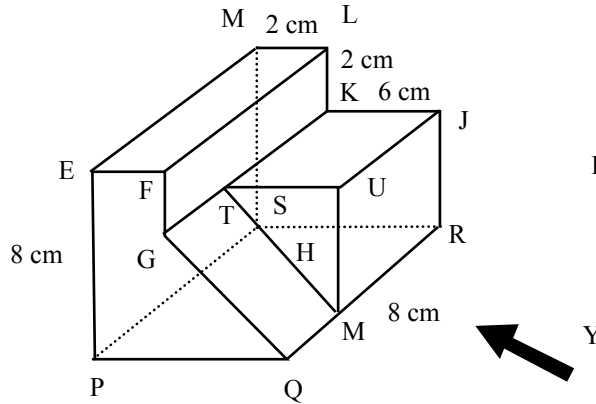


Diagram 7 (ii)

[4 marks]

16. K, L and M are three points on the surface of the Earth. KL is the diameter with parallel of latitude  $30^\circ \text{N}$  and KM is the diameter of the Earth. Longitude of M is  $65^\circ \text{W}$ .

(a) Find

(i) the latitude of M

(ii) the longitude of K

[4 marks]

(b) Find the distance from K to L along the parallel of latitude in nautical miles.

[4 marks]

(c) An aeroplane departs from K to L, by passing through the North Pole with an average speed of 800 knots. The aeroplane arrives at L at 1615 hour on the same day. Find the departure time of the aeroplane.

[4 marks]

END OF QUESTION PAPER