



**MAKTAB RENDAH SAINS MARA**

**PEPERIKSAAN PERCUBAAN  
SIJIL PELAJARAN MALAYSIA 2004**

---

**MATEMATIK**

Kertas 2

Dua jam tiga puluh minit

---

**JANGAN BUKA KERTAS SOALAN INI SEHINGGA DIBERITAHU**

*Calon dibenarkan menjawab keseluruhan atau sebahagian soalan sama ada dalam bahasa Melayu atau bahasa Inggeris.*

*INFORMATION FOR CANDIDATES*

1. This question paper consists of two sections: **Section A** and **Section B**. Answer **all** questions in **Section A** and **four** questions in **Section B**
2. Write your answers clearly in the spaces provided in the question paper.
3. Show your working. It may help you to get marks
4. If you wish to change your answer, neatly cross out the work you have done. Then write down the new answer.
5. The diagrams 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.
8. A booklet of four-figure mathematical tables is provided.
9. You may use a non-programmable scientific calculator
10. This question paper must be handed in at the end of the examination.

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

### RELATIONS

1  $a^m \times a^n = a^{m+n}$

2  $a^m \div a^n = a^{m-n}$

3  $(a^m)^n = a^{mn}$

4  $A^{-1} = \frac{1}{ad - bc} \begin{pmatrix} d & -b \\ -c & a \end{pmatrix}$

5  $P(A) = \frac{n(A)}{n(S)}$

6  $P(A') = 1 - P(A)$

7 Distance =  $\sqrt{(x_1 - x_2)^2 + (y_1 - y_2)^2}$

8 Midpoint

$$(x, y) = \left( \frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2} \right)$$

9 Average speed =  $\frac{\text{distance travelled}}{\text{time taken}}$

10 Mean =  $\frac{\text{sum of data}}{\text{number of data}}$

11 Mean =  $\frac{\text{sum of (class mark} \times \text{frequency)}}{\text{sum of frequencies}}$

12 Pythagoras Theorem

$$c^2 = a^2 + b^2$$

13  $m = \frac{y_2 - y_1}{x_2 - x_1}$

14  $m = -\frac{y - \text{intercept}}{x - \text{intercept}}$

## SHAPE AND SPACE

- 1 Area of trapezium =  $\frac{1}{2} \times \text{sum of parallel sides} \times \text{height}$
- 2 Circumference of circle =  $\pi d = 2\pi r$
- 3 Area of circle =  $\pi r^2$
- 4 Curved surface area of cone =  $\pi rs$
- 5 Curved surface area of cylinder =  $2\pi rh$
- 6 Surface area of sphere =  $4\pi r^2$
- 7 Volume of right prism = cross sectional area  $\times$  length
- 8 Volume of cylinder =  $\pi r^2 h$
- 9 Volume of cone =  $\frac{1}{3} \pi r^2 h$
- 10 Volume of sphere =  $\frac{4}{3} \pi r^3$
- 11 Volume of right pyramid =  $\frac{1}{3} \times \text{base area} \times \text{height}$
- 12 Sum of interior angles of a polygon =  $(n - 2) \times 180^\circ$
- 13  $\frac{\text{arc length}}{\text{circumference of circle}} = \frac{\text{angle subtended at centre}}{360^\circ}$
- 14  $\frac{\text{area of sector}}{\text{area of circle}} = \frac{\text{angle subtended at centre}}{360^\circ}$
- 15 Scale factor,  $k = \frac{PA'}{PA}$
- 16 Area of image =  $k^2 \times \text{area of object}$

**Section A**

[52 marks]

*Answer all questions in this section.*

- 1 Solve the equation  $x - 18 = 4(x + 2)(x - 3)$ . [4 marks]

*Answer:*

- 2 Calculate the values of  $v$  and  $w$  that satisfy the simultaneous linear equations :

$$2w - 3v = 4 \quad \text{and} \quad w - \frac{1}{3}v = -5$$

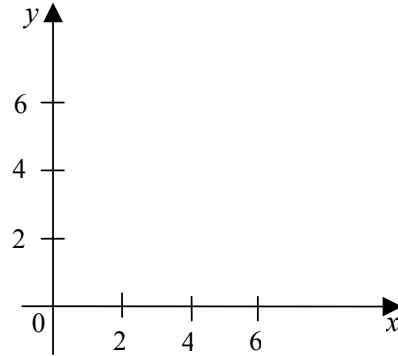
[4 marks]

*Answer:*

- 3 On the graph provided, shade the region which satisfies the three inequalities  $x + y \leq 6$ ,  $x \geq 2$  and  $y > 1$

[3 marks]

Answer:



- 4 Figure 1 shows a prism with a horizontal rectangular base  $ABCD$ . The uniform cross-section of the prism is an equilateral triangle.  $R$  and  $S$  are mid points of  $AB$  and  $CD$  respectively.

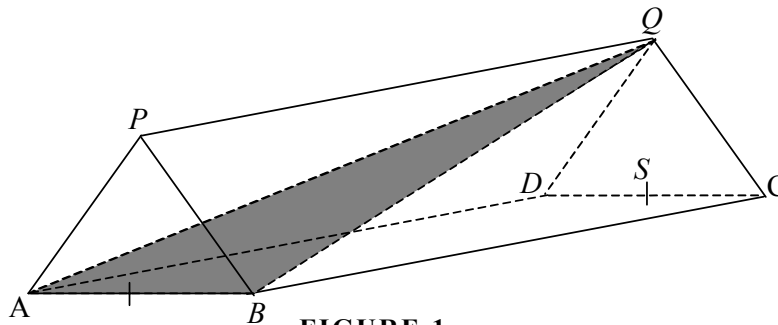


FIGURE 1

Given that  $AB = 8$  cm and  $BC = 15$  cm, calculate the angle between plane  $ABQ$  and plane  $ABP$ .

[4 marks]

Answer:

- 5 In Figure 2,  $O$  is the origin.  $PQR$  is a straight line and the area of the shaded region is  $25 \text{ unit}^2$ .

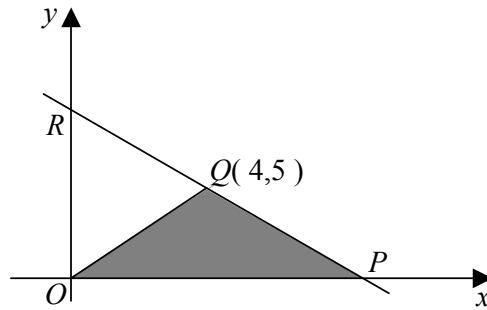


FIGURE 2

Find the

- coordinate of  $P$ ,
- equation of the straight line  $PR$ ,
- length  $OR$ .

[5 marks]

Answer: (a)

(b)

(c)

- 6 Figure 3 shows a solid cylinder after the shaded cone has been removed. The radius and height of the cylinder are 7 cm and 18 cm respectively. The ratio of the height of cone and the height of cylinder is 2 : 3.

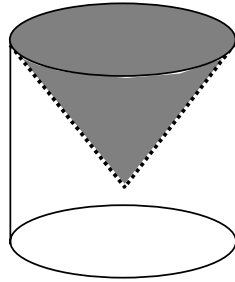


FIGURE 3

By using  $\pi = \frac{22}{7}$ , calculate the total surface area of the remaining solid.

[4 marks]

*Answer:*

- 7 In Figure 4,  $ABZD$  and  $CBWD$  are quadrants of circles centred at  $A$  and  $C$  respectively. The triangle  $XYZ$  touches the arc  $BZD$  at  $Z$  where  $Z$  is the midpoint of arc  $BZD$ .

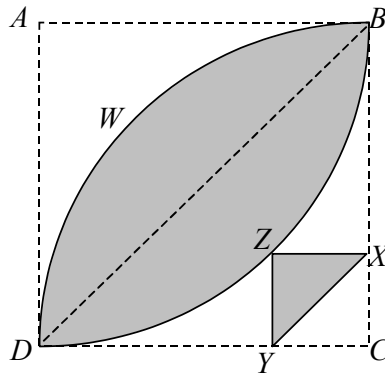


FIGURE 4

Given  $DC = 7$  cm, calculate the

- length of  $XZ$ ,
- perimeter of the shaded region,
- area of the shaded region.

[Use  $\pi = \frac{22}{7}$ ]

[6 marks]

Answer: (a)

(b)

(c)

- 8 (a) Write the true statement using the quantifiers “all” or “some ” using the object and feature below

*Object* : proper fraction

*Feature* : value less than 1.

- (b) State the converse of the implication below:

If the value of  $\theta$  lies between  $180^\circ$  and  $270^\circ$ ,  
then  $\cos \theta = -\cos (\theta - 180^\circ)$

- (c) “88, 82, 72, 58. ....” is a list of number pattern and can be written as

$$88 = 90 - 2 \times 1$$

$$82 = 90 - 2 \times 4$$

$$72 = 90 - 2 \times 9$$

$$58 = 90 - 2 \times 16$$

Make a general conclusion by induction regarding the list of number pattern based on the information above.

[4 marks]

*Answer:*

(a).....  
.....

(b).....  
.....

(c).....  
.....

- 9 Table 1 shows the number of plates according to colours and letters  $X$  and  $Y$  in a box. Three plates are drawn from the box at random, one at a time and without replacement.

Letters on plates Colours	$X$	$Y$
Blue	2	4
Green	3	9
Red	5	7

TABLE 1

Calculate the probability that

- (a) the second plate drawn is marked  $Y$ ,  
(b) all the three plates are of different colours.

[5 marks]

Answer:: (a)

(b)

- 10 Figure 5 shows the speed-time graph of a particle in motion for 18s. The distance traveled in the first  $(t+4)$  s is 183 m.

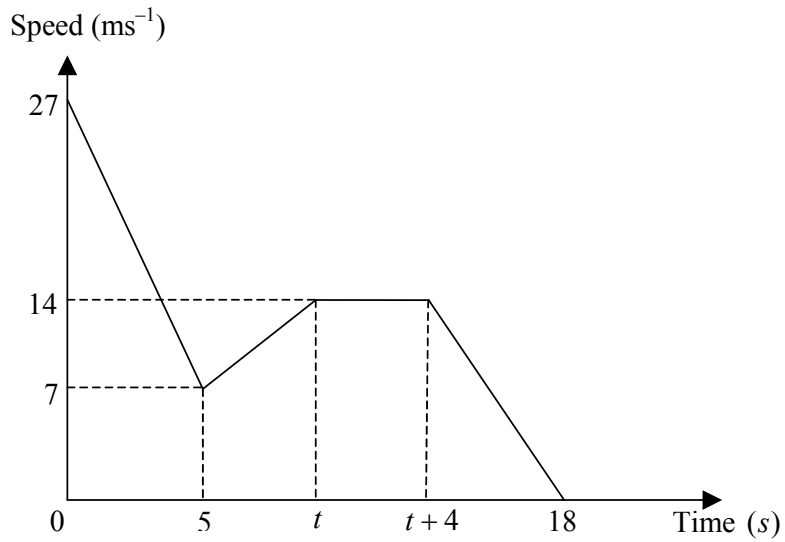


FIGURE 5

Calculate

- the value of  $t$ ,
- the distance traveled by the particle in the second half of its motion,
- the rate of change of speed in the last 3 seconds.

[6 marks]

Answer:: (a)

(b)

(c)

- 11 (a) The inverse of matrix  $\begin{pmatrix} -\frac{1}{2} & 1 \\ m & n \end{pmatrix}$  is  $\begin{pmatrix} 4 & -2 \\ 3 & -1 \end{pmatrix}$  .

Find the values of  $m$  and  $n$  .

- (b) By using matrices , calculate the values of  $x$  and  $y$  that satisfy this simultaneous equation .

$$\begin{aligned} 4x - 2y &= 10 \\ 3x - y &= 6 \end{aligned}$$

[6 marks]

*Answer:* (a)

(b)

**Section B**

[48 marks]

*Answer four questions from this section.*

- 12 (a) Complete Table 2 below for the values of  $y$  for  $y = 3 + 10x - 2x^3$ .

*Answer:*

$x$	-3	-2	-1	-0.5	0	0.5	1	2	3
$y$	27	-1		-1.75	3		11	7	

TABLE 2

[3 marks]

- (b) *For this part of the question, use the graph paper provided on page 27. You may use a flexible curve.*

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 graph of  $y = 3 + 10x - 2x^3$  for  $-3 \leq x \leq 3$ .

[3 marks]

- (c) Draw a suitable straight line on your graph to determine the values of  $x$  that satisfy the equation  $2x^3 - 15x = 8$  for  $-3 \leq x \leq 3$ . State the values of  $x$ .

[4 marks]

*Answer:* .....

.....

- d) Shade the region defined by the following three inequalities  $y \leq -5x - 5$ ,  $y > 3x$  and  $y + 2x^3 \geq 3 + 10x$  and label the region "**R**".

[2 marks]

13. (a) In Figure 6,  $\Delta AB'C'$  is the image of  $\Delta ABC$  under transformation  $V$  and  $\Delta A''B''C''$  is the image of  $\Delta AB'C'$  under transformation  $W$ .

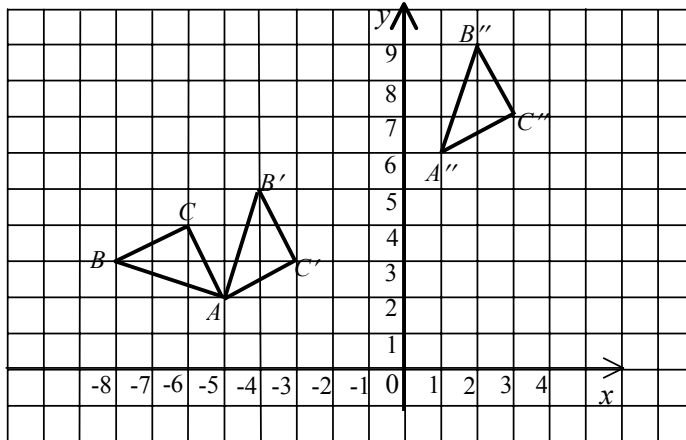


FIGURE 6

Fully describe

- (i) transformation  $V$ ,
- (ii) transformation  $W$ .
- (iii) a single transformation which is equivalent to transformation  $WV$

[8 marks]

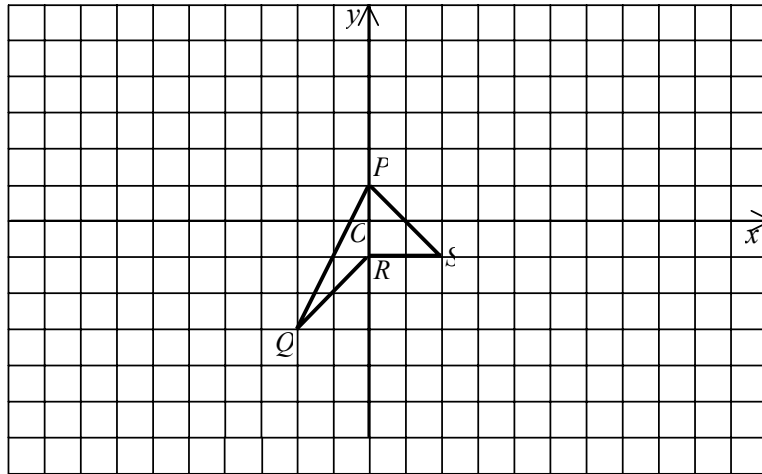
- (b) PQRS is a quadrilateral .

- (i) In the space provided on page 31, draw the image of PQRS under enlargement with scale factor 2 about the origin.
- (ii) If the area of the image obtained in (b) i) is  $16 \text{ cm}^2$ , calculate the area of PQRS.

[4 marks]

- Answer: (a) i) -----  
-----  
ii) -----  
-----  
iii) -----  
-----

- (b) i)



- ii)

14. Table 3, shows percentage distribution of carbon content in a chemical substance for 72 samples that are tested.

% Carbon Content	Frequency
3.1 - 3.5	4
3.6 - 4.0	10
4.1 - 4.5	22
4.6 - 5.0	16
5.1 - 5.5	10
5.6 - 6.0	7
6.1 - 6.5	3

TABLE 3

- (a) Calculate the estimate of the mean.

*Answer:*

- (b) Construct a cumulative frequency table from the data above.

*Answer:*

Class	Upper class boundary	Cumulative Frequency
3.1 - 3.5		
3.6 - 4.0		
4.1 - 4.5		
4.6 - 5.0		
5.1 - 5.5		
5.6 - 6.0		
6.1 - 6.5		

- (c) *For this part of the question , use the graph paper provided on page 35.*

By using a scale of 2 cm to 0.5% on the *x*-axis and 2 cm to 10 samples on the *y*-axis, draw an ogive based on the data.

- (d) From the ogive:

(i) find the Median

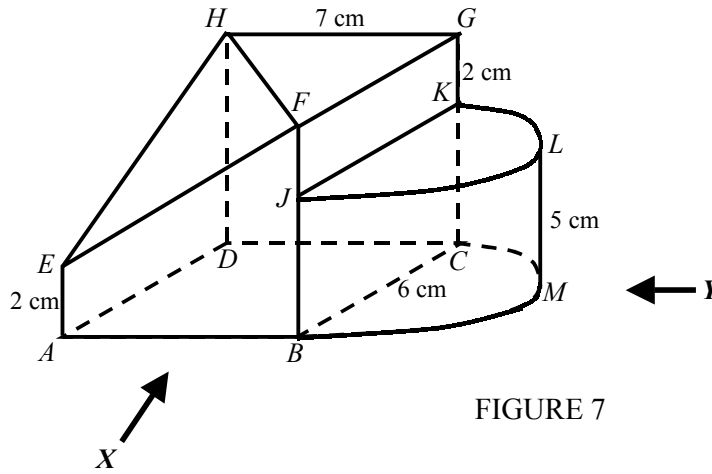
(ii) chemical substance exceeding the third quartile has to be tested again. State the minimum percentage of carbon content for the chemical substance that has to be tested again.

[12 marks]

*Answer:* (i) .....

(ii) .....

- 15 Figure 7 shows a solid joined with a half cylinder at the plane  $BCKJ$ .  $ADHE$ ,  $ABFE$ ,  $BCGF$  and  $DCGH$  are vertical planes.  $EFH$  is an inclined plane. The rectangular base  $ABCD$  and the semicircular base  $BCM$ , lie on a horizontal table.



Draw a full scale:

- (a) plan of this solid,
- (b) elevation of the combined solid on a vertical plane parallel to  $AB$  as viewed from  $X$ ,
- (c) elevation of the combined solid on a vertical plane parallel to  $BC$  as viewed from  $Y$ .

[12 marks]

Answer: (a)

*Answer: (b) and (c)*

- 16  $P$  ( $56^{\circ}N$ ,  $45^{\circ}W$ ),  $Q$ ,  $R$  and  $S$  are four points on the surface of the earth, such that  $PQ$  is a diameter of the earth.  $S$  is located to the north of  $Q$ .
- (a) State the location of  $Q$ .
- (b) Calculate the latitude of  $R$  which is located 3900 nautical miles to the south of  $P$ .
- (c) The plane  $X$  took off at  $P$  and flew east towards  $S$  with a speed of 300 knots. Two hours later, another plane  $Y$  took off at  $P$  and flew towards  $S$  using the shortest distance on the earth's surface. Calculate the
- (i) distance travelled by plane  $Y$ ,
- (ii) speed of plane  $Y$ .

[12 marks]

Answer: (a)

(b)

(c) (i)

(ii)

END OF QUESTION PAPER