MATHEMATICS SPM

This module aims to prepare the Form five students for the SPM examination and also for the Form four students to reinforce as well as to enable them to master the selected topics. It also serves as a guidance for effective acquisition of the various mathematical skills.

At the end of each topic, sample answers are given. Discussions on common mistakes that result in the students' failure to obtain full mark are included as well. This module suggests specific strategies for each chosen topic and strategies which can help the students in problem solving. It is hoped that this module can benefit all the Pahang students as well as helping them towards achieving excellent results in SPM Mathematics.

TABLE OF CONTENTS

FORMAT OF ASSESSMENT INSTRUMENT
MATHEMATICS 1449

NO	TOPIC	PAPER 1 (1449/1)	PAPER 2 (1449/2)
1	Instrument type	Objective questions	Subjective questions
2	Item type	Multiple Choice Questions	Open ended structure and limited response
3	Number of Questions	40 questions (answer all)	Section A 11 questions (answer all) Section B 5 questions (choose 4)
4	Total Marks	40	Section A Total marks : 52 Section B Total marks : 48 (Each question 12 marks) Overall Total :100
5	Test Duration	1 hour 15 minutes	2 hours 30 minutes
6	Constructs Weights	Knowledge - 45% Skills - 55%	Knowledge - 25% Skills - 70% Values - 5%
7	Context Scope	▪ Lower secondary school scope with continuation in the upper secondary. ▪ All aspects of learning from Form 4 and Form 5.	▪ Lower secondary school scope with continuation in the upper secondary. ▪ All aspects of learning from Form 4 and Form 5.
8	Difficulty level Low - L Medium - M High - H	L : M : H = 5 : 3 : 2	L : M : H = 5 : 3 : 2
9	Additional Tools	a. Scientific Calculator b. Four-figure Mathematical table b. Geometry Set	a. Scientific Calculator b. Four-figure Mathematical table b. Geometry Set

2. LIST OF MATHEMATICS TOPICS 1449

No.	FORM 1 – 3	FORM 4	FORM 5
1	Circles I and II	Standard Form	Number Bases
2	Polygons I and II	Quadratic Expressions and Equations	Graphs of Functions II
3	Solids and Volumes	Sets	Transformations III
4	Transformations I and II	Mathematical Reasoning	Matrices
5	Trigonometry I	The Straight Line	Variations
6	Algebraic Expressions I and II	Statistics III	Gradient and Area under a Graph
7	Algebraic fractions	Probability I	Probability II
8	Algebraic Formulae	Circles III	Bearing
9	Linear Equations(1 and 2 unknowns)	Trigonometry II	Earth as a Sphere
10	Indices	Angles of Elevation and Depression	Plans and Elevations
11	Linear Inequalities	Lines and Planes in 3 Dimensions	
12	Statistics I and II		
13	Arc Length & Area of Sector		

1.2 . TOPICAL ANALYSIS OF SPM MATHEMATICS PAPER 1

	TOPICS	FORM	NUMBER OF QUESTIONS				
			2003	2004	2005	2006	2007
1	Standard Form	4	1,2,3,4	1,2,3,4	1,2,3	1,2,3,4	1,2,3
2	Number Bases	5	5,6	5,6	4,5	5,6	4,5
3	Polygon II	3	7,8	7	6,7	7	6,7
4	Circles III	4	9	8	8	8	8
5	Angles of Elevation & Depression	4	10	15,16	15	15,16	15
6	Trigonometry II	4	11,12	11,12	11,12,13	11,12,13	11,12,13
7	Lines and Planes in 3 Dimensions	4	13	14	14	14	14
8	Bearing	5	14	18	16	17	16
9	Earth as a Sphere	5	15	17	17,18	18	17,18
10	Transformations I	2	16,17,18	10	9,10	9,10	9,10
11	Algebraic Expressions II	2	19	20	19	19,20	19
12	Linear Equations I	2	3,20	22	22	22	22
13	Algebraic Expressions III	3	21	19	20		21
14	Algebraic Formulae	3	22	21	21	21	20
15	Indices	3	23,24	23,24	23,24	23	23,24
16	Linear Inequalities	3	25,26	25,26	25	24	25
17	Matrices	5	27,28,29	40	39,40	39,40	39,40
18	Graph of Function II	5	30	29	28	28	28
19	The Straight Line	4	31	33,34	32,33	32,33	32,33
20	Sets	4	32,33,34	30,31,32	29,30,31	29,30,31	29,30,31
21	Variations	5	35,36	38,39	36,37,38	36,37,38	36,37,38
22	Probability I	4	37,38	35,37	34	34,35	34,35
23	Statistics I	2	39	27	27	26,27	26,27
24	Statistics II	3	40	28	-	25	
25	Transformations II	3	-	9	-	-	
26	Trigonometry I	3	-	13	-	-	
27	Probability II	5	-	36	35	-	
28	Statistics III	4	-	-	26	-	

1.3 TOPICAL ANALYSIS OF SPM MATHEMATICS PAPER 2

			Total Question			
No.	Form	Topic	04	05	06	07
Part A (Question 1 to Question 11)						
1.	1-3	Linear Simultaneous Equations	1	1	1	1
2	4	Quadratic Equation	1	1	1	1
3.a	4	Sets (Shade Venn diagrams)	1	-	1	-
3.b	5	Region for Inequalities	-	1	-	
4.	4	Mathematical Reasoning (Statement, implications, argument, mathematical induction, converse)	1	1	1	1
5.	4	The Straight Line (parallel, equation, y-intercept)	1	1	1	1
6.	5	Probability II	1	1	1	1
7.	1-3	Arc Length & Area of Sector	1	1	1	1
8.	1-3	Volume of Solids				
		a. Pyramids and half cylinders	-	-		
		b. Cones and Cylinders	1	1	-	
		c. Cones and cuboids				
		d. Pyramid and prism			1	1
9.	5	Matrices (Inverse, matrix equation)	1	1	1	1
10.	5	Gradient and Area Under a Graph				
		a. Speed-Time Graph	-	1	1	1
		b. Distance-Time graph	1	-	-	1
11.	4	Lines & Planes in 3 Dimensions (angle between 2 planes)	1	1	1	1
Part B (Question 12 to 16 - Choose any four)						
12.	5	Graphs of Functions II				
		a. Quadratic	-	1	1	
		b. Cubic	-	-	-	1
		c. Reciprocal	1	-	-	
13.	5	Transformations III (combined)	1	1	1	1
14.	5	Earth as a Sphere	1	1	1	1
15.	5	Plans and elevations				
		a. Prism and cuboids	1			
		b. Cuboids and half cylinder, prism	-	1	-	1
		c. Prism and prism	-	-	1	
16.	4	Statistics III				
		a. Raw data, frequency table, mean, frequency polygon, modal class	1	1	1	1
		b. Ogive	1	-	-	1
		c. Histogram	-	1	1	
		d. Frequency Polygon	-	-	-	
		e. Communication	1	1	-	
		Total Questions	16	16	16	16

Question Allocation (Mathematics SPM 2006)

Form	Number of questions					
	Paper 1	%	Paper 2	Marks	%	Total %
3	10	25.00	3	14	12.50	18.75
4	21	52.00	6	33	29.46	40.98
5	9	22.50	7	65	58.04	40.27
Total	40	100.00	16	112	100.00	100.00

Question Allocation (Mathematics SPM 2007)

Form	**Number of questions**					
	Paper 1	**%**	**Paper 2**	**Marks**	**%**	**Total %**
3	13	32.5	3	14	12.5	28.57
4	16	40.0	6	33	29.5	39.28
5	11	27.5	7	65	58	32.14
Total	40	100.00	16	112	100.00	100.00

1.4 General Strategies

Early preparations

The Important materials needed for Mathematics:
- Pen and common stationery
- A Scientific Calculator
- 2B pencils
- A Soft Eraser
- A 30 cm long transparent plastic ruler
- Graph Paper (16 cm x 24 cm)
- Geometry Set which consists of a pair of compasses, a protractor and a set square
- Two highlight pens of different colors (red and green)
- A graph book (grids of 0.2 cm)
- A flexible curve (if necessary)
- Text book / Revision series
- Authentic SPM examination papers starting 2003

Basic Skills needed for SPM Mathematics

You are supposed to have acquired the following skills:
- The multiplication table from 1 to 9

- The 4 basic operations of +, - , × and ÷.
- Computations in Whole numbers : Positive and Negative
- Computations in Fractions
- Computations in Decimals
- Computations involving the basic measurements (length, mass and time)
- Simple constructions
- Computations involving algebraic expressions
- Organizing structured data and concluding skill.
- Systematic presentation according to fixed algorithm and procedures

Effective method in studying Mathematics

- Give full attention when the teacher is teaching
- Understand the relevant Mathematic concept
- Understand the calculations involved via samples calculations
- Apply similar skills in different situations
- Memorize the formulae
- Have enough practice by doing a lot of exercises for each topic
- Have lots of drilling exercises including past year questions.(at least for 5 most recent years)

General Strategies For Answering Mathematics Questions

Read the questions carefully.

1. What are the information given?

Any number, data, graph, chart, diagram and other information given must be used to get your answer.

2. What are the key words given in the questions?

These key words are normally found in the instructions and they serve as indicators as to what method should be used to solve the problem. They also indicate the type of answer required.

Examples of instructional key words are:

- **Express** _____ as a number in base _____
- **Find** the value of ……..
- **Calculate** the value of ……
- **Solve** ……..
- **Sketch** the graph of ……
- By **using a scale** of …….
  ……..

Other examples will be given in each topic and would be discussed later.

3. What does the question want?

Make sure you know **what** to find (the **task**). The task is normally phrased as the last sentence.

Examples:

- Find the value of x and the value of y……
- Shade the region which ……
- ……in 2 significant figures.
  ……..

Important :

- Use a highlight pen to highlight or color or underline the key words and the given information.
- Use a red highlight pen to color the instructional words and the task so that it can capture your attention and nothing is likely to be left out when you answer that question.

Remember:

- **All information must be used**!!
- AND… Answer according to the TASK!!

PAPER 1 GENERAL GUIDE

Strategies to answer the Mathematics SPM paper 1

1. Answer all 40 questions.
2. Read every question carefully. Underline or highlight the keywords and other information given.
3. Use the correct formula.
4. Answer the easy questions first. Attempt the difficult ones later. Use the extra time to check your answers.
5. Apply the rules below.
   i. Try not to take too long a time to answer a question.
   ii. If stucked, mark with a symbol (for example: **X**) and proceed to the other questions.
   iii. If you are not sure of any answer, mark with a '?' and check it later.
   iv. Shade the answers with a 2B pencil in the correct answer box on the objective answer sheet provided.
   v. Make sure all the answers are blackened before the examiner collect the papers.

PAPER 2 GENERAL GUIDE

Strategies to answer the Mathematics SPM paper 2

1. Answer according to the task word given.
   i. Read the questions carefully.
   ii. Use the correct formula.
   iii. Use the information given such as numbers, data, graph, chart, figures as well as other information to get the answer.
   Decide how to present your answer based on the task words.
   Draw : must use Mathematical instruments such as ruler, compasses, protractor and etc., failure of which your answer will be regarded as a sketch and no mark will be awarded.

   Instructions on scale: Using the scale of 2 cm (1 big square) to represent 5 units… Do not change the scale. Any reduction or alteration to this scale will result in marks being deducted.

   iv. Know what is required for the question, for example:
   - Look for the x value and/or the y value (Graphs of Functions)
   - Draw full line or dashed line (Plans and Elevations)
   - State the angle (Lines and planes in 3D)

TOPICAL GUIDANCE

1. Simultaneous Linear Equations

Simultaneous linear equations in two unknowns can be solved using **elimination** or **substitution** method.

(a) **Elimination Method:**
   (a) Multiply one equation by a suitable number so that the coefficients for one of the unknowns differ only in signs.
   (b) Add or subtract the two equations obtained to eliminate one unknown.
   (c) Solve the remaining equation in one unknown.
   (d) Find the value of the other unknown by substitution.

(b) **Substitution Method:**
   (a) Choose a suitable equation. (the simpler one)
   (b) Express one unknown in terms of the other unknown
   (b) Substitute the expression in the other equation.
   (c) Solve the resulting equation in one unknown.
   (d) Find the value of the other unknown by substitution.

ELIMINATION METHOD

Example : Simultaneous Linear Equations

$4m + n = 2$

$2m - 3n = 8$

Step 1: Equate the coefficients for n:

$4m + n = 2$.....(1)

$2m - 3n = 8$.....(2)

(1) × 3: $3(4m) + 3(n) = 3(2)$

$\Rightarrow 12m + 3n = 6$.....(3)

Step 2: Elimination

Arrange the 2 equations one on top of the other.
Add the 2 equations if the similar terms have different signs and subtract if they have the same sign.

$2m - 3n = 8$.....(2)

(1) × 3: $12m + 3n = 6$.....(3) 1 mark

(3) + (2): $2m + 12m = 8 + 6$ ← $3n + (-3n) = 0$

$14m = 14$

$m = \frac{14}{14}$ 1 mark

$m = 1$

Step 3: Substitution

$4m + n = 2$.....(1)

$2m - 3n = 8$.....(2)

Substitute $m = 1$ into equation (1)

$4(1) + n = 2$

$4 + n = 2$

$n = 2 - 4$ 1 mark

$n = -2$

SUBSTITUITION METHOD

$4m + n = 2$.....(1)

$2m - 3n = 8$.....(2)

Using equation(1), express n in terms of m.

n = 2 – 4m ……..(3) 1 mark

Substitute into equation (2).

2m – 3(2 – 4m) = 8

$2m - 6 + 12m = 8$

$14m = 8 + 6$

$14m = 14$ 1 mark

$m = \frac{14}{14}$

$m = 1$ 1 mark

Substitute into equation (3)

$n = 2 - 4(1)$ 1 mark

$= -2.$

2. Quadratic Expressions and Quadratic Equations

Important concepts:

1. A Quadratic Expression is an expression in the form of , $ax^2 + bx + c$ where a, b, and c are constants with $a \neq 0$ and x is a variable.

   Example: $2x^2 - x - 6$, $8 - 3x^2$

2. A Quadratic Equation has the general form $ax^2 + bx + c = 0$.

3. Note that
   i. It involves only one variable.
   ii. The highest power of the variable is 2.

4. To find the solutions for a quadratic equation, it is the same as finding the roots of the quadratic equation.

5. HOT TIPS SPM

$$(a-b)^2 = (a-b)(a-b) = a^2 - 2ab + b^2$$

$$(a+b)^2 = (a+b)(a+b) = a^2 + 2ab + b^2$$

$$a^2 - b^2 = (a+b)(a-b)$$

Solution of Quadratic Equations

First, write the quadratic equation in the form **$ax^2 + bx + c = 0$** , $a \neq 0$.
Then factorise and write in the form of $(x + a)(x + b) = 0$
Next equate each factor to 0. $x + a = 0$ or $x + b = 0$
Find the values of x. $x = -a$, $x = -b$.

Example

Solve the quadratic equation $\frac{2k^2 - 5}{3} = 3k$.

$2k^2 - 5 = 3k \times 3$
$2k^2 - 5 = 9k$

$2k^2 - 9k - 5 = 0$ 1 mark

$(2k + 1)(k - 5) = 0$ 1 mark

$2k + 1 = 0, k - 5 = 0$

$2k = -1, \quad k = 5$ 1 mark

$k = -\frac{1}{2}$ 1 mark

3 Volume of Solids

Related formulae :

1. Area of Trapezium $= \frac{1}{2} \times$ sum of parallel sides $\times$ height
2. Circumference of a circle = $\pi d = 2\pi r$
3. Area of Circle = πr^2
4. Curved surface area of cylinder = $2\pi rh$
5. Surface area of sphere = $4\pi r^2$
6. Volume of right prism = cross sectional area $\times$ length
7. Volume of cylinder = Area of circle $\times$ Height = $\pi r^2 h$
8. Volume of Cones = $\frac{1}{3}$ x base area x height = $\frac{1}{3}\pi r^2 h$
9. Volume of sphere = $\frac{4}{3}\pi r^3$
10. Volume of right pyramids = $\frac{1}{3} \times$ base area $\times$ height
11. Volume of Cubes = length $\times$ length $\times$ length = l^3
12. Volume of Cuboids = length x breadth x height

Example :

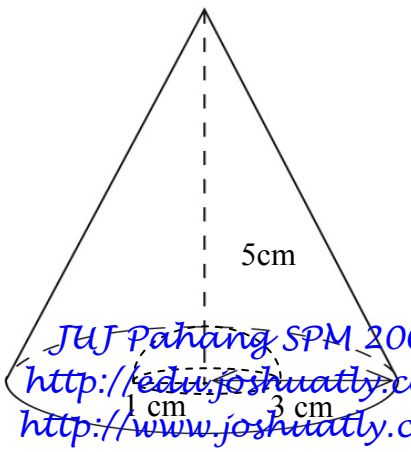


Diagram shows a solid cone with a base radius of 5 cm and height of 3 cm. A small hemisphere with radius 1 cm is removed from the cone as shown. Find the volume, in cm^3, of the remaining solid. (Use $\pi = \frac{22}{7}$) .

Answer

Volume of the cone = $\frac{1}{3}$ x $\frac{22}{7}$ x 3 x 3 x 5 = $47.14 cm^3$ 1 mark

Volume of the hemisphere = $\frac{2}{3}$ x $\frac{22}{7}$ x 1 x 1 x 1 = $2.10\ cm^3$ 1 mark

Volume of the remaining solid = 47.14 - 2.10 1 mark
= $45.04\ cm^3$ 1 mark

4 Probability

1. A group of 7 boys and 5 girls , take part in a holiday camp in a recreation ground. Each day, two pupils are chosen to write a daily report.

   a) Calculate the probability that both pupils chosen to write the report on the first day are girls.

   b) Two girls wrote the report on the first day. They are exempted from writing the report on the second day.

   Calculate the probability that both pupils chosen to write the report on the second day are of the same gender.

   [5 marks]

Answer:

a) Probability that both are girls = $\frac{5}{12}$ x $\frac{4}{11}$ 1 mark

= $\frac{20}{132}$ 1 mark

= $\frac{5}{33}$

b) Probability that both are of the same gender

$$= \frac{3}{10} \times \frac{2}{9} + \frac{7}{10} \times \frac{6}{9} \qquad \text{2 marks}$$

$$= \frac{48}{90} \qquad \text{1 mark}$$

$$= \frac{24}{45}$$

2. a quiz contest, there are three categories of questions consisting of 8 questions on history, 7 questions on geography and 5 questions on general knowledge.

Each question is placed inside an envelope. All of the envelopes are similar and put inside a box.

All the participants of the quiz contest are requested to pick at random two envelopes from the box.

Find the probability that the first participant picks

a) The first envelope with a history question and the second envelope with a general knowledge question,

b) Two envelopes with question of the same category.

[5 marks]

3. The table shows the number of students from a group of students classified according to forms and clubs.

	Numbers of members	
Club	Form four	Form five
Photography	9	11
Arts	10	10
History	16	14

a) Two students are selected at random from the group. Calculate the probability that both are Form five students from the photography club.

b) Two students are selected at random from the Form four students. Calculate the probability that both come from the same club.

[5 marks]

4. There are 7 red pens, 8 blue pens and 5 black pens in a drawer.
Ahmad takes out two pens from his drawer in the dark.

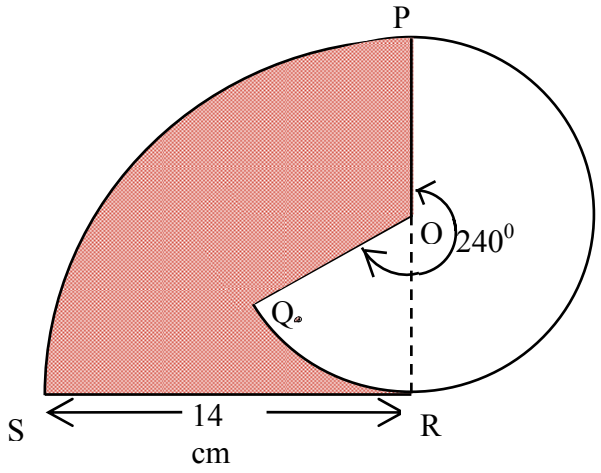
a) Find the probability that Ahmad gets 2 red pens.

b) Find the probability that Ahmad gets 2 pens of the same colour.

[5 marks]

5 Arc Length & Area of Sector

1. In Diagram , PRQ and PS are arcs of two different circles with centre O and R.



RP = RS = 14 cm. OP=OR=OQ=7 cm

Using $\pi = \frac{22}{7}$, calculate

a) The perimeter , in cm, of the whole diagram,

b) The area, in cm^2, of the shaded region.

2. In Diagram 5, *QR* and *TU* are two arc of circles with the same centre *O*. *QPOU* and *RSTO* are straight lines.

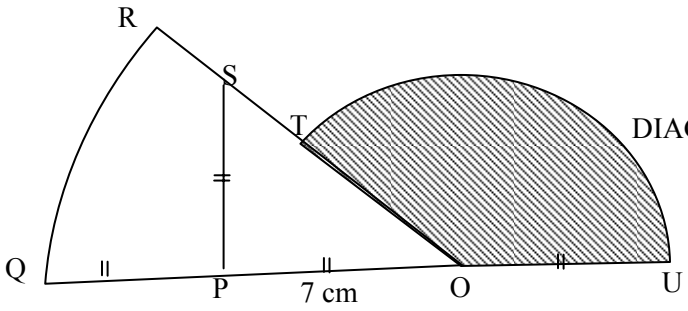


DIAGRAM 5

Using $\pi = \frac{22}{7}$, calculate

a) $\angle ROQ$,

b) Area, in cm^2, of the shade region

c) Perimeter, in cm, of whole diagram.

[6 marks]

3. In diagram 7, O is the centre of the circle with diameter POR = 28 cm. N is midpoint of radius OR and PMN is a semicircle.

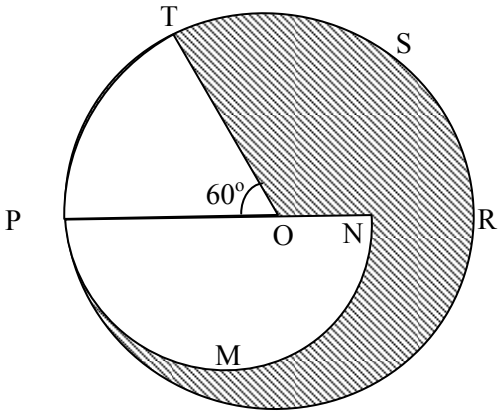


DIAGRAM 7

Using $\pi = \frac{22}{7}$, calculate

(a) the perimeter ,in cm, of the shaded region.

(b) the area ,in cm^2 ,of the shaded region.

[6 marks]

4. In diagram 8, TSR is a quadrant with centre O, P are the centre of the arc of the circle *OVU* and a semicircle *OQR*.

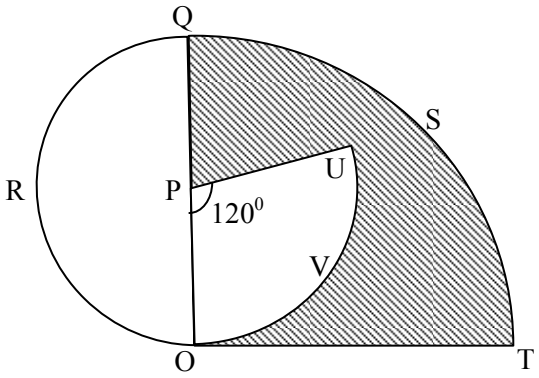


DIAGRAM 8

It is given that OT = 14 cm.

Using $\pi = \frac{22}{7}$, calculate

a) the perimeter of the whole diagram.

b) the area of the shaded region. [6 marks]

5. Diagram 4 shows three quadrants *OPQ*, *TQR* and *URS*. *POUS* is a straight line and *TOUR* is a square.

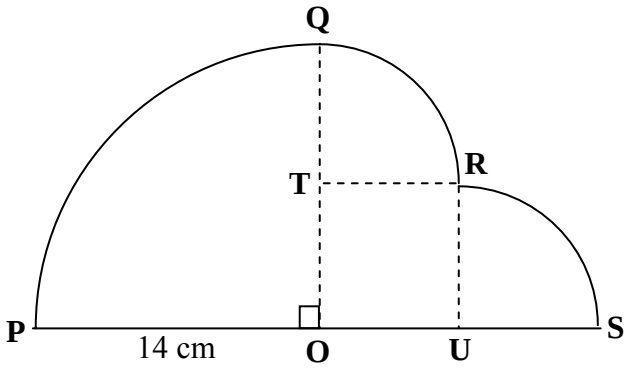


DIAGRAM 4

Using $\pi = \frac{22}{7}$, calculate

a) the perimeter of the whole diagram,

b) the area of the whole diagram.

[6 marks]

6 Mathematical Reasoning

1. (a) State whether the following statement is true or false.
$10 \div 2 = 5$ or $2^3 = 6$

(b) Write down two implications based on the following sentence:
$p = 10$ if and only if $p^3 = 1000$.

Implication 1 : .....
Implication 2 : .....

(c) Complete the premise in the following argument.
Premise 1 : If $x + 3 = 5$, then $x = 2$
Premise 2 : .....
Conclusion : $x + 3 \neq 5$

[5 marks]

Answer:
(a) True *(1 mark)*

(b) Implication 1 : If $p = 10$, then $p^3 = 1000$. *(1 mark)*
Implication 2 : If $p^3 = 1000$, then $p = 10$. *(1 mark)*

(c) Premise 2 : $x + 3 \neq 5$ *(2 marks)*

2. (a) State whether the following is true or false.
$10\ (9 - 4) = 50$ and $\sqrt{10} > 4$

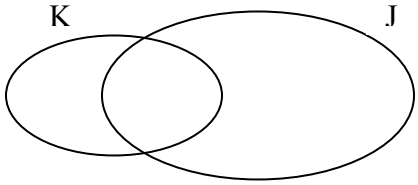
(b) Write down two implications based on the following sentence:
$x^2 = 36$ if and only if $x = 6$.

Implication 1 : .....
Implication 2 : .....

(c) Complete the premise in the following argument:
Premise 1 : If $x > 0$, then $x^2 > 0$
Premise 2 : .....
Conclusion : $5^2 > 0$

[5 marks]

3.



(a) Based the venn diagram above, complete the following statement by using the quantifier "all" or some" to form a true statement.

" …… elements in set K are elements in set J".

(b) By using the quantifier "all" or "some", complete the statement below to form a true statement.

" …….. regular polygons have equal sides".

(c) Write down two implications based on the following statements.

The area of the square is 25 cm^2 if and only if its sides are 5 cm.

Implication 1 : ……
Implication 2 : ……

(d) Complete the premise in the following argument.

Premise 1 : If a number is a factor of 8, then that number is a factor of 32.
Premise 2 : 6 is not a factor of 32.
Conclusion : ……

[6 marks]

4. (a) Determine whether the statement below is true or false.

Some of the triangles are right-angled triangles.

(b) By using a suitable quantifier "all" or "some", complete the statements below to form a true statement.

" …… multiples of 8 can be exactly divided by 4"

(c) Complete the premise in the following argument.

Premise 1 ……..
Premise 2 : John is a student in the account class.
Conclusion : John passed the SPM examination.

$2 = 2 + 3 (1 - 1)$
$5 = 2 + 3 (2 - 1)$
$8 = 2 + 3 (3 - 1)$
$11 = 2 + 3 (4 - 1)$

(d) Based on the information above, make a general conclusion by induction for the n^{th} term.

7 Matrices

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

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

(b) Using matrices, calculate the value of x and of y that satisfy the following simultaneous linear equations:

$$2x - 3y = 5$$
$$2x - y = 3$$

[6 marks]

Answer:

(a) $\frac{1}{mn+6}\begin{pmatrix} n & 3 \\ -3 & m \end{pmatrix}$ compare with $\frac{1}{4}\begin{pmatrix} n & 3 \\ -2 & 2 \end{pmatrix}$.

Therefore, m = 2

mn + 6 = 4

2n = - 2
n = -1

(b) Change the equations into the matrix form,

$$\begin{pmatrix} 2 & -3 \\ 2 & -1 \end{pmatrix}\begin{pmatrix} x \\ y \end{pmatrix} = \begin{pmatrix} 5 \\ 3 \end{pmatrix}$$

$$\begin{pmatrix} x \\ y \end{pmatrix} = \frac{1}{2(-1)-2(-3)}\begin{pmatrix} -1 & 3 \\ -2 & 2 \end{pmatrix}\begin{pmatrix} 5 \\ 3 \end{pmatrix}$$

$$= \frac{1}{4}\begin{pmatrix} -1(5)+3(3) \\ -2(5)+2(3) \end{pmatrix}$$

$$= \frac{1}{4}\begin{pmatrix} 4 \\ -4 \end{pmatrix}$$

$$= \begin{pmatrix} 1 \\ -1 \end{pmatrix}$$

$$x = 1, \quad y = -1$$

2. It is given that matrix P = $\begin{pmatrix} 3 & 1 \\ r & 2 \end{pmatrix}$ and matrix Q = k$\begin{pmatrix} 2 & -1 \\ 4 & 3 \end{pmatrix}$ such that PQ = $\begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix}$.

(a) Find the value of k and of r.

(b) Using matrices, find the value of x and of y that satisfy the following simultaneous linear equations:

$$2x - y = 11$$
$$4x + 3y = -3$$

[6 marks]

3. P is a 2×2 matrix where P$\begin{pmatrix} 2 & -5 \\ 1 & 3 \end{pmatrix}$ = $\begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix}$.

(a) Find the matrix P.

(b) Write the following simultaneous linear equations as a matrix equation:

$$2x - 5y = -17$$
$$x - 3y = 8$$

Hence, calculate the values of x and of y using matrices.

[6 marks]

4. It is given that $\frac{1}{n}\begin{pmatrix} 8 & -9 \\ 2 & -3 \end{pmatrix}\begin{pmatrix} -3 & 9 \\ -2 & m \end{pmatrix} = \begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix}$.

(a) Find the value of m and of n.

(b) Hence, using matrices, find the values of x and of y that satisfy the following simultenous linear equation:

$$\begin{pmatrix} 8 & -9 \\ 2 & -3 \end{pmatrix}\begin{pmatrix} u \\ v \end{pmatrix} = \begin{pmatrix} 5 \\ -1 \end{pmatrix}$$

5. (a) The inverse matrix of $\begin{pmatrix} 5 & 6 \\ 2 & 3 \end{pmatrix}$ *is* $\begin{pmatrix} 1 & -2 \\ m & n \end{pmatrix}$.

Find the values of m and of n.

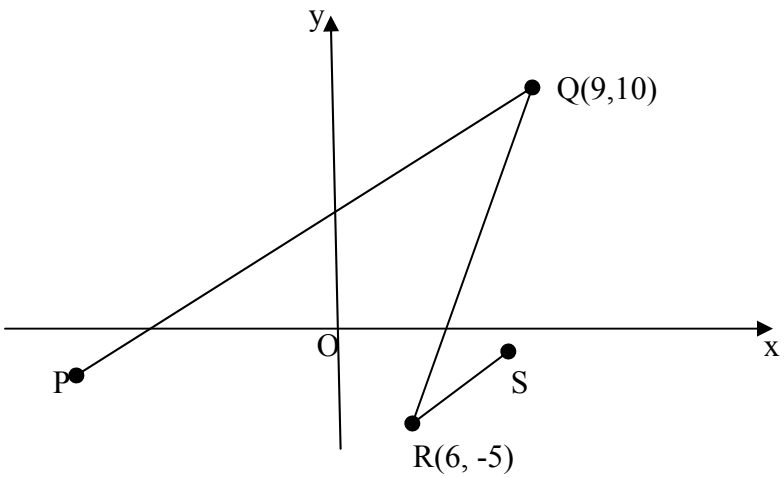
(b) Using matrices, calculate the value of u and of v that satisfy the following simultaneous linear equations:

$$\begin{pmatrix} 5 & 6 \\ 2 & 3 \end{pmatrix}\begin{pmatrix} u \\ v \end{pmatrix} = \begin{pmatrix} 3 \\ 9 \end{pmatrix}$$

[6 marks]

8 The Straight Line

1.

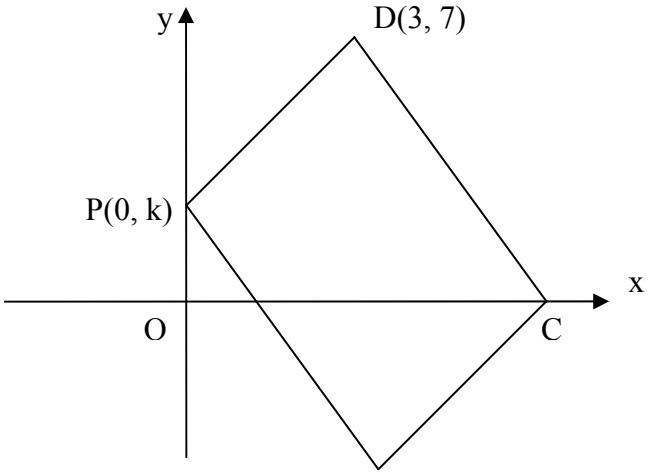


In diagram 1, the graph shows that PQ and RS are straight lines. PQ is parallel to RS. O is the origin. It is given that the equation of PQ is $y=\frac{2}{3}x+4$.

Find:

(a) The x-intercept of the straight line PQ.
(b) The gradient of the straight line QR
(c) The equation of the straight line RS.

2



In diagram 2, ABCD is a parallelogram and O is the origin. It is given that the gradient of the straight line BC is 2 and y-intercept of the straight line CD is 19.

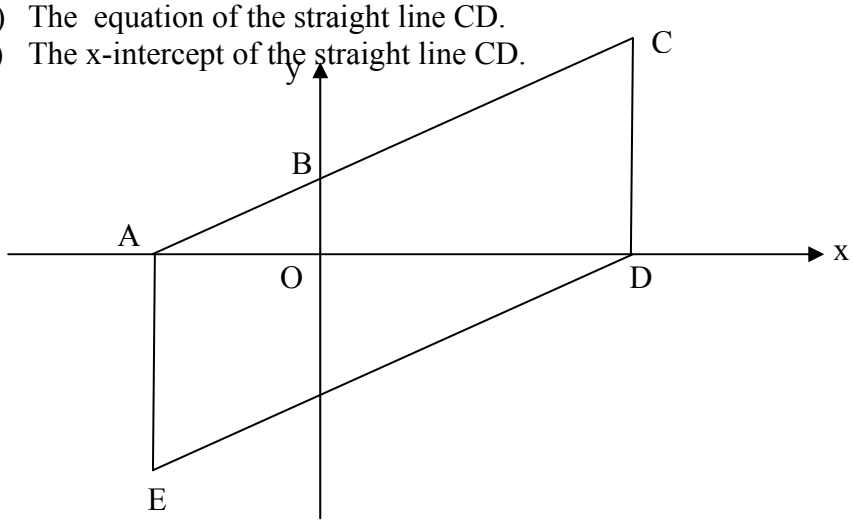
Find:

(a) The value of k.

(b) The equation of the straight line CD.

(c) The x-intercept of the straight line CD.

3.



In Diagram 4, ACDE is a parallelogram and O is the origin. Point A and point D lie on the x-axis.

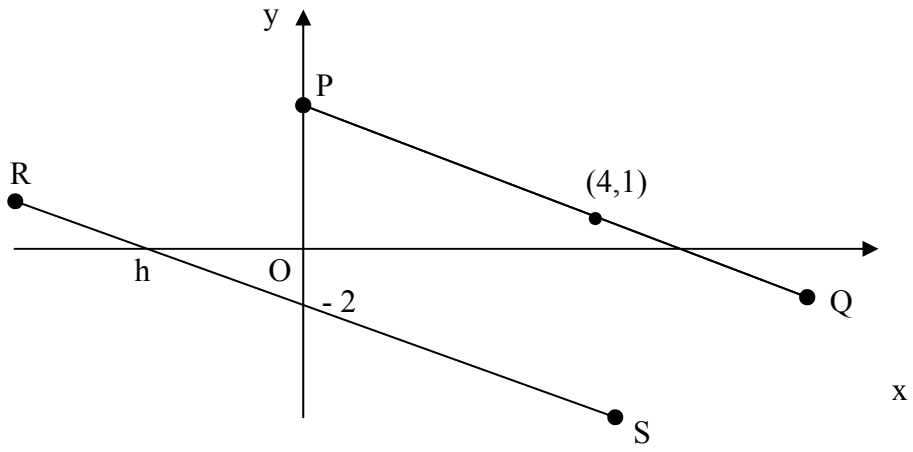
Find:

(a) the coordinates of the point D.

(b) the coordinates of the point A.

(c) the equation of the straight line ED.

4.



In diagram 5, the graph shows that PQ and RS are straight lines. O is the origin. It is given that the gradient RS is $-\frac{1}{2}$ and PQ is parallel to RS.

Find:
(a) The value of h.
(b) The equation of the straight line PQ.
(c) The x-intercept of the straight line PQ.

9 Gradient and Area Under a Graph

1.

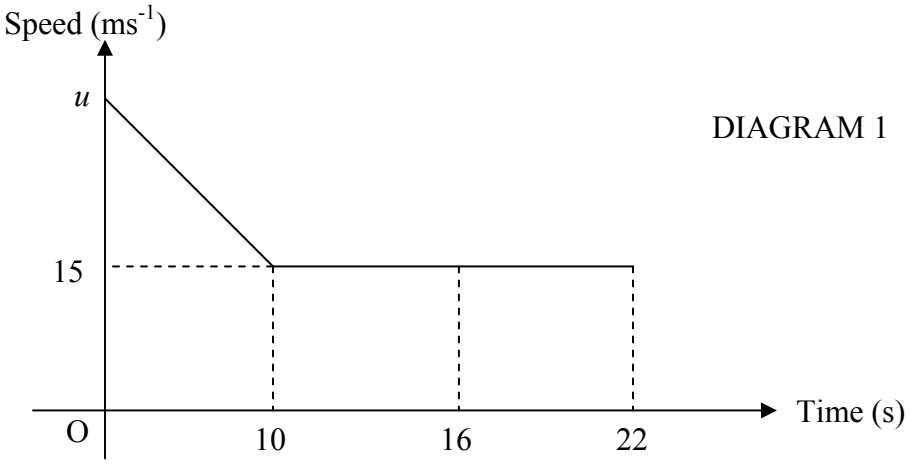


DIAGRAM 1

Diagram 1 shows the speed-time graph of a particle for a period of 22 s.
Calculate:

(a) The distance moved by the particle with uniform speed.
(b) The value of u, given that the average speed in the first 16 second is 20 ms^{-1}.

[5 marks]

2.

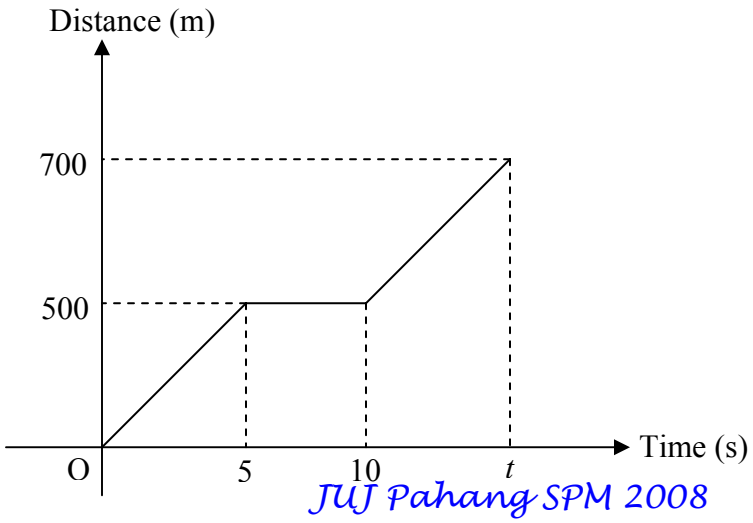


DIAGRAM 2

Diagram 2 shows the distance-time graph of a particle for a period of t s.

(a) State the time in which the particle is stationary.
(b) Find the average speed, in ms^{-1}, in the first 10 seconds.
(c) Calculate the value of t, if the average speed for the whole journey is 35 ms^{-1}.

3.

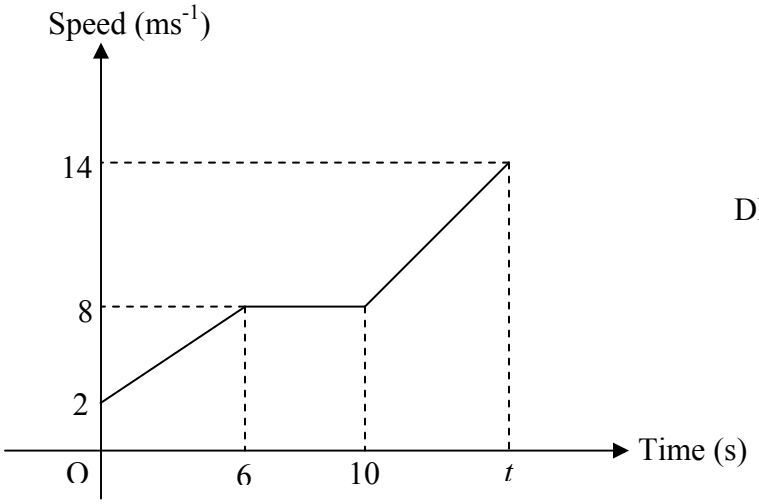


DIAGRAM 3

Diagram 3 shows the speed-time graph of a particle for a period of t s.

(a) State the duration of time, in s, that the particle moves with a constant speed.
(b) Calculate the rate of change of speed, in ms^{-2}, for the first 6 s.
(c) Calculate the value of t, if the total distance travelled for the period of t seconds is 128 m.

4.

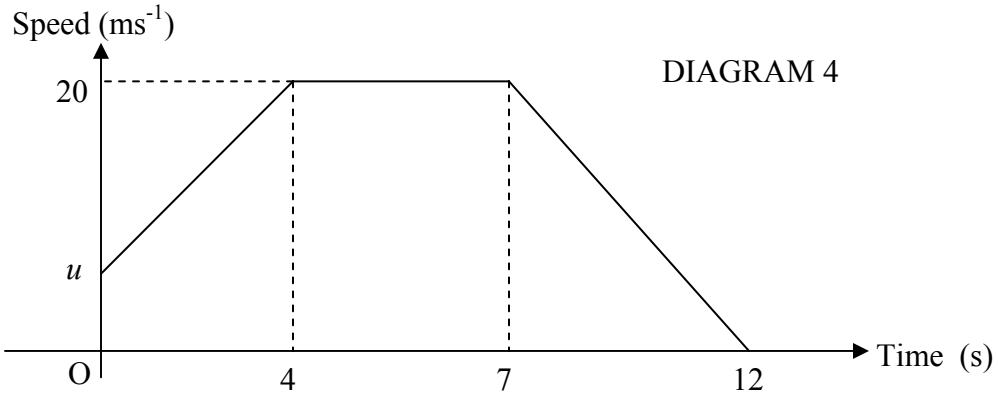


DIAGRAM 4

The diagram 4 shows tha speed-time graph of a particle for a period of 12 s.
Calculate:

(a) The value of u if the rate of change of speed for the first 4 s is 3 ms^{-2}.
(b) The rate of change of speed, in ms^{-2}, for the last 5 s.
(c) The average speed in ms^{-1} of the particle over 12s period.

5.

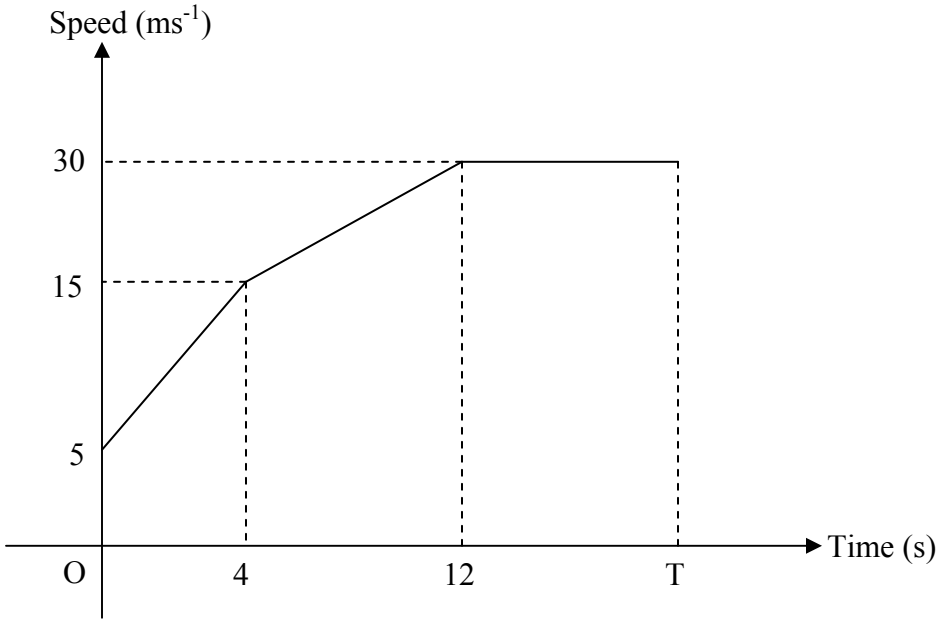


DIAGRAM 5

Calculate:

(a) The rate of change of speed in the first 4 s.
(b) The value of T, if the total distance travelled in T s is 400 m.

Answer:

(a) $\frac{15-5}{4}=\frac{5}{2}$

(b)

$$\frac{1}{2}(5+15)4+\frac{1}{2}(15+30)8+(T-12)30=400$$

$$40+180+30T-360=400$$

$$30T=540$$

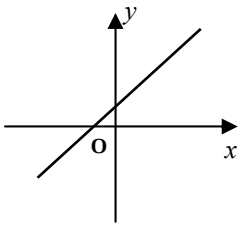
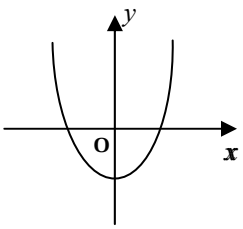
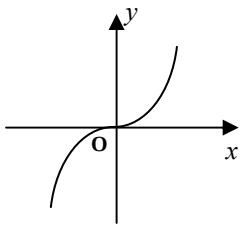
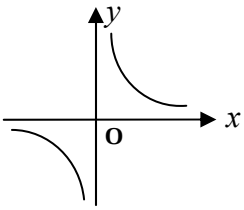
$$T=18$$

10. GRAPHS OF FUNCTIONS II

Students are expected to be able to **identify:**

a) the shape of the graph given a type of function

b) the type of function given a graph.

Linear	***Quadratic***	***Cubic***	***Reciprocal***
$y = mx + c$ m = gradient c = y-intercept	$y = ax^2 + bx + c$ $\boldsymbol{y = ax^2 + c}$	$y = ax^3 + bx^2 + cx + d$ $\boldsymbol{y = ax^3 + c}$	$y = \frac{a}{x}$
			

SKILLS	TIPS
a. - Complete the table by calculating the value of y (4 types of functions are involved: linear, quadratic ,cubic and reciprocal functions)	- Linear Function $y = ax + c$ - Quadratic Function $y = ax^2 + bx + c$ - Cubic Function $y = ax^3 + bx + c$ - Reciprocal Function $y = \frac{a}{x}$
b. - Plan and draw the graph systematically - Identify the range for x - axis - Identify the range for y - axis - Identify the position of the x - axis and y - axis - Mark x - axis and y - axis for the given range and with uniform scale.	- The plotting of values on the x – axis and the y –axis must be in the graph paper itself. - Use 1 big square (2 cm) to represent 1 unit for x – axis and 2 cm to represent the corresponding units as given in the scale for the y – axis. - The graph paper in the question measures 8 big squares (width) x 11 big squares (height) - 16cm x 22 cm - Use (x) to plot the points on the graph paper.

c. - Draw the curve for the graph - Draw x – axis and y – axis according to the uniform scale and all the plotted points must be within the graph paper - Mark all the points accurately - Join all the points by using a sharp pencil.	- The graphs for quadratic, cubic or reciprocal functions (curves) must be i. neat ii. pass through all the plotted points iii. no straight portion (do not use ruler) iv. Drawing the curve using "free hand" is more suitable. The minimum or the maximum points cannot be sharp.
d. Find the value of y or x when given value of x or y from the graph. State the value on the graph or in the answer space. - Draw parallel line to the y - axis to find the value of x. State the value on the graph or in the answer space.	- Draw parallel line to the y – axis from the given x value until it touches the graph and from there draw a parallel line to the x – axis. State the value of y. - Draw parallel line to the x – axis from the given y value until it touches the graph and from there draw a parallel line to the y – axis. - State the value of x . - The value that is obtained by calculation is not accepted.
e. - Drawing the straight line - Compared the original equation with the given equation. - Arrange it with the mark (=) on the same line on the left or right. - Add or subtract to get rid of the x term in powers of 2 or 3. - Write the equation as y = mx + c. - Build a table to get a pair of points. Suggestion. Get the value of y when x = 0 and when x = 2. - Mark the points accurately on the graph - Use a ruler to join the points On the same axes, draw a suitable straight line which satisfies the equation. Determine the solutions by reading off	ex: $y = x^3 - 8x + 5$ $x^3 - 12x - 1 = 0$ Re-arrange the equation, $y = x^3 - 8x + 5$ ……..(i) $0 = x^3 - 12x - 1$ ……..(ii) (i) - (ii) $y - 0 = -8x + 12x + 6$ $y = 4x + 6$ or $x^3 - 8x + 5 = y$ ……(i) $x^3 - 12x - 1 = 0$ …….(ii) (i) - (ii) $-8x + 12x + 6 = y - 0$ $4x + 6 = y$ Do not use "free hand" to draw the straight line. Make sure your straight line cuts the

the x-coordinates of the point of intersection of the two graphs.	original graph (the curve) at at least one point .

Example :

Graph of Functions.

a) The table below shows the values of x and y which satisfy the equation $y = x^3 - 4x + 8$

X	-3.6	-3	-2	-1	0	1	2	3	3.6
Y	-24.3	*p*	8	11	8	5	*q*	23	40.3

Calculate the values of *p* and *q*

b) By using a scale of 2 cm to 1 unit on the x - axis and 2 cm to 10 units on the y - axis, draw the graph of $y = x^3 - 4x + 8$ for $-3.6 \leq x \leq 3.6$

c) From your graph, find

i) the value of y when x = 2.8
ii) the value of x when $x^3 - 4x + 8 = 0$

d) Draw a suitable straight line on your graph to find all the value of x which satisfy the equation $x^3 - 13x - 10 = 0$.
State those value of x.

Solution :.

Step 1

Substitute x = -3 in $y = x^3 - 8x + 5$
$y = (-3)^3 - 8(-3) + 5 = -7$
Substitute x = 2 in $y = x^3 - 8x + 5$
$y = (2)^3 - 8(2) + 5 = 8$

X	-3	2
Y	-7	8

2 marks

Step 2

(On the Graph paper)
Plan x - axis and y – axis based on the given range.
Ensure that all the points must be marked on the graph paper.
(Marks cannot be acquired if it is outside the graph paper because it does not cater the range/ scale not uniform) 1 mark

Step 3

Draw the x – axis and y – axis and with uniform scales as given .
Make sure you use 2 cm (big square) to mark each axis.

Step 4

Plot all the points from left to right using the (x, y) co-ordinates.
Caution on the point which involves decimals . The value of 18.9 cannot be marked as 19.0 . The value of 18.4 cannot be marked as 18.5. 3 marks

Step 5

Join all the plotted points using "free hand" .
Ensure there is no straight portion and that your graph is smooth, neat and no double line.

Step 6

Find the value of y when x is given 1 mark

Find the value of x when y is given 1 mark

Step 7

Drawing the line.
Write the original equation and the given equation.
$y = x^3 - 4x + 8$
$x^3 - 13x - 10 = 0$
Re-arrange the equation
$y = x^3 - 4x + 8$ …….. (i)
$0 = x^3 - 13x - 10$ ……..(ii)
or
$x^3 - 4x + 8 = y$ ……(i)
$x^3 - 13x - 10 = 0$ …….(ii)
Subtract to get rid of x^3
(i) - (ii)
$y - 0 = 9x + 18$
$y = 9x + 18$ (Note : $y - 0 = y$)
$9x + 18 = y - 0$
$4x + 6 = y$ (Note : $y - 0 = y$) or
$y = 9x + 18$

Step 8

Construction of the line $y = 9x + 18$.
Choose 2 points only

1. when $x = 0$,
   $9x + 18 = y$
   $9(0) + 18 = y$, $y = 18$

2. when $x = 2$
   $9x + 18 = y$
   $9(2) + 18 = y$, $y = 36$

Mark the points (0, 18) and (2, 36).

Use a 30 cm ruler to join the pair of points. Make sure the line is long enough and it cuts the curve. 1 mark

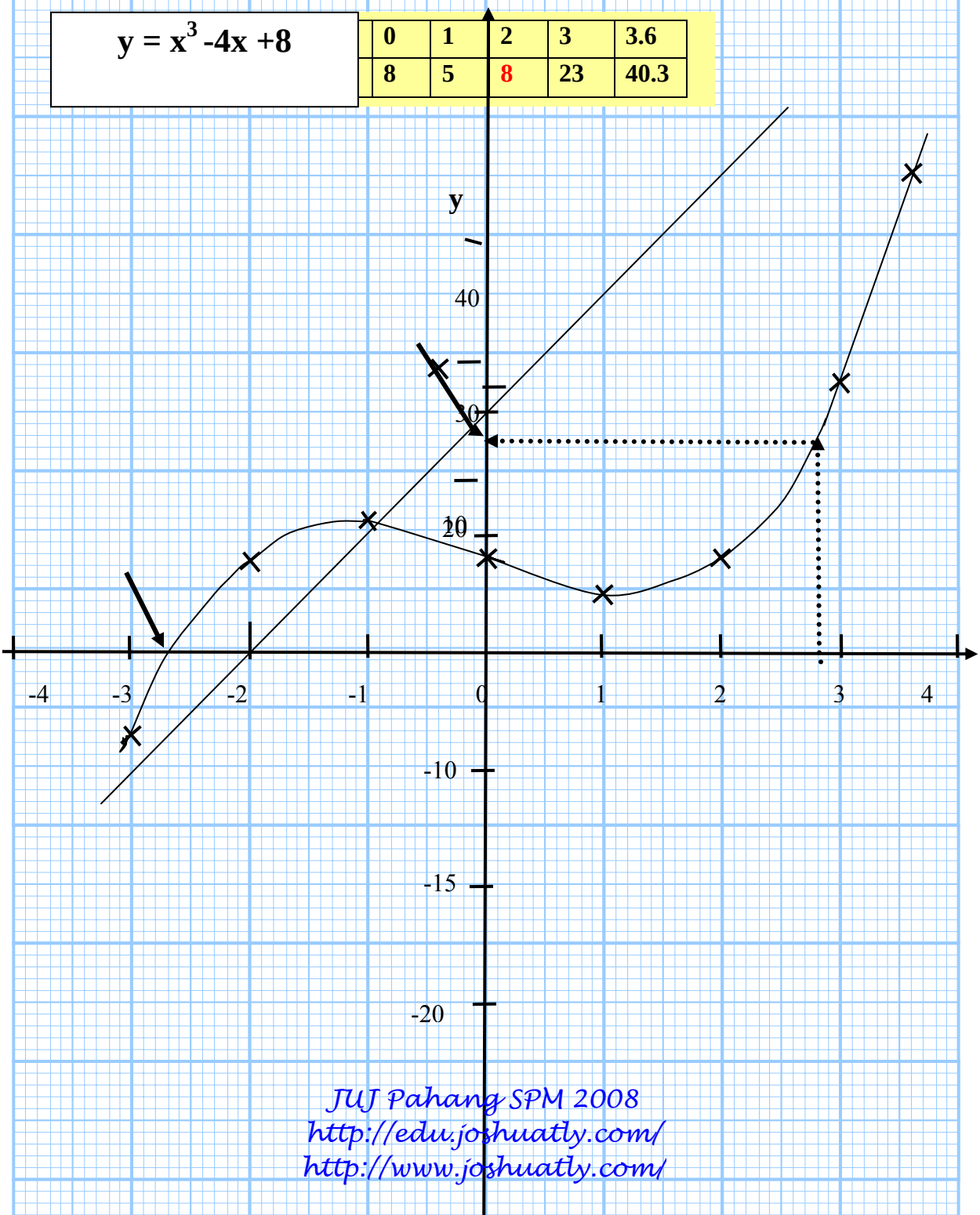
Step 9

Locate the intersection points.
From this intercept point, draw a line parallel to the y – axis until it cuts the x-axis.
Read the value of x. 1 mark
Repeat if there is more than 1 point.

[9 marks]

$y = x^3 - 4x + 8$

	0	1	2	3	3.6
	8	5	8	23	40.3



11. TRANSFORMATIONS III

1.(a) Transformation **P** represents a reflection at the line that passes through (0, 0) and (5, 5). Transformation **T** represents a translation $\begin{pmatrix} 3 \\ -1 \end{pmatrix}$.

State the coordinates of the image of point (1, 2) under the following transformation:

(i) **T**,
(ii) **PT**,
(iii) **TP.**

[5 marks]

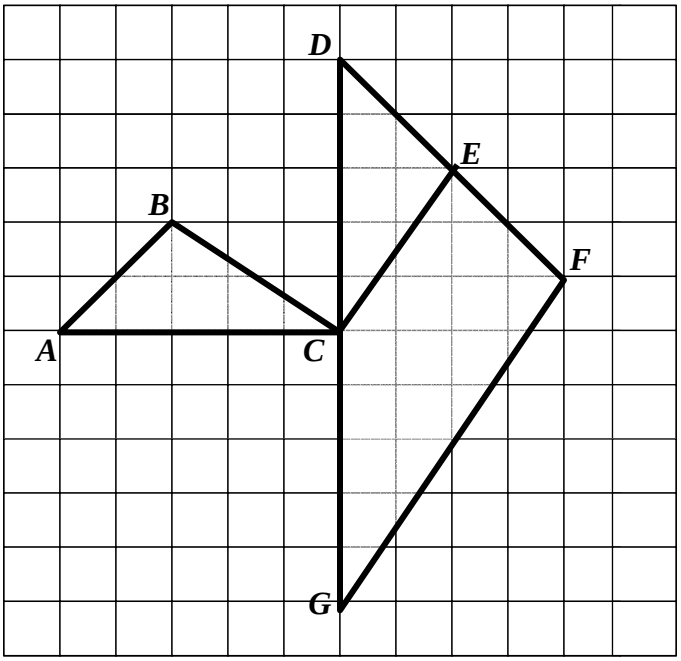


DIAGRAM 8

(b) In Diagram 8, triangle *DEC* is the image of triangle *ABC* under a transformation **V** and triangle *DFG* is the image of triangle *DEC* under a transformation **W.**

(i) Describe in full transformation **V.**

(ii) Given that transformation **W** is an enlargement. State the centre and scale factor of the enlargement.

(iii) Calculate the area of triangle *ABC* if the area of quadrilateral *CEFG* is 36 square units.

[7 marks]

2.(a) Transformation **T** represents a translation $\begin{pmatrix} -4 \\ 2 \end{pmatrix}$ and transformation **P** represents a reflection at the line y = -1.

State the coordinates of the image of point (2, 1) under the following transformation:

(i) T,

(ii) P,

(iii) TP. [4 marks]

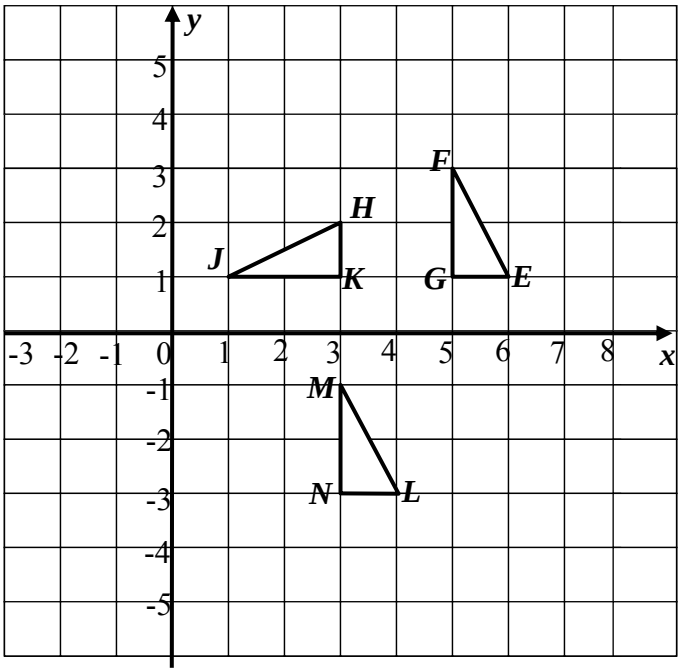


DIAGRAM 10

(b) In Diagram 10, triangle *HJK* is the image of triangle *EFG* under a transformation **V** and triangle *LMN* is the image of triangle *HJK* under a transformation **W**.

Describe in full

(i) transformation V ,

(ii) transformation W, and

(iii) a single transformation which is equivalent to WV.

[8 marks]

3.(a) Transformation **P** represents a reflection at the line y = 2. Transformation **T** represents a translation $\begin{pmatrix} -2 \\ 3 \end{pmatrix}$. Transformation **R** represents a rotation of 90° in the anticlockwise direction about the point (6, 4).

State the coordinates of the image of point (3, 1) under the following transformation:

(i) **P**,
(ii) **TP**,
(iii) **RT**.

[4 marks]

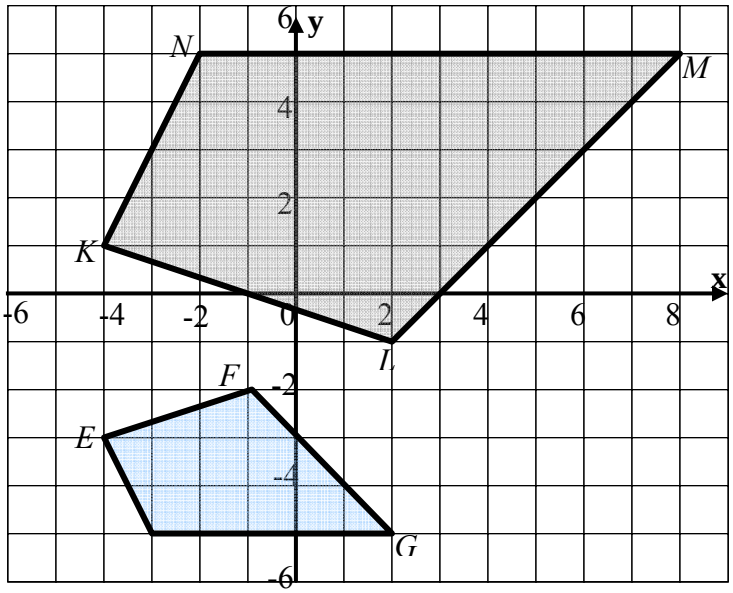


DIAGRAM 1

(b) In Diagram 1, quadrilateral KLMN is the image of quadrilateral EFGH under a transformation **V** followed by another transformation **W**.
Describe in full

(c) Given that quadrilateral KLMN represents an area of 104 unit^2, find the area represented by quadrilateral EFGH.

[8 marks]

4. Transformation **R** represents a rotation of 90° in the anti-clockwise direction at point (1, 4). Transformation **P** represents a reflection at the line y = 2.

State the coordinates of the image of point (3, 1) under the following transformation:

(i) **R**,

(ii) **PR.**

[3 marks]

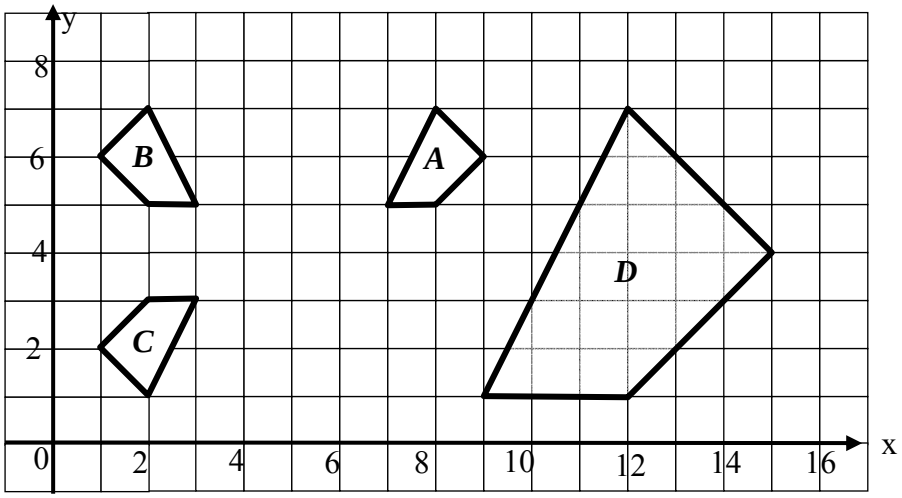


DIAGRAM 8

(a) The graph in diagram 8 shows quadrilaterals *A, B, C* and *D.*

(i) Quadrilateral *B* is the image of quadrilateral *A* under a transformation **V**, whereas quadrilateral *C* is the image of quadrilateral *B* under a transformation **W.**

Describe in full

(a) transformation **V**,

(b) a single transformation which is equivalent to transformation **WV**.

(ii) Quadrilateral *D* is the image of quadrilateral *A* under a certain enlargement.

(a) State the scale factor of the enlargement.

(b) Find the coordinates of the centre of the enlargement.

(c) If the area of quadrilateral *A* is 9 square units, calculate the area of quadrilateral *D.*

12. PLANS AND ELEVATIONS

SKILLS	TIPS
a. Draw the correct diagram	Label is not required. (whether it is right or wrong) The correct rotation of your answer is accepted. **No mark** for **sketch** (without using a ruler) **No mark** for **lateral inversion** *
b. Measurement	**No mark** for **"small gap" or "extensions"** $\geq$ **0.4 cm** **No mark** for **angle 90** $\pm$ **2°** ($\leq$ **88°** or $\geq$ **92°**)
c. The tidiness of the drawing	**No mark** for construction line and actual line that cannot be differentiated : - Dashed line : in the diagram - Solid line : outside the diagram **Minus mark** if: "double lines" or "bold line" or not in line

17.2 Orthogonal projection

- The *orthogonal projection* of an object is a two dimensional or flat image of the object. The image is formed by looking at perpendicular lines, that is , the **normals** coming from the object and intersecting the plane of view.

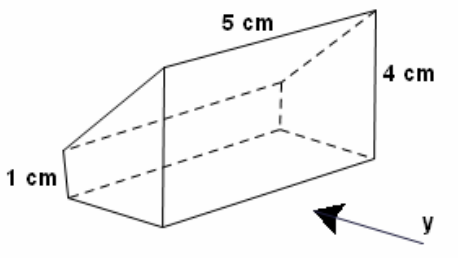
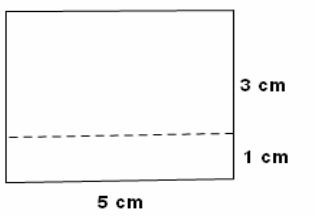
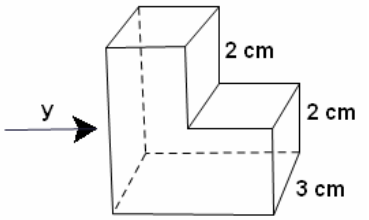
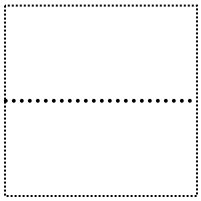
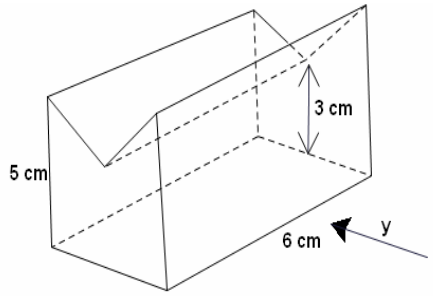
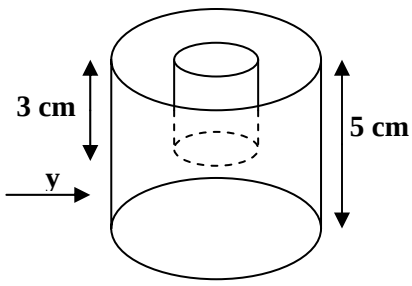
17.3 Plan

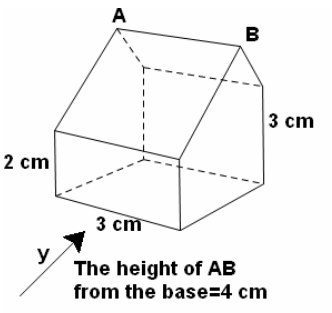
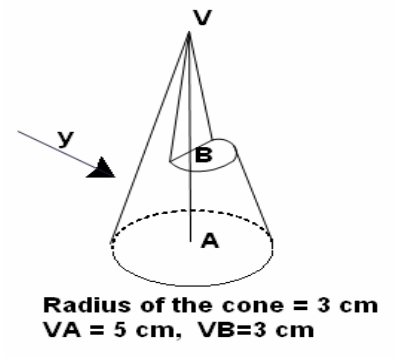
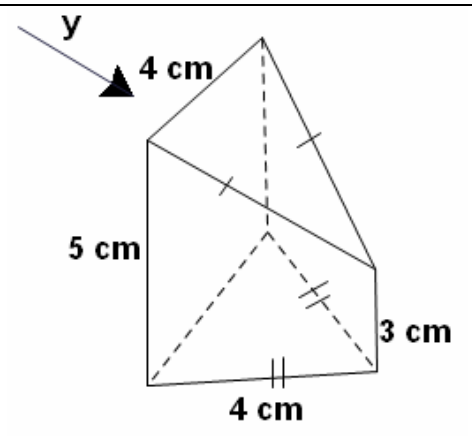
- The orthogonal projection of a solid on a horizontal plane as viewed from the top of the object is known as *plan.*

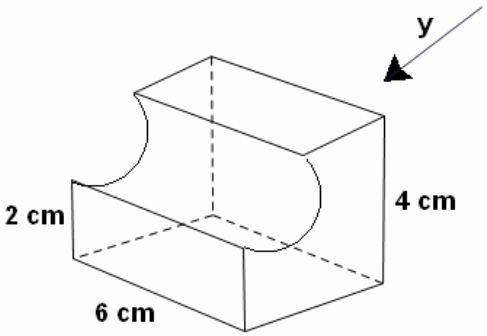
17.4 Elevation

- The orthogonal projection of a solid on a vertical plane as viewed from the front of the object is known as *front elevation***.**
- The orthogonal projection of a solid on a vertical plane as viewed from the side of the object is known as *side elevation***.**

- **Elevation involving hidden edges**
  Draw to full scale, the side elevation (Y) of the solids below.

	Solid	Elevation from y
	Example : 	
1		
2		
3	 **Radius of the inner cylinder= 1 cm** **Radius of the outer cylinder= 2 cm**	

4		
5		
6		

7		

12. STATISTICS III (FREQUENCY POLYGON)

SKILLS	TIPS
a. Student can re-arrange the given data according to the size of the class interval.	
b. Student can add an extra class interval from the given data with frequency 0.	Polygon begins with frequency 0
c. Able to find the midpoint of every class interval	Midpoint = $(x_1 + x_2) \div 2$
d. Able to calculate the estimated mean by using midpoint and frequency.	Mean = $\frac{\sum (\text{midpoint x frequency})}{\text{Total frequency}}$
e. Able to draw the frequency polygon by using frequency and the midpoint value of the class boundaries. Join all the midpoints to create a frequency polygon.	All the midpoints plotted are joined by using a ruler .
g. Able to find information from the frequency polygon obtained	Able to define the class mode. Able to define the straight line that linked the midpoint.

Examples of Frequency Polygon

1. The data below shows the height in cm for a group of students.

152	173	167	172	168	174	166	178
176	164	154	167	162	155	151	163
160	176	168	175	174	177	171	159
171	174	179	169	153	173	156	172
160	154	164	158	167	178	169	154

a) Based on the data above, by using size of class interval is 5
complete the table in the answer space

b) Then, calculate the mean height.

c) Using a scale of 2cm to 5 cm on the x – axis and 2 cm
to 5 student on the y – axis, draw a frequency polygon based on the data.

d) Based on the frequency polygon in (c) ,
state one information acquired.

Class Interval	Frequency	Midpoint
145 - 149	0	147
150 - 154	6	152
155-159	4	157
160-164	6	162
165-169	8	167
170-174	9	172
175-179	7	177
180-184	0	182

Step 1

Complete the table.
Start with frequency 0 that is one class interval before it. .Fill in the frequency.
Write the number (not a tally mark). 1mark

Step 2

Complete the table until the total of frequency is 40. 2 marks

Step 3

Find the midpoint by dividing two class interval

$\frac{1}{2}$(Lower limit + Upper limit) 2 marks

.

Step 4

Check that the total of frequency is 40.

Step 5

Construct the x – axis and y – axis according to the given scale
Note
Use the value of the midpoint for the x – axis and frequency for the y – axis according to the given scale. 1mark

Step 6

Mark the x – axis.
Note
Start with the value of midpoint (frequency 0), that is one class interval before the first class interval in the table. Mark the equivalent value for the frequency value on y - axis. (The midpoint for frequency 0 has to be stated) .
2 marks

Step 7

Plot the midpoint and the frequency with the x mark.
Note.
Join the points with a ruler to form a straight line.
(free hand drawing is not allowed) 1 mark

Step 8

State a correct information about the relationship between midpoint and frequency.
Example. Most of the students have the height of 170 - 174 cm 2 marks

2.Data below shows the body mass in kg, for a group of students.

27	13	22	28	21	17	29	25
29	18	22	20	25	18	24	27
27	25	16	19	16	24	26	27
29	19	30	25	23	24	26	29

a) Based on the above data by using the size of class interval ,complete the table in the answer space
b) Then, calculate the mean mass for the group of students.
c) Using a scale of 2cm to 3 kg on the x - axis and 2 cm to 1 student on the y - axis, draw a frequency polygon to represent the above data.

d) Based on the frequency polygon in (c) ,state an information about the distribution.

Class Interval	Frequency	Midpoint
10 - 12		
13-15		

STATISTICS III (OGIVE)

SKILLS	**TIPS**
a. Able to re-arrange the given data according to the class interval given.	-Complete the class interval given -Choose the class interval given in the question
b. Able to add a size of class interval from the given data for the upper boundaries for frequency 0	- Add a size of class interval for frequency 0, that is one class interval before
c. Able to find the upper boundaries of each of the class interval	
d. Able to find the midpoint of the class interval	
e. Able to find the cumulative frequency for each of the class interval	
d. Able to calculate the mean by using frequency and midpoint	Mean = $\frac{\sum (\text{Frequency} \times \text{Midpoint})}{\text{Total frequency}}$
e. Able to draw OGIVE by using cumulative frequency and the boundaries value of class interval. Join all upper boundaries to form an OGIVE.	Join the plots of the upper boundaries that is marked using "free hand" to form a curve.
g. Able to find one information from the drawn OGIVE.	Able to define the class mode, mean Able to define quartile Able to relate the quartile and the related data percentage.

Example

1. (a) The table shows the speed, in km h^{-1}, of 56 cars on a road.

Speed (km h^{-1})	Frequency	Midpoint
51 – 55	2	
56 – 60	6	
61 – 65	18	
66 – 70	15	
71 – 75	9	
76 – 80	5	
81 – 85	1	

(i) Find the midpoints of the class intervals.
(ii) Calculate the mean speed of the cars.

(b) Complete the table given in the answer space below.

(c) *For this part of question, use the graph paper.*
By using a scale of 2 cm to 5 km h^{-1} on the x axis and 2 cm to 5 cars on the y-axis, draw an ogive for the data.
Hence, find
(i) the median
(ii) the inter quartile range.

Solution:

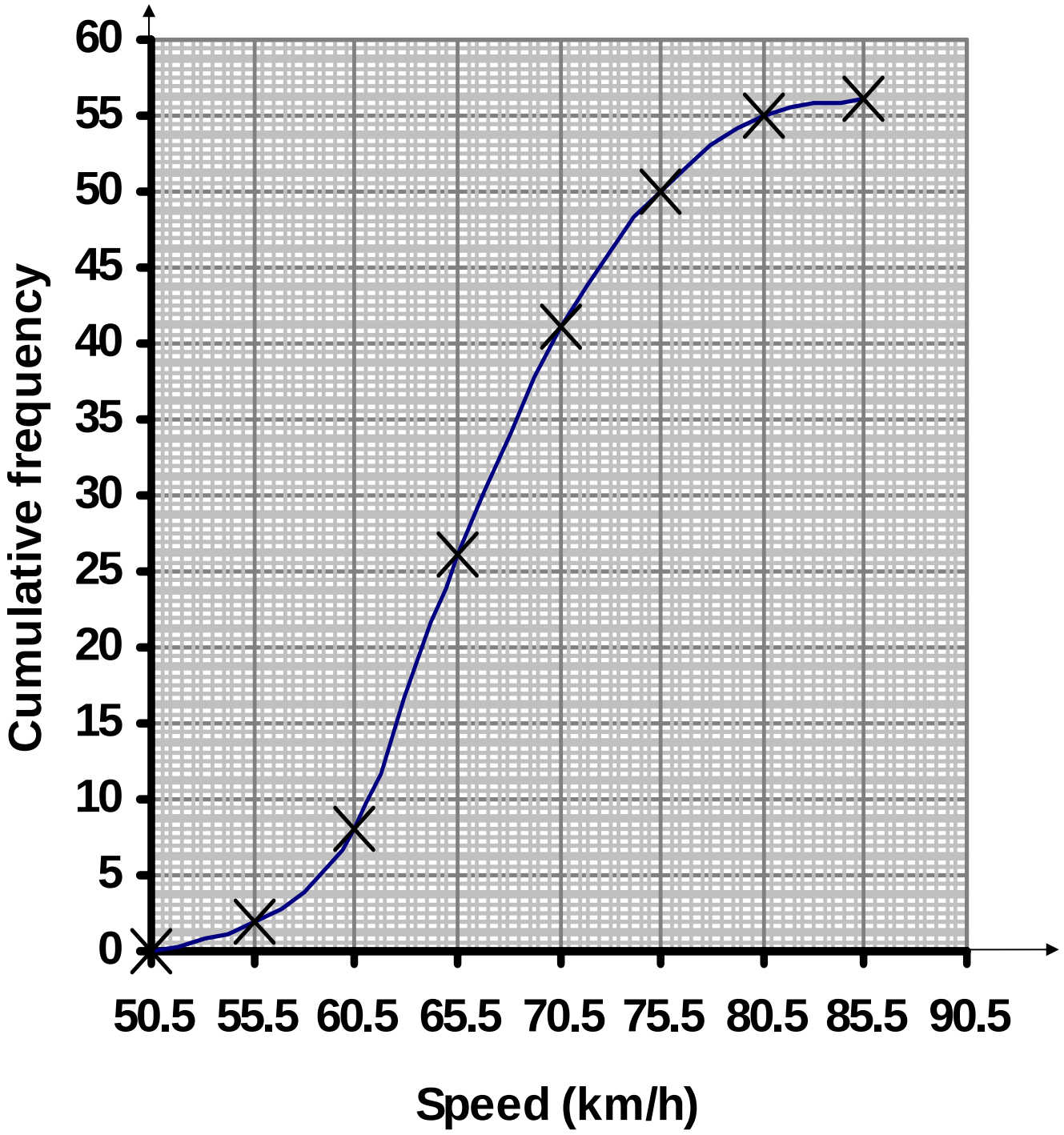
(a) (i) and (b)

Speed (km h^{-1})	**Frequency**	**Midpoint**	**Upper Boundary**	**Cumulative Frequency**
46 – 50	0	48	50.5	0
51 – 55	2	53	55.5	2
56 – 60	6	58	60.5	8
61 – 65	18	63	65.5	26
66 – 70	15	68	70.5	41
71 – 75	9	73	75.5	50
76 – 80	5	78	80.5	55
81 – 85	1	83	85.5	56

(ii) $\text{Mean} = \dfrac{(53\times 2)+(58\times 6)+(63\times 18)+(68\times 15)+(73\times 9)+(78\times 5)+(83\times 1)}{56}$

$= \dfrac{3738}{56}$

$= 66.75$ km h^{-1}.


Cumulative frequency
60
55
50
45
40
35
30
25
20
15
10
5
0
50.5
55.5
60.5
65.5
70.5
75.5
80.5
85.5
90.5
Speed (km/h)

ANSWERS FOR JUJ2007

1. (a) State whether the following is true or false.

$10 \div 2 = 5$ or $2^3 = 6$

(d) Write down two implications based on the following sentence:

P = 10 if and only if $p^3 = 1000$.

Implication 1 : .....
Implication 2 : .....

(e) Complete the premise in the following argument.

Premise 1 : If $x + 3 = 5$, then $x = 2$
Premise 2 : .....
Conclusion : $x + 3 \neq 5$

[5 marks]

Answer:

(d) True *(1 mark)*

(e) Implication 1 : If P = 10, then $P^3 = 1000$. *(1 mark)*
Implication 2 : If $P^3 = 1000$, then P = 10. *(1 mark)*

(f) Premise 2 : $x + 3 \neq 5$ *(2 marks)*

2. (a) State whether the following is true or false.

$10 (9 - 4) = 50$ and $\sqrt{10} > 4$

(d) Write down two implications based on the following sentence:

$x^2 = 36$ if and only if $x = 6$

Implication 1 : .....
Implication 2 : .....

(e) Complete the premise in the following argument:

Premise 1 : If $x > 0$, then $x^2 > 0$

Premise 2 : ……
Conclusion : $5^2 > 0$

[5 marks]

Answer:

(e) False

(f) Implication 1 : If $x^2 = 36$, then $x = 6$
Implication 2 : If $x = 6$, then $x^2 = 36$.

(c) Premise 2: $5 > 0$

3. (a) Determine whether the sentence below a statement or non-statement.

20 is a multiple of 5.

(b) Write down two implications based on the following sentence.

$2p > 10$ if and only if $p > 5$.

Implication 1 : ……
Implication 2 : ……

$3 = 2\ (1^2) + 1$
$9 = 2\ (2^2) + 1$
$19 = 2\ (3^2) + 1$
$33 = 2\ (4^2) + 1$

(c) Based on the information above, make a general conclusion by induction.

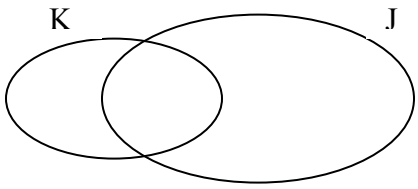
Answer

(a) Statement

(b) Implication 1 : If $2p > 10$, then $p > 5$
Implication 2 : If $p > 5$, then $2p > 10$

(c) 2n2 + 1, where n = 1, 2, 3, 4.

4.



(e) Based the venn diagram above, complete the statement below by using quantifier "all" or some" to form a true statement.

" …… elements in set K are elements in set J".

(f) By using the quantifier "all" or "some", complete the statement below to form a true statement.

" …….. the regular polygons are equal in length".

(g) Write down two implications based on the following statements.

The area of square is 25 cm^2 if and only if its sides are 5 cm.

Implication 1 : ……
Implication 2 : ……

(h) Complete the premise in the following argument.

Premise 1 : If one number is a factor of 8, then that number is a factor of 32.
Premise 2 : 6 is not a factor of 32.
Conclusion : …….

[6 marks]

Answer:

(a) Some

(b) All

(c) Implication 1 : If the area of square is 25 cm^2, then its sides are 5 cm.
Implication 2 : If its sides are 5 cm, then the area of square is 25 cm^2

(d) Conclusion : 6 is not a factor of 8.

5. (a) Determine whether statement below is true or false.

Some of the triangles are right-angled triangles

(g) By using the suitable quantifier "all" or "some". Complete the statements below to form a true statement.

" …… multiples of 8 can be exactly divided by 4"

(h) Complete the premise in the following argument.

Premise 1 : ……
Premise 2 : John is a student in the accounting class.
Conclusion : John passed the SPM examination.

$$2 = 2 + 3\,(1 - 1)$$
$$5 = 2 + 3\,(2 - 1)$$
$$8 = 2 + 3\,(3 - 1)$$
$$11 = 2 + 3\,(4 - 1)$$

(i) Based on the information above, make a general conclusion by induction regarding for list of numbers given.

Answer:

(a) True

(b) All

(c) Premise 1 : All the students in the accounting class passed the SPM examination.

(d) $2 + 3\,(n - 1)$, where $n = 1, 2, 3, 4$.

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

Find values of m and of n.

(c) Using matrices, calculate the value of x and of y that satisfy the following simultaneous linear equations:

$2x - 3y = 5$
$2x - y = 3$

[7 marks]

Answer:

(c) $\frac{1}{mn+6}\begin{pmatrix} n & 3 \\ -3 & m \end{pmatrix}$ compare with $\frac{1}{4}\begin{pmatrix} n & 3 \\ -2 & 2 \end{pmatrix}$. …….. 1 mark

Therefore, m = 2 …….. ……..1 mark

$mn + 6 = 4$

$2n = -2$

n = - 1 ……1 mark

(d) $\begin{pmatrix} 2 & -3 \\ 2 & -1 \end{pmatrix}\begin{pmatrix} x \\ y \end{pmatrix} = \begin{pmatrix} 5 \\ 3 \end{pmatrix}$ ……..1 mark

$\begin{pmatrix} x \\ y \end{pmatrix} = \frac{1}{4}\begin{pmatrix} -1 & 3 \\ -2 & 2 \end{pmatrix}\begin{pmatrix} 5 \\ 3 \end{pmatrix}$…… …… 1 mark

$= \frac{1}{4}\begin{pmatrix} 4 \\ -4 \end{pmatrix}$

x = 1…… ……1 mark
y = -1 ……..1 mark

2. It is given that matrix $P = \begin{pmatrix} 3 & 1 \\ r & 2 \end{pmatrix}$ and matrix $Q = K\begin{pmatrix} 2 & -1 \\ 4 & 3 \end{pmatrix}$. Such that $PQ = \begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix}$.

(a) Find the value of K and of r.

(b) Using matrices, find the value of x and of y that satisfy the following simultaneous linear equations:

$2x - y = 11$
$4x + 3y = -3$

Answer:

(a) $\frac{1}{6-r}\begin{pmatrix} 2 & -1 \\ -r & 3 \end{pmatrix} = K\begin{pmatrix} 2 & -1 \\ 4 & 3 \end{pmatrix}$

$r = -4$

$K = \frac{1}{10}$

(b) $\begin{pmatrix} 2 & -1 \\ 4 & 3 \end{pmatrix}\begin{pmatrix} x \\ y \end{pmatrix} = \begin{pmatrix} 11 \\ -3 \end{pmatrix}$

$\begin{pmatrix} x \\ y \end{pmatrix} = \frac{1}{10}\begin{pmatrix} 3 & -1 \\ -4 & 2 \end{pmatrix}\begin{pmatrix} 11 \\ -3 \end{pmatrix}$

$x = 3$
$y = -5$

3. P is a 2X2 matrix where $P\begin{pmatrix} 2 & -5 \\ 1 & 3 \end{pmatrix} = \begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix}$.

(c) Find the matrix P.

(d) Write the following simultaneous linear equations as a matrix equation:

$2x - 5y = -17$
$x - 3y = 8$

Hence, calculate the values of x and of y using matrices.

[6 marks]

Answer:

(a) $P = \frac{1}{6+5}\begin{pmatrix} 3 & 5 \\ -1 & 2 \end{pmatrix}$

$P = \frac{1}{11}\begin{pmatrix} 3 & 5 \\ -1 & 2 \end{pmatrix}$

(b) $\begin{pmatrix} 2 & -5 \\ 1 & 3 \end{pmatrix}\begin{pmatrix} x \\ y \end{pmatrix} = \begin{pmatrix} -17 \\ 8 \end{pmatrix}$

$\begin{pmatrix} x \\ y \end{pmatrix} = \frac{1}{11}\begin{pmatrix} 3 & 5 \\ -1 & 2 \end{pmatrix}\begin{pmatrix} -17 \\ 8 \end{pmatrix}$

$x = -1$
$y = 3$

4. It is given that $\frac{1}{n}\begin{pmatrix} 8 & -9 \\ 2 & -3 \end{pmatrix}\begin{pmatrix} -3 & 9 \\ -2 & m \end{pmatrix} = \begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix}$.

(c) Find the value of m and of n.

(d) Hence, using matrices, find the values of x and of y that satisfy the following simultenous linear equation:

$\begin{pmatrix} 8 & -9 \\ 2 & -3 \end{pmatrix}\begin{pmatrix} u \\ v \end{pmatrix} = \begin{pmatrix} 5 \\ -1 \end{pmatrix}$

Answer:

(a) $\frac{1}{-3m+18}\begin{pmatrix} m & -9 \\ 2 & -3 \end{pmatrix} = \frac{1}{n}\begin{pmatrix} 8 & -9 \\ 2 & -3 \end{pmatrix}$

$m = 8$
$n = -3m + 18$
$= -3\,(8) + 18$
$= -6$

(b) $\begin{pmatrix} u \\ v \end{pmatrix} = \frac{1}{-6}\begin{pmatrix} -3 & 9 \\ -2 & 8 \end{pmatrix}\begin{pmatrix} 5 \\ -1 \end{pmatrix}$

$\begin{pmatrix} u \\ v \end{pmatrix} = \frac{1}{-6}\begin{pmatrix} -15-9 \\ -10-8 \end{pmatrix}$

$u = 4$
$v = 3$

5. (a) The inverse matrix of $\begin{pmatrix} 5 & 6 \\ 2 & 3 \end{pmatrix}$ *is* $\begin{pmatrix} 1 & -2 \\ m & n \end{pmatrix}$

Find the values of m and of n.

(b) Using matrices, calculate the value of u and of v that satisfy the following simultaneous linear equations:

$\begin{pmatrix} 5 & 6 \\ 2 & 3 \end{pmatrix}\begin{pmatrix} u \\ v \end{pmatrix} = \begin{pmatrix} 3 \\ 9 \end{pmatrix}$

Answer:

(a) $\frac{1}{15-12}\begin{pmatrix} 3 & -6 \\ -2 & 5 \end{pmatrix}$

$\begin{pmatrix} 1 & -2 \\ -\frac{2}{3} & \frac{5}{3} \end{pmatrix}$

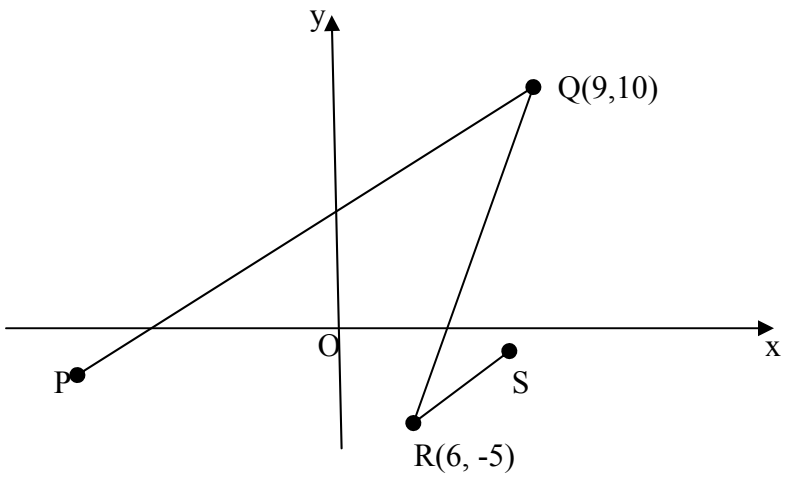
$m = -\frac{2}{3}$

$n = \frac{5}{3}$

(b) $\begin{pmatrix} u \\ v \end{pmatrix} = \frac{1}{3}\begin{pmatrix} 3 & -6 \\ -2 & 5 \end{pmatrix}\begin{pmatrix} 3 \\ 9 \end{pmatrix}$

$u = -15$
$v = 13$

1.



In diagram 1, the graph shows that PQ and RS are straight lines. PQ is parallel to RS. O is the origin. It is given that the equation of PQ is $y=\frac{2}{3}x+4$.

Find:

(d) x-intercept of the straight line PQ.
(e) The gradient of the straight line QR
(f) The equation of the straight line RS.

[6 marks]

Answer:

(a) $y = mx + c$

$0 = \frac{2}{3}x+4$ ..... 1 mark

$x = -6$ .....1 mark

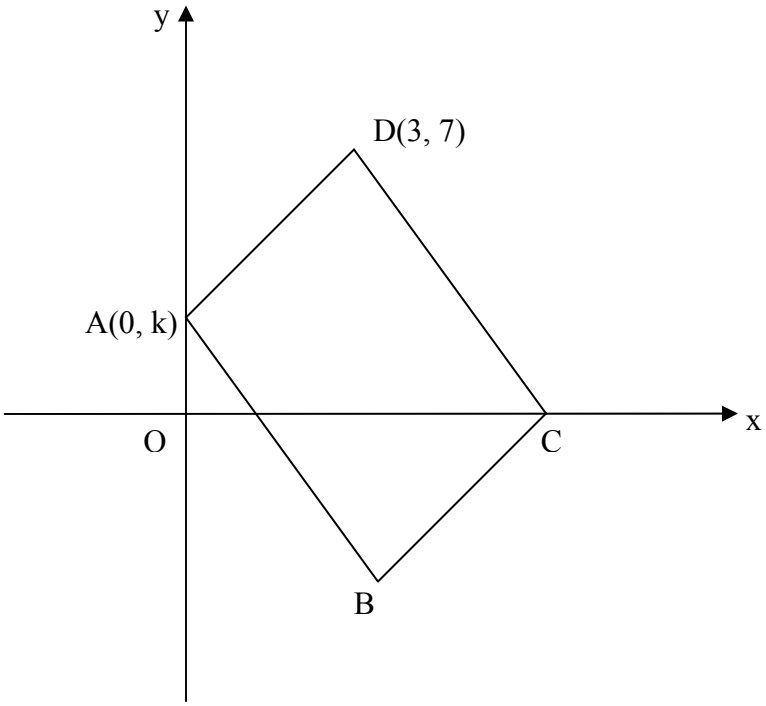
(b) $\frac{y_2-y_1}{x_2-x_1}=\frac{10-(-5)}{9-6}$ .....1 mark

$= 5$.....1 mark

(c) $y-(-5)=\frac{2}{3}(x-6)$ .....1 mark

$y=\frac{2}{3}x-9$ .....1 mark

2.



In diagram 2, ABCD is a parallelogram and O is the origin. It is given that the gradient of the straight line BC is 2 and y-intercept of the straight line CD is 19.

Find:

(d) The value of k.
(e) The equation of the straight line CD.
(f) The x-intercept of the straight line CD.

Answer:

(a) $\frac{7-k}{3-0}$

$k = 1$

(b) $y = mx + c$

$7 = 3m + 19$

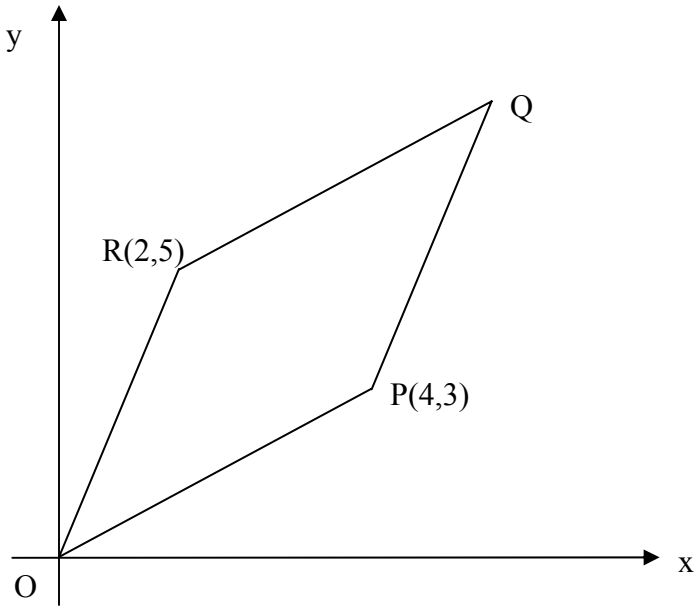
$m = -4$

$y = -4x + 19$

(c) $0 = -4x + 19$

$x = \frac{19}{4}$

3.



In diagram 3, OPQR is a parallelogram and O is the origin .

Find:

(a) The gradient of the straight line OR,
(b) The equation of the straight line PQ,
(c) The coordinate of Q.

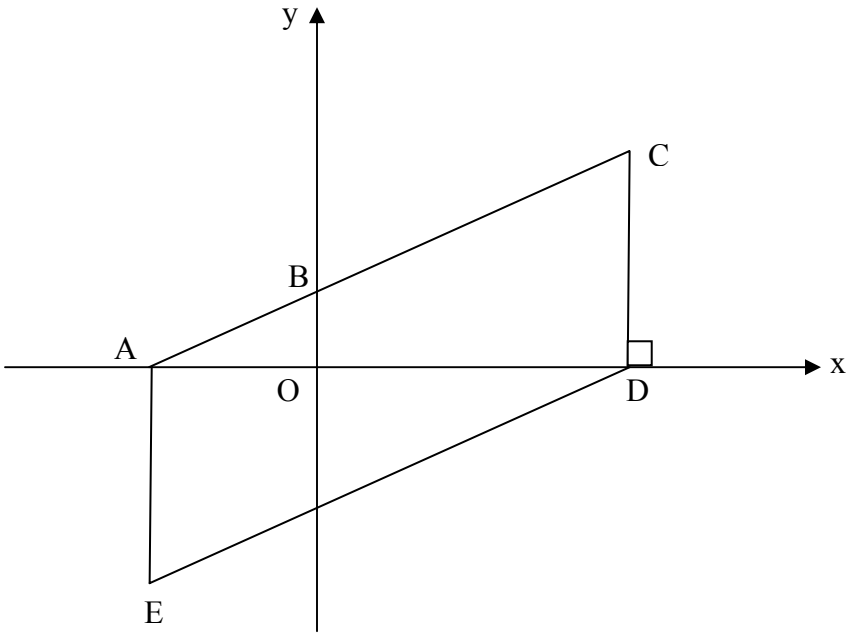
Answer:

(a) $\frac{5-0}{2-0}=\frac{5}{2}$

(b)
$$y = mx + c$$
$$3 = \frac{5}{2}(4) + c$$
$$c = -7$$
$$y = \frac{5}{2}x - 7$$

(c) (6,8)

4.



In Diagram 4, ACDE is a parallelogram and O is the origin. Point A and point D lies on the x-axis.

Find:

(d) Coordinate of the point D.
(e) Coordinate of the point A.
(f) The equation of the straight line ED.

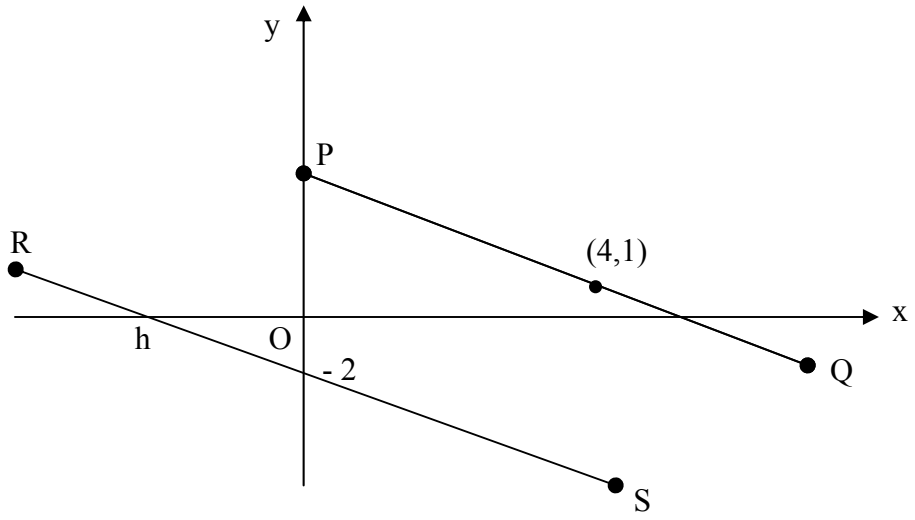
Answer:

(a)

(b)

(c)

5.



In diagram 5, the graph shows that PQ and RS are straight lines. O is the origin. It is given that the gradient RS is $-\frac{1}{2}$ and PQ is parallel to RS.

Find:

(d) The value of h.
(e) The equation of the straight line PQ.
(f) The x-intercept of the straight line PQ.

Answer:

(a) $\frac{0-(-2)}{h-0} = -\frac{1}{2}$

$h = -4$

$y = mx + c$

(b) $1 = -\frac{1}{2}(4) + c$

$c = 3$

$y = 0$

(c) $0 = -\frac{1}{2}x + 3$

$x = 6$

1.

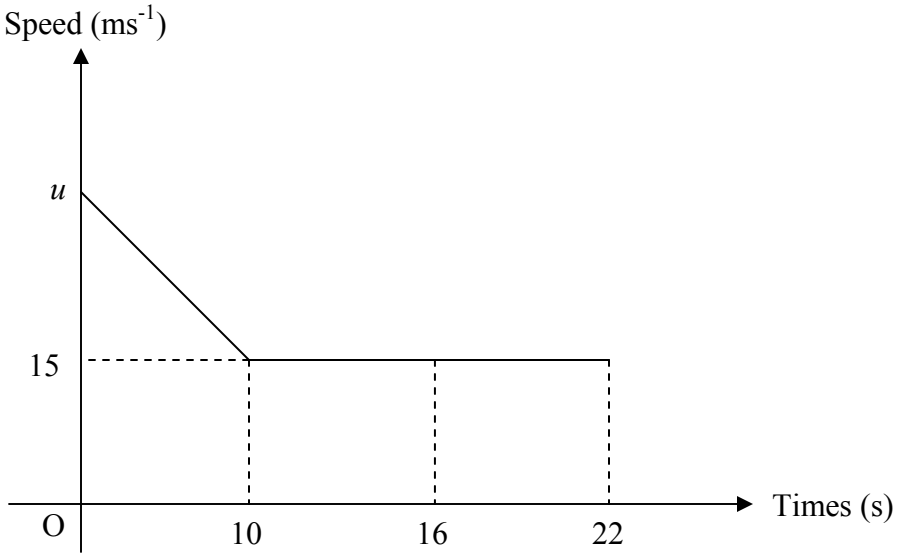


DIAGRAM 1

Diagram 1 shows the speed-time graph of a particle for a period of 22 s.

Calculate:

(c) The distance of the particle moves with uniform speed.
(d) The value of u, it is given that the average speed in the first 16 second is 20 ms^{-1}.

[5 marks]

Answer:

(a) $15 \text{ X } (22 - 10)$ ..... 1 mark

$= 180$ ..... 1 mark

(b) $\dfrac{15X16 + \frac{1}{2}X10(u-15)}{16} = 20$ .....2 marks

$u = 31$ .....1 mark

2.

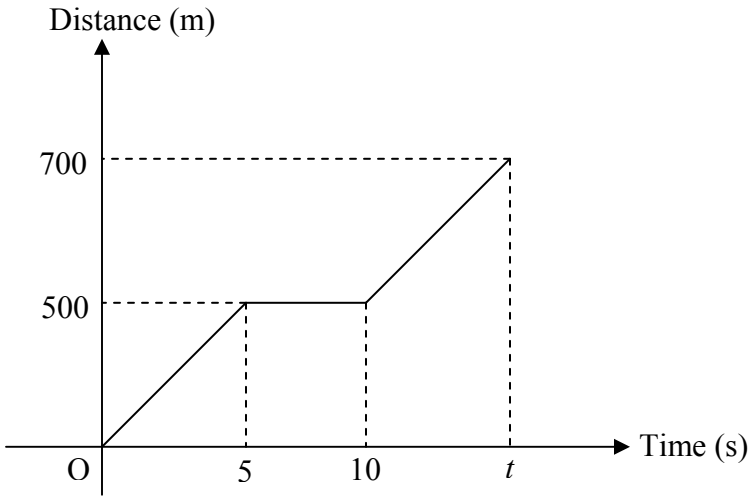


DIAGRAM 2

Diagram 2 shows the distance-time graph of a particle for a period of t s.

(d) State the time in which the particle is stationary.
(e) Find the average speed, in ms^{-1}, in the first 10 seconds.
(f) Calculate the value of t, if the average speed for the whole journey is 35 ms^{-1}.

Answer:

(a) $10 - 5 = 5$

(b) $\frac{500}{10} = 50$

(c) $\frac{700}{t} = 35$

$t = 20$

BONUS PRAKTIS BESTARI 1 2007

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

RELATIONS

1 $a^m x a^n = a^{m+n}$

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

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

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 $=$ $\frac{\text{Sum of (midpoint of interval x frequency)}}{\text{Sum of frequency}}$

12 Pythagoras Theorem

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

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

14 $m = -\frac{y - \text{int}\,ercept}{x - \text{int}\,ercept}$

SHAPE AND SPACE

1 Area of trapezium = $\frac{1}{2}$ x sum of parallel sides x height

2 Circumference of circle = $\pi d = 2\pi r$

3 Area of circle = πr^2

4 Curved surface area of cylinder = $2\pi rh$

5 Surface area of sphere = $4\pi r^2$

6 Volume of right prism = cross sectional area x length

7 Volume of cylinder = $\pi r^2 t$

8 Volume of cone = $\frac{1}{3}\pi r^2 t$

9 Volume of sphere = $\frac{4}{3}\pi r^3$

10 Volume of right pyramid = $\frac{1}{3}$ x base area x height

11 Sum of interior angles of a polygon = $(n - 2) \times 180^0$

12 $\frac{\text{Arc length}}{\text{Circumference of circle}} = \frac{\text{Angle subtended at centre}}{360^O}$

13 $\frac{\text{Area of sector}}{\text{Area of circle}} = \frac{\text{Angle subtended at centre}}{360^O}$

14 Scale factor, $k = \frac{P'A'}{PA}$

13 Area of image = $k^2 x$ area of object

Answer all question

1. Round off 0.002496 correct to three significant figures.
Bundarkan 0.002496 betul kepada tiga angka bererti

A. 0.002

B 0.003

C 0.00249

D 0.00250

2 Ungkapkan 34 juta dalam bentuk piawai.
Express 34 million in standard form

A. 34×10^{6}

B 34×10^{7}

C 3.4×10^{6}

D 3.4×10^{7}

3 $4.8 \times 10^{-3} - 1.43 \times 10^{-3}$

A 4.75×10^{1}

B 4.79×10^{-1}

C 3.37×10^{-2}

D 3.37×10^{-3}

4. In July, the mean number of shirts produced by factories J, K, and was 14 000. Factory K produced 9 600 shirts. Factory J produced three times as many as factory L. How many shirts did factory J produced in July?
Express the answer in standard form.

Dalam bulan Julai, purata bilangan baju yang dikeluarkan oleh Kilang J, kilang K dan Kilang L ialah 14 000 helai baju. Kilang K mengeluarkan 9600 helai baju. Pengeluaran dari kilang J adalah tiga kali lebih banyak dari kilang L. . Berapa helai baju yang telah dikeluarkan oleh kilang J pada bulan Julai? Ungkapkan jawapan itu dalam bentuk piawai.

A 2.43×10^4

B 3.24×10^4

C 4.2×10^4

D 4.4×10^4

5. $11011_2 - 1101_2 =$

A. 1110_2

B. 1111_2

C. 101102

D. 110102

6. Express 375_8 as a number in base two.
Ungkapkan 375_8 sebagai nombor dalam asas dua

A 11110100_2

B 10111111_2

C 11101101_2

D 11111101_2

7. In Diagram 1, *ABCEF* is a regular pentagon and CDE is a straight line.
Find the value of m
Dalam Rajah 1, ABCDF ialah sebuah pentagon sekata dan CDE ialah garis lurus. Carikan nilai m.

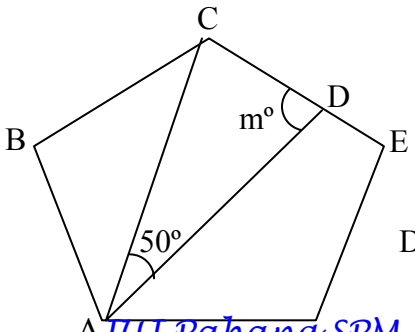


DIAGRAM 1

F

A 36

B 58

C 65

D 72

8 In Diagram 2, *O* is the centre of a circle KMN and JKL is the tangent to the circle at K.
Dalam Rajah 2, O ialah pusat bulatan KMN dan JKL ialah tangen kepada bulatan itu di K.

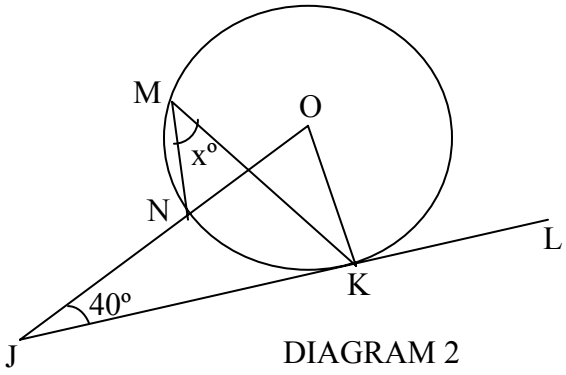


DIAGRAM 2

Find the value of x
Carikan nilai x.

A 20

B 25

C 50

D 80

9. Given $\cos x^o = -0.8910$ dan $0^o \leq x \leq 360^o$
Diberi kos $x^o = -0.8910$ dan $0^o \leq x \leq 360^o$

A 117 and 243

B 117 and 297

C 153 and 207

D 153 and 333

10. Diagram 3 is drawn on square grids. Quadrilateral OPQR is the image of quadrilateral OABC under an enlargement.
Rajah 3 dilukis pada grid segiempat sama. Sisiempat OPQR ialah imej bagi sisiempat OABC di bawah suatu pembesaran.

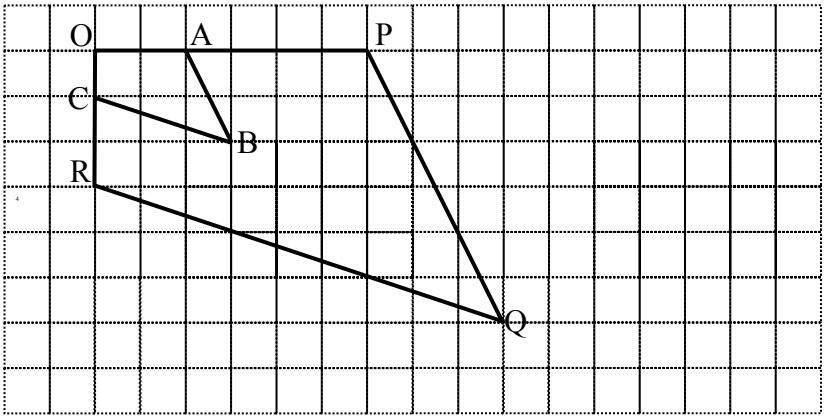


DIAGRAM 3

Which of the following gives the correct centre and scale factor of the enlargement?
Antara berikut yang manakah betul tentang pusat dan faktor skala bagi pembesaran itu?

	Centre	Scale Factor
A.	O	2
B.	O	3
C.	B	2
D.	B	3

11. Diagram 4 shows five points on a Cartesan plane.
Rajah 4 menujukkan lima titik pada suatu satah Cartesan.

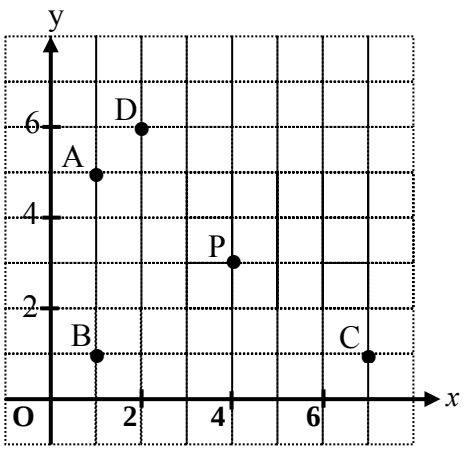


DIAGRAM 4

Point P is the image of point Q under translation $\begin{pmatrix} 3 \\ -2 \end{pmatrix}$.

Which of the point, **A, B, C,** or **D**, represents point Q?

Titik P ialah imej bagi titik Q di bawah translasi $\begin{pmatrix} 3 \\ -2 \end{pmatrix}$.

Antara titik **A, B, C** dan **D,** yang manakah mewakili titk Q?

12. In Diagram 5, graph y = cos x ^{o} and y = sin x ^{o} intersect at x = m ^{o} and x = n ^{o}
Dalam Rajah 5, graf y = cos x ^{o} dan y = sin x ^{o} bersilang di x = m ^{o} dan x = n ^{o}

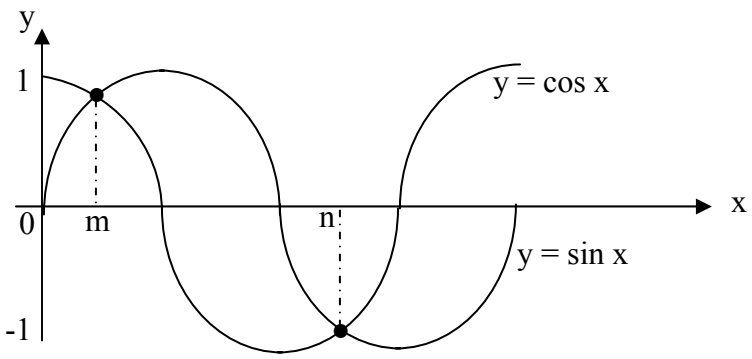


DIAGRAM 5

The value of m + n =
Nilai m + n =

A. 180^o

B. 270^o

C. 285^o

D. 360^o

13. In Diagram 6, MPQ is a straight line
Dalam Rajah 6, *MPQ* ialah garis lurus.

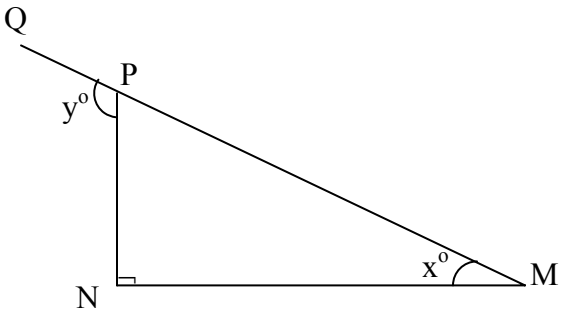


DIAGRAM 6

Given $\cos x^o = \frac{24}{25}$, find the value of $\tan y^o$.

Diberi kos $x^o = \frac{24}{25}$, carikan nilai $\tan y^o$.

A $-\frac{7}{24}$

B $-\frac{24}{7}$

C $\frac{7}{24}$

D $\frac{24}{7}$

14 Diagram 7 shows a right pyramid *VGDEF* with its square base *DEFG*.

Rajah 7 menunjukkan sebuah piramid tegak VGDEF dengan tapak segiempat Sama DEFG.

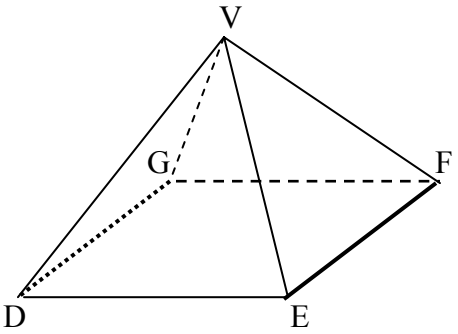


DIAGRAM 7

The angle between the line *VE* and the base *DEFG* is
Sudut antara garis VE dengan tapak *DEFG* ialah

A ∠VEF

B ∠VEG

C ∠VED

D ∠EGV

15 In Diagram 8, *J*, *K*, *L*, and *M* are four points on a horizontal ground. *MN* is a vertical pole with the height of 20 m, *JM* = *ML* dan ∠*JKL* = 90°.
Dalam Rajah 8, *J*, *K* , *L* dan *M* ialah empat titik pada permukaan tanah mengufuk.M*N* ialah sebatang tiang tegak dengan tinggi 20 m, *JM* = *ML* dan ∠*JKL* = 90°.

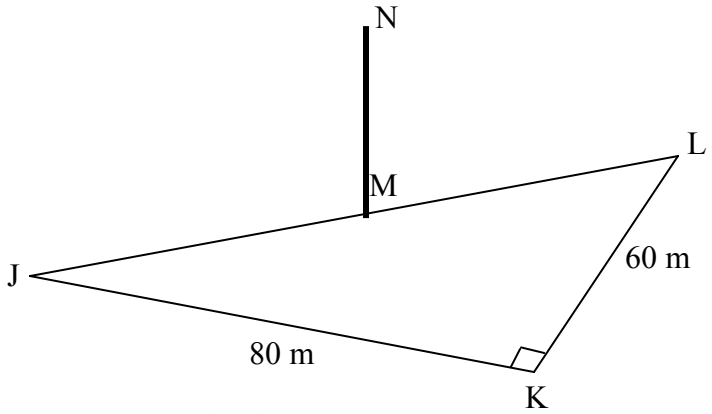


DIAGRAM 8

Calculate the angle of elevation of vertex *N* from the point *L*.
Hitungkan sudut dongakan puncak N dari titik L.

A 66° 25`

B 33° 41`

C 26° 34`

D 21° 48`

16. In Diagram 9, P, Q, and R are three points lie on a ground. PV is a vertical pole with *h* m height. If the angle of elevation V from R is 19º 27′, calculate the value of *h*

Dalam Rajah 9, P,Q dan R ialah tiga titik pada tanah mengufuk PV ialah sebatang tiang tegak setinggi h m. Jika sudut dongakan puncak tiang, V dari R ialah 19º 27′, Hitungkan nilai h

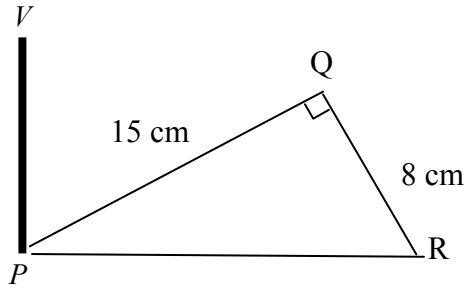


DIAGRAM 9

A 3

B 4

C 5

D 6

17 In Diagram 10, The point E is due north to the point G. EG = EF
Dalam Rajah 10, titik E terletak ke utara G. EG = EF

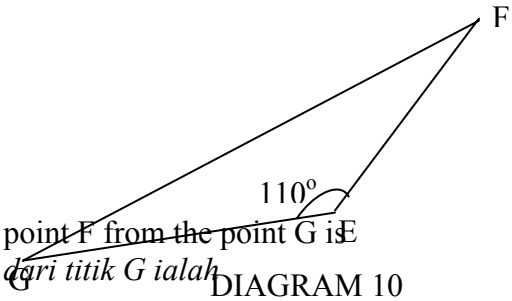


DIAGRAM 10

The bearing of point F from the point G is
Bearing titik F dari titik G ialah

.

A 325°

B 270°

C 250°

D 035°

18 $P(40^{o}N, 60^{o}W)$ and Q are two points on the earth's surface. If PQ is a diameter of the parallel latitude, the position of point Q is
$P(40^{o}N, 60^{o}W)$ dan Q adalah dua titik di permukaan bumi.Jika PQ ialah diameter bagi latitud selarian, kedudukan titik Q ialah

A $(40^{\circ}S, 120^{\circ}W)$

B $(40^{\circ}S, 120^{\circ}\text{E})$

C $(40^{\circ}N, 120^{\circ}W)$

D $(40^{\circ}N, 120^{\circ}E)$

19. $(p+2n)(5p-n) =$

A. $5p^2 + 9pn - 2n^2$

B. $5p^2 - 9pn + 2n^2$

C. $5p^2 + 11pn + 2n^2$

D. $5p^2 + 11pn + 2n^2$

20. $\frac{6+w}{6w} - \frac{z-w}{wz} =$

A. $\frac{z-1}{z}$

B. $\frac{z+1}{z}$

C. $\frac{z-6}{6z}$

D. $\frac{z+6}{6z}$

21. Given that $\sqrt{\frac{w-3}{2}} = \frac{p+1}{4}$, then w =

Diberi $\sqrt{\frac{w-3}{2}} = \frac{p+1}{4}$, maka w =

A. p + 4

B. P – 4

C. $\frac{(2p+1)^2+24}{8}$

D. $\frac{(p+1)^2+24}{8}$

22. $2-\frac{2}{3}t = -6$, then t =

$2-\frac{2}{3}t = -6$, maka t =

A. 6

B. 12

C. -6

D. -12

23. Simplify $\frac{(3p^{\frac{1}{2}}q^{-2})^2}{r^3} \times \frac{pr}{q}$

A. $3p^3q^{-3}r^{-1}$

B. $3p^2q^{-3}r$

C. $9p^2q^{-3}r^{-2}$

D. $9p^2q^{-3}r^2$

24 Find the solution of the simultaneous inequlities $\frac{1}{5}x \leq 1$ and $1 - 5x < -9$

Carikan penyelesaian bagi ketaksamaan serentak $\frac{1}{5}x \leq 1$ dan $1 - 5x < -9$

A $x \geq 2$

B $x < 5$

C $2 \leq x < 5$

D $2 < x \leq 5$

25. Table 1 is a frequency table which shows the masses of a group of childrens in Kinder Garden
Jadual 1 adalah jadual kekerapan yang menunjukkan berat sekumpulan kanak-kanak di sebuah sekolah tadika

Mass(kg)	24	25	26	27	28
Number of children	3	5	8	9	7

TABLE 1

The median mass(kg) of the children is
Median berat (kg) bagi kanak-kanak itu ialah

A. 26

B. 26.4

C. 26.5

D. 27

26. Given that set M = {a,b} list all the subsets of *M*.
Diberi set M = {a,b} senaraikan semua subset bagi M.

A {a}, {b}

B {a}, {b}, ϕ

C {a}, {b}, {a,b}

D {a}, {b}, {a,b}, ϕ

27 Diagram 11 shows a Venn diagram with a universal set $\xi = A \cup B \cup C$.

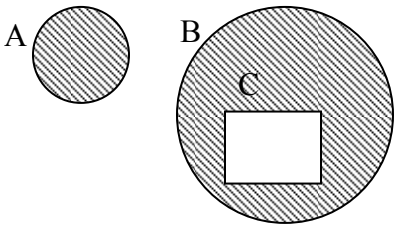


DIAGRAM 11

The shaded region represent
Kawasan yang berlorek mewakili

A. $A \cup (B \cap C)$

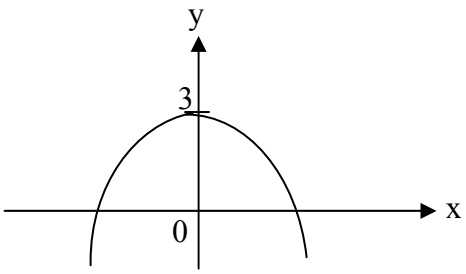
B. $A \cup (B \cap C')$

C. $A \cup (B' \cap C)$

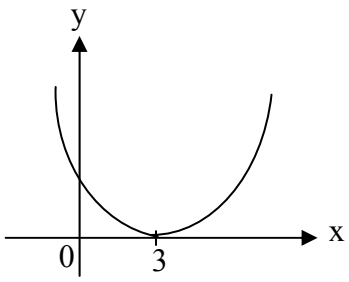
D. $A \cup (B \cap C)'$

28. Which of the following graphs represent $y = 3 - x^2$
Manakah antara yang berikut mewakili graf $y = 3 - x^2$

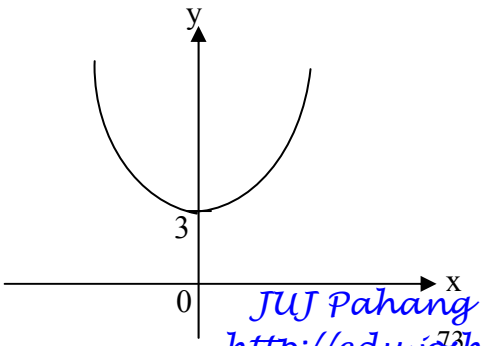
. A.



B.



C.



D.

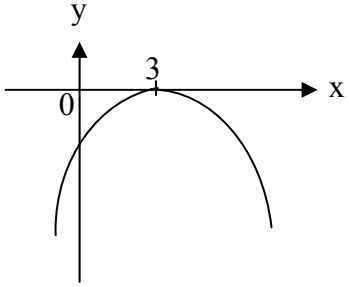


DIAGRAM 12

29. Given that set M = {a,b} list all the subsets of *M*.
Diberi set *M* = {a,b} senaraikan semua subset bagi *M*.

A {a}, {b}

B {a}, {b}, ϕ

C {a}, {b}, {a,b}

D {a}, {b}, {a,b}, ϕ

30

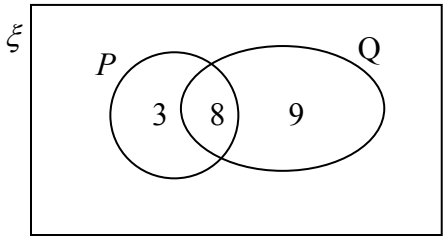


DIAGRAM 13

The Venn Diagram in diagram 13 shows a universal set ξ and the number of element in set P and set Q. Given that $n(\xi) = 32$, find the value of $n(P' \cup Q')$.

Gamba rajah Venn dalam Rajah 13 menunjukkan set ξ dan bilangan unsur dalam set P dan Q. Diberi $n(\xi) = 32$, Carikan nilai bagi $n(P' \cup Q')$.

A 12

B 24

C 26

D 28

31

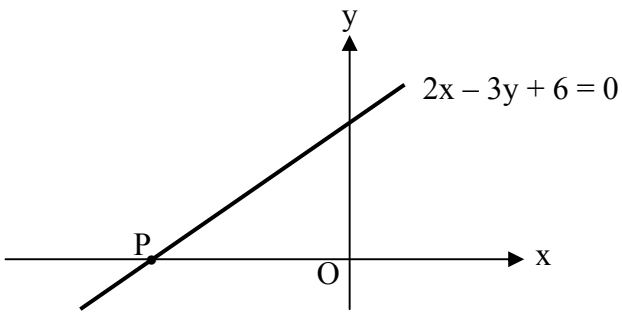


DIAGRAM 14

In Diagram 14 , P is lies on x-axis. Find the coordinate of P
Dalam Rajah 14, P terletak atas paksi-x. Cari koordinat P

A. (-3 , 0)

B (3 , 0)

C (-2 , 0)

D (6 , 0)

32

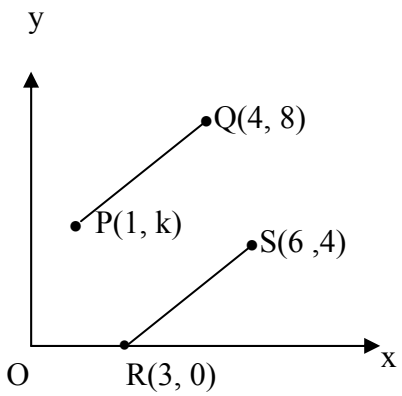


DIAGRAM 15

In Diagram 15 given that the line PQ is parallel to RS, find the value of k.
Dalam Rajah 15 diberi bahawa garis PQ adalah selari dengan garis RS .Carikan Nilai k

A. 5

B. 2

C. 3

D. 4

33. In Diagram 16, straight line SR is parallel to straight line MN
Find the gradient of straight line MN.

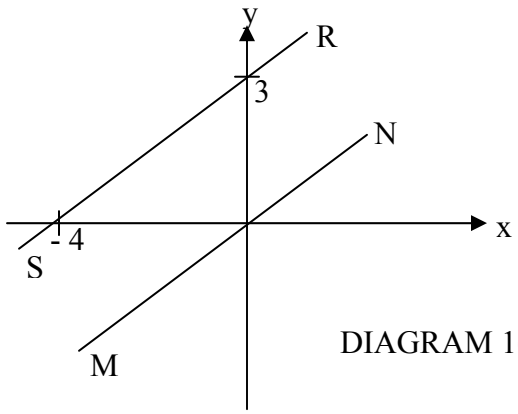


DIAGRAM 16

A. $\frac{3}{4}$

B. $\frac{4}{3}$

C. $\frac{-4}{3}$

D. $\frac{4}{-3}$

34

2	4	5	10	13	19	25	27	33	37

DIAGRAM 17

All the cards shown in Diagram 17 are placed in a box. A few cards with prime number are added into the box. If one card is randomly selected from the box, the Probability of getting a prime numbered card is $\frac{2}{3}$, calculate the number of prime numbered cards that was added to the box

Semua kad yang ditunjukkan dalam Rajah 17 dimasukkan ke dalam sebuah kotak kosong. Beberapa kad bertanda nombor perdana ditambah ke dalam kotak itu. Jika sekeping kad dikeluarkan secara rawak daripada kotak itu, kebarangkalian

kad yang dikeluarkan bertanda nombor perdana ialah $\frac{2}{3}$. *Hitung bilangan kad bertanda nombor perdana yang ditambah masuk.*

A 5

B 8

C 10

D 15

35 A box contain 10 red T-shirt and x number of yellow T-Shirt. If one T-shirt is picked at random from the box, the probability the T-shirt is red is $\frac{2}{5.}$.

Another 5 red T-shirtl are put inside the box. If one T-shirtl is picked from the box at random ,what is the probability the T-shirt is red.

Sebuah kotak mengandungi 10 helai baju T berwarna merah dan x helai baju T berwarna kuning. Jika sehelai baju T dipilih secara rawak dari kotak itu kebarangkalian mendapat Tshirt merah ialah $\frac{2}{5}$. *5 helai T shirt merah ditambah ke dalam kotak itu. Jika sehelai baju T dipilih secara rawak, apakah kebarangkalian mendapat baju T merah*

A. $\frac{1}{2}$

B $\frac{3}{5}$

C $\frac{7}{10}$

D $\frac{9}{10}$

36.

Monday	
Tuesday	□ □ □ □ □ □ □ □ □ □ □ □ □
Wednesday	□ □ □ □ □ □
Thursday	
Friday	

Key: □ represent 50 cupon

TABLE 2

Pictograph in Table 2 shows a number of cupon *COCO DAY* which had been sold in five days during a week. The number of cupon sold in Monday, Thursday and Friday is the same and the total amount of cupon sold in a week was 2400 pieces. If the information in pictograph above is drawn in pie chart, calculate the angle sector represented the cupon sold in Monday.

Piktograf dalam Jadual 2 menunjukkan bilangan kupon HARI KOKO yang terjual dalam masa lima hari persekolahan dalam suatu minggu tertentu. Bilangan kupon yang terjual pada hari Isnin, Khamis dan Jumaat adalah sama. Jumlah kupon terjual seminggu ialah 2400 keping. Jika maklumat dalam piktograf di atas diwakili oleh sebuah carta pai, kira sudut sektor yang mewakili bilangan kupon terjual pada hari Isnin.

A 72^o

B 75^o

C 225^o

D 135^o

37

Markah	5	10	15	20	25
Bilangan Pelajar	11	8	12	20	*9*

TABLE 3

Table 3 shows score attained by a group of students in certain activities during 'SCIENCE AND MATHEMATICS WEEK'. Find the difference between score mod and score median.

Jadual 3 menunjukkan skor yang diperolehi oleh sekumpulan pelajar dalam satu aktiviti ` MINGGU SAINS DAN MATEMATIK'.Carikan beza di antara skor mod dengan skor median?

A 5

B 8

C 10

D 15

38. It is given that M varies directly with the $\sqrt{N}$ and M = 8 when N = 9.
Express M in term of N.
Diberi bahawa M berubah langsung dengan $\sqrt{N}$ dan M = 8 apabila N = 9.
Ungkapkan M dalam sebutan N.

A. $M = \frac{3}{8}\sqrt{N}$

B. $M = \frac{8}{9}\sqrt{N}$

C. $M = \frac{8}{3}\sqrt{N}$

D. $M = \frac{9}{8}\sqrt{N}$

39. Given that $\begin{pmatrix} 2 & x \end{pmatrix}\begin{pmatrix} 3 \\ -5 \end{pmatrix} = (x+3)$, find the value of x

Diberi bahawa $\begin{pmatrix} 2 & x \end{pmatrix}\begin{pmatrix} 3 \\ -5 \end{pmatrix} = (x+3)$, carikan nilai x

A. $\frac{1}{2}$

B. $\frac{9}{-2}$

C. -2

D. 2

40. $3\begin{pmatrix}-1\\3\end{pmatrix}-\frac{1}{2}\begin{pmatrix}-4\\6\end{pmatrix}=$.

A. $\begin{pmatrix}-5\\6\end{pmatrix}$

B. $\begin{pmatrix}-1\\12\end{pmatrix}$

C. $\begin{pmatrix}-1\\6\end{pmatrix}$

D. $\begin{pmatrix}-5\\12\end{pmatrix}$

END OF QUESTION PAPER

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

LIST OF FORMULAE

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. Mid point $(x, y) = \left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2}\right)$
9. Average Speed $= \frac{dis\tan ce}{time}$
10. Mean $= \frac{\text{sum of data}}{\text{number of data}}$
11. Mean $= \frac{\text{Sum(class midpoint} \times \text{frequency)}}{\text{Total frequency}}$
12. Pythagoras Theorem
    $c^2 = a^2 + b^2$
13. $m = \frac{y_2 - y_1}{x_2 - x_1}$
14. m = $-\frac{\text{y - intersect}}{\text{x - intersect}}$

Shape and Space

1. Area of Trapezium
   $= \frac{1}{2} \times sum$ of parallel sides × height
2. Circumference of a circle = πd = 2πj
3. Area of Circle = πj^2
4. Curved surface area of cylinder
   = 2πjt
5. Surface area of sphere = $4\pi j^2$
6. Volume of right prism =
   cross sectional area × length
7. Volume of cylinder = $\pi r^2 h$
8. Volume of Cone = $\frac{1}{3}\pi r^2 h$
9. Volume of sphere = $\frac{4}{3}\pi r^3$
10. Volume of right pyramid
    $= \frac{1}{3} \times$ base area × height
11. Sum of interior angles of a poligon
    = (n - 2) × 180^o
12. $\frac{\text{area of sector}}{\text{area of circle}} = \frac{\text{angle substanded at centre}}{360^0}$
13. $\frac{\text{arc length}}{\text{circumference of circle}} = \frac{\text{angle substanded at centre}}{360^0}$
14. Scale factor , k = $\frac{PA'}{PA}$
15. Area of image = k^2 × area of object.

SECTION A
[52 marks]

Answer **all** questions in this section.

1. Solve the equation $(x + 4) (x - 4) = 6x$

Selesaikan persamaan $(x + 4) (x - 4) = 6x$

[4 marks]

Answer :

2. Calculate the value of h and k that satisfy the following simultaneous linear equations.

$$4h - 3k = -4 \text{ and } h + \frac{1}{2}k = 4$$

Hitungkan nilai h dan nilai k yang memuaskan kedua-dua persamaan berikut:

$$4h - 3k = -4 \text{ dan } h + \frac{1}{2}k = 4$$

[4 marks]

Answer :

3. Diagram 1 the graph provided, shade the region which satisfies the three inequalities $y \geq -x$, $2y \geq x$ and $y < 4$

Pada graf yang disediakan, lorekkan rantau yang memuaskan ketiga-tiga ketaksamaan $y \geq -x$, $2y \geq x$ *dan* $y < 4$

[3 marks]

Answer :

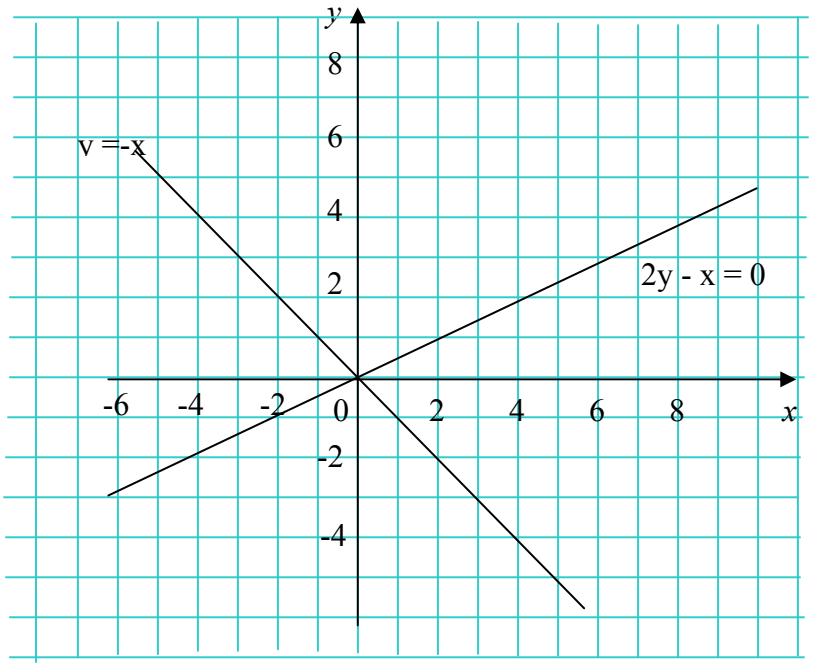


DIAGRAM 1

4.

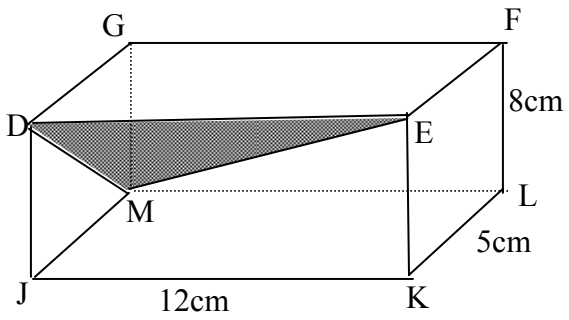


DIAGRAM 2

Diagram 2 shows a cuboid with horizontal square base JKLM. Identify and calculate the angle between the plane DEM and DEFG

Rajah 3 menunjukkan sebuah kuboid dengan tapak segiempat tepat JKLM Mengufuk. Kenalpasti dan hitungkan sudut antara satah DEM dengan DEFG.

[4 marks]

Answer:

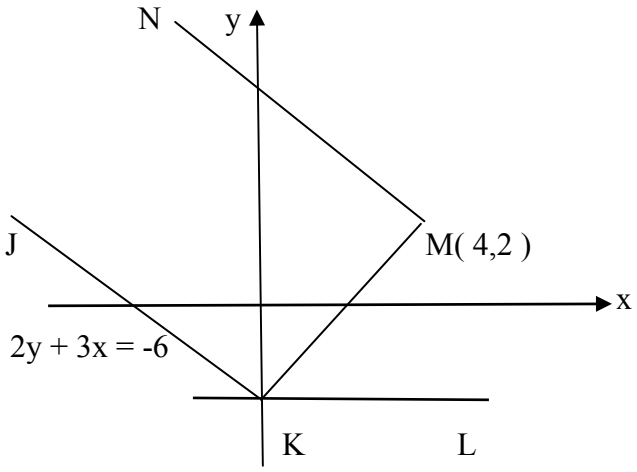


DIAGRAM 3

5. In Diagram 3, straight line JK is parallel to straight line MN. It is given the equation of the straight line JK is $2y + 3x = -6$. Straight line KL is parallel to the x- axis.

Dalam Rajah 3, Garis JK dan garis MN adalah selari. Diberi persamaan garis JK ialah $2y + 3x = -6$ dan garis KL adalah selari dengan paksi –x.

(a) Find the equation of the straight line KL
Cari persamaan garis KL

(b) Find the equation of the straight line MN
Cari persamaan garis MN

(c) x-intercept of the straight line KM
Pintasan - x bagi garis KM

[6 marks]

Answer:

(a)

(b)

(c)

6.. Diagram 4 shows a solid formed by joining right prism and right pyramids
Right angle triangle PST is the uniform cross section of the right prism.
PQRS is a square and the height of the pyramid is 7 cm.
Calculate the volume in cm^3 of the solid [4 marks]

Rajah 4 menunjukkan sebuah pepejal yang dibentuk daripada cantuman sebuah prisma tegak dan sebuah pyramid tegak.
Segitiga bersudut tegak PST ialah keratan rentas seragam prisma itu.
PQRS ialah segiempat sama dan tinggi pyramid itu ialah 7 cm.
Hitungkan isipadu , dalam cm^3 , pepejal itu.

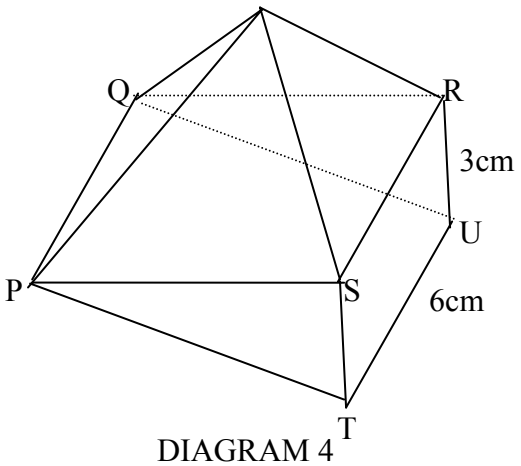


DIAGRAM 4

Answer:

7. In Diagram 5 , PQ is an arc of a circle with centre O . OJKL is an arc of a circle with centre M. OMKQ is a straight line.
Given OP = 21 cm and OM = 7 cm
Using $\pi = \frac{22}{7}$, calculate

Dalam rajah 5 , PQ ialah lengkok bulatan berpusat O dan OJKL ialah lengkok bulatan berpusat M. OMKQ ialah garis lurus. Diberi OP = 21 cm dan OM = 7 cm.
Dengan menggunakan $\pi = \frac{22}{7}$, *hitungkan*

(a) the area, in cm^2, of the shaded region
luas, dalam cm^2, *kawasan yang berlorek*

(b) the perimeter, in cm, of the whole figure
perimeter, dalam cm. seluruh rajah itu. [7 marks]

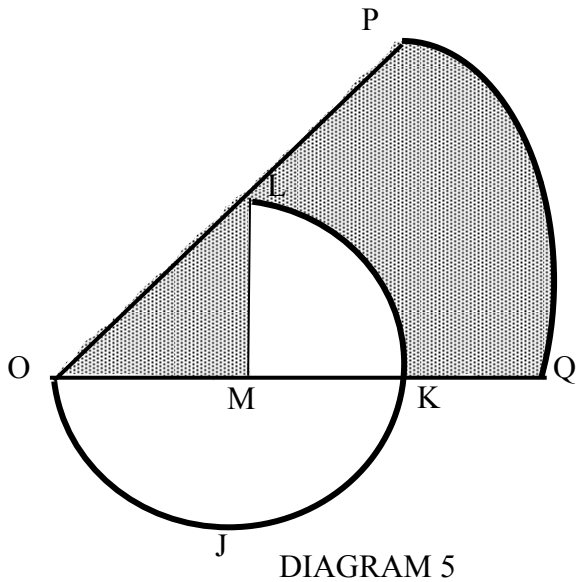


DIAGRAM 5

Answer:

(a)

(b)

8.

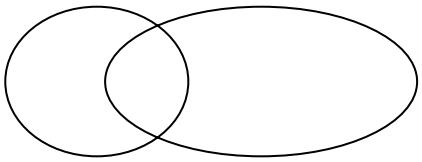


DIAGRAM 6

(i) Based Diagram 6, complete the statement below by using quantifier "all" or some" to form a true statement.

" …… elements in set K are elements in set J".

(j) By using the quantifier "all" or "some", complete the statement below to form a true statement.

" …….. the regular polygons are equal in length".

(k) Write down two implications based on the following statements.

The area of square is 25 cm^2 if and only if its sides are 5 cm.

Implication 1 : ……
Implication 2 : ……

(l) Complete the premise in the following argument.

Premise 1 : If one number is a factor of 8, then that number is a factor of 32.
Premise 2 : 6 is not a factor of 32.
Conclusion : …….

[6 marks]

Answer:

(e) ……..

(f) ……..

(g) Implication 1 : ……

Implication 2 : ……

(h) Conclusion : ……..

9. 1 card is drawn from each box at random as shown in Diagram 7

BOX P BOX Q

DIAGRAM 7

(a) List all the possible outcomes

(b) By listing the outcomes, find the probability of the following events

i) a consonant and an even number
ii) the letter M or an odd number

[5 marks]

Answer :

(a)

(b)

(i)

(ii)

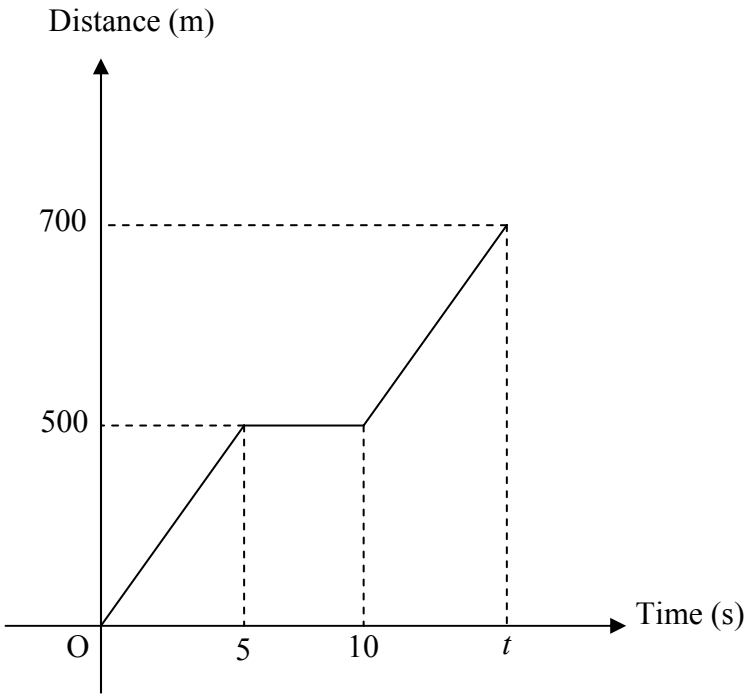


DIAGRAM 8

10. Diagram 8 shows the distance-time graph of a particle for a period of t s.

(g) State the time in which the particle is stationary.
(h) Find the average speed, in ms^{-1}, in the first 10 seconds.
(i) Calculate the value of t, if the average speed for the whole journey is 35 ms^{-1}.
[6 marks]

Answer

(a)

(b)

(c)

11. Given that $\frac{1}{k}\begin{pmatrix} 3 & 1 \\ r & 1 \end{pmatrix}$ is an inverse matrix of $\begin{pmatrix} 1 & -1 \\ 2 & 3 \end{pmatrix}$

Diberi bahawa $\frac{1}{k}\begin{pmatrix} 3 & 1 \\ r & 1 \end{pmatrix}$ *ialah matriks songsang bagi* $\begin{pmatrix} 1 & -1 \\ 2 & 3 \end{pmatrix}$

(i) Find the value of r and k
Carikan nilai r dan k.

(ii) Hence,using matrices,calculate the values of x and y that satisfy the following simultaneous linear equations

$$x - y = 11$$
$$2x + 3y = 2$$ [6 marks]

Seterusnya dengan menggunakan kaedah matriks, hitungkan nilai x dan nilai y yang memuaskan persamaan linear serentak berikut:

$$x - y = 11$$
$$2x + 3y = 2$$

Answer:

(i)

(ii)

SECTION B
[48 marks]

Answer four questions in this section
*Jawab **empat** soalan daripada bahagian ini*

12. (a) Complete Table 1 for the equation $y = 5 + 4x - x^3$
Lengkapkan Jadual 1 berikut untuk nilai y bagi persamaan $y = 5 + 4x - x^3$

x	-3	-2.5	-2	0	1	2	2.5	3	3.5
y	20	10.6	P	5	8	5	-0.6	q	-23.9

Table 1

[2 marks]

Answer :

(a)

x	-2	3
y		

(b) Using a scale of 2 cm to 1 unit on the x-axis and 2 cm to 5 unit on the y-axis
Draw the graph of $y = x^3 + 3x - 12$ for $-3 \le x \le 3.5$. [4 marks]
Dengan menggunakan skala 2 cm kepada 1 unit pada paksi -x dan 2 cm kepada 10 unit pada paksi y, lukis graf $y = x^3 + 3x - 12$ bagi nilai x dalam julat $-3 \le x \le 3.5$.

(c) From the graph, find
Carikan dari graf anda,

(i) the value of y when x = 1.7
nilai y, apabila x = 1.7

(ii) the value of x when y = 6
nilai x apabila y = 6 [2marks]

Answer:

(i) y = ...

(ii) x = ...

(d) Draw a suitable straight line on your graph to find all the values of x which satisfy the equation $x^3 + 3x - 19 = 0$ for $-3 \leq x \leq 3.5$
State this value of x. [4 marks]

Lukiskan satu garis lurus yang sesuai pada graf anda untuk mencari nilai x dalam julat $-3 \leq x \leq 3.5$ yang memuaskan persamaan $x^3 + 3x - 19 = 0$. Nyatakan nilai x itu.

x = ...

13. (a) Transformation **P** represents a reflection at the line y = 2. Transformation **T** represents a translation $\begin{pmatrix} -2 \\ 3 \end{pmatrix}$. Transformation **R** represents a rotation of 90° in the anticlockwise direction about the point (6, 4).

State the coordinates of the image of point (3, 1) under the following transformation:

(iv) **P**,
(v) **TP**,
(vi) **RT**.

[4 marks]

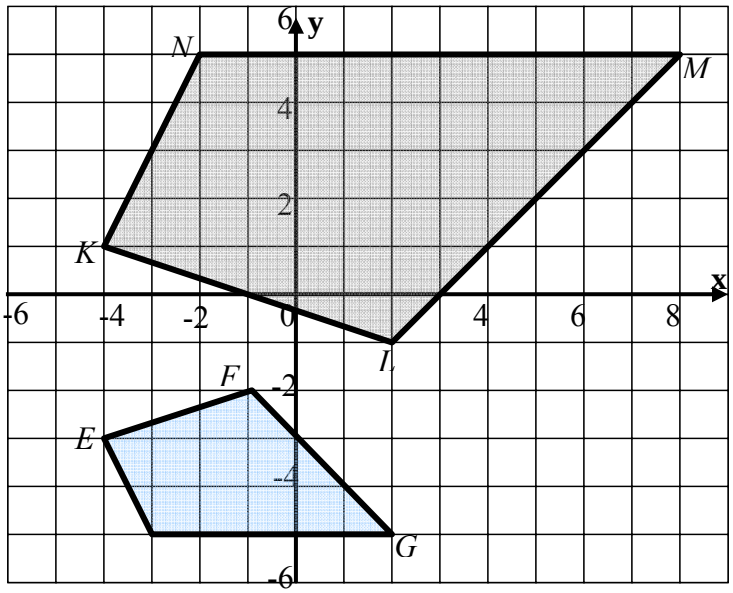


DIAGRAM 9

(c) In Diagram 9, quadrilateral KLMN is the image of quadrilateral EFGH under a transformation **V** followed by another transformation **W**. Describe in full

[5 marks]

(c) Given that quadrilateral KLMN represents an area of 104 unit^2, find the area represented by quadrilateral EFGH.

[3 marks]

14. The data in Diagram 10 shows the number of durian trees planted by 44 farmers.
Data di rajah 10 menunjukkan bilangan pokok durian yabg ditaman oleh 44 pekebun.

52	33	48	22	34	42	57	51	51	65	41
66	54	66	53	53	34	46	52	65	75	52
25	68	48	63	62	43	52	56	59	49	58
43	58	36	72	68	54	62	40	73	38	63

DIAGRAM 10

(a) (i) Based on the data in Diagram 10 and by using a class interval of 10, complete Table 2 provided in the answer space.
Berdasarkan data di rajah 10,dengan menggunakan selang kelas 10,lengkapkan Jadual 2 pada ruangan jawapan yang disediakan.

(ii) Hence, state the modal class. [6marks]
Seterusnya,,nyatakan kelas mod

Answer :

Class Interval	Upper Boundary	Frequency	Cumulative Frequency
11 – 20	20.5	0	0
21 – 30			

Table 2

(b) By using a scale of 2 cm to 10 trees on the x-axis and 2 cm to 5 farmers on the y-axis, draw an ogive for the data. [4marks]
Dengan menggunakan skala 2 cm kepada 10 pokok pada paksi – x dan 2 cm kepada 5 pekebun pada paksi – y,lukis satu ogif

(c) Based on the ogive in (b), Ahmad concludes that 50% of the farmers planted less than 52 durian trees.
Berdasarkan ogif di (b),Ahmad merumuskan bahawa 50% pekebun menanam kurang Dari 52 pokok durian.

Determine whether the conclusion is correct or not and give a reason.
Kenalpasti samada rumusan ini benar atau tidak dan berikan sebab.

[2marks]

15. (a) Diagram 11 shows a solid right prism with retangular base JKLM on a horizontal plane.The surface EJKHFG is the uniform cross section of the prism. Rectangle EGPQ is an incline plane and rectangle FHRS is a horizontal plane. EJ, GF and HK are vertical edges.

Rajah 11 menunjukkan sebuah pepejal berbentuk prisma tegak dengan tapak segiempat tepat JKLM terletak di atas meja meja mengufuk. Permukaan EJKHFG ialah keratan rentas seragamnya. Segiempat tepat EGPQ ialah satah condong. Segiempat tepat FHRS ialah satah mengufuk. Tepi EJ , GF dan HK adalah tegak.

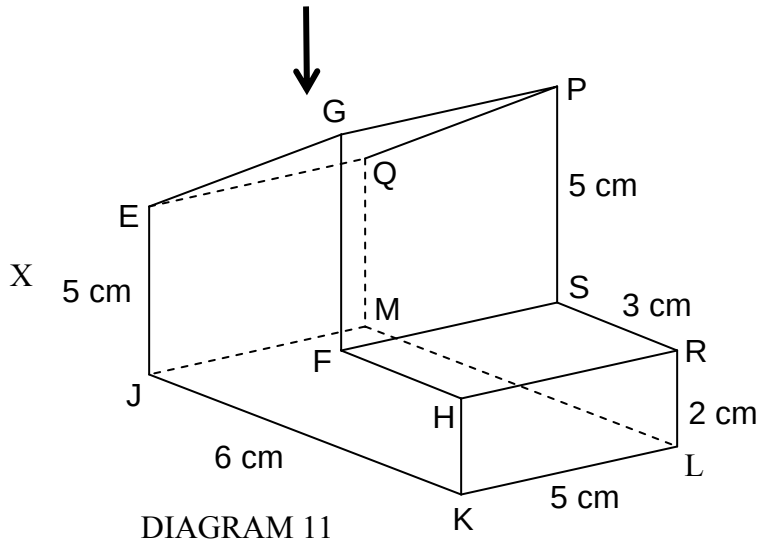


DIAGRAM 11

a) Draw to full scale, the plane of the solid [3 marks]

(b) A solid half cylinder is joined to the prism in Figure 9(ii) at the vertical Plane LRSPQM. The combined solid is as shown in Diagram 12 JKLVM is a horizontal plane.

Sebuah pepejal yang berbentuk separuh silinder dicantumkan kepada prisma dalam Rajah 11 pada satah LRSPQM untuk membentuk sebuah Pepejal gabungan seperti dalam Rajah 12 . JKLVM ialah satah mengufuk.

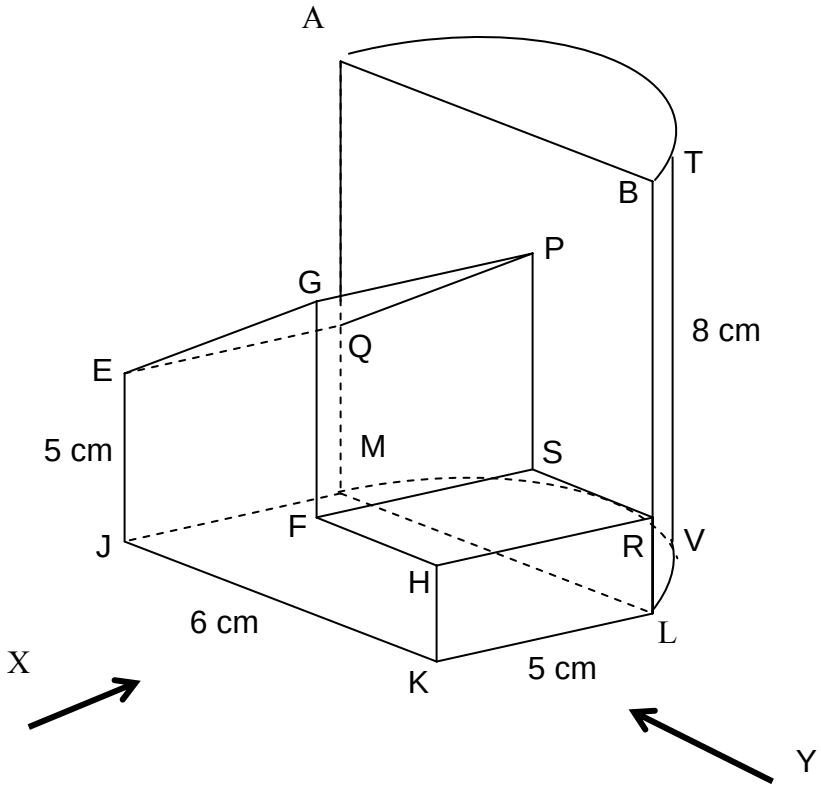


DIAGRAM 12

b) Draw to full scale
Lukiskan dengan skala penuh,

(i) The elevation of the combined solid on a vertical plane parallel To JK as viewed from X [4 marks]
Dongakan pepejal gabungan itu pada satah mencancang yang Selari dengan JK sebagaimana dilihat dari X

(ii) The elevation of the combined solid on a vertical plane parallel To KL as viewed from Y [5 marks]

Dongakan pepejal gabungan itu pada satah mencancang yang selari dengan KL sebagaimana dilihat dari Y

a) plane of the solid

b) (i) X

b (ii) Y

16. X(43° U,155° B) and Y are two points on the surface of the earth with XY is the diameter of common parallel of latitude.
X(43° U,155° B) dan Y ialah dua titik pada permukaan Bumi dengan keadaan XY ialah diameter selarian latitud sepunya.

(a) Find the longitude of Y [1 marks]
Cari longitud bagi titik Y.

(b) Given XZ is the diameter of earth. State the location of Y and Z
Hence, state the location of Z [2 marks]
Diberi XZ ialah diameter bumi. Pada rajah diruang jawapan, tandakan kedudukan titik Y dan Z. Seterusnya nyatakan kedudukan titik Z

(c) Calculate the shortest distance ,
in nautical miles from X to Y [3 marks]
Hitungkan jarak terpendek, dalam batu nautika, dari X ke P

(d) An aeroplane , took of from X and flew due west with an average speed of 650 knot. Given that the flight took 6 hours to reach P.
Calculate
Sebuah kapal terbang berlepas dari X dan terbang ke barat dengan purata laju 650 knot. Kapal terbang itu mengambil 6 jam untuk sampai ke P. Hitung

(i) the distance, in nautical miles between X and P
jarak, dalam batu nautika, dari X ke Y.

(ii) The longitude of P [6 marks]
longitud bagi P

Answer :

(a)

(b)

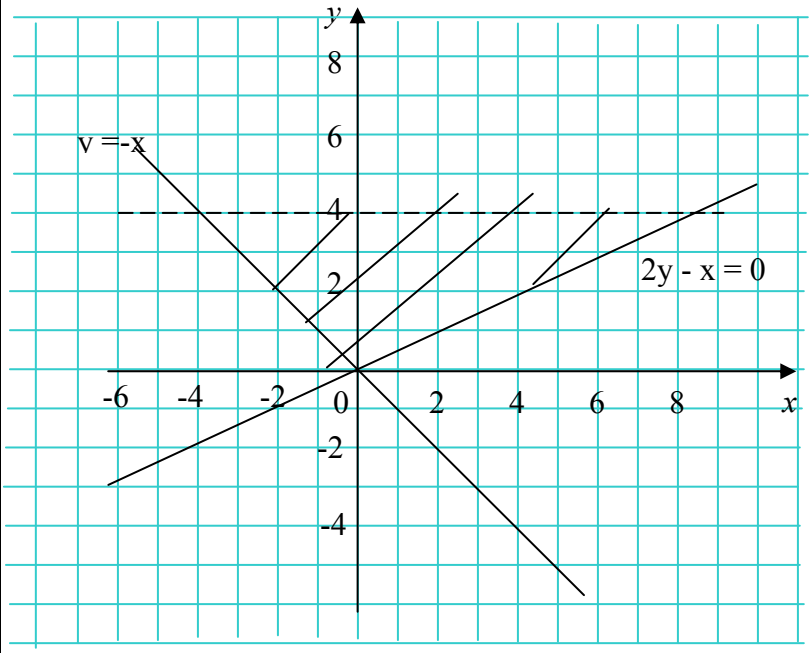
:

(c)

(d) (i)

(ii)

No	Peraturan Pemarkahan	Markah	
1	$x^2 - 6x - 16 = 0$	1M	
	$(x - 8)(x + 2) = 0$	1M	
	$x = 8$	1M	
	$x = -2$	1M	**4**
2	$4h + 2k = 16$ atau $6h + 3k = 24$	1M	
	$5k = 20$ atau $10h = 20$	1M	
	ATAU $h = -1/2k + 4$ atau $k = \frac{4h+4}{3}$ atau setara (1M) $5k=20$ atau $5h=10$ atau setara (1M)		
	ATAU $\begin{pmatrix} 4 & -3 \\ 1 & \frac{1}{2} \end{pmatrix}\begin{pmatrix} h \\ k \end{pmatrix} = \begin{pmatrix} -4 \\ 4 \end{pmatrix}$ (1M) $\begin{pmatrix} h \\ k \end{pmatrix} = \frac{1}{4(\frac{1}{2}) - 1(-3)}\begin{pmatrix} \frac{1}{2} & 3 \\ -1 & 4 \end{pmatrix}\begin{pmatrix} -4 \\ 4 \end{pmatrix}$ (1M)		
	$h = 2$	1M	
	$k = 4$	1M	**4**

3	3  Garis y=4 Rantau betul	 1M 2M	 3
4	Identify ∠GDM tan ∠GDM = $\frac{8}{5}$ atau setara 57.99^{o} atau $57^{o}\,59'$	1M 2M 1M	 **4**
5	(a) y=-3 (b) $2=\frac{-3}{4}(4)+c$ $y=\frac{-3}{4}x+8$ (c) $0=\frac{5}{4}x-3$ $x=\frac{12}{5}$ atau 2.4	1 M 2 M 1M 1M 1M	 **6**

6	Volume of Prism $= \frac{1}{2}$ x 6 x 3 x 6	1M	
	Volume of Pyramids $= \frac{1}{3}$ x 6 x 6 x 7	1M	
	Volume of solid $= \frac{1}{2}$ x 6 x 3 x 6 + $\frac{1}{3}$ x 6 x 6 x 7	1M	
	$= 180$	1M	**4**
7	(a) $\frac{45}{360} \times \frac{22}{7} \times 21^2$ *atau* $\frac{90}{360} \times \frac{22}{7} \times 7^2$	1M	
	$\frac{45}{360} \times \frac{22}{7} \times 21^2 - \frac{90}{360} \times \frac{22}{7} \times 7^2$	1M	
	$= 134\frac{3}{4}$	1M	
	(b) $\frac{45}{360} \times 2 \times \frac{22}{7} \times 21$ *atau* $\frac{180}{360} \times 2 \times \frac{22}{7} \times 7$	1M	
	$\frac{45}{360} \times 2 \times \frac{22}{7} \times 21 + \frac{180}{360} \times 2 \times \frac{22}{7} \times 7 + 21 + 7$	1M	
	$= 66\frac{1}{2}$	1M	**6**
8	(a) All	1M	
	(b) All	1M	
	(c) If the area of square is 25 cm^2, then its sides are 5 cm	1M	
	If its sides are 5 cm, then the area of square is 25 cm^2	1M	
	(d) 6 is not a factor of 8	2M	**6**

9	(a){(M,1),(M,2),(M,3),(A,1),(A,2),(A,3),(T,1),(T,2),(T,3),(H,1),(H,2),(H,3)} (b) (i) {(M,2),(T,2),(H,2))} $\frac{3}{12}$ atau $\frac{1}{4}$ (ii) {(M,1),(M,2),(M,3),(A,1),(A,3),(T,1),,(T,3),(H,1),(H,3)} $\frac{9}{12}$ atau $\frac{3}{4}$	1M 1M 1M 1M 1M	**5**
10	(a) 5 (b) $\frac{500}{10}$ $50\ ms^{-1}$ (c) $\frac{700}{35}$ 20 s	1M 1M 1M 2M 1M	**5**
11	(a) $k = 5$ $r = -2$ (b) $\begin{pmatrix}1 & -1\\2 & 3\end{pmatrix}\begin{pmatrix}x\\y\end{pmatrix}=\begin{pmatrix}11\\2\end{pmatrix}$ $\begin{pmatrix}x\\y\end{pmatrix}=\frac{1}{3(1)-2(-1)}\begin{pmatrix}3 & 1\\-2 & 1\end{pmatrix}\begin{pmatrix}11\\2\end{pmatrix}$ atau $\begin{pmatrix}x\\y\end{pmatrix}=\begin{pmatrix}matriks\\songsang\end{pmatrix}\begin{pmatrix}11\\2\end{pmatrix}$ $x = 7$ $y = -4$	1M 1M 1M 1M 1M 1M	**6**

BAHAGIAN B

12	(a) p = 5 q = - 10 Nota: Jika (a) tidak dijawab, berikan markah pada jadual atau jika titik-titik ditanda tepat pada graf atau lengkung melalui titik-titik itu. (b) *Graf* Paksi-paksi dilukis dengan arah yang betul dan skala seragam digunakan dalam $-3 \le x \le 3.5$ dan $-23.9 \le y \le 20$. 7 titik dan 2 titik* diplot dengan betul (7 atau 8 titik diplot dengan betul dapat 1 markah) Lengkung licin dan berterusan tanpa bahagian garis lurus dan melalui semua 9 titik yang betul.bagi $-3 \le x \le 3.5$. (c) (i) $6.5 \le x \le 7.3$ (ii) $0.2 \le x \le 0.3$ dan $1.8 \le x \le 1.9$ (d) Kenal pasti persamaan $y = 7x - 14$ Garis lurus $y = 7x - 14$ dilukis betul dan bersilang dengan lengkung $2 \le x \le 2.5$	1M 1M 1M 2M 1M 1M 1M 1M 1M 1M 1M	2 4 3 3 **12**
13	Answer: 13(a) (i) (3,3) (ii) (1,6) (iii) (6,-1) (b) (i) V= Reflection at the line y = -1 (ii) W = Enlargement with centre at F(-4,1) and a scale factor of 2 (iii) Area of KLMN = 2^2 x Area of EFGH Area of EFGH= $\frac{104}{4}$ Area of EFGH= 26 square units..	1M 2M 2M 2M 3M 1M 1M	

14 (a)

	Class Interval	Upper Boundary	Frequency	Cumulative Frequency
I	**11 - 20**	**20.5**	**0**	0
II	**21 - 30**	30.5	2	2
III	31 - 40	40.5	6	8
IV	41 - 50	50.5	8	16
V	51 - 60	60.5	15	31
VI	61 - 70	70.5	10	41
VII	71 - 80	80.5	3	44
VIII				

Selang kelas : (III hingga VIII) betul — 1M
Sempadan Atas : (II hingga VIII) betul — 1M
Titik tengah : (II hingga VIII) betul — 1M
Kekerapan : (II hingga VIII) betul — 1M
Kekerapan longgokan : (I hingga VIII) betul — 1M
1M — 6

modal class : 51 - 60

(b) Ogif

Paksi-paksi dilukis dengan arah yang betul, skala seragam bagi $20.5 \leq x \leq 80.5$ dan $0 \leq y \leq 44$, dan paksi-x dilabel menggunakan sempadan atas. — 2M

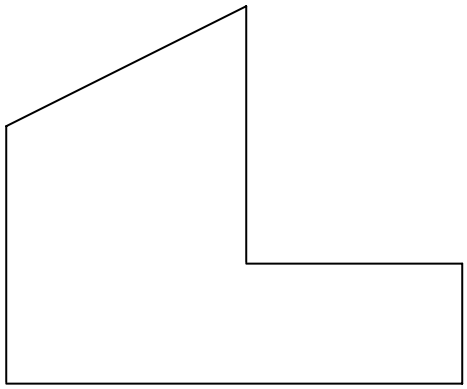
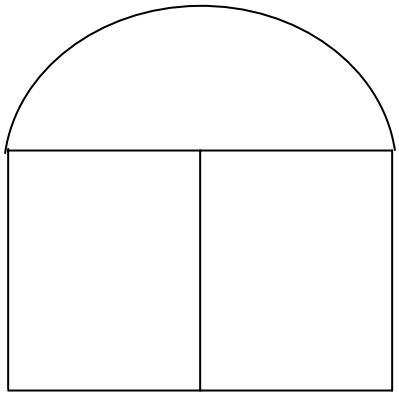
Plot 6 titik* yang betul.
5 atau 6 titik* betul dapat 1M. — 1M

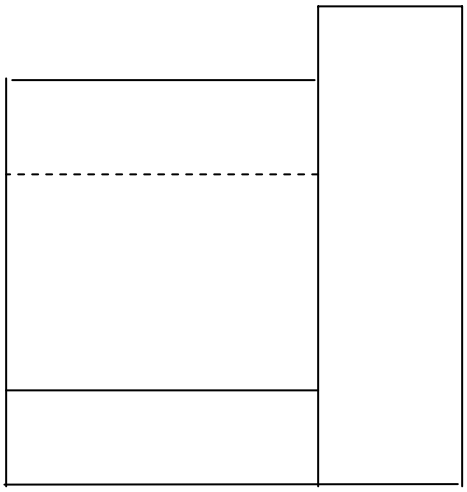
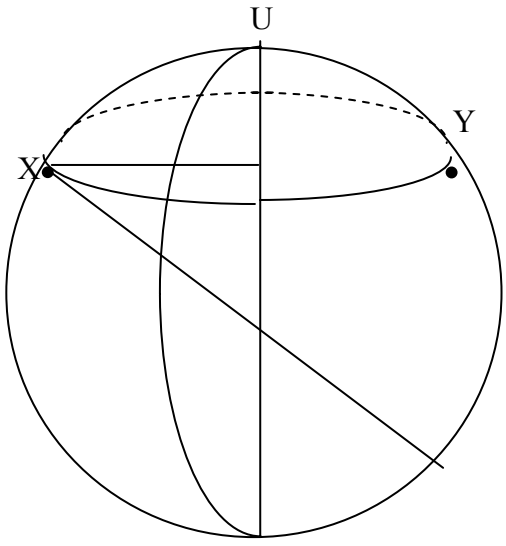
(20.5, 0) ditanda pada graf. — 1M — 4

Lengkung licin dan berterusan tanpa bahagian garis lurus dan melalui semua 8 titik yang betul.bagi $20.5 \leq x \leq 80.5$. — 2M — 2

(c) Rumusan tidak benar.
Sebab: 50% pekebun menanam kurang dari 53.5 pokok durian.

12

15	(a)  Bentuk kelihatan betul dengan, semua garis penuh. Ukuran betul sehingga ± 0.2 cm (sehala) dan sudut disemua bucu segiempat tepat= $90^o \pm 1^o$	1M 1M 1M	3
	(b) (i) **Dongakan dari X**  Bentuk kelihatan betul dengan heksagon *MPQRSHGJ*, segiempat tepat *MPGJ*, *PQRS* dan segitiga *GSH* ,semua garis penuh. QR > RH, RS = SH = MJ > GJ Ukuran betul sehingga ± 0.2 cm sehala dan sudut disemua bucu segiempat tepat = $90^o \pm 1^o$	1M 1M 2M	4

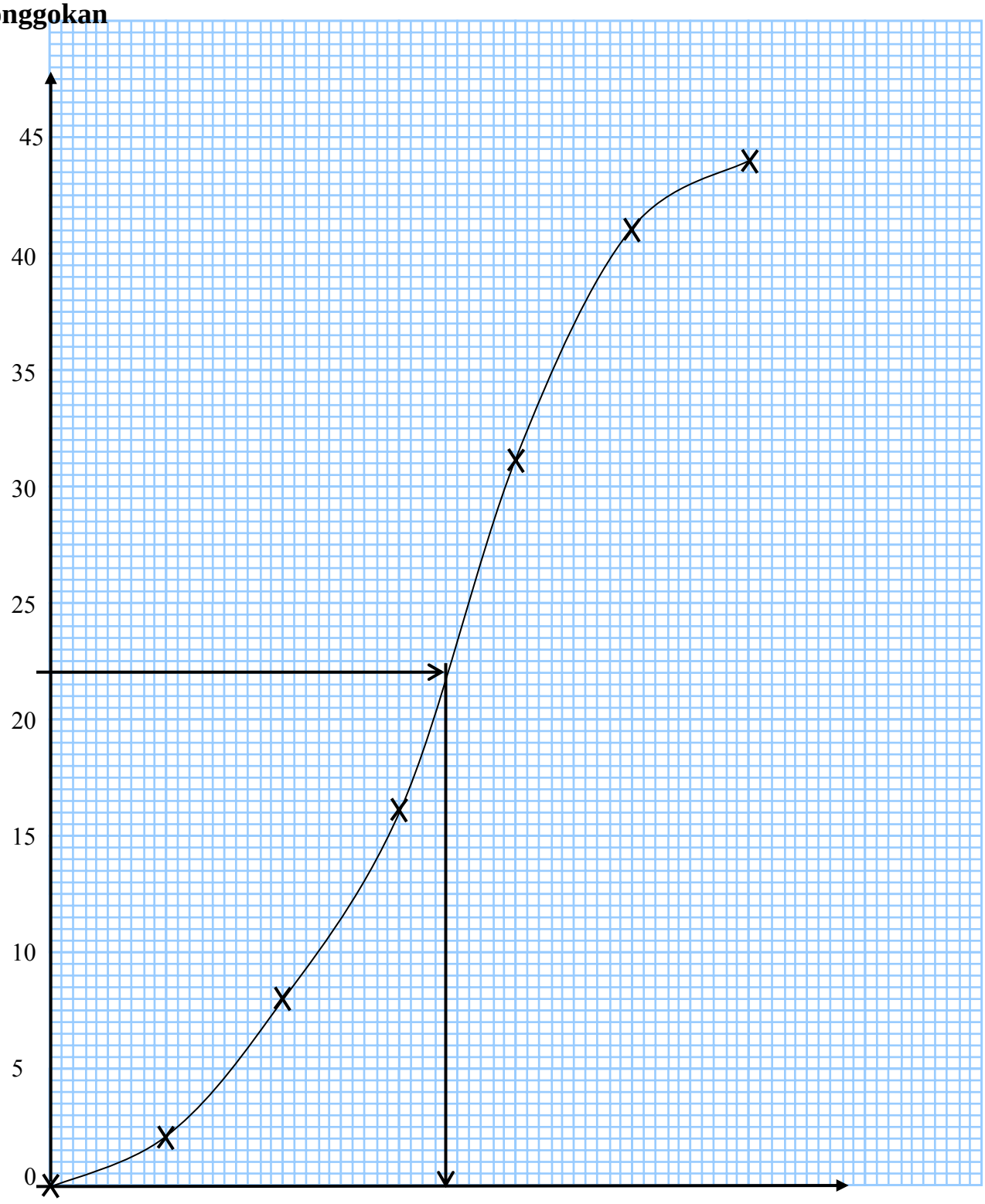
	(ii) **Dongakan dari Y**  Bentuk kelihatan betul dengan segiempat tepat semua garis penuh. disambung dengan garis putus-putus. EA > AB > BP > PM >MH Ukuran betul sehingga ± 0.2 cm sehala dan sudut disemua bucu segiempat tepat = $90^o \pm 1^o$	1M 1M 1M 2M	5 **12**
16	(a) (i) 25° T (b) (43^o S, 25^o T) (c) 94 x 60 = 5640 (d) Jarak = 650 x 6 = 3900 3900 = θ x 60 kos 43 $\theta = \frac{3900}{60kos43} = 88.87°$ Long D = 63.87° T  **PERATURAN PEMARKAHAN TAMAT**	P1 P1 P1 K1 N1 K1 M1 P1 K1 K1 N1	4 8 **12**

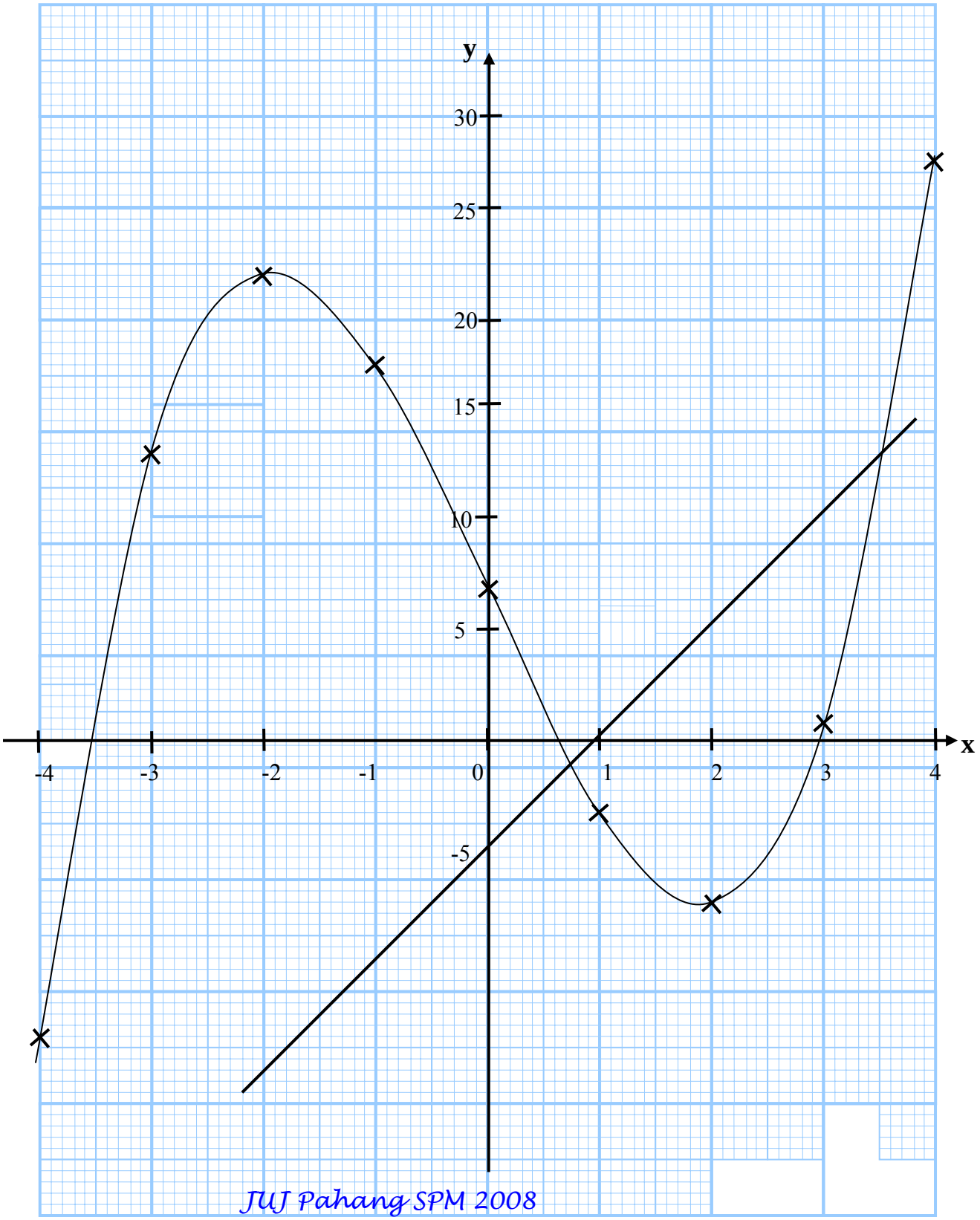
SCHEME OF MARKING PRAKTIS BESTARI

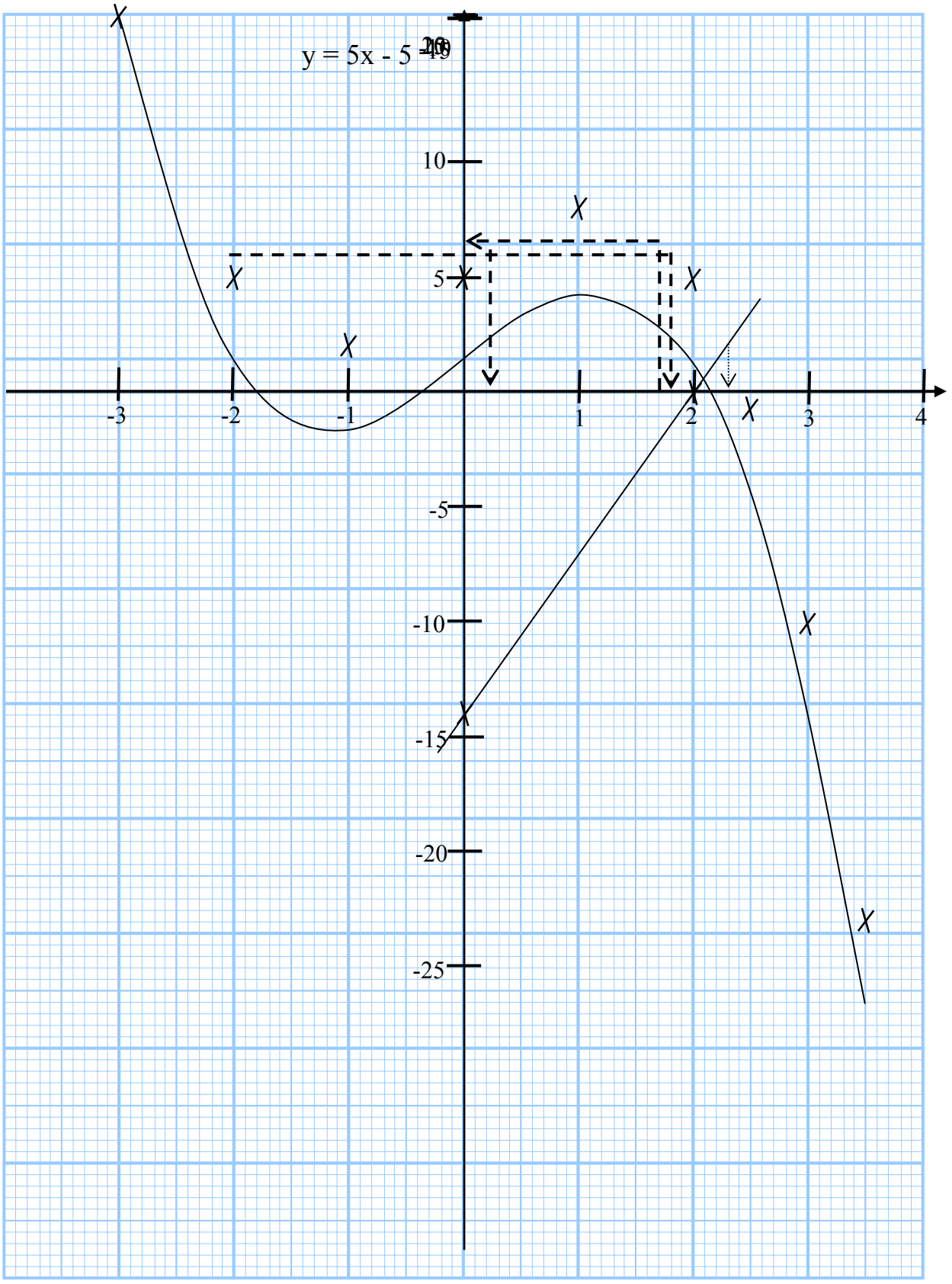
PAPER 1 SET 2

NO. OF QUESTION	ANSWER	NO. OF QUESTION	ANSWER	NO. OF QUESTION	ANSWER	NO. OF QUESTION	ANSWER
1	D	11	A	21	D	31	A
2	D	12	B	22	B	32	D
3	D	13	B	23	C	33	A
4	A	14	B	24	D	34	A
5	A	15	D	25	C	35	A
6	D	16	D	26	D	36	B
7	B	17	A	27	D	37	A
8	B	18	D	28	A	38	C
9	C	19	A	29	D	39	A
10	B	20	D	30	B	40	C

Kekerapan
Longgokan




y
30
25
20
15
10
5
-5
x
-4
-3
-2
-1
0
1
2
3
4


y = 5x - 5
10
5
-5
-10
-15
-20
-25
-3
-2
-1
1
2
3
4

Lines and Planes in 3-Dimensions

1. Diagram 1 shows a cuboids.

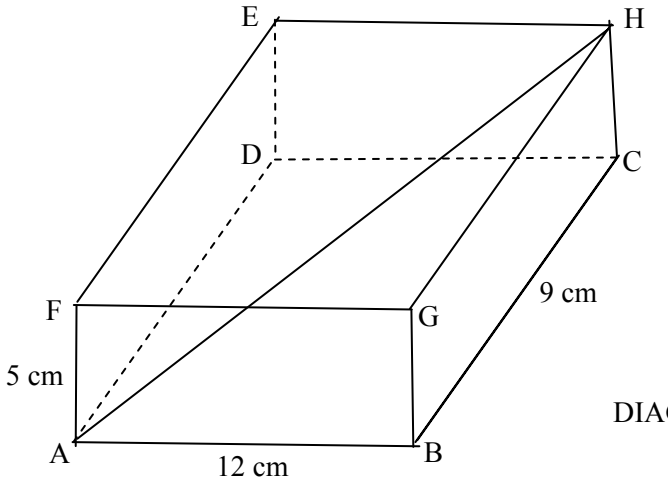


DIAGRAM 1

Calculate the angle between the line AH and the plane ABCD. [4 marks]

2. Diagram 2 shows a pyramid VJKLM.

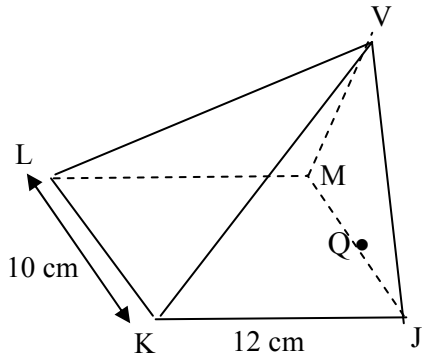


DIAGRAM 2

The base JKLM is a horizontal rectangle. Q is the midpoint of JM. The apex V is 8 cm vertically above the point Q.
Calculate the angle between the line KV and the base JKLM. [4 marks]

3. Diagram 3 shows a right prism with rectangle ABCD as its horizontal base. Right angled triangle FAB is the uniform cross-section of the prism. The rectangular surface BCEF is inclined.

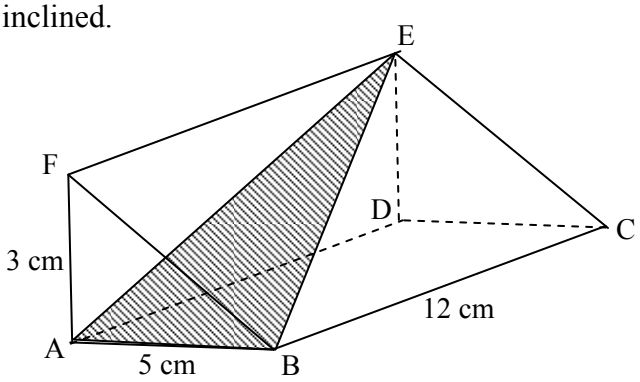


DIAGRAM 3

Calculate the angle between the plane ABE and the base ABCD. [3 marks]

4. Diagram 4 shows a right prism. Right angle triangle PQR is the uniform cross-section of the prism.

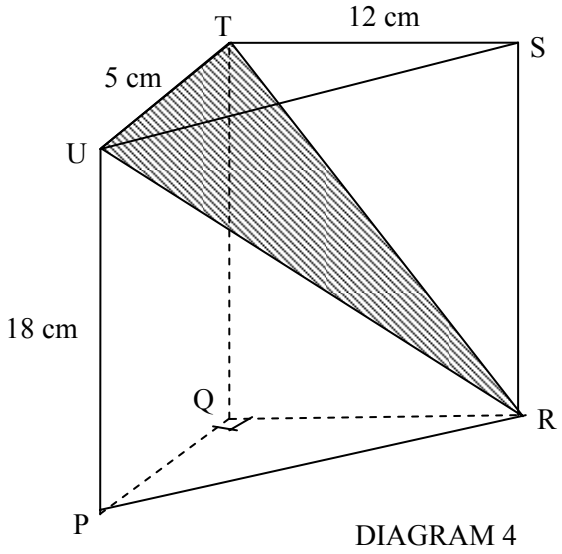


DIAGRAM 4

Calculate the angle between the plane RTU and the plane PQTU. [4 marks]

5. Diagram 5 shows a right prism. The base HJKL is a horizontal rectangle. The right angle triangle NHJ is the uniform cross-section of the prism.

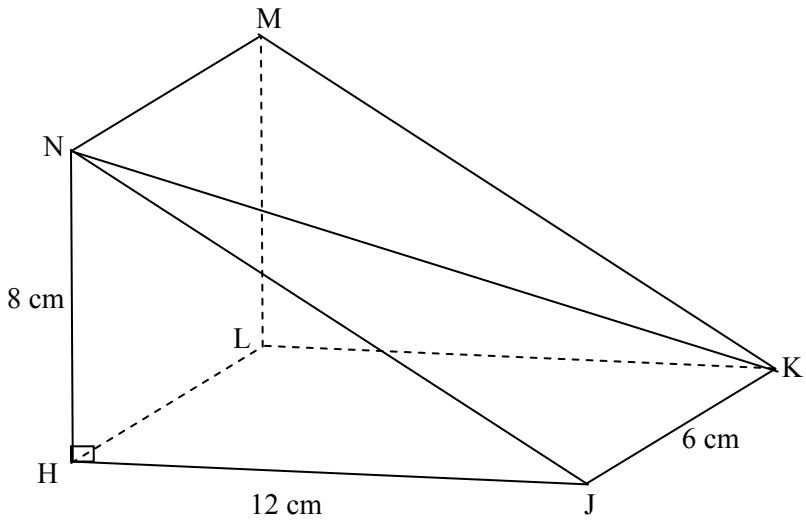


DIAGRAM 5

Identify and calculate the angle between the line KN and the plane HLMN
[4 marks]

6. Diagram 6 shows a right prism. The base PQRS is on horizontal rectangle. The right triangle UPQ is the uniform cross section of the prism.

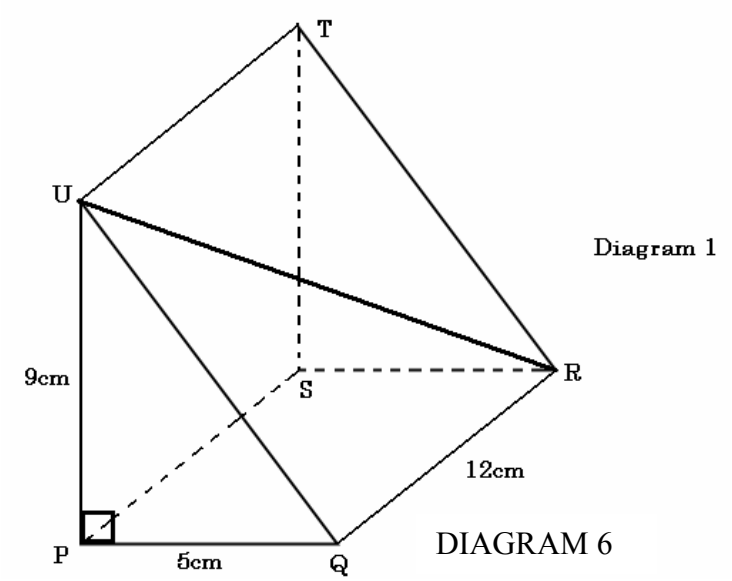


DIAGRAM 6

Identify and calculate the angle between the line RU and the base PQRS [4 marks]

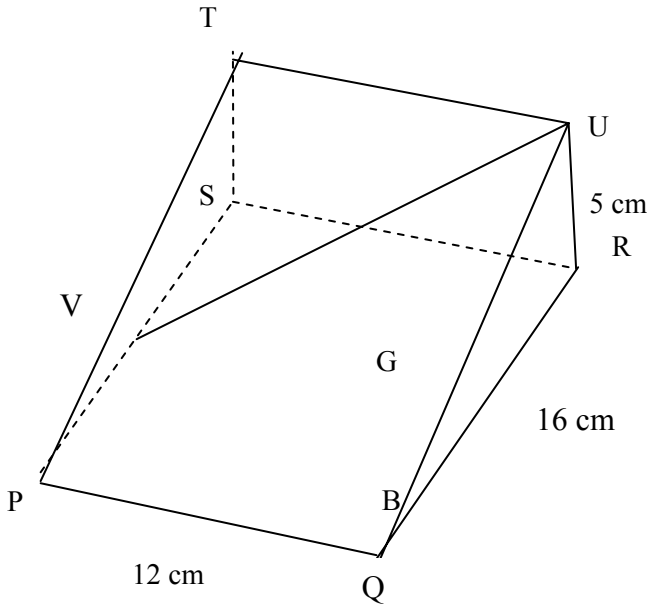


DIAGRAM 7

7. Diagram 7 shows a right prism. The base PQRS is a horizontal retangle. Right angle triangle QRU is the uniform cross-section of the prism. V is the point of PS. Identify and calculate the angle between the line UV and the plane RSTU [3 marks]

PROBABILITY

1. Diagram 1 shows ten labelled cards which are placed in an empty box.

M	A	T	H	E	M	A	T	I	C

Diagram 1

(a) If a card is chosen at random from the box, calculate the probability that the card labelled 'M' is chosen.
(b) If two cards are chosen at random from the box, calculate the probability that the first card labelled 'A' and the second card labelled 'C' are chosen.

2. A box contains 6 green marbles, 4 blue marbles and 5 red marbles. A marble is picked at random. Without replacing the first marble, another marble is taken from the box. Calculate the probability that
(a) the first marble is green and the second marble is red
(b) two marbles are the same colour.

3. Table 1 shows the probabilities that Ikmal and Ariff will join the Mathematics Society or Science Society.

Students	The probability of joining the	
	Mathematics Society	Science Society
Ikmal	$\frac{2}{3}$	$\frac{1}{6}$
Ariff	$\frac{3}{10}$	$\frac{2}{5}$

Table 1

Calculate the probability that
(a) Ikmal and Ariff will join the Mathematics Society
(b) One of them joins the Mathematics Society and the other Science Society

4. A box contains 3 red cards, 4 blue cards and 2 green cards. Two cards are chosen at one after another randomly from the box without replacement. Calculate the probability that
(a) both the cards are green
(b) at least one red card is choosen

5. Table 2 shows the probabilities of Atiqah and Sarah revising their lesson during the weekend. The table is incomplete.

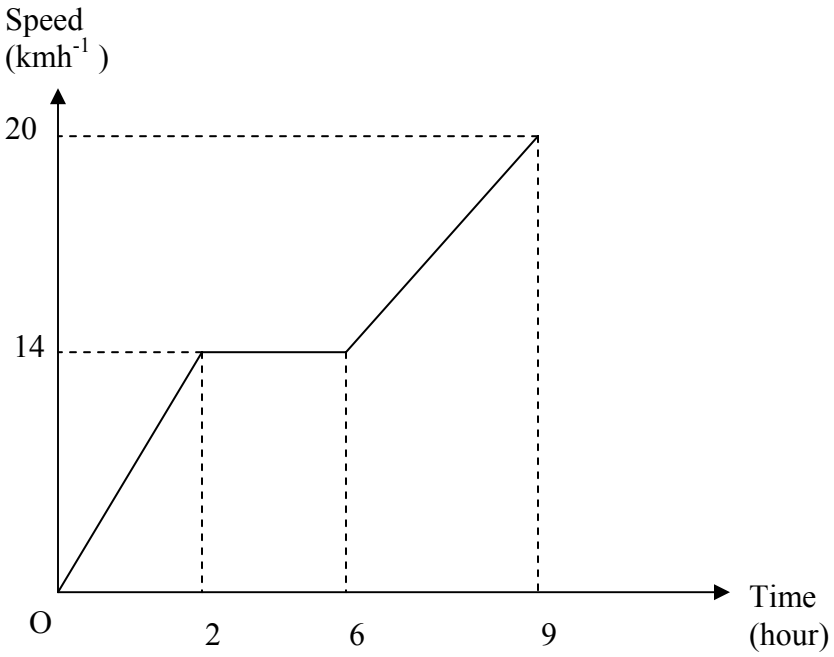
Students	Probability of revising		
	Chemistry	Biology	Physics
Atiqah	$\frac{4}{7}$	$\frac{1}{5}$	
Sarah	$\frac{1}{6}$		$\frac{3}{8}$

Table 2

Calculate the probability that
(a) Atiqah revises Physics and Sarah revises Biology.
(b) Atiqah and Sarah revise the same subject.

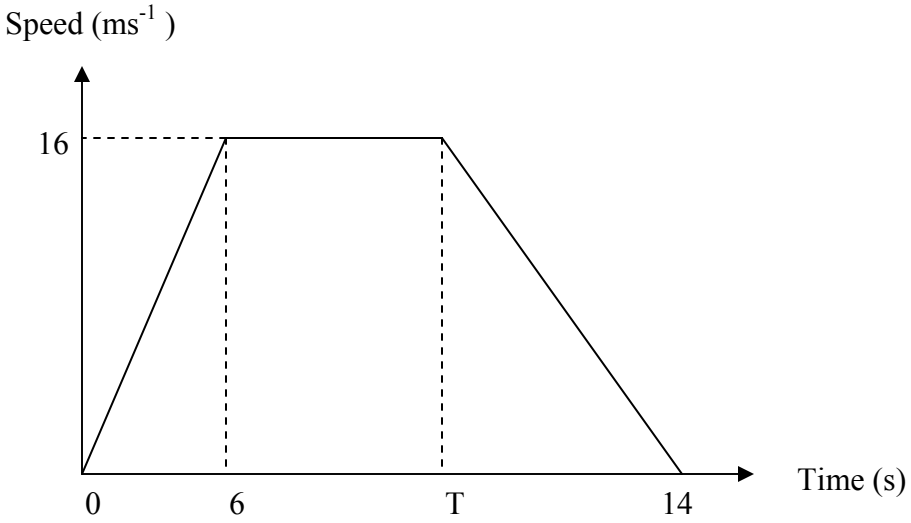
GRADIENT AND AREA UNDER A GRAPH

1. The diagram shows the distance – time graph of a car for a period of 9 hours.



(a) State the length of time, in hour, that the car is stationary.
(b) Calculate the rate of change of speed in kmh^{-1} of the car in the first 2 hours.
(c) The total distance traveled by the car in 9 hours.

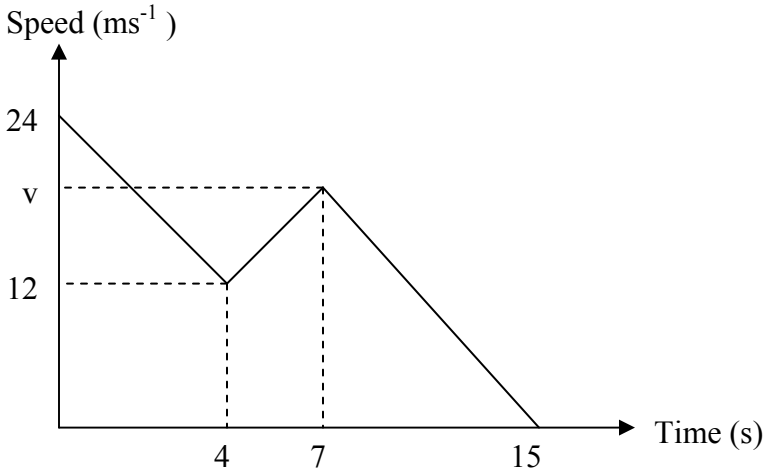
2.



The diagram shows the speed-time graph of a particle for a period of 14s.
(a) Calculate the rate of change of speed, in ms^{-1}, in the first 6 s.

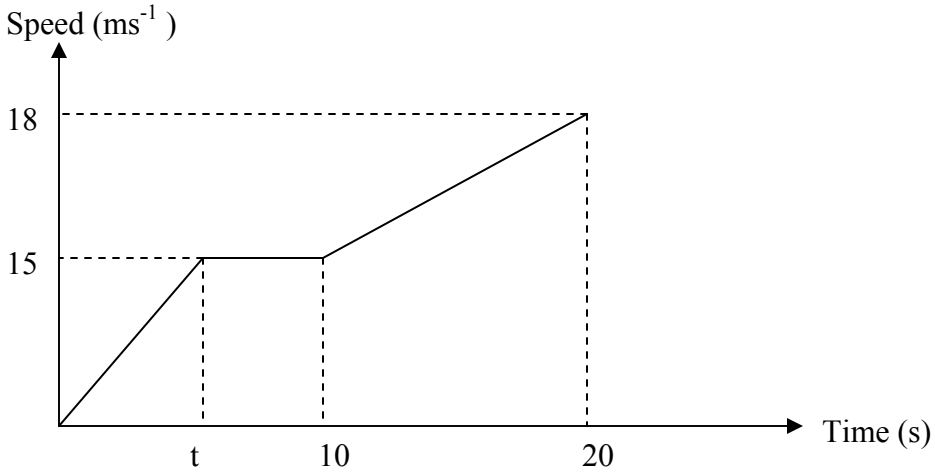
(b) Given the total distance travelled by the particle in 14 s is 144 m, calculate the value of T.

3. Diagram shows the speed-time graph of a particle for a period of 15s.



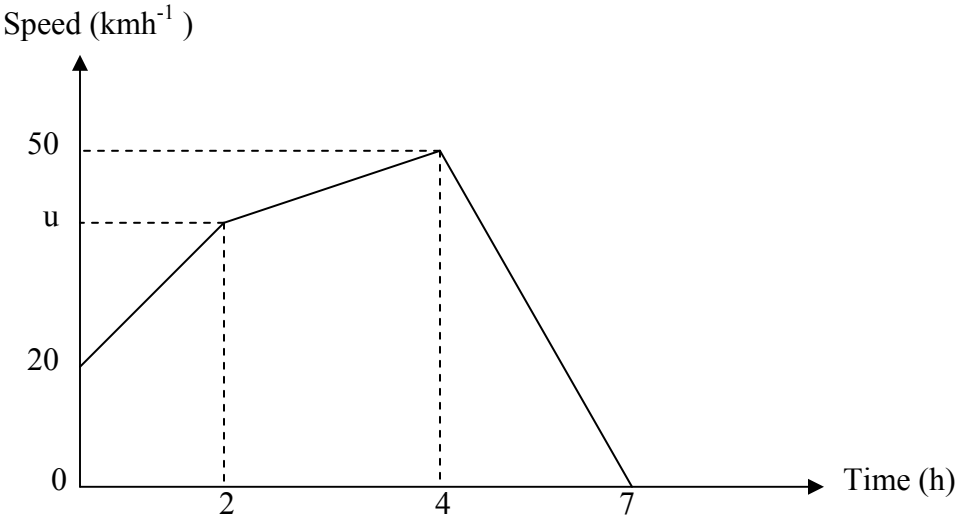
Calculate
(a) the rate of change of speed in the first four seconds.
(b) the value of v, given that the total distance travelled is 189m.

4. Diagram 4 shows the speed-time graph for the movement of a particle for a period of 20s.



Calculate
(a) the value of t, given that the rate of change of speed in the first t seconds is 3 ms^{-1}.
(b) the distance travelled in the last 10 seconds.

5. The graph shows the speed-time graph of a car for a period of 9 hours. The total Distance travelled by the car is 225km.



Find
(a) the value of u.
(b) the average speed, in kmh^{-1}, of the car for the whole journey.
(c) the rate of change of speed, in kmh^{-1}, of the car in the first 2 hours.

PERIMETERS AND AREAS OF CIRCLES

1. In Diagram 1, OAEB is a quadrant of a circle with centre O and CD is an arc of another circle with centre O.
OAC and OED are straight lines.

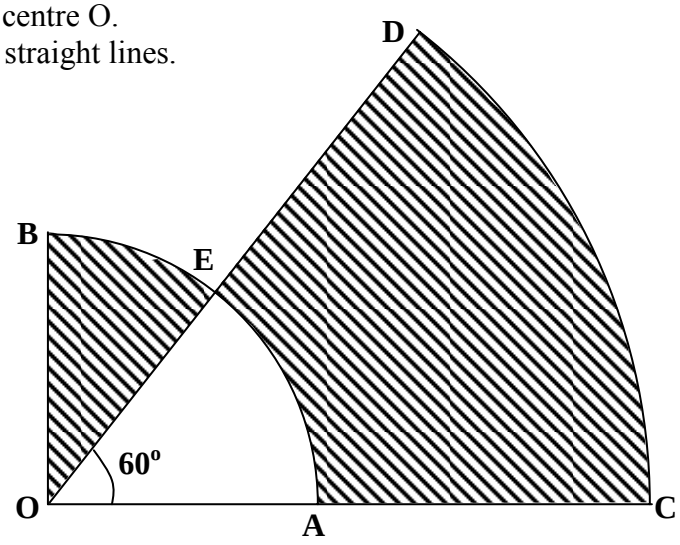


DIAGRAM 1

OA = AC = 7 cm and /COD =60°

Using $\pi = \frac{22}{7}$, calculate

(a) the perimeter, in cm, of the whole diagram
(b) the area, in cm^2, of the shaded region. [6marks]

.

2. Diagram 2 shows two sectors *ORST* and *OUV* with the same centre *O*. *RWO* is a semicircle with diameter *RO* and *RO* = *2OV*. *ROV* and *OUT* are straight lines.

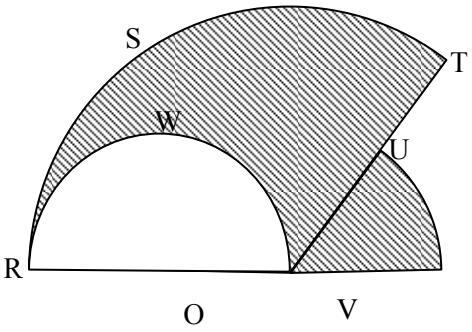


DIAGRAM 2

$OV = 7$ cm and $\angle UOV = 60^o$.

Using $\pi = \frac{22}{7}$, calculate

(a) the perimeter , in cm, of the whole diagram,
(b) the area, in cm^2 , of the shaded region. [6 marks]

3. In diagram 3, QRS and UT are arcs of two circles, centre P and S respectively.

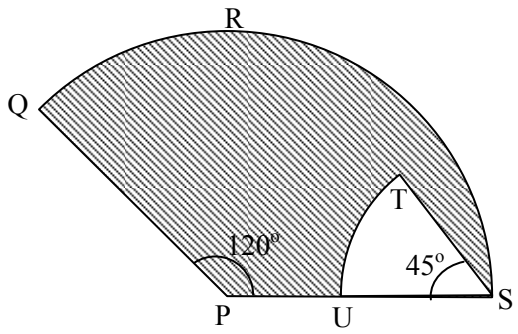


DIAGRAM 3

It is given that PUS is a straight line, PQ = 21 cm and US = 14 cm. Using $\pi = \frac{22}{7}$, calculate

a) the area, in cm^2, of the shaded region
b) the perimeter in cm, of the shaded region. [6 marks]

4. In diagram 4, LK is an arc of a circle with centre P and PQRS is an arc of a circle with centre O. PORL is a straight line.

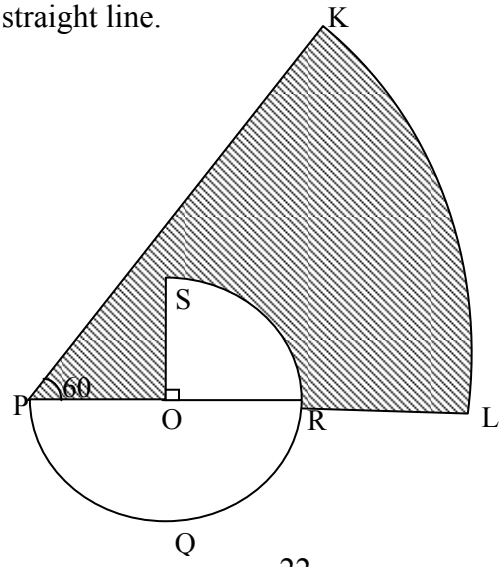


DIAGRAM 4

PK = 21 cm and OP = 7 cm. Using $\pi = \frac{22}{7}$, calculate

a) the area , in cm^2 of the shaded region
b) the perimeter in cm, of the whole diagram. [7 marks]

5. In diagram 5, PQ and RS are arcs of two different circles with O.

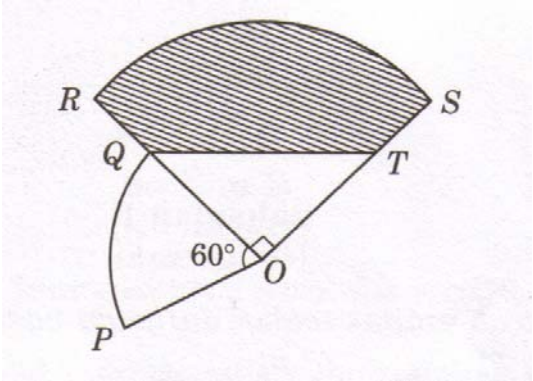


DIAGRAM 5

$RQ = ST = 7$ cm and $PO = 14$ cm.

Using $\pi = \frac{22}{7}$, calculate

(a) the area, in cm^2, of the shaded region,

(b) the perimeter , in cm, of the whole diagram. [6 marks]

6. Diagram 6 shows two sectors, PQR and TUV, with the same centre O. The angle of each sector is 270^o. OSR is a semicircle with centre V. PTO is a straight line and OP = 14 cm.

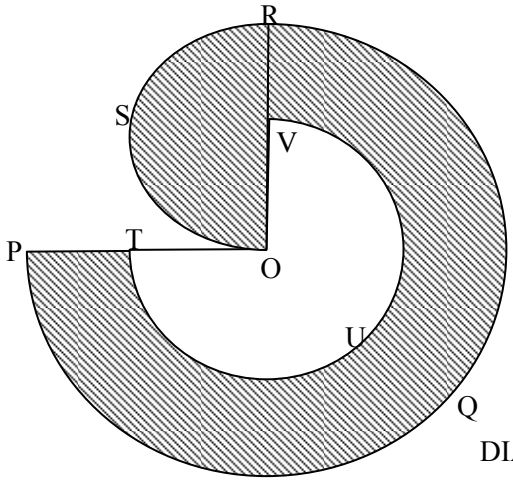


DIAGRAM 6

Using $\pi = \frac{22}{7}$, calculate

a) the perimeter, in cm, of the whole diagram,

b) the area, in cm^2, of the shaded region. [6 marks]

THE STRAIGHT LINE

1. In Diagram 1, OPQR is parallelogram and O is the origin .

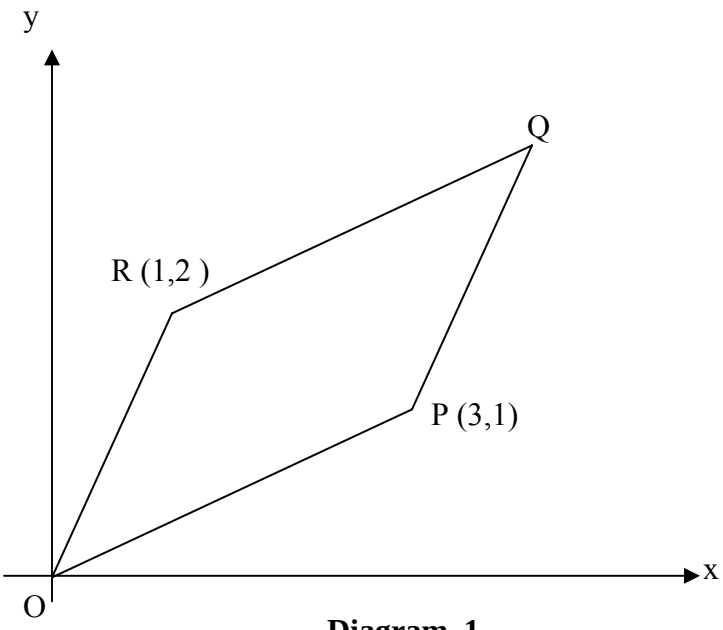


Diagram 1

Find
(a) the equation of the straight line PQ
(b) the x –intercept of the straight line PQ

2. In Diagram 2, O is the origin , point Q lies on the x-axis. Straight line PQ is parallel to the y-axis and straight line QR is parallel to straight line OP. The equation of straight line QR is 3y - 2x = - 6 .

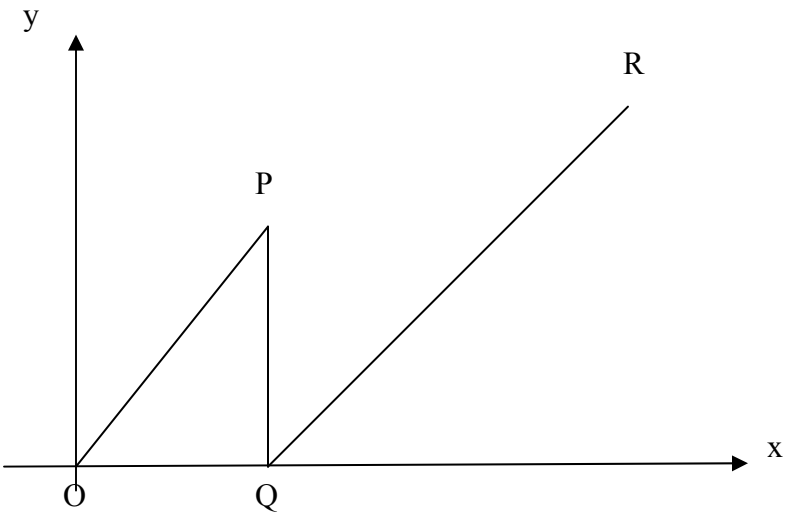


Diagram 2

(a) State the equation of straight line PQ.
(b) Find the equation of straight line OP.

3. In Diagram 3, ABCD is a parallelogram. Given that O is the origin.

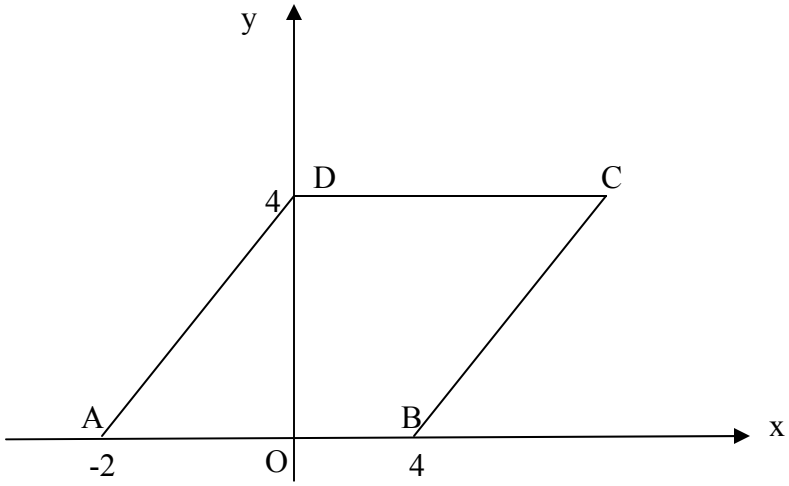


Diagram 3

Find
(a) the coordinate of point C
(b) the gradient of straight line BC
(c) the equation of straight line BC

4. In Diagram 4, G is the midpoint of the straight line EF and O is the origin.

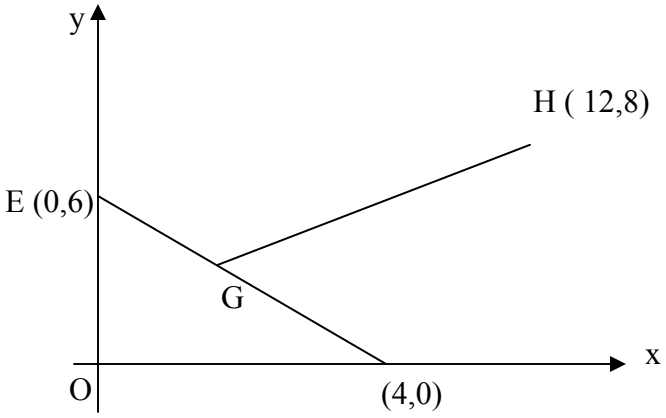


Diagram 4

Find
(a) the coordinate of point G
(b) the gradient of straight line HG
(c) the equation of straight line HG

5. In the diagram, the straight line AB is parallel to the straight line CD. O is the origin

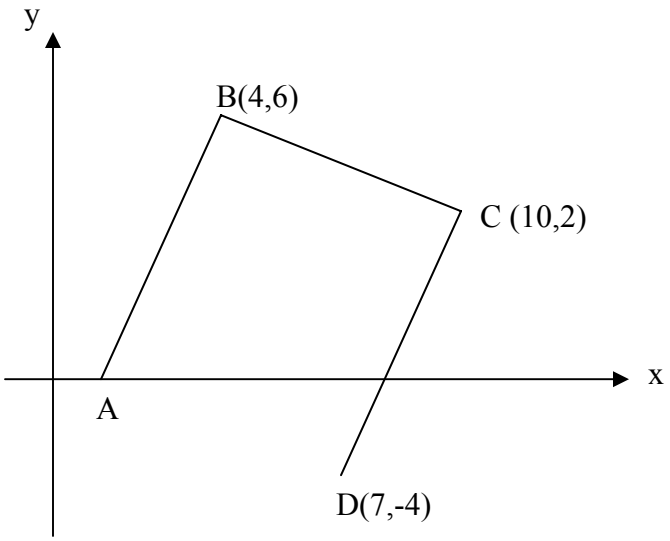


Diagram 5

Find

(a) the gradient of straight line CD.

(b) the equation of straight line AB.

TRANSFORMATIONS III

1. Diagram 1 shows trapeziums ABCD, ABEF, GHJK and LMNP on a Cartesian plane.

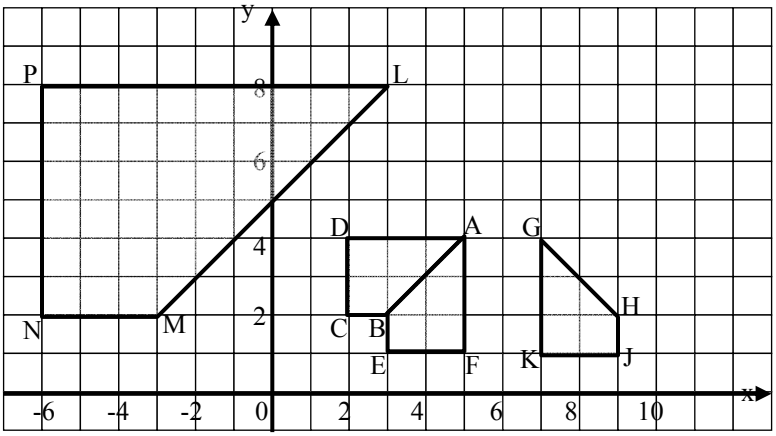


DIAGRAM 1

(a) Transformation **R** is a reflection about the line y = 3. Transformation **T** is the translation $\begin{pmatrix} -2 \\ 4 \end{pmatrix}$.

State the coordinates of the image of point *H* under the following transformations:

(i) **RT**,

(ii) **TR**.

[4 marks]

(b) *ABEF* is the image of *ABCD* under transformation **V** and *GHJK* is the image of *ABEF* under transformation **W**.

Describe in full

(i) transformation **V**,

(ii) a single transformation which is equivalent to transformation **WV**.

[5 marks]

(c) *LMNP* is the image of *ABCD* under an enlargement.

(i) State the coordinates of the centre of the enlargement.

(ii) Given that the area of *LMNP* is 325.8 units^2, calculate the area of *ABCD*.

[3 marks]

2(a) Transformation **U** is a translation $\begin{pmatrix} 3 \\ -2 \end{pmatrix}$.

Transformation **V** is a reflection in the straight line x = 2.

State the coordinates of the image of point (3,4) under the following transformations:

(i) **U**,

(ii) UV.

[3 marks]

(b) Diagram 2 shows three trapeziums *ABCD*, *MNCH* and *EFGH* on a Cartesian plane.

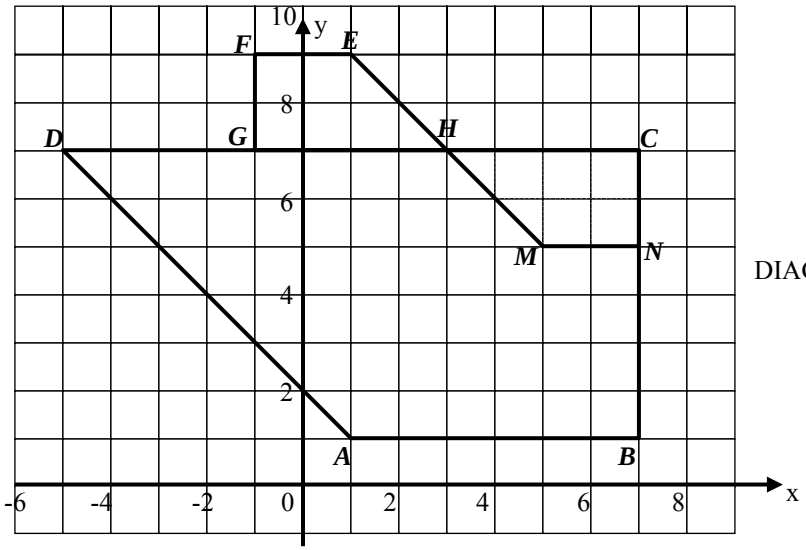


DIAGRAM 2

MNCH is the image of *EFGH* under transformation **W** and *ABCD* is the image of *MNCH* under transformation **Z**.

(i) Describe in full

(a) the transformation **W**,

(b) the transformation **Z.**

(ii) Given that the trapezium *MNCH* represents a region of area 22 m^2, calculate the area of the region represented by the hexagon ABNMHD.

[9 marks]

3. Diagram 3 shows quadrilaterals, *ABCD*, *PQRS* and *KLRM*, drawn on a Cartesian plane.

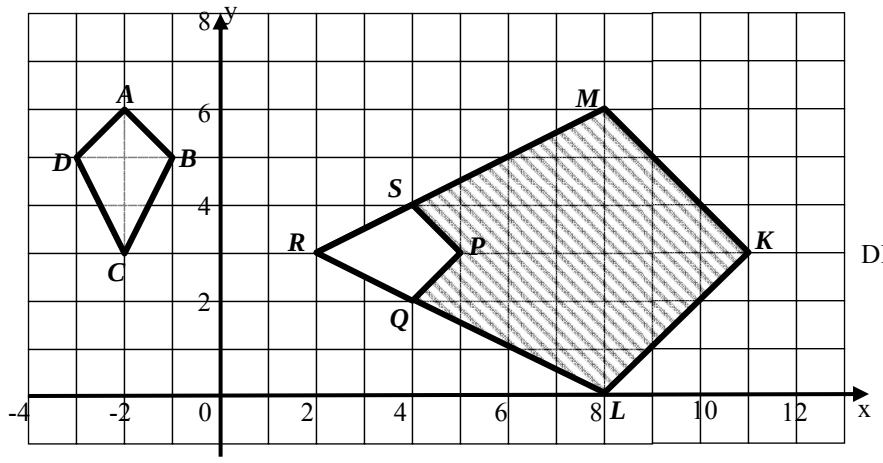


DIAGRAM 3

a) Transformation **T** is a translation $\begin{pmatrix} 4 \\ -2 \end{pmatrix}$.

Transformation **V** is a reflection in the line y = 1.
State the coordinates of the image of point A under each of the following transformations:

(i) Translation **T**.

(ii) Combined transformations **VT**.

[3 *marks*]

b)

(i) *KLRM* is the image of *ABCD* under the combined transformations **WU**.
Describe in full, the transformation **U** and the transformation **W**.

(ii) Given that the shaded region *KLQPSM* represents a region of area 120m^2, calculate the area, in m^2, of the region represented by *PQRS*.

[9 *marks*]

4 (a) Diagram 4 in the answer space shows point *A*, point *J* and straight line *KL* drawn on a Cartesian plane.

Transformation **T** is a translation $\begin{pmatrix} 4 \\ -1 \end{pmatrix}$.

Transformation **P** is a reflection in the straight line x = -2.

Transformation **R** is a rotation of 90° clockwise about the centre *A*.

(i) On Diagram 4 in the answer space, draw the image of straight line *KL* under translation **T**.

(ii) State the coordinates of the image of point *J* under the following transformation:

(a) **P**,

(b) **RT**.

[4 *marks*]

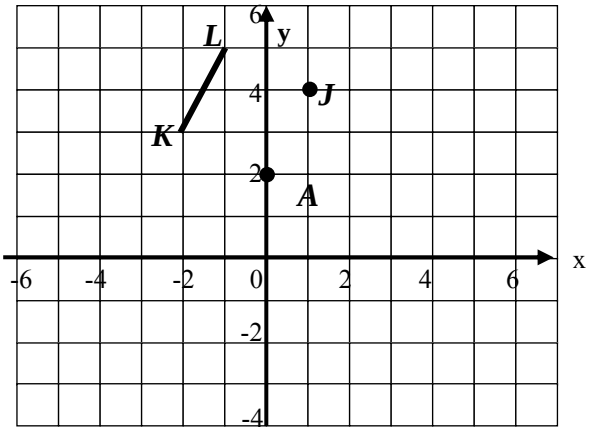


DIAGRAM 4

(b) Diagram 5 shows three quadrilaterals, *ABCD*, *EFGH* and *PQRS*, drawn on a Cartesian plane.

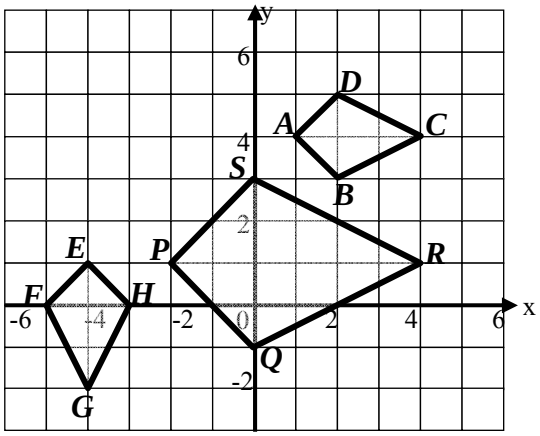


DIAGRAM 5

EFGH is the image of *ABCD* under transformation **V**.
PQRS is the image of *ABCD* under transformation **W**.

(i) Describe in full the transformation:
(a) **V**,
(b) **W**.
(ii) Given that the quadrilateral *ABCD* represents a region of area 32.8m^2, calculate the area of the region represented by the quadrilateral *PQRS*.

[8 *marks*]

5(a) Diagram 6 shows two points, *M* and *N*, on a Cartesian plane.

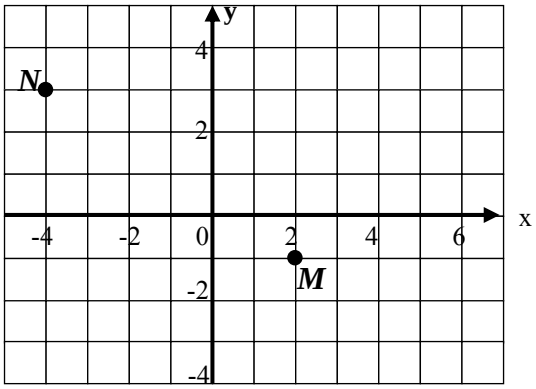


DIAGRAM 6

Transformation **T** is a translation $\begin{pmatrix} 3 \\ -1 \end{pmatrix}$.

Transformation **R** is an anticlockwise rotation of 90° clockwise about the centre (0, 2).

(i) State the coordinates of the image of point *M* under transformation **R**.
(ii) State the coordinates of the image of point *N* under the following transformation:
(a) $\mathbf{T}^2$,
(b) **TR**.

[5 *marks*]

(b) Diagram 7 shows three quadrilaterals, *ABCD*, *EFGH* and *PQRS* on a Cartesian plane.

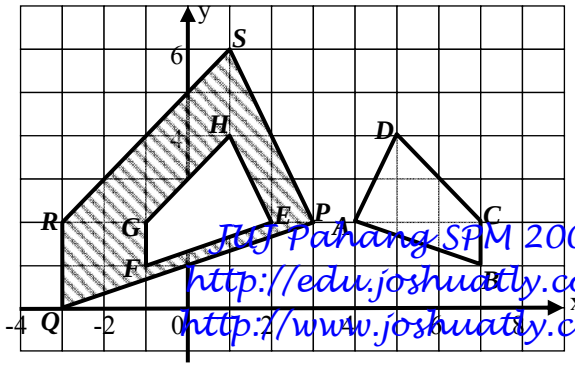


DIAGRAM 7

EFGH is the image of *ABCD* under transformation **V**.
PQRS is the image of *ABCD* under transformation **W**.

(ii) Describe in full the transformation:
(a) **V**,
(b) **W**.

(iii) Given that the quadrilateral *PQRS* represents a region of area 45.6cm^2, calculate the area, in cm^2, represented by the shaded region.

[7 *marks*]

6. Diagram 8 shows three quadrilaterals, *ABCD*, *EFLK* and *EGHJ*, drawn on a Cartesian plane.

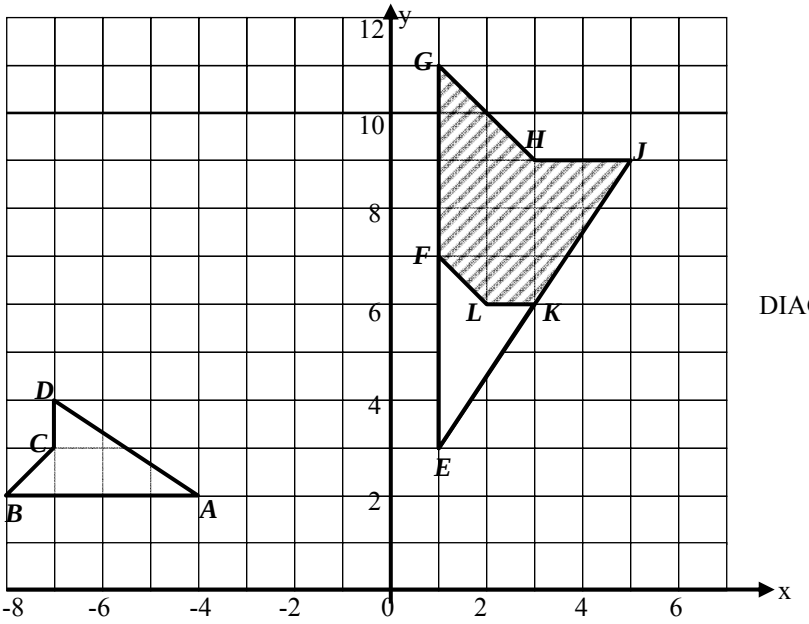


DIAGRAM 8

(a) Transformation **T** is a translation $\begin{pmatrix} -5 \\ 1 \end{pmatrix}$.

Transformation **P** is a reflection on the line y=4.
State the coordinates of the image of point *K* under each of the following transformations:

(i) Translation **T,**
(ii) Combined transformations **PT.**

[3 *marks*]

(b) *EGHJ* is the image of *ABCD* under the combined transformations **WV.**

(i) Describe in full the transformation:
(a) **V**,
(b) **W**.

(ii) It is given that the quadrilateral *ABCD* represents a region of area 21 m^2.
Calculate the area, in m^2, represented by the shaded region FGHJKL.

[9 *marks*]

7. (a) Transformation **T** is a translation $\begin{pmatrix} -3 \\ 2 \end{pmatrix}$ and transformation **P** is an anticlockwise rotation of 90^o about the centre (1,0).
State the coordinates of the image of point (5, 1) under each of the following transformations:

(i) Rotation **P**
(ii) Translation **T**,
(iii) Combined transformations $\mathbf{T}^2$.

[4 marks]

(b) Diagram 9 shows three quadrilaterals *ABCD*, *EFGH* and *JKLM,* drawn on a Cartesian plane.

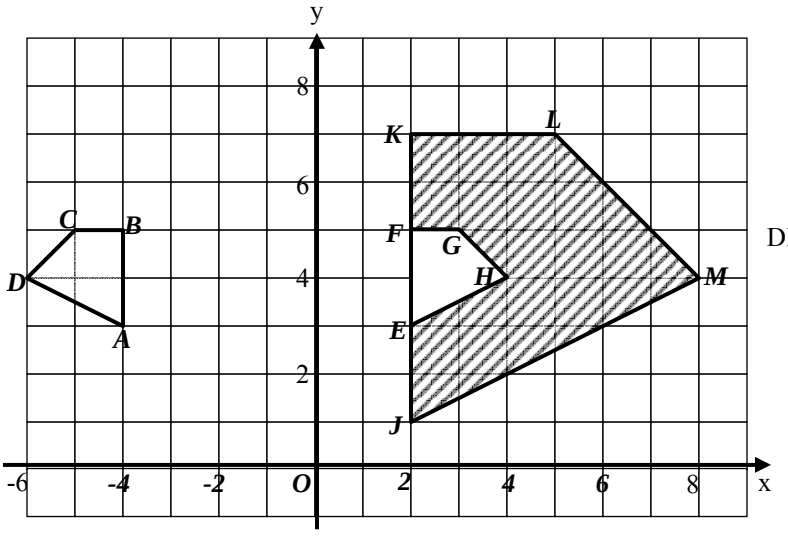


DIAGRAM 9

(i) *JKLM* is the image of *ABCD* under the combined transformations **VU.**
Describe in full the transformation:
(a) **U**,
(b) **V.**

(ii) It is given that the quadrilateral *ABCD* represents a region of area 18 m^2.
Calculate the area, in m^2, of the region represented by the shaded region .

[8 *marks*]

EARTH AS A SPHERE

1. Diagram 1 shows four points J, K, L and M, on the surface of the earth. J lies on the longitude of $80°W$. KL is the diameter of the parallel of latitude of $50°N$. M lies 5820 nautical miles due south of J .

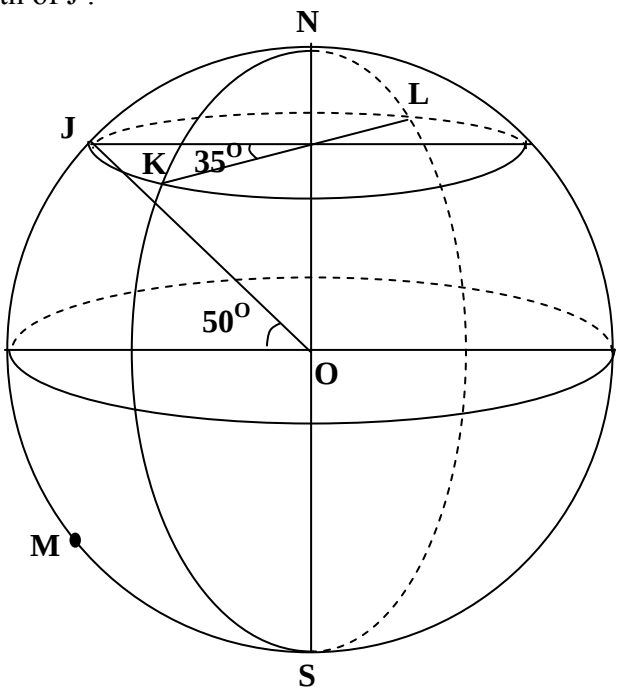


DIAGRAM 1

(a) Find the position of L. [3 marks]
(b) Calculate the shortest distance, in nautical miles, from K to L , measured along the surface of the earth. [2 marks]
(c) Find the latitude of M. [3 marks]
(d) An aeroplane took off from J and flew due west to L along the parallel of latitude with an average speed of 600 knots. Calculate the time, in hours, taken for the flight. [4 marks]

2. J (60^0 S, 70^0 E), K and L are three points on the surface of the earth. JK is the diameter of the parallel of latitude 60^0 S. L lies 4 800 nautical miles due north of J.

(a) State the longitude of K. [2 marks]

(b) Find the latitude of L. [3 marks]

(c) Calculate the distance, in nautical miles, from J to K measured along the parallel latitude. [3 marks]

(d) An aeroplane took off from K and flew towards J using the shortest distance, as measured along the surface of the earth, and then flew due north to L. Given that its average speed for the whole flight was 560 knots, calculate the total time taken for the flight. [4 marks]

3. The table below shows the latitudes and longitudes of four points J, K, L and M, on the surface of the earth.

Point	*Latitude*	*Longitude*
J	$20°N$	$25°E$
K	$x°S$	$25°E$
L	$20°S$	$y°W$
M	$30°S$	$y°W$

(a) P is a point on the surface of the earth such that JP is the diameter of the earth. State the position of P. [2 marks]

(b) Calculate

(i) the value of x, if the distance from J to K measured along the meridian is 4200 nautical miles.

(ii) the value of y, is the distance from J due west to L measured along the common parallel of latitude is 3270 nautical miles. [7 marks]

(c) An aeroplane took off from J and flew due west to L along the common parallel of latitude and then due south to M. If the average speed for the whole flight is 600 knots, calculate the time taken for the whole flight. [3 marks]

4. J(65^0 N, 40^0 W) ,K(65^0 N, 60^0 E),L and V are four points on the surface of the earth. JL is the diameter of the parallel of latitude 65^0 N

(a) i) State the longitude of K.

ii) Calculate the shortest distance, in nautical miles, from J to K measured along the surface of the earth [4marks]

(b) V lies south of K and the distance VK measured along the surface of the earth is 4 500 nautical mile.
Calculate the latitude of V [3 marks]

(d) An aero plane took of from J and flew due east to K and then flew due south to V.

The average speed for the whole flight was 550 knots.
Calculate

i) the distance, in nautical mile, taken by the aeroplane from J to K measured along the common parallel of latitude
ii) the total time, in hours, taken for the whole flight [5 marks]

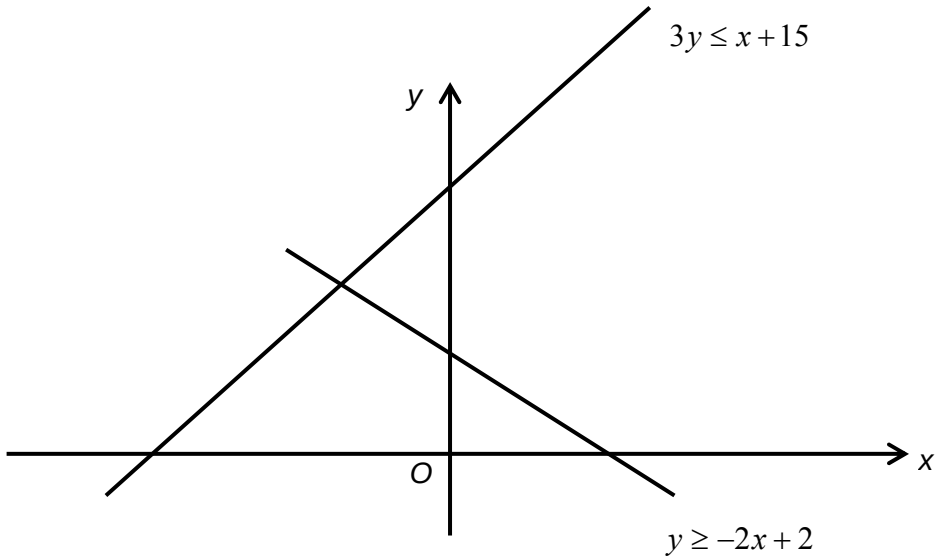
5. J(25^0 N, 60^0 E) ,K and R are three points on the surface of the earth.
JR is the diameter of earth
(a) State the longitude of R. [2 marks]
(b) JK is the diameter of the parallel of latitude 25^0 N [3 marks]
i) State the position of Q
ii)Calculate the shortest distance in nautical mile, from J to K measured along the surface of the earth
(c) An aeroplane took of from J and flew due east to K and then flew due south to V.
The average speed for the whole flight was 550 knots

LINEAR 1NEQUALITIES

1. On the graph in the answer space, shade the region which satisfies the three inequalities $3y \le x+15$, $y \ge -2x+2$ and $x < 2$.

[3 *marks*]

Answer :

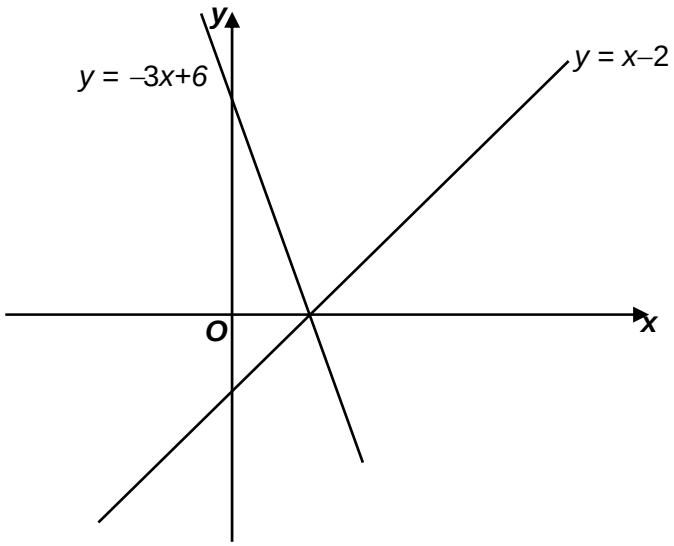


2.On the graph provided, shade the region which satisfies the three inequalities

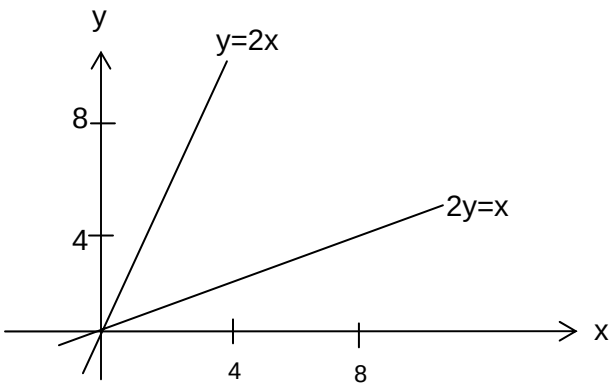
$y \geq -3x + 6$, $y \leq 6$ and $y \geq x - 2$.

[3 *marks*]

Answer:



3.On the graph in the answer space, shade the region which satisfies the three inequalities y ≤ 2x, 2y ≥ x and y + x ≤ 8.



QUADRATIC EXPRESSIONS AND EQUATIONS

1.Solve the quadratic equation $2x^2 + 3x = 15 + 2x$.

2.Solve the quadratic equation (2x + 1)(x – 2)=7

3.Solve the quadratic equation $\frac{3x(x-1)}{2} = x + 6$

4.Solve the quadratic equation $(2x - 1)^2 = 9x^2$

MATHEMATICAL REASONING

1. i: State whether the following statement is true or false.

$9 > 6$ and $4^2 = 16$

ii : Complete the premise in the following argument.

Premise 1 : If PQR is an equilateral triangle, then the value of its interior angle is 60^o

Premise 2 : _____

Conclusion : The value of the interior angle of PQR is 60^o.

iii : Write down two implications based on the following sentence.

$m > n$ if and only if $m - n > 0$

Implication 1 :

……

Implication II :

……

2. a) Complete the conclusion in the following argument.

Premise 1 : All regular pentagons have 5 equal sides.

Premise 2 : ABCDE is a regular pentagon.

Conclusion : ……

b) Make a conclusion by induction for a list of numbers 7, 22, 43,70,… that follow the patterns below :

$7 = 3(2)^2 - 5$
$22 = 3(3)^2 - 5$
$43 = 3(4)^2 - 5$
$70 = 3(5)^2 - 5$

c) Combine the two statements given below to form a true statement.

i) $15 \div (-5) = -5$
ii) 28 is a multiple of 4.

3.a) State whether each of the following statement is true or false.

i) $8 \div 2 = 4$ and $8^2 = 16$.

ii) The elements of set A = $\{12, 16, 20\}$ are divisible by 4 or the elements of set B = $\{3, 6, 9\}$ are multiples of 3.

b) Write down premise 2 to complete the following argument .

Premise 1 :If q is greater than zero, then q is a positive number..

Premise 2 :

……

Conclusion : 4 is a positive number.

c) Write down 2 implications based on the following sentence.

'5m > 15 if and only if m > 3'

Implication 1 : ……

Implication 2 : ……

(5 marks)

SETS

1. The Venn diagram in the answer space shows the universal set ξ, sets K, L and M.
The universal set $\xi = K \cup L \cup M$.
On the diagram in the answer space, shade the region for

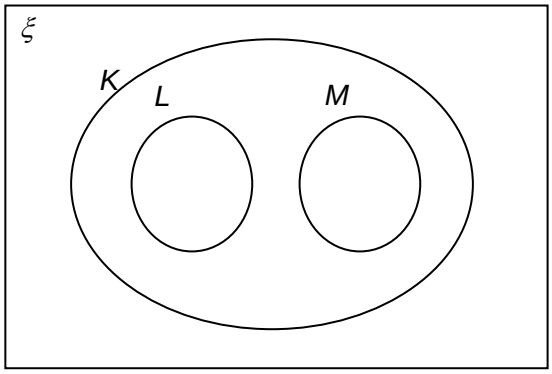
(a) $K \cap L$,

(b) $K \cap (L \cup M)'$.

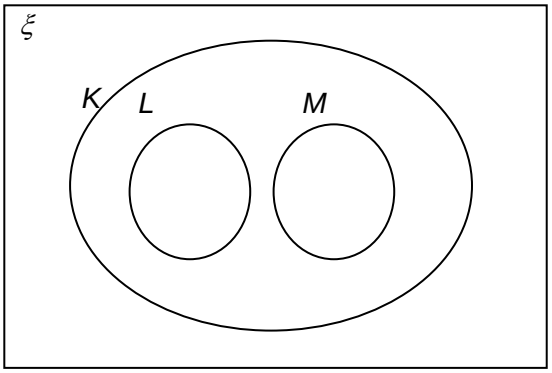
[3 *marks*]

Answer:

(a)



(b)



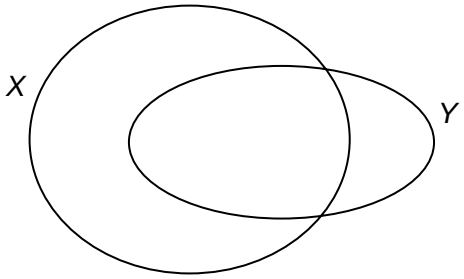
2. The Venn diagram in the answer space shows sets X ,Y and Z.
In the answer space, shade

(a) $\mathbf{X} \cap Y'$
(b) $(X \cup Y) \cap Z'$

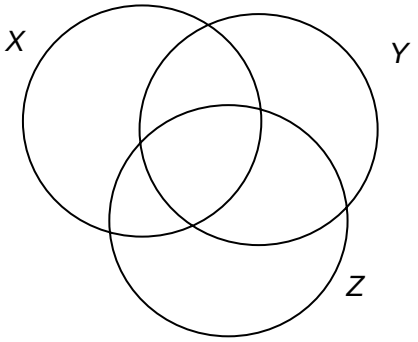
[3 *marks*]

Answer:

(a)



(b)



3 The Venn diagram in the answer space shows set *P*, set *Q* and set *R* with the universal set $\xi = P \cup Q \cup R$.

On the diagram in the answer space, shade

(*a*) $P \cup Q \cap R$

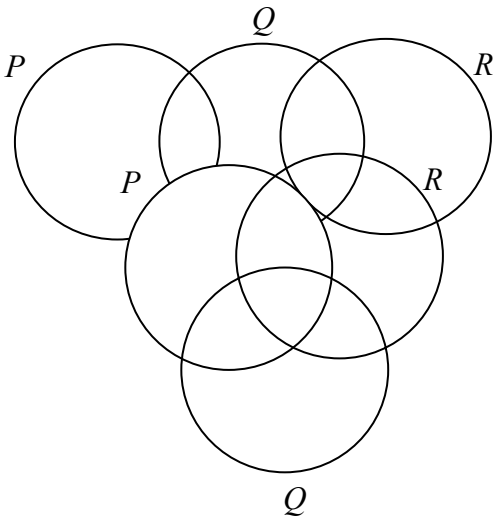
(*b*) $P \cap (Q \cup R)'$

[3 *marks*]

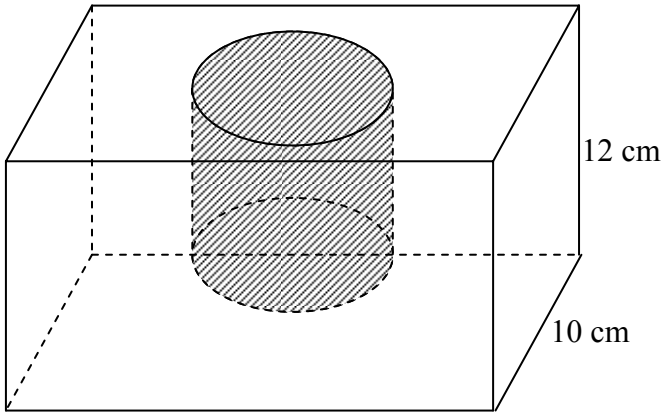
Answer:

(*a*)

(*b*)



SOLID GEOMETRY



1. Diagram 1 shows a solid cylinder with diameter 7 cm and height 10 cm is taken out of the solid. **Diagram 1** olume, in cm^3, of the remaining solid. [use $\pi = \frac{22}{7}$].

Exercise 2

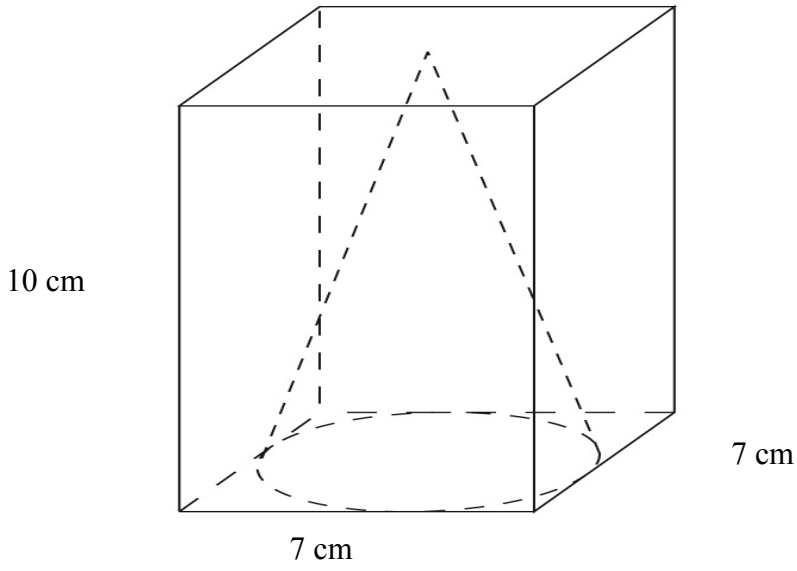


DIAGRAM 2

2. Diagram 2 shows the tip of a cone touches the top of the cuboid and the base rests on the base of the cuboid. If the cone is taken out of the solid. Calculate the volume, in cm^3, of the remaining solid. Use $\pi = \frac{22}{7}$.

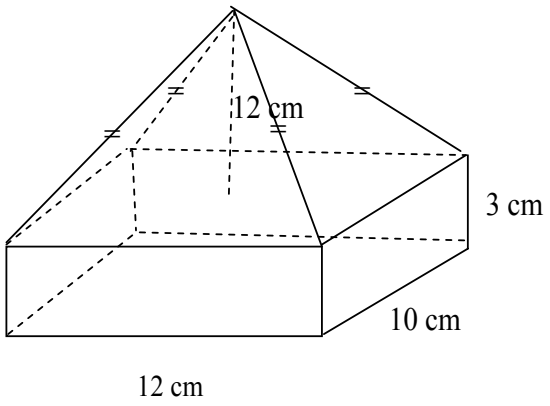


Diagram 3

Diagram 3 shows a solid formed by combining a right pyramid with a cuboid . Calculate the volume, in cm^3, of the solid.[use $\pi = \frac{22}{7}$]

MATRICES

1. a) The inverse matrix of $\begin{pmatrix} 2 & 1 \\ 3 & -4 \end{pmatrix}$ is m $\begin{pmatrix} -4 & -1 \\ p & 2 \end{pmatrix}$, find the value of m and p.

b) Using matrices, calculate the value of x and y which satisfy the following simultaneous linear equations.

$2x + y = 4$
$3x - 4y = 17$

2. It is given that matrix P $= \begin{pmatrix} 6 & 3 \\ k & +2 \end{pmatrix}$ does not have an inverse matrix.

(a) Find the value of k.
(b) If k = 3, find the inverse matrix of P and hence, using matrices, find the values of x and y that satisfy the following simultaneous linear equations.

$6x + 3y = 15$
$3x + 2y = 6$

3. a) It is given that matrix $M = \begin{pmatrix} 4 & 3 \\ 2 & 1 \end{pmatrix}$, find the inverse matrix of M

b) Using matrices, find the values of x and y which satisfy the following equations.

$4x + 3y = -8$

$2x + y = -10$

LINEAR EQUATIONS

1. Calculate the value of x and of y that satisfy the following simultaneous linear equations:

$$x + 3y = 6$$

$$\frac{3}{2}x - y = -7$$

2. Calculate the values of m and n that satisfy the simultaneous linear equations:

$2m - n = 2$

$4m - 3n = 5$

3. Calculate the values of d and of e that satisfy the following simultaneous linear equations:

$$3d - 2e = 9$$

$$6d + e = -2$$

GRAPHS OF FUNCTIONS

1. a) Complete Table 1 in the answer space for the equation $y = x^3 - 12x - 5$. [*2 marks*]

b) *For this part of the question, use the graph paper provided. You may use a flexible curve rule.*

By using a scale 2 cm to 1 unit on the x-axis and 2 cm to 5 units on the y-axis, draw the graph of $y = x^3 - 12x - 5$ for $-4 \leq x \leq 4$. [*4 marks*]

c) From your graph, find
a. the value of y when x = 1.5,
b. the values of x when y = - 8 [*3 marks*]

d) Draw a suitable straight line on your graph to find all the values of x which satisfy the equation $x^3 - 10x + 2 = 0$ for $-4 \leq x \leq 4$.
State these values of x. [*3 marks*]

Answer:

a)

x	-3	-2	-1	0	1	2	3	3.5	4
y	4		6	-5	-16	-21		-4.13	11

Table 1

2. a) Complete Table 2 in the answer space for the equation $y = 2x^2 - 4x - 3$. [*2 marks*]

b) *For this part of the question, use the graph paper provided. You may use a flexible curve rule.*
By using a scale 2 cm to 1 unit on the x-axis and 2 cm to 5 units on the y-axis, draw the graph of $y = 2x^2 - 4x - 3$ for $-3 \leq x \leq 5$. [*4 marks*]

c) From your graph, find
i) the value of y when x = -3.5,
ii) the values of x when $2x^2 - 4x - 3 = 0$. [*3 marks*]

d) Draw a suitable straight line on your graph to find all the values of x which satisfy the equation $2x^2 - 7x = 8$ for $-3 \leq x \leq 5$.
State these values of x. [*3 marks*]

Answer:

a)

X	-3	-2	-1	0	1	2	3	4	5
Y	27		3	-3	-5		3	13	27

Table 2

3. a) Complete Table 3 in the answer space for the equation $y = -3x^2 + 2x + 4$

[2 *marks*]

b) *For this part of the question, use the graph paper provided.*

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 $y = -3x^2 + 2x + 4$ for $-3 \le x \le 4$.

[5 *marks*]

c) From your graph, find
i) the value of y, when x = - 0.5
ii) the value of x, when y = - 14

[2 *marks*]

d) Draw a suitable straight line on your graph to find the values of x which satisfy the equation $3x^2 + 2x - 20 = 0$ for $-3 \le x \le 4$.
State these values of x. [3 *marks*]

Answer:

a)

x	-3	-2	-1	0	1	2	3	3.5	4
y	-29		-1	4	3	-4		-25.75	-36

Table 3

STATISTICS

1. The data in Diagram 1 shows the donations, in RM, collected by 40 pupils.

36	55	46	45	55	35	39	59
41	50	50	39	41	52	40	41
38	39	33	45	48	52	35	51
40	42	47	36	41	36	49	32
42	40	37	44	48	48	43	43

DIAGRAM 1

a) Based on the data in Diagram 1 and by using a class interval of 5, complete Table 3 in the answer space. [4 *marks*]

b) Based on Table 3 in a),
i) State the modal class,
ii) Calculate the estimated mean of the donation collected by a pupil. [4 *marks*]

c) *For this part of the question, use the graph paper provided.*
By using a scale of 2 cm RM5 on the horizontal axis and 2 cm to 1 pupil on the vertical axis, draw a frequency polygon for the data. [4 *marks*]

Answer:

a)

Mass(kg)	Midpoint	Frequency
30 – 34	32	2
35 – 39		

Table 3

2. The data in Diagram 2 shows the pocket money, in RM, of 40 students.

16	24	34	26	30	40	35	30	26	33
18	20	29	31	30	40	34	36	35	32
33	34	37	35	35	38	39	41	25	25
25	26	27	28	21	23	31	31	38	33

DIAGRAM 2

a) Based on the data in Diagram 2 and by using a class interval of 5, complete Table 2 in the answer space. [3 *marks*]

b) Based on table 2 in a),
i) state the modal class,
ii) calculate the estimated mean of the pocket money.
[4 *marks*]

c) *For this part of the question, use the graph paper provided.*
By using a scale of 2 cm to RM5 on the horizontal axis and 2 cm to 1 student on the vertical axis, draw a histogram to represent the above data.
[5 *marks*]

Answer:

a)

Class Interval	Midpoint	Frequency
15-19	17	2
20-24		

TABLE 2

148	168	158	154	164	153	158	157	153	144
163	156	152	159	163	159	148	163	155	158
148	152	146	158	151	157	161	153	147	153
142	164	158	154	156	152	159	159	150	169

3. The data in Diagram 3 show the heights, in cm of 40 students

(a) Based on the data in Diagram 3 and by using a class interval of 5, complete Table 3 in the answer space. [4 *marks*]

(b) *For this part of the question, use the graph paper provided.*

By using a scale of 2 cm to 5 cm on the horizontal axis and 2 cm to 5 students on the vertical axis, draw an ogive for the data. [6 *marks*]

(c) Based on the ogive in (b),
(i) find the median,
(ii) Find the number of students whose height is above 162 cm.
[2 *marks*]

Answer:

a)

Height (cm)	Frequency	Cumulative Frequency
135 - 139		
140 - 144		

TABLE 3

PLAN AND ELEVATION

1. (a) Diagram 1(i) shows a solid prism.
Hexagon ABCDEF is the uniform cross section of the prism.
The base ALGF is on the horizontal plane.
The sides BA, CD and EF are vertical whereas the sides BC and DE are horizontal.

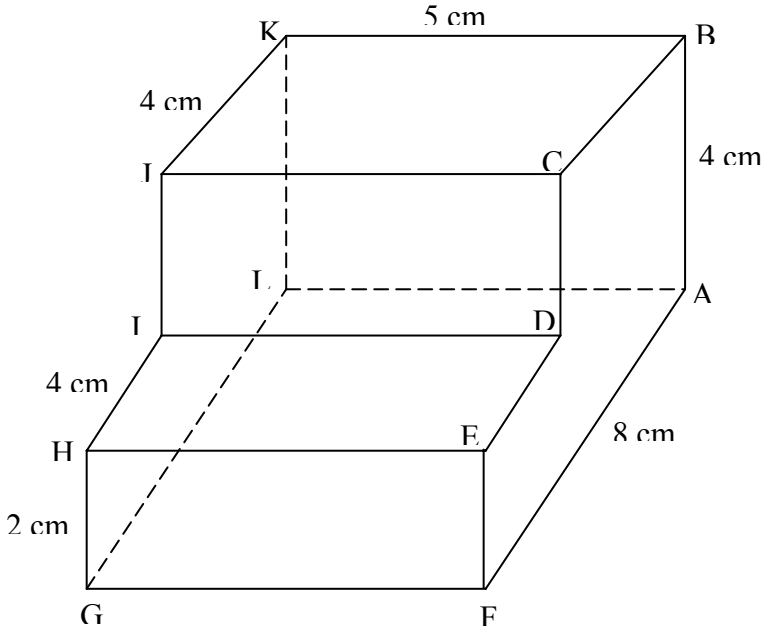


DIAGRAM 1(i)

Draw in full scale, the plan of the solid prism.

(b) A solid prism with triangle AFM as its uniform cross section is joined at the vertical plane ABCDEF to form a combined solid as shown in Diagram 1(ii).

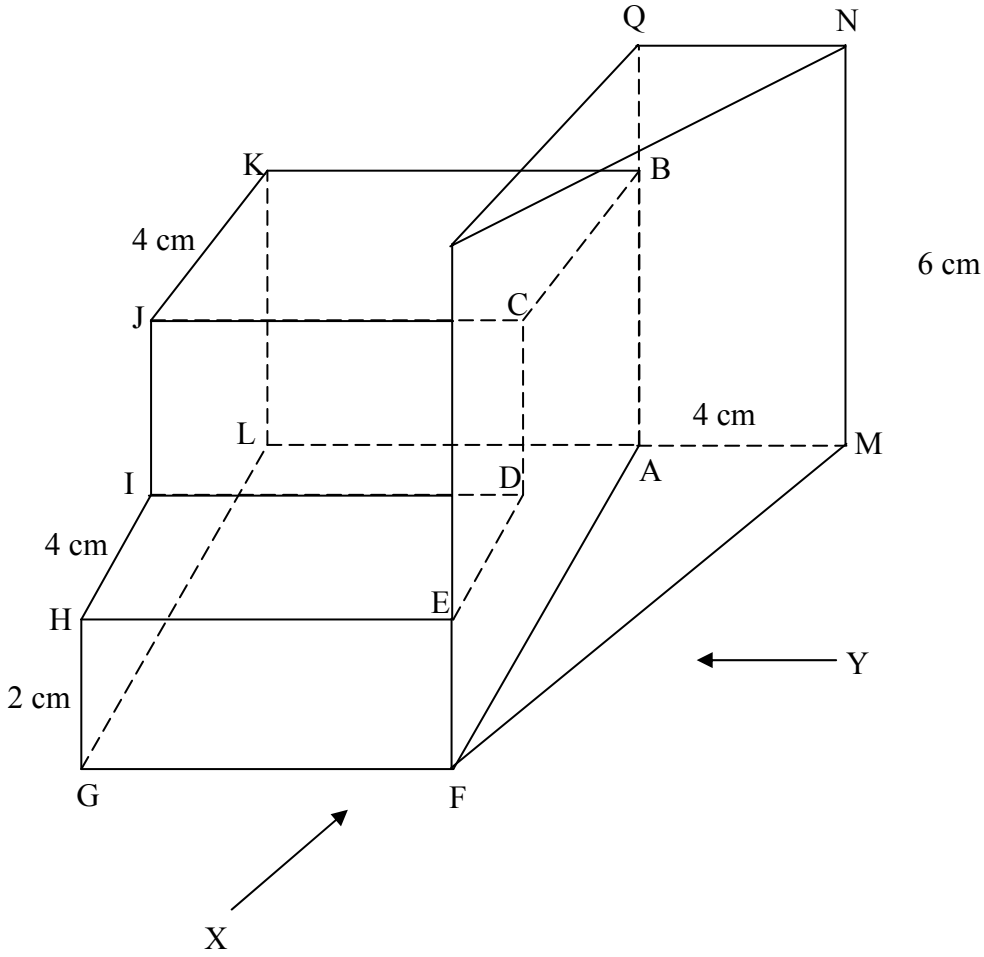


DIAGRAM 1(ii)

Draw in full scale,

(i) the elevation of the combined solid on a vertical plane parallel to GF as viewed from X.

(ii) the elevation of the combined solid on a vertical plane parallel to AF as viewed from Y.

2. (a) Diagram 2(i) shows a solid prism with its rectangular base, PQRS, on a horizontal table. The surface, FGKLRQ, is the uniform cross-section of the prism. Rectangle EFGH is an inclined plane and rectangle JKLM is a horizontal plane. FQ, KG and LR are vertical edges.

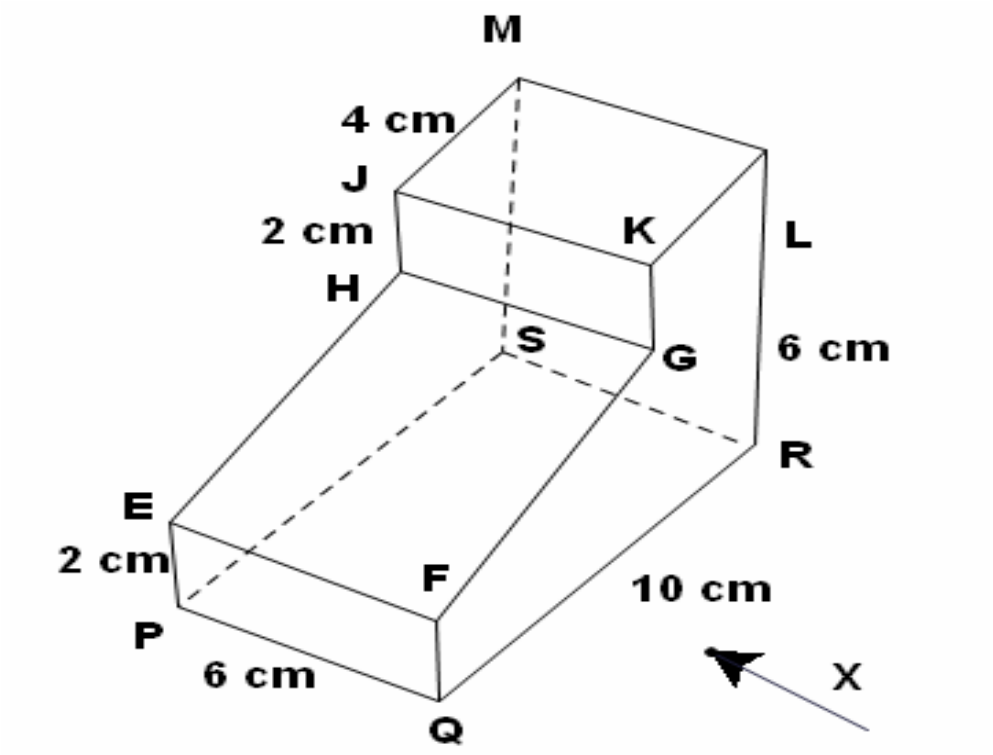


Diagram 2(i)

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

(b) A solid right prism with the uniform cross-section, ITU, is removed from the solid in Diagram 2(i) . The remaining solid is shown in Diagram 2(ii). Rectangle TFVU is a horizontal plane. IU is a vertical edge. FT = 3 cm and IU = 2 cm.

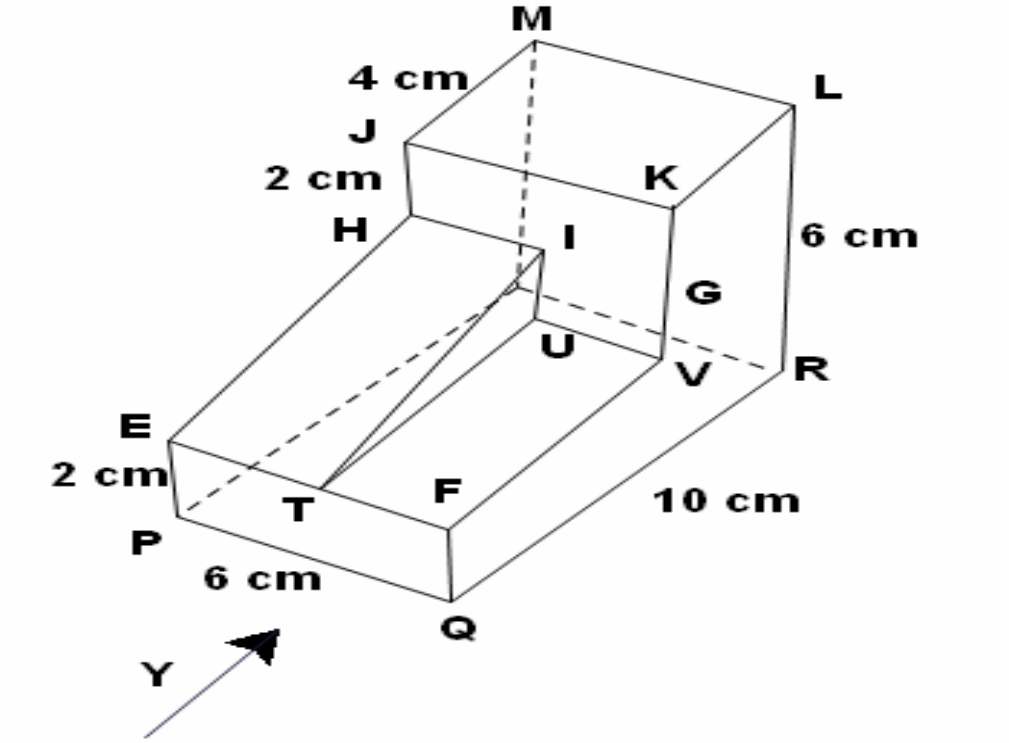


Diagram 2(ii)

Draw the full scale
(i) plan of the remaining solid
(ii) elevation of the remaining solid on a vertical plane parallel to PQ as viewed from Y.

3. (a) Diagram 3(i) shows a solid right prism.
The base BCKJ is on horizontal plane.
EFGM and CDLK are vertical planes whereas EDLM is a horizontal plane.
The plane AFGH is inclined.
Hexagon ABCDEF is the uniform cross section of the prism.
The sides AB, FE and DC are vertical.

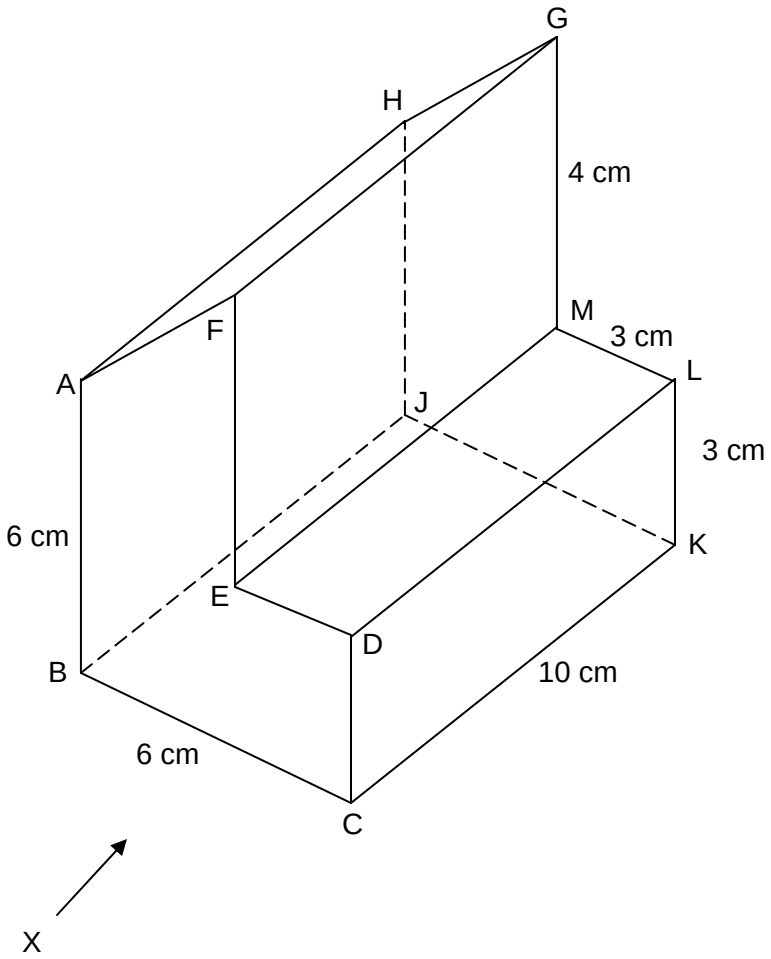


DIAGRAM 3(i)

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

(b) A half-cylinder is joined to in Diagram 3(i) at the vertical plane BCQP to form a combined solid as shown in Diagram 3(ii)

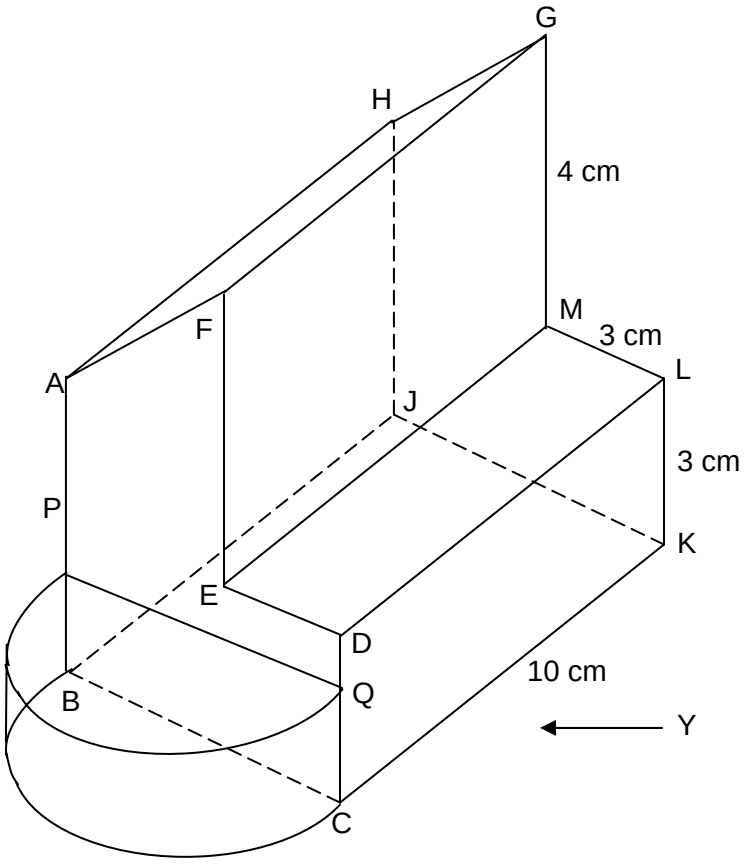


DIAGRAM 3(ii)

The height of the half-cylinder is 2 cm

Draw in full scale ,
(i) the plan of the combined solid.
(ii) the elevation of the combined solid on a vertical plane parallel to CK as viewed from Y.

ANSWER

LINES AND PLANES IN 3-DIMENSIONS

1.	Identify ∠ VKQ @ ∠ QKV	1M
	Tan ∠ VKQ =	2M
	31.6° or 31°36'	1M
2.	Identify ∠ VKQ @ ∠ QKV	1M
	Tan ∠ VKQ =	2M
	31.6° or 31°36'	1M
3.	Identify ∠ VKQ @ ∠ QKV	1M
	Tan ∠ VKQ =	2M
	31.6° or 31°36'	1M
4.	Identify ∠ QTR @ ∠RTQ	1M
	Tan ∠ QTR =	2M
	33.68° to33.70° or 31°41' or 31°42'	1M
5.	Identify ∠ QTR @ ∠RTQ	1M
	Tan ∠ QTR =	2M
	33.68° to33.70° or 31°41' or 31°42'	1M
6.	Identify ∠PRU @ ∠URP	1M
	Tan / PRU =	2M
	34.68° to33.70° or 31°40' or 31°42'	1M
7.	Identify ∠VUS @ ∠ SUV	1M
	Tan∠ VUS = 8/SU OR equivalent	1M
	31.6° or 31°36'	1M

PROBABILITY

1. (a) $\frac{1}{5}$

   (b) $\frac{1}{45}$

2. (a) $\frac{1}{7}$

(b) $\frac{31}{105}$

3. (a) $\frac{1}{5}$

(b) $\frac{19}{60}$

4. (a) $\frac{1}{36}$

(b) $\frac{7}{12}$

5. (a) $\frac{11}{105}$

(b) $\frac{229}{840}$

AREA AND GRADIENT UNDER A GRAPH

1. (a) 4 hours
(b) 7 kmh^{-1}
(c) 121 km

2. (a) $\frac{8}{3} ms^{-1}$
(b) T = 10

3. (a) 6
(b) 18

4. (a) 5
(b) 165

5. (a) 40
(b) 32.14
(c) 10

PERIMETERS AND AREA S OF CIRCLES
S5

Area $RS = \frac{90}{360} \times \frac{22}{7} \times 21^2$ @ $\frac{1}{2} \times 21^2 \times \frac{\pi}{2} = \frac{693}{2}$

Shaded Area

$\frac{90}{360} \times \frac{22}{7} \times 21^2 - \frac{1}{2} \times 14 \times 14$

$\frac{497}{2}$ or $248\frac{1}{2}$ or 248.5

Accept : 248.2 – 248.5

Perimeter $SR = \frac{90}{360} \times 2 \times \frac{22}{7} \times 21$ @ $21 \times \frac{\pi}{2} = 33$ @

Perimeter $PQ = \frac{60}{360} \times 2 \times \frac{22}{7} \times 14$ @ $14 \times \frac{\pi}{3} = \frac{44}{3} = 14.67$

Perimeter :

$\frac{90}{360} \times 2 \times \frac{22}{7} \times 21 + \frac{60}{360} \times 2 \times \frac{22}{7} \times 14 + 2(7 + 14)$

$\frac{269}{3}$ @ $89\frac{2}{3}$ @ 89.67 @ 89.66

Accept : 89.62 – 89.67 :

Area = $\frac{1}{2} j^2\theta$ @ Perimeter, $s = j\theta$.

THE STRAIGHT LINES

1. (a) $y = 2x - 5$
   (b) $x = \frac{5}{2}$

2. (a) $x = 3$
   (b) $y = \frac{2}{3}x$

3. (a) (6,4)
   (b) 2
   (c) $y = 2x - 8$

4. (a) (2,3)
   (b) $\frac{1}{2}$
   (c) $2y = x + 4$

5. (a) 2
   (b) $y = 2x - 2$

TRANSFORMATIONS III

1.

(a) (i) (7, 0) 2M
(ii) (7, 8) 2M
(b) (i) (a) V = Reflection at the line AB 2M
(b) WV = Rotation 90° anti-clockwise about point (6, 5) 3M
(c) (i) (6, 2) 1M

(ii) 36.2 2M

2.
(a) (i) (6, 2) 1M
(ii) (4, 2) 2M
(b) (i) (a) W = Rotation 180° clockwise about H. 3M
(b) Z = Enlargement with scale factor 3 at point C. 3M
(ii) 176 3M

3.
(a) (i) (2, 4) 1M
(ii) (2, -2) 2M
(b) (i) (a) U = Rotation 90° clockwise about point (0,1). 3M
(b) W = Enlargement with scale factor 3 at point R. 3M
(ii) 15 3M

4.
(a) (i) (-5, 4) 2M
(ii) (1, -3) 2M
(b) (i) (a) V = Rotation 90° clockwise about point (-3, 5). 3M
(b) Z = Enlargement with scale factor 2 at point (4, 7) 3M
(ii) 131.2 2M

5.
(a) (i) (3, 4) 2M
(ii) (a) (2, 1) 3M
(b) (2, -3)
(b) (i) (a) W = Reflection at the line x = 3. 2M
(b) Z = Enlargement with scale factor 2 at point (1, 2). 3M
(ii) 34.2 2M

6.
(a) (i) (-2, 7) 1M
(ii) (-2, 1) 2M
(b) (i) (a) V = Rotation 90° clockwise about point (-1, 0). 3M
(b) W = Enlargement with scale factor 2 at point E. 3M
(ii) 63 3M

7.
(a) (i) (0, 4) 1M
(ii) (2, 3) 1M
(iii) (-1, 5) 2M
(b) (i) (a) V = Reflection at the line x = -1 3M
(b) W = Enlargement with scale factor 3 at point (2, 4).
(ii) 144 2M

EARTH AS A SPHERE

1.

a) (50^0 N, 135^0 E) 3M

Note:

135^0 E or (50^0 N, θ^0 E) 2M

50^0 N or 135^0 E 1M

b) (40 + 40) x 60

4 800 2M

c) 5820 - 50

60

47^0 S

3M

d) (180-35)x60xkos50 @ (360-80-135)x60xkos50

600 600

9Hours 19minutes 4M

2.

a) 110^0 W, 2M

b) 4 800 @ 80

60

20^0 N 3M

c) 180 x 60 x kos60^0

5400 3M

d) (180-(60+60)x60 @[2(90-60)] x60

60 x 60 +4800

560 3M

15 1M

3.

a) (20^0 S, 155^0 W) 2M

Note:

20^0 S or 155^0 W, 1M

b) i) 4200 - 20

60

50 3M

ii) 3270

60xkos20

33 4M

c) (20 x 30)60 @ 3 000

3270 + (20 x 30)60 @ 6270
600 600

10.45h @ 10h27m 3M

4.

a (i) 140^0 E 2M

Note :
$140^{0\,@}$ θ^0 @ E or T (1M)

ii) (180 – 65 -65)x 60 or 2(90 – 65)x60

3 000 2M

b) 4500 or 75
60
10^0 S 3M

c) i) (40+60) x 60 x cos65

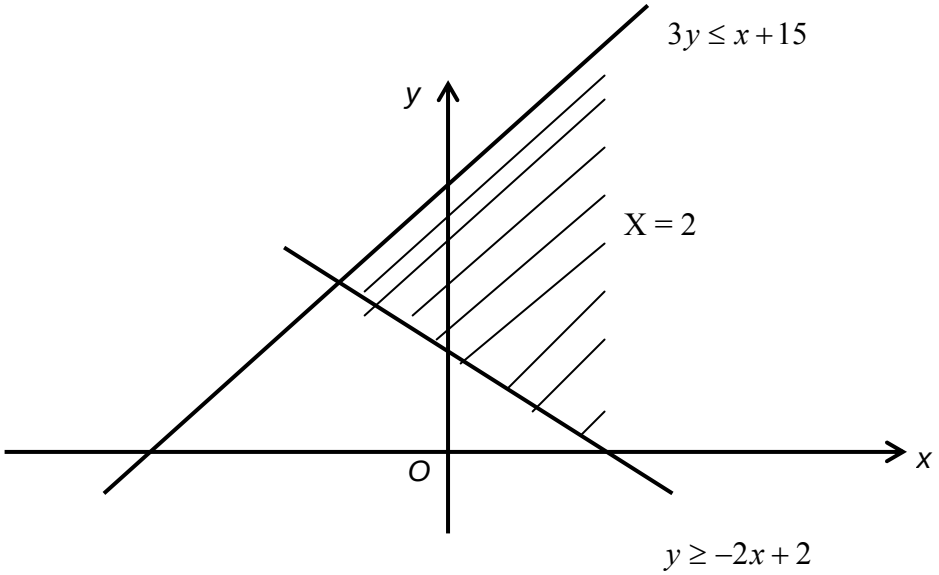
2536 3M

ii) 4500+(40+60)x60xcos65
550

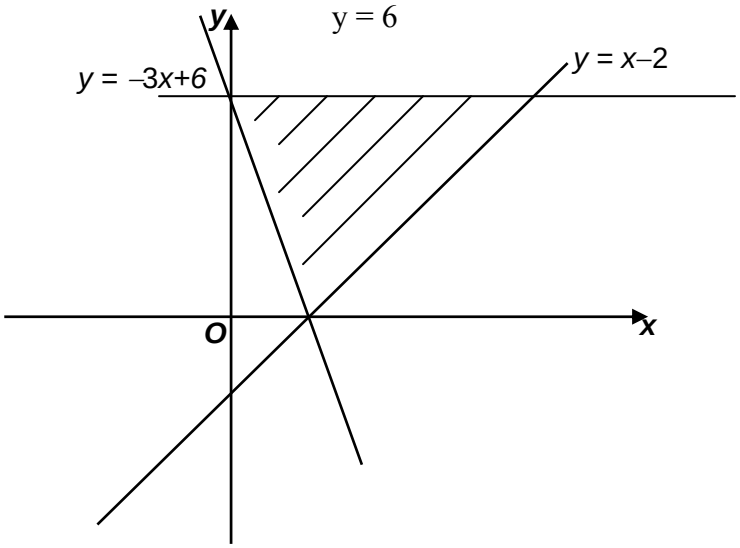
12.79 2M

LINEAR INEQUALITIES

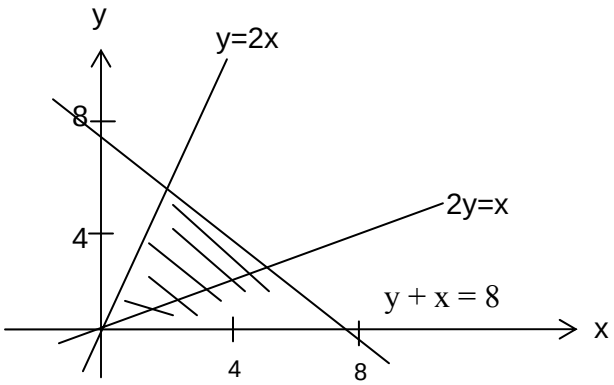
1.



2.



3.



QUADRATIC EXPRESSIONS AND EQUATIONS

Exercise 1:

$x = \frac{5}{2}$, x = -3

Exercise 2:

$x = \frac{3}{2}$, x = 3

Exercise 3:

$x = -\frac{4}{3}$, x = 3

Exercise 4:

$x = \frac{1}{5}$, x = -1

MATHEMATICAL REASONING

Exercise 1:

i: True.

ii : Premise 2 : PQR is an equilateral triangle

iii :

Implication 1 : If m > n, than $m - n > 0$

Implication II : If $m - n > 0$, than $m - n > 0$

(5 marks)

Exercise 2:

4. a) Conclusion : …ABCDE have 5 equal sides.

b) $3(n)^2 - 5$, n = 2,3,4,5,…

c) $15 \div (-5) = -5$ OR 28 is a multiple of 4.

(5 marks)

Exercise 3:

a) i) False.
ii) True

b) Premise 2 : 4 is greater than zero

c)

Implication 1 : If $5m > 15$, than $m > 3$

Implication 2 : If $m > 3$, than $5m > 15$

(5 marks)

SETS

Exercise 1:

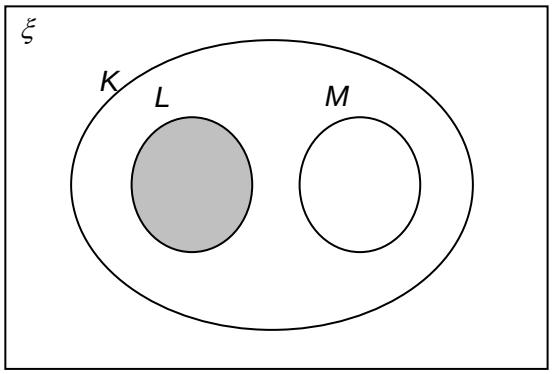
(a) $K \cap L$,

(b) $K \cap (L \cup M)'$.

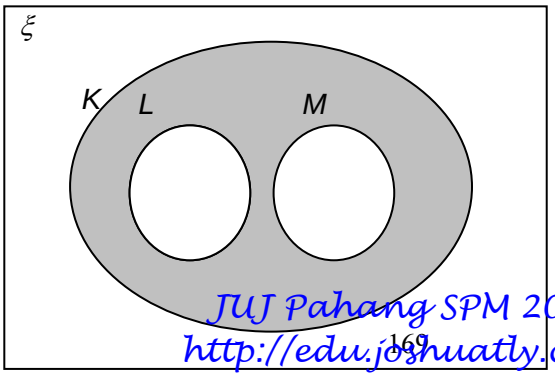
[3 *marks*]

Answer:

(a)



(b)



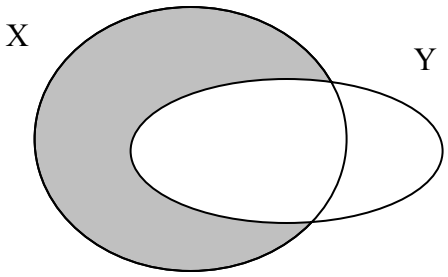
Exercise 2:

(a) $\mathbf{X} \cap Y'$
(b) $(X \cup Y) \cap Z'$

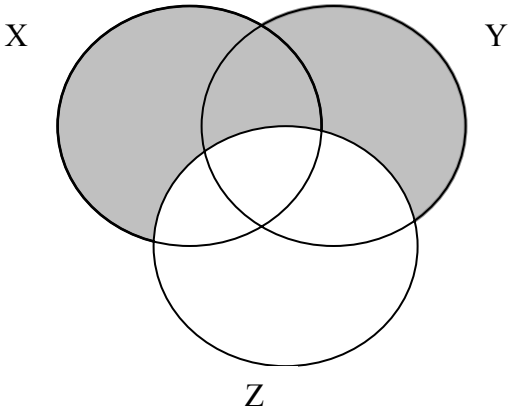
[3 *marks*]

Answer:

(a)



(b)



Exercise 3:

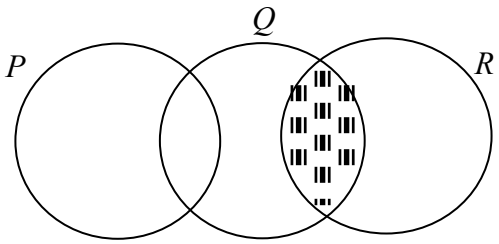
(*a*) $P \cup Q \cap R$

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

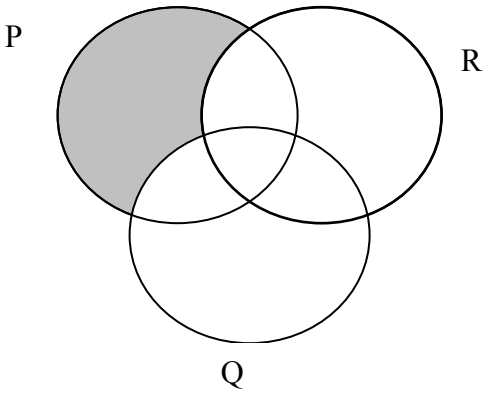
[3 *marks*]

Answer:

(*a*)



(*b*)



SOLID GEOMETRY

Exercise 1:

Volume of Solid = 1415 cm^3.

Exercise 2:

Volume of Solid = $361\frac{2}{3}$ cm^3 or 361.67cm^3

Exercise 3:

Volume of Solid = 840 cm^3.

MATRICES

Exersice 1:

a) $m = -\frac{1}{11}$ and $p = -3$

b) $x = 3$ and $y = -2$

Exercise 2:.

a) $k = 4$

b) $x = 4$ and $y = -3$

c)

Exercise 3:

a) $M^{-1} = \begin{pmatrix} -\frac{1}{2} & \frac{3}{2} \\ 1 & -2 \end{pmatrix}$

b) $x = -11$ and $y = 12$

LINEAR EQUATIONS

Exercise 1:

$x = -\frac{30}{11}$ and $y = \frac{32}{11}$

(4 marks)

Exersice 2:

m= $\frac{3}{2}$ and n = -1

(4 marks)

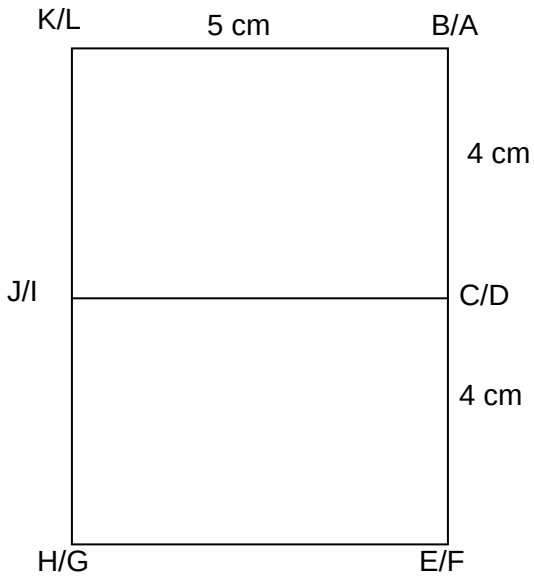
Exercise 3:

d = $\frac{1}{3}$ and e = -4 *(4 marks)*

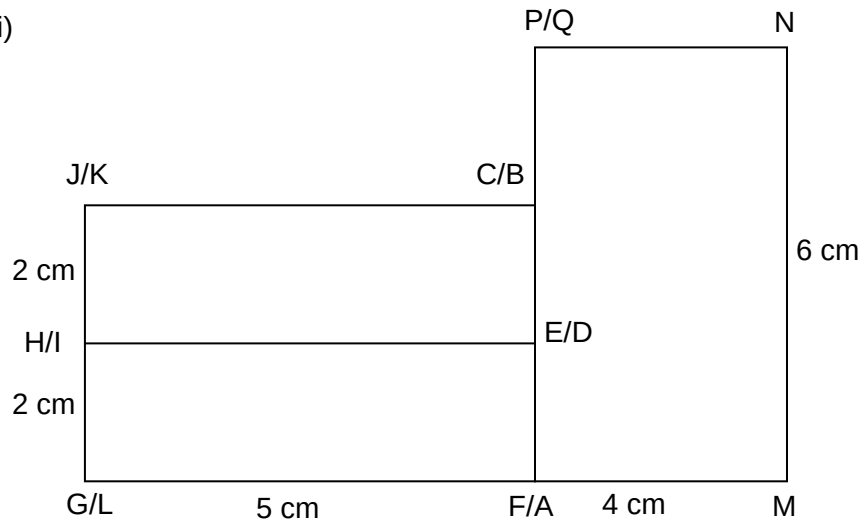
PLAN AND ELEVATIONS

.

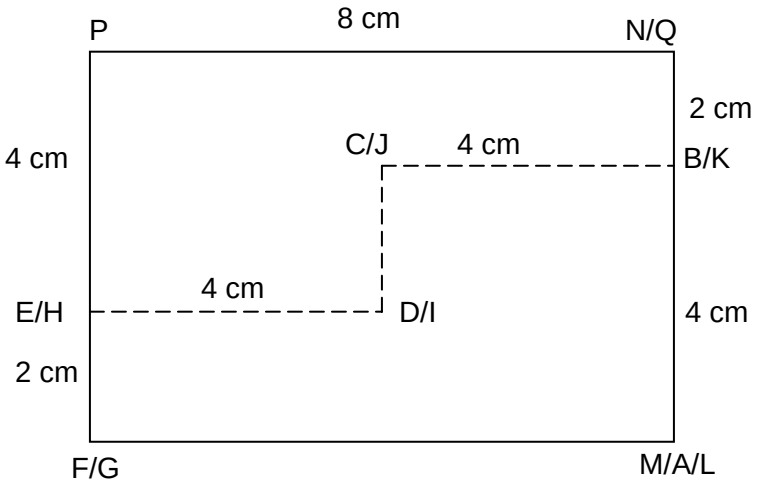
1. (a)



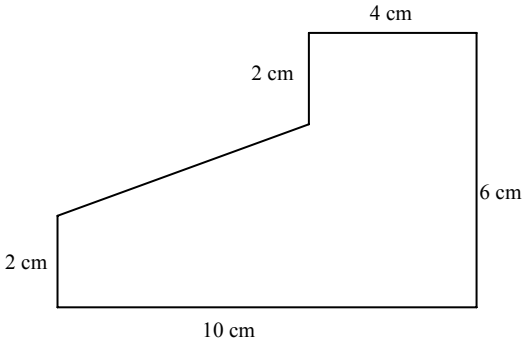
1 (b) (i)



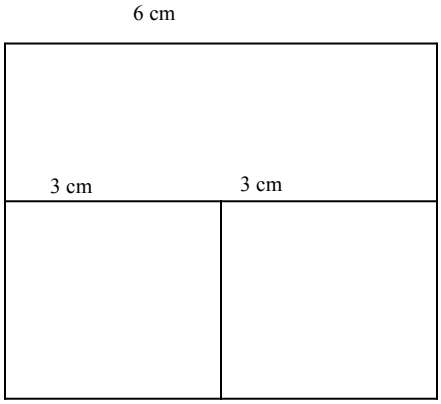
1 (b) (ii)


P
8 cm
N/Q
2 cm
4 cm
C/J
4 cm
B/K
4 cm
E/H
D/I
4 cm
2 cm
F/G
M/A/L

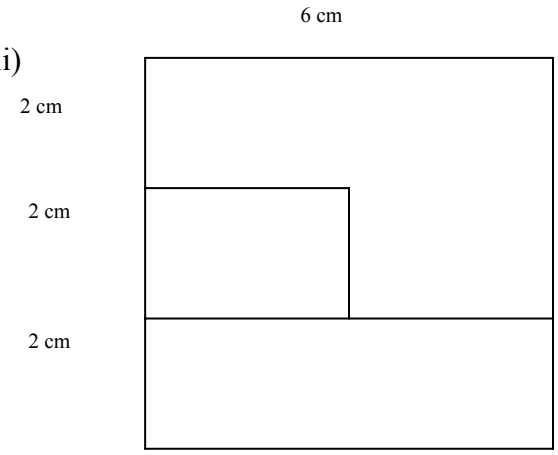
2. (a)


4 cm
2 cm
6 cm
2 cm
10 cm

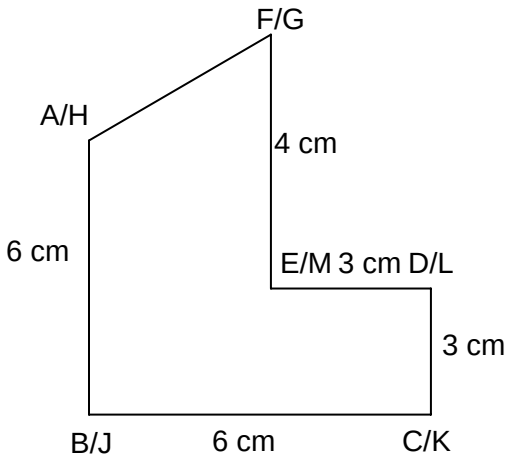
2. (b) (i)


6 cm
3 cm
3 cm

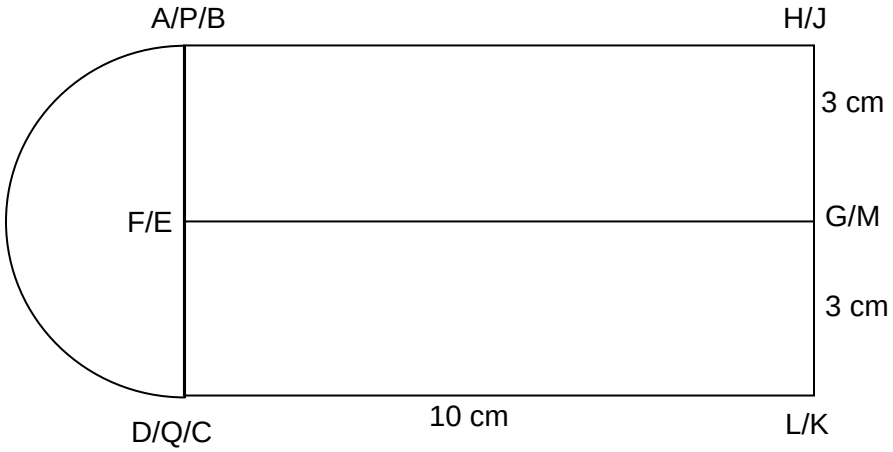
2. (b) (ii)



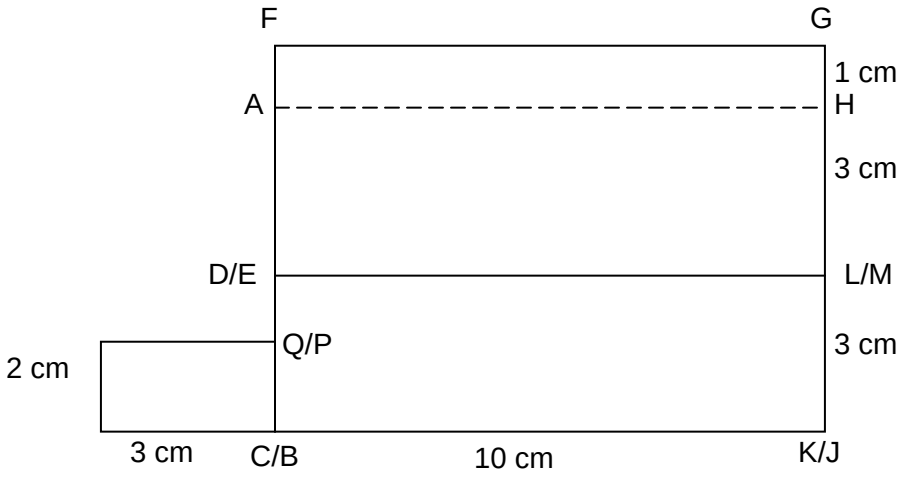
3 (a)



3. (b) (i)



3. (b) (ii)



GRAPHS OF FUNCTIONS

1

a)

x	-3	-2	-1	0	1	2	3	3.5	4
y	4	**11**	6	-5	-16	-21	**-14**	-4.13	11

Table 1

c) i) y = - 19

ii) x = 0.3, 3.3

d) y = - 2x – 7

x = 0.25, 3.1

2. a)

X	-3	-2	-1	0	1	2	3	4	5
Y	27	**13**	3	-3	-5	**-3**	3	13	27

Table 2

c) i) y = 7.5

ii) x = - 0.55, 3.6

d) y = 3x + 5

x = - 0.9, 4.5

3. Answer:

a)

x	-3	-2	-1	0	1	2	3	3.5	4
y	-29	**-12**	-1	4	3	-4	**-17**	-25.75	-36

Table 3

c) i) y = 2

ii) x = - 2.2, 2.75

d) y = 24

x = - 2.8

STATISTICS

1.

a)

Donation (RM)	Frequency	Midpoint
30-34	2	32
35-39	10	37
40-44	12	42
45-49	8	47
50-54	5	52
55-59	3	57

b) i) 40-44

ii) $\frac{(32x2)+(37x10)+(42x12)+(47x8)+(52x5)+(57x3)}{40}$

$= \frac{1745}{40}$

$= 43.625$

2)

a)

Class Interval	Midpoint	Frequency
15-19	17	2
20-24	22	4
25-29	27	9
30-34	32	13
35-39	37	9
40-44	42	3

c) i) Modal class 30-34

ii) Mean = $\frac{(17x2)+(22x4)+(27x9)+(32x13)+(37x9)+(42x3)}{40}$

$$= \frac{1240}{40}$$

$$= 31$$

3.

a)

Height (cm)	Frequency	Cumulative Frequency
135 - 139	0	0
140 - 144	2	2
145 - 149	5	7
150 - 154	11	18
155 - 159	14	32
160 - 164	6	38
165 - 169	2	40

TABLE 3

c) i) 155.25 cm
ii) 4