



SMJK PEREMPUAN PERAK, IPOH, PERAK.
PEPERIKSAAN PERCUBAAN SPM TAHUN 2021
ADDITIONAL MATHEMATICS
KERTAS 2(3472/2)

(Masa : 2 jam 30 min)

Nama murid : _____ () Kelas : 5 _____

Disediakan oleh : PN LEOW SOO EM Markah: _____

Disemak oleh : _____ Disahkan oleh : _____

(KALAIVANI A/P KARUPPIAH)
Ketua Panitia Matematik Tambahan

(WONG SOOK KUIN)
Pengetua

Kertas peperiksaan ini mengandungi 16 halaman bercetak.

This question paper consists of three sections: **Section A**, **Section B** and **Section C**. Answer **all** the questions in **Section A**, any **three** questions from **Section B** and any **two** questions from **Section C**. Show your working.

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

1 It is given α and β are the roots of the quadratic equation $2x^2 + 6x - 3 = 0$.

(a) Form the quadratic equation which has roots α^2 and β^2 . [3 marks]

Answer:

(b) Find the range of values of p if $2x^2 + 6x - 3 = p$ has no real roots. [3 marks]

Answer:

2 (a) Convert $13.567567567\dots$ to fraction.

[3 marks]

Answer:

(b) The area of a triangle is $20\sqrt{3} - 4 \text{ cm}^2$, the length of its base is $4 + 4\sqrt{3} \text{ cm}$. Determine the height of triangle in the form of $\alpha - \beta\sqrt{3} \text{ cm}$ where α, β are rational numbers.

[3 marks]

Answer:

- 3 (a) Calculate the number of four letter words that can be formed from the letters in the word MATHEMATICS. [3 marks]

Answer:

- (b) A ping-pong team that consists of 7 students will be chosen from a group of 9 male students and 6 female students. Find the number of teams that can be formed so that each team consists of

- (i) 5 male students,
(ii) not more than 3 female students.

[4 marks]

Answer:

(i)

(ii)

- 4 (a) Derive the identity $\cos 2x = \cos^2 x - \sin^2 x$. [2 marks]

Answer:

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

Hence, using the same axes, draw a suitable straight line to find the number of solutions of the

equation $\cos^2 x - \sin^2 x = \frac{x}{\pi} - 2$ for $0 \leq x \leq 2\pi$. [5 marks]

Answer:

- 5 A food packaging factory intends to pack *dodol* in a container in the shape of a right prism with a square base, as shown in Diagram 1.

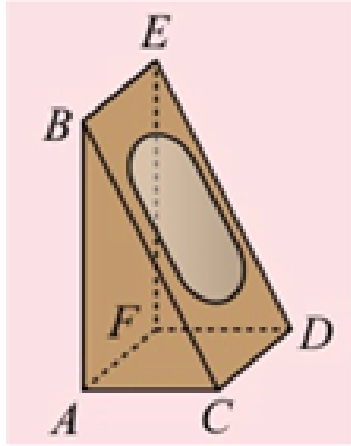


Diagram 1

Given that the total length of sides of the right prism is 130 cm and $ED=BC=25$ cm.

Can a piece of *dodol* of volume 600 cm^3 be packed into the container? Justify your answer.

[8 marks]

- 6 (a) Diagram 2 shows two straight lines L_1 and line L_2 with gradients m_1 and m_2 respectively.

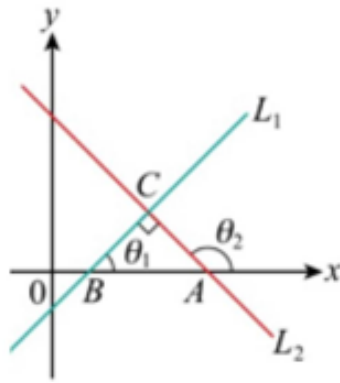


Diagram 2

If L_1 and L_2 are perpendicular at point C, show that $m_1 m_2 = -1$.

[2 marks]

Answer:

- (b) Diagram 3 shows the locations of house A and house B drawn on a Cartesian plane.

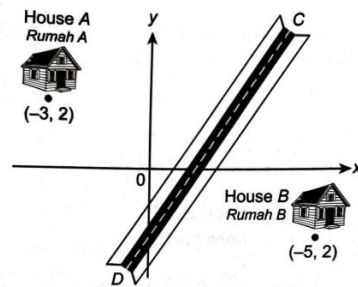


Diagram 3

- (i) CD is a straight bridge such that the distance from house A and house B to any point on the bridge is always equal. Find the equation of CD.
 (ii) A straight road, EF with equation $y = -3x + 8$ will be built. A lamp post will be installed at the intersection of the bridge and the road. Find the coordinates of the lamp post.

[6 marks]

Answer:

- (i)

(ii)

- 7 Diagram 4 shows part of the curves $y = x^2$ and $y^2 = kx$, where k is a constant, intersected at the points O and P .

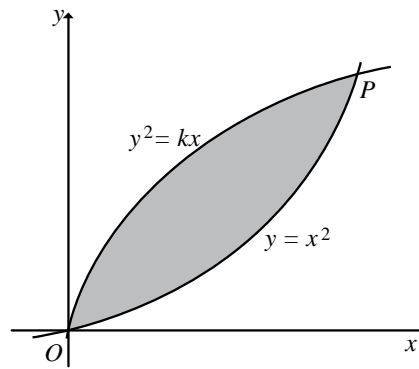


Diagram 4

- (a) It is given that the tangent to the curve $y = x^2$ at the point P is parallel to the straight line $2y - 8x + 3 = 0$. Find the coordinates of P . [2 marks]

Answer:

(b) Find the value of k . Hence, find the area bounded by the shaded region.

[3 marks]

Answer:

(c) Find the volume generated, in term of π , when the shaded region is revolved through 360° about the y -axis.

[3 marks]

Answer:

Section B
[30 marks]

Answer any **three** questions from this section.

- 8 Diagram 5 shows a triangle OAB where E is the midpoint of OA . The straight lines AF and BE intersect at point G . It is given that $\vec{OA} = 2\vec{a}$ and $\vec{OB} = 3\vec{b}$, $OF : FB = 2 : 1$, $\vec{AG} = h\vec{AF}$ and $\vec{BG} = k\vec{BE}$ where h and k are constants.

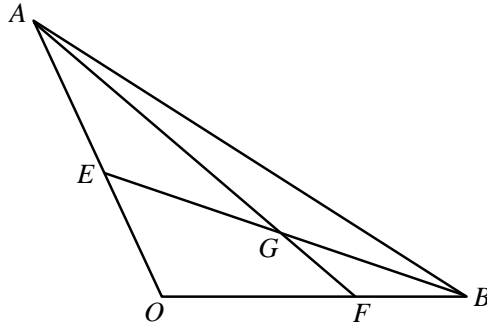


Diagram 5

- (a) Express \vec{OG} in terms of
- (i) h , \vec{a} and / or \vec{b} ,
 - (ii) k , \vec{a} and / or \vec{b} .

[5 marks]

Answer:

(i)

(ii)

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

[3 marks]

Answer:

(c) Given $\underline{a} = 2\underline{i} + \underline{j}$ and $\underline{b} = 3\underline{i}$, find $|\overline{OG}|$.

[2 marks]

Answer:

9 (a) Random variable X has a binomial distribution with parameter $n = 8$ and $p = 0.4$.

(i) Estimate its mean and standard deviation.

(ii) Find the value of $P(X \leq 2)$.

[5 marks]

Answer:

(i)

(ii)

(b) The lifespan of a type of bulbs is normally distributed with a mean of 200 days and a variance of 25 day².

(i) Find the probability that a bulb selected a random has a lifespan less than 190 days.

(ii) Given that 20% of the bulbs have lifespan of more than m days, find the value of m .

[5 marks]

Answer:

(i)

(ii)

10 Use a graph paper to answer this question.

Table 1 shows the values of two variables, x and y , obtained from an experiment. The variables x and y are related by the equation $y = pq^{(x-1)}$, where p and q are constants.

x	2	3	4	5	6	7
y	2.53	3.85	5.71	8.60	13.00	19.50

Table 1

- (a) Based on Table 1, construct a table for the values of $(x - 1)$ and $\log_{10} y$. [2 marks]
Answer:

- (b) Plot $\log_{10} y$ against $(x - 1)$, using a scale 2 cm to 1 unit on the $(x - 1)$ -axis and 2 cm to 0.2 unit on the $\log_{10} y$ -axis. Hence, draw the line of best fit. [3 marks]

- (c) Using the graph in 10(b), find the value of

(i) p ,

(ii) q .

Answer:

[5 marks]

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Diagram 6 shows a quadrant of a circle OQR with centre O and radius 10 cm. PQS is a sector of a circle with centre P.

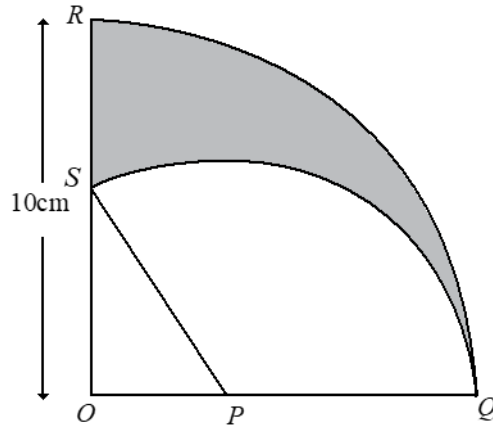


Diagram 6

- (a) It is given that S is the mid-point of OR. Find the length of PQ, in cm.

[Use $\pi = 3.142$]

Answer:

[2 marks]

- (b) Find $\angle QPS$ in radians.

Answer:

[2 marks]

- (c) Find the perimeter, in cm, of the shaded region.

Answer:

[3 marks]

- (d) Find the area, in cm^2 , of the shaded region.

Answer:

[3 marks]

Section C

[20 marks]

Answer any **two** questions from this section.

12 Use a graph paper to answer this question.

A college plans to send their students to an academic programme. They plan to rent x buses and y vans. The rental of a bus is RM500 and the rental of a van is RM200.

The rental of the vehicles for the programme is based on the following constraints:

- I : The total number of vehicles to be rented is not more than 10.
- II : The ratio of the number of buses to the number of vans is at most 3:2.
- III : The maximum allocation for the rental of the vehicles is RM3000.

(a) Write down three inequalities, other than $x \geq 0$ and $y \geq 0$, that satisfy all of the above constraints. [3 marks]

Answer:

(b) Using a scale of 2 cm to 1 vehicle on both axes, construct and shade the region R that satisfies all the above constraints. [3 marks]

(c) Use the graph constructed in 12(b) to find

- (i) the minimum number of vans rented if 4 buses are rented.
- (ii) the maximum number of students that can be accommodated into the rented vehicles if a bus can accommodate 48 passengers and a van can accommodate 12 passengers. [4 marks]

Answer:

(i)

(ii)

- 13 Table 2 shows the prices and price indices of five ingredients A , B , C , D and E , used to make a particular kind of pizza. Diagram 7 is a pie chart which represents the relative amount of the ingredients A , B , C , D and E , used in making these cakes. [2 marks]

Items	Price (RM) for the year		Price index for the year 2008 based on the year 2006
	2006	2008	
A	1.50	1.80	120
B	2.00	2.88	144
C	p	4.50	150
D	4.00	3.60	90
E	2.00	2.16	q

Table 2

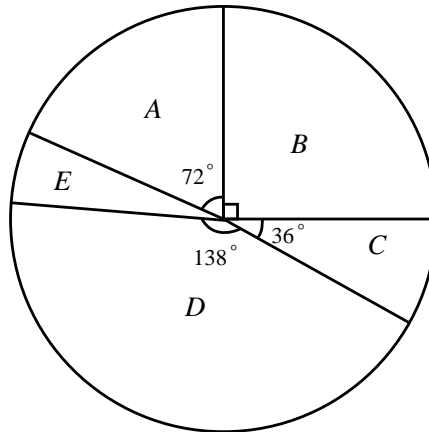


Diagram 7

- (a) Find the value of p and of q . [2 marks]
 Answer:
- (b) Calculate the composite index for the cost of making the pizza in the year 2008 based on the year 2006. [3 marks]
 Answer:
- (c) The price of each ingredient increases by 20% from the year 2008 to the year 2010. Given that the cost of making a piece of pizza in the year 2006 is RM50. Calculate the corresponding cost in the year 2010. [5 marks]
 Answer:

14 Diagram 8 shows triangle ABC .

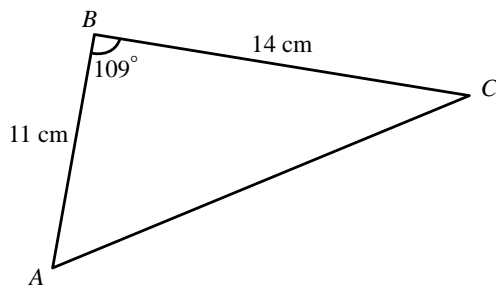


Diagram 8

- (a) Calculate the length, in cm, of AC . [2 marks]
Answer:

- (b) A quadrilateral $ABCD$ is now formed so that AC is a diagonal, $\angle CAD = 38^\circ$ and $CD = 14$ cm. Calculate the two possible values of $\angle ADC$. Hence, sketch the two possible triangle ADC . [3 marks]
Answer:

- (c) By using the acute $\angle ADC$ from 14 (b), calculate
(i) the length, in cm, of AD .
(ii) the area, in cm^2 , of the quadrilateral $ABCD$. [5 marks]

Answer:

(i)

(ii)

- 15 A particle moves along a straight line and passes through a fixed point O . Its velocity, v , in m s^{-1} , is given by $v = 10 + 6t - 3t^2$, where t is the time, in seconds, after passing through O .

[Assume motion to the right is positive]

- (a) Find the maximum velocity, in m s^{-1} , of the particle [3 marks]
Answer:

- (b) Find the acceleration, in m s^{-2} , when the particle passing through O again. [4 marks]
Answer:

- (c) Find the displacement, in m , of the particle from O when acceleration is -12 m s^{-2} [3 marks]
Answer:

END OF QUESTION PAPER