Module 4-KERTAS 2

Paper 2

Time: Two hours and thirty minutes

Instruction : This question paper consists of three sections: Section A, Section B and Section C. Answer all questions in Section A, four questions from Section B and two questions from Section C. Give only one answer/ solution for each question. All the working steps must be written clearly. Scientific calculator that are non-programmable are allowed.

Section A
[40 marks]

1. Given that (-1, 2k) is a solution for the simultaneous equation $x^2 + py - 29 = 4 = px - xy$ where k and p are constants. Find the value of k and of p. [5 marks]

Jawapan:
k = 4, p = 4; k = –2, p = –8

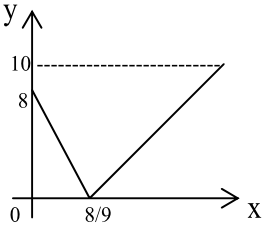
2. Given function $f : x \to 4 - 3x$.
   (a) Find,
   (i) $f^2(x)$,
   (ii) $(f^2)^{-1}(x)$. [3 marks]

   (b) Hence, or otherwise, find $(f^{-1})^2(x)$ and show $(f^2)^{-1}(x) = (f^{-1})^2(x)$. [3 marks]

   (c) Sketch the graph of $|f^2(x)|$ for the domain $0 \le x \le 2$ and find it's corresponding range. [2 marks]

Jawapan:

(a)(i) $9x - 8$ (ii) $\frac{x+8}{9}$ (c)



$0 \le y \le 10$

3. Diagram 3 shows five semicircles.

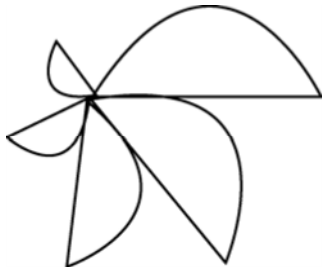


DIAGRAM 3

The area of the semicircles form a geometric progression. Given that area of the smallest semicircle is $\frac{1}{16}$ of the area of the largest semicircle. If the total area of the semicircles is $30\,\text{cm}^2$, find

(a) area of the smallest semicircle

(b) area of the largest semicircle

[5 marks]

Jawapan:

(a) 10 (b) 160

4. Given that $\tan(x-y)=-1$ and $\tan y=\frac{3}{4}$, show that $\tan x=-\frac{1}{7}$.

Sketch the graph of $y=|\tan x|$ for $0^0\le x\le 360^0$.

Hence, using the same axes , draw a suitable straight line and find the number of solutions for the equation

$3|\tan x|+x=6$

[6 marks]

Jawapan: Number of solutions = 3

5. Diagram 5 shows a parallelogram OABC.

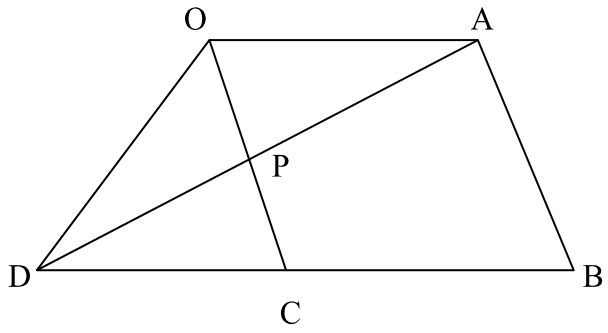


DIAGRAM 5

Given that APD, OPC and DCB are straight lines. Given that $\vec{OA} = 6a$, $\vec{OC} = 12c$ and OP : PC = 3 : 1.

(i) Express $\vec{AP}$ in terms of a and/or c.

(ii) Given the area of the ΔADB = 32 unit^2 and the perpendicular distance from A to DB is 4 units, find $|a|$. [5 marks]

Jawapan:

(a) $-6\underset{\sim}{a}+9\underset{\sim}{c}$

(b)2

6.

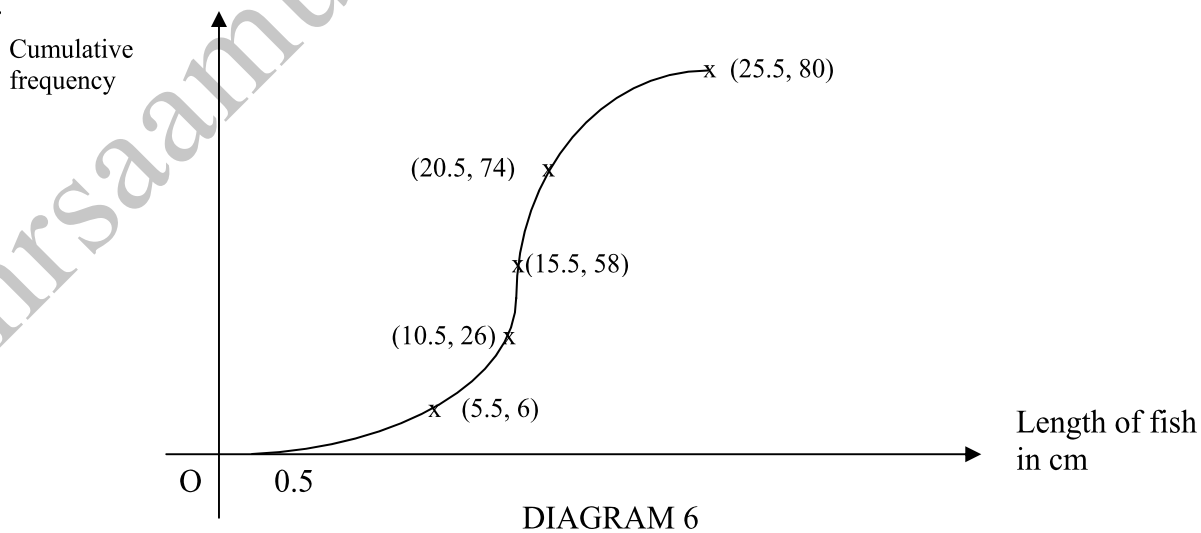


DIAGRAM 6

Diagram 5 shows an ogive for the distribution of 80 fishes in a tank when the cumulative frequency is plotted against upper boundaries for a certain classes. O is the origin.

(a) Construct a frequency table with a uniform class interval from the information given in the ogive.

[2 marks]

(b) Draw a histogram and determine the mode.

[3 marks]

(c) From the frequency table, find
(i) the variance,
(ii) the median
for the length of fish in the tank. [4 marks]

7. Use the graph paper provided to answer this question.
An experiment which involves samples of red blood cell used to trace the percentage, P, of the red blood cell which experience creanation when it is added by drops of sodium chloride solution with different concentration, K mol dm^3. Table below shows the results of the above experiment.

Sodium chloride concentration (K)	0.50	0.75	1.00	1.25	1.50	1.75
Percentage of red blood cells which experience creanation (P)	0.4	5.0	14.5	27.6	46.2	68.9

TABLE 7

Variables P and K are related by the equation $P = \frac{4}{\mu^2}(K + A)^2$ where μ and A are constants.

(a) Draw the graph of $\sqrt{P}$ against K.

[5 marks]

(b) From your graph, find the value of μ and the value of A.

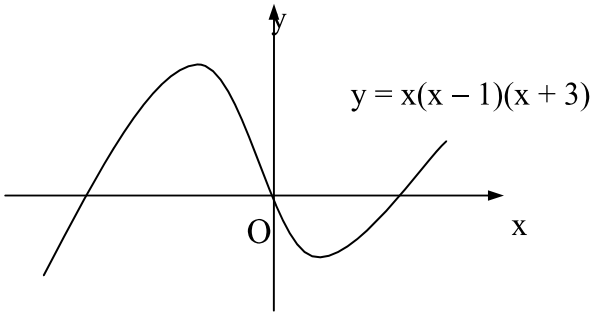
[4 marks]

(c) Find the value of P when K = 1.4?

[1 mark]

Jawapan:
(b) $\mu = 0.33, A = -0.40$
(c) $37.21 - 38.44$

8.

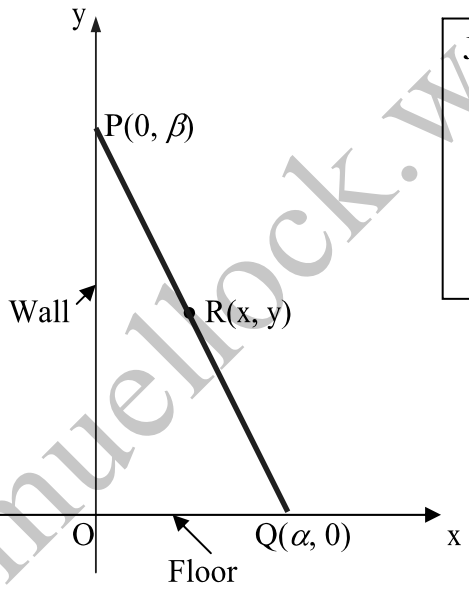


(a) Diagram above shows the curve y = x(x – 1)(x + 3). Calculate the area bounded by the curve, x-axis, line x = –2 and line x = 1. [6 marks]

(b) Diagram below shows the shaded region bounded by the curve $y = \sqrt{2x+1}$, line x = 1 and line x = k. When the region is revolved 360° at the x-axis, the volume generated is 18π unit^3. Find the value of k. [4 marks]

[answer (a) $\frac{47}{12}$ (b) k = 4]

9.



Jawapan:
(a) $\alpha^2 + \beta^2 = 81$
(b)(ii) $\left(\frac{2}{3}, 5.85\right)$
(c) 0.35

Diagram 9 shows the x-axis and the y-axis which represent the floor and the wall. The end of a piece of wood PQ with length 9 m touches the wall and the floor at the point P(0, β) and point Q(α, 0).

(a) Write the equation which relates α and β. [1 mark]
(b) Given R is a point on the piece of wood such that PR : RQ = 1 : 2.
(i) Show that the locus of the point R when the ends of the wood is slipping along the x-axis and the y-axis is $4x^2 + y^2 = 38$.
(ii) Find the coordinates of R when $\alpha = 2$.
(iii) Find the value of tan ∠ ORQ when $\alpha = 2$. [9 marks]

10.

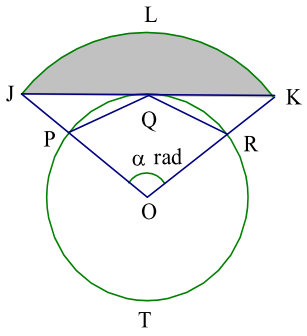


DIAGRAM 10

Diagram 10 shows a circle PQRT, centre O and radius 5 cm. JQK is a tangent to the circle at Q. The straight lines, JO and KO, intersect the circle at P and R respectively. OPQR is a rhombus. JLK is an arc of a circle, centre O. Calculate

(a) the angle α, in terms of π [2 marks]

(b) the length, in cm, of the arc JKL [4 marks]

(c) the area, in cm^2, of the shaded region. [4 marks]

Jawapan:

(a) $\frac{2}{3}\pi$

(b) $\frac{20}{3}\pi$

(c)61.50

11. (a) A study on post graduate students, revealed that 70% out of them obtained jobs six months after graduating.

(i) If 15 post graduates were chosen at random, find the probability of not more than 2 students not getting jobs after six months.

(ii) It is expected that 280 students will succeed in obtaining jobs after six months. Find the total number of students involved in the study.

[5 marks]

(b) The mass of 5000 students in a college is normally distributed with a mean of 58kg and variance of 25 kg^2. Find

(i) the number of students with the mass of more than 90 kg.

(ii) the value of w if 10% of the students in the colleges are less than w kg.

[5 marks]

Jawapan:

(a) (i) 0.1268 (ii)400

(b) (i) 82or 83 (ii) 38.77 or 38.79

12. Diagram 12 shows the position and direction of motion for two objects, P and Q, which move along a straight line and passes through two fixed points, A and B respectively.
At the instant when P passes through the fixed point A, Q passes through the fixed point B. Distance AB is 28 m.

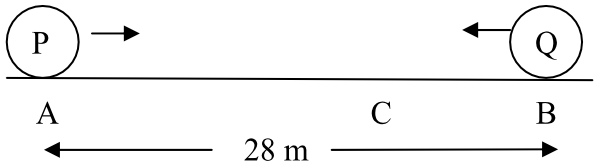


DIAGRAM 12

The velocity of P, v_p ms^{-1}, is given by $v_p = 6 + 4t - 2t^2$, where t is the time in seconds, after passing through A, whereas Q moves with a constant velocity of -2 ms^{-1}. Object P stops instantaneously at the point C.
(Assume towards the right is positive.)
Find,
(a) the maximum velocity, in ms^{-1}, for P, [3 marks]
(b) the distance, in m, C from A, [4 marks]
(c) the distance, in m, between P and Q at the instant when P is at the point C. [3 marks]

Jawapan:
(a) 8 m/s
(b) 18
(c) 4

13. . Diagram 13 shows a quadrilateral ABCD such that ∠ABC is acute.

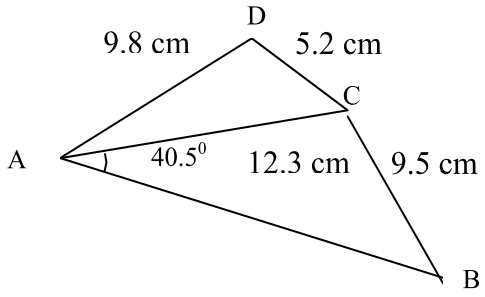


DIAGRAM 13

(a) Calculate,
(i) ∠ABC,
(ii) ∠ADC,
(iii) area, in cm^2, of quadrilateral ABCD. [8 marks]

(b) A triangle A'B'C' has the same measurements as those given for triangle ABC, that is, A'C' = 12.3 cm, C'B' = 9.5 cm and ∠B'A'C' = 40.5°, but which is different in shape to triangle ABC.
(i) Sketch the triangle A'B'C'.
(ii) State the size of ∠A'B'C'. [2 marks]

Jawapan:

(a) (i) 57.21-57.25
(ii) 106.07-106.08
(iii)82.37-82.39
(b) (ii) 122.75-122.79

14. Use the graph paper provided to answer this question.

Cloth	Preparation time (minutes)	Sewing time (minutes)
T-shirt	45	50
Slack	30	70

A tailor shop received payment only for sewing T-shirt and slack. Preparation time and sewing time for each T-shirt and slack are shown in the table above.
The maximum preparation time used is10 hours and the sewing time must be at least 5 hours 50 minutes. The ratio of the number of T-shirt to slack is not more than 4 : 5.
In a certain time, the shop is able to complete x pieces of T-shirt and y pieces of slack.

(a) Write three inequalities, other than $x \geq 0$ and $y \geq 0$, which satisfy the above conditions. [3 marks]
(b) By using a scale of 2 cm to I unit on the x-axis and 2 cm to 2 units on the y-axis, draw the graphs for the three inequalities. Hence, shades the region R which satisfies the above conditions. [3 marks]
(c) Based on your graph, find
(i) the minimum number of slacks which can be sewn in that time if 3 pieces of of T-shirt has been sewn..
(ii) maximum total profit received in that time if the profit gained from each piece of T-shirt and slack are RM16 and RM 10 respectively. [4 marks]

Jawapan:

(a) $45x + 3y \leq 600$
$50x + 70y \geq 350$
$5x \leq 4y$

(c) 4
(6,11), RM 206

15. (a)

Index number, I_i	105	94	120
Weightage, W_i	5 – x	x	4

The composite index number for the data in the table above is 108.
Find the value of x. [4 marks]

(b) (i) In the year 1995, price and price index for one kilogram of certain grade of rice is RM2.40 and 160 respectively. Based on the year 1990, calculate the price per kilogram of rice in the year 1990. [2 marks]

Item	Price index in the year 1994	Change of price index from the year 1994 to the year 1996	Weightage
Timber	180	Increased 10 %	5
Cement	116	Decreased 5 %	4
Iron	140	No change	2
Steel	124	No change	1

(ii) Table above shows the price index in the year 1994 based on the year 1992, the change in price index from the year 1994 to the year 1996 and the weightage respectively. Calculate the composite price index in the year 1996.
. [4 marks]

Jawapan:
(a) x=3
(b) (i) 1.50
(ii) RM152.90

End of question paper