

MODUL PERUNCINGAN KBAT SPM 2014

- 1 Jadual berikut menunjukkan hubungan antara kadar tindakbalas suatu bahan kimia, $x \text{ mols}^{-1}$, dengan suhu, $T^{\circ}\text{C}$.

$x \text{ (mols}^{-1}\text{)}$	0.8	2.5	4.0	5.8	7.5	9.1
$T (^{\circ}\text{C})$	-5.23	-2.49	2.13	12.89	33.69	71.43

Diberi bahawa T dan x dihubungkan oleh persamaan $T + 8 = Kn^x$, dengan keadaan K dan n adalah pemalar.

- (a) Plotkan $\log_{10} (T + 8)$ melawan x dengan menggunakan skala 2 cm kepada 1 unit pada paksi- x dan 2 cm kepada 0.2 unit pada paksi- $\log_{10} (T + 8)$. Seterusnya, lukiskan garis lurus penyuaian terbaik.

- (b) Gunakan graf anda dari (a) untuk mencari nilai

(i) K

(ii) n

- (c) Seterusnya, cari nilai T apabila $x = 6.5$.

ANS : (b) $K = 1.995$, $n = 1.489$ (c) $T = 19.54$

- 2 Jadual berikut menunjukkan nilai-nilai pembolehubah, x dan y , yang diperolehi daripada satu eksperimen.

x	3.2	6.3	10	30	50	80	100
y	17.8	25	31.6	54.7	70.1	89.4	100

Pembolehubah x dan y dihubungkan oleh persamaan $y = (1 + h)x^{\frac{k}{2}}$ dengan keadaan h dan k adalah pemalar.

- (a) Plotkan $\log_{10} y$ melawan $\log_{10} x$ dengan menggunakan skala 2 cm kepada 0.2 unit pada paksi- x dan 2 cm kepada 0.2 unit pada paksi- $\log_{10} x$. Seterusnya, lukiskan garis lurus penyuaian terbaik.

- (b) Gunakan graf anda dari (a) untuk mencari nilai

(i) h

(ii) k

ANS : (b) $h = 9$, $k = 1$

3. Jadual 6 menunjukkan markah-markah yang diperoleh oleh khairul dan Ameer dalam peperiksaan percubaan untuk mata pelajaran Matematik Tambahan.

Yusri	Yazit
85	90
87	89
82	70
90	95

- (a) Cari markah min bagi Yusri and Yazit.
- (b) Cari sisihan piawai bagi markah yang diperoleh oleh Yusri and Yazit.
- (c) Jika guru kelas ingin memberi hadiah kepada pelajar terbaik, cadangkan siapa yang akan mendapat hadiah tersebut. Beri alasan anda.

Ans : 86, 86 / 2.915 , 9.513 / ____ will get the prize ...marks are more consistent as his standard deviation is less than ____ std. deviation

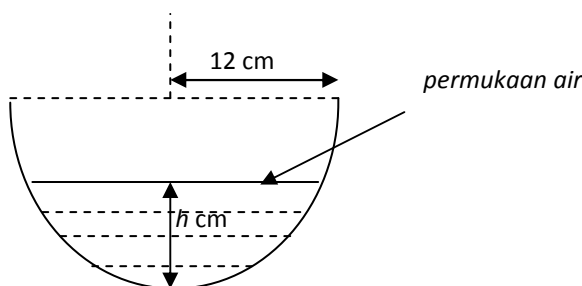
4. Cari titik-titik persilangan bagi garis lurus $\frac{x}{3} - \frac{y}{2} = \frac{8}{3}$ dan lengkung $x(1+y) = 2y+2$

Ans : (2,-4), $(\frac{13}{2}, -1)$

5. Diberi bahawa $(3h, 2k)$ ialah penyelesaian persamaan serentak $\frac{3}{x} + \frac{2}{3y} = 1$ dan $2x - 4y - 1 = 0$, cari nilai-nilai yang mungkin bagi h dan nilai-nilai yang sepadan bagi k .

Ans : $h = \frac{1}{9}$, $\frac{3}{2}$; $k = \frac{-1}{24}$, 1

6. Rajah 3, menunjukkan bekas berbentuk hemisfera dengan jejari 12 cm. Bekas itu berisi air dan ditempatkan di bawah panas matahari. Disebabkan proses pemeruawapan, paras air, h cm, menyusut pada kadar 0.06 cm s^{-1} .

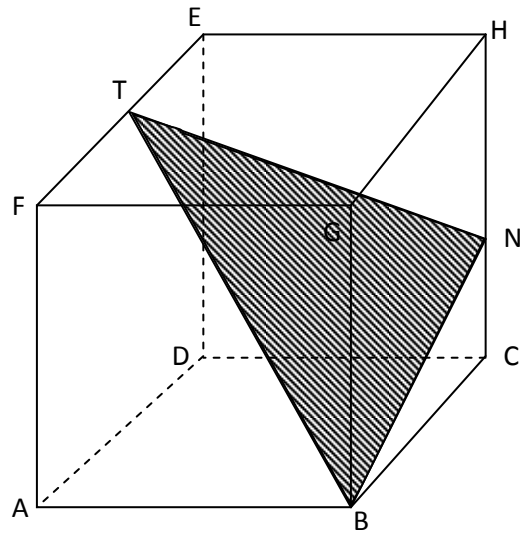


Diagram/Rajah 3

- (a) Tunjukkan bahawa luas permukaan air, $A \text{ cm}^2$, diberi oleh $A = \pi(24h - h^2)$.
- (b) Hitung kadar susutan luas permukaan air pada ketika $h = 9 \text{ cm}$

Ans : b) -0.36π

7. Diagram 13(b) shows a cuboid with square base $ABCD$.



Diberi bahawa $AF = 12 \text{ cm}$ dan $FE = 8 \text{ cm}$. T ialah titik tengah FE dan titik N terletak pada HC dengan keadaan $HN = \frac{3}{4} HC$. Hitung luas bagi $\triangle TNB$

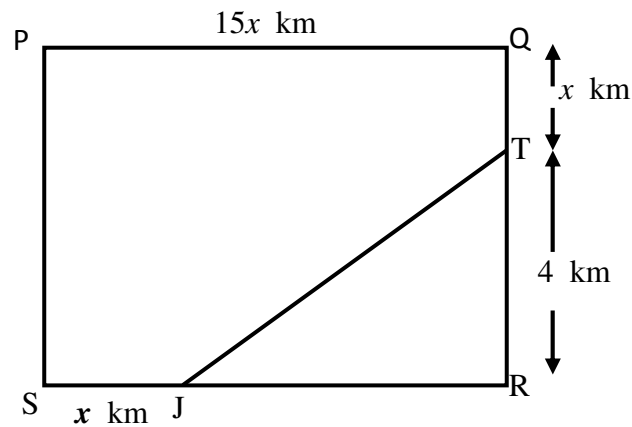
Ans: b) 54.15 cm^2

8. Straight line $y = mx + 1$ is tangent to the curve $x^2 + y^2 - 2x + 4y = 0$. Find the possible

values of m .

ans. $-\frac{1}{2}$ or 2

9. (a)



The above diagram shows a rectangular farm PQRS. JT is a straight line which link the sides SR and QR. Given that the area of the farm is 100 km^2 .

(i) Shows that $3x^2 + 12x - 20 = 0$.

(ii) Hence, find the

(a) positive value of x ,

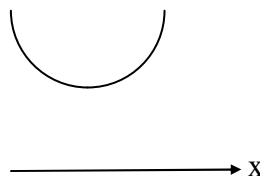
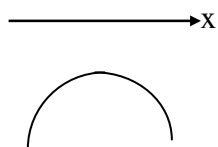
(b) length of the road JT.

(b) Graph $y = px^2 + 6x + p - 8$ does not intersect the x -axis for $p < p_1$ and $p > p_2$.

(i) Find the value of p_1 and p_2 .

(ii) Sketch two different graphs to represent case $p < p_1$ and case $p > p_2$. [5 marks]

Ans : (a)(ii) (a) 1.266 (b) 18.17 km / (b)(i) $p_1 = -1$, $p_2 = 9$ (ii) for $p < -1$ for $p > 9$



10.

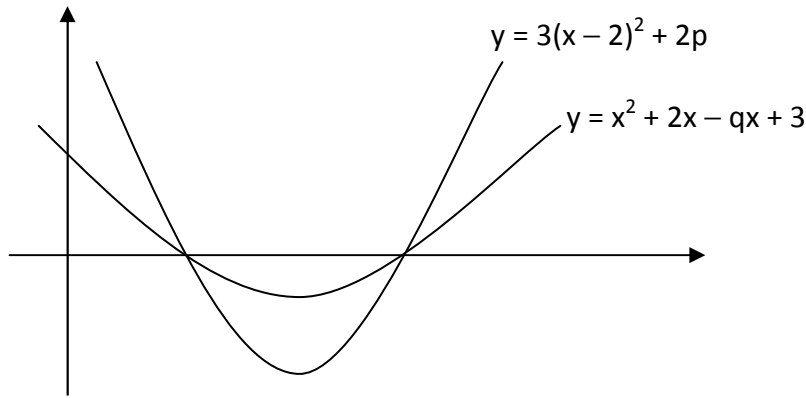


Diagram above shows the graphs of the curves $y = x^2 + 2x - qx + 3$ and $y = 3(x - 2)^2 + 2p$ which intersect at the x-axis at two points. Find.

- (a) the value of p and value of q,
- (b) the minimum points of the two curves.

$$\text{Ans} \therefore (a) p = -\frac{3}{2}, q = 6 \quad (b) -1 \text{ or } -3$$

11. Find the range of values of k so that the straight line $y = 2x + k$ intersects the curve $x^2 + y^2 - 6 = 0$.

$$\text{Ans:} \quad k < -\sqrt{30} \text{ or } k > \sqrt{30}$$

12.

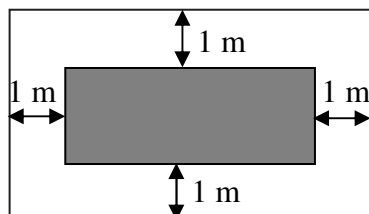


Diagram 1 shows a rectangular shape room . The shaded region is being covered with rectangular shape carpet placed 1 m from the walls of the room. If the area and the perimeter of the carpet is $8\frac{3}{4} \text{ m}^2$ and 12 m respectively, find the measurements of the room.

$$\text{Ans :} \quad 4\frac{1}{2} \times 5\frac{1}{2}$$

13. An aquarium with cuboid shape measuring u cm x w cm x u cm, has a rectangular Base. The top of the aquarium is open and other surfaces are made up of glass. Given that the total lengths of the edges is 440 cm and the total surface area of the glass is $6\,300\text{ cm}^2$. Calculate the value of u and of w .

$$\text{Ans : (a) } u = 30, w = 50; u = \frac{105}{2}, w = 5 \text{ or } u = 22.06, w = 65.88; u = 40.8, w = 28.4$$

14. 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 .

$$\text{Ans: 6. } k = 4, p = 4; k = -2, p = -8$$

15. Given that $(3k, -2p)$ is a solution for the simultaneous equation $x - 2y = 4$ and $\frac{2}{x} + \frac{3}{2y} = 1$. Find the value of k and of p

$$\text{Ans: } k = \frac{1}{3}, p = \frac{3}{4}; k = \frac{8}{3}, p = -1$$

16.

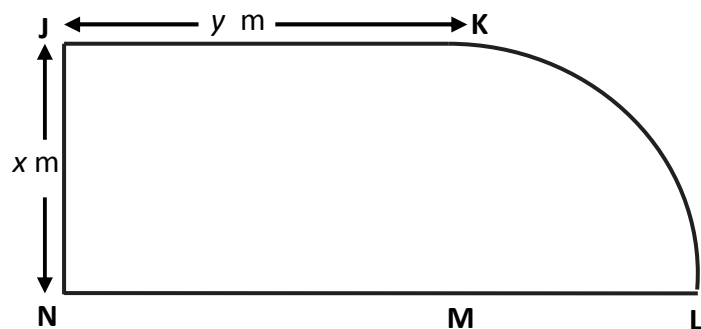
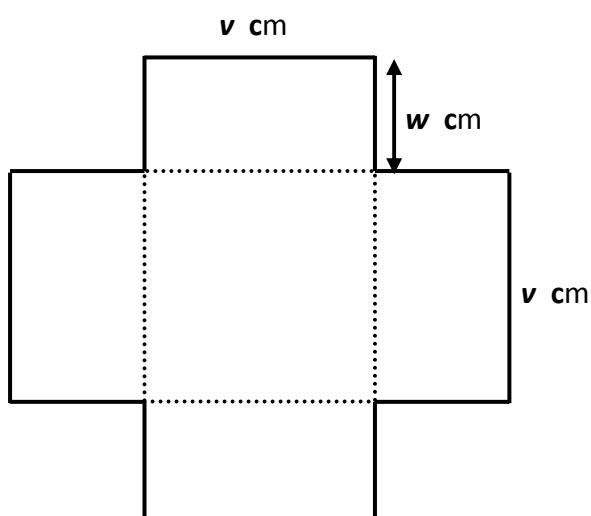


Diagram 6

Diagram 6 shows a rectangular shape pond JKMN dan quadrant KLM, centre at M. If the area of the pond is $10\pi \text{ m}^2$ and the length JK is longer than the arc KL by $\pi \text{ m}$, Find the value of x .

Ans: 3.05

17. (a) Diagram shows the net of an open rectangular box.. If the perimeter of the net is 48 cm and the total surface area is 135 cm^2 , calculate the possible value of v and of w .



Ans: $v = 9$, $w = 1\frac{1}{2}$

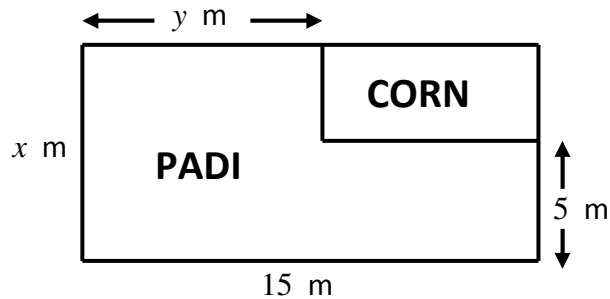
18. Given the curve $y^2 = 8(1 - x)$ and the straight line $\frac{y}{x} = 4$. Without drawing the graph, calculate the points of intersection of the two graphs .

Ans: $\left(\frac{1}{2}, 2\right), (-1, -4)$

19. Given $x + y - 3 = 0$ is a straight line which intersects the curve $x^2 + y^2 - xy = 21$ at two different point. Find the coordinates of the points.

Ans : $(-1, 4)$ and $(4, -1)$

20.



Pak Amin own a piece of land which is rectangular in shape . On this land, he planted padi and Corn in the area as shown in the diagram. The area for planting Corn is rectangular in shape. The area for planting padi is 115 m^2 and the perimeter of the area for Corn is 24 m. Find the area for planting Corn.

Ans : 35 m^2 ($x = 10, y = 8$)

21. The temperature of a metal increases from 30°C to $T^{\circ}\text{C}$ based on the equation $T = 30(1.2)^x$ when the metal is heated for x seconds.

Calculate,

- (i) the temperature of the metal when it is heated for 10.4 second,
(ii) time, in second, to increase the temperature of the metal from 30°C to 1500°C .

Ans : (i) 200 (ii) 21.45 s

22. (a) Given $2 \log_3 (x + y) = 2 + \log_3 x + \log_3 y$, show that $x^2 + y^2 = 7xy$.
(b) solve the equation $\log_9 [\log_3 (4x - 5)] = \log_4 2$.
(c) After n years, the value of a car bought is $\text{RM}60\,000 \left(\frac{7}{8}\right)^n$. Calculate, after how many years the value of the car will first be less than $\text{RM}20\,000$.

ans. (b) $x = 8$ (c) After 9 years.

23. (a) Given $\log_a 3 = x$ and $\log_a 5 = y$. Express $\log_a \left(\frac{45}{a^3}\right)$, in term of x and y .

(b) Find the value of $\log_4 8 + \log_r \sqrt{r}$.

- (c) Two experiments have been carried out to determine the relationship between the variables x dan y . Equations $3(9^x) = 27^y$ and $\log_2 y = 2 + \log_2 (x - 2)$ are obtained from the first and the second experiment respectively. Find the value of x and value of y which satisfy the two experiments.

Ans : (a) $2x + y - 3$ (b) 2 or 1.999 (c) $x = 2.5$, $y = 2$

24. (a) Without using four figure table, simplify $\frac{\log_{12} 49 \times \log_{64} 12}{\log_{16} 7}$.

(b) Given $3\log xy^2 = 4 + 2\log y - \log x$, such that x and y are positive integers. Show that $xy = 10$.

(c) The sum of money that is deposited in a cooperative society after n years is given by

$2000(1 + 0.07)^n$. Calculate the minimum number of years such that the saving will be more than RM4 000.

Ans: (a) $\frac{4}{3}$ (c) $n = 11$

25. (a) $2 \log_4 x - 4 \log_{16} y = 3$, express x in term of y.

(b) Solve the simultaneous equations $2^{m-1} \times 32^{k+2} = 16$ and $5^{-3m} \times 125^{3-k} = 1$, in which m and k are constants.

Ans : (a) $x = 8y$ (b) $m = 5, k = -2$

26. Prove $4^{2x-1} (3) = 2^{4(x-1)} (12)$

27.

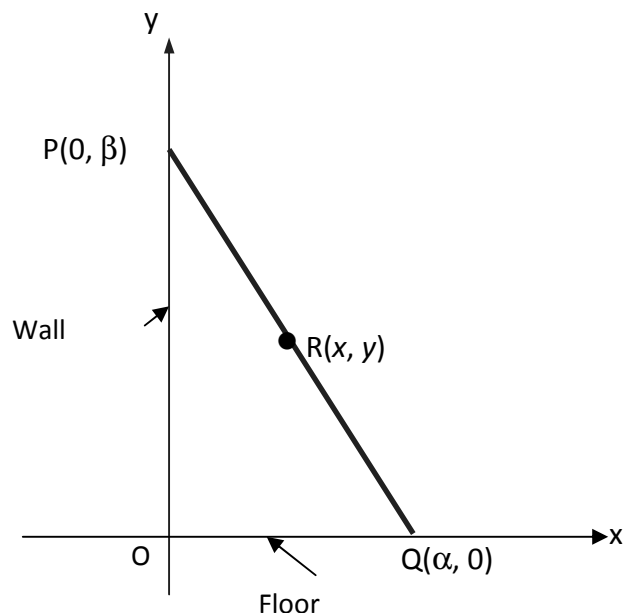


Diagram above shows the x -axis and the y -axis which represent the floor and the wall. The end of a piece of wood PQ with length 9 m touches the wall and the floor at the point $P(0, \beta)$ and point $Q(\alpha, 0)$.

(a) Write the equation which relates α and β .

(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 $4x^2 + y^2 = 36$.

(ii) Find the coordinates of R when $\alpha = 2$.

(iii) Find the value of $\tan \angle ORQ$ when $\alpha = 2$

Ans. (a) $\alpha^2 + \beta^2 = 81$ (b)(ii) $(\frac{2}{3}, 5.85)$ (c) 0.35

28. Point $A(1, 1)$, $B(5, 1)$ and $P(x, y)$, lies on the circumference of a circle with diameter AB .

(i) Show that $x^2 + y^2 - 6x - 2y + 6 = 0$.

(ii) If $x = y \neq 1$, find the equation of the straight line PB .

Ans: (ii) $x + y = 6$

29. (a) A coach wish to choose a player from two bowlers to represent the nation in a tournament. The following data show the number of pins scored by the two players in six successive bowls:

Player A: 8, 9, 8, 9, 8, 6

Player B: 7, 8, 8, 9, 7, 9

By using the values of mean and standard deviation, determine the player which qualified to be chosen because the score is consistent.

(b) *Use the graph paper provided to answer this question.*

Data in the table below shows the monthly income of 100 workers in a company.

Monthly income (RM)	Number of workers
501 - 1 000	10
1 001 - 1 500	12
1 501 - 2 000	16
2 001 - 2 500	22
2 501 - 3 000	20
3 001 - 3 500	12
3 501 - 4 000	6
4 001 - 4 500	2

(i) Based on the above table, draw an ogive to shows the monthly income distribution of the workers.

(ii) From your graph, estimate the number of workers who have an income of more than RM3 200.

Ans : (a) $\sigma_A = 1.0$, $\sigma_B = 0.817$; Player B is chosen. (b) 15

30.

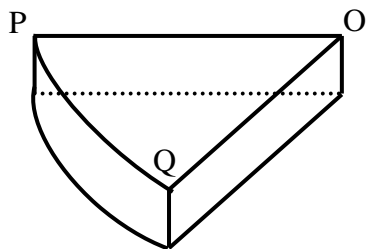


Diagram above shows a piece of cake with uniform cross section with shape of sector OPQ of a circle with radius 20 cm. Arc length of the sector is 15 cm and thickness of the of the cake is 8 cm.

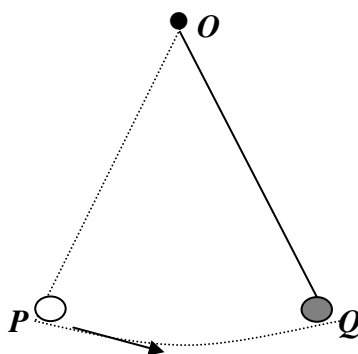
Find,

- (a) angle of the sector in radian,
- (b) total surface area of the cake.
- (c) Volume of the cake.

Ans : (a) 0.75 rad. (b) 740 cm²

31. Diagram shows the position of a simple pendulum which swing from P to Q. If the angle POQ is 8° and the length of the arc is 14.4 cm, find

- (a) the length of OQ,
- (b) area of the region swept by the pendulum.



Ans : (a) 103.15 cm (b) 742.67 or 742.68 cm²

32.

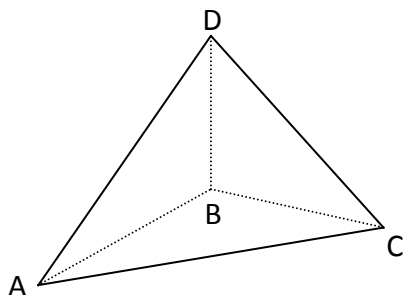


Diagram above shows a pyramid with $\triangle ABC$ as the horizontal base. Given $AB = 3$ cm, $BC = 4$ cm and $\angle ABC = 90^\circ$. Vertex D is 4 cm vertically above B.

Calculate the area of the slanting surface.

Ans : $2\sqrt{34}$ or 11.66

33.

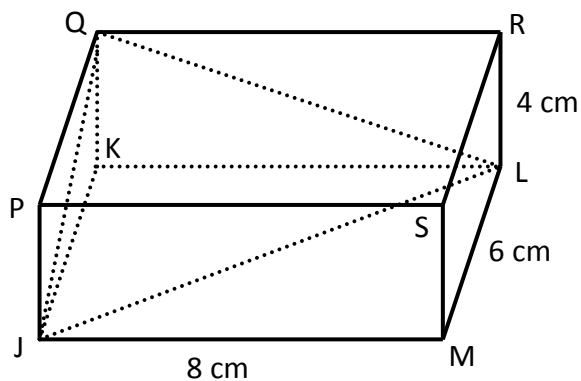


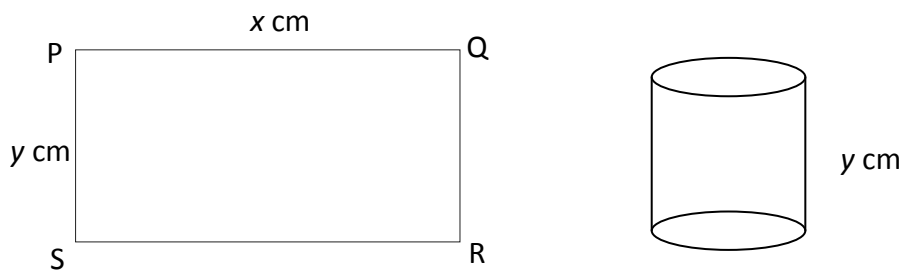
Diagram above shows a cuboids. Calculate,

(a) $\angle JQL$,

(b) the area of $\triangle JQL$.

Ans : (a) $75^\circ 38'$ (b) 31.24 cm^2

34.

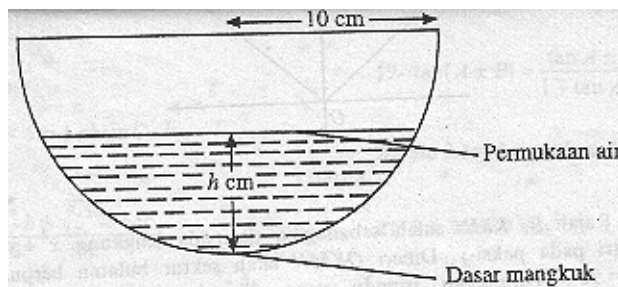


(a) Rajah di atas menunjukkan sekeping logam nipis berbentuk segiempat tepat PQRS.

Tepi PS dan QS dicantumkan untuk membentuk sebuah silinder terbuka dengan tinggi y cm. Diberi perimeter PQRS ialah 25 cm dan isipadu silinder ialah $V \text{ cm}^3$.

(i) Tunjukkan bahawa $V = \frac{x^2(25-2x)}{8\pi}$.

(ii) Carikan nilai x dan nilai y yang menjadikan isipadu silinder itu maksimum.



(b) Diagram above shows a hemispherical bowl of radius 10 cm. Water is poured into the bowl such that the height, h cm, of the water from the base of the bowl, increases at a rate of 0.2 cm s^{-1} .

(i) Show that the surface area, $L \text{ cm}^2$, of the water in the bowl is given by

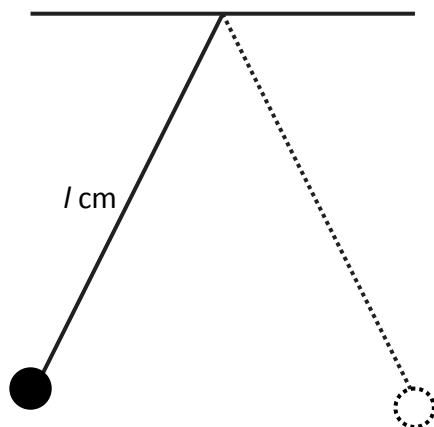
$$L = \pi(20h - h^2).$$

(ii) Find the rate of increase of surface area of the water when the height $h = 4$ cm.

Ans : (a)(ii) $x = \frac{25}{3}$, $y = \frac{25}{6}$

(b)(ii) 2.4π atau 7.541

35.



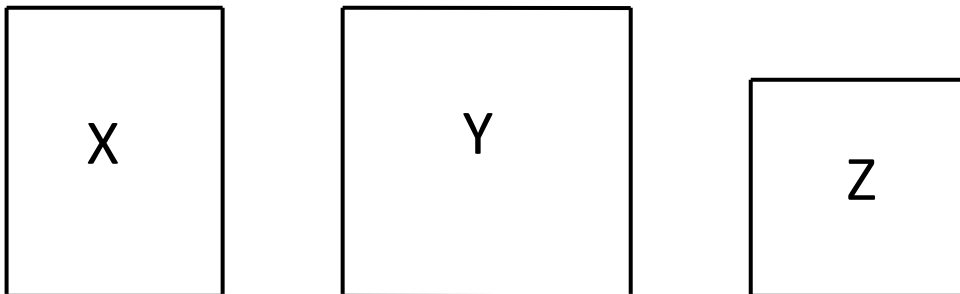
- (a) Diagram above shows a stone been hung to a string of length l cm, swings with a period T s.
 Given $T = 2\pi\sqrt{\frac{l}{10}}$.
- (i) Find $\frac{dl}{dT}$.
- (ii) Find the approximate increase in the period of swing when the length of the string increases from 90cm to 92 cm. [Give your answer in terms of π .]
- (b) Point P and point Q lie on the side BC and CD respectively of a square ABCD of side a cm, such that $BP = x$ cm and $CQ = 2x$ cm.
- (i) Show that the area of $\triangle APQ$ is $x^2 - \frac{1}{2}ax + \frac{1}{2}a^2$.
- (ii) Find, in terms of a , the value of x so that the area of $\triangle APQ$ is minimum.
- (iii) Find, in terms of a , the minimum area of $\triangle APQ$.

Ans: (a)(i) $\frac{5T}{\pi^2}$ (ii) $\frac{\pi}{5}$ (b)(ii) $\frac{1}{4}a$ (iii) $\frac{7}{16}a^2$

36. (a) A perfume container has the shape of a inverted pyramid. The upper surface is a square of area 36 cm^2 and the hight of the pyramid is 4 cm. Perfume is poured into the container such that area of the square upper surface is $4p^2 \text{ cm}^2$ and its height from the vertex of the pyramid is $h \text{ cm}$.
- (i) Show that the volume of the empty space above the container not filled with perfume is
- $$V = \frac{3}{4} (64 - h^2).$$
- (ii) If the rate of change of height of the perfume is 0.2 cms^{-1} , calculate the rate of change volume of the empty space not filled with perfume when $h = 2 \text{ cm}$.

Ans : (a)(ii) -1.8 (b)(ii) $\frac{12}{\pi}$

37. Rajah menunjukkan tiga padang permainan berbentuk segiempat tepat, X serta dua segiempat sama Y dan Z, dengan keadaan panjang sisi X adalah sama dengan panjang sisi Y dan lebar X sama dengan panjang sisi R.



Yusri mendapati bahawa 4 kali luas padang Y dan 3 kali luas padang Z adalah 700m^2 lebih luas berbanding 2 kali luas padang X. Beliau juga mendapati bahawa masa yang diambil apabila berjalan dengan kadar sama melalui sisi padang Z sebanyak 2 pusingan adalah sama dengan 1 pusingan melaui sisi padang Y. Berdasarkan maklumat yang diberi, tentukan panjang sisi bagi padang X.

38. Yusri menggunakan Seutas dawai dengan panjang 360cm digunakan untuk membuat rangka sebuah bingkai berbentuk kuboid. Tapak kuboid itu berukuran x cm dan $2x$ cm. Tingginya ialah h cm.
- (i) Cari nilai h dalam sebutan x .
 - (ii) Diberi isipadu maksimum kuboid itu ialah $24\,000\text{ cm}^3$. Cari ukuran bagi tinggi kuboid tersebut.
 - (iii) Bingkai itu ingin ditutup sepenuhnya dengan kaca. Berapa kuantiti kaca yang diperlukan.
 - (iv) Yusri ingin membentuk sebuah bingkai berbentuk kubus dengan menggunakan kuantiti kaca yang sama. Berapa ukuran bingkai kubus yang boleh dibina.
39. Sebuah kapal terbang berlepas dari Kuala Terengganu menuju ke Melaka. Berapakah jarak yang dilalui oleh kapal terbang tersebut bila pesawat tersebut bergerak dari titik $x (100, 50)$ km menuju ke Melaka sebelum mendarat di titik $y (110, 30)$ km ?
40. If vector $a = (3, 2)$ and vector $b (2, 4)$, what is vector $a + b$?
41. Yusri, Yazit dan Syauqi sedang berlatih bermain hoki. Jarak terdekat di antara Yusri dan Yazit ialah 7.5 m manakala jarak terdekat di antara Yazit dan dengan Syauqi ialah 19.5 km. Pada satah Cartesan lokasi Yusri berada di titik O , Yazit $(3, 4)$ dan Syauqi $(h, 16)$.
Cari nilai h dan seterusnya ungkapkan vektor pukulan bola hoki Yusri ke Syauqi dalam $xi + yj$.