Rumus-rumus berikut boleh membantu anda menjawab soalan. Simbol-simbol yang diberi adalah yang biasa digunakan.

ALGEBRA

1. $x = \dfrac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

2. $a^m \times a^n = a^{m+n}$

3. $a^m \div a^n = a^{m-n}$

4. $\left(a^m\right)^n = a^{mn}$

5. $\log_a mn = \log_a m + \log_a n$

6. $\log_a \dfrac{m}{n} = \log_a m - \log_a n$

7. $\log_a m^n = n \log_a m$

8. $\log_a b = \dfrac{\log_c b}{\log_c a}$

9. $T_n = a + (n-1)d$

10. $S_n = \dfrac{n}{2}\left[2a + (n-1)d\right]$

11. $S_n = \dfrac{a\left(r^n - 1\right)}{r-1} = \dfrac{a\left(1 - r^n\right)}{1-r}, r \neq 1$

12. $Tn = ar^{n-1}$

13. $S_\infty = \dfrac{a}{1-r}, |r| < 1$

KALKULUS (CALCULUS)

1. $y = uv, \ \dfrac{dy}{dx} = u\dfrac{dv}{dx} + v\dfrac{du}{dx}$

2. $y = \dfrac{u}{v}, \ \dfrac{dy}{dx} = \dfrac{v\dfrac{du}{dx} - u\dfrac{dv}{dx}}{v^2}$

3. $\dfrac{dy}{dx} = \dfrac{dy}{du} \times \dfrac{du}{dx}$

4. Luas di bawah lengkung (Area under a curve)

   $= \int_a^b y\,dx$ atau (or) $\int_a^b x\,dy$

5. Isipadu janaan (Volume generated)

   $= \int_a^b ® y^2 dx$ atau (or) $\int_a^b ® x^2 dy$

STATISTIK (STATISTICS)

1. $\bar{x} = \dfrac{\sum x}{N}$

2. $\bar{x} = \dfrac{\sum fx}{\sum f}$

3. $± = \sqrt{\dfrac{\sum (x - \bar{x})^2}{N}} = \sqrt{\dfrac{\sum x^2}{N} - \bar{x}^2}$

4. $± = \sqrt{\dfrac{\sum f(x - \bar{x})^2}{\sum f}} = \sqrt{\dfrac{\sum fx^2}{\sum f} - \bar{x}^2}$

5. $m = L + \left(\dfrac{\frac{1}{2}N - F}{f_m}\right)C$

6. $I = \dfrac{Q_1}{Q_o} \times 100$

7. $\bar{I} = \dfrac{\sum W_i I_i}{\sum W_i}$

8. ${}^nP_r = \dfrac{n!}{(n-r)!}$

9. ${}^nC_r = \dfrac{n!}{(n-r)!\,r!}$

10. $P(A \cup B) = P(A) + P(B) - P(A \cap B)$

11. $P(X = r) = {}^nC_r\, p^r q^{n-r}, \ p + q = 1$

12. Min (Mean), $« = np$

13. $± = \sqrt{npq}$

14. $Z = \dfrac{X - «}{±}$

GEOMETRI (GEOMETRY)

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

2. Titik tengah (Midpoint)

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

3. Titik yang membahagi suatu tembereng garis

(A point dividing a segment of a line)

$$(x, y) = \left(\frac{nx_1 + mx_2}{m+n}, \frac{ny_1 + my_2}{m+n} \right)$$

4. Luas segitiga (Area of triangle)

$$= \frac{1}{2} \left| (x_1y_2 + x_2y_3 + x_3y_1) - (x_2y_1 + x_3y_2 + x_1y_3) \right|$$

5. $|\underset{\sim}{r}| = \sqrt{x^2 + y^2}$

6. $\hat{\underset{\sim}{r}} = \dfrac{x\underset{\sim}{i} + y\underset{\sim}{j}}{\sqrt{x^2 + y^2}}$

TRIGONOMETRI (TRIGONOMETRY)

1. Panjang lengkok, $s = j\bar{}$

   Arc length, $s = r\bar{}$

2. Luas sektor, $L = \frac{1}{2} j^{2}\bar{}$

   Area of sector, $A = \frac{1}{2} r^{2}\bar{}$

3. $\sin^2 A + kos^2 A = 1$

   $\sin^2 A + \cos^2 A = 1$

4. $\text{sek}^2 A = 1 + \tan^2 A$

   $\sec^2 A = 1 + \tan^2 A$

5. $\text{kosek}^2 A = 1 + kot^2 A$

   $\text{cosec}^2 A = 1 + \cot^2 A$

6. $\sin 2A = 2 \sin A kos A$

   $\sin 2A = 2 \sin A \cos A$

7. $\text{kos} 2A = kos^2 A - \sin^2 A$

   $= 2kos^2 A - 1$

   $= 1 - 2\sin^2 A$

   $\cos 2A = \cos^2 A - \sin^2 A$

   $= 2\cos^2 A - 1$

   $= 1 - 2\sin^2 A$

8. $\sin(A \pm B) = \sin A kos B \pm kos A \sin B$

   $\sin(A \pm B) = \sin A \cos B \pm \cos A \sin B$

9. $\text{kos}(A \pm B) = kos A kos B \mp \sin A \sin B$

   $\cos(A \pm B) = \cos A \cos B \mp \sin A \sin B$

10. $\tan(A \pm B) = \dfrac{\tan A \pm \tan B}{1 \mp \tan A \tan B}$

11. $\tan 2A = \dfrac{2\tan A}{1 - \tan^2 A}$

12. $\dfrac{a}{\sin A} = \dfrac{b}{\sin B} = \dfrac{c}{\sin C}$

13. $a^2 = b^2 + c^2 - 2bc\ kos A$

    $a^2 = b^2 + c^2 - 2bc\ \cos A$

14. Luas segitiga (Area of triangle)

    $= \frac{1}{2} ab \sin C$

Section A
[40 marks]
Answer all questions

1. Solve the following simultaneous equations:
$x^2 + y^2 = xy + 7$
$2x - y = 5$ [5 marks]

2. a) The quadratic equation $x^2 - 6x + 7 = m(2x - 3)$ has two equal roots. Find the possible values of m. [3 marks]

b) Hence, determine the stationary point and determine the axis of symmetry for the above equation. [3 marks]

3. A closed rectangular box is made of very thin sheet metal, and its length is three times its width. If the volume of the box is 288 cm^3, show that its surface area is equal to $\frac{768}{x} + 6x^2$ cm^2, where x cm is the width of the box. [3 marks]
Find by differentiation the dimension of the box of least surface area. [3 marks]

4. A set of data which consists of 15 numbers has a mean of 12 and a standard deviation of 3.
a) For the set of data, find
i) the sum of the numbers,
ii) the sum of squares of the numbers [3 marks]

b) Another set of data which consists of 5 numbers with a mean of 11 and a variance of 8 is added to the original set of data. For the combined set of data, find
i) the new mean
ii) the new standard deviation [5 marks]

5. ***Diagram 1*** shows a triangle OXY. The straight line AY intersects the straight line XB at C. It is given that $\overrightarrow{OX} = \underset{\sim}{x}$, $\overrightarrow{OY} = \underset{\sim}{y}$, $OA = \frac{1}{3}OX$ and $OB = BY$

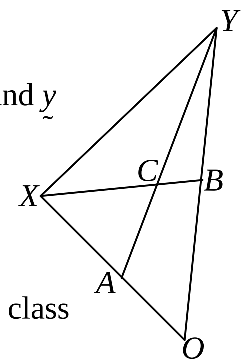
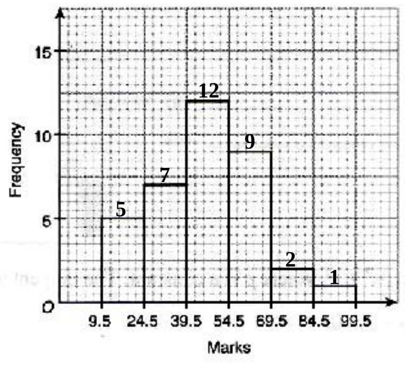


Diagram 1

a) Express each of the following vectors in terms of $\underset{\sim}{x}$ and $\underset{\sim}{y}$
i) $\overrightarrow{AB}$ ii) $\overrightarrow{BX}$ iii) $\overrightarrow{AY}$ [5 marks]
b) Given that $\overrightarrow{BC} = h\overrightarrow{BX}$ and $\overrightarrow{AC} = k\overrightarrow{AY}$, find the value of h and of k. [4 marks]

6. The histogram below shows the marks obtained by a Form 5 class of students in an Additional Mathematics test.



a) Without drawing an ogive, calculate the median mark [3 marks]
b) Calculate the standard deviation of the marks distribution. [3 marks]

Section B
[40 marks]
Answer any **four** questions from this section.

7. Use the 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 $y = \frac{px+1}{qx^2}$, where *p* and *q* are constants.

x	1	2	3	4	5	6
y	2.601	0.551	0.194	0.089	0.040	0.017

Table 1

a) Based on ***table 1***, construct a suitable table for the values of x^2y [1 mark]

b) Plot x^2y against *x*, using a scale of 2 cm to 1 unit on the *x*-axis and 2 cm to 0.5 unit on the x^2y - axis
Hence, ***draw the line of best fit***. [3 marks]

c) Use the graph drawn to give the best estimated value of
i) *y* when $x = 2.5$
ii) *p*
iii) *q* [6 marks]

8. ***Diagram 2*** shows an equation $y = x(x-4)$, the *x*-axis, the straight line $y = 5$ and the straight line *AB*

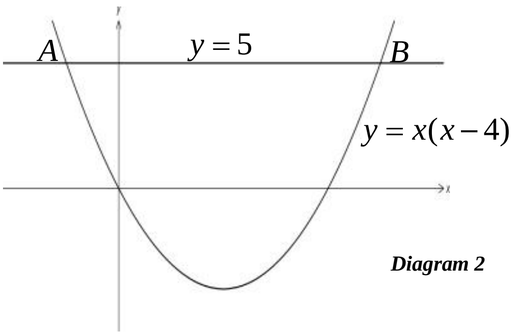


Diagram 2

Find
a) The turning point of the curve $y = x(x-4)$ [2 marks]
b) Determine the axis of symmetry of the curve. [1 mark]
c) The equations of normal at point *A* and point *B* [3 marks]
d) Hence or otherwise, determine the point of intersection, *D* of the normal at point *A* and normal at the point *B* [3 marks]
e) What can you say about the position of point *D*, the midpoint of *AB* and the turning point of the curve $y = x(x-4)$? [1 mark]

9. ***Diagram 3*** shows two arcs, *PQ* and *RS*, of two concentric circles, with the same centre *O*. *RQ* is perpendicular to *OS*.
Given that *OP* = *OQ* = 5 cm and $\angle POQ = 1$ radian,
find
a) the perimeter of the shaded region *A*, [7 marks]
b) the area of the shaded region *B*. [3 marks]

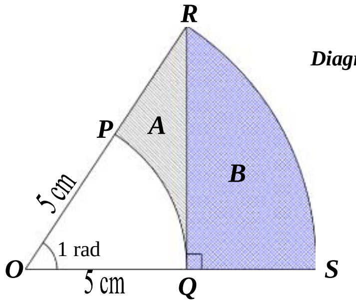


Diagram 3

10. *Solutions by scale drawing will not be accepted for this question.*
Diagram 4 shows that the straight lines *AB* and *BC* are perpendicular to each other. The equation of the straight line *BC* is $2x = y + 6$

a) Find
   i) the equation of the straight line *AB* giving your answer in the general form,
   ii) the coordinates of point *B*. [4 marks]

b) The straight line *AB* is extended to point *D* such that *AB* : *BD* = 2 : 3. Calculate the area of triangle *ADO*. [3 marks]

c) A point *M* moves such that the angle *AMB* is always a right-angle. Find the equation of the locus of *M*. [3 marks]

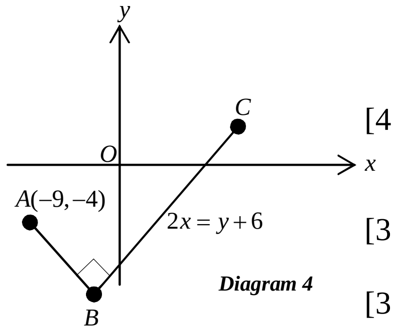


Diagram 4

11. a) ***Diagram 5*** shows a shaded region bounded by the curve $y^2 = x - k$, the *y*-axis and the straight lines $y = -3$ and $y = 3$. If the area of the shaded region is 30 units^2, find the value of *k*. [4 marks]

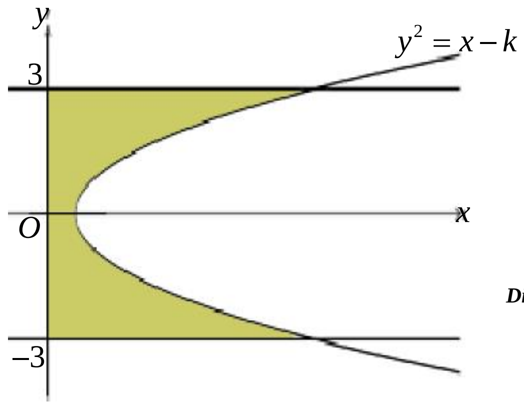


Diagram 5

b) Find the ratio of the volumes if the shaded region is rotated about the *y*-axis for 180^{o} to that of the shaded region if it is rotated about the *x*-axis for 180^{o}. [6 marks]

Section C
[20 marks]
Answer any **two** questions from this section.

12. The cost to produce a tin of paint depends on the cost of the raw materials, the production cost and the packaging cost. The table shows the price indices and weightages of those costs.

Cost	I_{2002} (based on the year 1999)	I_{2005} (based on the year 1999)	I_{2005} (based on the year 2002)	Weightages, *w*
Raw materials	175	182	104	*x*
Production	*h*	200	125	5
Packaging	145	*k*	120	2

a) Given that the composite index of the cost to produce a tin of paint for the year 2005 based on the year 2002 is 117.7, find the value of *x*. [3 marks]

b) Given that the price of a tin of paint in the year 2002 was RM 30, calculate its corresponding price in the year 2005. [1 mark]

c) Find the values of
   i) *h*,
   ii) *k*. [6 marks]

13. a) If $m = \log_6 3$ and $n = \log_6 5$, express $\log_2 45$ in terms of m and n. [5 marks]

b) Given $\log_a x = 6$, $\log_b x = 8$ and $\log_{abc} x = 3$, find the value of $\log_c x$ [5 marks]

14. ***Diagram 6*** shows, *AEC* and *BED* are straight lines and *BE* = *ED*. It is given that *AB* = 9 cm, *AD* = 14 cm, *CD* = 15 cm, $\angle AED = 115^\circ$ and $\angle ACD = 35^\circ$.

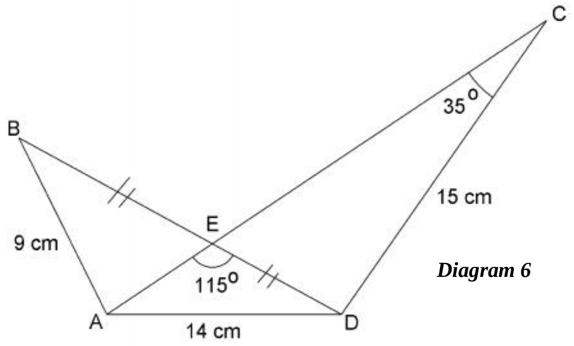


Diagram 6

Calculate

a) the length of *BD*, [4 marks]

b) $\angle BAD$, [2 marks]

c) the area of the whole diagram. [4 marks]

15. ***Diagram 7*** shows a circular cylinder of height *h* and radius *r* surmounted by a hemisphere of the same radius.

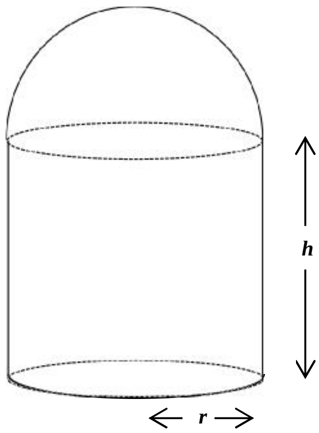


Diagram 7

Express the total surface area *S* of the object and the total volume *V* in terms of *h* and *r*.

[2 marks]

If the total surface area *S* is 20π, express *h* in terms of *r* and hence show that $V = 10\pi r - \dfrac{5\pi r^3}{6}$.

[2 marks]

Find the value of *r* which makes *V* a maximum and calculate the maximum value of *V*, giving your answer in terms of π [6 marks]

End of Questions