

SECTION I (50MARKS)

Answer all the questions in this section.

1. Use Square roots, reciprocal and square tables to evaluate to 4 significant figures the expression.

(3mks)

$$(0.0546)^{\frac{1}{2}} + \left(\frac{2}{4.327} \right)^2$$

2. A line passes through the points A (2, 6) and B (4, -8). Find the equation of the perpendicular bisector of line AB.

(3mks)

3. Find the value of x which satisfies the equation.

$$16^{x^2} = 8^{4x-3}$$

(3mks)

4. A water tank has a capacity of 50 litres. A similar model tank has a capacity of 0.25litres. if the larger tank has a height of 100cm. calculate the height of the model tank. (3mks)

5. Given that matrix $M = \begin{pmatrix} a & o \\ 5 & b \end{pmatrix}$

- (a) Determine M^2
(2mks)

- (b) If $M^2 = \begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix}$, determine the possible pairs of values of a and b
(2mks)

6. Find the integral values that satisfy the inequality.

$$2x + 3 \geq 5x - 3 > -8$$

(3mks)

7. A tea blender buys two grades of tea at sh 60 and sh 80 per packet. Find the ratio in which he should mix them so that by selling the mixture at sh 90, a profit of 25% is realized. (3mks)

8. A two digit number is such that when the digits are reversed the value of the number increases by 9. Three times the sum of its digits is less than the value of the number by 8. Find the number.

(3mk

s)

9. From the roof of a house, a boy can see an avocado tree which is 20m away from the house. He measures the angle of elevation of the top of the tree as

21° and the angle of depression of the bottom of the tree as 31° . Find the height of the avocado tree. (3mks)

10. Three people Makori, Ondieki and Mosomi contributed money to start a business. Makori contributed a quarter of the total amount and Ondieki two fifth of the remainder. Mosomi's contribution was one and half times that of Makori. They borrowed the rest of the money from the bank which was sh. 60,000 less than Mosomi's contribution. Find the total amount required to start the business.

(3mks)

11. Draw line $PQ = 7.0\text{cm}$. Locate a point R on line PQ such that $PR:RQ = 3:4$ (3mks)

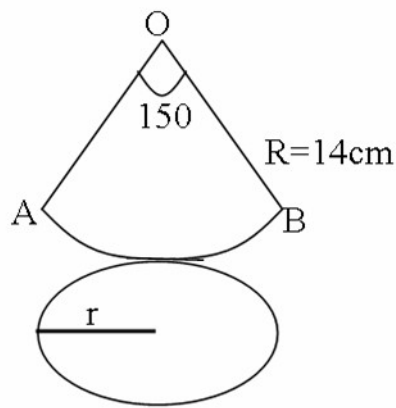
12. From a survey carried out the following information was entered in a field book

	Y	
	240	180 to N
To R 90	180	
	120	60 to M
	X	

If XY is 360m and SM, RP and QN are the offsets. Determine the area of the field in metres.

(4mks)

13. The figure below shows a net of a circular cone with a lid. Given that $\angle AOB = 150^\circ$ and $OA = 14\text{cm}$.



Determine

(i) The radius of the base of the cone
(2mks)

(ii) The total surface area of the cone
(2mks)

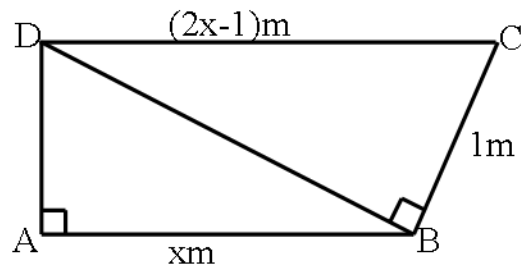
14. The interior angle of a regular polygon is 9 times the exterior angle. How many sides does the polygon have?
(2mks)

15. Solve for x in the equation

(3mks)

$$\log_3(x+23) - \log_2 16 + 1 = \log_3(9-x)$$

16. The figure below represents a school field.



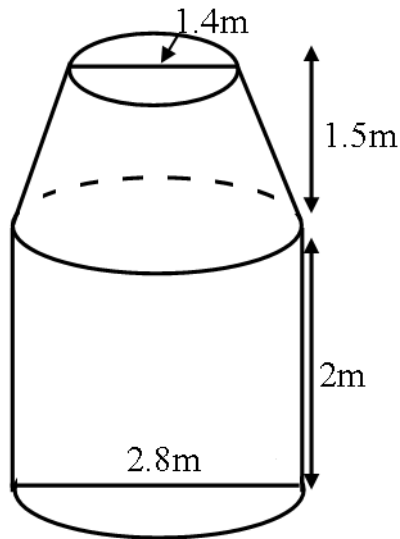
Find the length of AB given that $\angle BAD$ and $\angle CBD$ are right angles.

(3mks)

SECTION II

Answer any FIVE questions in this section.

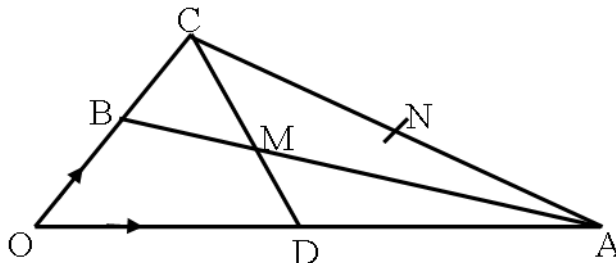
17. A plastic water tank has a shape as shown below, with a frustrum of a cone on top, a cylindrical body and a hemispherical bottom.



- (a) Calculate
- (i) The volume of the tank in m^3 .
(4mks)
- (b) A filler pipe takes 3 hours to fill a third of the tank. If the tank is already $\frac{1}{4}$ full, at what time will the filler pipe fill the tank if the pipe is opened at 9.00a.m. (4mks)
- (c) A particle falls in the tank. If its chances of being in any part of the tank are equally likely, find the probability of it being in the hemispherical part (2mks)

18. In the figure below $\vec{OB} = \vec{b}$; $\vec{OC} = 3\vec{OB}$ and $\vec{OA} = \vec{a}$

(a) Given that $\vec{OD} = \frac{1}{3}\vec{OA}$ and $\vec{AN} = \frac{1}{2}\vec{AC}$, CD and AB meet at M . Determine in terms of $\vec{a}$ and $\vec{b}$



(i) $\vec{AB}$ (1mk)

(ii) $\vec{CD}$ (1mk)

(b) Given that $\vec{CM} = K\vec{CD}$ and $\vec{AM} = h\vec{AB}$. Determine the values of the scalars K and h .

(5mks)

(c) Show that O, M and N are collinear
(3mks)

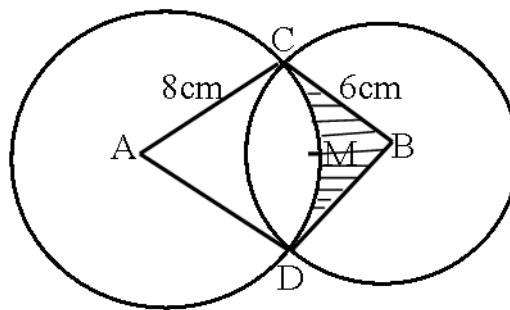
19. Construct a parallelogram ABCD in which $AB = 8.5\text{cm}$, $AD = 6\text{cm}$ and angle $BAD = 75^\circ$. (Use a ruler and pair of compasses only in this question)
- (a) Measure the length of AC
- (3mks)

- (b) On the same diagram, construct
- (i) a perpendicular from B to line AD at M. Measure BM. Hence calculate the area of the parallelogram ABCD.
- (4mks)

(ii) The locus of a point x which moves such that it is equidistant from A and C (1mk)

(iii) The locus of point Y which moves such that $\angle BYD = 90^\circ$
(2mks)

20. The figure below shows two circles intersecting at C and D. The centres are A and B with radii 8cm and 6cm respectively. $AB = 10\text{cm}$.



Determine

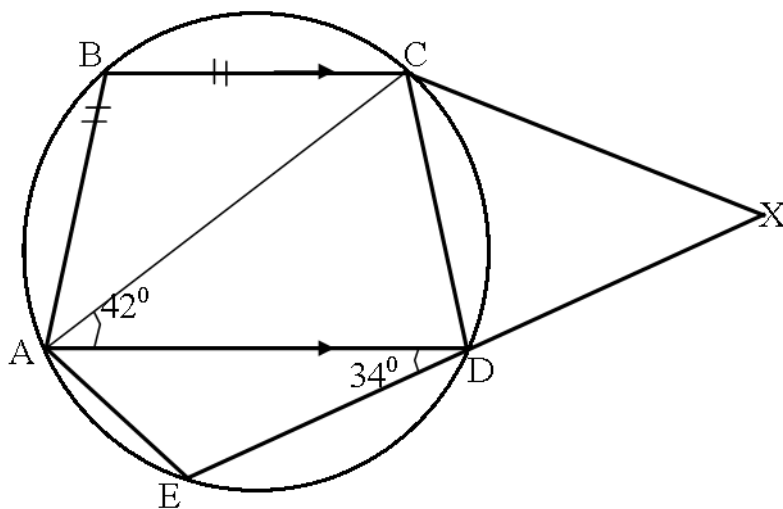
(i) Size of angle DAC
(2mks)

(ii) Size of angle DBC
(2mks)

(iii) Area of sector ACMD
(2mks)

- (iv) Area of the shaded region
(4mks)

21. In the figure below ABCDE is a pentagon inscribed in a circle. CX is a tangent to the circle at C and EDX is a straight line. Angle ADE = 34° , angle CAD = 42° , AB = BC and BC is parallel to AD. Giving reasons, determine



- (a) (i) Angle ABC
(2mks)

- (ii) Angle ACD
(2mks)

(iii) Angle EAD
(2mks)

(iv) Angle CXD
(2mks)

(b) Given that $ED = 5\text{cm}$, $DX = 4\text{cm}$, calculate the length of CX
(2mks)

22. Complete the table below for the function

$$Y = 2x^2 + 4x - 3$$

(2mks)

X	-4	-3	-2	-1	0	1	2
$2x^2$	32		8			2	
$4x-3$			-11				5
Y			-3			3	13

(a) On the grid provided draw the graph of the function $Y = 2x^2 + 4x - 3$ for $-4 \leq x \leq 2$ and use your graph to estimate the roots of the equation.
(3mks)

(i) $2x^2+4x-3=0$
(1mk)

(ii) $2x^2-x-5=0$
(2mks)

(b) Determine the equation of the tangent to the curve $y=2x^2+4x-3$ at the point $x=1$ (2mks)

23. (a) Every time an insect jumps forward the distance covered is half of the previous jump.

If the insect initially jumped 6.4m. Calculate

(i) The length of 7th jump
(2mks)

(ii) The total distance covered after the 7th jump
(2mks)

(b) An arithmetic progression has the first term as a and common difference as d

(i) Write down the third, ninth and twenty fifth term of the progression (1mk)

(ii) The arithmetic progression above is such that it is increasing and the third, ninth and twenty fifth terms form the first three consecutive terms e.g. a geometric progression. If the sum of the seventh term and twice the sixth term of the A.P is 78. Calculate the first term and the common difference of A.P.
(5mks)

24. (a) Draw the graphs of $y = \sin 3x$ and $y = \cos (x + 30^\circ)$. On the same axis for $-180^\circ \leq x \leq 180^\circ$. Take an interval of 30° .

(6mks)



(b) Use the graph to solve

(i) $\cos(x+30^\circ) - \sin 3x = 0$

(2mks)

(ii) $3 \cos (x + 30^\circ) - 2 = 0$

(2mks)