NAME: ....Marking Scheme..... ADM NO: 12.....CLASS: Maths.

ANESTAR/GABRIEL/PREMIER
FORM TWO MATHEMATICS
END OF YEAR EXAMS – 2019
TIME: 2 HOURS

Attempt all the questions in the spaces provided.

1. Two spheres have surface areas of $36cm^2$ and $49cm^2$. If the volume of the smaller sphere is $20.2cm^3$ calculate the volume of the larger one. (3 mks)

$A.S.f = \frac{36}{49}$

$L.S.f = \sqrt{A.S.f}$

$= \sqrt{\frac{36}{49}}$ (1)

$= \frac{6}{7}$

$V.S.f = (L.S.f)^3$

$= \left(\frac{6}{7}\right)^3$ (1)

$= \frac{216}{343}$

$\frac{343}{216} \times 20.2 = 32.0768 cm^3$ (1)

2. Using mathematical tables, evaluate: (4 mks)

$$\frac{5467 \times 0.3278}{\sqrt[5]{0.0894}}$$

No	Std form	Log
5467	5.467×10^3	3.7377
0.3278	3.278×10^{-1}	$\bar{1}.5156$
		3.2533
0.0894	8.94×10^{-2}	$\bar{2}.9513 \div 5$
		$= \bar{1}.7026$
3552	3.552×10^3	3.5507

3.2533
$-\ \bar{1}.7026$
3.5507 (1)

3. Simplify the expression below (3 mks)

$$\frac{6b + 2ab - 3a - a^2}{3a + 2ab - 6b - a^2}$$

$N = 6b + 2ab - 3a - a^2$

$2b(3+a) - a(3+a)$

$(2b - a)(3+a)$ (1)

$D = 3a - a^2 + 2ab - 6b$

$a(3-a) + 2b(a-3)$

$(a+2b)(3-a)$ (1)

$\frac{N}{D} = \frac{(2b-a)(3+a)}{(a+2b)(3-a)}$

$3a - 6b - a^2 + 2ab$

$3(a-2b) - a(a-2b)$ (1)

$(3-a)(a-2b)$

$\frac{N}{D} = \frac{(2b-a)(3+a)}{(3-a)(a-2b)}$

$-1(2b-a)(3+a)$
$(3-a)(a-2b)$

$= \frac{-3+a}{3-a}$ (1)

4. If $4^{3y-4x} = 64$ and $3^y \div 9^x = 1$, solve for x and Y. (3 mks)

$4^{3y-4x} = 4^3$

$3y - 4x = 3$ (1)

$3^y \div 3^{2x} = 3^0$

$y - 2x = 0$

$3y - 4x = 3$ --(1)

$y - 2x = 0$ --(2)

$y = 2x$

$3(2x) - 4x = 3$

$6x - 4x = 3$ (1)

$2x = 3$

$x = 3$

$y = 2(3)$

$y = 6$ (1)

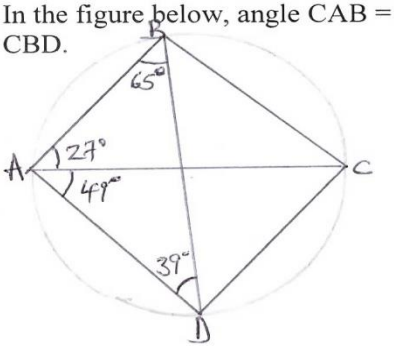
5. Find the values of h and t if the line whose equation is $3h + 5x - 2y = 0$ passes through the point (5, 17) and is parallel to the line $y + tx + 3 = 0$. (3 mks)

$3h+5x-2y=0$
$y+tx+3=0$
$y=-tx-3$
$G_1=-t=G_2$
$2y=3h+5x$
$y=\frac{3}{2}h+\frac{5}{2}x$

$\frac{y-17}{x-5}=-t$
$y-17=$
$3h+5x-2y=0$
$3h+25-34=0$
$3h=9$
$h=3$ ✓ (1)

$2y-5x-3=0$
$y=\frac{5x}{2}+3/2$
$m_1=5/2$ ✓ (1)
$m_1=m_2$
$-t=5/2$
$t=-5/2$ ✓ (1)

6. In the figure below, angle CAB = 27°, angle ABD = 65° and angle DB = 39°. Find the size of angle CBD. (3 mks)



$180°-(27°+65°+39°)$ (1)
$=49°$ (1)
CBD = 49° ∠s subtended by the same chord CD (1)

7. Common salt has a density of 2.2g/cm^3 while sand has a density of 3.2g/cm3. If 0.8kg of salt is mixed with 1.5kg of sand, find the density of the mixture. (3 mks)

Volume of Salt $= 2.2 \times 800g$
$= 1760cm^3$
Volume of Sand $= 3.2 \times 1500g$
$= 4800cm^3$
Total Vol. $= 4800 + 1760$
$= 6560cm^3$ (1)

Density $= \frac{\text{Total mass}}{\text{Total Volume}}$
$= \frac{23800g}{6560cm^3}$ (1)
$= 0.3506g/cm^3$ (1)

8. The volume of water in a measuring cylinder is 25.2cm^3. After a solid metal sphere is immersed into it, the measuring cylinder reads 29.4cm^3. Calculate the radius of the sphere. (3 mks)

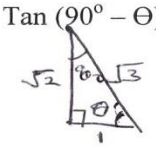
Vol. of sphere $= 29.4 - 25.2$
$= 4.2cm^3$
$V = \frac{4}{3}\pi r^3$
$4.2 = \frac{4}{3} \times \frac{22}{7} \times r^3$ (1)

$4.2 = \frac{88}{21} r^3$
$4.2 \times \frac{21}{88} = r^3$
$r^3 = 1.00$ (1)

$r = \sqrt[3]{1.00}$
$r = 1cm.$ (1)

9. Cos Θ = $\frac{1}{\sqrt{3}}$ where Θ is an acute angle. Without using mathematical tables, find;

(a) Tan $(90^\circ - \theta)$ (1 mk)



$\tan(90^\circ - \theta)$

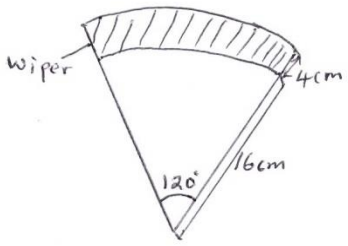
$\tan(90^\circ - \theta) = \frac{1}{\sqrt{2}}$ ✓(1)

(b) Sin Θ in the form $\frac{\sqrt{a}}{\sqrt{b}}$ where a and b are integers. (2 mks)

$\sin\theta = \frac{OPP}{HYP} = \frac{\sqrt{2}}{\sqrt{3}}$

$\sin\theta = \frac{\sqrt{2}}{\sqrt{3}}$ ✓(2)

10. The shaded region in the figure below shows the area swept out on a flat windscreen by a wiper. Calculate the area of this region. (3 mks)



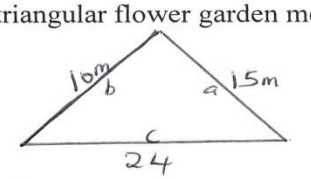
$A = \frac{120}{360} \times \frac{22}{7} \times 20 \times 20 = 419.05\,cm^2$ ✓(1)

$A = \frac{120}{360} \times \frac{22}{7} \times 16 \times 16 = 268.19\,cm^2$ ✓(1)

$A_{shaded\ region} = 419.05 - 268.19$

$= 150.86\,cm^2$ ✓(1)

11. A triangular flower garden measures 10m, 15m and 24m. Find the area of the garden. (3 mks)



$Area = \sqrt{s(s-a)(s-b)(s-c)}$

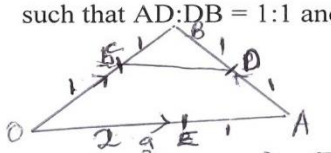
$s = \frac{1}{2}(10 + 15 + 24) = 24.5$ ✓(1)

$A = \sqrt{24.5 \times 14.5 \times 0.5 \times 9.5}$ ✓(1)

$A = \sqrt{1687.4375}$

$= 41.078\,cm^2$ ✓(1)

12. Triangle OAB is such that $\overrightarrow{OA} = \underset{\sim}{a}$ and $\overrightarrow{OB} = \underset{\sim}{b}$. C lies on OB such that OC:CB = 1:1. D lies on AB such that AD:DB = 1:1 and E lies on OA such that OE:EA = 3:1. Find CD in terms of $\underset{\sim}{a}$ and $\underset{\sim}{b}$. (3 mks)



$\overrightarrow{CD} = \overrightarrow{CO} + \overrightarrow{OA} + \overrightarrow{AD}$

$\overrightarrow{AD} = \frac{1}{2}(\overrightarrow{AB})$ ✓(1)

OA:AE

$\overrightarrow{AB} = -\underset{\sim}{a} + \underset{\sim}{b}$

$= \underset{\sim}{b} + \underset{\sim}{a}$

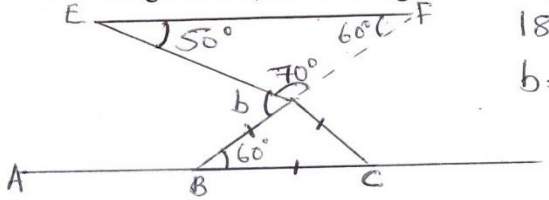
$\overrightarrow{CO} = -\frac{1}{2}\underset{\sim}{b}$

$\overrightarrow{CD} = -\frac{1}{2}\underset{\sim}{b} + \underset{\sim}{a} + \frac{1}{2}(\underset{\sim}{b} - \underset{\sim}{a})$ ✓(1)

$= -\frac{1}{2}\underset{\sim}{b} + \underset{\sim}{a} + \frac{1}{2}\underset{\sim}{b} - \frac{1}{2}\underset{\sim}{a}$

$\overrightarrow{CD} = \frac{1}{2}\underset{\sim}{a}$ ✓(1)

13. Giving reasons, find the angle marked b, given that EF is parallel to AC. (3 mks)



$180^\circ - 110^\circ = 70^\circ$ (Angles of a Δ add up to 180°) ✓(1)

$b = 180^\circ - 70^\circ$

$= 110^\circ$ (∠s on a straight line add up to 180°) ✓(1)

SECTION B: (30 MARKS)

Answer any three questions in this section.

14. The height (in cm) of some seedlings in a nursery are recorded in the table below.

Height (cm)	1.0 – 1.4	1.5 – 1.9	2.0 – 2.4	2.5 – 2.9
No. of seedlings	2	6	4	8
C.F	2	8	12	20

(a) State the median class (1 mk)

Median $= \frac{n}{2} = \frac{20}{2} = 10$

Median class $= 2.0 - 2.4$

(b) Calculate the mean height of the seedlings in the nursery. (4 mks)

Height	F	x	fx
1.0 – 1.4	2	1.2	2.4
1.5 – 1.9	6	1.8	10.8
2.0 – 2.4	4	2.2	8.8
2.5 – 2.9	8	2.7	21.6
	$\Sigma f = 20$		$\Sigma fx = 43.6$

$\bar{x} = \frac{\Sigma fx}{\Sigma f}$

$= \frac{43.6}{20}$

$= 2.18$ cm

(c) On the grid provided, draw a histogram and a frequency polygon to represent the information. (5 mks)

15. On the graph paper provided, plot the triangle whose co-ordinates are A(1, 3) B(2, 1) and C(3, 4). (1 mk)

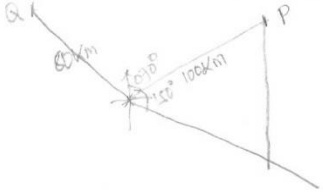
(a) On the same grid, draw;

(i) A'B'C' the image of ABC under an enlargement, centre (0,0), scale factor -1 and state its co-ordinates. (3 mks)

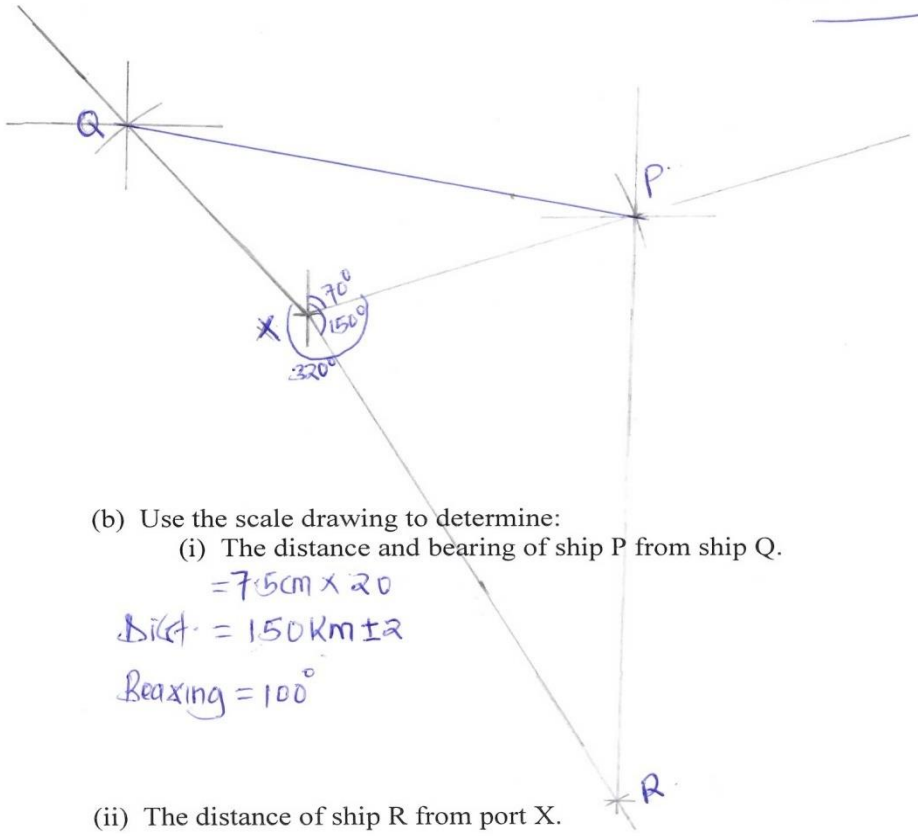
(ii) A"B"C" the image of A'B'C' under a rotation of +90° about origin. State the co-ordinates of A"B"C". (3 mks)

16. Three warships P,Q and R leave port X at 9.00 a.m. Ship P sails at a steady speed on a bearing of 070°, 100km from port X while ship Q sails on a bearing of 320°, 80km from port X. Ship R is on a bearing of 150° from port X and due south of ship P.

(a) Construct a scale drawing to show the position of P, Q, R and X. (4 mks)



Scale 1cm rep 20km .



(b) Use the scale drawing to determine:

(i) The distance and bearing of ship P from ship Q. (2 mks)

=7.5cm x 20

Dist. = 150Km ±2

Bearing = 100°

(ii) The distance of ship R from port X. (2 mks)

=9.1cm x20

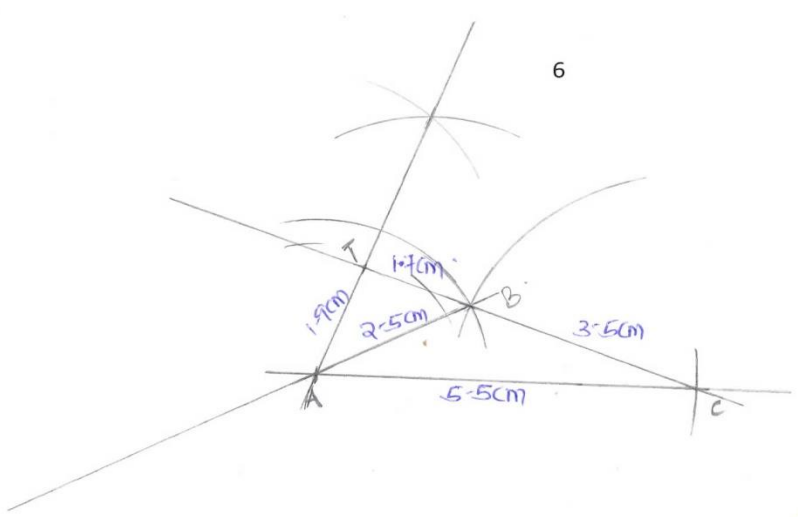
=182Km ±2

(iii) The distance of ship R from ship P. (2 mks)

=9.5x20

=190Km ±2

17. (a) Use a ruler and a pair of compasses only to construct triangle ABC such that AB = 2.5cm, BC = 3.5cm and AC = 5.5cm. Measure < ABC. (3 mks)



∠ABC = 131° ± 0.1°

(b) Drop a perpendicular from A to a point T on CB produced. Measure the length AT. (3 mks)

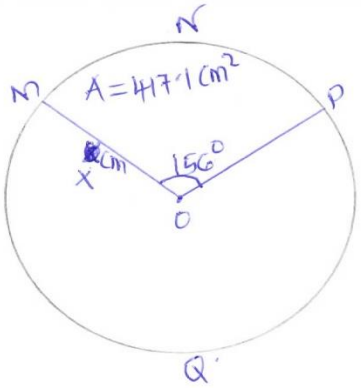
AT = 1·9cm

(c) With BT as the base, calculate the area of triangle ABT and triangle ACT. (4 mks)

A(ABT) = ½ × 1·9 × 1·7
= 1·615 cm² ✓(2)

A(ACT) = ½ × 1·9 × 5·2
= 4·94 cm² ✓(2)

18. The circle in figure below has a radius Xcm and centre O. Minor arc MNP subtends an angle of 156° at the centre of the circle. Sector MNP has an area of 417.1cm²



(a) Taking $\pi = \frac{22}{7}$, find x. (3 mks)

$A = \frac{\theta}{360} \times \pi x^2$ ✓(2)

$417.1 = \frac{156}{360} \times \frac{22}{7} \times (x)^2$

$417.1 = 1.3619x^2$ ✓(1)

$x^2 = 306.2622$

$x = 17.50\text{cm}$ ✓(1)

(b) The major sector MQP is obtained from the circle and folded into a cone. Find:

(i) The radius of the cone's base. (2 mks)

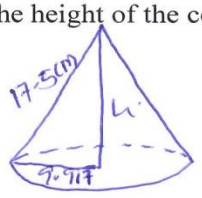
length of major arc
$= \frac{204}{360} \times \frac{22}{7} \times 2 \times 17.5$
$= 62.333\text{cm}$ ✓(1)

$C = 2\pi x$

$2 \times \frac{22}{7} \times x = 62.333$ ✓(1)

$x = 9.9167\text{ cm}$ ✓

(ii) The height of the cone. (2 mks)



$h^2 = H^2 - b^2$ (1)

$h = \sqrt{(17.5)^2 - (9.917)^2}$

$h = 14.419\ cm$ (1)

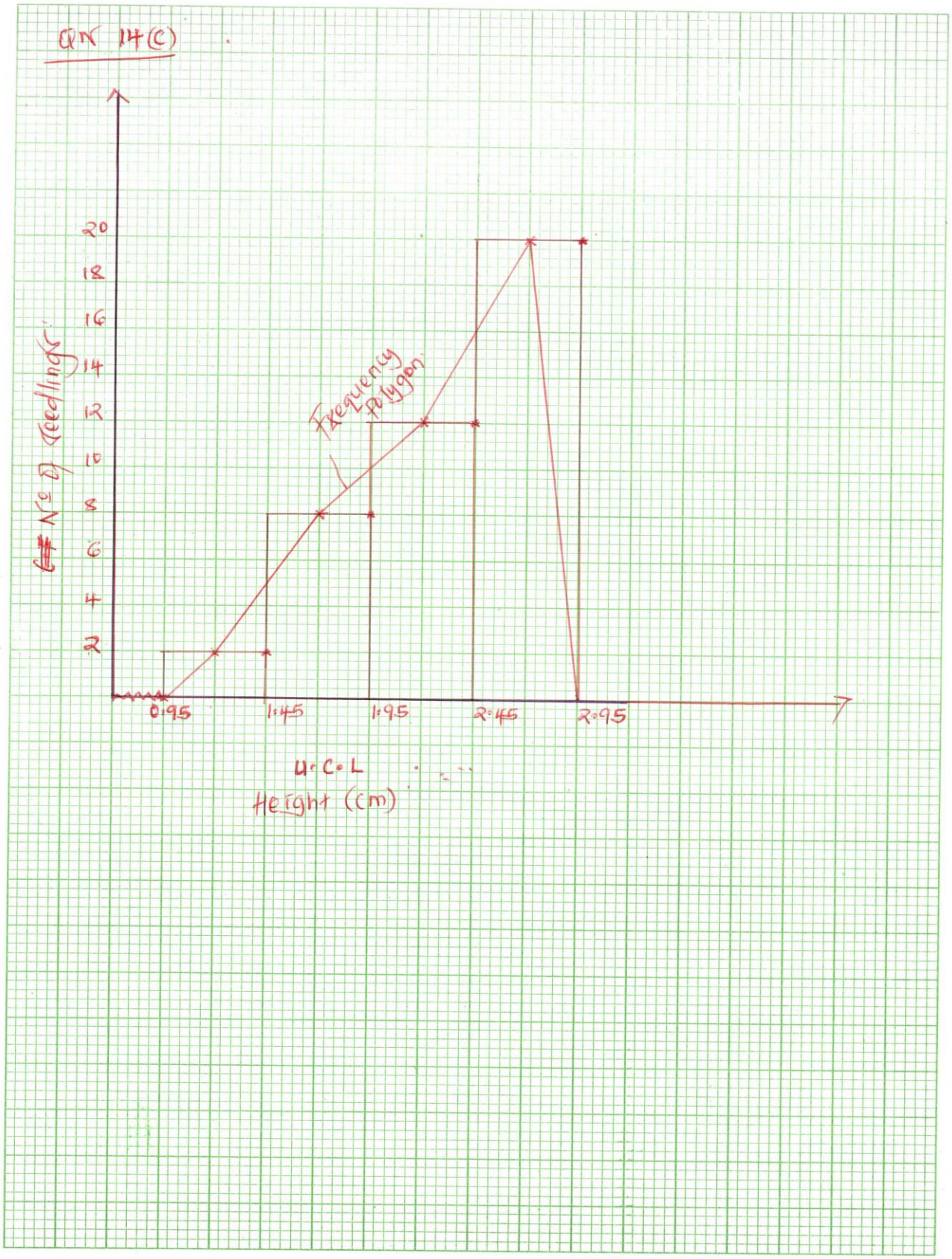
(iii) The surface area of the cone. (3 mks)

$A = \pi r^2 + \pi r L$

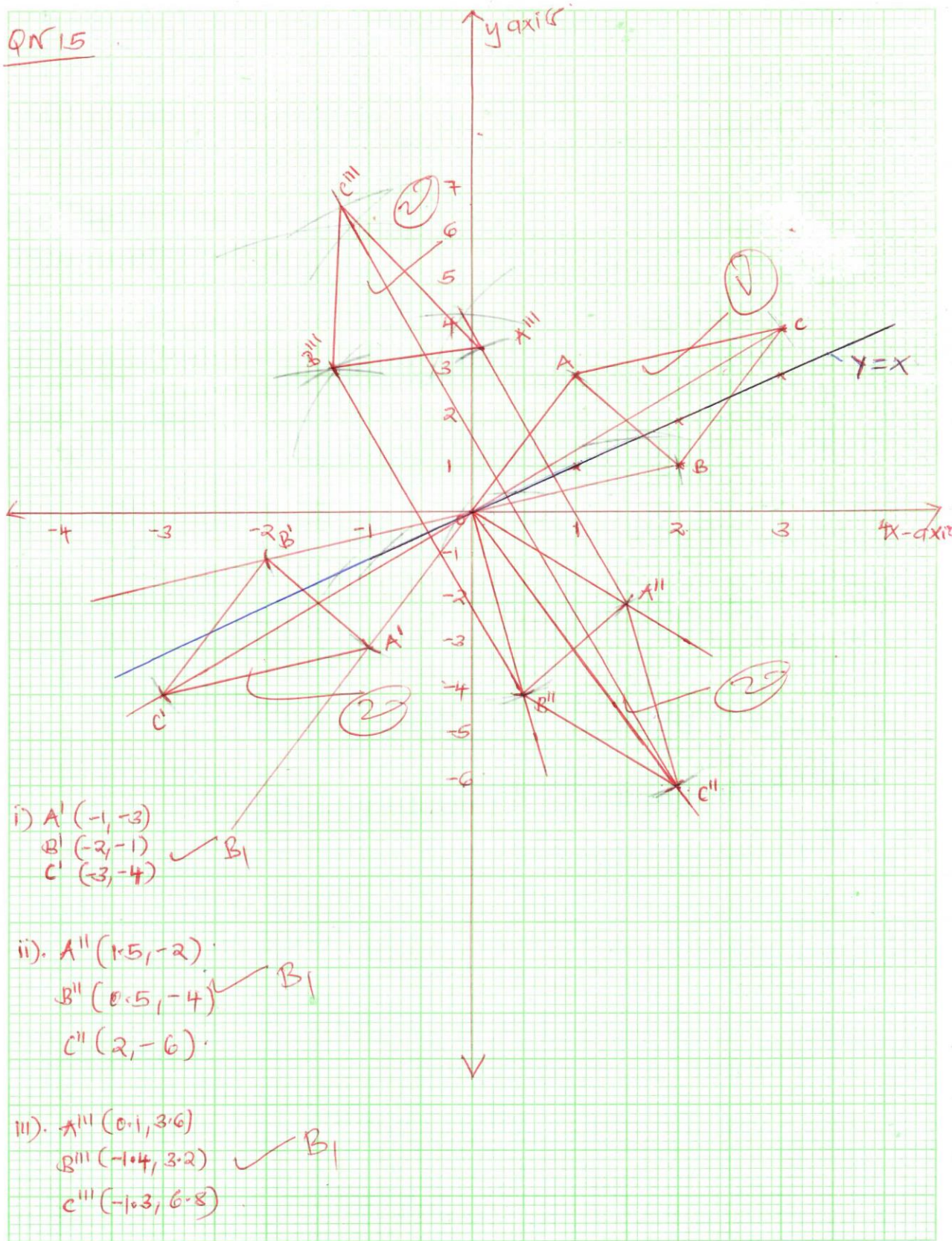
$= \left(\frac{22}{7} \times 9.917 \times 9.917\right) + \left(\frac{22}{7} \times 9.917 \times 17.5\right)$ (3)

$= 854.5252\ cm^2$

Qn 14(c)


No. of seedlings
20
18
16
14
12
10
8
6
4
2
Frequency polygon
0·95
1·45
1·95
2·45
2·95
U.C.L
Height (cm)

QN 15



i) $A'(-1,-3)$
$B'(-2,-1)$ ✓ B_1
$C'(-3,-4)$

ii). $A''(1.5,-2)$
$B''(0.5,-4)$ ✓ B_1
$C''(2,-6)$

iii). $A'''(0.1,3.6)$
$B'''(-1.4,3.2)$ ✓ B_1
$C'''(-1.3,6.8)$