GRADE 11 PAPER 2
NOV 2016

1.1. SEE DIAGRAM SHEET (3)

1.2. Median June: 63%.
[61 – 65 acceptable from diagram]

November median: 73%. (2)

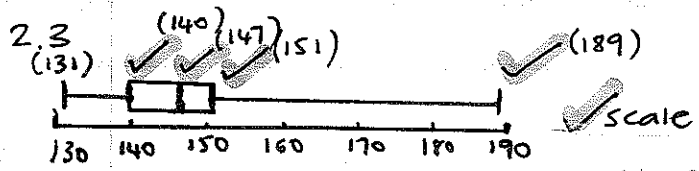
1.3. $\frac{80}{100} \times 110 = 88$

$\therefore 110 - 88 = 22$ students (2) [7]

2.1 149,07 km (2)

2.2. 14,40 (2)

2.3



(6)

2.4. SKEWED RIGHT OR POSITIVELY SKEWED (1)

2.5.1 $\overline{x} = 149,07 + q$ (1)

2.5.2. $\sigma = 14,40$ (1) [12]

3.1. $m_{QR} = \frac{18}{12} = \frac{3}{2}$ (2)

3.2. $\tan\theta = 3/2$

$\theta = 56,31°$ (2)

3.3. $m_{PM} = \frac{12}{-12} = -1$

$y = -x + c$

$12 = -(-9) + c$

$3 = c$

$\therefore y = -x + 3$ (3)

3.4. $S(15; -12)$ (2)

3.5.1 $NQ = \sqrt{(9-a)^2 + (9-b)^2}$ (1)

3.5.2. Subst $(a; b)$

$b = -a + 3 \quad \ldots (1)$

$5\sqrt{5} = \sqrt{(9-a)^2 + (9-b)^2}$

$\therefore 25(5) = (9-a)^2 + (9-b)^2$

$\therefore 125 = 81 - 18a + a^2 + [9 - (-a+3)]^2$

$\therefore 125 = 81 - 18a + a^2 + [6+a]^2$

$\therefore 125 = 81 - 18a + a^2 + 36 + 12a + a^2$

$\therefore 0 = 2a^2 - 6a - 8$

$\therefore 0 = a^2 - 3a - 4$

$\therefore 0 = (a-4)(a+1)$

$\therefore a \neq 4$ or $a = -1$

$\therefore b = -(-1) + 3 = 4$

$N(-1; 4)$ (6) [10]

4.1.1. $2\sqrt{5} = \sqrt{(a-2)^2 + (-3+1)^2}$

$4(5) = (a-2)^2 + (-2)^2$

$\therefore 0 = a^2 - 4a + 4 + 4 - 20$

$\therefore 0 = a^2 - 4a - 12$

$\therefore 0 = (a-6)(a+2)$

$a = 6 \quad \text{or} \quad a \neq -2$ (6)

4.1.2 $m_{rad} = \frac{-2}{4} = -\frac{1}{2}$

$m_{tan} = 2 \quad (rad \perp tan)$

$\therefore y = 2x + c$

$-1 = 2(2) + c$

$-5 = c$

$\therefore y = -2x - 5$ (4)

4.2.1 $x^2 - 4x + 4 + y^2 + 8y + 16 = -k + 4 + 16$

$\therefore (x-2)^2 + (y+4)^2 = 20 - k$

Centre $(2; -4)$ (3)

4.2.2. $20 - k = 7^2 \quad r = 7$

$\therefore -29 = k$ (3)

[15]

5.1. $y \in [-2; 2]$ (1)

5.2. $720°$ (1)

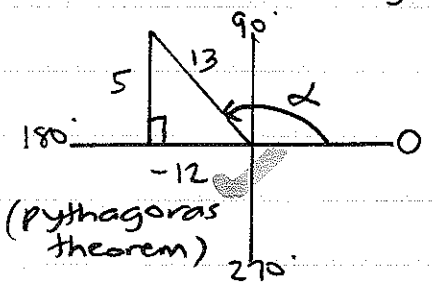
5.3. SEE DIAGRAM SHEET (4)

5.4. $x \in [60; 180°] \cup [240; 270°]$ (4)

[10]

6.1. $13\sin\alpha - 5 = 0$

$\sin\alpha = \frac{5}{13}$



(pythagoras theorem)

$24\tan\alpha + 26\cos\alpha$

$24\left(\frac{5}{-12}\right) + 26\left(\frac{-12}{13}\right)$

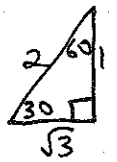
$= -10 - 24$

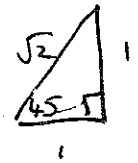
$= -34$ (4)

6.2. $\frac{\sin 210 \cdot \cos 150}{\cos 315 \cdot \sin 135}$

$= \frac{(-\sin 30)(-\cos 30)}{(\cos 45)(\sin 45)}$

$= \frac{\left(-\frac{1}{2}\right)\left(-\frac{\sqrt{3}}{2}\right)}{\frac{1}{\sqrt{2}} \cdot \frac{1}{\sqrt{2}}}$





$= \frac{\frac{\sqrt{3}}{4}}{\frac{1}{2}} = \frac{\sqrt{3}}{4} \times \frac{2}{1} = \frac{\sqrt{3}}{2}$ (6)

6.3.1

$$\frac{\sin^2\theta}{\sin\theta} + \cos\theta(+\cos\theta) + \frac{1}{\tan\theta}$$

$$= \frac{\sin^2\theta + \cos^2\theta}{\sin\theta} + \frac{1}{\frac{\sin\theta}{\cos\theta}}$$

$$= \frac{1}{\sin\theta} + \frac{\cos\theta}{\sin\theta}$$

$$= \frac{1+\cos\theta}{\sin\theta}$$

$= RHS$ (6)

6.3.2. UNDEFINED :

* IF $\sin\theta = 0$ OR $\tan\theta = 0$

$\therefore \theta = 0 + n180°$ $n \in \mathbb{Z}$

* FOR $\tan\theta$

$\therefore \theta = 90 + n180°$ (2)

[THEY CAN SIMPLIFY TO $\theta = n90$]

6.4. $\sin(\theta+57) = -0,8$

Ref $\angle$: 53,13

QIII: $\theta + 57 = 233,13 + n360°$

$\theta = 176,13 + n360°$ $n \in \mathbb{Z}$

QIV: $\theta + 57 = 306,87 + n360°$

$\theta = 249,87 + n360°$ (4)

6.5.1.

LHS: $$\frac{\sin^n\theta - \cos^n\theta}{\frac{\sin^n\theta}{\cos^n\theta} - 1}$$

$$= \frac{\sin^n\theta.\cos^n\theta - \cos^{2n}\theta}{\sin^n\theta - \cos^n\theta}$$

$$= \frac{\cos^n\theta(\sin^n\theta - \cos^n\theta)}{\sin^n\theta - \cos^n\theta}$$

$= \cos^n\theta = RHS$ (3)

6.5.2.

$$\cos^{2016}28 \times \frac{1}{\cos^{2013}28}$$

$= \cos^3 28$

$= 0,6883$ (3)

[25]

7.1.1 $$\frac{\sin Z}{7} = \frac{\sin 52}{8}$$

$$\therefore \sin Z = \frac{7\sin 52}{8}$$

$\therefore Z = 43,59$

$\therefore \hat{Y} = 84°$ ($<$ sum Δ) (4)

7.1.2. $TZ^2 = 8^2 + 3^2 - 2(8)(3)\cos 84$

$TZ^2 = 67,98...$

$TZ = 8,25$ units (3)

7.2. $A = \frac{1}{2} \cdot t \cdot QR \cdot \sin\gamma$

$\frac{PQ}{QR} = \tan x$

$\therefore \frac{PQ}{\tan x} = QR$

$\therefore A = \frac{1}{2} \cdot t \cdot \frac{PQ}{\tan x} \cdot \sin\gamma$

$\therefore \frac{2A \cdot \tan x}{t \sin\gamma} = PQ$

(5) [12]

8.1. $V = 10\pi(5)^2 9 + 10 \times \frac{4}{3}\pi(5)^3$

$= 1230,57 mm^3$

(3)

8.2.

$SA = 10\left[2\pi(5)^2 + 2\pi(5)9\right] + 10(4\pi(5)^2)$

$= 500\pi + 900\pi + 1000\pi$

$= 2400\pi\ mm^2$

(4) [7]

9. SEE DIAGRAM SHEET [5]

10. $\hat{C} = 108°$ (opp $\angle$ parm)

$2x + 40 + 108° = 180°$ (opp $\angle$ cyclic quad)

$\therefore 2x = 32°$

$\therefore x = 16°$

[5]

11.1. $\hat{D}_1 = x$ (tan chord theorem)

$\hat{C}_1 = x$ (tan chord theorem)

$\hat{B}_3 = x$ (alt $\angle$; ED $\|$ BC)

$\hat{A}_4 = x$ (alt $\angle$; ED $\|$ BC)

$\hat{A}_2 = x$ (tan chord theorem)

(5)

11.2. $\hat{F}_2 = 180 - 2x$ ($\angle$ sum Δ)

$\hat{S}_4 = 180 - 2x$ ($\angle$ sum Δ)

$\therefore \hat{F}_2 = \hat{S}_4$

$\therefore$ FBSA cyclic

[CONVERSE EXT $\angle$ CYCLIC QUAD]

(5) [15]

12.1 $\hat{P}_3 = x$ ($\angle$ opp = sides)

$\hat{Q}_1 = 2x$ (ext $\angle$ of Δ = sum int opp $\angle$)

$\therefore \hat{O}_1 = 4x$ ($\angle$ at centre = 2 $\angle$ at circum)

(5)

12.2. $\hat{M}_2 = x$ ($\angle$ opp = sides)

$\therefore \hat{P}_3 = \hat{M}_2 = x$

$\therefore$ RP is a tangent

[CONVERSE tan chord theorem]

(3) [8]

13.1 $\hat{E}_4 = 90^\circ$ (line from centre bisects chord)

$\hat{R} = 90^\circ$ ($\angle$ in semi ○)

$\therefore \hat{E}_4 + \hat{R} = 180^\circ$

$\therefore$ DC // KR (co-int $\angle$ suppl)

(5)

13.2 $\hat{K}_2 = x$ (tan chord theorem)

$\therefore \hat{O}_3 = x$ (alt $\angle$s; DC // KR)

$\therefore \hat{B}_3 = \hat{D}_1$ ($\angle$ opp = radii)

$\therefore \hat{B}_3 = \hat{D}_1 = \frac{1}{2}x$ (ext $\angle$ of $\triangle$)

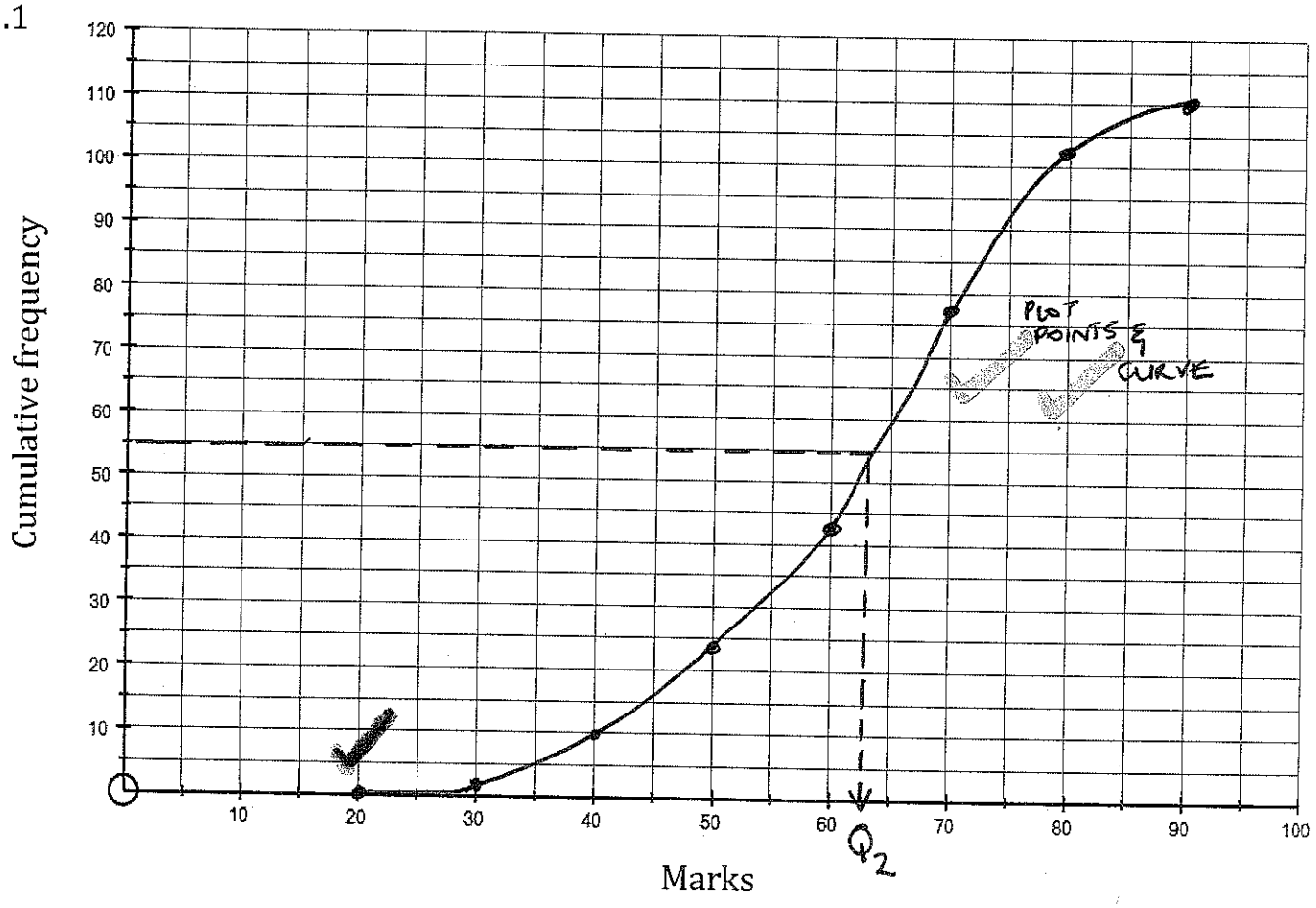
[9]

Name: Memo **Teacher:** _____

Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13	
Data	Data	Analyt geom	Analyt geom (Cricle)	Trig graphs	Trig	Trig triangle formulae	Volume/ surface area	Circle geom	Circle geom	Circle geom	Circle geom	Circle geom	TOTAL
7	12	16	15	11	28	12	7	5	5	15	8	9	150

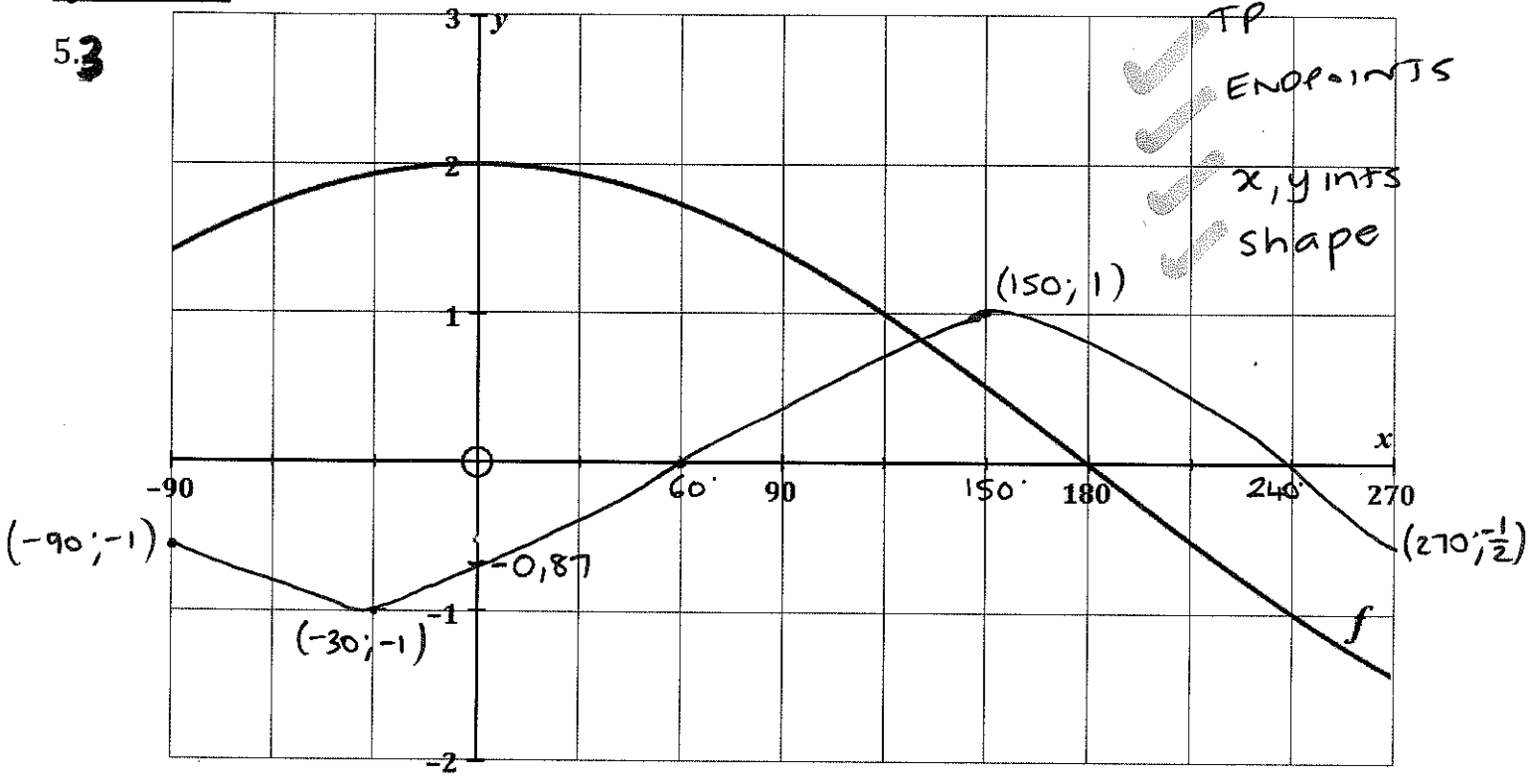
Question 1

1.1 Ogive showing Grade 11 Mathematics marks



Question 5

5.3



TP ✓
ENDPOINTS ✓
x, y ints ✓
shape ✓

Question 9 (THEOREM)

CONSTRUCTION: JOIN RO AND OT ✓

PROOF: Let $\hat{P} = x$

$\therefore R\hat{O}T = 2x$ ($\angle$ at centre = 2 $\angle$ circum) ✓

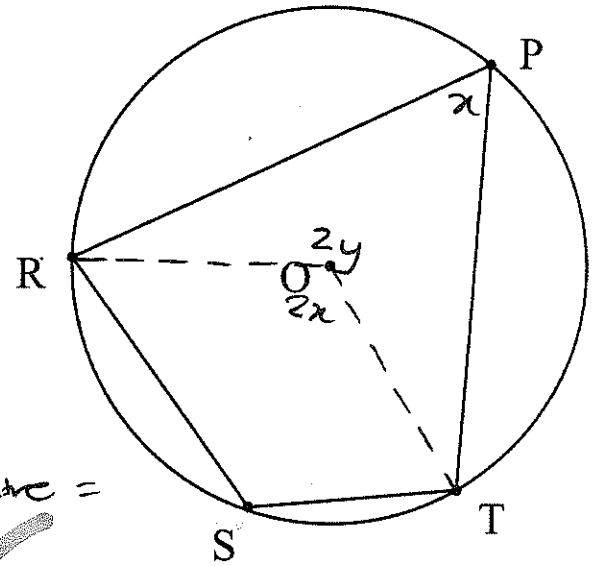
Let $\hat{S} = y$

$\therefore$ Reflex $R\hat{O}T = 2y$ ($\angle$ at centre = 2 $\angle$ circum) ✓

$\therefore 2x + 2y = 360°$ ✓ ($\angle$ around a point)

$\therefore x + y = 180°$ ✓

$\therefore \hat{P} + \hat{S} = 180°$



[5]