GRADE 11 PAPER 2 2015

1.1.1. $AC = \sqrt{5^2 + 4^2} = \sqrt{41} = 6,4$ (2)

1.1.2. $m_{AC} = \frac{5}{4}$ $m_{BC} = \frac{7}{-1}$ (2)

1.1.3. $m_{AC} = 5/4 = \tan$ reflex $X\hat{C}A$

Ref< : 51,34

reflex $XCA = 231,34$

$m_{BC} = -7 = \tan$ reflex XCB

Ref< : 81,87 ref<

Reflex $XCB = 278,13$

$\therefore A\hat{C}B = 46,79$ (4)

1.1.4. $D(-3; 6)$ (2)

1.2.1 $y = -2x$ (2)

1.2.2. EQN DC $y = \frac{1}{2}x + c$

$4 = \frac{1}{2}(-2) + c$

$5 = c$

$y = \frac{1}{2}x + 5$

$C(0;5)$ (3)

1.2.3. $y = -2x + 10$

$y + 2x - 10 = 0$ (2)

[17]

2.1. $(x-3)^2 + y^2 = 25$ (2)

2.2. y int circle A: $(-3)^2 + y^2 = 25$

$y^2 = 16$

$\therefore y = \pm 4$

Circle B

$(x-7)^2 + (y-8)^2 = r^2$

$(0-7)^2 + (4-8)^2 = r^2$

$49 + 16 = r^2$

$65 = r^2$

$(x-7)^2 + (y-8)^2 = 65$ (4)

2.3. $x^2 - 2x + 1 + y^2 - 12y + 36 = -32 + \underbrace{1 + 36}$

$\therefore (x-1)^2 + (y-6)^2 = 5$

centre $(1;6)$ radius $= \sqrt{5}$ (6)

2.4. $m_{rad} = \frac{8-4}{7-0} = \frac{4}{7}$

$m_{tan} = -7/4$ (tan ⊥ rad)

$y = -7/4\,x + 4$ (3)

[15]

3.1. Graph } See DS (2)

3.2. (2)

3.3. (2)

3.4. $Q_3 - Q_1 = 106 - 93$ (±1 for each Q)

$= 13$ (±3)

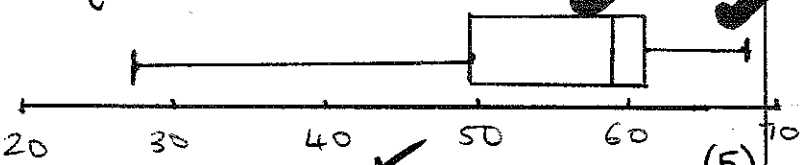
(3)

[9]

4.1

28, 41, 48 | 52, 59, 59 | 59, 59, 60 | 61, 63, 68

$\{28;\ 50;\ 59;\ 60{,}5;\ 68\}$



(5)

4.2. Not evenly distributed, skewed left OR negatively skewed (2)

4.3.

Mean of 13 values: $\frac{657+p}{13} = 52$

$657 + p = 676$

$\therefore p = 19$

(3)

4.4. $52 < q < 60$ (2)

[12]

5.1.

$s^2 = 16^2 + 12^2$ (pythag thrm)

$s^2 = 400$

$s = 20$

SA cone $= \pi(16)(20)$

$= 320\pi$ units^2 (3)

5.2. $s^2 = 8^2 + 6^2$ (Pythagoras)

$= 64 + 36$

$= 100$

$s = 10$

SA cut off : $\pi(8)10$

$= 80\pi$

∴ SURFACE AREA OF LAMPSHADE

$= 320\pi - 80\pi$

$= 240\pi$ (4)

$= 753{,}98$ units^2

[7]

6.1.1. $b = 2$

$c = 30°$ (2)

6.1.2. 180° (1)

6.1.3. 1 (1)

6.1.4. $x \in (-120°; 60°)$ (2)

6.1.5. $h(x) = -\sin(x - 10°)$

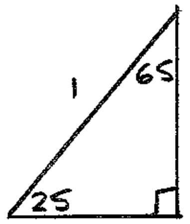
(2)

6.2. see DS (3)

[11]

(3)

7.1



$\sqrt{1-k^2}$ (pythag thrm)

$\tan 115 = -\tan 65$

$= -\dfrac{\sqrt{1-k^2}}{k}$ (4)

7.2.1. $\dfrac{\tan(360-A)\sin(90+A)\cos 180^\circ}{\sin(-180+A)}$

$= \dfrac{(-\tan A)(\cos A)(-1)}{-\sin A}$

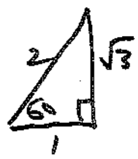
$= -\dfrac{\sin A}{\cos A} \cdot \dfrac{\cos A}{\sin A}$

$= -1$ (6)

7.2.2 $\dfrac{\cos 240 + \cos 120}{\cos(240+120)}$

$= \dfrac{-\cos 60 - \cos 60}{\cos 360^\circ}$

$= \dfrac{-2\cos 60}{1}$



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

$= -1$ (5)

7.3 $\sin 2x = \cos(x - 20^\circ)$

$\sin 2x = \sin[90 - (x-20)]$

Ref <: $110 - x$

QI: $2x = 110^\circ - x + n360$

$n \in \mathbb{Z}$ $3x = 110^\circ + n360^\circ$

$x = 36{,}67 + n120$

QII: $2x = 180 - (110 - x) + n360^\circ$

$2x = 70 + x + n360^\circ$

$x = 70^\circ + n180^\circ$ (5)

7.4.1

LHS: $\tan\theta + \dfrac{\cos\theta}{\sin\theta - 1}$

$= \dfrac{\sin\theta}{\cos\theta} + \dfrac{\cos\theta}{\sin\theta - 1}$

$= \dfrac{\sin\theta(\sin\theta - 1) + \cos^2\theta}{\cos\theta(\sin\theta - 1)}$

$= \dfrac{\sin^2\theta - \sin\theta + \cos^2\theta}{\cos\theta(\sin\theta - 1)}$

$= \dfrac{1 - \sin\theta}{\cos\theta(\sin\theta - 1)}$

$= \dfrac{-(-1+\sin\theta)}{\cos\theta(\sin\theta - 1)}$

$= -\dfrac{1}{\cos\theta}$ (5)

= RHS

7.4.2. Undefined if:

$\sin\theta - 1 = 0$ $\cos\theta = 0$

$\sin\theta = 1$

$\theta = 90 + n360^\circ$ $\theta = 90^\circ + n180^\circ$

$n \in \mathbb{Z}$

$\tan\theta$ undefined at

$\theta = 90 + n180^\circ$

$\therefore$ overall: $\theta = 90^\circ + n180^\circ; n \in \mathbb{Z}$ (3)

[28]

8.1. DIAGRAM SHEET (4)

8.2.1. $\frac{x}{BE} = \cos\alpha$

$BE = \frac{x}{\cos\alpha}$ (2)

8.2.2.

$\frac{BD}{\sin\alpha} = \frac{x}{\sin\beta}$

$\therefore BD = \frac{x\sin\alpha}{\sin\beta}$ (1)

8.2.3. $E\hat{B}D = \beta - \theta$ (ext < of Δ)

Area $\Delta BED = \frac{1}{2} \cdot BE \cdot BD \cdot \sin(\beta-\theta)$

subst

$= \frac{1}{2}\left(\frac{x}{\cos\alpha}\right)\left(\frac{x\sin\alpha}{\sin\beta}\right)\sin(\beta-\theta)$

simplify

$= \frac{1}{2}\frac{x^2 \sin\alpha \cdot \sin(\beta-\theta)}{\cos\alpha \cdot \sin\beta}$ (4)

or $\boxed{\frac{1}{2}\frac{x^2 \tan\alpha \cdot \sin(\beta-\theta)}{\sin\beta}}$

8.2.4. Area $= \frac{2^2(\sin 40°)(\sin 27°)}{2(\cos 40°)(\sin 37°)}$

$= 1{,}27$ units^2 (1)

8.3.1 $\frac{269}{BA} = \tan 37°$

$\therefore BA = \frac{269}{\tan 37}$

$= 356{,}98$ (2)

≈ 357 m

8.3.2. $\frac{AC}{\sin 18} = \frac{357}{\sin 28}$

$\therefore AC = \frac{357\sin 18}{\sin 28}$

$= 234{,}99$ m

(3)

[17]

9. DIAGRAM SHEET [6]

10.1. $\hat{K} = 76°$ (< at centre = 2 < circum) (2)

10.2. $\hat{M}_1 = 76°$ (tan chord thrm) (2)

10.3. $\hat{M}_2 = \hat{L}_1$ (< opp = radii)

$\hat{L}_1 = 14$ (< sum of Δ)

$\hat{M}_1 = M\hat{L}K = 76°$ (alt <; $NP \parallel KL$)

$\therefore \hat{L}_2 = 76° - 14 = 62°$

(5)

[9]

11.1.1. $\hat{S} = x$ (alt <; $QT \parallel PS$) (1)

11.1.2. $\hat{Q}_4 = x$ (tan chord thrm) (1)

11.1.3 $\hat{W}_1 = x$ (< in same segment) (1)

11.2. $\hat{L}_3 = x + y$ (ext < of Δ)

$\hat{Q}_3 = y$ (< subt by = chords)

$\therefore \hat{R}_1 = x + y$ (ext < of Δ)

$\therefore \hat{R}_1 = \hat{L}_3 = x + y$

(4)

11.3 $\hat{L}_1 = x + y$ (vert opp <)

$\hat{R}_3 = x + y$ (alt <; $PS \parallel QT$)

$\therefore \hat{Q}_{3+4} = \hat{R}_3 = x + y$

$\therefore$ PRKQ cyclic [CONVERSE ext < of cyclic quad]

(4)

[11]

(S)

12.1. $\hat{D}_2 = x$ (ext $\angle$ cyclic quod)

$\hat{D}_4 = 180 - x$ ($\angle$ on str line)

$\hat{E}_1 + \hat{E}_2 = 180 - x$ (opp $\angle$ cyclic quod)

(4)

$\therefore \hat{E}_1 + \hat{E}_2 = \hat{D}_4 = 180 - x$

12.2. $D\hat{F}G = x$ (corres $\angle$; $GH \parallel EC$)

$\therefore D\hat{F}G = \hat{B} = x$

$\therefore$ GH is a tangent

(CONVERSE tan chord thrm)

(4)

OR

$\hat{D}_3 = x$ (vert opp $\angle$)

$\therefore G\hat{F}D = x$ (alt $\angle$; $GH \parallel EC$)

$\therefore G\hat{F}D = \hat{B} = x$

$\therefore$ GH tangent

(CONVERSE tan chord thrm)

OR

$D\hat{F}H = 180 - x$ (alt $\angle$; $GH \parallel EC$)

$\therefore H\hat{F}D = \hat{E}_1 + \hat{E}_2$

$\therefore$ GH tangent

(CONVERSE tan chord thrm)

[8]

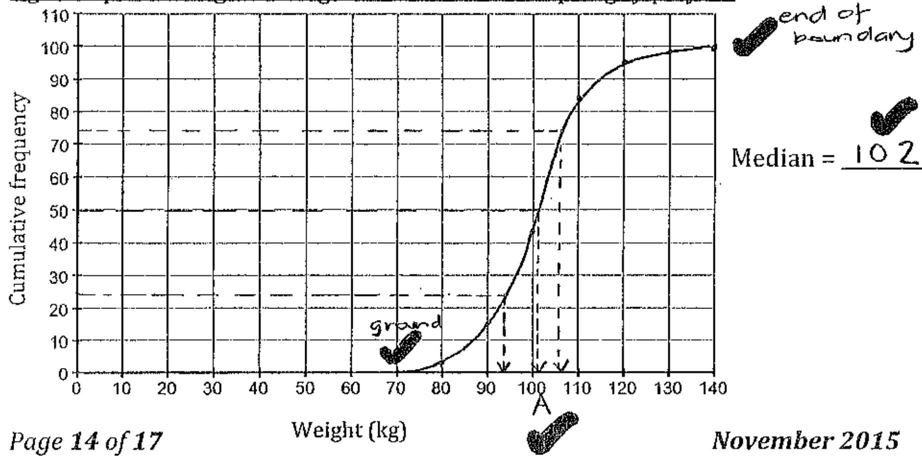
Name: ____________ **Teacher:** MEMO

Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	
Analyt geom	Analyt geom (Cricle)	Data	Data	TSA	Trig graphs	Trig	Trig triangle formulae	Circle geom	Circle geom	Circle geom	Circle geom	TOTAL
17	15	9	12	7	11	28	17	6	9	11	8	150

Question 3

Weights (kg) in intervals	Number of players	Cumulative frequency
$70 < x \le 80$	1	1
$80 < x \le 90$	14	15
$90 < x \le 100$	28	43
$100 < x \le 110$	41	84
$110 < x \le 120$	11	95
$120 < x \le 130$	4	99
$130 < x \le 140$	1	100
TOTAL	**100**	

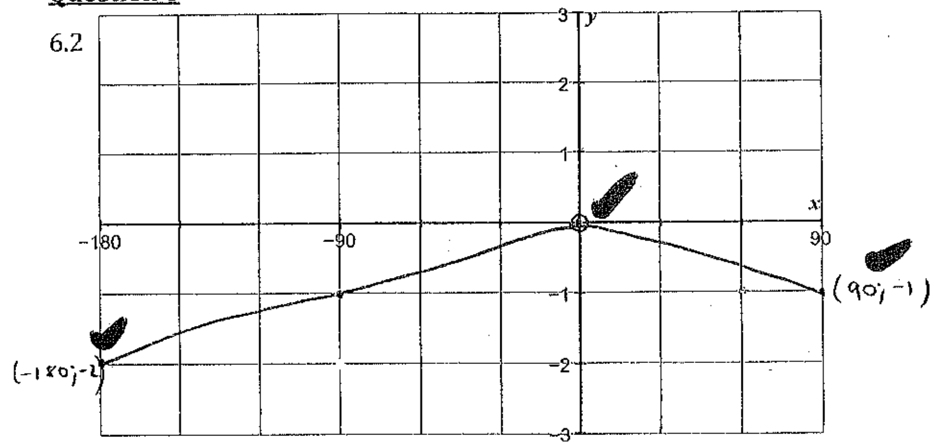
Ogive representing the weights of 100 World Cup rugby players



Median = 102

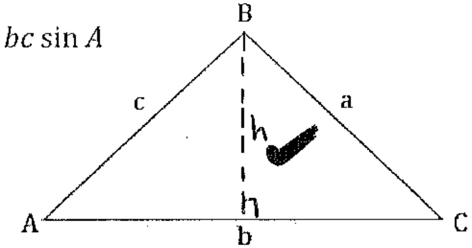
Question 6

6.2



Question 8

8.1 In ΔABC prove that: $area\ \Delta ABC = \frac{1}{2}bc\sin A$



$\frac{h}{c} = \sin A$

$\therefore h = c\sin A$

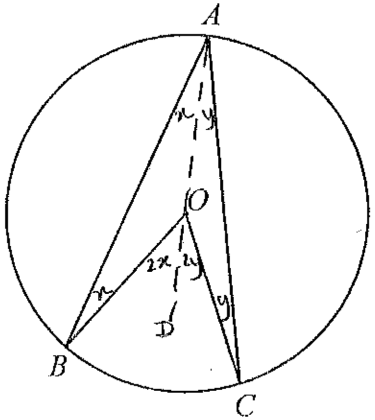
Area $= \frac{1}{2} \cdot$ base $\cdot \perp h$

$= \frac{1}{2} \cdot b \cdot c\sin A$

(4)

Question 9

Prove the theorem which states that: $B\hat{O}C = 2B\hat{A}C$



CONSTRUCT: RADIUS AO EXTENDED TO D

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

$\therefore B\hat{A}O = x$ (< opp radii)

$B\hat{O}D = 2x$ (ext < Δ)

Let $\hat{C} = y$

$\therefore O\hat{A}C = y$ (< opp radii)

$D\hat{O}C = 2y$ (ext < Δ)

$\therefore B\hat{O}C = 2x + 2y = 2(x+y) = 2(\hat{A})$

(6)

Question 10