Gr 11 Nov 2015 P2 Memo

Q1

1.1.1 $\bar{x} = \frac{\sum_{i=1}^{n} x_i}{n} = \frac{571}{15}$ ✓ $= 38{,}07$ ✓ (2)

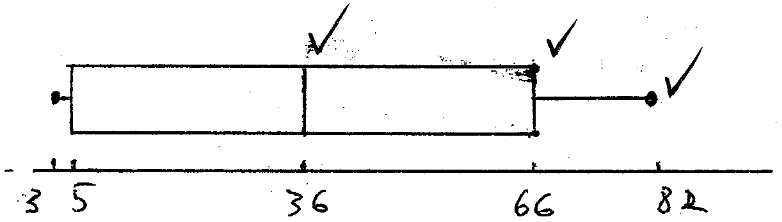
1.1.2 Median $= T_8 = 36$ ✓ (1)

1.1.3 $Q_1 = T_4 = 5$ ✓ ; $Q_3 = T_{12} = 66$ ✓

$\therefore IQR = 66 - 5$
$= 61$ ✓ (3)

1.1.4 $\sigma = \sqrt{\frac{\sum_{i=1}^{15}(x_i - \bar{x})^2}{15}} = 26{,}39$ ✓✓ (2)

1.2



(3)

1.3 Data is skewed to the right ✓ (1)

[12]

Q2

2.1 approximately $140 - 102 = 38$ people ✓✓ (2)

2.2 approx $61 - 26 = 35$ people ✓✓ (2)

2.3 $11 \leq t < 16$ ✓ (1)

[5]

Q3

3.1 at E $y = 0$ $\therefore E(-\frac{8}{3}$ ✓ $; 0$ ✓ $)$ (2)

3.2 $A\hat{D}E = 45°$ ✓ (vert. opp ∠'s)

$D\hat{E}O = \arctan(m_{DE})$ (A.o.I. DE)
$= \arctan(3)$
$= 71{,}57°$ ✓

$D\hat{A}E = D\hat{E}O - A\hat{D}E$ (ext ∠'s in △ADE)
$= 71{,}57° - 45°$
$= 26{,}57°$ ✓ (3)

3.3 $m_{AB} = \tan(D\hat{A}E)$ ✓
$= \frac{1}{2}$ ✓

sub in $B(1;5)$ $\therefore 5 = \frac{1}{2}(1) + c$ ✓
$\therefore c = \frac{9}{2}$ ✓

$\therefore y_{AB} = \frac{1}{2}x + \frac{9}{2}$ (4)

3.4 at D $3x + 8 = \frac{1}{2}x + \frac{9}{2}$ ✓

$\therefore \frac{5}{2}x = -\frac{7}{2}$ ✓

$\therefore x = -\frac{7}{5}$ ✓

$\therefore y = \frac{19}{5}$ ✓

$\therefore D(-\frac{7}{5} ; \frac{19}{5})$ (4)

[13]

5.3.1 $\therefore \tan\theta = 2$ ✓

$\therefore \theta = \arctan(2) + k180°$; $k \in \mathbb{Z}$ ✓

$= 63,43° + k180°$ ✓ (3)

5.3.2 $\therefore 6 - 10\cos\theta = 3(1-\cos^2\theta)$ ✓

$\therefore 3\cos^2\theta - 10\cos\theta + 3 = 0$ ✓

$\therefore (3\cos\theta - 1)(\cos\theta - 3) = 0$ ✓

$\therefore \cos\theta = \frac{1}{3}$ or $\cos\theta \neq 3$ ✓ nrs

$\therefore \theta = \pm \arccos(\tfrac{1}{3}) + k360°$; $k \in \mathbb{Z}$ (6)

✓ $= \pm 70,53° + k360°$ ✓

$\theta = 70,53° + k.360°$ or $\theta = 289,47° + k.360°$

5.4 $LHS = \cos^2 x\left[\frac{\sin x + 1 + \sin x - 1}{(\sin x - 1)(\sin x + 1)}\right]$ ✓✓

$= \cos^2 x\left[\frac{2\sin x}{\sin^2 x - 1}\right]$ ✓✓

$= \cos^2 x\left[\frac{2\sin x}{-\cos^2 x}\right]$ ✓

$= -2\sin x$ (5)

$= RHS$

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Q6 6.1 $p = -45°$ ✓ ; $q = -1$ ✓ (2)

6.2 $B(112,5° ; 0,38)$ ✓✓ (symmetry) (2)

6.3 $f(x) < g(x)$ ✓ when

$-180° \leq x < -67,5°$ or $112,5° < x \leq 180°$ ✓ (2)

6.4.1 $h(x) = \sin(x + 30°)$ ✓ (1)

6.4.2 h has minimum at $x = -120°$ ✓ (1)

Q7 7.1 $x = \arcsin\left(\frac{4\sqrt{3}}{8}\right)$ ✓ $\frac{\sin x}{4\sqrt{3}} = \frac{\sin 90°}{8}$

$= 60°$ ✓

7.2 $A\hat{P}D = A\hat{P}C = 30°$ ✓

$\therefore AD^2 = 8^2 + 4^2 - 2(8)(4)\cos 30°$ ✓

$= 24,57$

$\therefore AD = 4,96$ ✓ (3)

7.3 $\frac{\sin y}{4} = \frac{\sin 30°}{AD}$ ✓ OR cos rule

$\therefore \sin y = \frac{4\sin 30°}{4,96}$ (2)

$\therefore y = 23,78°$ ✓ {if exact AD: y = 23,7

7.4 area $\triangle ADP = \frac{1}{2}(8)(4)\sin 30°$ ✓

$= 8$ units^2 ✓ (2)

9

Q4

4.1 $m_{RS} = \frac{2-1}{4-2}$ ✓ $= \frac{1}{2}$ ✓ (2)

4.2 $y_{PQ} = \frac{x}{2} + 6 \quad \therefore m_{PQ} = m_{RS} = \frac{1}{2}$ ✓

$\therefore PQ \parallel RS \quad \therefore PQRS$ parm. (2 pairs // sides)

$\therefore PQ = RS$

$= \sqrt{(2-1)^2 + (4-2)^2}$ ✓ $= \sqrt{5}$ ✓ (3)

4.3 $m_{PT} = m_{MR}$ (//)

$= \frac{4-2}{0-4}$ ✓ $= -\frac{1}{2}$ ✓

sub in $S(2;1) \therefore 1 = -\frac{1}{2}(2) + c$

$\therefore c = 2$ ✓

$\therefore y_{PT} = -\frac{1}{2}x + 2$ (3)

4.4 $N(0;2)$ ✓ (1)

4.5 $N_y = R_y$ (i.e. y-val at N = y-val at R)

$\therefore RN \parallel$ x-axis ✓ $\therefore R\hat{N}S = \hat{T}_1$ (alt ∠'s)

$\therefore R\hat{N}S = 180° - \hat{T}_2$

$= 180° - [180° + \arctan(-\frac{1}{2})]$ ✓✓

$= 26{,}57°$ ✓ (4)

OR cos rule 3 sides ✓ d= ✓

$5 = 5 + 16 - 2(\sqrt{5})(4)\cos N$ ✓

$\cos N =$ ✓ answer ✓

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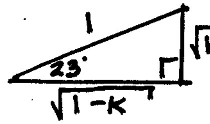
Q5 5.1.1 $\sin 203 - \sin(180 + 23)$

$= -\sin 23°$ ✓

$= -\sqrt{k}$ ✓ (2)

5.1.2 $\cos 23° = \sqrt{1 - \sin^2 23°}$ $\{\cos^2\theta + \sin^2\theta = 1\}$



✓

$= \sqrt{1-k}$ ✓ (2)

5.1.3 $\tan(-23°) = -\tan 23°$ ✓

$= -\frac{\sin 23°}{\cos 23°}$

$= -\sqrt{\frac{k}{1-k}}$ ✓ (2)

5.2.1 $= \frac{\tan(180° - 45°)[\sin(180° - 45°)]^2 \cancel{\cos 23°}}{\cancel{\cos(90° - 67°)} \tan(180° - 30°) \sin(180° + 60°)}$

✓ $\cos 23° = \sin 67°$

$= \frac{-\tan 45° \sin^2 45°}{-\tan 30°(-\sin 60°)}$ ✓✓

$= \frac{(-1)(\frac{1}{2})}{(-\frac{1}{\sqrt{3}})(-\frac{\sqrt{3}}{2})}$ ✓✓ $= -1$ ✓ (6)

5.2.2 $= \frac{-\tan x\,(-\cos x)\,\cancel{\cos x}}{\sin x \cdot \cancel{\cos x}}$ ✓✓✓✓

$= (-\tan x)(-\cot x)$ (6)

$= 1$ ✓

Q8 $a = 29^\circ$ ✓ (tan/chord thm) ✓

$b = 180^\circ - (a + 75^\circ)$ (∠'s on a straight line) ✓

$= 76^\circ$ ✓

$c = 75^\circ - 34^\circ$ ($Q\hat{P}R = Q\hat{T}R$, ∠'s in same segment) ✓

$= 41^\circ$ ✓

$\hat{Q}_1 = 76^\circ$ (∠s in same segment) ✓

$d = 105^\circ$ ✓ (ext. ∠ : cyclic quad PQRT) ✓

[9]

Q9 9.1 construct radii OP and OR and ✓ label $\hat{O}_1$ in PORS and $\hat{O}_2$ in PORT

let $\hat{O}_1 = 2x$

$\therefore P\hat{T}R = x$ (central ∠ theorem) ✓

and $\hat{O}_2 = 360^\circ - 2x$ (∠'s round a point) ✓

$\therefore P\hat{S}R = 180^\circ - x$ (central ∠ thm) ✓

$\therefore P\hat{T}R + P\hat{S}R = 180^\circ$ ✓ (5)

9.2.1 $\hat{C} = x$ ✓ (tan/chord thm) ✓

$\therefore \hat{K}_3 = x$ (corr ∠'s; TK//AC) ✓ (3)

9.2.2 TB subtends x at A_3 and K_3 ✓

$\therefore$ AKBT cyclic (∠'s in same seg =) ✓ (2)

9.2.3 $B_2 = A_3$ (base ∠'s isos △ ATB; ✓ TA = TB ∵ tangents from common pt) tan chord.

$= x$

$\hat{K}_2 = \hat{B}_2 = x$ (∠'s in same seg) ✓

$\therefore \hat{K}_2 = \hat{K}_3$

$\therefore$ TK bisects $A\hat{K}B$ (2)

9.2.4 $\hat{A}_3 = \hat{K}_2 = x$ ✓

$\therefore$ TA tangent to circle through A, K and H (converse tan/chord) ✓ (2)

[14]

Q10 10.1.1 $\hat{D}_4 = \hat{C} = x$ ✓ (Σ ∠'s isos △ FDC) ✓

$\therefore \hat{E}_1 = 180^\circ - x$ ✓ (opp ∠'s cyclic quad BEDC) ✓ (4)

10.1.2 $\hat{A} = \hat{F}_2$ ✓ (opp. int ∠ in cyclic quad ADFB) ✓

$= 180^\circ - 2x$ (2)

10.2 $\therefore A\hat{B}C = x$ ✓ (Σ ∠'s △ ABC) ✓

$\hat{E}_2 = 180^\circ - \hat{E}_1$ (∠'s on str line) ✓

$= x$

$\therefore$ ED // BC (corr ∠'s =) ✓ (4)

OR $\hat{C} = x$ ✓✓ $\hat{D}_1 = x$ ✓

[10]

OR $E\hat{B}C = x$ (ext ∠ cyclic quad ABFD)

$\hat{E}_1 = 180 - x$

co-int ∠s supp.

TOTAL : 125