

MEMO PAPER 2 (2013)



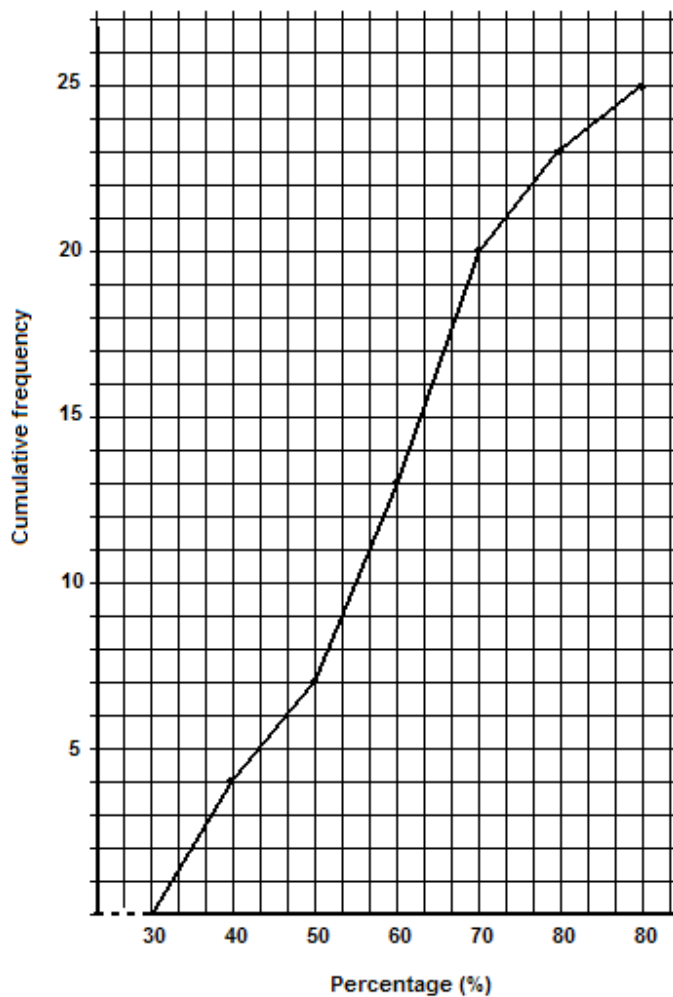
1.1.1

Percentage	Frequency	Cumulative frequency
$30 \leq x < 40$	4	4
$40 \leq x < 50$	3	7
$50 \leq x < 60$	6	13
$60 \leq x < 70$	7	20
$70 \leq x < 80$	3	23
$80 \leq x < 90$	2	25

✓✓
✓✓

(4)

1.1.2



✓✓✓

(3)

1.1.3

$$\bar{x} = \frac{\sum f}{n} = 57,52$$

✓✓

(2)

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1.1.4

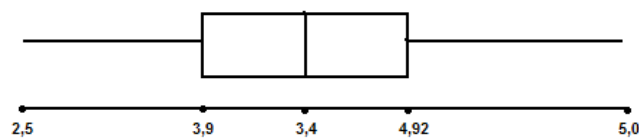
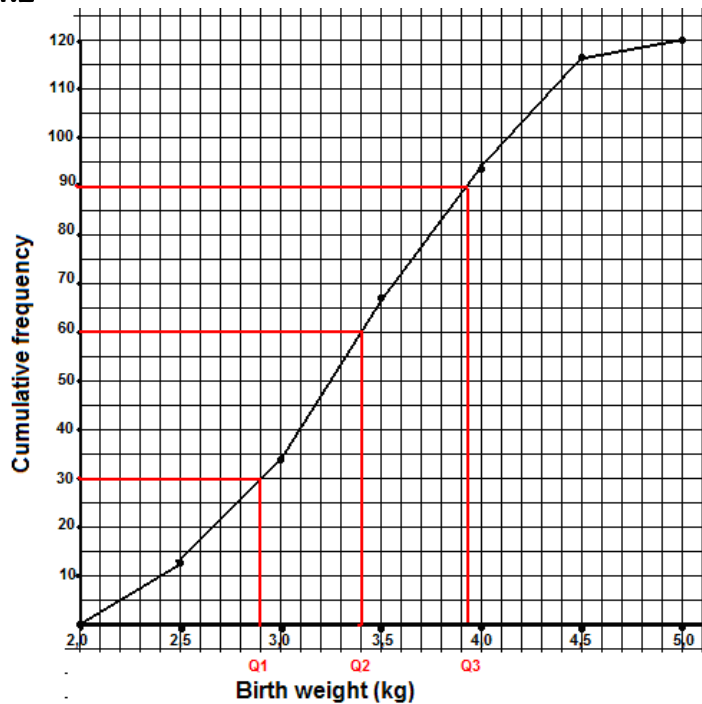
$$\sigma = 14.283$$

$$\bar{x} + \sigma = 71,803$$

$$\bar{x} - \sigma = 43,237$$

Number of students within one standard deviation of the mean: 15

1.2



✓
✓
✓

(3)

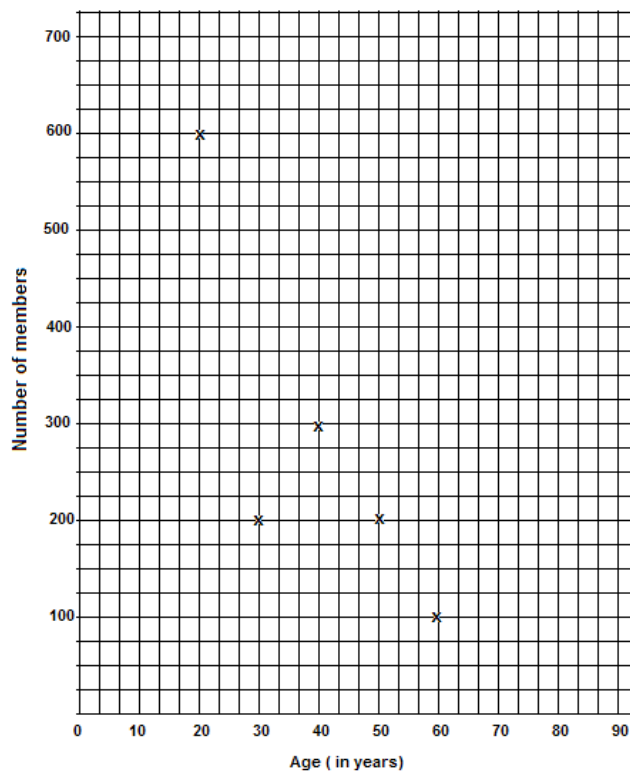
✓✓✓✓✓

(5)
[17]

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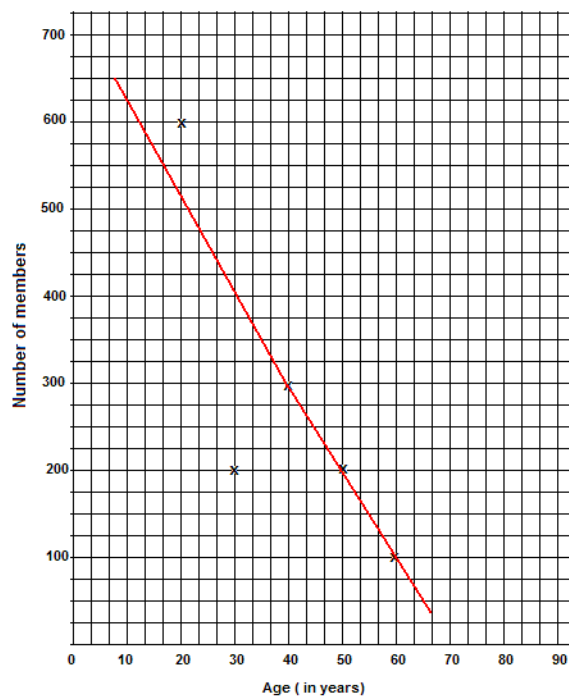
2.1



✓✓
✓✓

(4)

2.2 Negative correlation



✓

✓

(2)

2.3.1 45-year olds = 250

2.3.2 55-year olds = 149

✓

✓

(2)

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	[8]
3.1 $m_{AB} = \frac{6-4}{3+1} = \frac{2}{4} = \frac{1}{2}$ 3.2 $M(x; y) = \left(\frac{3+4}{2}; \frac{6+1}{2} \right) = \left(\frac{7}{2}; \frac{7}{2} \right)$ 3.3 $\frac{7}{2} = \frac{-1+x}{2} \qquad \frac{7}{2} = \frac{4+y}{2}$ $7 = -1+x \qquad 7 = 4+y$ $x = 8 \qquad y = 3$ $\therefore C(8;3)$ 3.4 $m_{CD} = \frac{3-1}{8-4} = \frac{2}{4} = \frac{1}{2} \quad \text{OR} \quad m_{CD} = m_{AB} = \frac{1}{2}$ $\tan \sigma = \frac{1}{2}$ $\theta = \tan^{-1}(0,5) = 26.57^\circ$	✓✓ (2) ✓✓ (2) ✓✓ ✓✓ (4) ✓ ✓ ✓ (3) [11]

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4.1.1 $x^2 - 2x + y^2 - 4y - 11 = 0$ $(x^2 - 2x + 1) + (y^2 - 4y + 4) = 11 + 1 + 4$ $(x - 1)^2 + (y - 2)^2 = 16$ $P(1;2)$ $x^2 - 10x + y^2 - 4y = -20$ $(x^2 - 10x + 25) + (y^2 - 4y + 4) = -20 + 25 + 4$ $(x - 5)^2 + (y - 2)^2 = 9$ $Q(5;2)$	✓ ✓ ✓ ✓ (4)
4.1.2 $R = 4$ $r = 3$ $R + r = 7$ $PQ^2 = (1 - 5)^2 + (2 - 2)^2$ $PQ^2 = 16$ $PQ = 4$ $PQ < R + r$	✓ ✓ ✓ ✓ ✓ (4)
∴ Two points of intersections	
4.2.1 <i>Tangent : OB</i> $y = 0$ <i>Tangent : OA</i> $y = \frac{4}{3}x$	✓ ✓ (2)
4.2.2 $m_{MN} = -\frac{3}{4}$ $y = -\frac{3}{4}x + c$ $8 = -\frac{3}{4}(6) + c$ $c = \frac{25}{2}$	✓ ✓

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$y = -\frac{3}{4}x + \frac{25}{2}$ $4y = -3x + 50$ $4y + 3x - 50 = 0$	✓ ✓	(4)
4.2.3 $P(x;0)$ $OP = ON$ $OP^2 = ON^2$ $x^2 = 6^2 + 8^2$ $x^2 = 100$ $x = 10$ $\therefore P(10;0)$	✓ ✓ ✓	(3)
4.2.4 $M(10;b)$ $4y + 3x - 50 = 0$ $4(b) + 3(10) - 50 = 0$ $4b = 20$ $b = 5$ $\therefore M(10;5)$	 ✓ ✓	(2)
4.2.5 $MP = r = 5$ $(x-10)^2 + (y-5)^2 = 25$	✓✓	(2) [21]
5.1 $A(-3;8)$	✓✓	(2)
5.2 $M(x; y) = \left(\frac{-3-3}{2}; \frac{-2+8}{2}\right) = (-3;3)$	✓✓	(2)
5.3 $(x+3)^2 + (y-3)^2 = 25$	✓✓✓	(3)
5.4		

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$C(x;0)$ $(x+3)^2 + (0-3)^2 = 25$ $x^2 + 6x + 9 + 9 = 25$ $x^2 + 6x - 7 = 0$ $(x+7)(x-1) = 0$ $x = -7$ $x = 1$ $\therefore C(-7;0)$ 5.5 $m_{AC} = \frac{0-8}{-7+3} = \frac{-8}{-4} = 2$ $m_{BC} = \frac{-2-0}{-3+7} = -\frac{2}{4} = -\frac{1}{2}$ $m_{AC} \times m_{BC} = -1$ $\therefore \overset{\wedge}{ACB} = 90^\circ$	✓ ✓ ✓ ✓ ✓ (3) (3) [13]
6.1.1 $\frac{2}{\tan \alpha} = \frac{\sin 2\alpha}{1 - \cos^2 \alpha}$ $LHS : \frac{2}{\tan \alpha}$ $= \frac{2 \cos \alpha}{\sin \alpha}$ $RHS : \frac{\sin 2\alpha}{1 - \cos^2 \alpha}$ $= \frac{2 \sin \alpha \cos \alpha}{\sin^2 \alpha}$ $= \frac{2 \cos \alpha}{\sin \alpha}$ $\therefore LHS = RHS$ 6.1.2 $\sin 3A = 3 \sin A - 4 \sin^3 A$	✓✓ ✓✓ (4)

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$LHS : \sin 3A$ $= \sin(2A + A)$ $= \sin 2A \cos A + \cos 2A \sin A$ $= 2 \sin A \cos A \cos A + (2 \cos^2 A - 1) \sin A$ $= 2 \sin A \cos^2 A + 2 \cos^2 A \sin A - \sin A$ $= 4 \sin A \cos^2 A - \sin A$ $= 4 \sin A(1 - \sin^2 A) - \sin A$ $= 4 \sin A - 4 \sin^3 A - \sin A$ $= 3 \sin A - 4 \sin^3 A$ $= RHS$	✓	
	✓	
	✓	
	✓	
	✓	(4)
6.2.1		
$\cos 36^\circ$	✓	
$= \cos 2(18^\circ)$	✓	
$= 1 - 2 \sin^2 18^\circ$	✓	(3)
$= 1 - 2m^2$		
6.2.2		
$\sin 54^\circ$	✓	
$= \cos 36^\circ$	✓	(2)
$= 1 - 2m^2$		
6.2.3		
$\cos 18^\circ$	✓✓	
$= \sqrt{1 - \sin^2 18^\circ}$	✓	(3)
$= \sqrt{1 - m^2}$		
6.2.4		
$\sin 72^\circ$	✓	
$= \cos 18^\circ$	✓	(2)
$= \sqrt{1 - m^2}$		
6.3.1		
$\sqrt{16^{\cos 300^\circ} \cdot (\sin 150^\circ)^{4 \sin 30^\circ}}$	✓✓	
$= \sqrt{16^{\cos 60^\circ} \cdot (\sin 30^\circ)^{4 \sin 30^\circ}}$		
$= \sqrt{(4^2)^{\frac{1}{2}} \cdot \left(\frac{1}{2}\right)^{4 \times \frac{1}{2}}}$	✓✓	
$= \sqrt{4 \cdot \frac{1}{4}}$	✓	(5)
$= 1$		

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6.3.2 $\cos 240^\circ \left(\frac{-2}{\tan 120^\circ} - \tan 240^\circ \right) - 3 \cos 420^\circ \cdot \frac{1}{\tan(-60^\circ)}$ $= -\cos 60^\circ \left(\frac{-2}{-\tan 60^\circ} - \tan 60^\circ \right) - 3 \cos 60^\circ \cdot \frac{-1}{\tan 60^\circ}$ $= -\frac{1}{2} \left(\frac{2}{\sqrt{3}} - \sqrt{3} \right) - 3 \left(\frac{1}{2} \right) \frac{-1}{\sqrt{3}}$ $= -\frac{1}{\sqrt{3}} + \frac{\sqrt{3}}{2} + \frac{3}{2\sqrt{3}}$ $= \frac{-2+3+3}{2\sqrt{3}}$ $= \frac{2}{\sqrt{3}}$ 6.4.1 $\frac{\sin(-\beta)}{2} = \cos(360^\circ - \beta)$ $-\sin \beta = 2 \cos \beta$ $\tan \beta = -2$ Reference $\leq 63,43494..^\circ$ $2^{\text{nd}} : \beta = 180^\circ - 63,43494..$ $\therefore \beta = 116,57^\circ + k \cdot 180^\circ$ 6.4.2 $\beta = 116,57^\circ + k \cdot 180^\circ$ $k = 0 : \beta = 116,57^\circ$ $k = 1 : \beta = 296,57^\circ$ $k = -1 : \beta = -63,43^\circ$	✓✓✓✓ ✓✓✓ ✓ (8) ✓✓✓ ✓ ✓ (5) ✓ ✓ ✓ (3) [39]
7.1 $\hat{C} = 180^\circ - 2 \hat{A}$ 7.2	✓✓ (2)

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$\frac{AB}{\sin C} = \frac{b}{\sin B}$ $AB = \frac{\sin(180^\circ - 2A).b}{\sin A}; \hat{A} = \hat{B}$ $AB = \frac{b.\sin 2A}{\sin A}$ $AB = \frac{b.2 \sin A \cos A}{\sin A}$ $AB = 2b \cos A$	✓	
7.3		
$a = b$	✓	
$\text{Area}\Delta ABC = \frac{1}{2}.b.b \sin(180^\circ - 2A)$	✓✓	
$\text{Area}\Delta ABC = \frac{1}{2}b^2 \sin 2A$	✓	(4)
		[10]
8.1.1		
$a = 2$	✓	(1)
8.1.2		
$f(120^\circ) = 2 \sin 120^\circ$		
$f(120^\circ) = 2 \sin 60^\circ$		
$f(120^\circ) = 2 \times \frac{\sqrt{3}}{2}$	✓	
$f(120^\circ) = \sqrt{3}$		
$\therefore b = \sqrt{3}$	✓	(2)
8.1.3		
$B(240^\circ; -\sqrt{3})$	✓✓	(2)
8.1.4		
$x \in (0^\circ; 90^\circ) \cup (270^\circ; 360^\circ)$	✓✓	(2)
8.1.5		
$\text{Period} = 360^\circ$	✓✓	(2)
8.1.6		
$\text{Amplitude} = 2$	✓✓	(2)
8.2	✓	(1)



	✓✓✓ ✓✓✓ (6) [16]
9.1 $(x'; y') = (x \cos A - y \sin A; x \sin A + y \cos A)$ $x' = -1 \cos(-44^\circ) - 4 \sin(-44^\circ)$ $x' = -\cos 44^\circ + 4 \sin 44^\circ$ $x' = 2,06$ $y' = -1 \sin(-44^\circ) + 4 \cos(-44^\circ)$ $y' = \sin(44^\circ) + 4 \cos(44^\circ)$ $y' = 3,57$ $\therefore (x'; y') = (2,06; 3,57)$ 9.2.1 $S(-3; -3)$ $Q(7; 6)$ 9.2.2 $P'(-6; 3)$ $Q'(-6; 7)$ $R'(3; 1)$ $S'(3; -3)$ 9.2.3	✓ ✓ ✓ ✓ ✓ (5) ✓ ✓ (2) ✓ ✓ ✓ ✓ (4)

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$P'Q' = \sqrt{(-6+6)^2 + (7-3)^2}$ $P'Q' = \sqrt{16}$ $P'Q' = 4\text{units}$	✓✓	(2)
9.2.4 <i>Ratio :</i> $1:k^2$ $1:9$ $\text{Area} = 36 \times 9 = 324\text{units}^2$	✓✓	(2) [15]
	TOTAL:	150