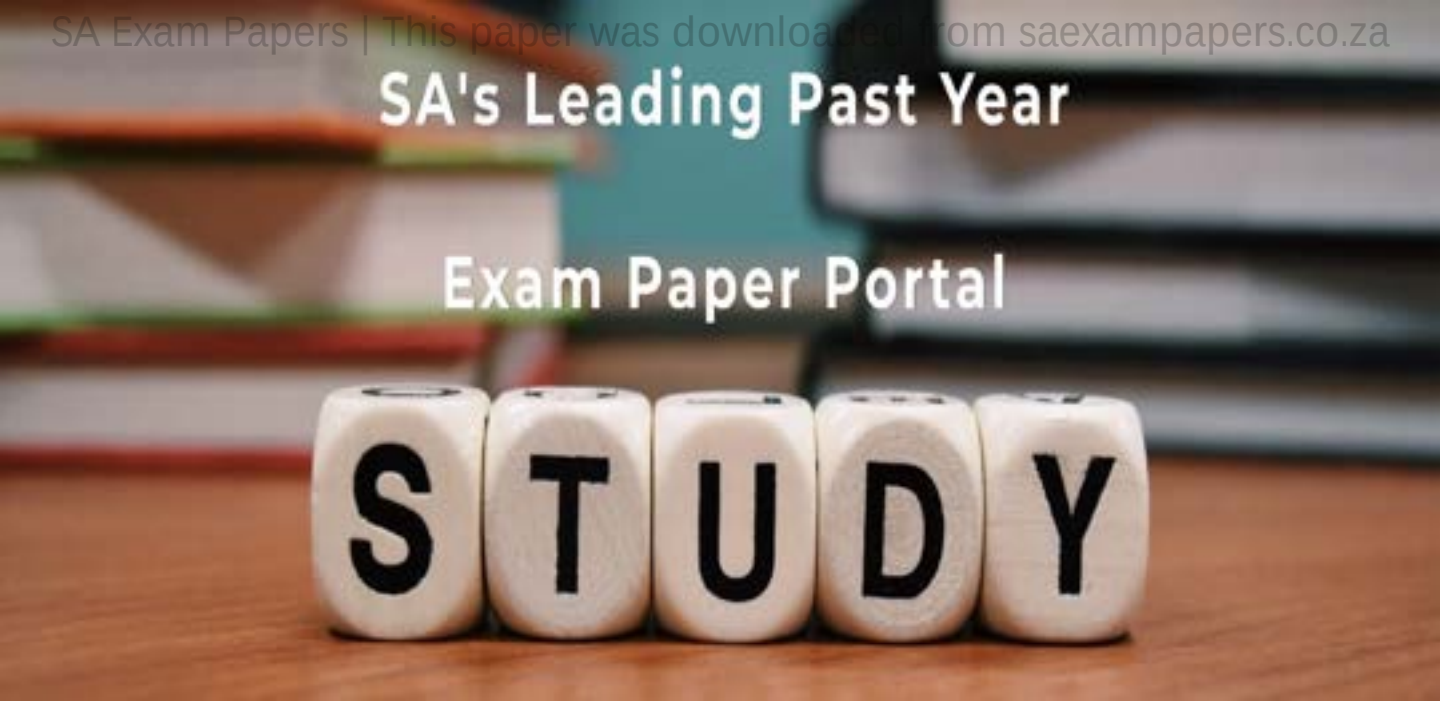


education

Department of Education
FREE STATE PROVINCE

GRADE 12

MATHEMATICS

MARKING GUIDELINE

MOCK EXAM

SEPTEMBER EXAM PAPER 2

18 AUGUST 2023

MARKS: 150

This marking guideline consists of 14 pages.

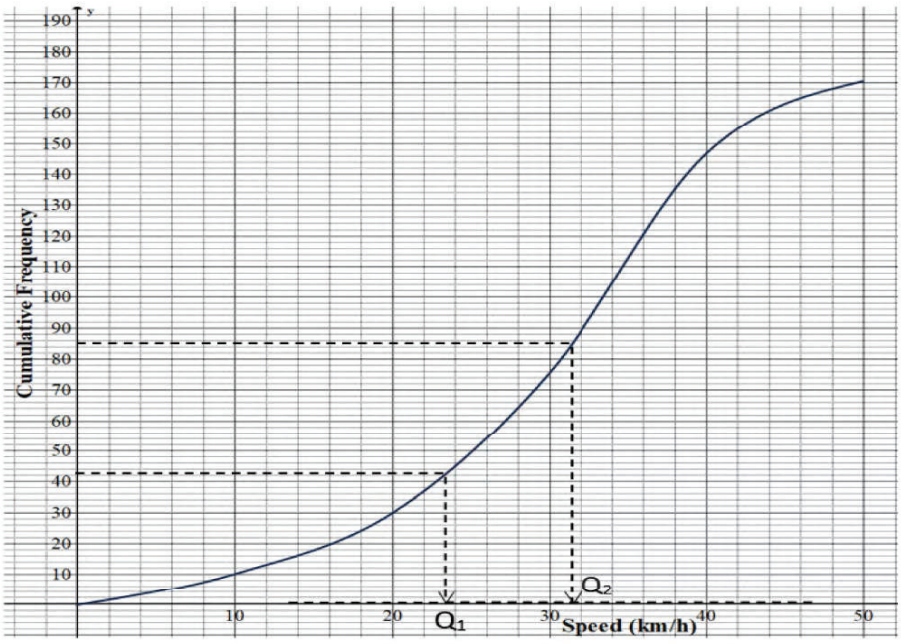
QUESTION 1

1.1

Speed (km/h)	Frequency (f)	Cumulative frequency
$0 < x \leq 10$	10	10
$10 < x \leq 20$	20	30
$20 < x \leq 30$	45	75
$30 < x \leq 40$	72	147
$40 < x \leq 50$	23	170

✓ column 1 values
✓ column 2 values (2)

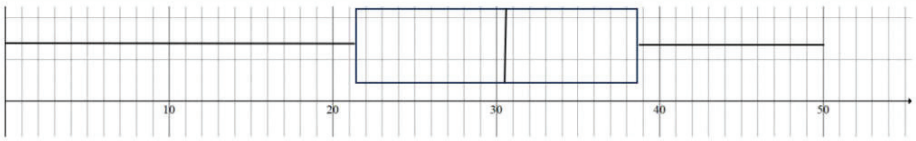
1.2 & 1.3



✓ Grounding(0; 0)
✓Maximum (50; 170)
✓Curve (3)

✓ Q_1
✓ Q_2 (2)

1.4

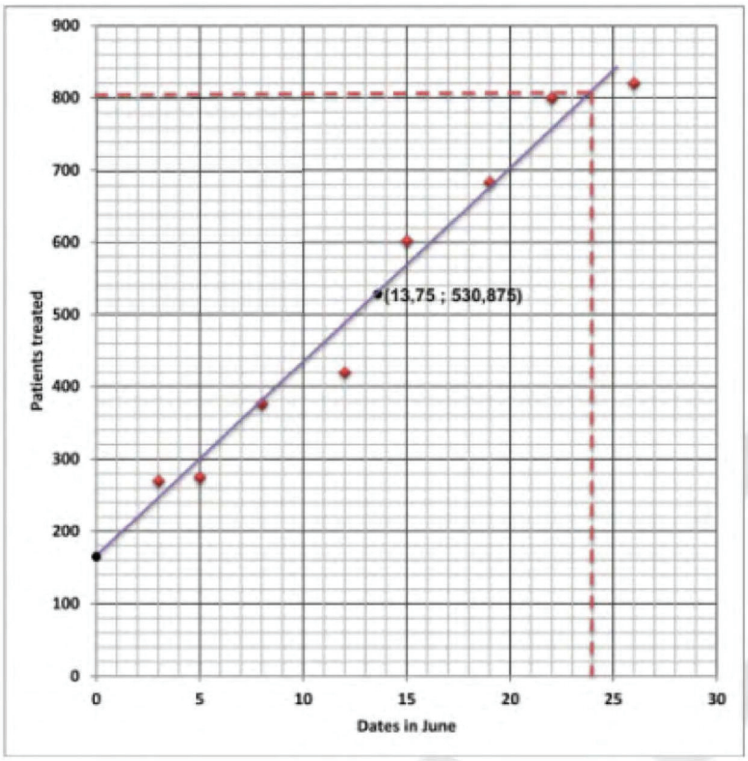


✓ Q3
✓ Box (2)

1.5 164 (Accept 163 – 165) ✓ Answer (1)

[10]

QUESTION 2

2.1		✓ ✓ ✓ ALL points plotted correctly -1 for every 2 mistakes -1 if points are joined (3)
2.2	$y = 26{,}88x + 161{,}24$	✓value of a= 161,24 ✓ value of b = 26,88 ✓equation of the line (3)
2.3	$y = 26{,}88(24) + 161{,}24$ $y = 806{,}36$ 806 people treated on 24th of June	✓ ssubstitute in formula ✓ answer as Natural Number (2)
2.4	see grid	✓ straight line ✓graph passes through (x ; y) ✓graph passes through y-intercept from regression line formula (3)
2.5	r = 0,98 This is a very strong positive, linear correlation. As the days increase the number of patients increase	✓✓ correct answer ✓interpretation (3)
2.6	$(\bar{x} - \sigma; \bar{x} + \sigma)$ $(528{,}63 - 210{,}46; 528{,}63 + 210{,}46)$ $(318{,}17\ ;\ 739{,}09)$ 4 patients.	✓ 318,17 ✓ $(739{,}09)$ ✓ answer (3)

		[17]

QUESTION 3

3.1	$m_{BC} = \frac{y_2 - y_1}{x_2 - x_1}$ $m_{BC} = \frac{8-0}{4-5}$ $m_{BC} = -8$	✓ correct substitution into the correct formula ✓ answer (2)
3.2	$AB = \sqrt{(-3-4)^2 + (k-8)^2}$ $65 = 49 + k^2 - 16k + 64$ $k^2 - 16k + 48 = 0$ $(k-4)(k-12) = 0$ $k = 4 \text{ or } k = 12$ $k = 4$	✓ substitute A and B into distance formula ✓ standard form ✓ factors ✓ k = 4 (4)
3.3	$m_{BD} = \frac{8-(-4)}{4-(-2)}$ $m_{BD} = 2$ $m_{AC} = \frac{4-0}{-3-5} = -\frac{1}{2}$ $m_{AC} \times m_{BD} = 2 \times -\frac{1}{2} = -1$ $AC \perp BD$	✓ m_{BD} ✓ m_{AC} ✓ $m_{BD} \times m_{AC}$ (3)
3.4	$midpoint\ of\ AC = midpoint\ of\ DC$ $\frac{x+(-3)}{2} = \frac{-2+5}{2} \text{ and } \frac{y+4}{2} = \frac{-4+0}{2}$ $x = 6 \text{ or } y = -8$ $F(6;-8)$	✓ x-coordinate ✓ y-coordinate
3.5	$m_{AD} = m_{BC} = -8$ $\tan\alpha = -8$ $\alpha = 180° - \tan^{-1}(8)$ $\alpha = 97{,}13°$ $\tan\beta = m_{BD} = 2$ $\beta = 63{,}43°$ $O_1 = 63{,}43° (vert\ opp\ \angle^s)$	✓ m_{AD} ✓ $\tan\alpha = -8$ ✓ $\alpha = 97{,}13°$ ✓ $\beta = 63{,}43°$ ✓ $\alpha - \beta$ ✓ answer (6)

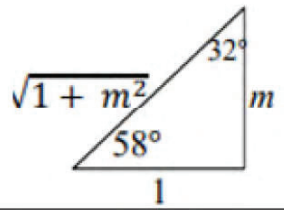
	$E\hat{D}O = \alpha - \beta$ $E\hat{D}O = 97{,}13° - 63{,}43° = 33{,}7°$	
3.6	$AC = \sqrt{(5-(-3))^2 + (0-4)^2} = \sqrt{80} = 4\sqrt{5}$ $DP = \sqrt{(-2-1)^2 + (-4-2)^2} = \sqrt{45} = 3\sqrt{5}$ $Area\ of\ \Delta ADC = \frac{1}{2} AC \times DP$ $Area\ of\ \Delta ADC = \frac{1}{2}(4\sqrt{5})(4\sqrt{5})$ $Area\ of\ \Delta ADC = 30\ square\ units$	✓ length of AC ✓ length of DP ✓ correct substitution into formula ✓ answer (4)
		[08]

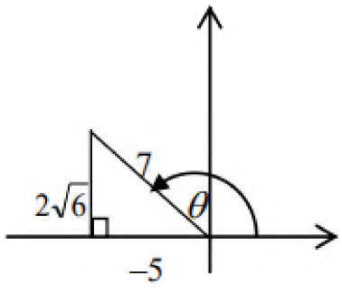
QUESTION 4

4		
4.1	$OB = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$ $OB = \sqrt{(-4-0)^2 + (-6-0)^2}$ $OB = \sqrt{52}$ $OB = 2\sqrt{13}$ $r = \sqrt{13}$	✓ substitution ✓ $OB = \sqrt{52}$ ✓ $r = \sqrt{13}$ (3)
4.2	$C\left(\frac{-4+0}{2}; \frac{-6+0}{2}\right)$ $C(-2;-3)$ $(x+2)^2 + (y+3)^2 = 13$	
4.3	Right-angled triangle, tangent perpendicular to the radius.	✓ right angled Δ ✓ reason (2)
4.4	$m_{OB} = \frac{y_2 - y_1}{x_2 - x_1}$ $m_{BO} = \frac{-6-0}{-4-0}$ $m_{BO} = \frac{3}{2}$ $m_{KL} = -\frac{2}{3}$ $y - y_1 = m(x - x_1)$ $y + 6 = -\frac{2}{3}(x+4)$	✓ m_{OB} ✓ m_{KL} ✓ substitution ✓ answer (4)

	$y=-\frac{2}{3}x-\frac{26}{3}$	
4.5	$E(0;-6)$	✓✓ answer (2)
4.6	$(x+2)^2+(0+3)^2=13$ $F(-4;0)$ $m_{FC}=\frac{-3-0}{-2+4}=-\frac{3}{2}$ $m_{CE}=\frac{-3+6}{-2+0}=-\frac{3}{2}$ Points F, C and E are collinear EF is a diameter	✓ x_F ✓ y_F ✓ m_{FC} ✓ m_{CE} ✓ Points F, C and E are collinear (5)
		[20]

QUESTION 5

5.1.1	$\tan 58°=m$ $x^2+y^2=r^2$ $1^2+m^2=r^2$ $\sqrt{1+m^2}=r$ $\sin 58°=\frac{m}{\sqrt{1+m^2}}$  	✓ $\sqrt{1+m^2}=r$ ✓ answer (2)
5.1.2	$\sin 296°=-\sin 64°$ $\sin 296°=-\sin 2(32°)$ $\sin 296°=-2\sin 32°\times\cos 32°$ $\sin 296°=-2\times\frac{m}{\sqrt{1+m^2}}\times\frac{1}{\sqrt{1+m^2}}$ $\sin 296°=-\frac{2m}{1+m^2}$	✓ $-\sin 64°$ ✓ substitution ✓ answer (3)
5.2.1	$5\tan\theta+2\sqrt{6}=0$	

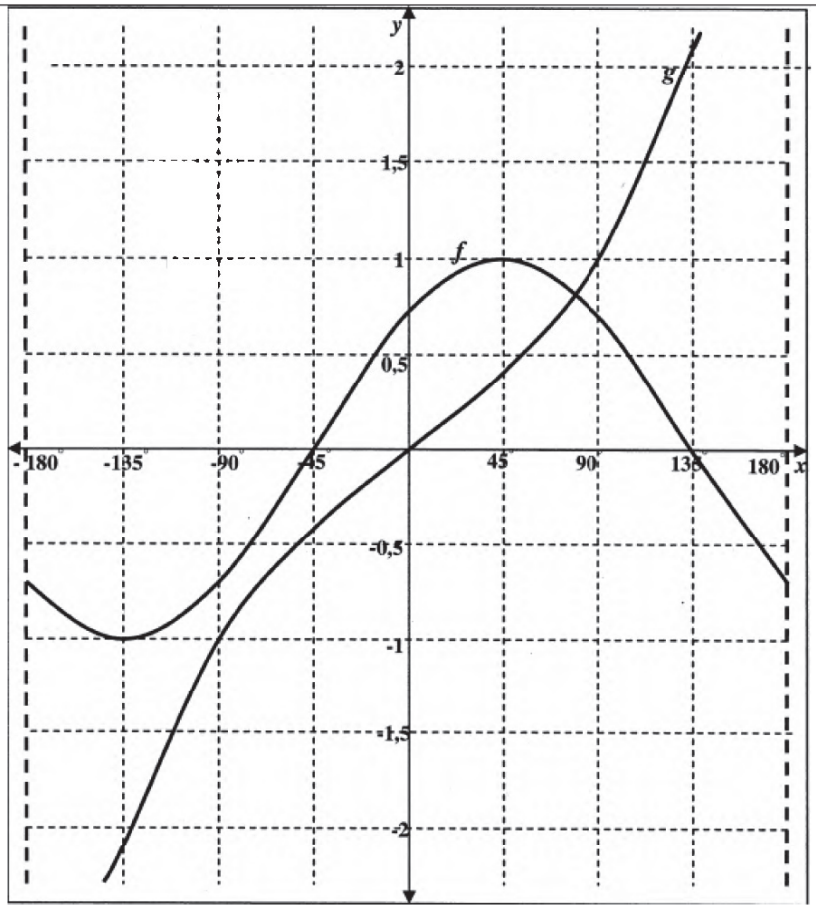
	 $\tan\theta = -\frac{2\sqrt{6}}{5}$ $\quad 0° < \theta < 270°$ $r^2 = y^2 + x^2$ $r^2 = \left(-2\sqrt{6}\right)^2 + (5)^2$ $r^2 = 49$ $r = 7$ $\sin\theta = \frac{2\sqrt{6}}{7}$	✓ $r = \frac{\sqrt{649}}{5}$ ✓ $\sin\theta = \frac{2\sqrt{6}}{\frac{\sqrt{649}}{5}}$ (2)
5.2.2	$\cos\theta = -\frac{5}{7}$	✓ answer (1)
5.2.3	$\frac{14\cos\theta + 7\sqrt{6}\sin\theta}{\cos(-240°).\tan 225°}$ $= \frac{14\left(-\frac{5}{7}\right) + 7\sqrt{6}\left(\frac{2\sqrt{6}}{7}\right)}{\cos(90° + 30°).\tan(180° + 45°)}$ $= \frac{-10 + 12}{-\sin 30°.\tan 45°}$ $= \frac{2}{-\frac{1}{2} \times 1}$ $= -4$	✓ $-\sin 30°$ ✓ $\tan 45°$ ✓ $-\frac{1}{2} \times 1$ ✓ answer (4)
		[15]

QUESTION 6

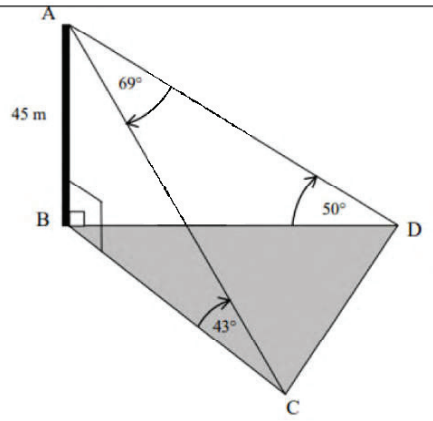
6.1	$\frac{\cos(180°+x)\,.\tan(360°-x).\sin^2(90°-x)}{\sin(180°-x)}+\sin^2 x$ $=\frac{(-\cos x).(-\tan x).\cos^2 x}{\sin x}+\sin^2 x$ $=\frac{\cos x.\frac{\sin x}{\cos x}.\cos^2 x}{\sin x}+\sin^2 x$ $=\cos^2 x+\sin^2 x$ $=1$	✓ $-\cos x$ ✓ $-\tan x$ ✓ $\cos^2 x$ ✓ $\sin x$ ✓ $\cos^2 x+\sin^2 x$ ✓ answer (6)
6.2.1	$\cos(A-B)-\cos(A+B)$ $=\cos A\cos B+\sin A\sin B-[\cos A\cos B-\sin A\sin B]$ $=\cos A\cos B+\sin A\sin B-\cos A\cos B+\sin A\sin B$ $=2\sin A\sin B$	✓ ✓ ✓ (3)
6.2.2	$\cos15°-\cos75°=\cos(45°-30°)-\cos(45°+30°)$ $=2\sin45°.\sin30°$ $=2\times\frac{\sqrt{2}}{2}\times\frac{1}{2}$ or/*of* $2\times\frac{1}{\sqrt{2}}\times\frac{1}{2}$ $=\frac{\sqrt{2}}{2}$ or/ *of* $\frac{1}{\sqrt{2}}$ **OR** $\cos15°-\cos75°$ $=\cos(45°-30°)-\cos(45°+30°)$ $=\cos45°\cos30°+\sin45°\sin30°-[\cos45°\cos30°-\sin45°\sin30°]$ $=2\sin45°\sin30°$ $=2\times\frac{\sqrt{2}}{2}\times\frac{1}{2}$ or/*of* $2\times\frac{1}{\sqrt{2}}\times\frac{1}{2}$ $=\frac{\sqrt{2}}{2}$ or/ *of* $\frac{1}{\sqrt{2}}$	✓ ✓ ✓ ✓ (4)

6.3	$AB^2 = (\cos\theta - 6)^2 + (\sin\theta - 7)^2$ $86 = \cos^2\theta - 12\cos\theta + 36 + \sin^2\theta - 14\sin\theta + 49$ $86 = 1 + 36 + 49 - 12\cos\theta - 14\sin\theta$ $0 = -12\cos\theta - 14\sin\theta$ $14\sin\theta = -12\cos\theta$ $\frac{\sin\theta}{\cos\theta} = \frac{-12}{14}$ $\tan\theta = -\frac{6}{7}$ / -0,86	✓ ✓ ✓ ✓ (4)

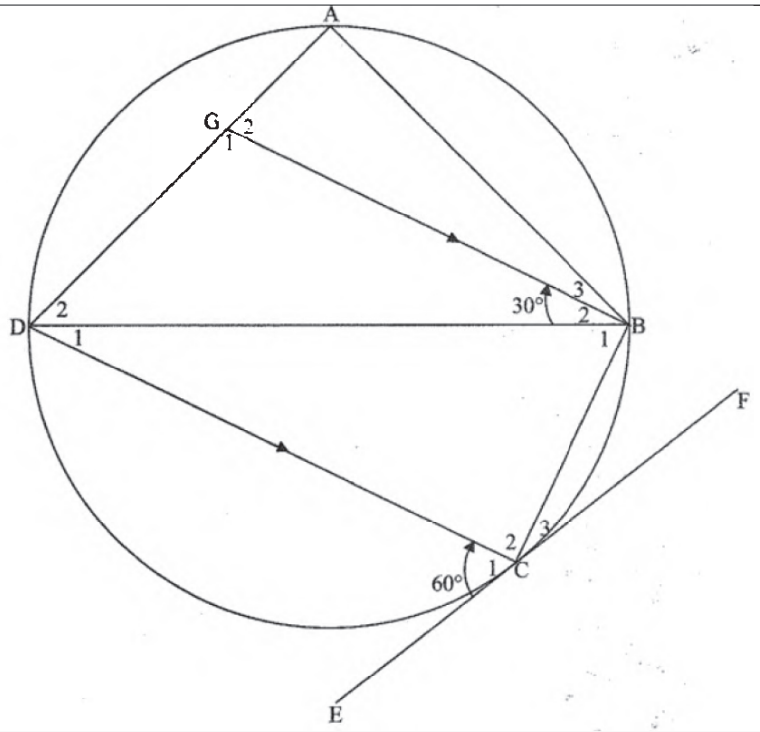
QUESTION 7

7.1		✓ shape f ✓ intercepts ✓ turning point ✓ shape f ✓ intercepts ✓ turning point (6)
7.2.1	$x = -45°$ or $x = 135°$	✓ ✓ answer (2)
7.2.2	$x = 180°$ *or / of* $x = -180°$	✓ ✓ answer (2)
7.2.3	$y \in [-1;1]$ or/*of* $-1 \leq y \leq 1$	✓ answer (1)
7.2.4	1	✓ answer (1)
7.2.5	$x \in (-180°;-45°)$ *or / of* $(0° ; 135°)$ **OR** $-180° < x < -45°$ or/of $0° < x < 135°$	✓ end points ✓ notation ✓ answer (3)
		[15]

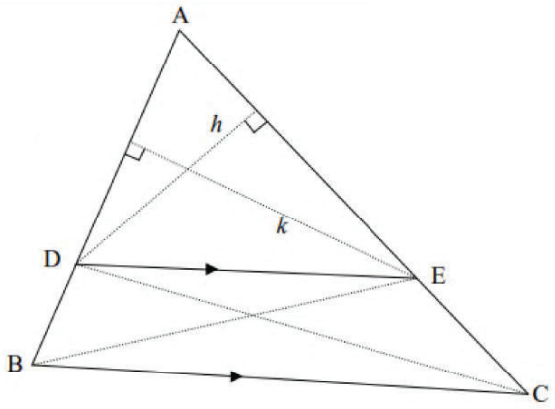
QUESTION 7

		
7.1	$\sin 43° = \frac{45}{AC}$ $AC = 66m$ $\sin 43° = \frac{45}{AC}$ $\sin 50° = \frac{45}{AD}$ $AD = 58{,}74m$	✓ $\sin 43° = \frac{45}{AC}$ ✓ AC ✓ $\sin 43° = \frac{45}{AC}$ ✓ AD (4)
7.2	$CD^2 = AC^2 + AD^2 - 2AC.AD\cos 69°$ $CD^2 = (66)^2 + (58.74)^2 - 2(66).(58.74)\cos 69°$ $CD^2 = 5027{,}72$ $CD = 70.91m$	✓ using cosine rule ✓ substitution ✓ answer (3)

QUESTION 8

		
8.1.1	$\hat{D}_1 = \hat{B}_2 = 30°$ (alter angles DC parallel GB)	✓ S&R (1)
8.1.2	$\hat{B}_1 = \hat{C}_1 = 60°$ (tan-chord theorem)	✓ S ✓ R (2)
8.1.3	$\hat{C}_2 = 90°$ (sum of angles in triangle)	✓ S&R (1)
8.1.4	$D\hat{A}B + \hat{C}_2 = 180°$ $D\hat{A}B = 90°$	✓ S ✓ R (2)
8.2	Yes is diameter, converse angle in a semi-circle	✓ S ✓ R (2)

QUESTION 9

9.1	 Construction: Connect DC and BE and draw the altitudes k and h $\frac{\text{Area } \Delta ADE}{\text{Area } \Delta BDE} = \frac{\frac{1}{2} \times AD \times k}{\frac{1}{2} \times BD \times k} = \frac{AD}{BD}$ $\frac{\text{Area } \Delta ADE}{\text{Area } \Delta DEC} = \frac{\frac{1}{2} \times AE \times h}{\frac{1}{2} \times EC \times h} = \frac{AE}{EC}$ but/maar: Area ΔBDE = Area ΔDEC [DE common base and DE $\|\|$ BC/ DE gemeensk basis en DE $\|\|$ BC] $\therefore \frac{\text{Area } \Delta ADE}{\text{Area } \Delta BDE} = \frac{\text{Area } \Delta ADE}{\text{Area } \Delta DEC}$ $\therefore \frac{AD}{BD} = \frac{AE}{EC}$	✓ constr ✓S ✓S ✓S ✓R ✓conclusion (6)
9.2.1	tangent-chord theorem	✓ R (1)
9.2.2	In ΔABC and ΔADB: $\hat{A}_1 = \hat{A}_1$ [common/gemeenskaplik] $\hat{B}_1 = \hat{D}_1$ [proven/bewys in 10.2.1] $\therefore \Delta ABC \|\|\| \Delta ADB$ [$\angle$; $\angle$; $\angle$] OR In ΔABC and ΔADB: $\hat{A}_1 = \hat{A}_1$ [common/gemeenskaplik] $\hat{B}_1 = \hat{D}_1$ [proven/bewys in 10.2.1] $B\hat{C}A = \hat{B}_2$ [$\angle$s of $\Delta = 180°$] $\therefore \Delta ABC \|\|\| \Delta ADB$	✓S ✓ S ✓ R ✓S ✓ S ✓ R
9.2.3	$\hat{E}_2 = \hat{F}_1$ [verwiss $\angle$e/alternate $\angle$s ; EA $\|\|$ GF] $\hat{F}_1 = \hat{D}_2$ [ext $\angle$ of cyc quad DGFC/buite $\angle$ v kdvh DGFC] $\therefore \hat{E}_2 = \hat{D}_2$	✓ S ✓R ✓ S ✓R

9.2.4	In ΔAEC and ΔADE: $\hat{A}_2 = \hat{A}_2$ [common/gemeenskaplik] $\hat{E}_2 = \hat{D}_2$ [proven/bewys in 10.2.3] $\therefore \Delta AEC \mid\mid\mid \Delta ADE$ [$\angle ; \angle ; \angle$] $\therefore \frac{AE}{AD} = \frac{AC}{AE}$ $\therefore AE^2 = AD \times AC$ OR In ΔAEC and ΔADE: $\hat{A}_2 = \hat{A}_2$ [common/gemeenskaplik] $\hat{E}_2 = \hat{D}_2$ [proven/bewys in 10.2.3] $A\hat{C}E = \hat{G}_1$ [$\angle$s of $\Delta = 180°$ OR ext $\angle$ of cyc quad DGFC/ buite $\angle$ v kdvh DGFC] $\therefore \Delta AEC \mid\mid\mid \Delta ADE$ $\therefore \frac{AE}{AD} = \frac{AC}{AE}$ $\therefore AE^2 = AD \times AC$	✓S ✓ S ✓ R ✓ S ✓S ✓ S ✓ R ✓ S
9.2.5	$\frac{AB}{AD} = \frac{AC}{AB}$ [$\Delta ABC \mid\mid\mid \Delta ADB$] $AB^2 = AD \times AC$ $= AE^2$ [from 10.2.4] $\therefore AB = AE$	✓S ✓S ✓S
		[21]