SEPTEMBER P/ V2 2016 MARKING/ NASIEN MEMORANDUM

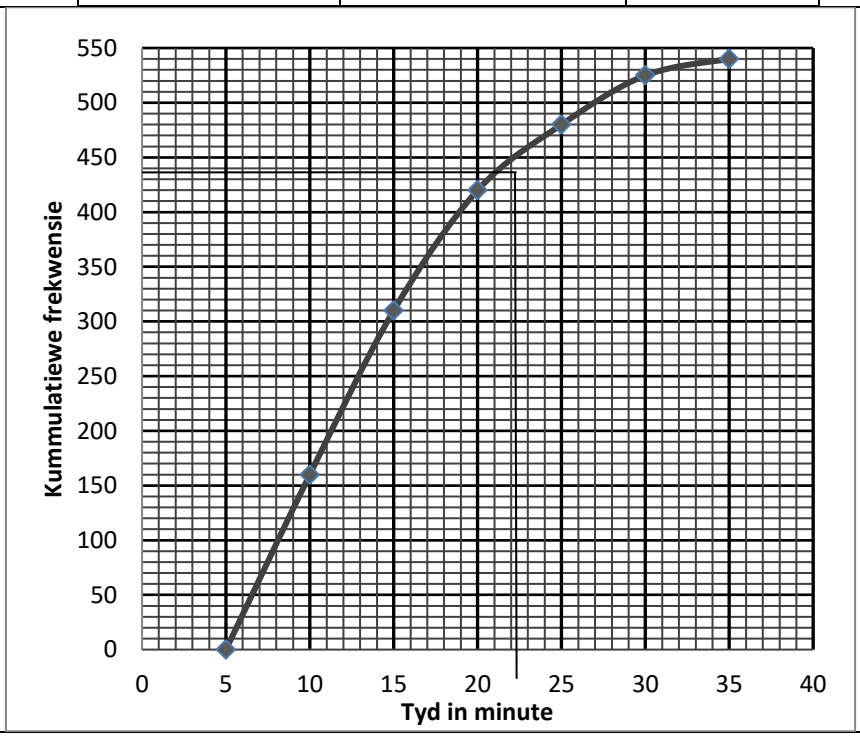
NOTE:

• If a candidate answers a question TWICE, only mark the FIRST attempt.
• If a candidate has crossed out an attempt of a question and not redone the question, mark the crossed out version.
• Consistent accuracy applies in ALL aspects of the marking memorandum.
• Assuming answers/values in order to solve a problem is NOT acceptable..

NOTA:

• *As 'n kandidaat 'n vraag TWEEKEER beantwoord, merk slegs die EERSTE poging.*
• *As 'n kandidaat 'n poging om die vraagte beantwoord, doodgetrek het en nie dit oorgedoen het nie, merk die doodgetrekte poging.*
• *Volgehoue akkuraatheid word in ALLE aspekte van die Nasienmemorandum toegepas.*
• *Aanvaarding van antwoorde/waardes om 'n probleem op te los, is ONaanvaarbaar.*

QUESTION/ *VRAAG*1

<table>
<tr><th>Q1</th><th></th><th>DESCRIPTORS/ BESKRYWERS</th><th>MARK/ PUNT</th></tr>
<tr><td>1.1</td><td>
<table>
<tr><th>Tyd in minute
Time in minutes</th><th>Aantal leerders
Number of learners</th><th>Kum f
Cum f</th></tr>
<tr><td>$5 < t \leq 10$</td><td>160</td><td>160</td></tr>
<tr><td>$10 < t \leq 15$</td><td>150</td><td>310</td></tr>
<tr><td>$15 < t \leq 20$</td><td>110</td><td>420</td></tr>
<tr><td>$20 < t \leq 25$</td><td>60</td><td>480</td></tr>
<tr><td>$25 < t \leq 30$</td><td>45</td><td>525</td></tr>
<tr><td>$30 < t \leq 35$</td><td>15</td><td>540</td></tr>
</table>
</td><td>✓✓ A/CA
Cum frequency values/ Kum.frek. waardes</td><td>(2)</td></tr>
<tr><td>1.2</td><td> 
</td><td>✓ anchor point (5;0)/ Begin punt
✓ use cum freq/ gebruik kum.frek.
✓ use upper limits/ boonste limiete
✓ smooth curve/ gladde kurwe</td><td>(4)</td></tr>
<tr><td>1.3</td><td>average time = 14,95 min</td><td>✓✓ ans/ antw</td><td>(2)</td></tr>
<tr><td>1.4</td><td>SD = 6,89</td><td>✓✓ ans/ antw</td><td>(2)</td></tr>
<tr><td>1.5</td><td>> 14,95 + 6,89 = 21,84
∴ 540 – 442 = 98 learners</td><td>✓ 21,84
✓ accept/ aanvaar 440 – 445
✓ accept/aanvaar 95 – 100</td><td>(3)
[13]</td></tr>
</table>

QUESTION/ *VRAAG* 2

Q2	**SUGGESTED ANSWER/ *VOORGESTELDE ANTWOORD***	**DESCRIPTORS/ *BESKRYWERS***	MARK/ PUNT
2.1	a = –22,70544202 b = 0,1989294404 $y = -22{,}71 + 0{,}20x$	✓ a- value/*waarde* ✓ b-value/*waarde* ✓Equation/*Vergelyking*	(3)
2.2	r = 0.8496991 = 0,85	✓ r	(1)
2.3	$y = -22{,}71 + 0{,}20(350)$ y = 47,29 = 47	✓ Substitute/*Instel* ✓ Ans/*Antw*	(2)
2.4	a positive strong correlation/ *sterk positief*	✓ Ans/*Antw*	(1) **[7]**

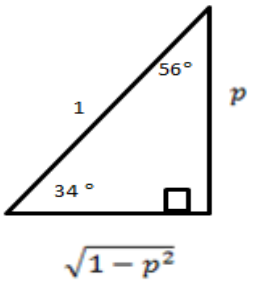
QUESTION/ *VRAAG* 3

Q3	**SUGGESTED ANSWER/ *VOORGESTELDE ANTWOORD***	**DESCRIPTORS/ *BESKRYWERS***	MARK/ PUNT
3.1	$AB = \sqrt{(4+2)^2 + (9-1)^2}$ $= \sqrt{6^2 + 8^2}$ $= \sqrt{100}$ $= 10$	✓ Subst in correct formula/*Instel in korrekte formule* ✓ Ans/*Antw*	(2)
3.2	$AB = BC = 10$ $y\ value = 9 + 10 \quad BC \parallel y\ -axis$ $C(4; 19)$	✓x value/*waarde* ✓$y-$ value/*waarde*	(2)
3.3	$K\left(\frac{x_1 + x_2}{2}\ ;\ \frac{y_1 + y_2}{2}\right)$ $K\left(\frac{4-2}{2}\ ;\ \frac{19+1}{2}\right)$ $K(1\ ;10)$	✓Subst in correct formula/ *Instel in korrekte formule* ✓Ans/ *Antw*	(2)
3.4	$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{19-1}{4+2} = \frac{18}{6} = 3$ $y - y_1 = m(x - x_1)$ $y - 1 = 3(x + 2)$ $y = 3x + 6 + 1$ $y = 3x + 7$	✓m ✓Subst A or C point into correct formula/ *Stel A of C in korrekte formule* ✓Ans/*Antw*	(3)
3.5	$m_{AC} = 3$ $Angle\ of\ inclination = \tan^{-1}(3)$ $= 71{,}57°$ $\therefore\ \theta = 90° - 71{,}57°$ $= 18{,}43°$ OR In the right-angled triangle: $\tan\theta = \frac{6}{18}$ $\theta = 18.43°$	✓ tan ∠ = m ✓∠ of inclination/ *Inklinasie*∠ ✓ Comple ∠'s/ *Kompl* ∠ ✓Ants/*Antw* OR ✓correct trig ratio/ *korrekte trig verhouding* ✓✓ correct values /*korrekte waardes* ✓Ans/ *Antw*	(4)
3.6	Area ΔABC = $\frac{1}{2}$. BC . ⊥h = $\frac{1}{2}$(10)(6) = 30 sq units	✓correct formula/ *korrekte formule* ✓base/*basis* = 10 ✓ height/*hoogte* = 6 ✓ ans/ *antw*	(4)
			[17]

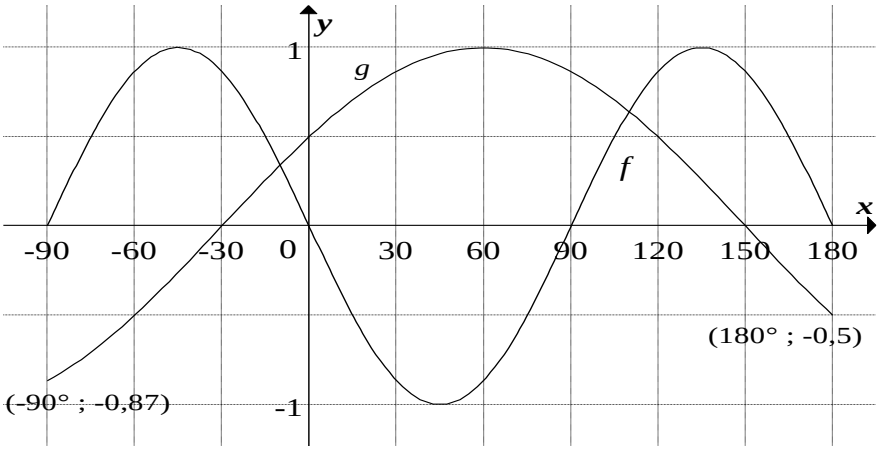
QUESTION/ *VRAAG*4

Q4	**SUGGESTED ANSWER/ *VOORGESTELDE ANTWOORD***	**DESCRIPTORS/ *BESKRYWERS***	MARK/ PUNT
4.1	OC ⊥ tangent [r ⊥ tangent] CE ⊥ tangent [r ⊥ tangent] ∴ O, C and E straight line [adjacent ∠s = 180°]	✓ both/ *beide* S's ✓ R	(2)
4.2	$m_{OC} = \frac{-2-0}{1-0} = -2$	✓ Substitute/ *Vervang* C ✓Ans/ *Antw*	(2)
4.3	$m_{CD} = -2$ $\frac{y_2-y_1}{x_2-x_1} = -2$ $\frac{-6+2}{t-1} = -2$ $-2(t-1) = -4$ $t-1=2$ $t=3$	✓ $m_{tangent/raaklyn}$ ✓ Substitute(any point) correct equation/ *Vervang enige punt*	(2)
4.4	$m_{tangent} = \frac{1}{2}$ $AC:\ y-y_1 = m(x-x_1)$ $y+2 = \frac{1}{2}(x-1)$ $y = \frac{1}{2}x - \frac{1}{2} - 2$ $y = \frac{1}{2}x - \frac{5}{2}$	✓ $m_{tangent/raaklyn}$ ✓ Substitute(any point) correct equation/ *Vervang enige punt* ✓ Answer/ *Antw*	(3)
4.5	D is the midpoint of circle $x-coordinate: \frac{1+x}{2} = 3$ $1+x=6$ $x=5$ $y-coordinate: \frac{y-2}{2} - -6$ $y-2 = -12$ $y = -10$ $E(5;-10)$	✓ x value/ *waarde* ✓ y value/ *waarde*	(2)
4.6	$A\hat{C}D = 90°$ $[radius \perp tangent]$ $\therefore AE\ is\ the\ diameter \odot$ ACE $AE = \sqrt{(5-5)^2+(0+10)^2}$ $AE = \sqrt{0+100}$ $AE = 10$ $\therefore radius = \frac{1}{2}(10) = 5$ $Midpnt_{AE}\left(\frac{5+5}{2}; \frac{-10}{2}\right)$ $\therefore Centre\ of\ circle$ (5;-5) Equation of circle ACE: $(x-5)^2+(y+5)^2 = 25$	✓AE diameter/ *middellyn* ✓AE = 10 ✓Radius = 5 ✓Midpnt Equation of Circle/*Vegel van sirkel* ✓Point/ *Punt* ✓r^2	(6)
4.7	$Circle\ centre\ O: x^2+y^2 = 5$ $Diameter = 2\sqrt{5}$ $\sqrt{20} < r < \sqrt{20}+2\sqrt{5}$ $2\sqrt{5} < r < 4\sqrt{5}$	✓ $r^2 = 5$ ✓Diameter / *Middellyn* ✓✓Endpoints/ *Eindpunte*	(4)
			[21]

QUESTION/ *VRAAG 5*

Q5	**SUGGESTED ANSWER/ *VOORGESTELDE ANTWOORD***	**DESCRIPTORS/ *BESKRYWERS***	MARK/ PUNT
	$(1)^2 = p^2 + (opp)^2$ $(1)^2 - (p)^2 = x^2$ $\therefore x = \sqrt{1-p^2}$  		
5.1.1	$\sin 214°$ $= \sin(180° + 34°)$ $= -\sin 34°$ $= -p$	✓$-\sin 34°$ ✓Ans/ *Antw*	(2)
5.1.2	$\cos 34°.\cos(-22°) + \sin 34°.\sin 338°$ $= \cos 34°.cos22° + \sin 34°(-sin22°)$ $= \cos 34°.\cos 22° - \sin 34°.\sin 22°$ $= \cos(34° + 22°)$ $= \cos 56°$ $\therefore = p$	✓✓ reduction/ *reduksie* ✓ compound angles/ *saamgestelde hoeke* ✓ $\sqrt{1-p^2}$	(4)
5.1.3	$\cos 68°$ $= \cos 2(34°)$ $= 2\cos^2 34° - 1$ $= 2\left(\sqrt{1-p^2}\right)^2 - 1$ $= 2(1-p^2) - 1$ $= 1 - p^2$	✓Double angle/ *dubbele hoek* ✓Ans/ *Antw*	(2)
5.2.1	$\dfrac{\cos(90° - 2\theta).\sin(\theta).}{sin^2(180° + \theta)\cos(720° + \theta).}$ $= \dfrac{\sin 2\theta.(\sin\theta)}{(-sin\theta)^2.(cos\theta)}$ $= \dfrac{2\sin\theta\, cos\theta.sin\,\theta}{sin^2\theta.cos\theta.}$ $= 2$	✓ $sin2\theta$ ✓ $(-sin\,\theta)^2$ ✓$\sin^2\theta$ ✓ $\cos\theta$ ✓$2\sin\theta\, cos\theta$ ✓ 2	(6)
5.2.2	$\dfrac{1}{sin^2 2x} - \dfrac{1}{tan^2 2x}$ $= \dfrac{1}{sin^2 2x} - \dfrac{cos^2 2x}{sin^2 2x}$ $= \dfrac{1 - cos^2 2x}{sin^2 2x}$ $= \dfrac{sin^2 2x}{sin^2 2x} = 1$	$\dfrac{cos^2 x}{sin^2 x}$ ✓ $\dfrac{1 - cos^2 2x}{sin^2 2x}$ ✓ ✓ $\sin^2 2x$ ✓Ans/ *Antw*	(4)
			[18]

QUESTION/ *VRAAG 6*

Q6	**SUGGESTED ANSWER/ *VOORGESTELDE ANTWOORD***	**DESCRIPTORS/ *BESKRYWERS***	MARK/ PUNT
6.1		✓ shape / *vorm* ✓ endpoints/ *eindpunte* ✓ intercepts with axes/ *snypunte met asse*	(3)
6.2	$-\sin 2x = \cos(x - 60°)$ $-\sin 2x = \sin(90° - (x - 60°))$ $-\sin 2x = \sin(150° - x)$ $\sin(180° + 2x) = \sin(150° - x)$ $180° + 2x = 150° - x + n(360°), n\epsilon Z$ $3x = -30 + n(360), n \in Z$ $x = -10° + n(120°)$	✓ equate the equations / *vergelyking* ✓ co-functions/ *ko-funksies* $\sin(180° + 2x)$✓ ✓ ✓ Ans/ *Antw*	(5)
6.4	$-10° \leq x \leq 110°$	✓ Inequality/ *Ongelykheid* ✓✓Ans/ *Antw*	(3)
6.4	$y = -\sin(2x + 30°)$	✓ ✓ Ans/ *Antw*	(2)
6.5	g must shift 30° right	✓ 30° ✓ right/*regs*	(2)
			[15]

QUESTION/VRAAG 7

Q7	**SUGGESTED ANSWER/ *VOORGESTELDE ANTWOORD***	**DESCRIPTORS/ *BESKRYWERS***	MARK/ PUNT
7.1	$\cos\theta = \frac{DC}{p}$ $p.\cos\theta = DC$ $\frac{BD}{\sin(90° - \theta)} = \frac{DC}{\sin 2\theta}$ $\frac{BD}{\cos\theta} = \frac{DC}{2\sin\theta.\cos\theta}$ $\frac{BD}{1} = \frac{DC.\cos\theta}{2\sin\theta.\cos\theta}$ but $p\cos\theta = DC$ $\frac{BD}{1} = \frac{p\cos\theta.\cos\theta}{2\sin\theta.\cos\theta}$ $BD = \frac{p\cos\theta}{2\sin\theta}$	✓ DC ✓ Subst in Sine Rule/ *Sinus reël* ✓Simplification/ *Vereenvoudig* ✓Subst/ *vervang* DC ✓ Simplification/ *Vereenvoudig*	(5)
7.2	$\sin 30° = \frac{AC}{p}$ $3\sin 30° = AC$ $\therefore AC = 1{,}5\ m$	✓Substitution */Instel* ✓Ans/*Antw*	(2)
7.3	$BD = \frac{3\cos 30°}{2\sin 30°} = \frac{3}{2}\left(\frac{1}{\sqrt{3}}\right) = \frac{\sqrt{3}}{2}$ $AB^2 = AD^2 + BD^2 - 2AD.BD\cos ADB$ $= 3^2 + \left(\frac{\sqrt{3}}{2}\right)^2 - 2(3)\left(\frac{\sqrt{3}}{2}\right)\cos 70°$ $= 9 + \frac{3}{4} - 3\sqrt{3}\cos 70°$ $= 7.97$ $AB = 2.82$ metres	✓BD ✓Cos rule/*reël* ✓Subst / *vervang* ✓AB^2 ✓AB	(5)
			[12]

EUCLIDEAN GEOMETRY/ EUKLIDIESE MEETKUNDE

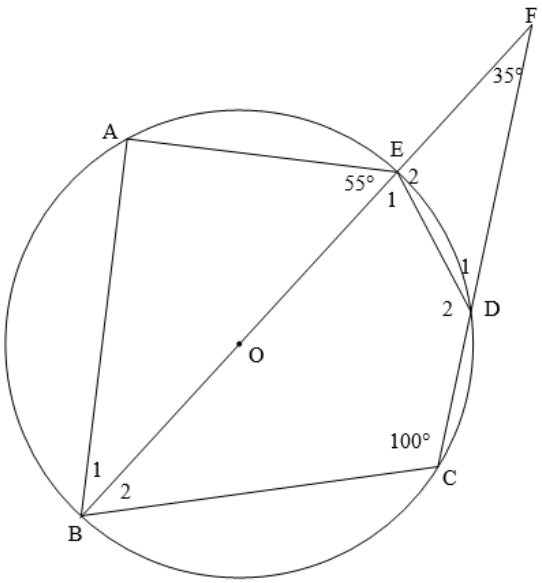
✓S – Statement/ *Bewering*

✓R – Reason/ *Rede*

✓S/R – Statement + Reason/ *Bewering + Rede*

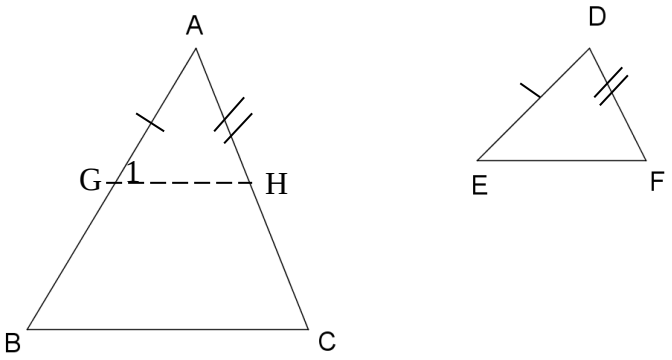
QUESTION/ *VRAAG 8*

8.1

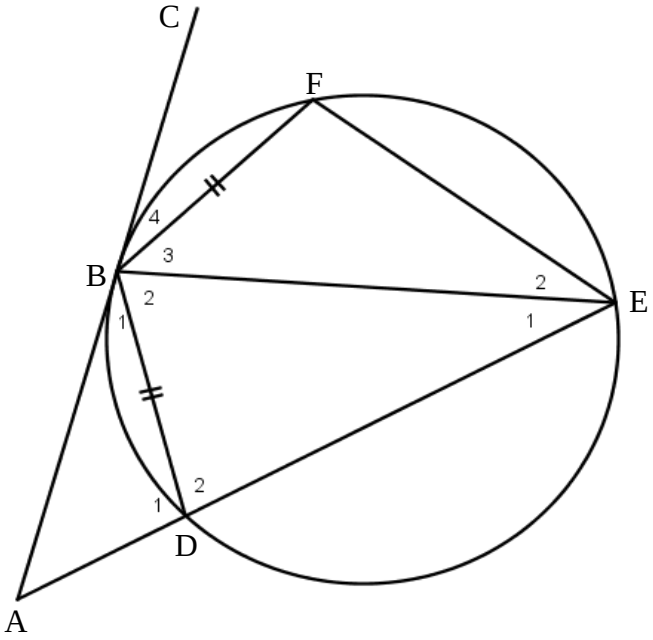


Q8	**SUGGESTED ANSWER/ *VOORGESTELDE ANTWOORD***	**DESCRIPTORS/ *BESKRYWERS***	MARK/ PUNT
8.1.1	$B\hat{A}E = 90°$ ∠ in semi circle/ *∠in halwesirkel*	✓S ✓R	(2)
8.1.2	$\hat{E}_1 = 80°$ opp angles cyclic quad/ *teenoorst ∠e koordevierhoek*	✓S ✓R	(2)
8.1.3	$D_1 = 45°$ ext∠ of Δ FED/ buite∠*van* Δ *FED*	✓S ✓R	(2)
8.2	$\hat{B}_1 = 35°$ Interior ∠ of Δ $\hat{F} = 35°$ given $\therefore AB \parallel CF$ Alternate angles =	✓S ✓R ✓S ✓R	(4)
			[10]

QUESTION/ VRAAG 9

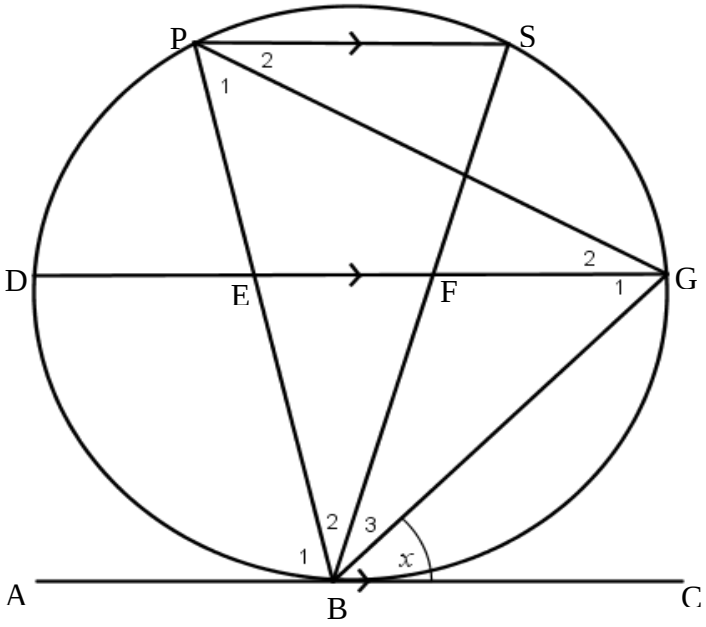
Q9	**SUGGESTED ANSWER/ *VOORGESTELDE ANTWOORD***	**DESCRIPTORS/ *BESKRYWERS***	MARK/ PUNT
9.1		**Consider other proofs as well/ *Oorweeg ander bewyse ook***	
	Constr./*Konstr*.: Measure/*Meet* AG = DE on/*op* AB and/*en* AH = DF on/*op* AC . Draw/*Trek* GH	✓constr/ *konstr*.	
	Proof/ *Bewys*:		
	$\hat{A} = \hat{D}$…given/*gegee*		
	AG = DE ...Constr./ *konstr*		
	AH = DF ...Constr./ *konstr*		
	$\therefore \Delta GAH \equiv \Delta EDF \quad (s;\angle;S)$	✓S✓R	
	$\therefore \widehat{G_1} = \hat{E}$		
	But / *maar* $\widehat{B} = \hat{E}$ ...given/*gegee*		
	$\therefore \widehat{G_1} = \hat{B}$	✓$\widehat{G_1} = \hat{B}$	
	$\therefore$ GH‖ BC … corresp∠*s* = / ooreenk.∠*e* =	✓**S&**R	
	$\therefore \frac{AG}{AB} = \frac{AH}{AC}$	✓**S**	
	$\therefore \frac{DE}{AB} = \frac{DF}{AC}$ … AG = DE ; AH = DF	✓**S&R**	
			(7)

9.2



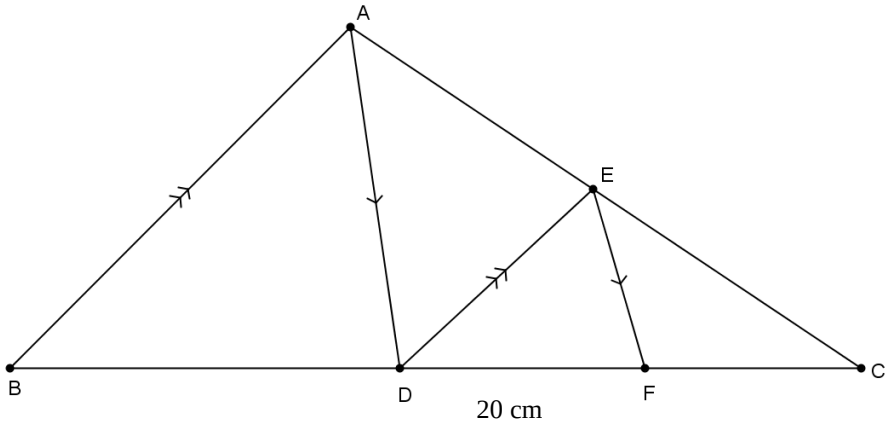
9.2.1	1) $\widehat{B_1} = \widehat{E_1}$ …tan-chord thm/ *raakl- koordstelling* $\widehat{E_2} = \widehat{E_1}$…equal chords; equal ∠'s /*gelyke koorde gelyke∠e* $\therefore \widehat{E_2} = \widehat{B_1}$	✓S&R ✓S	(3)
9.2.2	In ΔBDA and / *en* ΔEFB *:* B$\widehat{D}$A = $\hat{F}$…ext∠ of cyclic quad/ buite∠*van koordevierhoek* $\therefore \widehat{E_2} = \widehat{B_1}$ *Proven* $\therefore \Delta BDA \text{III} \Delta EFB$ (∠;∠;∠)	✓✓S&R ✓S ✓S&R	(4)
	OR		
	In ΔBDA and / *en* ΔEFB *:* 1) B$\widehat{D}$A = $\hat{F}$ … ext∠ of cyclic quad/ *buite∠van koordevierhoek* 2) $\widehat{B_1} = \widehat{E_1}$… tan-chord thm/ *raakl- koordstelling* $\widehat{E_2} = \widehat{E_1}$ … equal chords; equal ∠'s /*gelyke koorde gelyke∠e* $\therefore \widehat{E_2} = \widehat{B_1}$ $\widehat{A} = \widehat{B_3}$ … sum of ∠'s in Δ/ *∠e van* Δ $\therefore \Delta BDA \text{III} \Delta EFB$	✓S&R ✓S&R ✓S &R ✓S &R	
9.2.2	$\frac{BD}{EF} = \frac{DA}{FB}$ $\therefore BD.FB = EF.DA$ $\therefore BD^2 = DA.EF$ … BD = FB	✓S ✓S&R	(2)
			[16]

QUESTION/ VRAAG 10



Q10	**SUGGESTED ANSWER/ *VOORGESTELDE ANTWOORD***	**DESCRIPTORS/ *BESKRYWERS***	MARK/ PUNT
10.1.	alt ∠s / *verwisselende* ∠e; YT ∥ RQ	✓R	(1)
10.2.1	$\frac{BP}{BE}=\frac{BS}{BF}$… Prop. Thm; EF ∥ PS/ *Ewer. Stelling*; EF ∥ PS $BE=\frac{BP.BF}{BS}$	✓S✓R	(2)
10.2.2	In ΔBGP and/ *en* ΔBEG: 1) $\hat{G}_1=\hat{P}_1$… Tan chord thm/ *Raaklyn koordstelling* 2) $\hat{B}=\hat{B}$… common ∠ / *gemene∠* ∴ $\Delta BGP\|\|\|\Delta BEG$ (∠;∠;∠)	✓✓ S&R ✓S &R ✓S &R	(4)
	OR		
	In ΔBGP and/ *en*ΔBEG 1) $\hat{G}_1=\hat{P}_1$… Tan chord 2) $\hat{B}=\hat{B}$… common ∠ / *gemene∠* 3) $B\hat{G}P=B\hat{E}G$ … sum of ∠'s in Δ/ ∠e van Δ ∴ $\Delta BGP\|\|\|\Delta BE$	✓✓ S&R ✓S &R ✓S	
10.2.3	$\frac{BG}{BE}=\frac{BP}{BG}$ …$\Delta BGP\|\|\|\Delta BEG$ ∴ BG² = BP.BE $BG^2=BP.\frac{BP.BF}{BS}$ $BG^2=\frac{BP^2.BF}{BS}$ ∴ $\frac{BG^2}{BP^2}=\frac{BF}{BS}$	✓S ✓S ✓ Subst	(3)
			[10]

QUESTION/ VRAAG 11



Q11	**SUGGESTED ANSWER/ *VOORGESTELDE ANTWOORD***	**DESCRIPTORS/ *BESKRYWERS***	MARK/ PUNT
11.1.1	$\frac{FC}{20}=\frac{4}{5}$ … EF ∥AD ∴ FC=16	✓✓S&R ✓answer/*antw*	(3)
11.1.2	$\frac{36}{DB}=\frac{4}{5}$ … DE ∥AB ∴ DB= 45	✓DC = 36 ✓✓S&R ✓answer/*antw*	(4)
11.2	$\frac{Area\ \Delta\ ECF}{Area\ \Delta ABC}=\frac{\frac{1}{2}.4k.8.\sin C}{\frac{1}{2}.9k.81.\sin C}$ $\frac{Area\ \Delta\ ECF}{Area\ \Delta ABC}=\frac{32}{81}$	✓½. $4k.8.sinC$ ✓½. $9k.40.5.sinC$ ✓ ✓ Answer	(4)
	TOTAL / TOTAAL: [150]		**[11]**