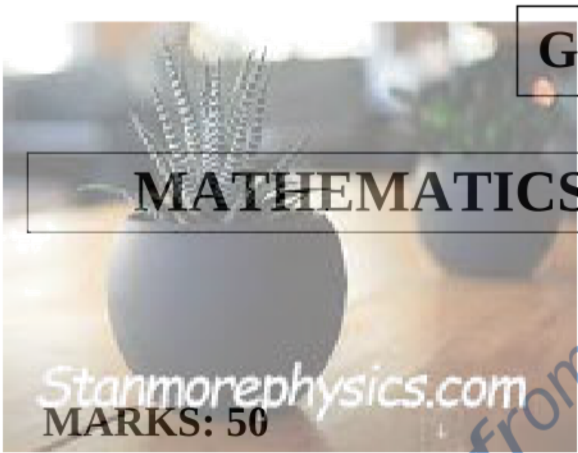
Province of the
EASTERN CAPE
EDUCATION

NATIONAL
SENIOR CERTIFICATE

GRADE 12

MATHEMATICS TERM 1 TEST - 2022



MARKS: 50

TIME: 1 HOUR

This question paper consists of 6 pages, including information sheet.

INSTRUCTIONS AND INFORMATION

1. This question paper consists of SIX questions
2. Answer ALL the questions
3. Answers only will NOT necessarily be awarded full marks.
4. If necessary, round off answers to TWO decimal places, unless stated otherwise.
5. Diagrams are NOT necessarily to drawn to scale.
6. An information sheet with formulae is attached at the end of the question paper.
7. Write neatly and legibly.

QUESTION 1

Consider the quadratic number pattern: $-\frac{1}{2}$; 2 ; $\frac{11}{2}$; 10 ; . . .

1.1 Write down the value of T_5. (1)

1.2 Show that the general term of this number pattern is $T_n = \frac{1}{2}n^2 + n - 2$. (4)

1.3 Determine the value of $T_{75} - T_{74}$. (2)

[7]

QUESTION 2

Given the linear pattern: 3 ; 7 ; 11 ; . . .

2.1 Determine T_{20}. (3)

2.2 Calculate the sum of the first 20 terms. (2)

[5]

QUESTION 3

The n^{th} term of a geometric series is $T_n = x(x+1)^{n-1}$

3.1 Determine the common ratio, in terms of x, in its simplest form. (2)

3.2 Determine the values of x so that the series $\sum_{n=1}^{\infty} x(x+1)^{n-1}$ converges. (3)

3.3 Calculate S_∞. (3)

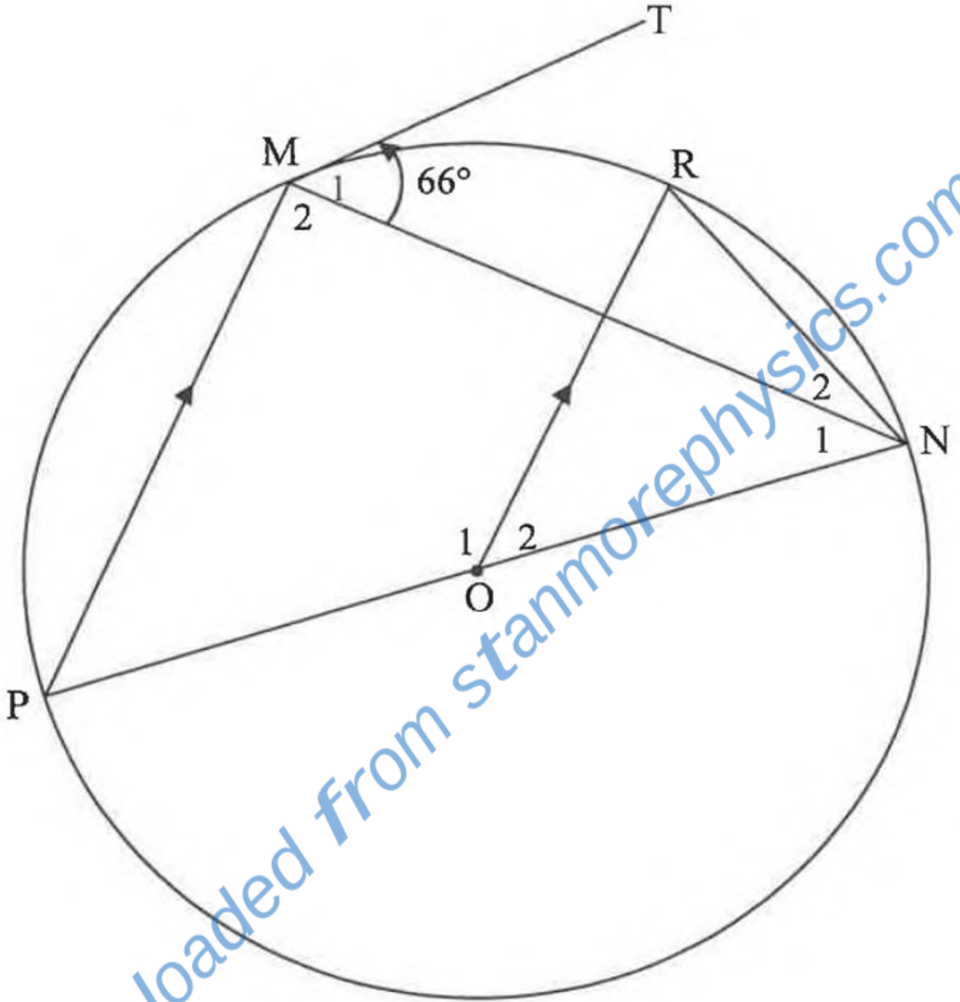
3.4 If $x = 1$, write down the first three terms of the geometric series. (2)

3.5 Determine the sum of the first 25 terms of the series calculated in Question 3.4 . (3)

[13]

QUESTION 4

PON is a diameter of the circle centred at O. TM is a tangent to the circle at M, a point on the circle. R is another point on the circle such that OR || PM. NR and MN are drawn and $\hat{M}_1 = 66^\circ$.



Calculate with reasons, the size of EACH of the following angles.

4.1 $\hat{P}$ (2)

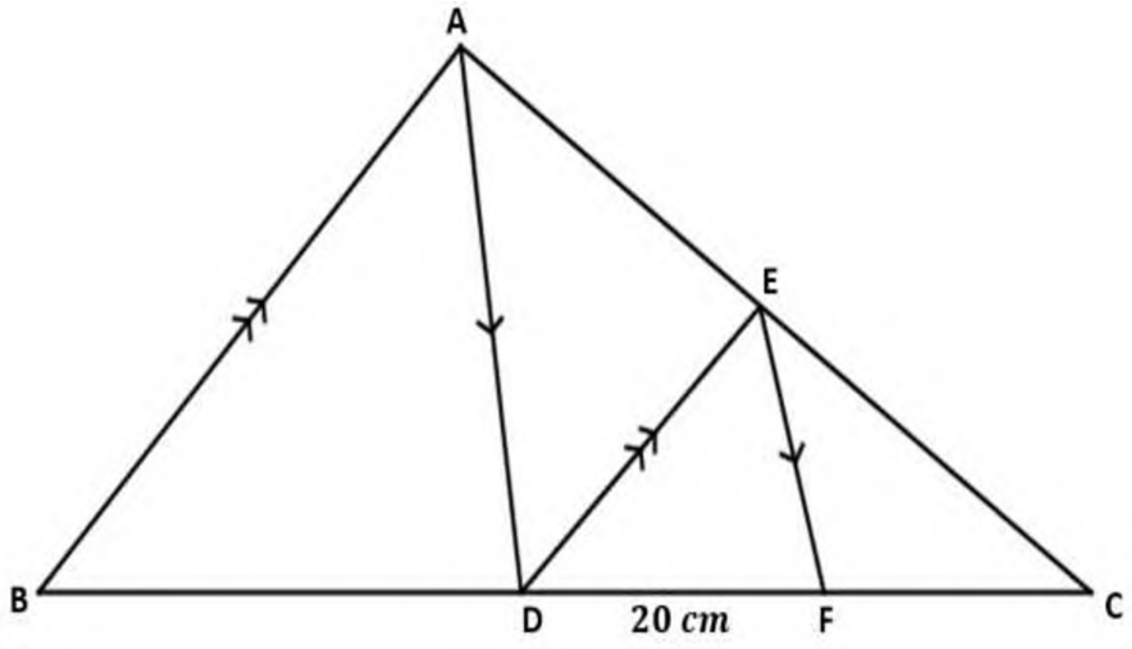
4.2 $\hat{M}_2$ (2)

4.3 $\hat{N}_1$ (1)

[5]

QUESTION 5

In the diagram, $\Delta\, ABC$ with points D and F on BC and E a point on AC such that EF || AD and DE || BA. Further it is given that $\frac{AE}{EC} = \frac{5}{4}$ and DF = 20 cm.



5.1 Calculate giving reasons, the length of:

5.1.1 FC (3)

5.1.2 BD (3)

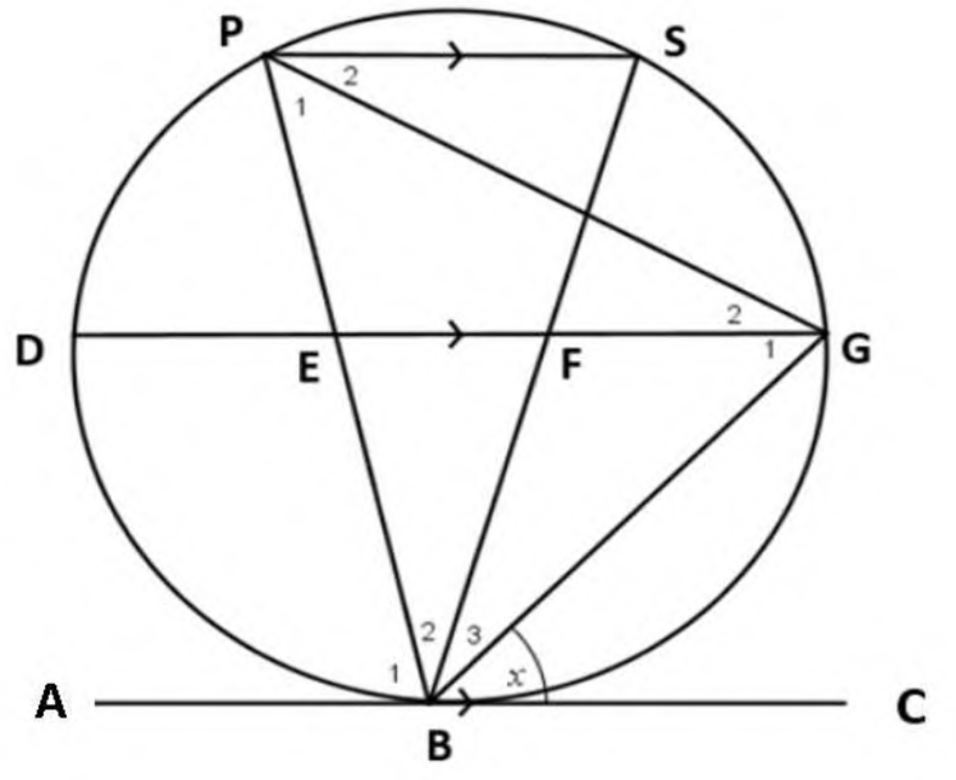
5.2 Evaluate $\frac{Area\,\Delta\, ECF}{Area\,\Delta\, ABC}$ (4)

[10]

QUESTION 6

In the diagram P, S, G, B and D are points on the circle such that PS || DG || AC.

ABC is a tangent to the circle at B. $\hat{GBC} = x$



6.1 Give a reason why $\hat{G}_1 = x$. (1)

6.2 Prove that:

6.2.1 $BE = \frac{BP \times BF}{BS}$ (2)

6.2.2 $\Delta BGP ||| \Delta BEG$ (4)

6.2.3 $\frac{BG^2}{BP^2} = \frac{BF}{BS}$ (3)

[10]

TOTAL: 50 Marks

INFORMATION SHEET: MATHEMATICS

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$A = P(1+ni)$ $\quad A = P(1-ni)$ $\quad A = P(1-i)^n$ $\quad A = P(1+i)^n$

$T_n = a + (n-1)d$ $\quad S_n = \frac{n}{2}(2a + (n-1)d)$

$T_n = ar^{n-1}$ $\quad S_n = \frac{a(r^n - 1)}{r-1}$; $r \neq 1$ $\quad S_\infty = \frac{a}{1-r}$; $-1 < r < 1$

$F = \frac{x\left[(1+i)^n - 1\right]}{i}$ $\quad P = \frac{x\left[1-(1+i)^{-n}\right]}{i}$

$$f'(x) = \lim_{h \to 0} \frac{f(x+h) - f(x)}{h}$$

$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$ $\quad M\left(\frac{x_1 + x_2}{2} ; \frac{y_1 + y_2}{2}\right)$

$y = mx + c$ $\quad y - y_1 = m(x - x_1)$ $\quad m = \frac{y_2 - y_1}{x_2 - x_1}$ $\quad m = \tan\theta$

$$(x-a)^2 + (y-b)^2 = r^2$$

In ΔABC:

$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$ $\quad a^2 = b^2 + c^2 - 2bc.\cos A$ $\quad area\ \Delta ABC = \frac{1}{2} ab.\sin C$

$\sin(\alpha + \beta) = \sin\alpha.\cos\beta + \cos\alpha.\sin\beta$ $\quad \sin(\alpha - \beta) = \sin\alpha.\cos\beta - \cos\alpha.\sin\beta$

$\cos(\alpha + \beta) = \cos\alpha.\cos\beta - \sin\alpha.\sin\beta$ $\quad \cos(\alpha - \beta) = \cos\alpha.\cos\beta + \sin\alpha.\sin\beta$

$\cos 2\alpha = \begin{cases} \cos^2\alpha - \sin^2\alpha \\ 1 - 2\sin^2\alpha \\ 2\cos^2\alpha - 1 \end{cases}$ $\quad \sin 2\alpha = 2\sin\alpha.\cos\alpha$

$\bar{x} = \frac{\sum x}{n}$ $\quad \partial^2 = \frac{\sum_{i=1}^{n}(x_i - \bar{x})^2}{n}$

$P(A) = \frac{n(A)}{n(S)}$ $\quad P(A \text{ or } B) = P(A) + P(B) - P(A \text{ and } B)$

$\hat{y} = a + bx$ $\quad b = \frac{\sum(x-\bar{x})(y-\bar{y})}{\sum(x-\bar{x})^2}$

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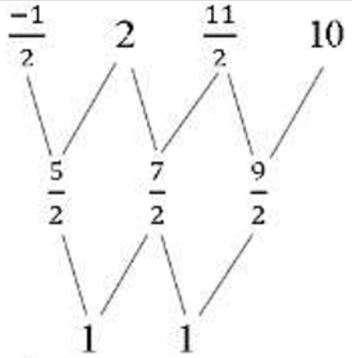
GRADE 12

MARKING GUIDELINE TERM 1 TEST – 2022

MARKS: 50

TIME: 1 HOUR

This marking guideline consists of 6 pages.

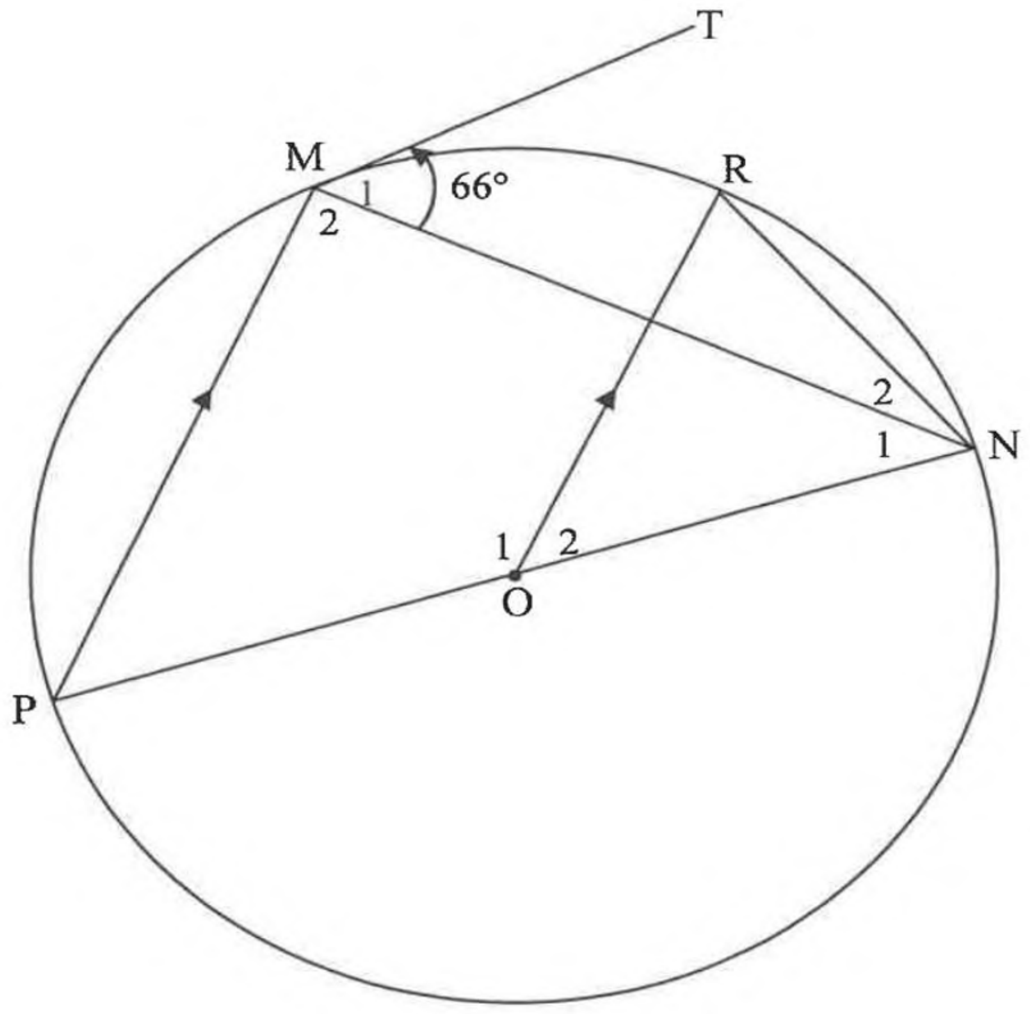
QUESTION 1		
1.1.	$\frac{31}{2}$	✓ answer (1)
1.2.	 $2a = 1$ $a = \frac{1}{2}$ $3\left(\frac{1}{2}\right) + b = \frac{5}{2}$ $b = 1$ $\frac{1}{2} + 1 + c = -\frac{1}{2}$ $c = -2$ $T_n = \frac{1}{2}n^2 + n - 2$	✓ second difference ✓ $a = \frac{1}{2}$ ✓ $b = 1$ ✓ $c = -2$ (4)
1.3.	$T_{75} - T_{74} = \frac{1}{2}(75)^2 + 75 - 2 - [\frac{1}{2}(74)^2 + 74 - 2]$ $= \frac{151}{2}$	✓ correct substitution ✓ answer (2)
		[7]

QUESTION 2		
2.1.	$a = 3$ and $d = 4$ $T_{20} = 3 + (20-1)4$ $= 79$	✓ a and d ✓ substitution into correct formula ✓ answer (3)
2.2.	$S_n = \frac{n}{2}[2a + (n-1)d]$ $S_{20} = \frac{20}{2}[2(3) + (20-1)4]$ $= 820$ **OR** $S_{20} = \frac{20}{2}[3 + 79]$ $= 820$	✓ substitution into correct formula ✓ answer (2)
		[5]

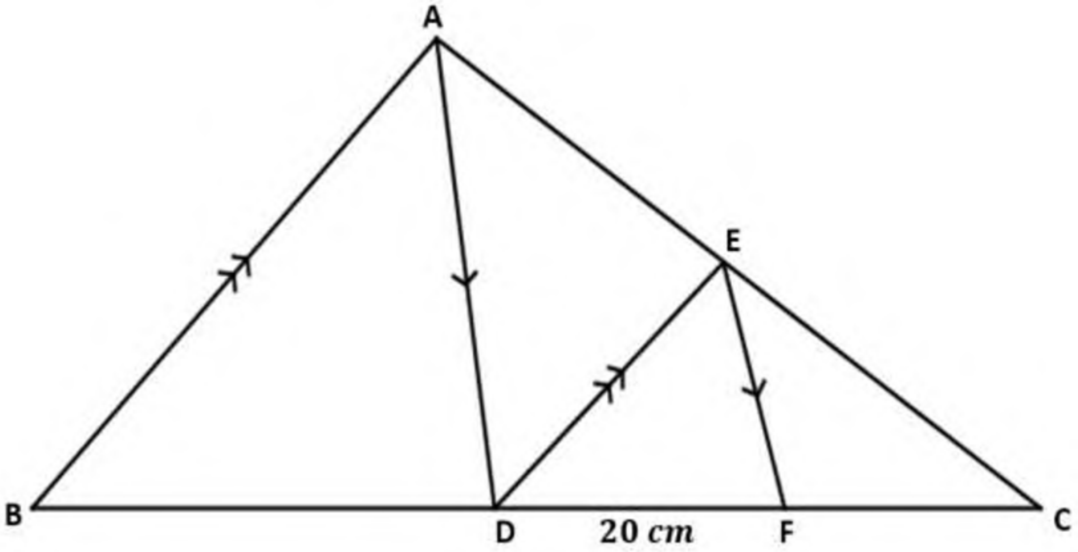
QUESTION 3		
3.1	$T_1 = x(x+1)^0 = x$ $T_2 = x(x+1)^1$ $\frac{T_2}{T_1} = \frac{x(x+1)}{x}$ $= x + 1$	✓ substitution of n = 0 and n =1 ✓ $r = x + 1$ (2)
3.2	If a series converges $-1 < r < 1$ $-1 < x + 1 < 1$ $-2 < x < 0$	✓ $-1 < r < 1$ ✓ substitution of r ✓ answer (3)
3.3	$S_\infty = \frac{a}{1 - r}$ $= \frac{x}{1 - (x+1)}$ $= \frac{x}{1-x-1}$ $= -1$	✓ substitution in the correct formula ✓ simplification ✓ answer (3)
3.4	$T_1 = x = 1$ $T_2 = x(x+1) = 1(1+1) = 2$ $T_3 = x(x+1)^2 = 1(1+1)^2 = 4$ $r = 2$ $1 + 2 + 4 + \cdots$	✓ ratio r =2 ✓ series (2)

3.5	$S_n = \frac{a(r^n - 1)}{r - 1}$ $S_{25} = \frac{1(2^{25} - 1)}{2 - 1}$ $= 33554432 - 1$ $= 33554431$	✓ substitution in the correct formula ✓✓ answer (3)
		[13]

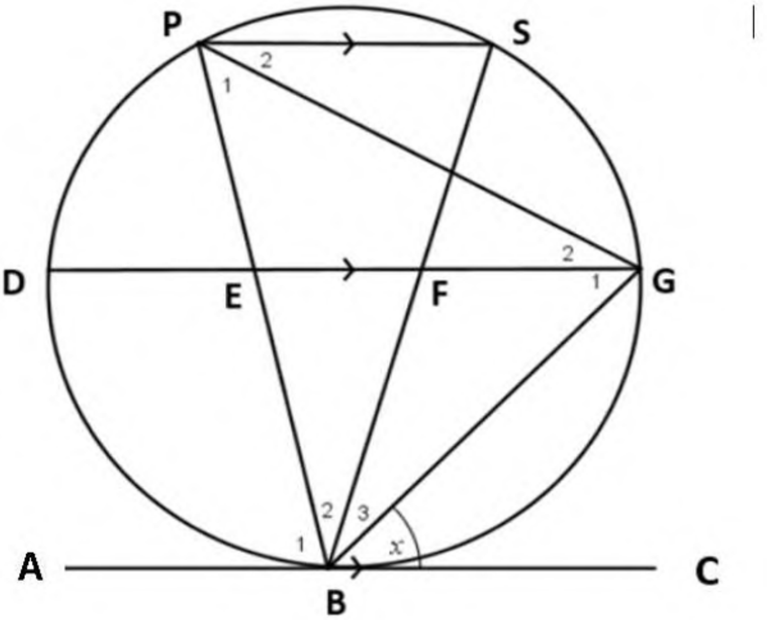
QUESTION 4



4.1	$\hat{P} = \widehat{M_1} = 60°$ [tan chord theorem]	✓S ✓R (2)
4.2	$\widehat{M_2} = 90°$ [angle in semi-circle]	✓S ✓R (2)
4.3	$\widehat{N_1} = 180° - (90° + 66°)$ $= 24°$ [sum of ∠s of $\Delta\, MNP$]	✓S (1)
		[5]

QUESTION 5		
 		
5.1	In $\Delta\, ADC$ $\frac{FC}{DF} = \frac{CE}{EA}$ [prop theorem, EF ‖ AD] $\frac{FC}{20} = \frac{4}{5}$ FC = 16 cm	✓S ✓R ✓ FC = 16 cm (3)
5.2	In $\Delta\, ABC$ $\frac{CD}{DB} = \frac{CE}{EA}$ $[prop\ theorem;\ \ DE \parallel AB]$ CD = 20 + 16 = 36 $\frac{36}{BD} = \frac{4}{5}$ $BD = 45\ cm$	✓ S/R ✓ CD = 36 ✓ BD = 45 (3)
5.3	$\frac{Area\,\Delta\, ECF}{Area\,\Delta\, ABC} = \frac{\frac{1}{2} EC.FC\ Sin\ C}{\frac{1}{2} AC.BC\ SinC}$ $= \frac{\frac{1}{2}(4)(16) Sin\ C}{\frac{1}{2}(9)(81) Sin\ C}$ $= \frac{64}{729}$	✓area rule ✓substitution area $\Delta\, ECF$ ✓area ΔABC ✓ratio (4)
		[10]

QUESTION 6



6.1.	Alt ∡ [DG ∥ AC]	✓R (1)
6.2.1.	$\frac{BE}{BP} = \frac{BF}{BS}$ (Prop theorem EF ∥ PS) $\therefore BE = \frac{BP \times BF}{BS}$	✓S ✓R (2)
6.2.2	In Δ BGP and Δ BEG $\hat{P}_1 = x$ [tan-chord theorem] $= \hat{G}_1$ …… from 6.1 P$\hat{B}$G = E$\hat{B}$G [common] B$\hat{G}$P = B$\hat{E}$G [sum ∡ of Δ] ∴ Δ BGP ||| Δ BEG [∠,∠,∠]	✓S ✓R ✓S ✓R (4)
6.2.3.	$\frac{BG}{BE} = \frac{BP}{BG}$ [Δ BGP ||| Δ BEG] $\therefore BG^2 = BP \times BE$ $= BP \times \left(\frac{BP \times BF}{BS}\right)$ $= \frac{BP^2 \times BF}{BS}$ $\therefore \frac{BG^2}{BP^2} = \frac{BF}{BS}$	✓ratio ✓substitution of BE ✓ $\frac{BP^2 \times BF}{BS}$ (3)
		[10]
		TOTAL: 50