

LEARNER NAME

Solns

NATIONAL SENIOR CERTIFICATE

MATHEMATICS P2

GRADE 11

NOVEMBER 2014

SPECIAL ANSWER BOOK

QUESTION	MARK	INITIAL	MOD.
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
TOTAL			

This answer book consists of 24 pages.

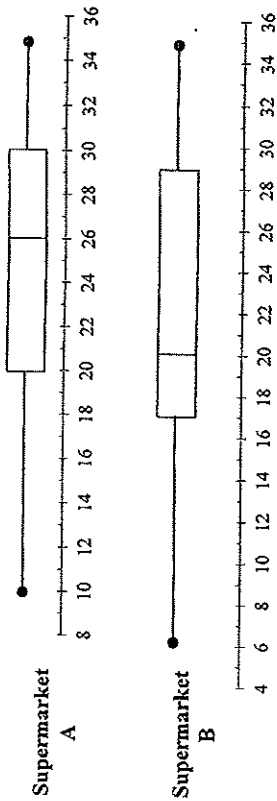


EASTERN CAPE

Please turn over

QUESTION 1

1.1



	Solution	Marks
1.1.1	<p>A: $IQR = Q_3 - Q_1$ $= 30 - 20$ ✓ $= 10$ ✓</p>	2 (2)
1.1.2	<p>A: $M - Q_1 = 26 - 20 = 6$... 1 $Q_3 - M = 30 - 26 = 4$... 2 (1) > (2) ∴ skewed to the left ✓</p>	1 (1)
1.1.3	<p>B: $R = \text{max} - \text{min}$ $= 35 - 6$ ✓ $= 29$ ✓</p>	2 (2)
1.1.4	<p>A: $25 < M$ ∴ on more than 50% of the days > 25 del.p.d B: $25 > M$ ∴ on less than 50% of the days < 25 del.p.d ∴ Supermarket A ✓</p>	2 (2)

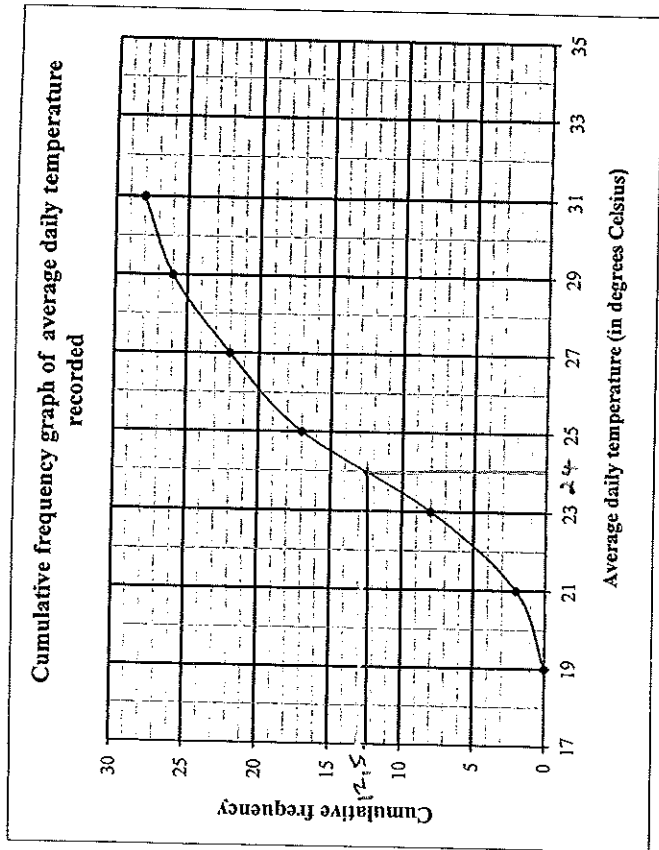


1.2

	Solution	Marks
1.2	<p>$\bar{x} = \frac{\sum x}{n}$ $24,5 = \frac{10 + 15 + \dots + 29}{14}$ $24,5 = \frac{2x + 293}{14}$ ✓ $24,5 \cdot 14 = 2x + 293$ ✓ $343 = 2x + 293$ $25 = x$ ✓</p>	3 (3)
		10 (10)



QUESTION 2



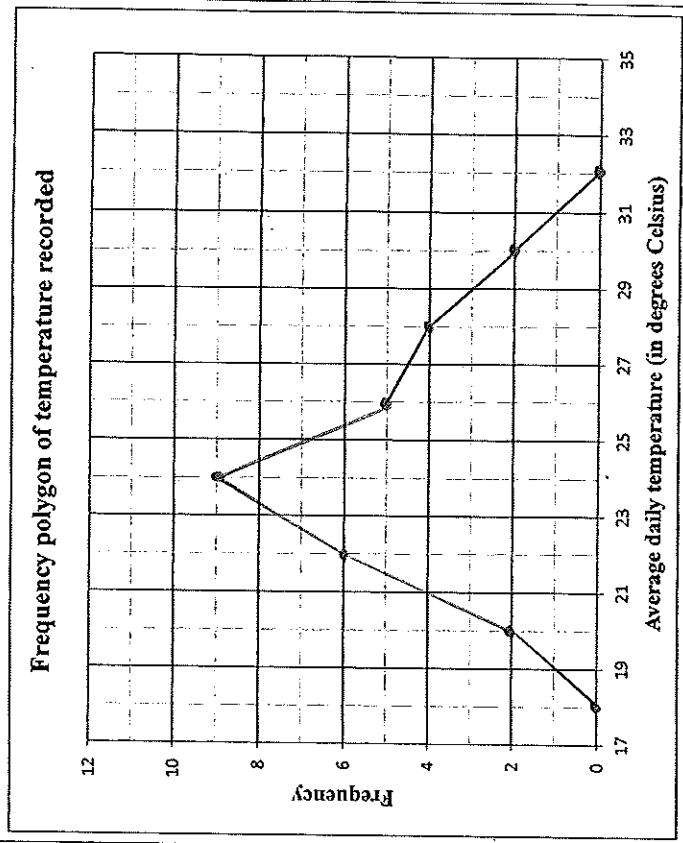
Solution	Marks
2.1 <u>28 days</u> ✓	1 (1)
2.2 $24^{\circ}\text{C} \therefore \approx 12,5 \text{ days}$ ✓ So, $\frac{12,5}{28} \times 100 = 44,64\%$ ✓	2 (2)
2.3 Accept 12 $\frac{42,86\%}{46,43\%}$	3 (3)

Temperature, T, in degrees Celsius	Frequency	cf
$19 \leq T < 21$	2	2
$21 \leq T < 23$	6	8
$23 \leq T < 25$	9	17
$25 \leq T < 27$	5	22
$27 \leq T < 29$	4	26
$29 \leq T < 31$	2	28



Solution

2.4



(4)

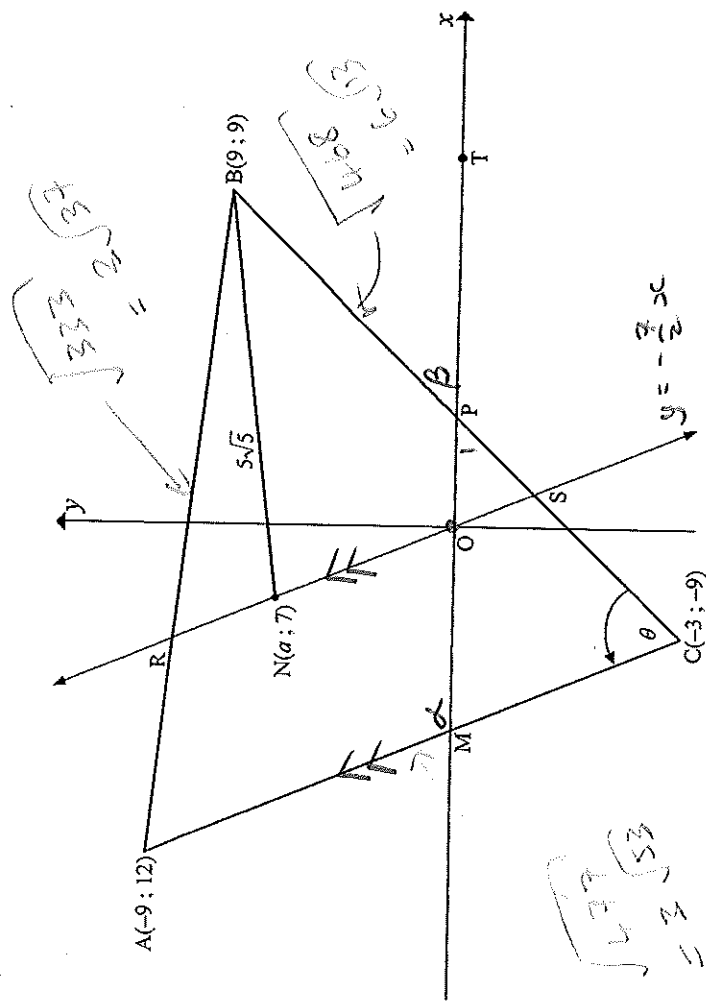
[10]

- ✓ anchors
- ✓ middle
- ✓ rules
- ✓ plotting

4



QUESTION 3

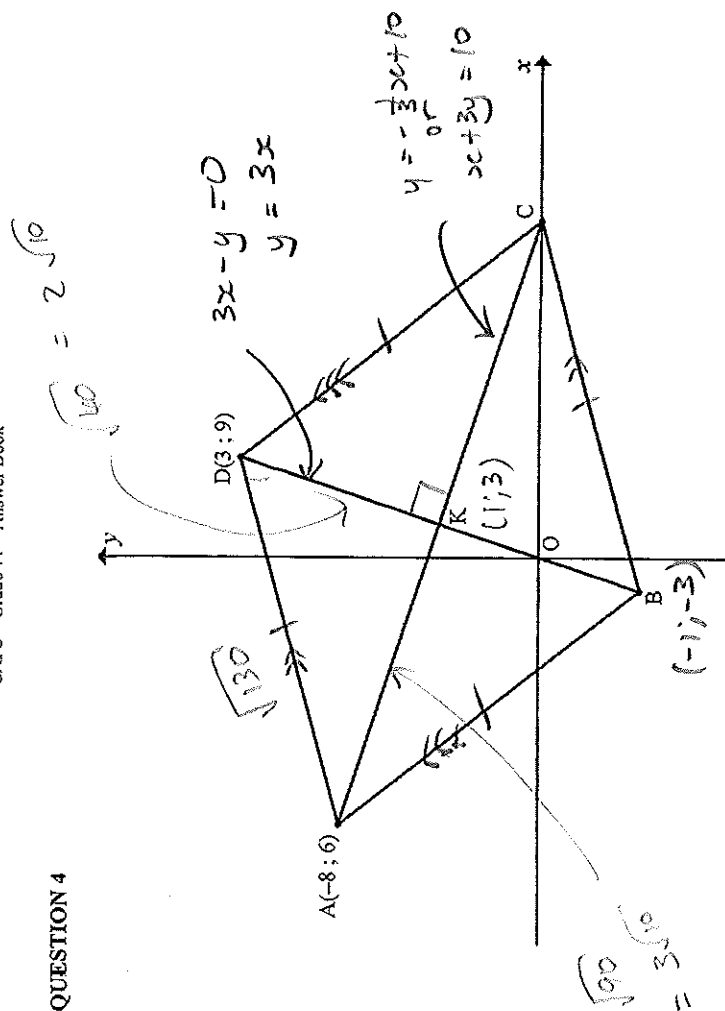


Solution	Marks
$M_{AC} = \frac{-9 - 12}{-3 - (-9)} = \frac{-21}{-6} = \frac{7}{2}$	2
$A(-9;12) \quad C(-3;-9)$	
$RNS \parallel AC$	2
$\therefore y = -\frac{7}{2}x + c$	
$\text{but } C = 0 \Rightarrow (0;0)$	
$\therefore y = -\frac{7}{2}x$	2



Solution	Marks
$y = -\frac{7}{2}x$	4
$\text{Sub } N(a;7)$	
$7 = -\frac{7}{2}(a)$	
$-2 = a$	
$N(a;7) \quad B(9;9)$	
$NB = \sqrt{(9-7)^2 + (9-7)^2}$	
$5\sqrt{5} = \sqrt{4 + (9-a)^2}$	
$1)^2 \text{ b.s.}$	
$25.5 = 4 + (9-a)^2$	(4)
$\tan \alpha = -\frac{7}{2}$	
$M_{BC} = \frac{-9-9}{-3-9} = \frac{1}{2}$	
$\tan -\alpha$	
$\therefore \alpha = 105.94^\circ$	
$\tan \beta = \frac{3}{2}$	
$\text{Def } \beta = 56.30^\circ$	
$\tan + \alpha$	
$\therefore \beta = 56.30^\circ$	
$P_1 = 56.30^\circ$	
$\text{vert opp } \alpha =$	
$M_{AN}, 105.94^\circ = \theta + 56.30^\circ \quad \text{Ext } \wedge A$	
$49.64^\circ = \theta$	
$(3\sqrt{3})^2 = (3\sqrt{3})^2 + (6\sqrt{3})^2 - 2(3\sqrt{3})(6\sqrt{3}) \cos \theta$	5
$333 = 477 + 468 - 36\sqrt{189} \cos \theta$	
$0.647 = \cos \theta$	
$\theta = 49.64^\circ$	(5)

QUESTION 4



Solution	Marks
$AB = \sqrt{(9-6)^2 + (3-(-8))^2} = \sqrt{130}$ $= \sqrt{130}$ ✓ ∴ Perimeter ✓ $= 4 \times \sqrt{130}$ ✓ Sides rhomb =	3
	(3)



Solution	Marks
4.2 BD : $y = 3x$ ✓ $m = 3$ ∴ $m_{AC} = -\frac{1}{3}$ diagonals rhomb ⊥ ∴ $y = -\frac{1}{3}x + c$ ✓ Sub A(-8;6) ✓ $6 = -\frac{1}{3}(-8) + c$ $\frac{10}{3} = c$ ∴ $y = -\frac{1}{3}x + \frac{10}{3}$ ✓ (x 3: $3y = -x + 10$) $x + 3y = 10$	4
4.3 $y = 3x$... $x + 3y = 10$... 2 (1) into (2) : $x + 3(3x) = 10$ $10x = 10$ $x = 1$ ∴ $y = 3(1)$ $= 3$ ∴ $K(1;3)$ ✓ (OR) ✓ x int : $x = 10$ ∴ $C(10;10)$ ✓ then $\frac{-8 + 10}{2} = x_k$ $\frac{6 + 10}{2} = y_k$ $x_k = 1$	3
	(4)



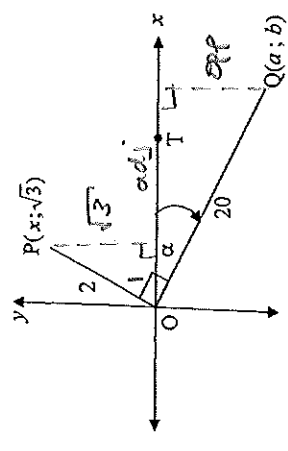
Solution	Marks
<p>4.4</p> <p> $x_B + 3 = 1$ $x_B + 3 = 2$ $x_B = -1$ </p> <p> $\frac{y_B + 9}{2} = 3$ $y_B + 9 = 6$ $y_B = -3$ </p> <p> $\therefore B(-1; -3)$ </p>	2
<p>4.5</p> <p> $M_{AB} = \frac{-3 - 6}{-1 - (3)} = -\frac{9}{4}$ $M_{AD} = \frac{9 - 6}{3 - (3)} = \frac{3}{0}$ </p> <p> $M_{AB} \cdot M_{AD} = -\frac{9}{4} \times \frac{3}{0} = -\frac{27}{0} \neq -1$ </p> <p> $\therefore \hat{BAD} \neq 90^\circ$ $\therefore ABCD$ is not a square as all int'ns $\neq 90^\circ$ </p> <p> $\cos D = \frac{140}{\sqrt{350}} \therefore \hat{D}_1 = 56, 30 \dots$ $\therefore \hat{ADC} = 2 + 56, 30 \dots = 112, 61 \dots \neq 90^\circ$ </p> <p>not a square ✓</p>	5

QUESTION 5

Solution	Marks
<p>5.1.1</p> <p> $\cos 203^\circ = \cos(180^\circ + 23^\circ)$ $= -\cos 23^\circ$ $= -p$ </p>	2
<p>5.1.2</p> <p> $\sin 293^\circ = \sin(270^\circ + 23^\circ)$ $= -\cos 23^\circ$ $= -p$ </p>	3
<p>5.2</p> <p> $\sin(360^\circ - x) = -\sin x$ $\tan(-x) = -\tan x$ $\cos(180^\circ + x) = -\cos x$ $\sin^2 A + \cos^2 A = 1$ $\therefore \frac{(-\sin x)(-\tan x)}{(-\cos x)(1)}$ $= \frac{\tan x}{-\cos x} = -\tan x$ </p>	6



5.5

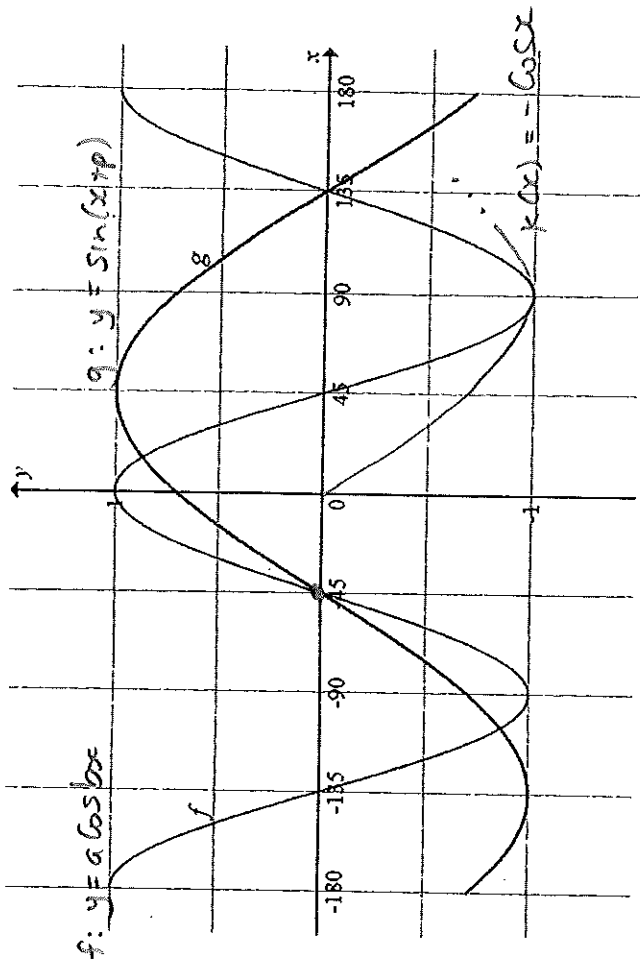


Solution	Marks
5.5.1	2
$x^2 + (\sqrt{3})^2 = (20)^2$	Pythag
$x^2 + 3 = 400$	
$x^2 = 397$	
$x = \pm \sqrt{397}$	
$\therefore x = \sqrt{397}$ or 0	
5.5.2	(2)
$\sin \hat{Q} = \frac{\sqrt{3}}{20}$	✓
$\hat{Q} = 60^\circ$	
sin + in	
$\therefore \hat{O} = 60^\circ$	✓
$\therefore \hat{A} = 30^\circ$	✓
$\hat{P} \hat{O} \hat{Q} = 90^\circ$	

Solution	Marks
5.3.1	5
$\frac{\cos x}{1 + \sin x} + \frac{1 + \sin x}{\cos x}$	
$= \frac{\cos x \cdot \cos x + (1 + \sin x)(1 + \sin x)}{(1 + \sin x) \cos x}$	
$= \frac{\cos^2 x + (1 + 2\sin x + \sin^2 x)}{(1 + \sin x) \cos x}$	
$= \frac{\cos^2 x + 1 + 2\sin x + \sin^2 x}{(1 + \sin x) \cos x}$	
$= \frac{2 + 2\sin x}{(1 + \sin x) \cos x}$	
$= \frac{2(1 + \sin x)}{(1 + \sin x) \cos x}$	
$= \frac{2}{\cos x}$	
$= \text{RHS}$	
5.3.2	(5)
$1 + \sin x = 0 \quad (k \in \mathbb{Z})$	$\cos x = 0$
$\sin x = -1$	$x = 90^\circ + k180^\circ$
$x = 270^\circ + k360^\circ$	$\therefore x = 90^\circ$ or 270°
$\therefore x = 270^\circ$	✓
5.4	(2)
$\sin 2x = 4 \cos 2x$	tan + in (k ∈ Z)
Ret A = 2x	I: A = 75, 96... + k180°
$\therefore \sin A = 4 \cos A$	2x =
$\div \cos A:$	$x = 37, 96^\circ + k \cdot 90^\circ$
$\frac{\sin A}{\cos A} = 4$	✓
$\tan A = 4$	✓
$\hat{A} = 75, 96...$	✓



QUESTION 6



	Solution	Marks
6.1	$a = \frac{360^\circ}{180^\circ} = 2$ $x = -45^\circ \therefore x + 45^\circ = 0$	3
6.2	$\therefore b = 2$ For $L \rightarrow R$ $x \in (-90^\circ; 0^\circ)$ - each error For $R \rightarrow L$ $x \in (0^\circ; 90^\circ)$ error	2
6.3	$f(x) = \cos 2x$ $f(2x) = \cos 4x$ $hp = \frac{360^\circ}{4} = 90^\circ$	2
6.4	$f: y \in [-1; 1]$ $3f: y \in [-3; 3]$ $\therefore y_{min} = -4$	2
6.5	g shifted right by 135° Reflect x and $45^\circ \rightarrow$	2
		[11]

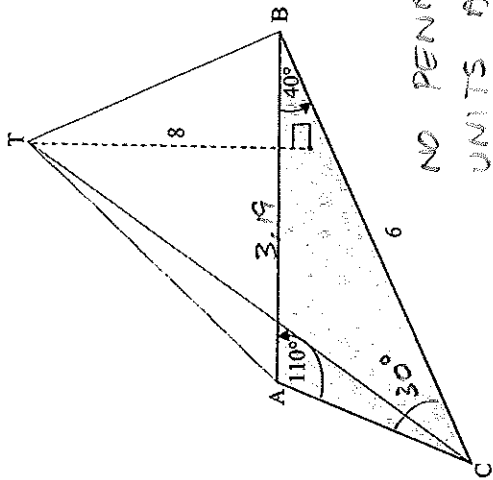
	Solution	Marks
5.5.3	$\frac{opp}{20} = \sin 30^\circ$ $opp = 20 \cdot \sin 30^\circ = 10$ $\therefore b = -10$ $\therefore a = 17, 32$ $So Q(17, 32; -10)$ or surd form	5
		(5)
		[33]

$x \in [-90^\circ; 0^\circ]$
 $x \in (-135^\circ; 0^\circ)$



QUESTION 7

7.1



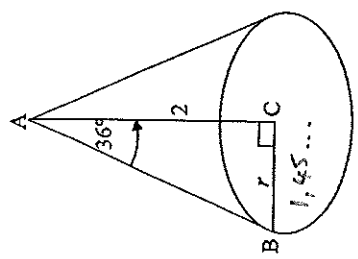
NO PENALTY IF
 UNITS ARE EXCLUDED

Solution	Marks
$\checkmark \hat{C} = 30^\circ$ $\hat{A}'S \Delta = 180^\circ$ $\frac{AB}{\sin 30^\circ} = \frac{6}{\sin 110^\circ}$ \checkmark f+s $AB = \sin 30^\circ \cdot \frac{6}{\sin 110^\circ}$ $= 3,19 \text{ m}$ \checkmark	3 (3)
$\Delta ABC = \frac{1}{2}(3,19)(6) \sin 40^\circ$ \checkmark $= 6,15 \text{ m}^2$ \checkmark	2 (2)
$V = \frac{1}{3} A_{\text{base}} \times h$ \checkmark wrong f $= \frac{1}{3} (6,15)(8)$ \checkmark s $= 16,4 \text{ m}^3$ \checkmark	3 (3)



EASTERN CAPE

7.2



NO PENALTY
 FOR ROUNDING

Solution	Marks
$\frac{r}{2} = \tan 36^\circ$ $\therefore r = 2 \tan 36^\circ$ $= 1,45 \dots$ \checkmark $\frac{2}{AB} = \cos 36^\circ$ \checkmark $2 = AB \cdot \cos 36^\circ$ $\frac{2}{\cos 36^\circ} = AB$ $2,47 \dots =$ \checkmark	6
$TSA = \pi (1,45 \dots)^2 + \pi (1,45 \dots)(2,47 \dots)$ \checkmark $= 6,63 \dots + 11,28 \dots$ $= 17,92 \text{ m}^2$ \checkmark	6

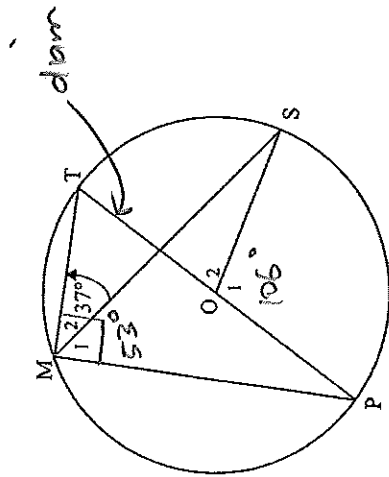


EASTERN CAPE

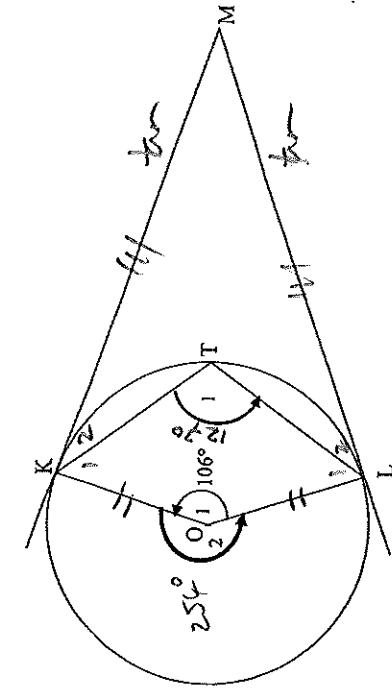
GIVE REASONS FOR YOUR STATEMENTS AND CALCULATIONS IN QUESTIONS 8, 9 AND 10.

QUESTION 8

8.1



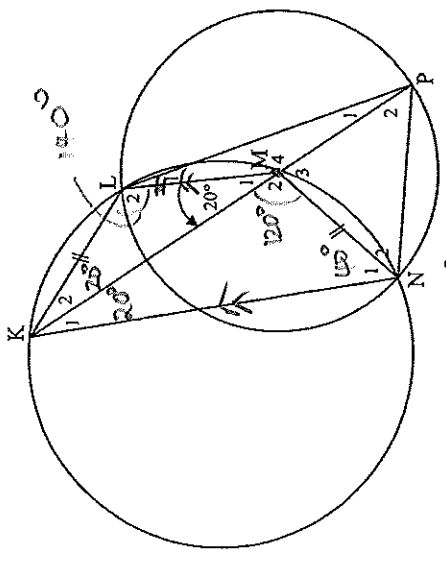
Solution	Marks
$\hat{M}_1 = 53^\circ$ ✓ ✓ in semi $\odot = 90^\circ$ ✓ ✓ ✓	2
$\hat{O}_1 = 106^\circ$ ✓ ✓ in centre = 2 \times \odot ✓ ✓ ✓	(2)
	2
	(2)



Solution	Marks
$\hat{O}_2 = 254^\circ$ ✓ ✓ rev $1\text{ rev} = 360^\circ$ $\therefore \hat{T}_1 = 127^\circ$ ✓ ✓ \angle @ centre = \angle @ \odot ✓ ✓ ✓	3
$OK = OL$ ✓ ✓ radii $KM = LM$ ✓ ✓ tan's ext pt = $\therefore OELML$ is ✓ ✓ 2 p's adj sides = a kite ✓ $\hat{K}_{1+2} = 90^\circ$ ✓ ✓ tan \perp rad ✓ $\hat{L}_{1+2} = 90^\circ$ ✓ ✓ bn \perp rad ✓ $\therefore \hat{K}_{1+2} + \hat{L}_{1+2} = 90^\circ + 90^\circ = 180^\circ$ $\therefore OKML$ is ✓ ✓ conv opp \angle 's cyclic ✓ cyclic quad ✓ quad $= 180^\circ$ ✓ $\hat{M} = 74^\circ$ ✓ ✓ opp \angle 's cyclic quad ✓ $= 180^\circ$ ✓ ✓	(3)
	3
	(3)
	2
	(2)



QUESTION 9



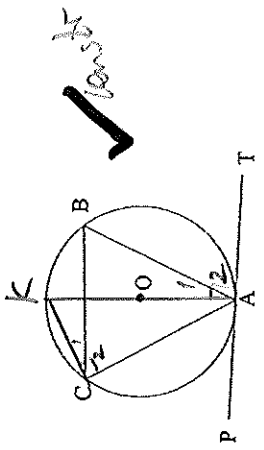
Solution	Marks
$\hat{K}M = 20^\circ$ $\hat{K}P = 20^\circ$ $\hat{K}LN = 140^\circ$ $\hat{LNM} = 120^\circ$ $\hat{MNP} = 40^\circ$ $\hat{MPN} = 20^\circ$	2
$\hat{K}_1 = \hat{N}_1$ both = 20° $\therefore KN \parallel LM$ alt $\hat{\text{a}}\text{s} = \checkmark$	(2)
$LM = MN$ \checkmark radii $= KL$ \checkmark given $\therefore LM = KL$ both = MN	(1)
	2
	(2)



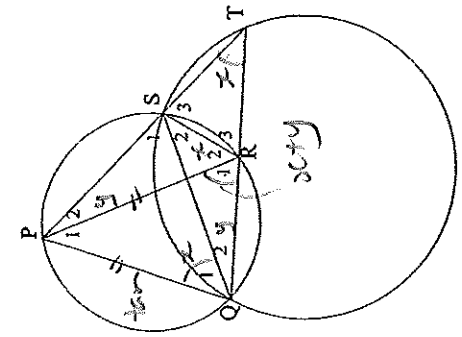
Solution	Marks
$\hat{P}_2 = 20^\circ$ \checkmark $\hat{L}_2 = 140^\circ$ \checkmark $\hat{N}_1 = 40^\circ$ \checkmark opp $\hat{\text{a}}\text{s}$ cyclic quad = 180° \checkmark	4
$\hat{M}_2 = 120^\circ$ \checkmark $\hat{M}_{1,2} = 140^\circ$ \checkmark $\hat{P}_{1,2} = 70^\circ$ \checkmark @ centre = $2 \times 35^\circ$ \checkmark	(4)
	3
	(3)
	[12]



QUESTION 10



Solution	Marks
<p>10.1 Const: diam AOK KC</p> <p>$\hat{A}_1 + \hat{A}_2 = 90^\circ$ ✓ ✓ tan 1 rad ✓</p> <p>$\hat{C}_1 + \hat{C}_2 = 90^\circ$ ✓ ✓ in semi C = 90° ✓</p> <p>but $\hat{C}_1 = \hat{A}_1$ ✓</p> <p>$\therefore \hat{A}_2 = \hat{C}_2$ ✓</p> <p>ie $\hat{B\hat{A}T} = \hat{C}$ ✓</p>	<p>(6)</p>



Solution	Marks
<p>10.2.1(a) $\hat{Q}_1 = \hat{P}$ ✓ = x ✓</p> <p>10.2.1(b) $\hat{Q}_2 = \hat{P}_2$ ✓ = y ✓</p> <p>10.2.2 $\hat{R}_1 = x + y$ ✓ Ext Δ ✓ $\therefore \hat{P}_1 = \hat{Q}_1 + \hat{Q}_2$ ✓ Both = x + y ✓ $\therefore \Delta PQR$ is base $\hat{A} \hat{S} = \hat{R}$ ✓ ISOS Δ ✓</p>	<p>(1)</p> <p>(1)</p> <p>(1)</p> <p>(4)</p>

4



Solution	Marks
$\hat{P}_2 = \hat{x}$ ✓ $\hat{P}_2 = \hat{P}_1$ ✓ $\therefore PR$ is tangent to $\odot P_1$ ✓ $\therefore PR$ is tangent to $\odot P_2$ ✓ $\therefore PR$ is a chord of $\odot P_2$ ✓	
$\therefore PR$ is a chord of $\odot P_2$ ✓	
$\therefore PR$ is a chord of $\odot P_2$ ✓	
$\therefore PR$ is a chord of $\odot P_2$ ✓	
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$\therefore PR$ is a chord of $\odot P_2$ ✓	
$\therefore PR$ is a chord of $\odot P_2$ ✓	
$\therefore PR$ is a chord of $\odot P_2$ ✓	(3)
TOTAL:	150

3

