



basic education

Department:
Basic Education
REPUBLIC OF SOUTH AFRICA

**NATIONAL
SENIOR CERTIFICATE**

GRADE 12

MATHEMATICS P3

NOVEMBER 2011

POSSIBLE ANSWERS

MARKS: 100

This memorandum consists of 14 pages.

NOTE:

- If a candidate answers a question TWICE and does not delete any attempt, 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.
- A learner cannot use what s/he must prove to prove it (i.e. the circular argument.).

QUESTION 1

<p>1.1</p>	<p>$T_{k+1} = T_k - 2; k \geq 1; T_1 = 12$</p> <p>$T_1 = 12$ $T_2 = 12 - 2 = 10$ $T_3 = 10 - 2 = 8$ $T_4 = 8 - 2 = 6$</p>	<p>✓ 10 ✓ 8 ✓ 6</p> <p>(3)</p>
<p>1.2</p>	<p>$12 + 10 + 8 + 6 + 4 + 2 + 0 + (-2) + (-4) + (-6) + (-8) + (-10) + (-12)$ $= 0$ \therefore 13 terms</p> <div style="border: 1px solid black; padding: 5px; margin: 10px 0;"> <p>Note: If a learner writes out $12 + 10 + 8 + 6 + 4 + 2 + 0$ then 1/3 marks</p> </div> <div style="border: 1px solid black; padding: 5px; margin: 10px 0;"> <p>Note: Answer only: FULL marks</p> </div> <p>OR</p> <p>There are 6 positive terms before the 7th term, which is 0. We need 6 negative terms of equal value to the positive terms so that the sum is zero</p> <p>6 positive terms + 1 zero term + 6 negative terms $= 13$ terms</p> <p>OR</p> <p>$\frac{n}{2}[2(12) + (n-1)(-2)] = 0$ $\frac{n}{2}[24 + 2 - 2n] = 0$ $\frac{n}{2}[26 - 2n] = 0$ $13n - n^2 = 0$ $n(13 - n) = 0$ $n \neq 0 \text{ or } n = 13$</p>	<p>✓✓ expansion ✓ 13 terms</p> <p>(3)</p> <p>✓ $T_7 = 0$ ✓ 12 terms ✓ 13 terms</p> <p>(3)</p> <p>✓ substitution into the arithmetic sum formula ✓ $\frac{n}{2}[26 - 2n] = 0$</p> <p>✓ 13 terms</p> <p>(3) [6]</p>

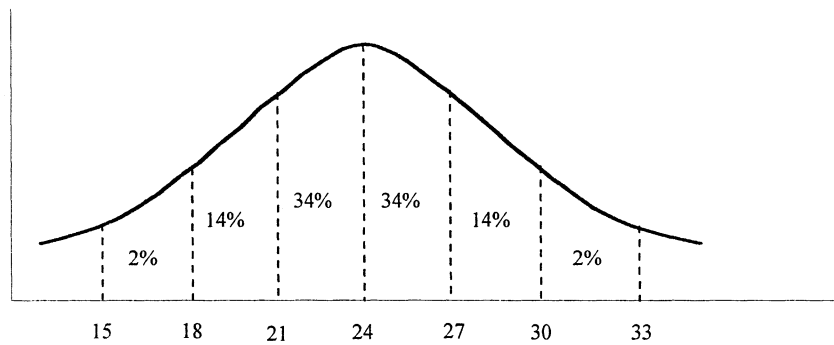
QUESTION 2

2.1	$42 - 28 = 14$	✓ answer (1)
2.2	Approximately 88 kg NOTE: Accept a range from 86 to 89 kg	✓ answer (1)
2.3	15 learners in the sample have a weight of less than 80 kg. One would expect $\frac{15}{50} \times 250 = 75$ learners in the grade to have a weight of less than 80 kg. OR 15 learners in the sample have a weight of less than 80 kg. One would expect $15 \times 5 = 75$ learners in the grade to have a weight of less than 80 kg. NOTE: <ul style="list-style-type: none"> Accept $\frac{14}{50} \times 250 = 70$ Answer as percentage: 1/2 marks Answer only: 2/2 marks 	✓ Cumulative Frequency value read off the graph when less than 80 ✓ answer (2) ✓ Cumulative Frequency value read off the graph when less than 80 ✓ answer (2)
2.4	This sampling method is biased towards those who arrive early on a Monday morning. In this way all the learners in the Grade do not have the same chance of being selected for the sample.	✓ sensible explanation of random sample (1) [5]

QUESTION 3

3.1	For mutually exclusive events $P(A \text{ or } B) = P(A) + P(B)$ $0,7 = 0,4 + k$ $k = 0,3$ NOTE: If the candidate writes down $k = 1 - 0,7 = 0,3$: 0/2 marks	Note: Answer only: FULL marks ✓ $0,7 = 0,4 + k$ ✓ answer (2)
3.2	For independent events $P(A \text{ and } B) = P(A) \cdot P(B)$ $= 0,4k$ $P(A \text{ or } B) = P(A) + P(B) - P(A \text{ and } B)$ $0,7 = 0,4 + k - 0,4k$ $0,3 = 0,6k$ $k = 0,5$ OR $0,7 = 0,4 + k - 0,4k$ $0,3 = 0,6k$ $k = 0,5$	✓ $P(A \text{ and } B) = P(A) \cdot P(B)$ ✓ $0,4k$ ✓ $0,7 = 0,4 + k - 0,4k$ ✓ answer (4) ✓✓✓ $0,7 = 0,4 + k - 0,4k$ ✓ answer (4) [6]

QUESTION 4



4.1	21 minutes is 1 standard deviation from the mean \therefore 34% of the pizzas are delivered between 21 and 24 minutes <div style="border: 1px solid black; padding: 5px; width: fit-content; margin-top: 10px;"> Note: Answer only: FULL marks </div>	✓ 1 standard deviation ✓ 34% (2)
4.2	15 minutes is 3 standard deviations to the left of the mean \therefore 50% 27 minutes is 1 standard deviation to the right of the mean \therefore 34% 84% of the pizzas are delivered between 15 and 27 minutes OR $2\% + 14\% + 34\% + 34\%$ $= 84\%$ <div style="border: 1px solid black; padding: 5px; width: fit-content; margin-top: 10px;"> Note: Answer only: FULL marks </div>	✓ 50% ✓ 34% ✓ 84% ✓ 50% ✓ 34% ✓ 84% (3)
4.3	The required 2% is the area found to the right of 2 standard deviations on the right hand side of the mean. Maximum for delivery should be $24 + 2(3)$ $= 30$ minutes <div style="border: 1px solid black; padding: 5px; width: fit-content; margin-top: 10px;"> Note: Answer only: FULL marks </div>	✓ 2 standard deviations ✓ $24 + 2(3)$ ✓ 30 (3) [8]

QUESTION 5

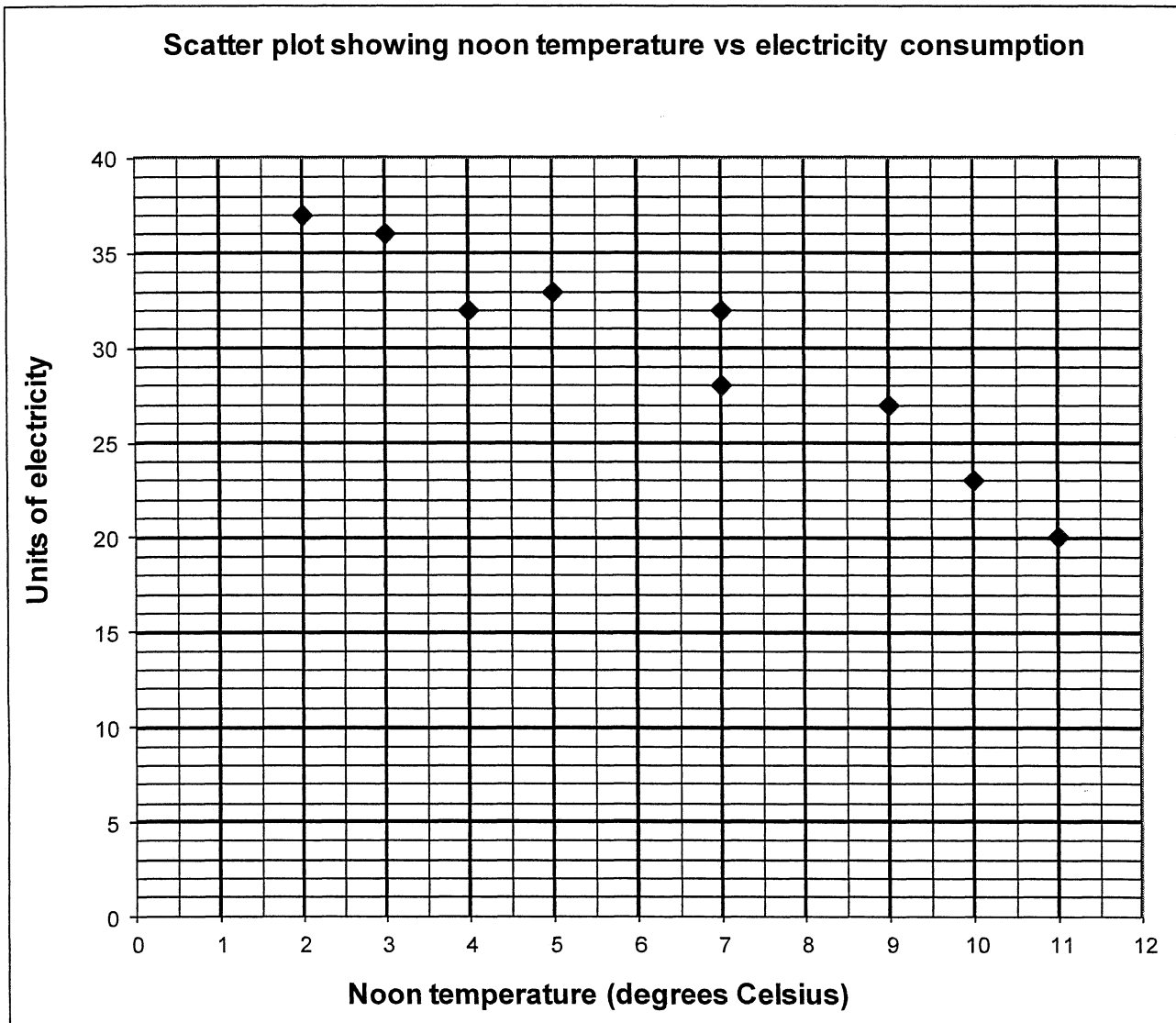
5.1	Number of unique codes $= 7 \times 7 \times 7$ $= 7^3$ $= 343$ <div style="border: 1px solid black; padding: 5px; width: fit-content; margin-top: 10px;"> Note: Answer only: FULL marks </div>	✓ $7 \times 7 \times 7$ ✓ answer (2)
5.2	Number of unique codes without repetition $= 7 \times 6 \times 5$ $= 210$ OR $\frac{7!}{4!}$ $= 210$ <div style="border: 1px solid black; padding: 5px; width: fit-content; margin-top: 10px;"> Note: Answer only: FULL marks </div>	✓ $7 \times 6 \times 5$ ✓ answer ✓ $\frac{7!}{4!}$ ✓ answer (2)
5.3	Number of codes with repetition that are greater than 300 and divisible by 5 $= 4 \times 7 \times 2 - 1$ $= 55$ OR For a 100 numbers there are 14 numbers divisible by 5 $14 \times 4 = 56$ $56 - 1 = 55$ <div style="border: 1px solid black; padding: 5px; width: fit-content; margin-top: 10px;"> Note: • No CA marking for the answer. • Answer only 3/3 marks </div>	✓ $4 \times 7 \times 2$ ✓ $- 1$ ✓ answer (3) ✓ 14×4 ✓ $- 1$ ✓ answer (3) [7]

QUESTION 6

<p>6.1</p>		<ul style="list-style-type: none"> ✓ $79 - x$ ✓ 20 ✓ $19 - x$ ✓ 11 ✓ 16 ✓ $40 - x$ <p style="text-align: right;">(6)</p>
<p>6.2</p>	$79 - x + 20 + x + 11 + 19 - x + 16 + 40 - x = 173$ $185 - 2x = 173$ $x = 6$ <p>OR 232 complaints and 173 people in total 94 complaints from 47 people 138 complaints from remaining 126 people For the two to be equal $126 - x = 138 - 3x$ $2x = 12$ $x = 6$</p> <p>OR $110 + 55 + 67 = 232$ $2x + 20 + 11 + 16 = 232 - 173$ $2x + 47 = 59$ $2x = 12$ $x = 6$</p> <div style="border: 1px solid black; padding: 5px; width: fit-content; margin: 10px auto;"> <p>Note: Check the reasonableness of the answer.</p> </div>	<ul style="list-style-type: none"> ✓ addition ✓ 173 ✓ answer <p style="text-align: right;">(3)</p> <ul style="list-style-type: none"> ✓ $126 - x$ and $138 - 3x$ ✓ $126 - x = 138 - 3x$ ✓ answer <p style="text-align: right;">(3)</p> <ul style="list-style-type: none"> ✓ 232 ✓ $2x + 20 + 11 + 16 = 232 - 173$ ✓ answer <p style="text-align: right;">(3)</p>
<p>6.3</p>	<p>P(at least two complaints)</p> $= \frac{11 + 20 + 6 + 16}{173}$ $= \frac{53}{173}$ <p>= 0,31 (0,30635838...)</p> <p>OR 30,64%</p>	<ul style="list-style-type: none"> ✓ $11 + 20 + 6 + 16$ ✓ 173 <ul style="list-style-type: none"> ✓ answer <p style="text-align: right;">(3)</p> <p style="text-align: right;">[12]</p>

QUESTION 7

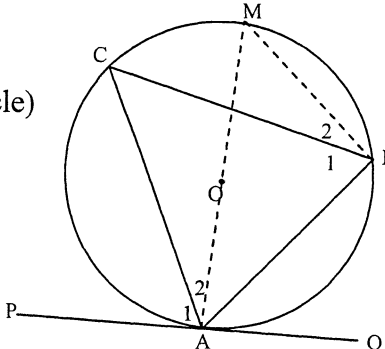
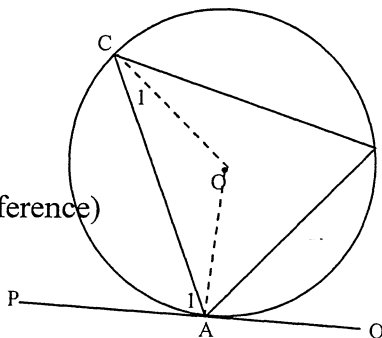
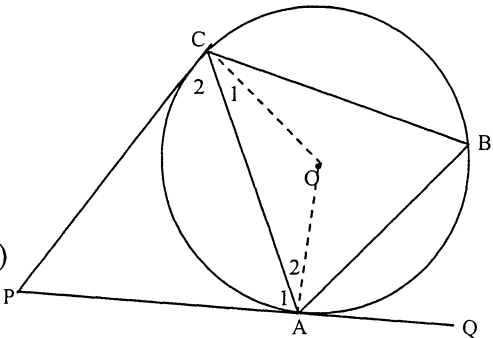
Noon temperature (in °C)	2	3	4	5	7	7	9	10	11
Units of electricity used	37	36	32	33	32	28	27	23	20



7.1	See scatter plot above <div style="border: 1px solid black; padding: 5px; margin: 10px 0;"> <p>Note: Please ignore the point (0 ; 41).</p> </div>	<p>✓✓✓ all 9 points plotted correctly 2 marks if 5 – 8 points are plotted correctly 1 mark if 1 – 4 points are plotted correctly.</p> <p style="text-align: right;">(3)</p>
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<p>7.2</p>	<p>$a = 40,97$ (40,97108844...) $b = -1,74$ (-1,736394558...) $\hat{y} = 40,97 - 1,74x$</p> <div style="border: 1px solid black; padding: 5px; margin: 10px 0;"> <p>Note:</p> <ul style="list-style-type: none"> • Penalise 1 mark for incorrect rounding to ONE decimal place in either 7.2 or 7.3 • Answer only: FULL marks </div> <p>NOTE: If the candidate works the coefficients out manually that $b = \frac{-204,2}{117,6}$ then 2 marks for b.</p>	<p>✓✓ a ✓ b ✓ equation</p> <p style="text-align: right;">(4)</p>
<p>7.3</p>	<p>$r = -0,97$ (-0,9699269087...)</p> <p>NOTE: If the candidate gives $b = \frac{6,139218}{3,42928}r$ and not simplified then 1 mark.</p>	<p>✓✓ answer</p> <p style="text-align: right;">(2)</p>
<p>7.4</p>	<p>There is a strong negative correlation between the noon temperature and the units of electricity used.</p> <p>OR</p> <p>As the noon temperature increases, the units of electricity used decreases.</p> <p>OR</p> <p>As the noon temperature decreases, the units of electricity used increases.</p>	<p>✓ strong ✓ negative</p> <p style="text-align: right;">(2)</p> <p>✓✓ as noon temp increases & units decrease</p> <p style="text-align: right;">(2)</p> <p>✓✓ as noon temp decreases & units increases</p> <p style="text-align: right;">(2)</p>
<p>7.5</p>	<p>$\hat{y} \approx 40,97 - 1,74(8)$ $\approx 27,05$</p> <p>OR</p> <p>$\hat{y} \approx 27,0799 \approx 27,08$</p> <div style="border: 1px solid black; padding: 5px; margin: 10px 0;"> <p>Note:</p> <ul style="list-style-type: none"> • Answer only: 2/2 marks • Accept a range of 26,5 – 27,5 if the least squares regression line is drawn and the answer is read off: 2/2 marks </div>	<p>✓ substitution ✓ answer</p> <p style="text-align: right;">(2)</p> <p style="text-align: right;">[13]</p>

QUESTION 8

<p>8.1</p>	<p>Draw diameter AM and join M to B.</p> <p>$\hat{A}_1 + \hat{A}_2 = 90^\circ$ (rad \perp tangent) $\hat{B}_1 + \hat{B}_2 = 90^\circ$ (\angles in a semi circle) $\hat{B}_2 = \hat{A}_2$ (\angles in same seg) $\hat{B}_1 = \hat{A}_1$</p> <p>OR</p> <p>Draw radii OC and OA</p> <p>Let $\hat{A}_2 = x$ $\hat{C}_1 = x$ (\angle opp = radii) $\hat{A}_1 = 90^\circ - x$ (rad \perp tan) $\hat{AOC} = 180^\circ - 2x$ (\angle sum Δ) $\hat{ABC} = 90^\circ - x$ (\angle circ cent = 2 \angle circumference) $\hat{ABC} = \hat{A}_1$ ($= 90^\circ - x$)</p> <div style="border: 1px solid black; padding: 5px; margin: 10px 0;"> <p>NOTE: If there is no construction: 0 / 5 marks If candidate changes lettering and states "Similarly": full marks</p> </div> <p>OR</p> <p>Draw QA extend to P. Draw tangent CP at C.</p> <p>PC = PA (tan from comm pt) $\hat{C}_2 = \hat{A}_1$ (\angles opp = sides) $\hat{COA} = 2\hat{ABC}$ (\angle circ cent = 2 \angle circumf) $\hat{A}_1 + \hat{A}_2 = 90^\circ$ (tan \perp radius) $\hat{COA} = 180^\circ - (90^\circ - \hat{A}_1 + 90^\circ - \hat{C}_2)$ $= \hat{A}_1 + \hat{C}_2$ $= \hat{A}_1 + \hat{A}_1$ $= 2\hat{A}_1$ $\hat{A}_1 = \frac{1}{2}\hat{COA}$ $= \hat{CBA}$</p>	  	<p>✓ construction ✓ S/R ✓ $\hat{B}_1 + \hat{B}_2 = 90^\circ$ ✓ \angles in a semi circle ✓ S/R</p> <p>(5)</p> <p>✓ construction ✓ $\hat{A}_1 = 90^\circ - x$ ✓ rad \perp tan ✓ S/R ✓ S/R</p> <p>(5)</p> <p>✓ construction ✓ S/R ✓ S/R ✓ $\hat{A}_1 + \hat{A}_2 = 90^\circ$ ✓ tan \perp radius</p> <p>(5)</p>
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NSC -

Draw diameter AM and Join M and C

$\hat{MCA} = 90^\circ$ (\angle s in semi circle)

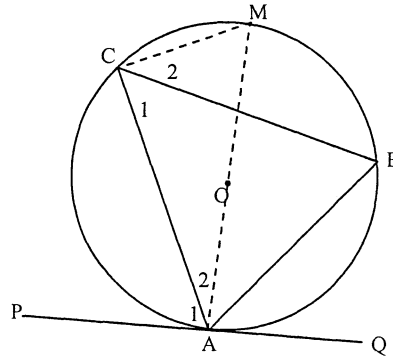
$\hat{AMC} + \hat{A}_2 = 90^\circ$ (\angle sum Δ)

$\hat{A}_1 + \hat{A}_2 = 90^\circ$ (rad \perp tangent)

$\hat{AMC} = \hat{A}_1$

$\hat{AMC} = \hat{B}$ (\angle s in same seg)

$\hat{A}_1 = \hat{B}$



✓ construction

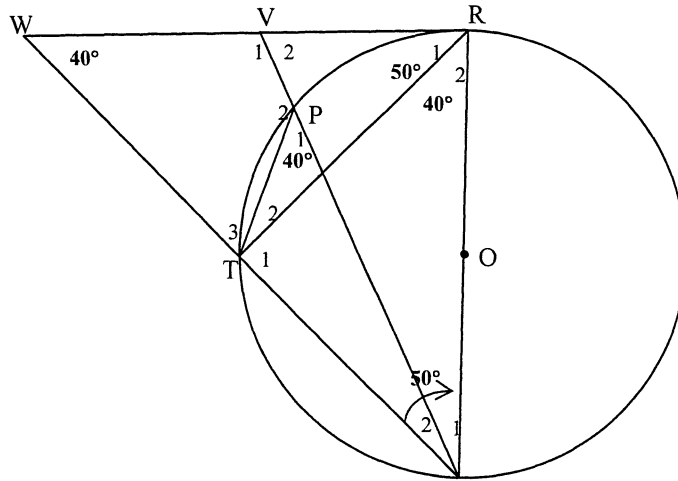
✓ S/R

✓ S/R

✓ $\hat{A}_1 + \hat{A}_2 = 90^\circ$

✓ tan \perp radius

(5)



8.2.1	$\hat{WRS} = 90^\circ$ (tan \perp radius)	✓ statement	(1)
8.2.2	$\hat{RST} = 50^\circ$ (tan ch th) $\hat{W} = 40^\circ$ (\angle sum Δ)	✓ S/R ✓ $\hat{W} = 40^\circ$	(2)
	OR $\hat{T}_1 = 90^\circ$ (\angle s in semi circle) $\hat{W} + \hat{R}_1 = \hat{T}_1$ (ext \angle Δ) $\hat{W} = 40^\circ$	✓ $\hat{W} + \hat{R}_1 = \hat{T}_1$ ✓ $\hat{W} = 40^\circ$	(2)
8.2.3	$\hat{R}_2 = 40^\circ$ (tan \perp radius) $\hat{P}_1 = 40^\circ$ (\angle s in same seg)	✓ $\hat{R}_2 = 40^\circ$ ✓ $\hat{P}_1 = 40^\circ$ ✓ \angle s in same seg	(3)

<p>8.2.4</p>	<p>$\hat{P}_1 = \hat{W}$ ($= 40^\circ$) WVPT is a cyclic quadrilateral (ext $\angle =$ int opp) $\hat{V}_1 = \hat{P}\hat{T}\hat{S}$ (ext \angle cyclic quad)</p> <p>OR</p> <p>$\hat{T}_1 = 90^\circ$ (\angles in semi circle) $\hat{P}\hat{T}\hat{S} = 90^\circ + \hat{T}_2$ $\hat{T}_2 = \hat{S}_1$ (\angles in same seg) $\hat{P}\hat{T}\hat{S} = 90^\circ + \hat{S}_1$ $\hat{V}_1 = 90^\circ + \hat{S}_1$ (ext $\angle \Delta$) $\hat{V}_1 = \hat{P}\hat{T}\hat{S}$</p> <p>OR</p> <p>$\hat{P}_2 = 140^\circ$ (\angles on str line) $\hat{W} + \hat{P}_2 = 180^\circ$ WVPT is cyclic quad (opp \angles suppl) $\hat{V}_1 = \hat{P}\hat{T}\hat{S}$ (ext \angle cyclic quad)</p> <p>OR</p> <p>$\hat{V}_1 = \hat{R}_1 + \hat{R}_2 + \hat{S}_1$ (ext $\angle \Delta$) $\hat{V}_1 = 90^\circ + \hat{S}_1$ $\hat{P}\hat{T}\hat{S} = 90^\circ + \hat{T}_2$ But $\hat{T}_2 = \hat{S}_1$ (\angles in same seg) $\hat{V}_1 = \hat{P}\hat{T}\hat{S}$</p> <p>OR</p> <p>In $\Delta P\hat{T}\hat{S}$ and $\Delta W\hat{V}\hat{S}$ $\hat{P}_1 = \hat{W}$ ($= 40^\circ$) \hat{S}_2 is common $\hat{V}_1 = \hat{P}\hat{T}\hat{S}$ (\angle sum Δ)</p>	<p>✓ $\hat{P}_1 = \hat{W}$ ✓ WVPT is a cyclic quadrilateral ✓ ext $\angle =$ in opp ✓ ext \angle cyclic quad (4)</p> <p>✓ \angles in semi circle ✓ $\hat{P}\hat{T}\hat{S} = 90^\circ + \hat{T}_2$ ✓ $\hat{T}_2 = \hat{S}_1$ ✓ \angles in same seg (4)</p> <p>✓ $\hat{W} + \hat{P}_2 = 180^\circ$ ✓ WVPT is a cyclic quadrilateral ✓ opp \angle suppl ✓ ext \angle cyclic quad (4)</p> <p>✓ $\hat{V}_1 = 90^\circ + \hat{S}_1$ ✓ $\hat{P}\hat{T}\hat{S} = 90^\circ + \hat{T}_2$ ✓ $\hat{T}_2 = \hat{S}_1$ ✓ \angles in same seg (4)</p> <p>✓ identification of triangles ✓ $\hat{P}_1 = \hat{W}$ ✓ \hat{S}_2 is common ✓ \angle sum Δ (4)</p> <p>[15]</p>
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QUESTION 9

9. $\hat{C} = 90^\circ$ (\angle s in semi circle)
 $\hat{OEA} = 90^\circ$ (corres \angle s; $OD \parallel BC$)
 $AE = 8 \text{ cm}$ (line from circ cent \perp ch bis ch)
 $OE = 6 \text{ cm}$ (Pythagoras)
 $ED = 10 - 6 = 4 \text{ cm}$

OR

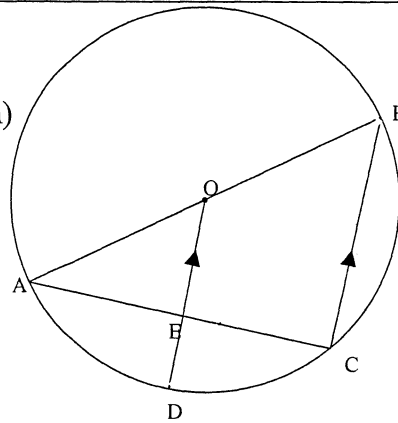
$\hat{C} = 90^\circ$ (\angle s in semi circle)
 $\hat{OEA} = 90^\circ$ (corres \angle s; $OD \parallel BC$)
 $OE \parallel BC$ (given)
 $OA = OB$ (radii)
 $AE = EC = 8 \text{ cm}$ (midpoint theorem)
 $OE = 6 \text{ cm}$ (Pythagoras)
 $ED = 10 - 6 = 4 \text{ cm}$

OR

$\hat{C} = 90^\circ$ (\angle s in semi circle)
 $BC^2 = (20)^2 - (16)^2$
 $BC^2 = 144$
 $BC = 12$
 $OE = \frac{1}{2} BC$ (midpoint theorem)
 $OE = 6 \text{ cm}$
 $OD = 10 \text{ cm}$
 $ED = 10 - 6 = 4 \text{ cm}$

OR

$\hat{C} = 90^\circ$ (\angle s in semi circle)
 $BC^2 = (20)^2 - (16)^2$
 $BC^2 = 144$
 $BC = 12$
 $OE = \frac{1}{2} BC$ (midpoint theorem)
 $OE = 6 \text{ cm}$
 $ED = 4 \text{ cm}$



✓ $\hat{C} = 90^\circ$
 ✓ $\hat{OEA} = 90^\circ$
 ✓ line from circ cent \perp ch bis ch
 ✓ $OE = 6 \text{ cm}$
 ✓ $ED = 4 \text{ cm}$

✓ $\hat{C} = 90^\circ$
 ✓ $\hat{OEA} = 90^\circ$
 ✓ midpoint theorem
 ✓ $OE = 6 \text{ cm}$
 ✓ $ED = 4 \text{ cm}$

✓ $\hat{C} = 90^\circ$
 ✓ $BC = 12$
 ✓ reason
 ✓ $OE = 6 \text{ cm}$
 ✓ $ED = 4 \text{ cm}$

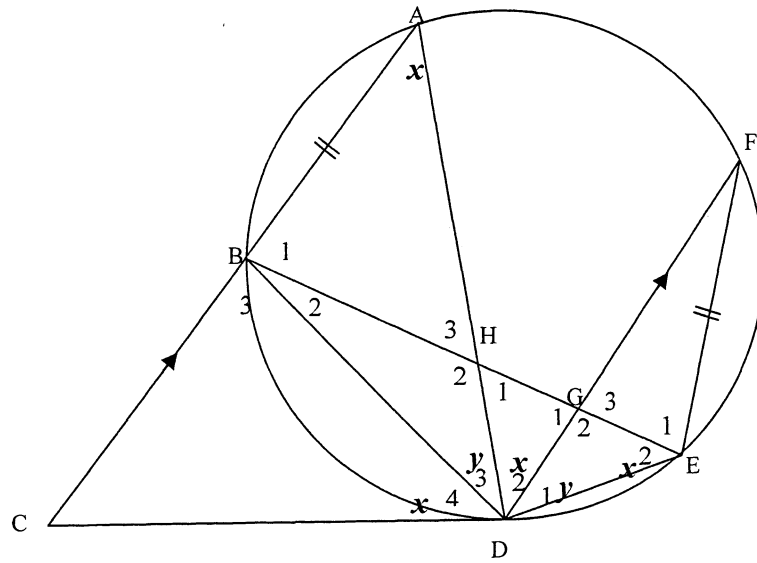
[5]

✓ $\hat{C} = 90^\circ$
 ✓ $BC = 12$
 ✓ reason

✓ $OE = 6 \text{ cm}$
 ✓ $ED = 4 \text{ cm}$

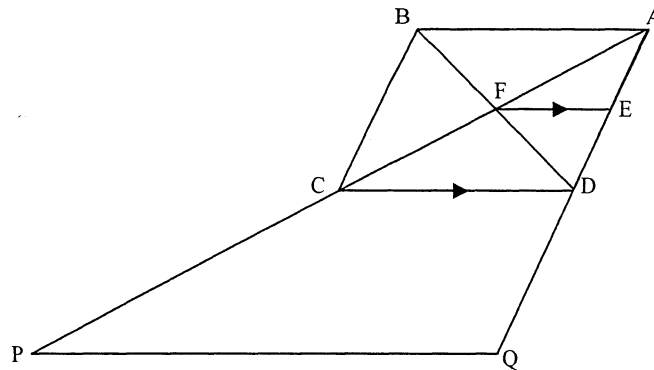
[5]

QUESTION 10



<p>10.1</p>	<p>$\hat{A} = \hat{D}_4 = x$ (tan ch th) $\hat{E}_2 = x$ (tan ch th) OR (\angles in same seg) $\hat{D}_2 = \hat{A} = x$ (alt \angles; CA \parallel DF)</p>	<p>✓ $\hat{A} = x$ ✓ tan ch th ✓ $\hat{E}_2 = x$ ✓ reason ✓ $\hat{D}_2 = x$ ✓ alt \angles; CA \parallel DF (6)</p>
<p>10.2</p>	<p>In $\triangle BHD$ and $\triangle FED$ 1. $\hat{B}_2 = \hat{F}$ (\angles in same seg) 2. $\hat{D}_3 = \hat{D}_1$ (= chs subt = \angles) $\triangle BHD \parallel \triangle FED$ ($\angle\angle\angle$)</p>	<p>✓ $\hat{B}_2 = \hat{F}$ ✓ \angles in same seg ✓ $\hat{D}_3 = \hat{D}_1$ ✓ = chs subt = \angles ✓ $\angle\angle\angle$ (5)</p>
<p>10.3</p>	<p>$\frac{FE}{BH} = \frac{FD}{BD}$ ($\parallel \Delta$s) But FE = AB (given) $\frac{AB}{BH} = \frac{FD}{BD}$ AB.BD = FD.BH</p>	<p>✓ $\frac{FE}{BH} = \frac{FD}{BD}$ ✓ FE = AB (2) [13]</p>

QUESTION 11



11.1	$AF = FC$ (diags of parallelogram bisect) $FE \parallel CD$ $AE = ED$ (Prop Th; $FE \parallel CD$) OR (Midpoint Theorem)	✓ $AF = FC$ ✓ reason (2)
11.2	$\frac{AC}{CP} = \frac{1}{2}$ (given) $\frac{AD}{DQ} = \frac{1}{2}$ (given) $\frac{AC}{CP} = \frac{AD}{DQ}$ $CD \parallel PQ$ (converse proportionality theorem) $CD \parallel FE$ (given) $\therefore PQ \parallel FE$ OR $\frac{AC}{AP} = \frac{1}{3}$ $\frac{AD}{AQ} = \frac{1}{3}$ $\frac{AC}{AP} = \frac{AD}{AQ}$ $CD \parallel PQ$ (converse proportionality theorem) $CD \parallel FE$ (given) $\therefore PQ \parallel FE$ OR $\frac{AF}{AP} = \frac{1}{6}$ $\frac{AE}{AQ} = \frac{1}{6}$ $\frac{AF}{AP} = \frac{AE}{AQ}$ $\therefore PQ \parallel FE$ (converse proportionality theorem)	✓ ratios equal ✓ $CD \parallel PQ$ ✓ reason: converse prop th and conclusion (3) ✓ ratios equal ✓ $CD \parallel PQ$ ✓ reason: converse prop th and conclusion (3) ✓ $\frac{AF}{AP} = \frac{1}{6}$ ✓ $\frac{AF}{AP} = \frac{AE}{AQ}$ ✓ conv prop theorem

<p>11.3</p> <p>In $\triangle AEF$ and $\triangle APQ$</p> <ol style="list-style-type: none"> 1. \hat{A} is common 2. $\hat{A}\hat{E}F = \hat{A}\hat{Q}P$ (corres \angles; $FE \parallel PQ$) 3. $\hat{A}\hat{F}E = \hat{A}\hat{P}Q$ (corres \angles; $FE \parallel PQ$) <p>$\therefore \triangle AEF \parallel \triangle APQ$ ($\angle\angle\angle$)</p> $\frac{FE}{PQ} = \frac{AF}{AP} \quad (\parallel \Delta\text{s})$ $\frac{FE}{60} = \frac{1}{6}$ <p>$FE = 10 \text{ cm}$</p> <p>OR</p> <p>In $\triangle ADC$ and $\triangle APQ$</p> <ol style="list-style-type: none"> 1. \hat{A} is common 2. $\hat{A}\hat{D}C = \hat{A}\hat{Q}P$ (corres \angles; $CD \parallel PQ$) 3. $\hat{A}\hat{C}D = \hat{A}\hat{P}Q$ (corres \angles; $CD \parallel PQ$) <p>$\therefore \triangle ADC \parallel \triangle APQ$ ($\angle\angle\angle$)</p> $\frac{AC}{AP} = \frac{AD}{AQ} = \frac{1}{3} \quad (\parallel \Delta\text{s})$ $CD = \frac{1}{3} PQ$ <p>$CD = 20 \text{ cm}$</p> <p>But $AF = FC$</p> <p>$AE = ED$ (Midpoint Theorem)</p> $FE = \frac{1}{2} CD$ <p>$FE = 10 \text{ cm}$</p>	<div style="border: 1px solid black; padding: 5px; margin: 10px auto; width: fit-content;"> <p>NOTE: If the similarity has not been proven, then max 3/5 marks</p> </div> <p>✓ first pair of angles equal with reason ✓ second pair of angles equal with reason</p> <p>✓ $\frac{AF}{AP} = \frac{1}{6}$ ✓ $\frac{FE}{PQ} = \frac{AF}{AP}$ ✓ answer (5)</p> <p>✓ first pair of angles equal with reason ✓ second pair of angles equal with reason</p> <p>✓ $CD = \frac{1}{3} PQ$</p> <p>✓ $FE = \frac{1}{2} CD$ ✓ answer (5)</p> <p style="text-align: right;">[10]</p>
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TOTAL: 100