



Department: Education

PROVINCE OF KWAZULU-NATAL

NATIONAL SENIOR CERTIFICATE

GRADE 12

MATHEMATICS P2

PREPARATORY EXAMINATION

SEPTEMBER 2020

MARKS: 150

TIME:

3 hours

This question paper consists of 11 pages and an information sheet.

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INSTRUCTIONS AND INFORMATION

Read the following instructions carefully before answering the questions:

- 1. This question paper consists of **10** questions.
- 2. Answer ALL the questions.
- 3. Clearly show ALL calculations, diagrams, graphs, et cetera, which you have used in determining the answers.
- 4. Answers only will not necessarily be awarded full marks.
- 5. You may use an approved scientific calculator (non-programmable and non-graphical), unless stated otherwise.
- 6. If necessary, round off answers to TWO decimal places, unless stated otherwise.
- 7. Diagrams are NOT necessarily drawn to scale.
- 8. Number the answers correctly according to the numbering system used in this question paper.
- 9. Write neatly and legibly.

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QUESTION 1

The total number of red cards issued per country to players during a soccer competition are given in the table below:

NUMBER OF RED CARDS	NUMBER OF COUNTRIES (f)	MIDPOINT OF INTERVAL (x)	f.x
$0 < x \le 2$	27		
$2 < x \le 4$	15		
$4 < x \le 6$	5		
$6 < x \le 8$	5		
$8 < x \le 10$	3		
TOTAL			

1.1 Calculate the estimated mean of the number of red cards bel country.	country. (.	oer country.	an of the number of red cards per country.	of the number of i	mean of th	ie estimated	Calculate the	1.1
--	-------------	--------------	--	--------------------	------------	--------------	---------------	-----

- 1.2 Draw an ogive curve to represent the above data. (3)
- 1.3 Calculate the interquartile range of the number of red cards issued per country in the competition. (2)

[8]

QUESTION 2

The table below shows a relationship between the monthly rent (x) a person pays for an apartment and the person's monthly income (y). Both are given in thousands of rands.

YEAR	2003	2004	2005	2006	2007	2008
Rent (x)	2	3	3,5	5,2	5,6	6
Income (y)	9	13,5	15	16,5	17	20

2.1	Determine the equation of the regression line.	(4)

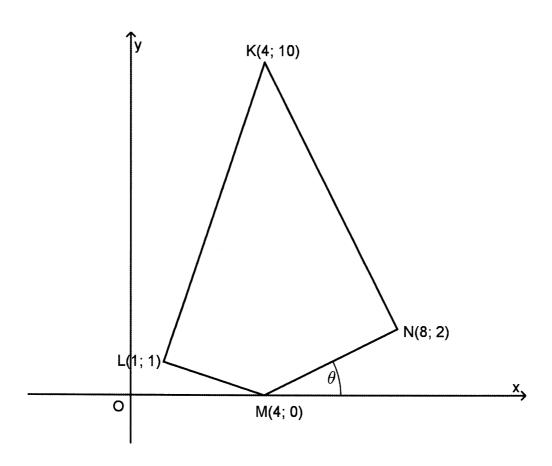
- 2.2 Determine the estimated monthly income if the rent per month is R9000. (2)
- 2.3 Calculate the value of the correlation coefficient. (2)
- 2.4 Describe the relationship between the monthly rent and the monthly income. (2)

[10]

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QUESTION 3

In the diagram KLMN is a quadrilateral with K(4; 10), L(1; 1), M(4; 0) and N(8; 2).



3.1 Determine the:

3.1.1 gradient of LM and MN (4)

3.1.2 length of KM. (2)

3.1.3 value of θ (2)

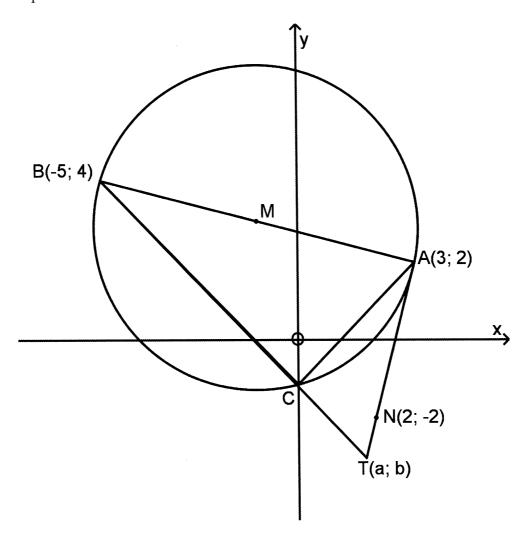
3.1.4 midpoint of LN (2)

3.2 Show that $KL \perp LM$ (3)

3.3 Prove that KLMN is a cyclic quadrilateral. (4)

[17]

In the sketch below, AB is a diameter with coordinates A(3; 2) and B(-5; 4) of circle ABC. M is the centre of the circle. BC produced meets AT in T. N(2; -2) is a point on the line TA. C is the y – intercept of the circle.



- 4.1 Determine the co-ordinates of M the centre of the circle (2)
- 4.2 Write down the equation of the circle in the form $(x-p)^2 + (y-q)^2 = r^2$ (3)
- 4.3 Prove that TA is a tangent to the circle at A. (5)
- 4.4 Determine the equations of the lines

4.4.2 BT
$$(6)$$

4.5 If the coordinates of T are (a; b), calculate the values of a and b. (3)

[23]

QUESTION 5

5.1 Without using a calculator, evaluate

$$\cos 79^{\circ} \cos 311^{\circ} + \sin 101^{\circ} \sin 49^{\circ} \tag{4}$$

5.2 Given: $\sin (x + y) = 3 \sin (x - y)$

Prove that:
$$\tan x = 2 \tan y$$
 (4)

5.3 Given:
$$\frac{\cos x}{\sin 2x} - \frac{\cos 2x}{2\sin x} = \sin x$$

5.3.1 Prove that
$$\frac{\cos x}{\sin 2x} - \frac{\cos 2x}{2\sin x} = \sin x \tag{4}$$

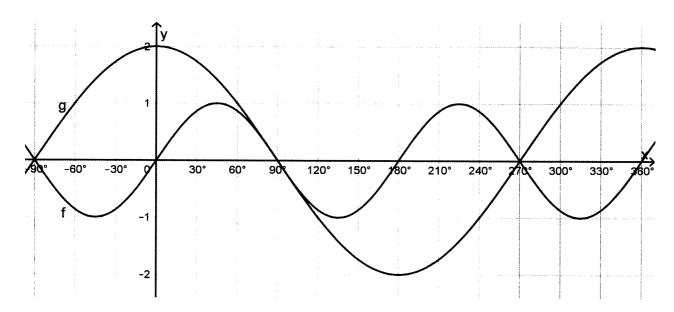
5.3.2 Hence, solve for x where $x \in [0^{\circ}; 360^{\circ}]$:

$$1 + 2\cos 2x = \frac{\cos 2x}{2\sin x} - \frac{\cos x}{\sin 2x} \tag{6}$$

[18]

QUESTION 6

In the diagram, the graphs of $f(x) = a \sin bx$ and $g(x) = c \cos dx$ are drawn for the interval $x \in [-90^\circ; 360^\circ]$



6.2 Write down the period of
$$g$$
. (1)

6.3 Determine the value(s) of x in the interval $x \in [-90^{\circ}; 360^{\circ}]$, for which

$$6.3.1 \quad f(x) \le g(x) \tag{2}$$

6.3.2
$$f'(x) \times g'(x) > 0$$
 where $g(x) > 0$ (3)

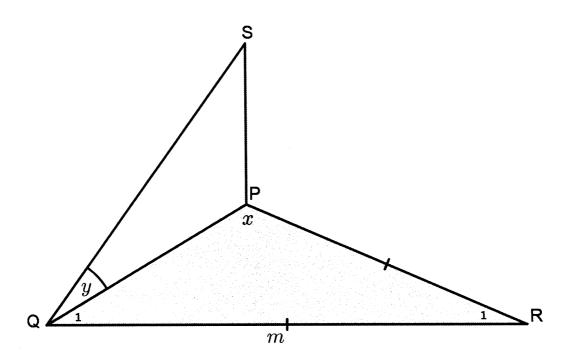
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(4)

[10]

QUESTION 7

In the diagram P, Q and R are three points in the same horizontal plane. PR = QR = m, $Q\hat{P}R = x$. SP is perpendicular to PQ. The angle of elevation of S from Q is y.

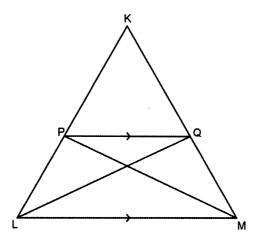


- 7.1 Express the area of $\triangle PQR$ in terms of x and m. (5)
- 7.2 Show that $PQ = 2m \cos x$ (4)
- 7.3 Hence, prove that $SP = 2m \cos x \tan y$ (2)

[11]

QUESTION 8

8.1 In the diagram below Δ KLM is given, with P and Q lying on KL and KM respectively such that PQ || LM. PM and LQ are drawn.

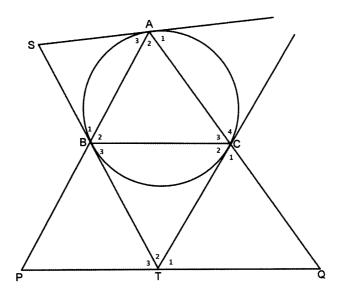


Prove that
$$\frac{KP}{PL} = \frac{KQ}{QM}$$
 (6)

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8.2 In the diagram, SBT, SA and TC are tangents to the circle at B, A and C respectively. AB is produced to P and AC is produced to Q such that T lies on the line PQ.

In
$$\triangle APQ$$
, $\frac{AB}{AP} = \frac{AC}{AQ}$.



Use the above information to prove:

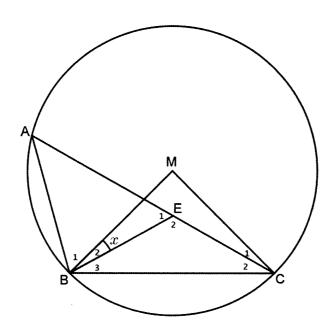
8.2.1
$$\hat{A}_2 = \hat{T}_1$$
 (4)

8.2.2
$$\triangle ABC /// \triangle TCQ$$
 (4)

[23]

QUESTION 9

In the diagram, M is the centre of the circle through A, B and C. E is on AC. AC bisects \hat{MCB} and EB bisects \hat{MBC} . $\hat{B}_2 = x$



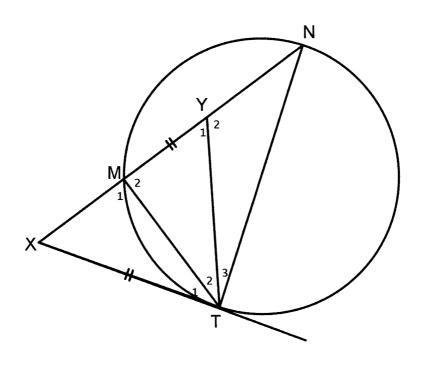
9.1 Determine the size of \hat{E}_2 in terms of x. (4)

9.2 Show
$$BAC = 90^{\circ} - 2x$$
 (3)

9.3 Prove that AE is a diameter of circle ABE. (5)

[12]

10.1 In the diagram XMN is a straight line and XT is a tangent to the circle. Y is a point on XN so that XY = XT.



Prove that:

$$10.1.2 \frac{XM}{XT} = \frac{XT}{XN} \tag{6}$$

10.2 Given that MY = 20 mm, YN = 50 mm and XT = k mm:

10.2.1 Express XM in terms of
$$k$$
. (3)

10.2.2 Calculate the length of
$$k$$
. (4)

[18]

TOTAL MARKS: 150

FORMATION SHEET: MATHEMATICS

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

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

$$A = P(1 - ni)$$

$$A = P(1-i)'$$

$$A = P(1+i)^n$$

$$T_n = a + (n-1)d$$

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

$$T_n = ar^{n-1}$$

$$S_n = \frac{a(r^n - 1)}{r - 1}$$

$$r \neq 1$$

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

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

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

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

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

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

$$M\left(\frac{x_1+x_2}{2}; \frac{y_1+y_2}{2}\right)$$

$$y = mx + c$$

$$y - y_1 = m(x - x_1)$$

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

$$m = \tan \theta$$

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

In
$$\triangle ABC$$
: $\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$ $a^2 = b^2 + c^2 - 2bc \cdot \cos A$ area $\triangle ABC = \frac{1}{2}ab \cdot \sin C$

$$a^2 = b^2 + c^2 - 2bc \cdot \cos A$$

$$area \Delta ABC = \frac{1}{2}ab.\sin C$$

$$\sin(\alpha + \beta) = \sin \alpha \cdot \cos \beta + \cos \alpha \cdot \sin \beta$$

$$\cos(\alpha + \beta) = \cos \alpha \cdot \cos \beta - \sin \alpha \cdot \sin \beta$$

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

$$\cos(\alpha - \beta) = \cos\alpha \cdot \cos\beta + \sin\alpha \cdot \sin\beta$$

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

$$\sin 2\alpha = 2\sin \alpha.\cos \alpha$$

$$\bar{x} = \frac{\sum f.x}{n}$$

$$\mathbf{p}(A) = n(\mathbf{A})$$

$$P(A) = \frac{n(A)}{n(S)}$$

$$\hat{y} = a + bx$$

$$\sigma^2 = \frac{\sum_{i=1}^n (x_i - \overline{x})^2}{n}$$

$$P(A \text{ or } B) = P(A) + P(B) - P(A \text{ and } B)$$

$$b = \frac{\sum (x - \overline{x})(y - \overline{y})}{\sum (x - \overline{x})^2}$$



TIME: 3 hours

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MATHEMATICS P2

PREPARATORY EXAMINATION

SEPTEMBER 2020

SPECIAL ANSWER BOOK

NATIONAL SENIOR CERTIFICATE

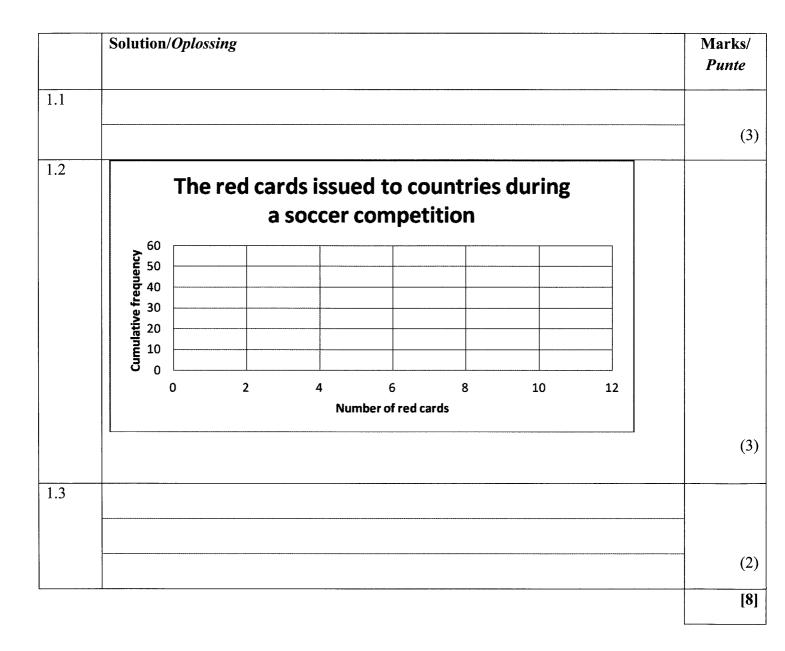
GRADE 12

NAME OF CANDIDATE:		
	150	

This answer book consists of 20 pages

QUESTION 1

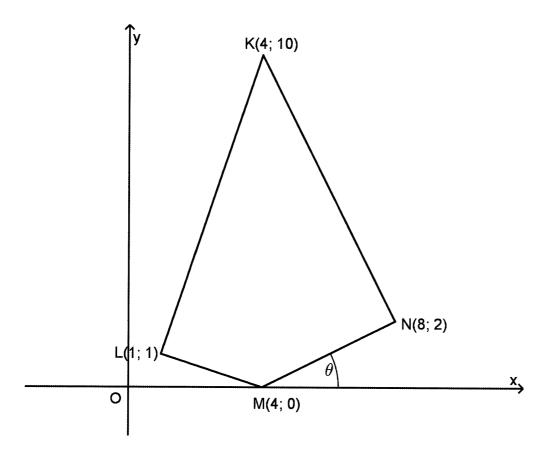
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$8 < x \le 10$	3		
TOTAL			



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Income (y)	9	13,5	15	16,5	17	20

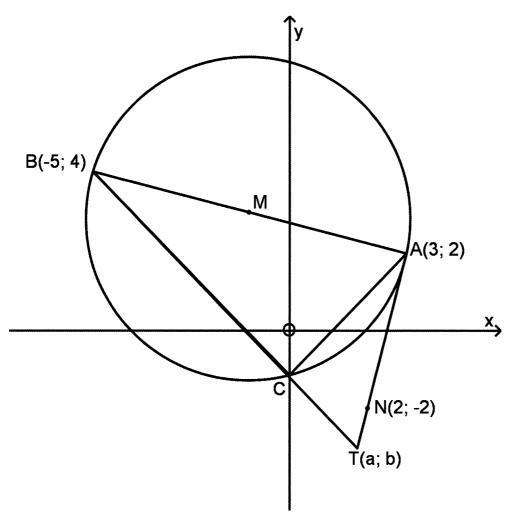
	Solution/Oplossing	Marks/ Punte
2.1		
		(4)
2.2		
		(2)
2.3		
		(2)
2.4		(2)
		[10]



	Solution/Oplossing	Marks/
		Punte
3.1.1		
		(4)
3.1.2		
		(2)
		, í

Solution/Oplossing	Marks/ Punte
3.1.3	
	(2)
3.1.4	
	_
	(2)
3.2	
	(3)
3.3	
	(4)
	[17]

QUESTION 4



	Solution/Oplossing	Marks/ Punte
		Punte
4.1		
		(2)
4.2		
		(3)

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	Solution/Oplossing	Marks/
		Punte
4.3		
		(5)
4.4.1		
		(4)
		(-7)
4.4.2		
		(6)
		(6)
1		

	Solution/Oplossing	Marks/
		Punte
4.5		
		(3)
		[23]

QUESTION 5

	Solution/Oplossing	Marks/ Punte
5.1		
		_
		(4)
5.2		
		_

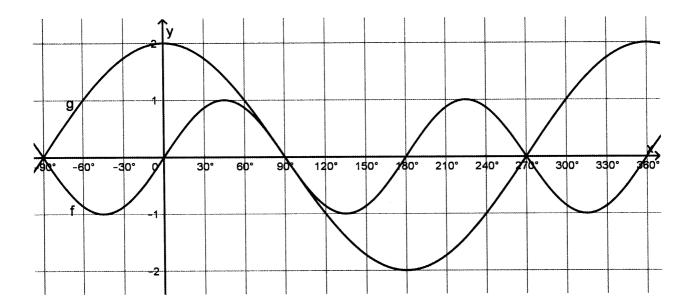
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	Solution/Oplossing	Marks/ Punte
5.2 (CONT)		
,		
		(4)
5.3.1		(4)
3.3.1		
		(4)
		(4)

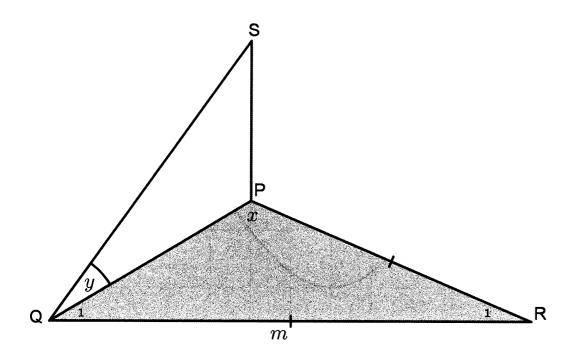
	Solution/Oplossing	Marks/ Punte
5.3.2		
		(6)

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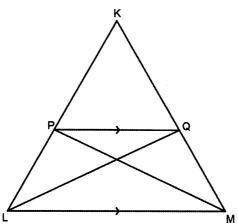
	Solution/Oplossing	Marks/ Punte
6.1		
		(4)
6.2		
		(1)
6.3.1		
		(2)
6.3.2		
		(3)
		[10]



	Solution/Oplossing	Marks/ Punte
7.1		1 mile
		_
		_
		(5)
		(5)

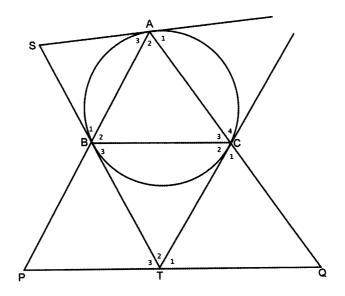
	Solution/Oplossing	Marks/ Punte
7.2		
		(4)
7.3		
		-
		_
		_
		(2)
		[11]
		[**]

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	Solution/Oplossing	Marks/ Punte
8.1		
		(6)

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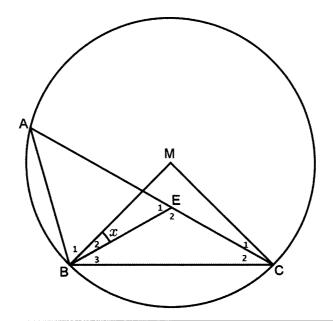
	Solution/Oplossing	Marks/ Punte
8.2.1		
		(4)
8.2.2		
		(4)

	Solution/Oplossing	Marks/ Punte
8.2.3		Tunc
		(4)
8.2.4		
		
		(5)
		[23]

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QUESTION 9



	Solution/Oplossing	Marks/ Punte
9.1		
		(4)
9.2		
		(2)
		(3)

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	Solution/Oplossing	Marks/ Punte
9.3		
		(5)
		[12]
		[14]

QUESTION 10

	Solution/Oplossing	Marks/ Punte
10.1.1		
		(5)

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	Solution/Oplossing	Marks/ Punte
10.1.2		
		(6)
10.2.1		
10.2.1		
		(3)
10.2.2		
		(4)
		[18]
		[10]

TOTAL: 150

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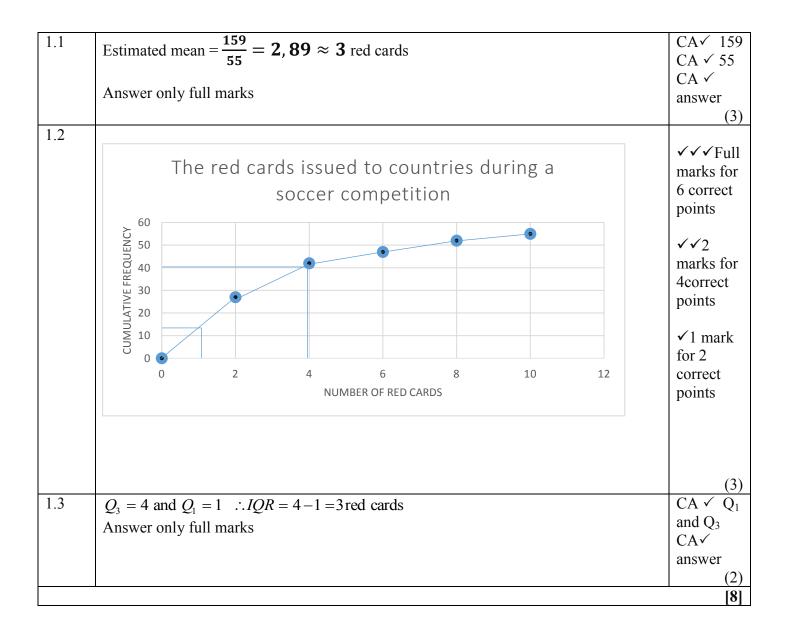
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PREPARATORY EXAMINATION
SEPTEMBER 2020
MARKING GUIDLINES

MARKS: 150

TIME: 3 hours

This marking guideline consists of 12 pages.

NUMBER OF RED CARDS	NUMBER OF COUNTRIES (f)	MIDPOINT OF INTERVAL (x)	f. x
$0 < x \le 2$	27	1	27
$2 < x \le 4$	15	3	45
$4 < x \le 6$	5	5	25
$6 < x \le 8$	5	7	35
$8 < x \le 10$	3	9	27
TOTAL	55		159



2.1	A = 5,97; B = 2,18	A ✓ for A
	Y = 5.97 + 2.18 x	A √ for B
		A✓✓
		For equation
	Answer only full marks	(4)
2.2	Estimated monthly income	CA✓
	y = 5.97 + 2.18(9)	substitution
	= 25,59	CA√ answer
	∴ Monthly income = R25598,89	(2)
	If 9000 is used only 1 mark	
2.3	r = 0.94	CA✓✓ (2)
2.4	Very strong positive relationship between the monthly rent and the monthly	CA ✓ strong
	income.	CA ✓ positive
		(2)
		[10]

3.1.1	0-1 1	A✓ sub into correct formula
	$m_{LM} = \frac{0-1}{4-1} = -\frac{1}{3}$	
		$A \checkmark -\frac{1}{3}$
	$m_{MN} = \frac{2-0}{8-4} = \frac{1}{2}$	
	$\frac{m_{MN}}{8} = 8 - 4 = 2$	A✓ Sub into correct formula
		$A \checkmark \frac{1}{2}$
		2
		(4)
3.1.2	$KM = \sqrt{(4-4)^2 + (10-0)^2}$	CA ✓ subst
	$=\sqrt{100}$	CA ✓10 units
	= 10 units	(2)
	Answer only full marks	
3.1.3	1	z 1
	$m_{MN} = \frac{1}{2}$	$CA \checkmark \tan \theta = \frac{1}{2}$
	$\tan \theta = \frac{1}{2}$	_
	$oldsymbol{L}$	
	$\theta = 26,57^{\circ}$	CA $\checkmark \theta = 26,57^0$ provided acute
	Answer only full marks	angle
2.1.4		(2)
3.1.4	$\left(\frac{x_1+x_2}{2};\frac{y_1+y_2}{2}\right)$	A√correct substitution
	(1+8, 1+2)	
	$\left(\frac{1+8}{2};\frac{1+2}{2}\right)$	
	(9,3)	
	$\left(\frac{9}{2};\frac{3}{2}\right)$	A√answer (2)
3.2	$m_{KL} = \frac{10-1}{4-1} = 3$	A√subst
	$m_{KL} \times m_{LM} = 3 \times \left(-\frac{1}{3}\right)$	A ✓ 3
	= -1	$A \checkmark product = -1$
	$\therefore KL \perp LM$	Av product -1 (3)
3.3	10 - 2	(3)
	$m_{KN} = \frac{1}{4-8}$	
	=-2	A✓M _{KN} -2
	, IZNI I NIM	A√KN ⊥ MN
	$ \begin{array}{l} \therefore KN \perp NM \\ \therefore K\widehat{L}M + K\widehat{N}M = 180^{\circ} \end{array} $	$A \checkmark KN \perp MN$ $A \checkmark Sum of 180°$
	$\therefore KLM + KNM = 180^{\circ}$ \times KLMN is cyclic quadrilateral (converse, opp \angle^s of a cyclic	
	quad are supplementary)	$M_{MN} = \frac{1}{2} : (-2) \left(\frac{1}{2}\right) = -1$
		A√ reason
		(4)
		[17]

4.1 $M\left(\frac{-5+3}{2}:\frac{4+2}{2}\right) = M(-1;3)$ $A \lor x = -1$ $A \lor y = 3$ (2) 4.2 $r^2 = BM^2 = (-5+1)^2 + (4-3)^2 = 17$ $CA \lor \text{ subst into equation}$ $CA \lor r^2 = 17$ $CA \lor \text{ equation}$ For CA marks coordinates of M must be in second quadrant must be in second quadrant must be in second quadrant $A \lor m_{AM} \text{ or } m_{BA}$ $A \lor m_{AM} \text{ or } m_{AM} o$		T . O . 4 . O	
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	4.1	$\left M \left(-5 + 3 \cdot 4 + 2 \right) - M \left(1 \cdot 2 \right) \right $	$A \checkmark x = -1$
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$		$M(\frac{1}{2}; \frac{1}{2}) = M(-1; 3)$	$A \checkmark v = 3$
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$			
$ \begin{array}{c} \therefore (x+1)^2 + (y-3)^2 = 17 \\ \\ \begin{array}{c} \text{CA} \checkmark \text{ equation} \\ \text{For CA marks coordinates of M} \\ \text{must be in second quadrant} \\ \\ \begin{array}{c} 4.3 \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\$			
$ \begin{array}{c} \therefore (x+1)^2 + (y-3)^2 = 17 \\ \\ \end{array} \begin{array}{c} \text{CA} \checkmark \text{ equation} \\ \text{For CA marks coordinates of M} \\ \text{must be in second quadrant} \\ \end{array} \\ \begin{array}{c} 4.3 \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\$	4.2	$ r^2 = BM^2 = (-5+1)^2 + (4-3)^2 = 17$	CA✓ subst into equation
$ \begin{array}{c} \therefore (x+1)^2 + (y-3)^2 = 17 \\ \\ \end{array} \begin{array}{c} \text{CA} \checkmark \text{ equation} \\ \text{For CA marks coordinates of M} \\ \text{must be in second quadrant} \\ \end{array} \\ \begin{array}{c} 4.3 \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\$			$C\Delta\sqrt{r^2}=17$
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4.4.2 Let $C(x; y)$ $\therefore (x+1)^2 + (y-3)^2 = 17$ $At C; x = 0$ $\therefore (0+1)^2 + (y-3)^2 = 17$ $(y-3)^2 = 16$ $y-3 = \pm 4$ $y = 7 \text{ or } y = -1$ $\therefore C(0; -1)$ $m_{BC} = \frac{-1-4}{0+5} = -1$ $Now y = -x - 1$ $\frac{-1}{5x} = 9$ $x = \frac{9}{5} = a$ $b = -\frac{9}{5} - 1 = -2\frac{4}{5}$ $CA \checkmark \text{ equation of circle}$ $CA \checkmark \text{ subst } x = 0$ $CA \checkmark \text{ y values}$ $CA \checkmark \text{ co-ordinate}$ $CA \checkmark \text{ equation}$ $CA \checkmark \text{ equation}$ $CA \checkmark \text{ equations equal}$ $CA \checkmark \text{ equations equal}$ $CA \checkmark \text{ value of a}$ $CA \checkmark \text{ value of b, For CA marks}$ $A \text{ and B are points in the } 4^{th}$ $quadrant$ (3)		_ ~ ~	
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4.4.2 Let $C(x; y)$ $\therefore (x + 1)^2 + (y - 3)^2 = 17$ $At C; x = 0$ $\therefore (0 + 1)^2 + (y - 3)^2 = 17$ $(y - 3)^2 = 16$ $y - 3 = \pm 4$ $y = 7 \text{ or } y = -1$ $\therefore C(0; -1)$ $m_{BC} = \frac{-1 - 4}{0 + 5} = -1$ $\text{Now } y = -x - 1$ $\frac{1}{5x = 9}$ $x = \frac{9}{5} = a$ $b = -\frac{9}{5} - 1 = -2\frac{4}{5}$ $CA \checkmark \text{ equation of circle}$ $CA \checkmark \text{ subst } x = 0$ $CA \checkmark \text{ y values}$ $CA \checkmark \text{ co-ordinate}$ $CA \checkmark \text{ equation}$ $CA \lor \text$			(4)
$\therefore (x+1)^2 + (y-3)^2 = 17$ At C; $x = 0$ $\therefore (0+1)^2 + (y-3)^2 = 17$ $(y-3)^2 = 16$ $y-3 = \pm 4$ $y = 7 \text{ or } y = -1$ $\therefore C(0; -1)$ $m_{BC} = \frac{-1-4}{0+5} = -1$ Now $y = -x - 1$ $5x = 9$ $x = \frac{9}{5} = a$ $b = -\frac{9}{5} - 1 = -2\frac{4}{5}$ CA \(\text{equation of circle} \) CA \(\text{subst } x = 0 \) CA \(\text{subst } x = 0 \) CA \(\text{values} \) CA \(\text{values} \) CA \(\text{values} \) CA \(\text{value of a} \) CA \(\text{value of b, For CA marks} \) A and B are points in the 4 th quadrant (3)	112	Lot C(v: v)	
At C; $x = 0$	4.4.2		
		$\therefore (x+1)^2 + (y-3)^2 = 17$	CA✓ equation of circle
			_
$(y-3)^2 = 16$ $y-3 = \pm 4$ $y = 7 \text{ or } y = -1$ $\therefore C(0; -1)$ $m_{BC} = \frac{-1-4}{0+5} = -1$ $\text{Now } y = -x - 1$ $4.5 \text{ Lines AT and BT intersect at C}$ $\therefore 4x - 10 = -x - 1$ $5x = 9$ $x = \frac{9}{5} = a$ $b = -\frac{9}{5} - 1 = -2\frac{4}{5}$ $\text{CA} \checkmark \text{ values}$ $\text{CA} \checkmark \text{ ordinate}$ $\text{CA} \checkmark \text{ equation}$ $\text{CA} \checkmark \text{ equations equal}$ $\text{CA} \checkmark \text{ value of a}$ $\text{CA} \checkmark \text{ value of a}$ $\text{CA} \checkmark \text{ value of b, For CA marks}$ $\text{A and B are points in the 4}^{\text{th}}$ quadrant (3)		,	CA /1
$y - 3 = \pm 4$ $y = 7 \text{ or } y = -1$ $\therefore C(0; -1)$ $m_{BC} = \frac{-1 - 4}{0 + 5} = -1$ $\text{Now } y = -x - 1$ $4.5 \text{ Lines AT and BT intersect at C}$ $x + 2x - 10 = -x - 1$ $5x = 9$ $x = \frac{9}{5} = a$ $b = -\frac{9}{5} - 1 = -2\frac{4}{5}$ $CA \checkmark \text{ values}$ $CA \checkmark \text{ equation}$ $CA \checkmark \text{ equations equal}$ $CA \checkmark \text{ value of a}$ $CA \checkmark \text{ value of b, For CA marks}$ $A \text{ and B are points in the } 4^{\text{th}}$ $quadrant$ (3)			$CA \vee subst X = 0$
$y - 3 = \pm 4$ $y = 7 \text{ or } y = -1$ $\therefore C(0; -1)$ $m_{BC} = \frac{-1 - 4}{0 + 5} = -1$ $\text{Now } y = -x - 1$ $4.5 \text{ Lines AT and BT intersect at C}$ $x + 2x - 10 = -x - 1$ $5x = 9$ $x = \frac{9}{5} = a$ $b = -\frac{9}{5} - 1 = -2\frac{4}{5}$ $CA \checkmark \text{ values}$ $CA \checkmark \text{ equation}$ $CA \checkmark \text{ equations equal}$ $CA \checkmark \text{ value of a}$ $CA \checkmark \text{ value of b, For CA marks}$ $A \text{ and B are points in the } 4^{\text{th}}$ $quadrant$ (3)		$(v-3)^2 = 16$	
$y = 7 \text{ or } y = -1$ $\therefore C(0; -1)$ $m_{BC} = \frac{-1 - 4}{0 + 5} = -1$ $\text{Now } y = -x - 1$ $4.5 \text{ Lines AT and BT intersect at C}$ $x = \frac{9}{5} = a$ $b = -\frac{9}{5} - 1 = -2\frac{4}{5}$ $CA \checkmark \text{ equation}$ $CA \checkmark \text{ equation}$ $CA \checkmark \text{ equations equal}$		• • • • • • • • • • • • • • • • • • • •	
$\therefore C(0; -1)$ $m_{BC} = \frac{-1 - 4}{0 + 5} = -1$ $\text{Now } y = -x - 1$ $4.5 \text{ Lines AT and BT intersect at C}$ $\therefore 4x - 10 = -x - 1$ $5x = 9$ $x = \frac{9}{5} = a$ $b = -\frac{9}{5} - 1 = -2\frac{4}{5}$ $\text{CA} \checkmark \text{ co-ordinate}$ $\text{CA} \checkmark \text{ equation}$ $\text{CA} \checkmark \text{ equations equal}$ $\text{CA} \checkmark \text{ value of a}$ $\text{CA} \checkmark \text{ value of b, For CA marks}$ $\text{A and B are points in the 4}^{\text{th}}$ equadrant $\text{CA} \checkmark \text{ value of b, For CA marks}$ $\text{A and B are points in the 4}^{\text{th}}$		<u> </u>	
$m_{BC} = \frac{-1 - 4}{0 + 5} = -1$ $Now y = -x - 1$ $4.5 \text{Lines AT and BT intersect at C}$ $\therefore 4x - 10 = -x - 1$ $5x = 9$ $x = \frac{9}{5} = a$ $b = -\frac{9}{5} - 1 = -2\frac{4}{5}$ $CA \checkmark \text{ equation}$ $CA \checkmark \text{ equations equal}$ $CA \checkmark \text{ value of a}$ $CA \checkmark \text{ value of b, For CA marks}$ $A \text{ and B are points in the 4}^{\text{th}}$ equations equal $CA \checkmark \text{ value of b, For CA marks}$ $A \text{ and B are points in the 4}^{\text{th}}$ equations equal $CA \checkmark \text{ value of b, For CA marks}$ $A \text{ and B are points in the 4}^{\text{th}}$ equations equal $CA \checkmark \text{ value of b, For CA marks}$ $A \text{ and B are points in the 4}^{\text{th}}$		y = 7 or y = -1	CA y values
$m_{BC} = \frac{-1 - 4}{0 + 5} = -1$ $Now y = -x - 1$ $4.5 \text{Lines AT and BT intersect at C}$ $\therefore 4x - 10 = -x - 1$ $5x = 9$ $x = \frac{9}{5} = a$ $b = -\frac{9}{5} - 1 = -2\frac{4}{5}$ $CA \checkmark \text{ equation}$ $CA \checkmark \text{ equations equal}$ $CA \checkmark \text{ value of a}$ $CA \checkmark \text{ value of b, For CA marks}$ $A \text{ and B are points in the 4}^{\text{th}}$ equations equal $CA \checkmark \text{ value of b, For CA marks}$ $A \text{ and B are points in the 4}^{\text{th}}$ equations equal $CA \checkmark \text{ value of b, For CA marks}$ $A \text{ and B are points in the 4}^{\text{th}}$ equations equal $CA \checkmark \text{ value of b, For CA marks}$ $A \text{ and B are points in the 4}^{\text{th}}$		$\therefore C(0:-1)$	CA√co-ordinate
$m_{BC} = \frac{1}{0+5} = -1$ Now $y = -x - 1$ 4.5 Lines AT and BT intersect at C			
Now $y = -x - 1$ CA equation (6) 4.5 Lines AT and BT intersect at C		$\frac{-1-4}{m} - \frac{-1}{m} = -1$	
Now $y = -x - 1$ CA equation (6) 4.5 Lines AT and BT intersect at C		$m_{BC} - \frac{1}{0+5} - \frac{1}{1}$	CA ✓ gradient
4.5 Lines AT and BT intersect at C		0 1 3	_
4.5 Lines AT and BT intersect at C			CA (agustian
Lines AT and BT intersect at C		Now $y = -x - 1$	CA v equation
Lines AT and BT intersect at C			
Lines AT and BT intersect at C			(6)
$\therefore 4x - 10 = -x - 1$ $5x = 9$ $x = \frac{9}{5} = a$ $b = -\frac{9}{5} - 1 = -2\frac{4}{5}$ CA \(\sim \) equations equal CA \(\sim \) value of a CA \(\sim \) value of b, For CA marks A and B are points in the 4 th quadrant (3)			(0)
$\therefore 4x - 10 = -x - 1$ $5x = 9$ $x = \frac{9}{5} = a$ $b = -\frac{9}{5} - 1 = -2\frac{4}{5}$ CA \(\sim \) equations equal CA \(\sim \) value of a CA \(\sim \) value of b, For CA marks A and B are points in the 4 th quadrant (3)	4.5	Lines AT and BT intersect at C	
$5x = 9$ $x = \frac{9}{5} = a$ $b = -\frac{9}{5} - 1 = -2\frac{4}{5}$ CA value of a CA value of b, For CA marks A and B are points in the 4 th quadrant (3)		$A_{r} - 10r - 1$	C∆√equations equal
$x = \frac{9}{5} = a$ $b = -\frac{9}{5} - 1 = -2\frac{4}{5}$ CA value of a CA value of b, For CA marks A and B are points in the 4 th quadrant (3)			Cris equations equal
A and B are points in the 4 th quadrant (3)		5x = 9	
A and B are points in the 4 th quadrant (3)		9	
A and B are points in the 4 th quadrant (3)		$x = \frac{1}{a} = a$	CA value of a
A and B are points in the 4 th quadrant (3)		5 ,	CA value of a
A and B are points in the 4 th quadrant (3)		h = 9 1 2 4	
A and B are points in the 4 th quadrant (3)		$D = -\frac{1}{6} - 1 = -2\frac{1}{6}$	CA√value of b For CA marks
quadrant (3)		J J	
(3)			-
(3)			quadrant
			_ ÷
[23]			
			[23]

<i>7</i> 1	700 0440 L 4040 L 400		
5.1	cos 79° cos 311° + sin 101° sin 49°		
	$= \cos 79^{\circ} \cos 49^{\circ} + \sin 79^{\circ} \sin 49^{\circ}$	$A\checkmark \cos 49^{\circ} A \checkmark \sin 79^{\circ}$	
	$= \cos(79^{\circ} - 49^{\circ})$		
	$= \cos 30^{\circ}$	$A\checkmark\cos 30^{\circ}$	
	$=\frac{\sqrt{3}}{2}$	A√ answer	
	$=\frac{\sqrt{3}}{2}$		(4)
	2		(4)
	Answer only no marks, used calculator		
5.2	$\sin(x+y) = 3\sin(x-y)$		
	$\sin x \cos y + \cos x \sin y$	A√expansion	
	$= 3(\sin x \cos y - \cos x \sin y)$		
	$\sin x \cos y + \cos x \sin y$	A√like terms added	
	1	11 like terms added	
	$= 3\sin x \cos y - 3\cos x \sin y$	A√divide	
	$-2\sin x\cos y = -4\cos x\sin y$	Av divide	
	$\div -2\cos x\cos y$:		
	$\frac{\sin x}{\cos x} = 2\left(\frac{\sin y}{\cos y}\right)$	A✓	
	$\frac{1}{\cos x} = 2\left(\frac{1}{\cos y}\right)$	$\frac{\sin x}{\cos x} = 2\left(\frac{\sin y}{\cos y}\right)$	
	$\therefore \tan x = 2 \tan y$	$\frac{1}{\cos x} - 2\left(\frac{1}{\cos y}\right)$	
	turn 2 tury		
			(4)
5.3.1	$\cos x \cos 2x$		
	$\frac{\cos x}{\sin 2x} - \frac{\cos 2x}{2\sin x} = \sin x$		
	LHS: $\frac{\cos x}{\cos x} - \frac{\cos 2x}{\cos x}$		
	$\sin 2x$ $2\sin x$		
	$\cos x$ $1 - 2\sin^2 x$	$A\checkmark 2 \sin x \cos x$	
	$=\frac{2\sin x\cos x}{2\sin x}$	$A \checkmark 2 \sin x \cos x$ $A \checkmark 1 - 2 \sin^2 x$	
1	$1 \qquad (1-2\sin^2 x)$	$A \cdot 1 - 2Sin^{-}x$	
1	$=\frac{2\sin x}{2\sin x} - \frac{2\sin x}{2\sin x}$		
	$1 - 1 + 2\sin^2 x$		
	=	A√numerator	
1	$2\sin x$		
1	$=\frac{2sin^2x}{}$	A√answer	
	$=\frac{1}{2\sin x}$		
	$=\sin x$		(4)
1	=RHS	1	(4)
	1 1 10	1	

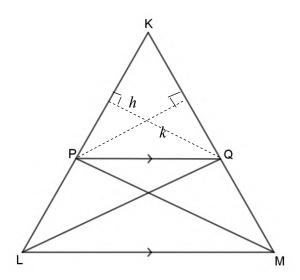
5.3.2	$1 + 2\cos 2x = \frac{\cos 2x}{2\sin x} - \frac{\cos x}{\sin 2x}$ $1 + 2\cos 2x = -\sin x$ $1 + 2(1 - 2\sin^2 x) = -\sin x$ $1 + 2 - 4\sin^2 x = -\sin x$ $4\sin^2 x - \sin x - 3 = 0$ $(\sin x - 1)(4\sin x + 3) = 0$ $\sin x = 1 \qquad OR$ $x = 90^\circ$	$\sin x = -\frac{3}{4}$ $\operatorname{ref} \angle = 48,59^{\circ}$ $x = 228.59$	$A \checkmark - \sin x$ A \checkmark standard quadratic form A \checkmark Factors
	$x = 90^{\circ}$	ref $\angle = 48,59^{\circ}$ x = 228.59 OR	A ✓ Factors $CA \checkmark 90^{0}$
		$x = 311,41^{\circ}$	CA✓228.59° CA✓311.41° (6)

6.1	a = 1	$A \checkmark a = 1$
	b=2	$A \checkmark b = 2$
	c=2	$A\checkmark c=2$
	d = 1	$A \checkmark d = 1$
		(4)
6.2	360°	A√360°
		(1)
6.3.1	$x \in [-90^{\circ}; 90^{\circ}] or x \in [270^{\circ}; 360^{\circ}]$	AA✓✓ values and notation
		(2)
6.3.2	$x \in (-45^{\circ}; 0^{\circ})$ or $x \in (45^{\circ}; 90^{\circ})$ or $x \in (315^{\circ}; 360^{\circ})$	AAA✓✓✓ values and
		correct notation
		(3)
		[11]

7.1	n ΔPQR:		
	$\hat{Q}_1 = x \qquad (PR = QR)$	$ \widehat{A \lor Q_1} = x \widehat{A \lor R} = 180^\circ - 2x $	
	$\hat{Q}_1 = x \qquad (PR = QR)$ $\hat{R} = 180^{\circ} - 2x \qquad (sum \ of \ \triangle PQR)$ $Area of \triangle PQR = \frac{1}{2} ma \sin \hat{R}$	$A\widehat{\sqrt{R}} = 180^{\circ} - 2x$	
	Area of $\Delta PQR = \frac{1}{2}pq \sin \hat{R}$ = $\frac{1}{2}m. m \sin(180^{\circ} - 2x)$	A√Subst. into Area rule	
	$=\frac{1}{2}m^2\sin 2x$	A√sin2x A√answer	
	2	Av answer	(5)
			(3)

7.2	$ \therefore \frac{PQ}{\sin(180^\circ - 2x)} = \frac{m}{\sin x} $ $ \therefore PQ = \frac{m \cdot \sin(180^\circ - 2x)}{\sin x} $ $ \therefore PQ = \frac{m \cdot \sin 2x}{\sin x} $ $ \therefore PQ = \frac{m \cdot 2 \sin x \cdot \cos x}{\sin x} $ $ \therefore PQ = 2m \cos x $	A \checkmark Use of sine rule A \checkmark subst into sine Rule A \checkmark sin $2x$ A \checkmark 2 sin x cos x (4)
7.3	In $\triangle SPQ$: $\tan y = \frac{SP}{PQ}$ $\therefore SP = PQ \tan y$ $\therefore SP = 2m \cos x \tan y$	$A \checkmark \tan y = \frac{SP}{PQ}$ $A \checkmark SP = PQ \tan y$ (2)

QUESTION 8 8.1



R.T.P	WD WO	
K.1.F	$\frac{KP}{PL} = \frac{KQ}{QM}$	
	PL QM	
	CONSTRUCTION: In Δ KPQ, draw perpendicular heights, h from Q to KP and K from P to KQ	A√construction
	$\frac{\text{Area of } \Delta \text{KPQ}}{\text{Area of } \Delta \text{LPQ}} = \frac{\frac{1}{2} \text{KP} \times \text{h}}{\frac{1}{2} \text{PL} \times \text{h}}$	A✓method
	$=\frac{\mathrm{KP}}{\mathrm{PL}}$	$A\checkmark \frac{KP}{PL}$
	$\frac{Area of \Delta KPQ}{Area of \Delta MQP} = \frac{\frac{1}{2}KQ \times k}{\frac{1}{2}QM \times k}$	A✓method
	$=\frac{KQ}{QM}$	$A\checkmark \frac{KQ}{QM}$
	But area of \triangle PLQ = Area of \triangle MPQ Same base, same height	
	$\therefore \frac{\text{Area of } \Delta \text{KPQ}}{\text{Area of } \Delta \text{LPQ}} = \frac{\text{Area of } \Delta \text{KPQ}}{\text{Area of } \Delta \text{MQP}}$	A✓method
	$\therefore \frac{KP}{PL} = \frac{KQ}{QM}$	(6)

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	10		
8.2.1	In ΔAPQ:		
	BC PQ $\frac{AB}{AP} = \frac{AC}{AQ}.; \text{ conv prop}$	A√S A√R	
	$\widehat{T}_1 = \widehat{C}_2$ alternate $\angle s$; BC PQ $\widehat{A}_2 = \widehat{C}_2$ tangent TC; chord BC $\therefore \widehat{A}_2 = \widehat{T}_1$	A✓ S/R A✓ S/R	
			(4)
8.2.2	In ΔABC and ΔTCQ:		
	$ \widehat{C}_3 = \widehat{Q} \qquad \text{corr} \angle^s; \ BC \parallel PQ $ $ \widehat{A}_2 = \widehat{T}_1 \qquad \text{proved above} $ $ \widehat{B}_2 = \widehat{C}_1 \qquad \text{rem } \angle^s $	A ✓ S/R A ✓ S/R A ✓ S/R A ✓ S/R	
			(4)
8.2.3	$\widehat{B}_1 = \widehat{C}_3$ tangent SB; chord AB $\widehat{Q} = \widehat{C}_3$ proven $\widehat{B}_1 = \widehat{Q}$	A√S A√R A√ S	()
		A√ S/R	(4)
8.2.4	TB = TC tangents from common point $\widehat{B}_3 = \widehat{C}_2$ TB = TC; \angle s opp eq. sides $\widehat{T}_1 = \widehat{C}_2$ alt. \angle s; BC \parallel PQ \therefore $\widehat{B}_3 = \widehat{T}_1$	A√S A√R A√S A√S/R	
	∴ $B_3 = I_1$ ∴ TQ is a tangent conv. tan; chord theorem	A√S/R	
			(5)
			[23]

9.1	In ΔMBC:	
	$\hat{B}_2 = \hat{B}_3 = x$ BE bisects MBC	A✓S
	$\therefore \hat{MBC} = 2x$	
	$\hat{MBC} = \hat{MCB} = 2x$ angles opposite equal sides	A✓S/R
	In ΔBEC:	
	$\hat{E}_2 = 180^\circ - (x+x)$ Sum of angles of a Δ	A√S/R
	$= 180^{\circ} -2x$	A✓Answer
		(4)

9.2 In \triangle MBC:B \hat{M} C = 180° - (2x+2x) Sum of angles of a \triangle	
$= 180^{\circ} - 4x$	A√S A√R
But $\hat{BAC} = \frac{1}{2}\hat{BMC}$ \angle at centre twice angle	
$= \frac{1}{2}(180^{\circ} - 4x)$	A✓S/R
= 90 - 2x	(3)
9.3 In ΔABE:	
9.3 In $\triangle ABE$: $\hat{E}_1 + \hat{E}_2 = 180^{\circ}$ Straight line	A✓S/R
$\hat{E}_1 = 180^{\circ} - E_2$	
$= 180^{\circ} - (180^{\circ} - 2x)$	
=2x	A✓S
In ΔΑΒΕ:	
$A\hat{B}E + B\hat{A}C + \hat{E} = 180^{\circ}$ Sum of $\angle s$ of Δ	A✓S/R
$\hat{ABE} = 180^{\circ} - (\hat{BAC} + \hat{E}_1)$	
$= 180^{\circ} - (90^{\circ} - 2x + 2x)$	
= 90°	A✓S
∴ AE is a diameter of circle ABE (Subtends) ∠ 90°	A √ R (5)
	[12]

10.1.1 Let $\hat{Y}_1 = a$ and $\hat{N} = b$	
	A✓ S/R
$\widehat{T}_1 = \widehat{N} = b$ (tan XT; chord MT)	
$\widehat{T}_1 = \widehat{N} = b$ (tan XT; chord MT) $\widehat{XTY} = a$ (angles opposite equal sides)	A√S A√R
$\widehat{T}_2 = X\widehat{T}Y - \widehat{T}_1$	A / C/D
= a - b	A√ S/R
$\therefore \widehat{T}_3 = \widehat{T}_2$	
∴ YT bisects MTN	
	A√S
	(5)
10.1.2 In ΔXMT and ΔXTN:	
\widehat{X} is common	A√S/R
$\widehat{T}_1 = \widehat{N}$ tan XT; chord MT	A√S A√R
$\widehat{M}_1 = X\widehat{T}N$ remaining \angle	A√R
∴ ∆XMT∭∆XTN ∠∠∠	A√R
	A√ S/R
	TY S/IX
$\frac{1}{N} \frac{1}{N} = \frac{1}{N}$	
	(6)
$10.2.1 \mid XM = XY - 20 \qquad XY = XT$	A√S A√R
= k - 20	A√answer
	(2)
10.2.2 XM XT	(3) A✓ LHS
$\left \frac{10.2.2}{XT} \right \frac{XM}{XT} = \frac{XT}{XN}$	AV LHS A√ RHS
	A KIIS
k-20 k	
$\therefore \frac{k-20}{k} = \frac{k}{k+50}$	
	A√Simplification
$\therefore k^2 + 30k - 1000 = k^2$	_
30k - 1000 = 0	
30k = 1000	
$ \therefore \qquad \qquad k = 33,3 \text{ mm} $	A√Answer
	(4)
	[18]

TOTAL: 150