

NAME

RONDEBOSCH BOYS' HIGH SCHOOL

GRADE 11

MATHEMATICS ~ PAPER TWO

Monday 1st December 2014



Set by R. Harmuth

Moderated by P. Ghignone

Three Hours

150 Marks

QUESTION	MAXIMUM	MARKS
1	13	
2	11	
3	18	
4	16	
5	9	
6	20	
7	21	
8	11	
9	11	
10	20	
	TOTAL	

INSTRUCTIONS

1. **Answer all questions in this booklet.**
2. *Calculators can be used, unless otherwise stated, with answers corrected to two decimal places.*
3. **All necessary working MUST be shown. Correct answers with no working will be penalised heavily.**
4. *Graphs and diagrams are NOT drawn to scale.*
5. *Number your answers as the questions are numbered.*
6. *Untidy work will be penalised.*
7. *Only blue and black pens may be used.*
8. *Sketches should be done in pencil.*
9. **This exam contains 10 questions.**

QUESTION ONE

The following marks were obtained in a test in a small English class:

37 ; 57 ; 61 ; 66 ; 67 ; 67 ; 68 ; 78 ; 93

1.1 Write down the five number summary for these marks. (3)

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1.2 Calculate the interquartile range. (2)

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1.3 What percentage of these marks lies outside one standard deviation of the mean? Show all calculations. (5)

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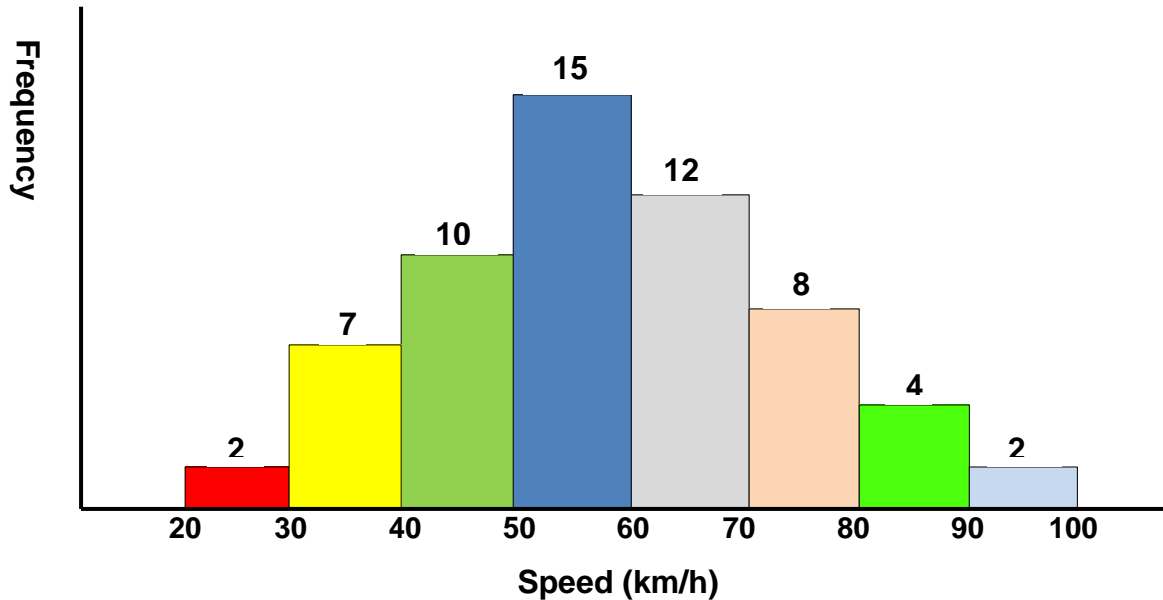
1.4 Are there any outliers? Back up your answer with suitable calculations. (3)

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[13]

QUESTION TWO

The speeds of 60 motor-cycles passing the Campground robots in one hour were recorded. The speed limit on this section of road is 75 km/h. A histogram has been drawn representing the information recorded.



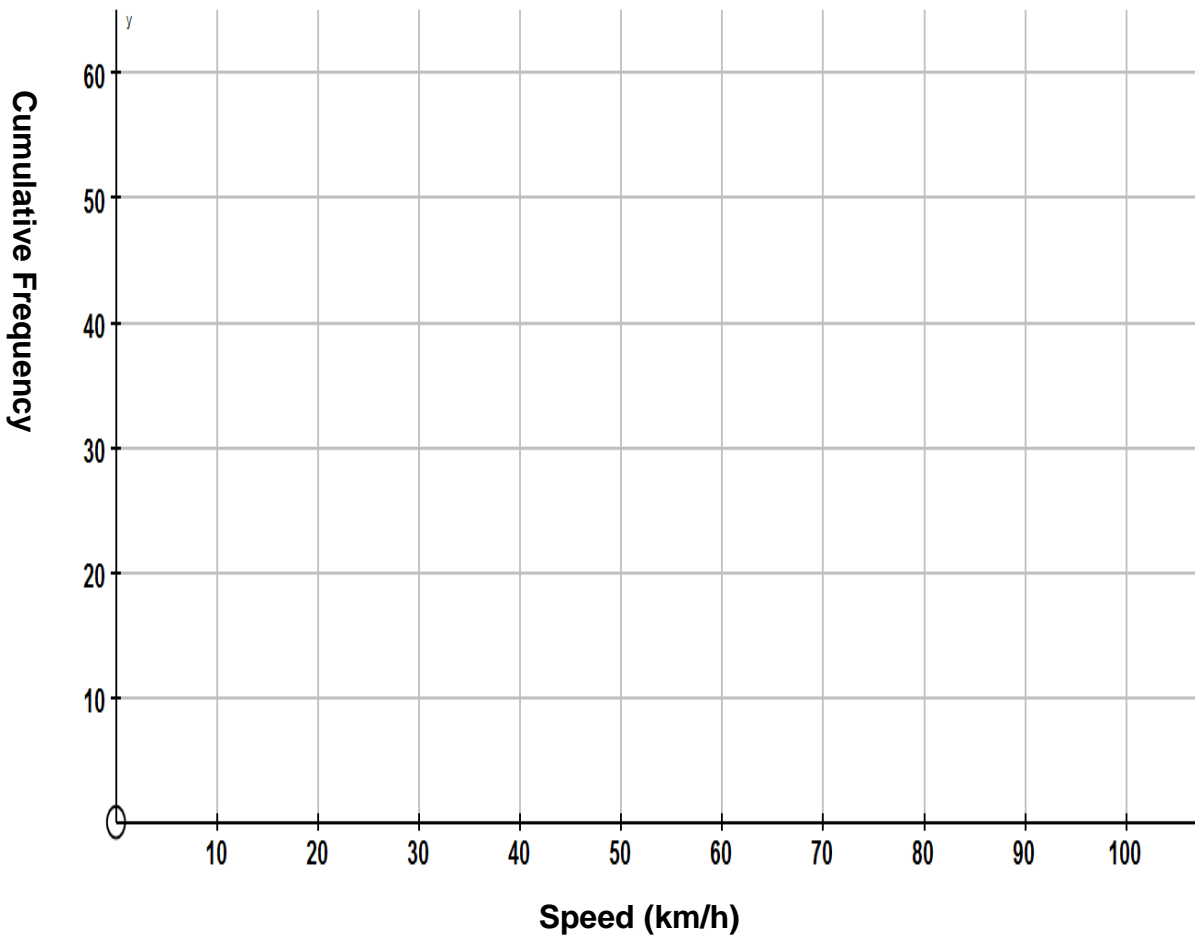
2.1 Identify the modal class interval of the data. (1)

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2.2 Complete the frequency distribution table below. (3)

Speed Intervals	Frequency	Cumulative Frequency
$20 < x \leq 30$	2	
$30 < x \leq 40$	7	
$40 < x \leq 50$		
$50 < x \leq 60$		
$60 < x \leq 70$		
$70 < x \leq 80$		
$80 < x \leq 90$		
$90 < x \leq 100$		

2.3 Draw an ogive of the above data on the grid below. (3)



2.4 Use your ogive to estimate the upper quartile. (2)

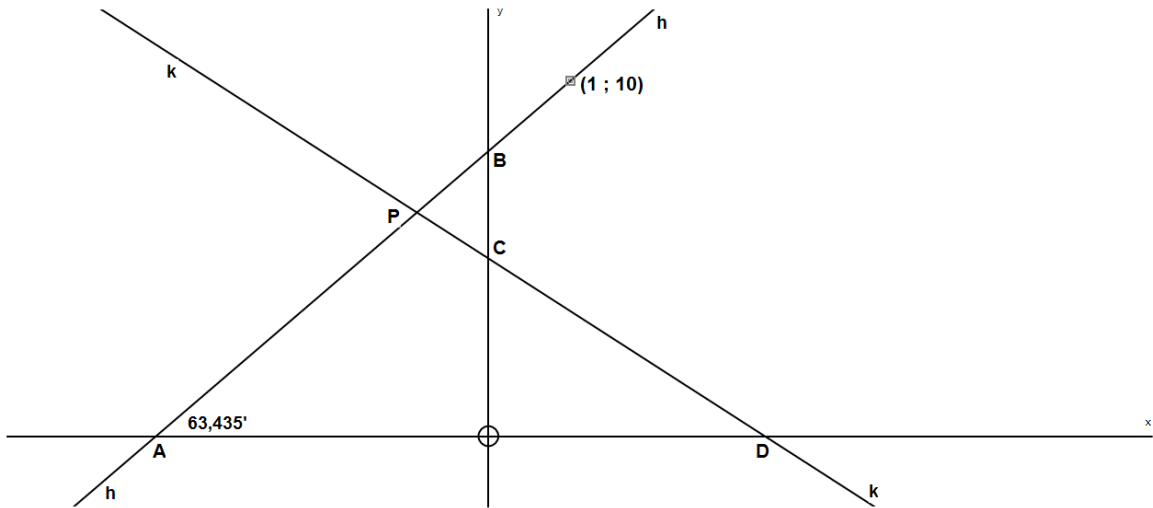
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2.5 Estimate the number of motor-cycles driving above the speed limit. (2)

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QUESTION THREE

In the diagram below, A and B are the intercepts of line h. Line h passes through the point (1 ; 10) and $\angle BAO = 63,435^\circ$. Line k has intercepts at C and D, and the two lines intersect at P. The equation of line k is given as $y = -x + 5$.



3.1 Write down the y co-ordinate of C. (1)

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3.2 Determine the equation of line h. (4)

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3.3 Determine the size of $\angle APD$. (3)

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3.4 Assuming that h is defined by the equation $y - 2x = 8$ calculate the co-ordinates of P . (4)

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3.5 Calculate the area of quadrilateral $PAOC$. (6)

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QUESTION FOUR

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

4.1 A circle is defined by $x^2 + 8x + y^2 - 4y = 5$.

4.1.1 Determine the co-ordinates of the centre, as well as the radius. (4)

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4.1.2 $P(-1 ; 6)$ is a point on the circle. Find the equation of the tangent to this circle at P . (4)

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4.2 Consider the circle defined by $(x - 2)^2 + (y + 4)^2 = 4$. Write down the new equation of this circle after it has been enlarged through the origin by a factor of $1\frac{1}{2}$. (4)

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4.3 Circle A has a centre at $A(-4 ; 2)$ and a radius of 5 units.
Circle B has a centre at $B(4 ; 8)$ and a radius of 3 units.

4.3.1 Calculate the length of AB. (2)

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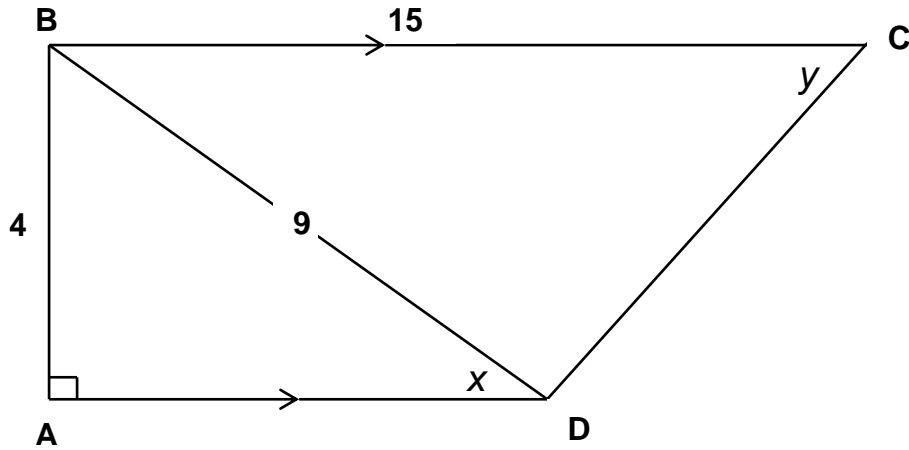
4.3.2 Explain why the two circles will not cut each other. (2)

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QUESTION FIVE

In the figure below, $AB = 4$, $BD = 9$, $BC = 15$, $AD \parallel BC$, and $BA \perp AD$.

$\angle BDA = x$ and $\angle BCD = y$.



5.1 Calculate $\angle BDA$, correct to 2 decimal places. (2)

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5.2 Assuming that $x = 26^\circ$, calculate the length of CD (4)

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5.3 Calculate $\angle BCD$ (3)

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QUESTION SIX

6.1 Simplify completely:

$$\frac{\cos(90^\circ + x) + \tan x \cos(180^\circ + x)}{\sin 210^\circ} \quad (7)$$

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6.2 Given: $\cos \theta = \frac{15}{17}$ with $\theta > 90^\circ$

6.2.1 Represent this information in a sketch in the correct quadrant, clearly showing the position of θ . (4)

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6.2.2 Using your diagram only, determine $\tan(180^\circ - \theta)$. (2)

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6.2.3 Calculate θ .

(2)

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6.3 If $\sin 58^\circ = x$ and $\cos 58^\circ = y$, prove, without using a calculator, that $x^4 - y^4 = 2 \sin^2 58^\circ - 1$.

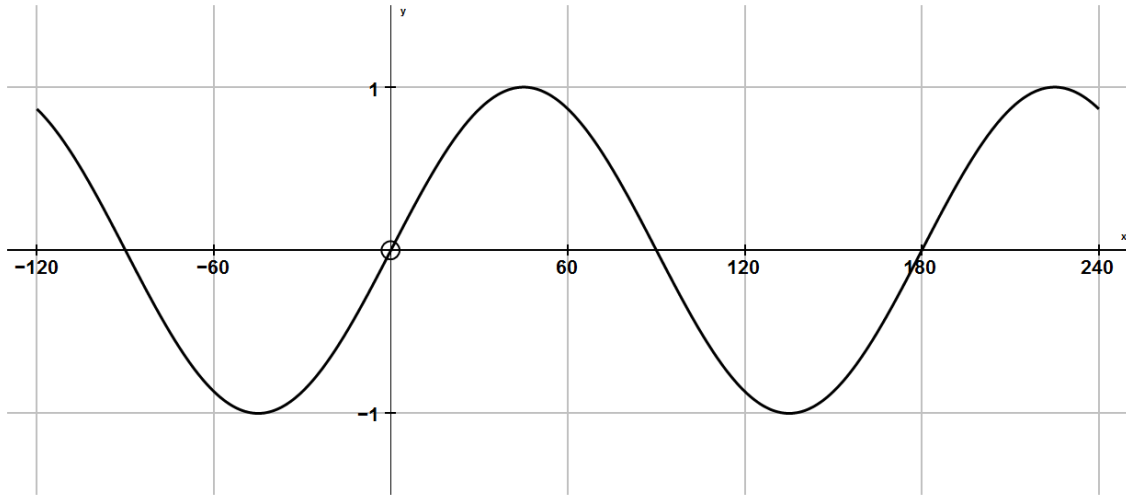
(5)

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QUESTION SEVEN

In the diagram below, the graph of $f(x) = \sin 2x$ is drawn for $-120^\circ \leq x \leq 240^\circ$.



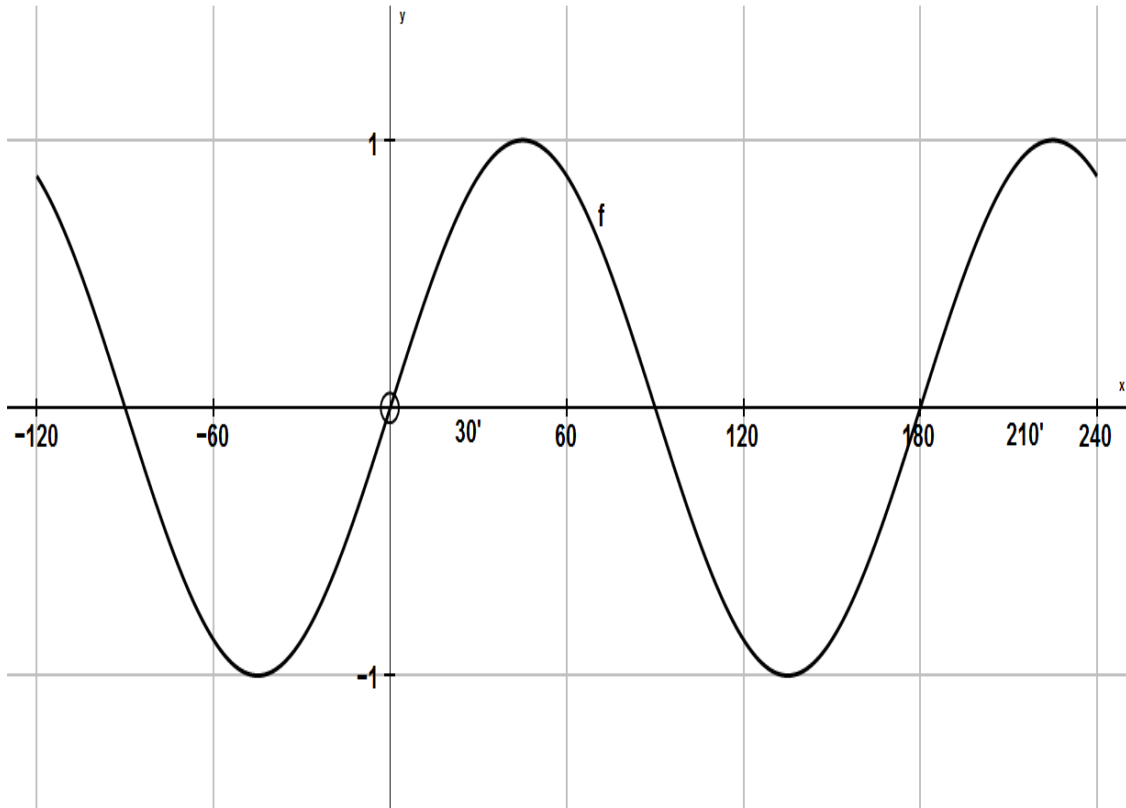
7.1 Write down the range of f . (2)

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7.2 Determine the general solution of $\cos(x + 60^\circ) = \sin 2x$. (7)

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7.3 On the grid below draw the graph of $g(x) = \cos(x + 60^\circ)$ for $-120^\circ \leq x \leq 240^\circ$ showing x and y intercepts. (4)



7.4 Use your general solution in Q7.2 as well as your graphs above to write down the values of x for which:

7.4.1 $f(x) = g(x)$, $-120^\circ \leq x \leq 240^\circ$ (4)

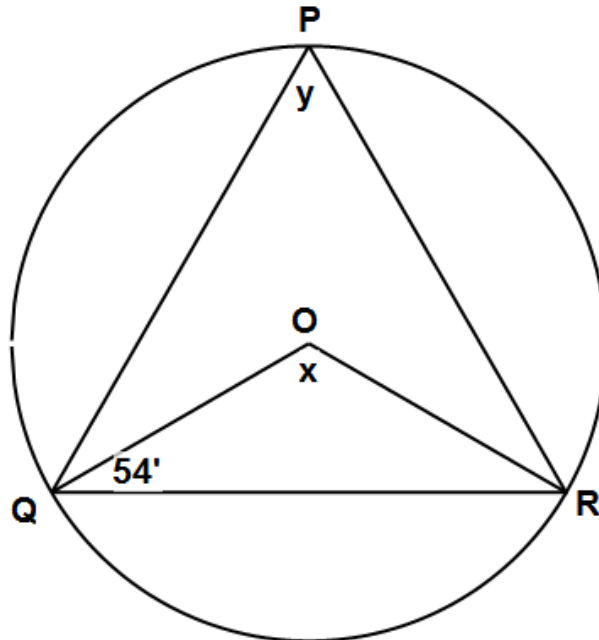
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7.4.2 $f(x) \geq g(x)$, $0^\circ \leq x \leq 240^\circ$. (4)

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QUESTION EIGHT

8.1 In the diagram, O is the centre of the circle passing through P , Q and R . $\angle OQR = 54^\circ$, $\angle QOR = x$ and $\angle QPR = y$.



Determine, with reasons, the size of:

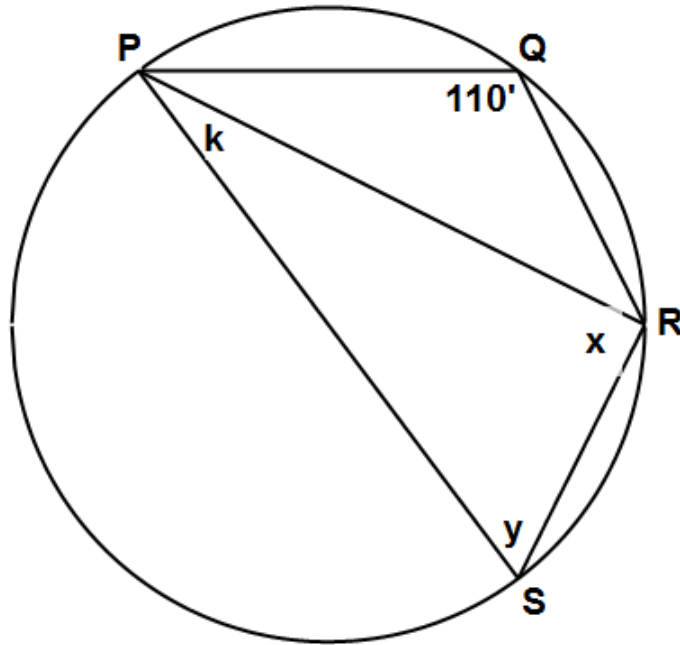
8.1.1 x (3)

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8.1.2 y (2)

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8.2 In the diagram below, PS is the diameter of the circle passing through P , Q , R and S . PR is joined. $\angle PQR = 110^\circ$, $\angle PSR = y$, $\angle RPS = k$ and $\angle PRS = x$.



Determine, with reasons, the size of:

8.2.1 x (2)

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8.2.2 y (2)

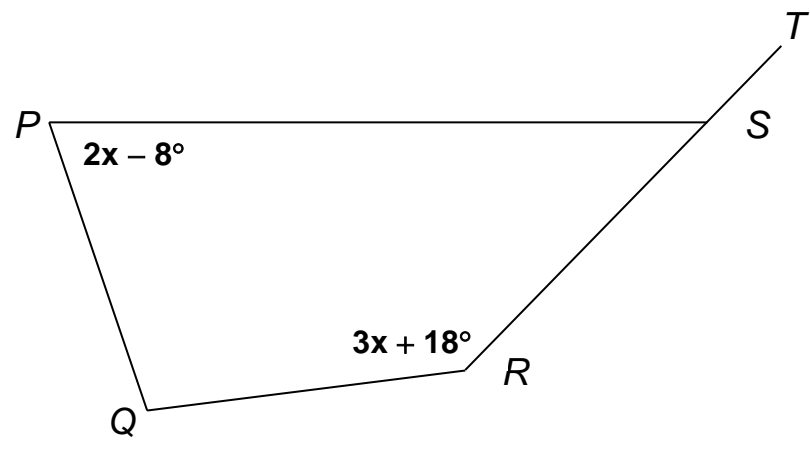
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8.2.3 k (2)

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[11]

9.2 In the diagram below, $\angle QPS = 2x - 8^\circ$, $\angle QRS = 3x + 18^\circ$,
 $\angle Q = \angle PST$



Determine, with reasons, the value of x . (4)

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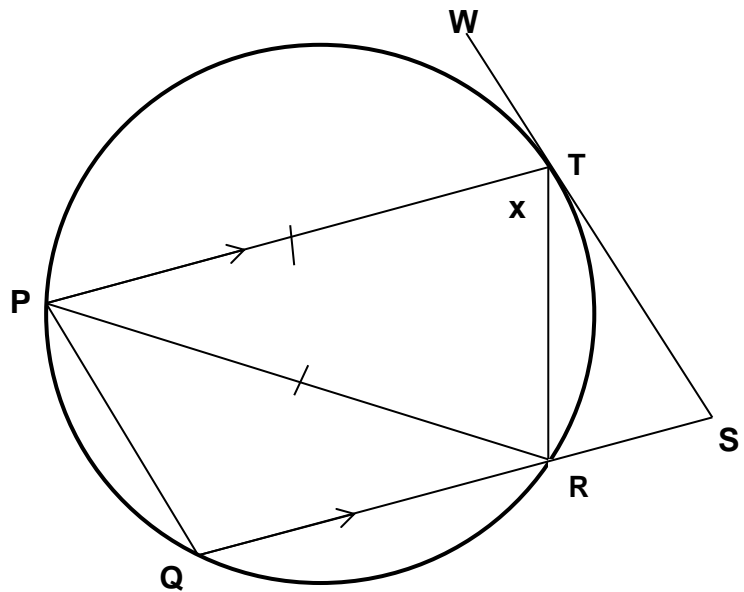
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QUESTION TEN

In the diagram below, P , Q , R and T are points on the circumference of the circle. $PT \parallel QR$ and $PT = PR$.

WTS is a tangent at T , and $\angle PTR = x$.



10.1 Find, with reasons, FIVE other angles equal to x (10)

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10.2 Prove that $TSQP$ is a parallelogram. (4)

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10.3 Name (no proof needed) a Δ similar to ΔTRP ,
and hence prove that $TS^2 = RS \cdot SQ$ (6)

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