HILLCREST HIGH SCHOOL

GRADE 12

MATHEMATICS P3

TRIALS 2013

MARKS: 100

TIME: 2 hours

This question paper consists of 10 pages, an information sheet and 3 diagram sheets.

INSTRUCTIONS AND INFORMATION

Read the following instructions carefully before answering the questions.

1. This question paper consists of 10 questions. Answer ALL the questions.

2. Clearly show ALL calculations, diagrams, graphs, et cetera, which you have used in determining the answers.

3. An approved scientific calculator (non-programmable and non-graphical) may be used, unless stated otherwise.

4. If necessary, answers should be rounded off to TWO decimal places, unless stated otherwise.

5. Diagrams are NOT necessarily drawn to scale.

6. THREE diagram sheets for answering QUESTION 6.1, QUESTION 6.3, QUESTION 7.2, QUESTION 8, QUESTION 9 and QUESTION 10 are attached at the end of this question paper. Write your name on these sheets in the spaces provided and hand them in together with your ANSWER BOOK.

7. Number the answers correctly according to the numbering system used in this question paper.

8. It is in your own interest to write legibly and to present the work neatly.

QUESTION 1

Consider the sequence: 2 ; 6 ; 10 ; 14 ; 18 ; 22 ; ...

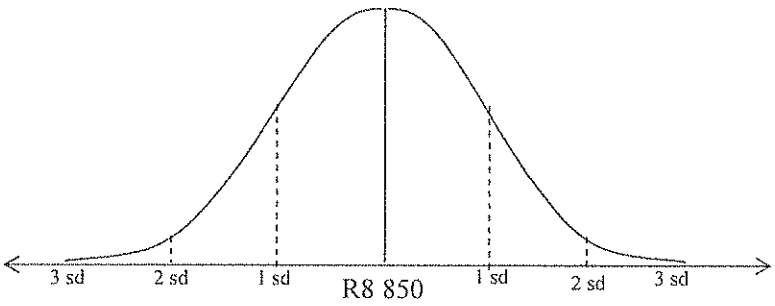
1.1 Write down a recursive formula for the sequence. (3)

1.2 Write down another formula for the sequence. (2)
[5]

QUESTION 2

After protracted union protests, a company analysed its salary structure for employees. They found that the salaries are symmetrically distributed with a mean of R8 850 per month and a standard deviation of R2 950 per month.

Research has indicated that if the monthly salary is below R3 000, the employee will not maintain an acceptable quality of life.



It is also known that:

Approximately 68% of the monthly salary recorded is within one standard deviation of the mean: 34% above and 34% below.
Approximately 96% of the monthly salary recorded is within two standard deviations of the mean: 48% above and 48% below.
Approximately 100% of the monthly salary recorded is within three standard deviations of the mean: 50% above and 50% below.

2.1 Estimate the percentage of employees who will struggle to maintain an acceptable quality of life. (2)

2.2 Estimate the percentage of employees who earn more than R11 800 per month. (2)

2.3 Do you think that the company has a fair salary structure? Use the given data to motivate your answer. (3)
[7]

QUESTION 3

During August 2007 a television station carried out a survey during a programme on Southern Africa. They asked viewers to respond to the question: 'Should South Africa do something to help the refugees from Zimbabwe?' Respondents were required to answer either 'yes' or 'no' to the question by means of a Short Message Service (SMS).

The results at the end of the programme indicated that 65% of the respondents had voted 'no'. The station thanked the 7 800 respondents who participated in the survey.

3.1 Calculate the number of people who voted 'no' to the question. (2)

3.2 Can you conclude from this survey that 65% of all South Africans believe that South Africa should not help Zimbabwean refugees? Discuss by making reference to the validity of the results of this survey. (3)
[5]

QUESTION 4

4.1 A survey of 80 students at a local library indicated the reading preferences below:

44 read the *National Geographic* magazine

33 read the *Getaway* magazine

39 read the *Leadership* magazine

23 read both *National Geographic* and *Leadership* magazines

19 read both *Getaway* and *Leadership* magazines

9 read all three magazines

69 read at least one magazine

4.1.1 How many students did not read any magazine? (1)

4.1.2 Let the number of students who read *National Geographic* and *Getaway*, but not *Leadership*, be represented by x. Draw a Venn diagram to represent reading preferences. (5)

4.1.3 Hence show that $x = 5$. (3)

4.1.4 What is the probability, correct to THREE decimal places, that a student selected at random will read at least two of the three magazines? (3)

4.2 A smoke detector system in a large warehouse uses two devices, A and B. If smoke is present, the probability that it will be detected by device A is 0,95. The probability that it will be detected by device B is 0,98 and the probability that it will be detected by both devices simultaneously is 0,94.

4.2.1 If smoke is present, what is the probability that it will be detected by device A or device B or both devices? (3)

4.2.2 What is the probability that the smoke will not be detected? (1)
[16]

QUESTION 5

5.1 The Matric Dance Committee has decided on the menu below for the 2008 Matric Dance. A person attending the dance must choose only ONE item from each category, that is starters, main course and dessert.

MENU

STARTERS	MAIN COURSE	DESSERT
Crumbed Mushrooms	Fried Chicken	Ice-cream
Garlic Bread	Beef Bolognaise	Malva Pudding
Fish	Chicken Curry	
	Vegetable Curry	

5.1.1 How many different meal combinations can be chosen? (2)

5.1.2 A particular person wishes to have chicken as his main course. How many different meal combinations does he have? (2)

5.2 A photographer has placed six chairs in the front row of a studio. Three boys and three girls are to be seated in these chairs.

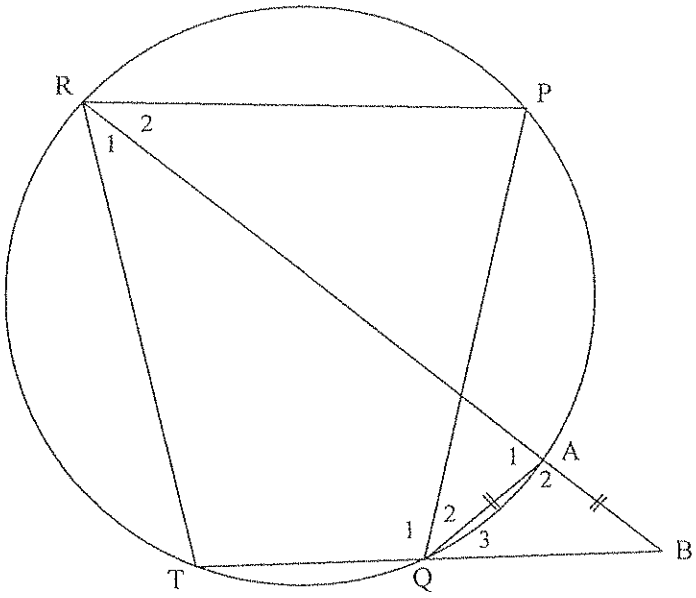
In how many different ways can they be seated if:

5.2.1 Any learner may be seated in any chair (2)

5.2.2 Two particular learners wish to be seated next to each other (3)
[9]

QUESTION 8

In the diagram below, points R, P, A, Q and T lie on a circle. RA bisects $\hat{R}$ and AB = AQ. RA and TQ produced meet at B.



Prove that:

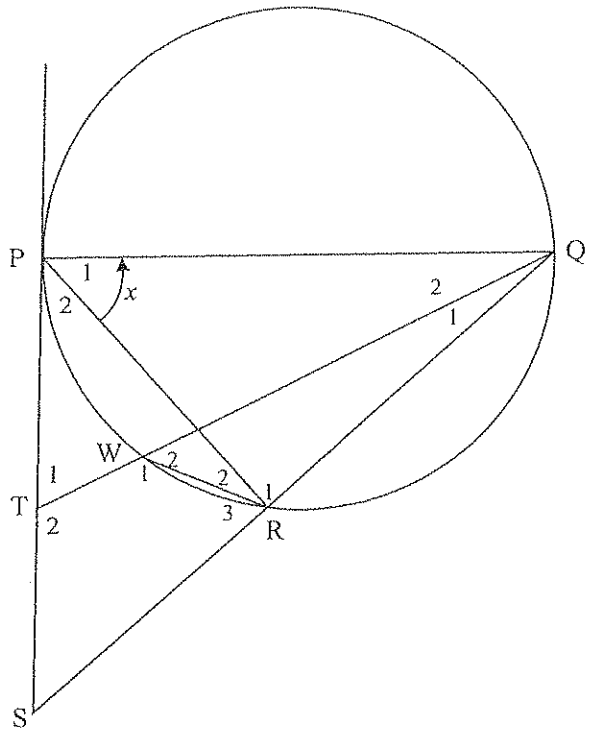
8.1 AQ bisects $P\hat{Q}B$ (3)

8.2 TR = TB (2)

8.3 $\hat{P} = T\hat{R}P$ (3)
[8]

QUESTION 9

In the figure below, PQ is a diameter to circle PWRQ. SP is a tangent to the circle at P.
Let $\hat{P}_1 = x$



9.1 Why is $P\hat{R}Q = 90°$? (1)

9.2 Prove that $\hat{P}_1 = \hat{S}$. (3)

9.3 Prove that SRWT is a cylic quadrilateral. (3)

9.4 Prove that $\Delta QWR \ /// \ \Delta QST$. (3)

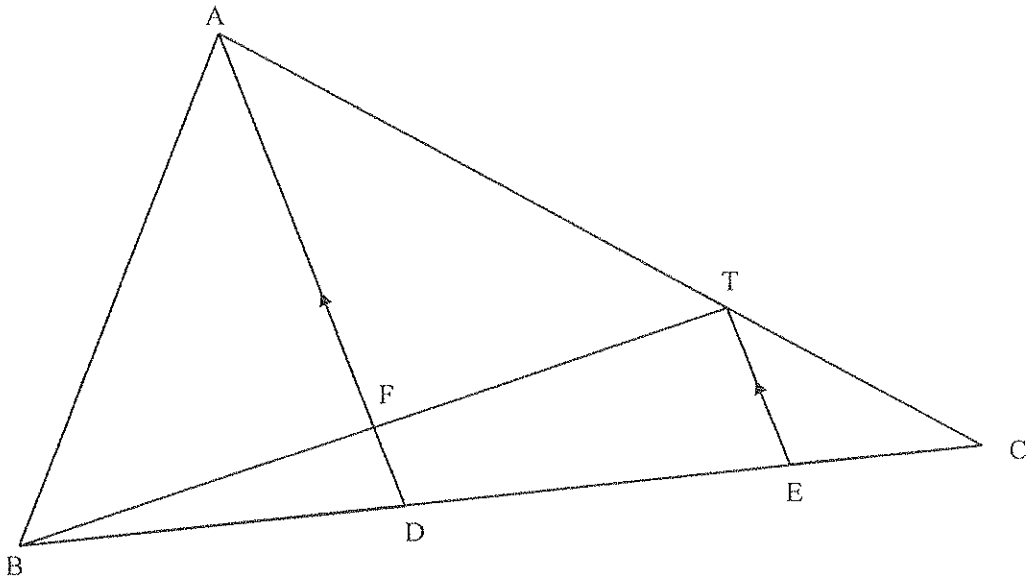
9.5 If QW = 5 cm, TW = 3 cm, QR = 4 cm and WR = 2 cm, calculate the length of:

9.5.1 TS (3)

9.5.2 SR (3)
[16]

QUESTION 10

In the figure below, ΔABC has D and E on BC. BD = 6 cm and DC = 9 cm.
AT : TC = 2 : 1 and AD ∥ TE.



10.1 Write down the numerical value of $\frac{CE}{ED}$ (1)

10.2 Show that D is the midpoint of BE. (2)

10.3 If FD = 2 cm, calculate the length of TE. (2)

10.4 Calculate the numerical value of:

104.1 $\frac{\text{Area of } \Delta ADC}{\text{Area of } \Delta ABD}$ (1)

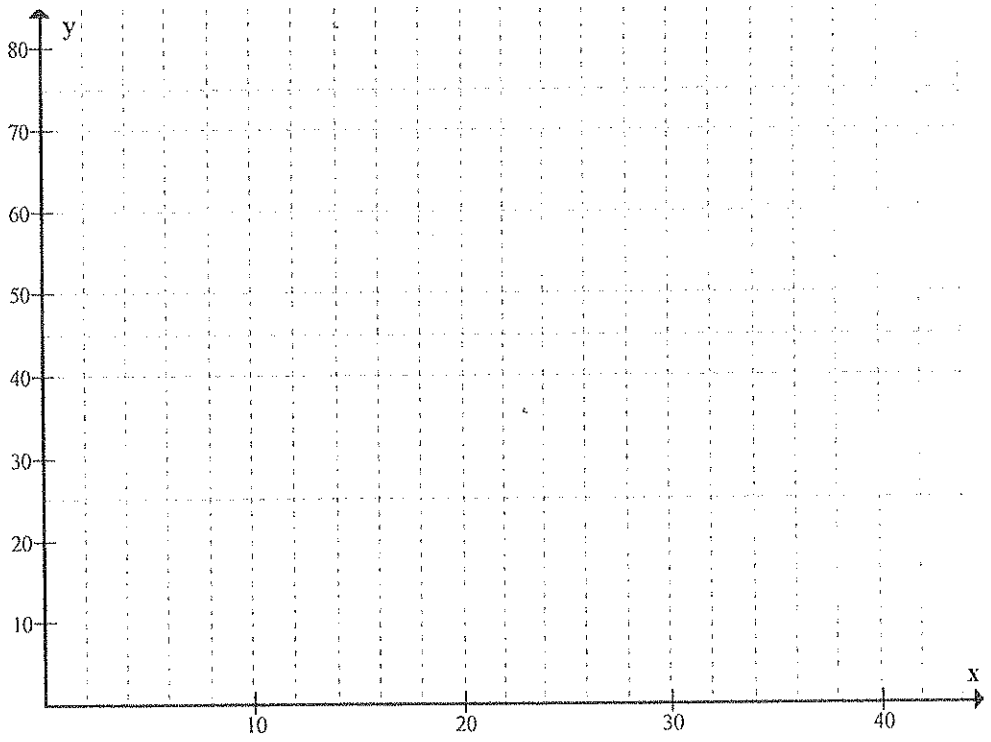
10.4.2 $\frac{\text{Area of } \Delta TEC}{\text{Area of } \Delta ABC}$ (3)
[9]

TOTAL: 100

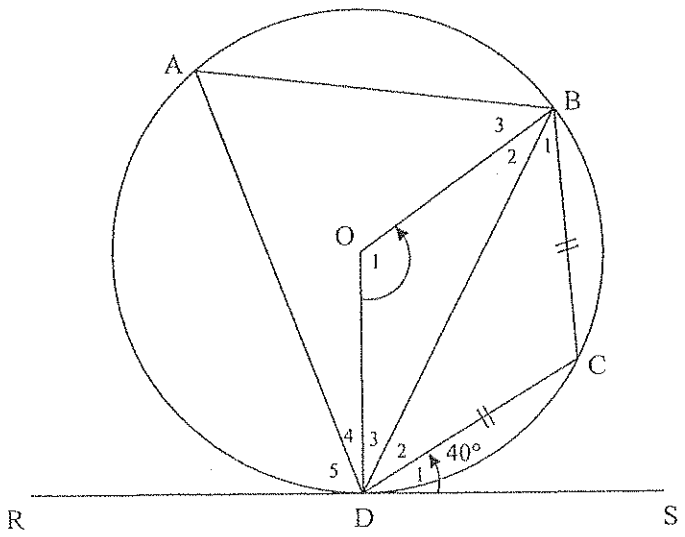
NAME:

DIAGRAM SHEET 1

QUESTIONS 6.1 and 6.3



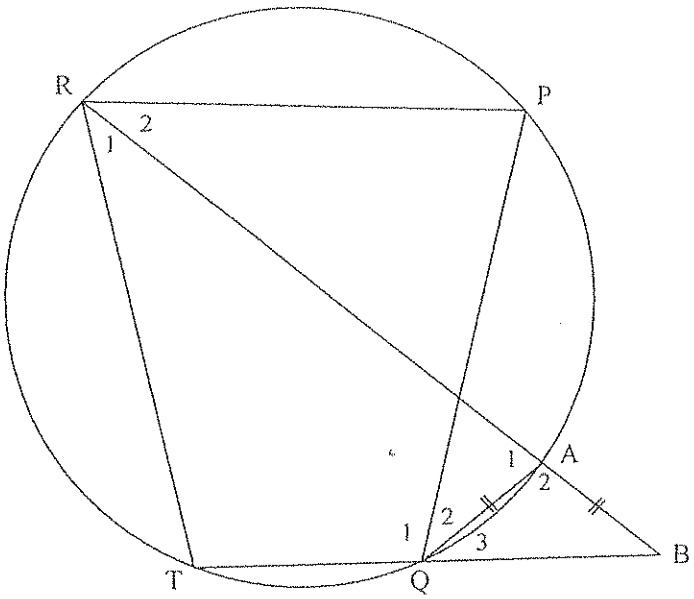
QUESTION 7.2



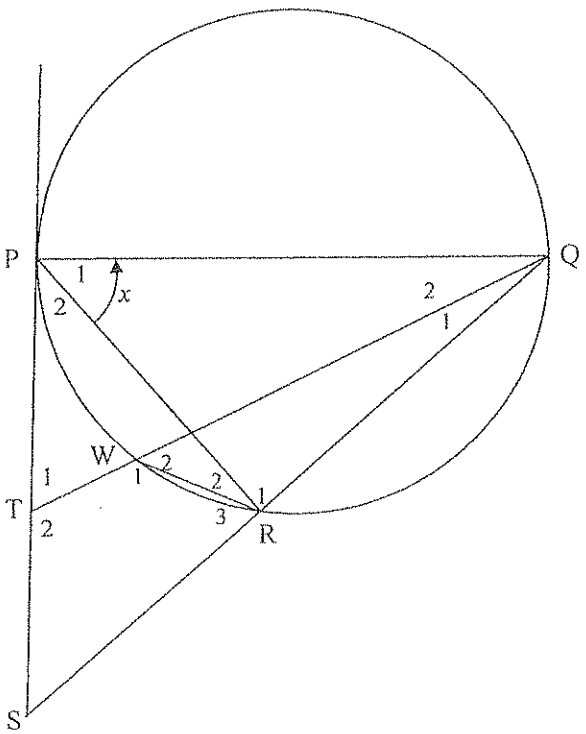
NAME: _____

DIAGRAM SHEET 2

QUESTION 8



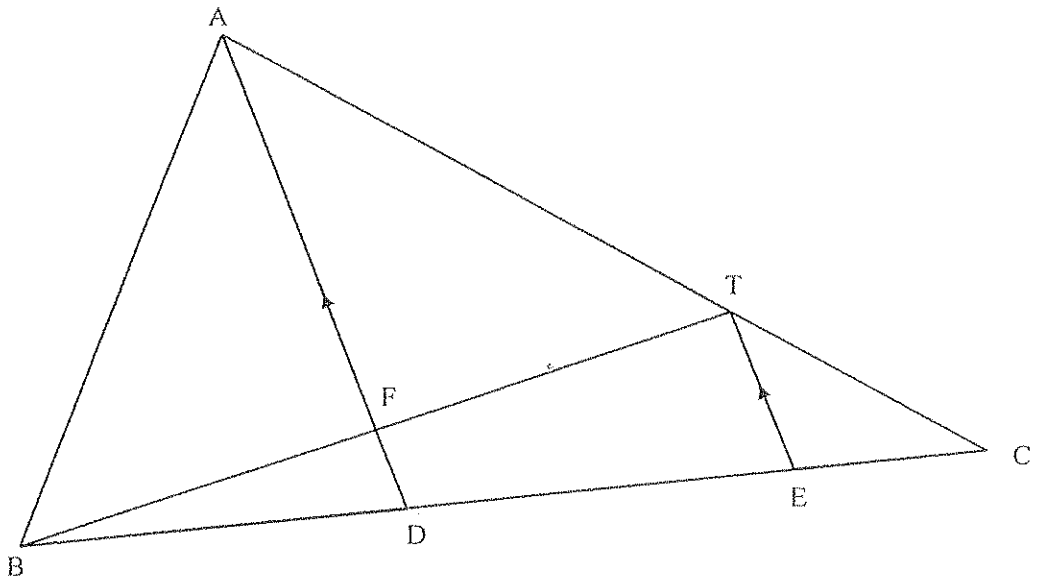
QUESTION 9



NAME: _____

DIAGRAM SHEET 3

QUESTION 10



INFORMATION SHEET: MATHEMATICS
INLIGTINGSBLAD: WISKUNDE

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

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

$$\sum_{i=1}^{n} 1 = n \qquad \sum_{i=1}^{n} i = \frac{n(n+1)}{2} \qquad T_n = a + (n-1)d \qquad S_n = \frac{n}{2}\left(2a + (n-1)d\right)$$

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

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

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

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

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

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

In ΔABC: $\dfrac{a}{\sin A} = \dfrac{b}{\sin B} = \dfrac{c}{\sin C}$ $\qquad a^2 = b^2 + c^2 - 2bc.\cos A$ $\qquad$ area $\Delta ABC = \dfrac{1}{2}ab.\sin C$

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

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

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

$$(x\,;\,y) \to (x\cos\theta + y\sin\theta\,;\, y\cos\theta - x\sin\theta) \qquad (x\,;\,y) \to (x\cos\theta - y\sin\theta\,;\, y\cos\theta + x\sin\theta)$$

$$\bar{x} = \frac{\sum fx}{n} \qquad \sigma^2 = \frac{\sum_{i=1}^{n}\left(x_i - \bar{x}\right)^2}{n}$$

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

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