HILLCREST HIGH SCHOOL

Grade 11 Paper 1 Exam
November 2014

Examiner: Mr Reuben

MARKS: 150 TIME: 3 hours

INSTRUCTIONS AND INFORMATION

Read the following instructions carefully before answering the questions.

1. This question paper consists of 12 questions. Answer ALL the questions.
2. Write your name and **your Mathematics teacher**'s name on your answer booklet.
3. Clearly show ALL calculations, diagrams, graphs, etc which you have used to determine your answers.
4. Answers only will NOT necessarily be awarded full marks.
5. An approved scientific calculator (non-programmable), unless otherwise stated.
6. If necessary, answers should be rounded off to TWO decimal places, unless otherwise stated.
7. Number the answers EXACTLY as the questions are numbered.
8. Diagrams are not necessarily drawn to scale.
9. It is in your own interest to write legibly and to present your work neatly.

QUESTION 1

1.1 Solve for x

1.1.1 $x^2 + 3x - 10 = 0$ (3)

1.1.2 $2x^2 + 3x = 1$ (answer correct to 2 d.p.) (4)

1.1.3 $x + 2 - \frac{15}{x-1} = 5\,; x \neq 1$ (5)

1.1.4 $2x^2 - x - 6 \leq 0$ (4)

1.2 Solve for x and y simultaneously:

$$y - 2x = -3$$

$$xy = 20$$ (7)

[23]

QUESTION 2

2.1 Without solving the equation, determine the nature of the roots of:

$x^2 + 3x + 4 = 0$ (3)

2.2 Given $A = \frac{\sqrt{x+4}}{x-2}$ determine the value(s) of x for which:

2.2.1 A is undefined (2)

2.2.2 A is non-real (2)

[7]

QUESTION 3

Simplify the following. Show all working.

3.1 $32^{\frac{-2}{5}}$ (2)

3.2 $\sqrt{3}(\sqrt{3} + \sqrt{6}) + \sqrt{2}$ (3)

3.3 $\frac{\sqrt{12x} + \sqrt{27x}}{\sqrt{75x}}$ (4)

3.4 Solve for x:

3.4.1 $3 + \sqrt{x-1} = x$ (6)

3.4.2 $3x^{\frac{2}{3}} - 12 = 0$ (3)

[18]

QUESTION 4

Consider the number pattern:

$$7 ; 3 ; -1 ; -5 ; -9 ; \ldots$$

4.1 Identify the pattern as linear, quadratic or exponential. Give a reason for your answer. (2)

4.2 Determine the general term, T_n of this pattern. (3)

4.3 Which term of this sequence is equal to -121? (3)

4.4 Determine the value of the 19^{th} term. (2)

[10]

QUESTION 5

Consider the following patterns of diamond shapes:

5.1 How many diamonds (♦) are there in the next pattern? (1)

5.2 Determine a formula for the number of diamonds in the nth pattern. (5)

5.3 Which pattern has 960 diamonds? (4)

[10]

QUESTION 6

Given the number pattern:

$$\frac{1}{2} ; \frac{2}{3} ; \frac{3}{4} ; \frac{4}{5} ; \ldots$$

Determine a formula for T_n, the nth term of the pattern. (2)

[2]

QUESTION 7

7.1 Thando purchases a car for R145 000. Determine the rate of depreciation if the car depreciates on a reducing balance and has a book value of R80 000 after 5 years. (5)

7.2 John inherits R80 000 and decides to invest the money so that he can finance weddings for his two daughters. The one gets married exactly one year later and he withdraws R50 000 to pay for this event. If interest of 10% p.a. compounded quarterly is applicable for two years and this rate then changes to 9.5% p.a. compounded monthly:

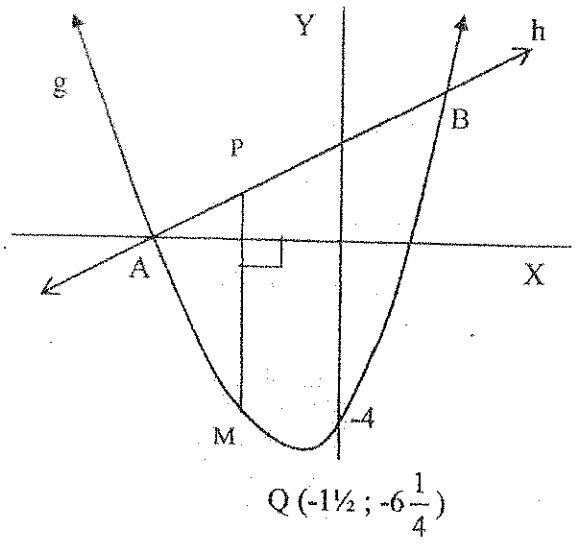
7.2.1 Calculate how much he will have available when his other daughter gets married after five years (four years after the first daughter). (6)

7.2.2 Determine the effective interest rate per year for the first 2 years of the investment. (3)

[14]

QUESTION 8

Given: $g(x) = ax^2 + bx + c$ with turning point Q and $h(x) = x + 4$



8.1 Show that the equation of g is $g(x) = x^2 + 3x - 4$ (5)

8.2 For which values of x is g descending? (1)

8.3 Determine the coordinates of A and B, the points of intersection of h and g. (5)

8.4 Solve for x if $g(x) > h(x)$. (2)

8.5 Determine the length of PM in terms of x. (3)

8.6 Determine the maximum length of PM. (3)

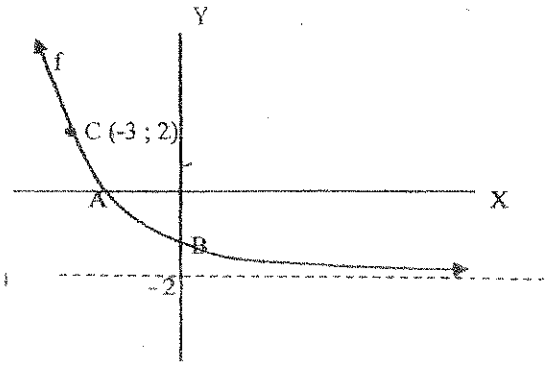
8.7 If $f(x) = g(x - 2)$, give the coordinates of the turning points of f. (2)

8.8 Calculate the average gradient between A and Q. (2)

[23]

QUESTION 9

If $f(x) = (\frac{1}{2})^{x+p} + q$; C is the point (-3 ; 2)



9.1 Write down the value of q. (1)

9.2 Write down the range of f. (2)

9.3 Calculate the value of p. (3)

[6]

QUESTION 10

Given : $f(x) = \frac{2}{x-2} + 1$ and $g(x) = (\frac{1}{4})^x + 1$

10.1 Write down the asymptotes of f. (2)

10.2 Calculate the x and y intercepts of f. (3)

10.3 Draw a neat sketch graph of f on the DIAGRAM SHEET provided and clearly indicate the intercepts and asymptotes (4)

10.4 Draw a neat sketch graph of g on the same system of axis on the DIAGRAM SHEET Provided. (2)

10.5 Write down the domain of f. (2)

10.6 The line $y = -x + c$ is a line of symmetry of the graph of f. Determine the value of c. (3)

[16]

QUESTION 11

There are 130 learners in Grade 11 at the Nu Kwa High School.

- The learners belong to three different clubs, namely Chess, Science and the Debates.
- 30 learners belong to the Debating club whilst 45 learners belong to the Chess club.
- 10 learners belong to the Science and Debates only.
- 14 learners belong to the Chess club only, while half of this number of learners belong to both the Debate and Chess only.
- 25 learners belong to Debates only
- 30 learners belong to Science club only.

11.1 Draw a Venn diagram to illustrate the above. (5)

11.2 How many learners belong to all three clubs? (2)

11.3 How many learners belong to the Science club? (2)

11.4 How many do not belong to any club? (1)

[10]

QUESTION 12

12.1 It is given that A and B are independent events. P(A) = 0,4 and P(B) = 0,5.

Calculate:

12.1.1 P(A or B) (4)

12.1.2 P(neither A or B) (1)

12.2 In all South African schools, EVERY learner must choose to do either Mathematics or Mathematical Literacy.

At a certain South African school, it is know that 60% of the learners are girls. The probability that a randomly chosen girl at the school does Mathematical Literacy is 55%. The probability that a randomly chosen boy at the school does Mathematical Literacy is 65%.

Using a tree diagram, determine the probability that a learner selected at random from this school does Mathematics. (6)

[11]

Total 150

INFORMATION SHEET: MATHEMATICS

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Grade 11 150 marks	MATHEMATICS PAPER 1 NOV 2014											
Name:									Teacher:			
Q 1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Total
23 marks	7 marks	18 marks	10 marks	10 marks	2 marks	14 marks	23 marks	6 marks	16 marks	10 marks	11 marks	**150 marks**

DIAGRAM SHEET

Question 10.3 and 10.4