

HILLCREST HIGH SCHOOL



Grade 11 Paper 1 Exam

November 2015

Examiner: Mrs Sparks

Moderator: Mrs Cole

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 A.J.J. 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 $(2x-3)(x+5) = 0$ (2)

1.1.2 $x^2 = 5x + 3$ (correct to 2 decimal places) (4)

1.1.3 $x - 6 = \sqrt{x}$ (5)

1.1.4 $3x^2 - 5x < 2$ (4)

1.2 Solve the following equations simultaneously:

$$x = -2y - 4$$

$$y = \frac{4}{x-6}$$
 (6)

1.3 Without solving, determine the nature of the roots of

$$2x^2 + 7x + 4 = 0$$
 (4)

[25]

QUESTION 2

2.1 Simplify the following fully: $\frac{3^{x-1} + 3^{x+1}}{2 \cdot 3^x}$ (3)

2.2 Solve for x :

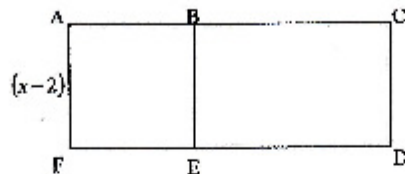
$$2^0 + 2^{x-2} + 2^{x+1} + 2^x = 53$$
 (5)

2.3 Rationalise the following, show all working: $\frac{2}{1-\sqrt{8}}$ (4)

[12]

QUESTION 3

ACDF is a rectangle with an area of $(x^2 + 3x - 10)\text{cm}^2$. B is a point on AC and E is a point on FD such that ABEF is a square with sides of length $(x - 2)$ cm



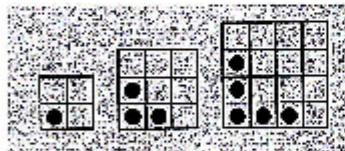
Calculate the length of BC. [5]

QUESTION 4

Consider the following quadratic number pattern: -6; -2; 4; 12; 22

- 4.1 Show that the general term for this pattern is $T_n = n^2 + n - 8$ (4)
 - 4.2 Which term of the quadratic pattern is equal to 148? (4)
 - 4.3 A new pattern is made with the first differences of the above sequence. Determine the general term of the first differences. (3)
 - 4.4 Between which TWO terms of the quadratic pattern will the first difference be 100? (3)
- [14]

QUESTION 5



	Pattern 1	Pattern 2	Pattern 3	Pattern 4
No. of dotted tiles	1	3	5	
No. of blank tiles	3	5	7	11

- 5.1 How many blank tiles will there be in the FOURTH pattern? (1)
 - 5.2 Determine the number of dotted tiles in the 115th pattern. (3)
 - 5.3 Determine the n^{th} term for the blank tiles. (3)
 - 5.4 Calculate the largest value of n for which the pattern will have less than 444 blank tiles. (4)
- [11]

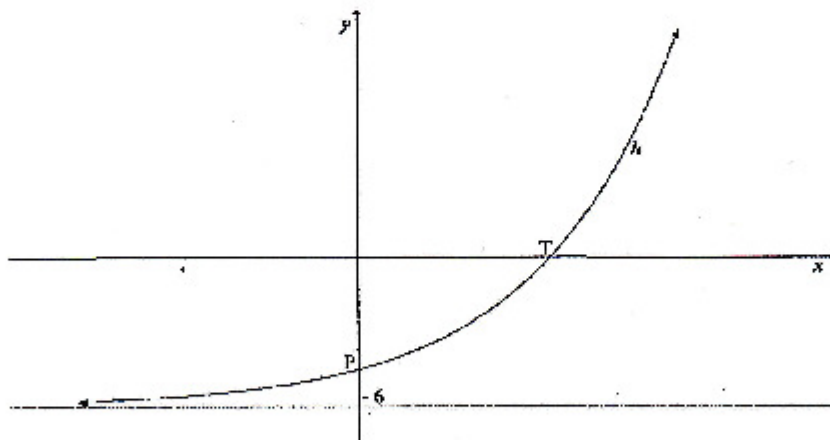
Question 6

Given: $f(x) = \frac{9}{x-1} - 3$

- 6.1 State the equations of the asymptotes of f . (2)
 - 6.2 Calculate the x - and y -intercepts of f . (4)
 - 6.3 On DIAGRAM SHEET 1, provided in your answer booklet, sketch the graph of f . Show clearly the intercepts with the axes and the asymptotes. (3)
 - 6.4 If $y = x + k$ is an equation of the line of symmetry of f , calculate the value of k . (2)
 - 6.5 Determine the equation of $h(x)$ if $h(x) = f(x+2)$. (2)
- [13]

QUESTION 7

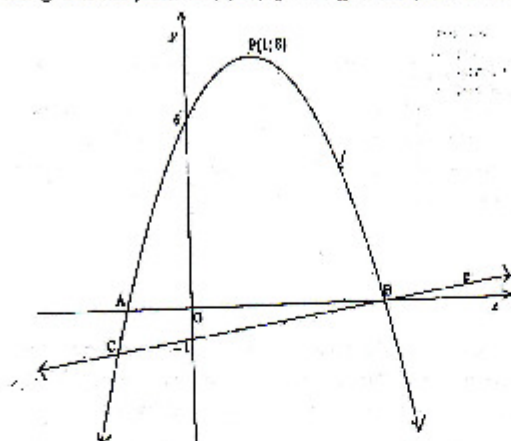
Given: $h(x) = a \cdot 3^{x-1} + q$. The line $y = -6$ is an asymptote to the graph of h . P is the y -intercept of h and T is the x -intercept of h .



- 7.1 State the value of q . (1)
 - 7.2 If the graph of h passes through the point $(1; -4)$, calculate the value of a . (3)
 - 7.3 State the domain and range of h . (2)
 - 7.4 Calculate the coordinates of T, the x -intercept of h . (2)
 - 7.5 Calculate the equation of $p(x)$ if p is the reflection of h about the x -axis. (2)
- [10]

QUESTION 8

Below is a sketch graph of parabola f and straight line g . $P(1; 8)$ is the turning point of f , f cuts the y -axis at $(0; 6)$ and g cuts the y -axis at $(0; -1)$. f and g intersect at B and C . B is a point on the x -axis.



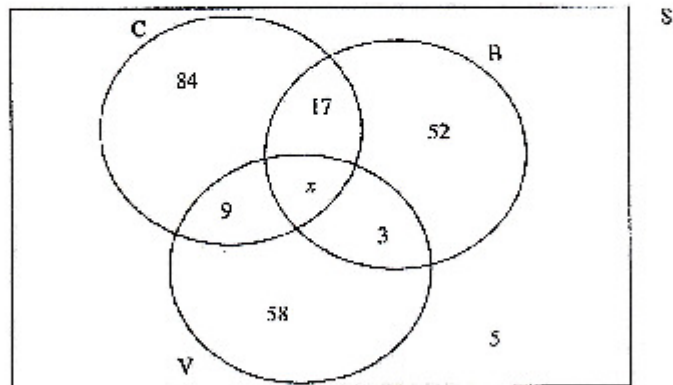
- 8.1 Determine the equation of the parabola f in the form $y = a(x - p)^2 + q$ (4)
- 8.2 Hence, show that the equation of the straight line g is $y = \frac{1}{3}x - 1$. (6)
- 8.3 For which values of x will:
- 8.3.1 $f(x) \geq 0$ (2)
- 8.3.2 $\frac{f(x)}{g(x)} > 0$ (2)
- 8.4 For which value of p if $f(x) = p$ will have non-real roots? (2)
- 8.5 Determine the coordinates of C . (6)
- [22]

QUESTION 9

- 9.1 A car valued at R150 000, depreciates to a value of R72 000 after 8 years on a reducing balance scale. Calculate the rate of depreciation per annum if the rate was a fixed annual rate. (4)
- 9.2 Calculate the effective rate if interest is 8,6% compounded monthly. (3)
- 9.3 Shannon invests R50 000 when she turns 21 to save towards the deposit on purchasing a flat at a rate of 8% p.a. compounded monthly. Two years later she deposits another R6 000. A year after that the interest rate changes to 9% compounded quarterly. Use a timeline to determine how much money will she have towards her deposit when she turns 26 years old? (6)
(13)

QUESTION 10

A survey was carried out with 240 customers who bought food from a fast-food outlet on a particular day. The outlet sells cheese burgers (C), bacon burgers (B) and vegetarian burgers (V). The Venn diagram below shows the number of customers who bought different types of burgers on the day.



- 10.1 Solve for the value of x . (2)
- 10.2 Are B and C mutually exclusive, give a reason for your answer. (2)
- 10.3 If a customer from this group was selected at random, determine the probability that he/she:
- 10.3.1 Ordered a cheese burger only. (1)
 - 10.3.2 Bought a vegetarian burger and a bacon burger. (1)
 - 10.3.3 Did not buy a bacon burger. (3)
 - 10.3.4 Bought a cheese or vegetarian burger. (3)
- (12)

QUESTION 11

Given: $P(A) = 0,11$
 $P(B) = 0,36$
 $P(A \text{ or } B) = 0,428$

Determine whether events A and B are independent or not. Show ALL relevant calculations used in determining the answer.

[4]

QUESTION 12

Blessing has a bag containing 60 marbles that are either red, yellow or blue. $\frac{2}{3}$ of the marbles are red and 10% are yellow. Blessing picks TWO marbles out of the bag, one at a time and without replacing the first one.

12.1 How many blue marbles are in the bag? (2)

12.2 Fill in the tree diagram drawn on DIAGRAM SHEET 2 to represent the above situation. (5)

12.3 What is the probability that Blessing will choose a RED and a YELLOW marble? (2)

[9]

INFORMATION SHEET: MATHEMATICS
INLIGTINGSBLAD: WISKUNDE

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

$$\bar{x} = \frac{\sum fx}{n}$$

$$\sigma^2 = \frac{\sum (x_i - \bar{x})^2}{n}$$

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

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

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

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

