Beaulieu College

Mathematics Department

GRADE 11

MATHEMATICS

PAPER 1

Time:	2 ½ Hours		125 marks
Date:	9 November 2015		
Examiner:	Ms Smith	Moderator:	Mrs Prinsloo

NAME: _____

PLEASE READ THE FOLLOWING INSTRUCTIONS CAREFULLY

1. This paper consists of 13 pages. A **FORMULA SHEET** and an **ANSWER SHEET** are attached at the end of the paper.
2. Please check that your paper is complete.
3. Answer all the questions on the folio pages except for QUESTION 7 (b). QUESTION 7 (b) must be answered on the **ANSWER SHEET**. Please ensure that the answer sheet is detached and handed in with your answers.
4. Please note that diagrams are not necessarily drawn to scale.
5. All necessary working details must be shown.
6. Round your answers off to ONE decimal place unless stated otherwise.
7. Approved non-programmable and non-graphical calculators may be used, unless otherwise stated.
8. It is in your own interest to write legibly and to present your work neatly.

QUESTION 1

Simplify the following:

(a) $\frac{2}{x-4}-\frac{1}{x+2}$ if $x \neq -2$ and $x \neq 4$ (3)

(b) $\sqrt{\frac{2^{x+3}-2^{x+2}}{2^{x-2}}}$ (4)

[7]

QUESTION 2

Solve for $x \in R$:

(a) $(2x-1)(x+3)=-5$ (3)

(b) $2x^2-3x-7=0$, rounding your answers of to one decimal place. (3)

(c) $\sqrt{x+5}+5=\frac{14}{\sqrt{x+5}}$ (6)

(d) $x^2-7x+12>0$ (4)

(e) $(5^x-1)(5^x-25)=0$ (3)

[19]

(*Please turn over for Question 3.*)

QUESTION 3

(a) The roots of a quadratic equation is given by $x = \frac{-2 \pm \sqrt{4-20k}}{2}$.

Determine the value(s) of k for which the equation will have real roots. (2)

(b) Solve for x and y simultaneously if:

$x - 2y - 3 = 0$ and $4x^2 - 5xy + y^2 = 0$ (7)

[9]

QUESTION 4

(a) The following sequence is given: $\frac{1}{8}$; $\frac{4}{27}$; $\frac{9}{64}$; ...

(1) Write down the next term in the sequence. (1)

(2) Determine a formula for the n^{th} term. (2)

(b) The 4th , 5th and 6th terms of linear number pattern are $x+2$, $2x+2$ and $4x-1$ respectively.

Determine the first term of the sequence and the common difference. (5)

[8]

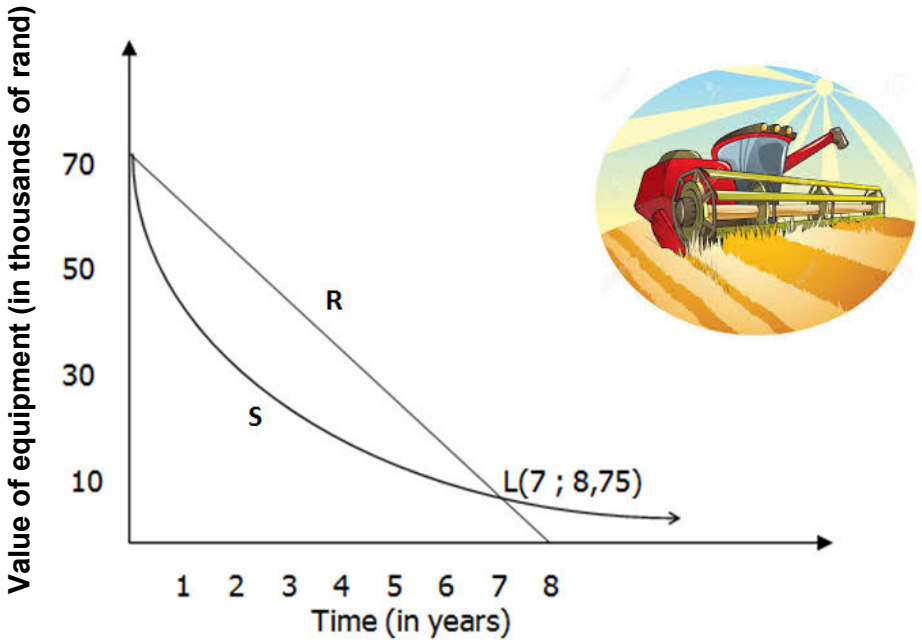
(*Please turn over for Question 5.*)

QUESTION 5

ALL ANSWERS IN THIS QUESTION MUST BE ROUNDED OFF TO TWO DECIMAL PLACES

(a) The diagram below displays two methods of depreciation for farming equipment.

Point $\mathrm{L}(7;\ 8{,}75)$ is the intersection of line R and curve S.



(1) What was the initial value of the equipment? (1)

(2) What type of decrease does **Method R** illustrate? (1)

(3) **Method S** uses the formula $\mathrm{A} = \mathrm{P}(1-i)^n$.

Determine the annual rate of depreciation using the above formula and the information provided on the graph. (3)

(b) Russel wants to invest money at a bank that offers interest on investments at a rate of 7,2% per annum compounded monthly.

(1) Calculate the annual effective interest rate equivalent to this. (2)

(2) Determine how much Russel must invest now (as a lump sum) so that he has R12 450 in five years' time. (3)

(c) Carmen decides to buy a new smart phone from Mobile Madness on hire purchase.

Mobile Madness offers the following deal on the Samsung Galaxy S6:

Pay a 15% cash deposit on the purchase price of R11 599 and you can pay the outstanding balance monthly at 18,5% simple interest over 2 years.

[http://www.samsung.com/za/home]

Determine Carmen's monthly payments. (4)

(d) Ciaran opens a savings account by making an initial deposit of R5 850.
After 2 years, he deposits a further R4 700 into the account.
Five years after opening the account, he withdraws R3 600 from the account.

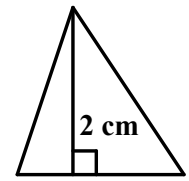
Interest is paid at 6,3% per annum, compounded monthly, for the first 2 years and 8% per annum, compounded quarterly, thereafter.

Determine the value of Ciaran's investment after seven years. (6)

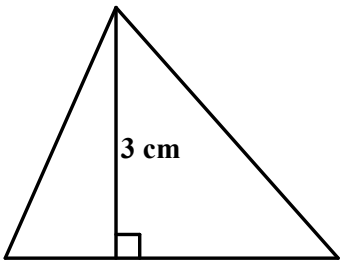
[20]

QUESTION 6

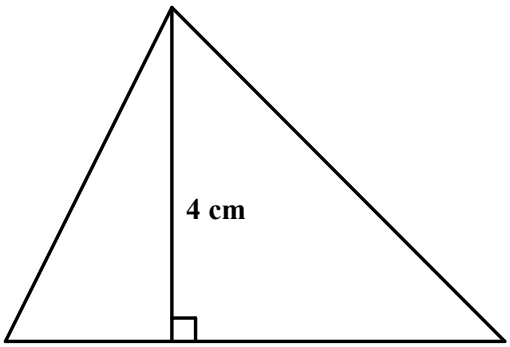
A pattern of triangles is formed by increasing the base of the triangle by 2 cm and the perpendicular height by 1 cm in each successive triangle. The first triangle has a base of 2 cm and a height of 2 cm. The pattern continues in this manner.



TRIANGLE 1



TRIANGLE 2



TRIANGLE 3

(a) Determine the areas of the first four triangles. (3)

(b) Calculate the area of the 98^{th} triangle in the pattern. (4)

[7]

QUESTION 7

Given: $f(x) = -(x-3)(x+1)$ and $g(x) = 2x+2$

(a) Write down the x-intercepts of the graph of f. (2)

(b) Sketch the graphs of f and g on the set of axes provided on the **ANSWER SHEET** at the end of the paper. Clearly indicate all turning points and label all intercepts with the axes. (6)

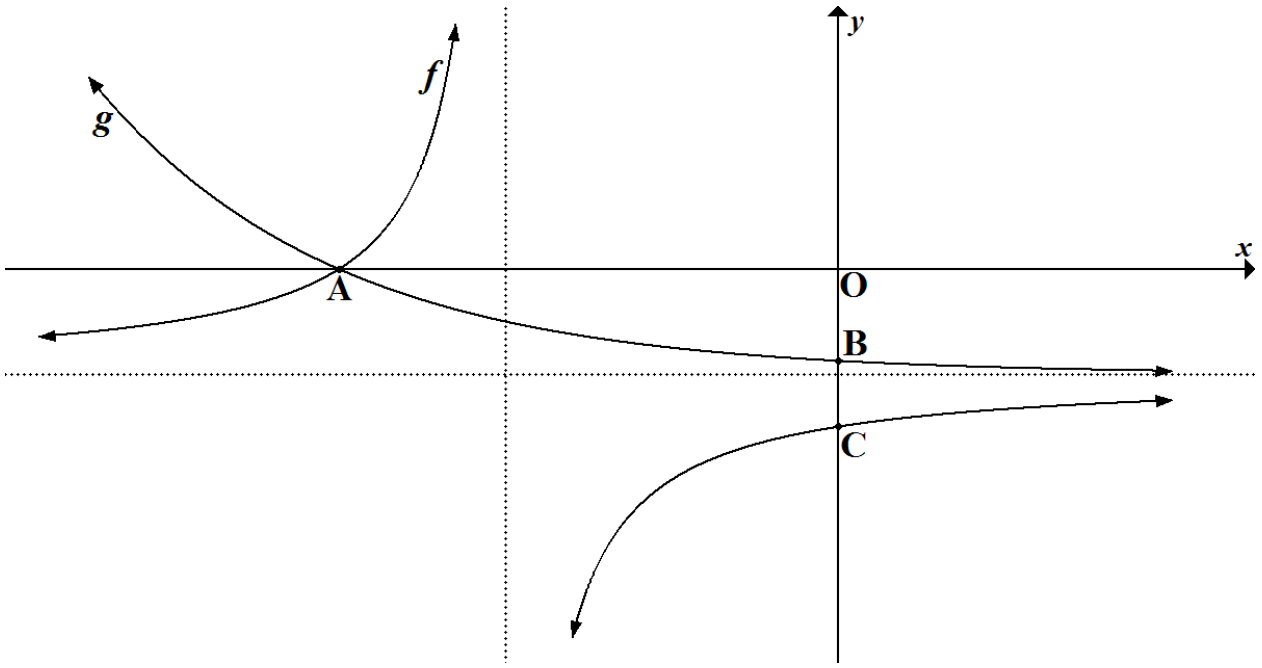
(c) Write down the range of f. (2)

(d) For which value(s) of k will $f(x) - k = g(x)$ have equal roots? (2)

[12]

QUESTION 8

The diagram below shows the graphs of $f(x)=\frac{-4}{x+2}-4$ and $g(x)=2^{-x+p}+q$.



The graphs of f and g have the same horizontal asymptote as well as the same x-intercept at point A. Points B and C are the y-intercepts of the graphs of g and f respectively.

(a) Determine the coordinates of point A. (3)

(b) Determine the values of p and q. (5)

(c) Determine the length of BC. (3)

(d) Determine the equations of the asymptotes of $f(x-5)+9$. (2)

(e) Use your graphs to determine the value(s) of x for which $f(x).g(x)>0$. (2)

[15]

QUESTION 9

Sketch the graph of $h(x) = a.b^x + q$ if it also given that:

- $a < 0$
- $b > 1$
- $q < 0$
- a, b and q are real numbers.

[3]

QUESTION 10

ALL ANSWERS IN THIS QUESTION MUST BE ROUNDED OFF TO THREE DECIMAL PLACES

(a) During a survey, 120 people were asked with which hand they write and whether they prefer scientific or artistic subjects. The results are summarised in the table below:

		HAND USED FOR WRITING		
		Right	**Left**	**Total**
	Scientific	28	16	**44**
	Artistic	74	2	**76**
	Total	**102**	**18**	**120**

(1) If a left handed person is chosen, what is the probability that this person prefers scientific subjects? (2)

(2) Showing all working, determine whether it can be said that the events, a person's preferred subjects and the hand used for writing are independent. (3)

(b) A bag contains 4 red and 7 green balls. A second bag contains 6 red and 2 green balls. A ball is taken randomly from one of the two bags.

(1) Draw a tree diagram to represent the above information. Clearly indicate the probability of each branch of the tree. (4)

(2) Determine the probability of the chosen ball being red. (3)

[12]

QUESTION 11

For a sample space S and events A and B, it is given that:

- $P([\text{not } A] \text{ and } B) = P(A' \text{ and } B) = \frac{2}{5}$
- $P(A \text{ and } B) = \frac{3}{10}$
- $P(1 - [A \text{ or } B]) = \frac{1}{10}$

(a) Draw a Venn diagram to represent the above information. (4)

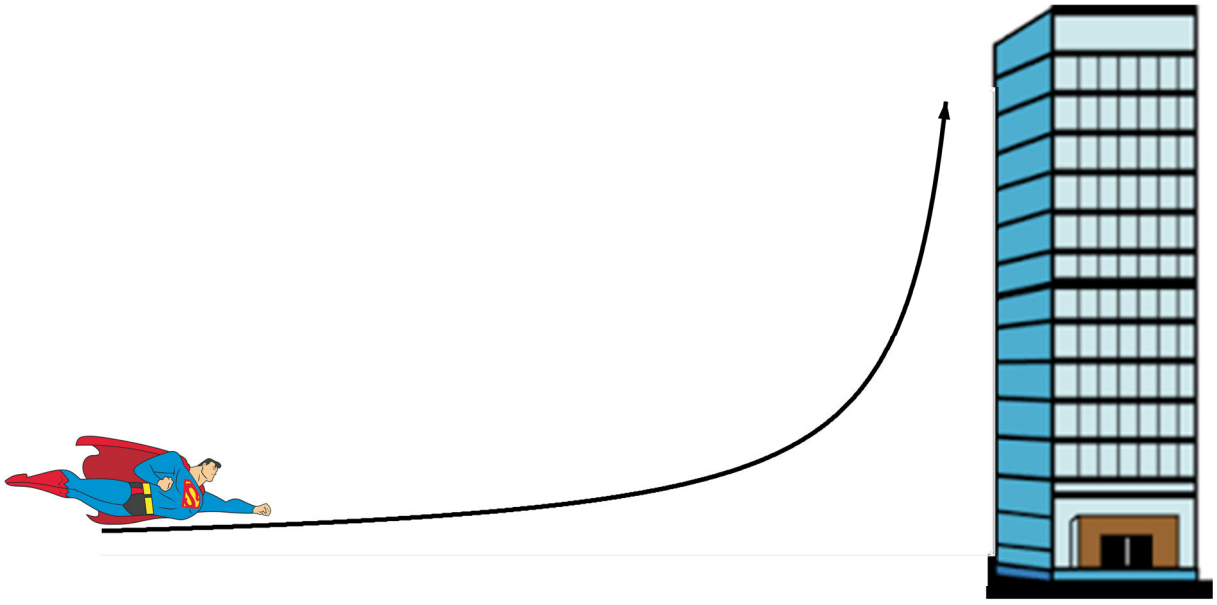
(b) Determine $P(B)$. (2)

[6]

(*Please turn over for Question 12.*)

QUESTION 12

Lois Lane spots Superman flying along the ground towards a tall building as shown below. His flight path is in the shape of a hyperbola.



The following table shows his height above the ground in metres, t seconds after Lois spotted him:

Time (t) in seconds	Height (h) above the ground in metres
0	2
3	3
6	6

After 8,6 seconds, Superman reaches the same height as the top of the building. He immediately discontinues his hyperbolic flight path in order to land on the roof of the building.

If the ground is given as the horizontal asymptote of the hyperbola, determine the height of the building. Show all your calculations.

[7]

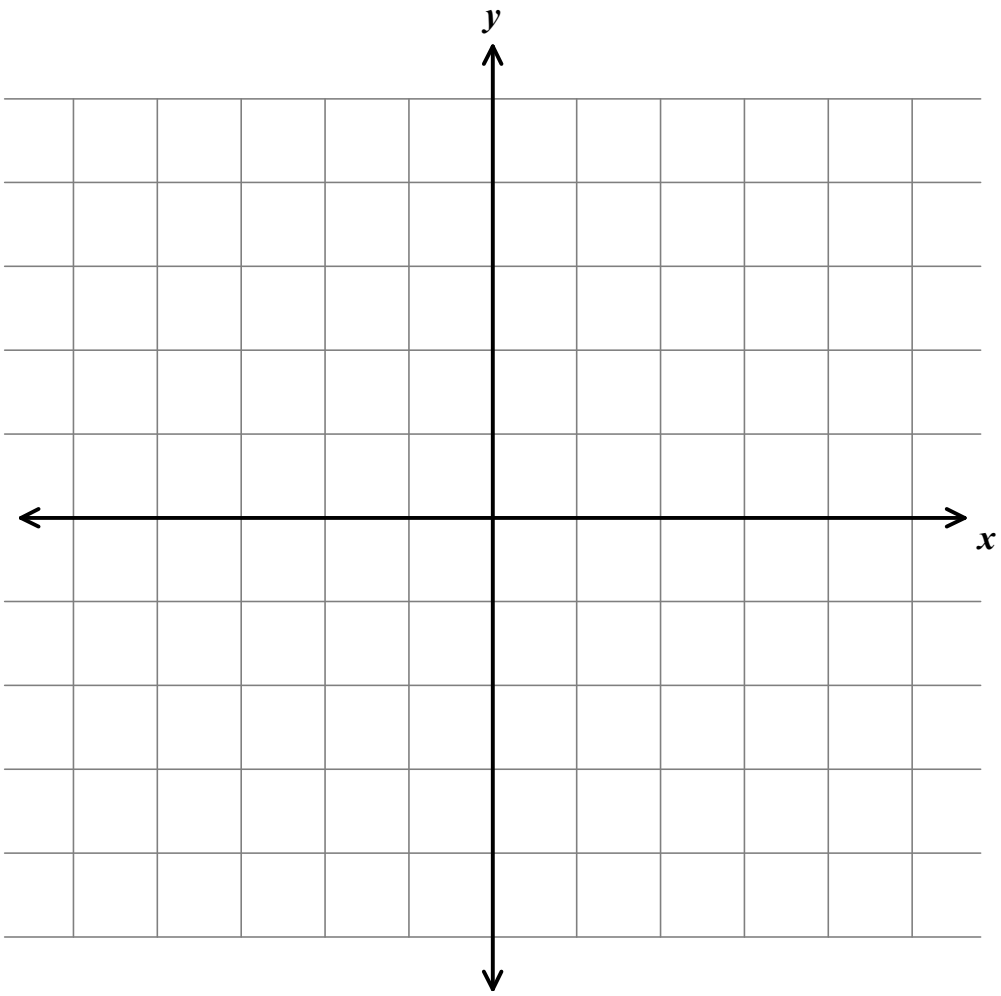
TOTAL: [125]

ANSWER SHEET

Name: _____

QUESTION 7 (b)

Please detach this page and hand in with your answers.



MARKING GRID

Question	Algebra & Equations	Patterns & Sequences	Finance & Growth	Functions & Graphs	Probability	
1	/7					
2	/19					
3	/9					
4		/8				
5			/20			
6		/7				
7				/12		
8				/15		
9				/3		
10					/12	
11					/6	
12				/7		
TOTAL	/35	/15	/20	/37	/18	/125

FORMULA SHEET

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

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

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

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

$$y = mx + c \qquad y - y_1 = m(x - x_1)$$

$$m = \frac{y_2 - y_1}{x_2 - x_1}$$

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

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