

KING DAVID HIGH SCHOOL LINKSFIELD



GRADE 11
MATHEMATICS PAPER 1

NOVEMBER 2015

Reading time: 10 minutes

Writing time: $2\frac{1}{2}$ hours

Marks: 125 marks

This paper consists of a question paper of 8 pages (including the front cover) and a data sheet.
Check that your paper is complete.

Write your name on the A4 paper and on the question paper.

Please read the following instructions carefully:

1. Number all questions exactly as they appear on the question paper.
2. Pay careful attention to time management and mark allocation.
3. Write legibly and not in pencil.
4. Non programmable calculators may be used unless otherwise instructed.
5. All answers to be given to 2 decimal places where appropriate.
6. **All necessary calculations must be clearly shown. You will NOT receive full credit if you write down only the answers and show no working out.**

Name: _____

Q1 [21]	Q2 [7]	Q3 [5]	Q4 [14]	Q5 [16]	Q6 [8]	Q7 [7]	Q8 [12]
Q9 [4]	Q10 [7]	Q11 [11]	Q12 [5]	Q13 [4]	Q14 [4]	TOTAL	
						<hr/> 125	

SECTION A

QUESTION 1

Solve for x:

1.1 $8x^2 + 1 = 7x$ (4)

1.2 $\frac{x}{x-1} - \frac{2x+4}{3x+1} = -4$ (6)

1.3 $x^2 \geq 16$ (4)

1.4. $4^x + 2^x = 8(2^x + 1)$ (7)

QUESTION 2

Solve for x and y:

$$x = 2y - 6$$

$$x^2 + y^2 = 20$$
 (7)

QUESTION 3

Simplify: $\frac{9^x \cdot 10^{x-2}}{6^{x-1} \cdot 15^x}$ (5)

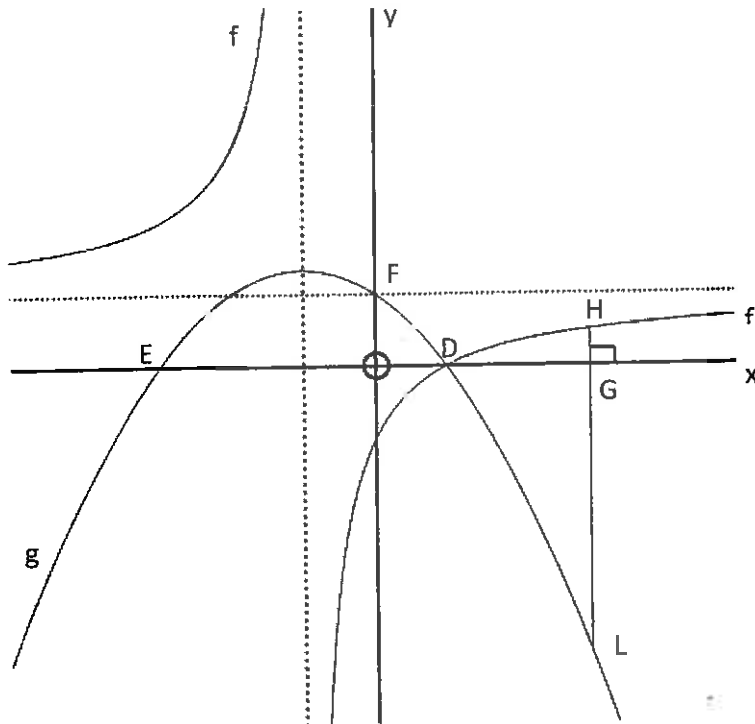
QUESTION 4

4.1. Ms Moodley invested R5000 at an interest rate of 10% per annum compounded quarterly. After 2 years the interest rate changed to 9% compounded monthly. Find the value of the investment after 5 years. (6)

4.2. If a bank pays an interest rate of 9,8% per annum compounded monthly, what is the effective annual interest rate. (3)

4.3. Mrs Horwitz buys a car for R150000 with the intention of replacing it with a similar one in 5 years time. The value of her car depreciates at 20% per annum on a reducing balance. The price of a similar car is expected to increase by 12% per annum each year. What will be the difference between the two values in 5 years time? (5)

QUESTION 5



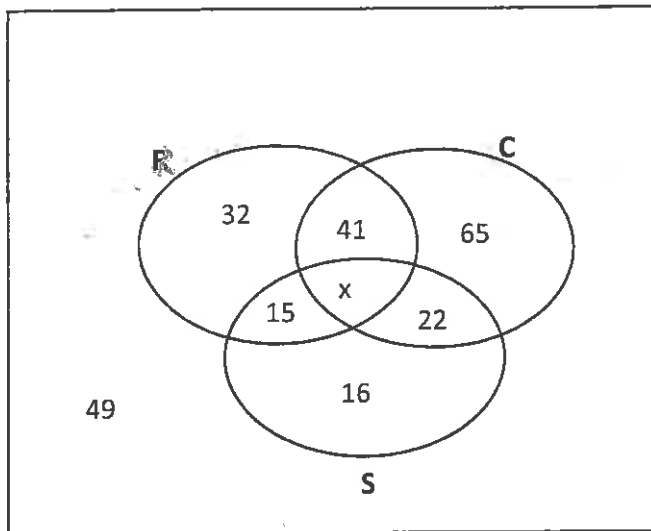
The sketch represents the graphs of $f(x) = \frac{-2}{x+1} + 1$ and

$g(x) = ax^2 + bx + c$. The graphs intersect each other on the x axis and the vertical asymptote of f is the axis of symmetry of g . The y intercept of g lies on the horizontal asymptote of f .

- 5.1. Write down the equations of the asymptotes of f . (2)
- 5.2. Find the co-ordinates of D , E and F . (5)
- 5.3. Determine, showing all working, the values of a , b and c . (4)
- 5.4. If $g(x) = -\frac{1}{3}x^2 - \frac{2}{3}x + 1$ find the length of HL given that $OG = 3$ units. (3)
- 5.5. Write down the values of x for which $f(x) \leq g(x)$ (2)

QUESTION 6

250 people are interviewed and asked if they like watching rugby (R), cricket (C) or swimming (S) on television. The results are shown in the Venn diagram. Use this diagram to answer the questions below.



- 6.1. How many people enjoy watching all 3 sports? (3)
- 6.2. What is the probability that a randomly selected person likes rugby or cricket? (2)
- 6.3. What is the probability that a randomly selected person likes only rugby and cricket? (2)
- 6.4. What is the probability that a randomly selected person does not like watching any of the three sports? (1)

SECTION B

QUESTION 7

Given that $3x^2 + 2px = q^2$

7.1. Solve for x (in terms of p and q) by completing the square. (5)

7.2. Hence determine the nature of the roots if $p = q$ (2)

QUESTION 8

8.1. Write down the next term in each sequence

i. 1; 4; 9; ...

ii. 4; 7; 10; ...

iii. $1; \sqrt{5}; 5$;

(4)

8.2. Consider the quadratic sequence

6; 9; w ; 21; 30

8.2.1. Calculate the value of w (show all calculations) (4)

8.2.2. Determine the formula for T_n of this sequence. (4)

QUESTION 9

If $0 < a < 1$ and $b < 0$ draw a rough sketch of:

9.1. $y = ax - b$ (2)

9.2. $y = a^x + b$ (2)

QUESTION 10

The graph of an increasing exponential function with equation

$f(x) = ab^x + q$, $b > 0$ has the following properties.

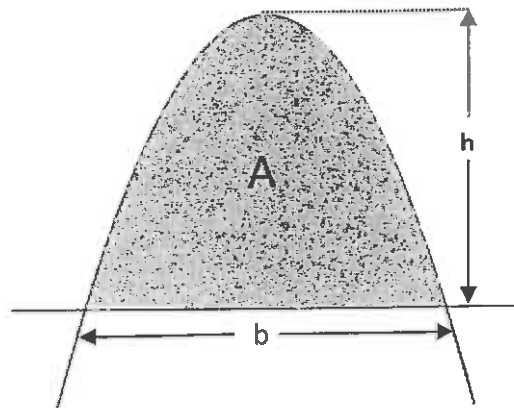
- Range: $y > -3$
- f cuts the y axis at -1
- The point $(2; 5)$ lies on the graph of f

10.1. Determine the equation that defines f (5)

10.2. Describe the transformation from $f(x)$ to $h(x) = 2^x$ (2)

QUESTION 11

Consider the area, A , contained between a parabola and a horizontal line.



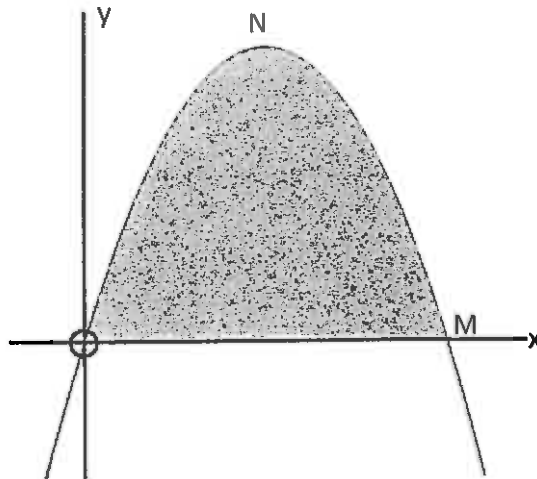
Let b be the horizontal base of the area and h the height i.e. h is the vertical distance from the turning point to the base.

The area of A is given by the formula: $A = \frac{2}{3}bh$

In both diagrams below the equation of the parabola is $y = 6x - x^2$

The graph cuts the x axis at O and M and has turning point at N .

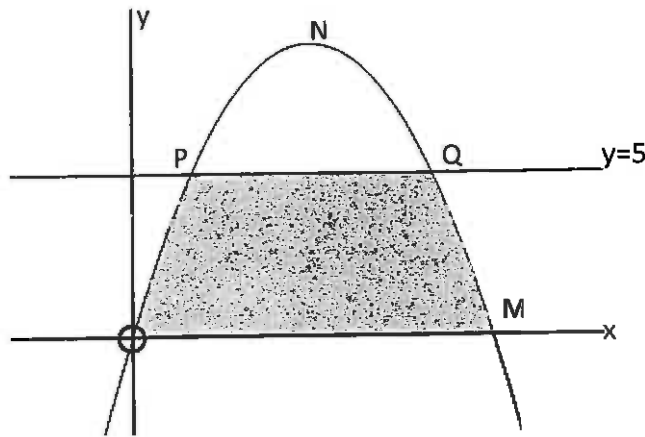
11.1.



11.1.1. Write down the co-ordinates of M and N (4)

11.1.2. Hence find the shaded area. (2)

11.2. The line $y = 5$ is drawn to cut the parabola at P and Q.



11.2.1. Find the co-ordinates of P and Q. (3)

11.2.2. Hence find the shaded area (2)

QUESTION 12

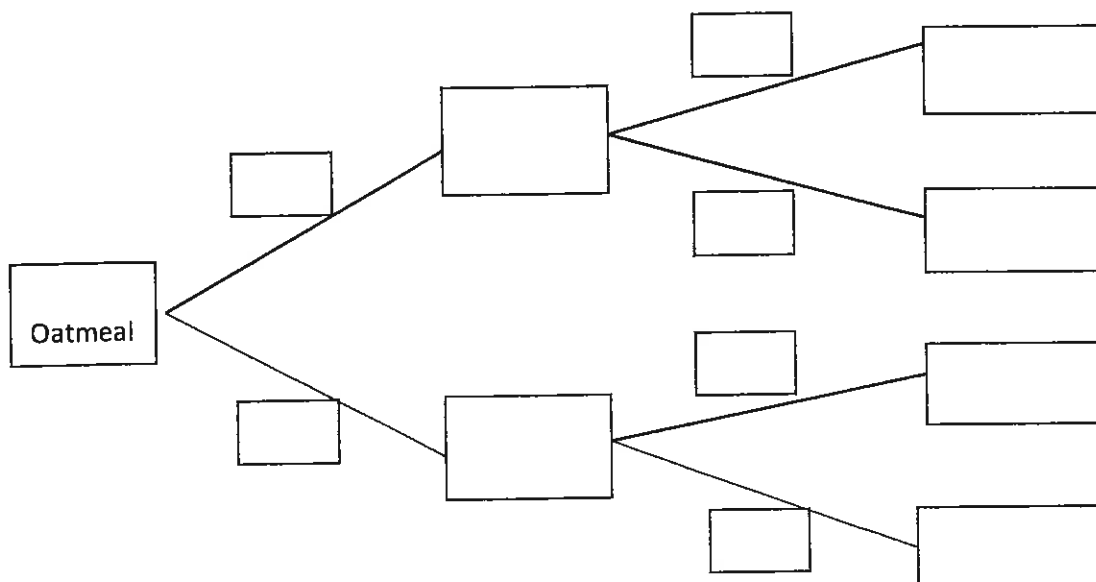
Mrs Bloch eats either cereal or oatmeal for breakfast every day.

If she has cereal one day the probability that she has cereal the next day is 0,2.

If she has oatmeal one day the probability that she has oatmeal the next day is 0,4.

She had oatmeal on Tuesday 3 November. Using the given diagram as a guideline, draw a tree diagram (on your A4 paper) to illustrate this and hence determine the probability that she had oatmeal this morning (Thursday 5 November).

Give your answer correct to 2 decimal places. (5)



QUESTION 13

A and B are independent but not mutually exclusive events.

$$P(A) = \frac{2}{5} \text{ and } P(B) = \frac{1}{3}$$

Determine $P(A \cup B)$

(4)

QUESTION 14

Jaymee had to find the product of 2^{2007} and 5^{2000} and then calculate the sum of the digits of the answer. Jaymee arrived at the answer 11. Is she correct? Without using a calculator, show all calculations to justify your answer.

(4)