

RONDEBOSCH BOYS' HIGH SCHOOL



GRADE 11

**MATHEMATICS PAPER 1
2 JUNE 2017**

MARKS: 100

EXAMINER: S CARLETTI

TIME: 2 HOURS

MODERATOR: S VERSTER

This question paper consists of 7 pages.

Instructions:

1. Calculators may be used, unless otherwise stated, with answers correct to 2 decimal places.
2. All necessary working must be shown. Answers only will not necessarily be awarded full marks.
3. Where necessary, leave answers with positive exponents.
4. Graphs are not necessarily drawn to scale.
5. Number your answers as the questions are numbered.
6. Untidy work will be penalised.
7. Only blue or black ink to be used.
8. Sketches may be done in pencil.
9. Write your name on your question paper and place it inside your answer book.

Question 11.1 Solve for x :

1.1.1 $x(x - 1) = 6$ (3)

1.1.2 $3x^2 - 5x + 1 = 0$ (3)

1.1.3 $\sqrt{x + 5} = 2x + 9$ (4)

1.1.4 $x(5x - 7) \geq 6$ (4)

1.2 Solve for x and y simultaneously:

$$x = 2y + 1 \quad \text{and} \quad x^2 - 2y + 3xy = 6$$
 (6)

1.3 Is it possible to bend a 12 cm piece of wire to form the two shorter sides of a right-angled scalene triangle with an area of 20 cm^2 ? Justify your answer with relevant calculations. (4)

[24]

Question 22.1 Show that the roots of the equation $kx^2 + (2k - 1)x = 1 - k$ are rational for all rational values of k . (4)

2.2 A group of elderly citizens chartered a bus for R1600. However, at the last minute, due to illness, eight of them had to miss the trip. Consequently the other citizens had to pay an extra R10 each. How many elderly citizens went on the trip? (6)

[10]

Question 3

CALCULATORS MAY NOT BE USED IN THIS QUESTION.

3.1 Simplify:

$$3.1.1 \quad \frac{3^{x+1} - 3^{x-1}}{2 \times 3^x} \quad (3)$$

$$3.1.2 \quad \left(\frac{\sqrt{7^{2017}} - \sqrt{7^{2015}}}{\sqrt{7^{2016}}} + \sqrt{7} \right)^2 \quad (4)$$

3.2 Solve for x :

$$3.2.1 \quad 3x^{\frac{2}{5}} = 48 \quad (4)$$

$$3.2.2 \quad x^{\frac{2}{3}} - x^{\frac{1}{3}} - 2 = 0 \quad (4)$$

3.3 Given $g(x) = \frac{x}{2}$ if x is rational
 $g(x) = x^2$ if x is irrational

$$\text{Evaluate } g(\sqrt{4}) + g(\sqrt{8}) \quad (3)$$

3.4 Suppose that

$$4^a = 5$$

$$5^b = 6$$

$$6^c = 7$$

$$7^d = 8$$

Find the value of $abcd$. (3)

[21]

Question 4

4.1 The sequence below is a quadratic sequence.

Pattern	3	p	25
First difference		9	q

4.1.1 Calculate the values of p and q . (2)

4.1.2 Determine the n th term of the quadratic sequence. (4)

4.2 The diagram shows the first three figures in a pattern.

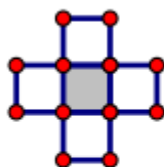


Fig. 1

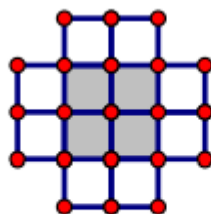


Fig. 2

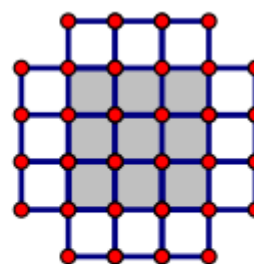


Fig. 3

4.2.1 Write down the values of a and b .

Figure	Number of dots	Number of grey squares	Number of white squares
1	12	1	4
2	21	4	8
3	a	9	b

(2)

4.2.2 Write down the n th term of the following:

(a) the number of grey squares. (1)

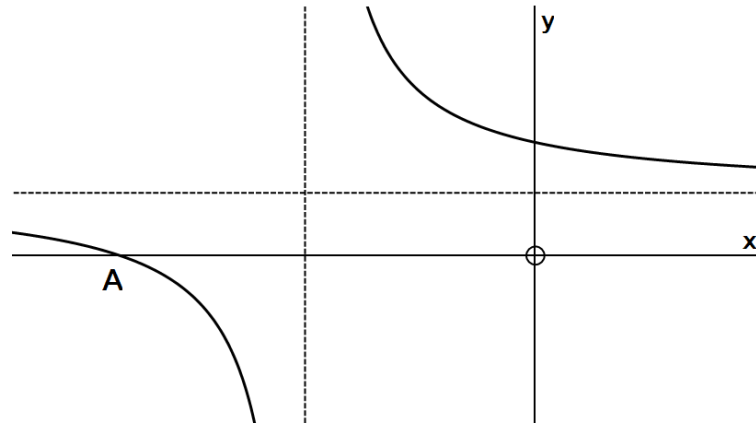
(b) the number of white squares. (1)

4.2.3 The number of dots is given by the formula $T_n = n^2 + 6n + 5$. There are 320 dots in a particular figure. Using appropriate calculations, determine the TOTAL number of squares in that particular figure. (5)

[15]

Question 5

5.1 In the diagram, the graph of $h(x) = \frac{3}{x+2} + 1$ has been sketched.

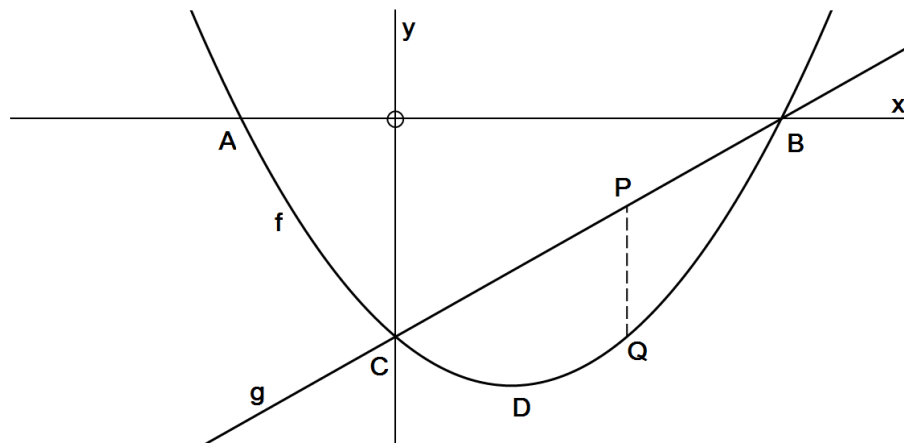


- 5.1.1 Write down the equations of the asymptotes of h . (2)
- 5.1.2 If the graph of h is symmetrical about the line $y = -x + c$, determine the value of c . (2)
- 5.1.3 Calculate the co-ordinates of A, the x -intercept of h . (3)
- 5.1.4 Write down the new equation of h if it is translated horizontally so that point A is at the origin. (1)
- 5.2 Draw a rough sketch of $s(x) = a^{x+p} + q$ where $a > 1$, $q < 0$ and $s(0) = 0$. (3)

[11]

Question 6

The graphs of $f(x) = x^2 - 3x - 10$ and $g(x) = ax + b$ are given below. A and B are the x -intercepts, C is the y -intercept and D is the turning point of f . The graph of $g(x)$ passes through B and C.



- 6.1 Determine the co-ordinates of:
- 6.1.1 C (1)
- 6.1.2 B (2)
- 6.1.3 D (2)
- 6.2 Find the values of a and b . (2)
- 6.3 For what values of x is:
- 6.3.1 $f(x) < g(x)$ (1)
- 6.3.2 $\frac{f(x)}{g(x)} > 0$ (2)
- 6.4 PQ is a vertical line between C and B. Find the maximum length of PQ. (4)
- 6.5 The graph of $h(x) = x + k$ touches $f(x)$ once. Find the value of k . (5)

[19]

TOTAL MARKS: 100