# TEACHERS WITHOUT BORDERS PROGRAMME

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With grateful thanks to our associate partners, The National Department of Basic Education, The Independent Examinations Board, Siyavula Education, Smarticks, Noteshare, Lemonlicious, datacentrix, and most of all, to the schools and teachers from both the public and private education sectors who as founder contributors, have lent content to the Teachers without Borders programme, for the benefit of all South Africa's learners.

In Bill Gates words, at the Mandela Day 'Living Together' address: "Maintaining the quality of this country's higher education system while expanding access to more students will not be easy. But it's critical to South Africa's future" – working together, we can help achieve this."

**Contributing schools to date:**

| | | | |
|---|---|---|---|
| Clifton School | Milnerton High | Rustenburg Girls' High | St Peter's |
| Durban Girls' | Northwood High | St Anne's DC | St Stithians |
| Fairmont High | Roedean | St John's DSG | Wynberg Boys' High |
| Herzlia High | Rondebosch Boys' | St Mary's DSG Kloof | Wynberg Secondary |

| | | |
|---|---|---|
| | | 20 November 2014 |
| Grade 8 | Mathematics<br>Paper 1 | 1½ hours<br>100 marks |

Instructions:

- Answer all questions.
- **All necessary working must be shown in its proper place with the answer.**
- No calculators may be used in this paper.
- Diagrams are not necessarily drawn to scale.
- Blue or black pen must be used in answers although pencil may be used on diagrams.
- The use of correcting fluid is not allowed.
- This examination paper consists of 8 pages and a 2 page answer sheet. Staple the answer sheet to the **FRONT** of your answers.

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Question 1

Complete the table **ON THE YELLOW ANSWER SHEET.**

Put ticks in the correct places to classify each number.

| | Natural | Integer | Rational | Irrational | Real | Imaginary |
|---|---|---|---|---|---|---|
| $-3$ | | | | | | |
| $4\pi$ | | | | | | |
| $\sqrt{-7}$ | | | | | | |
| $\sqrt{36}$ | | | | | | |

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Question 2

2.1 Write down the lowest common multiple of 10 and 12. (1)

2.2 Which is bigger: 13,2 or $\sqrt{163}$? (1)

2.3 How many whole numbers are between $\sqrt{8}$ and $\sqrt{80}$? (1)

2.4 Consider the numbers $-7;\ -5;\ -1;\ 1;\ 3$
Using only two of the above numbers, what is the smallest product one could make? (1)

2.5 Write down the factors of 18. (2)

2.6 Simplify $\frac{10^7}{5\times10^4}$ (2)

2.7 $\diamond$ and $\Delta$ are natural numbers and $\diamond \times \Delta = 36$. What is the largest possible value of $\diamond - \Delta$? (2)

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Question 3

3.1 Simplify:

3.1.1 $1\frac{1}{2} + 3\frac{2}{3}$ (3)

3.1.2 $1\frac{5}{16} \div 2\frac{11}{12}$ (3)

3.2 $n^*$ means the reciprocal of $n$. So $5^* = \frac{1}{5}$
Which of the following are true? Write down the letter(s) that correspond to all the correct statements.

A $3^* + 6^* = 9^*$
B $6^* - 4^* = 2^*$
C $2^* \times 6^* = 12^*$
D $10^* \div 5^* = 2^*$

(2)

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Question 4

4.1 A pet shop sells only dogs, cats and mice in the ratio $2:3:30$. If there are $385$ animals in total, how many cats are there in the shop? (2)

4.2 Matthew began peeling a pile of $44$ potatoes at a rate of $3$ potatoes per minute. Four minutes later Charles joined him and peeled at a rate of $5$ potatoes per minute. When they finished, how many potatoes had Charles peeled? (3)

4.3 If $\frac{x}{y} = \frac{2}{3}$ and $\frac{y}{z} = \frac{7}{5}$ find the value of $\frac{z}{x}$ (3)

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Question 5

Given: $3x - 4x^2 + 2x^3 - 1$

5.1 What is the degree of the expression? (1)

5.2 What is the coefficient of $x^3$? (1)

5.3 Write down the constant term. (1)

5.4 What is the value of the expression if $x = 1$? (1)

5.5 Rearrange the expression in descending powers of $x$. (1)

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Question 6

Simplify:

6.1 $-4x + 6x - x$ (1)

6.2 $-6x^2 - (-x^2)$ (1)

6.3 $-4(x + 2y)$ (2)

6.4 $\sqrt[3]{27x^{27}}$ (2)

6.5 $-3x^2y \times 4xy^3$ (2)

6.6 $-(2x^2)^3$ (2)

6.7 $\frac{4x^4}{16x^{16}}$ (2)

6.8 $3x - x(2x + 1)$ (2)

6.9 $\frac{6x^3 \times -4x^2}{-12x} - (2x)^4$ (4)

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Question 7

7.1 If $a = -2$, which is the largest number in the set $\left\{-3a;\ \ 4a;\ \ \frac{24}{a};\ \ a^2;\ \ 1\right\}$? (2)

7.2 Subtract:

$$\begin{array}{r} 3x - 4y - z \\ \underline{-x - 3y + z} \end{array}$$ (3)

7.3 Multiply: $-5xy^2(4x^3 - xy^3)$ (2)

7.4 Divide: $\frac{9x^3y^2 - 27xy^4}{-9xy^2}$ (2)

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Question 8

8.1 Solve for $x$:

8.1.1 $-\frac{12}{x} = -3$ (1)

8.1.2 $x^2 = 25$ (2)

8.1.3 $2x - 3 = 5$ (2)

8.1.4 $-3(2x + 3) = 4x - 4$ (3)

8.2

8.2.1 Solve for $x$: $x - 5 + 2x = -14$ (2)

8.2.2 Hence solve for $y$: $\sqrt[3]{2y + 1} - 5 + 2\sqrt[3]{2y + 1} = -14$ (4)

8.3 Jonathan can't quite read the board in his Maths class. He writes down the equation he reads on the board as $3x - 7 = 38$. He correctly solves the equation he wrote down, but is surprised to hear the teacher says the answer is 6 less than the answer he found. When he asks the teacher to check his work, the teacher says that Jonathan copied the coefficient of $x$ incorrectly (but copied everything else correctly). Showing some working, what should the coefficient of $x$ have been? (5)

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Question 9

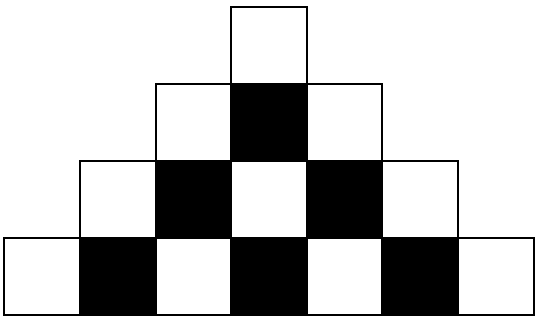
9.1 Write down the next term in the patterns below:

9.1.1 $11; 8; 5; 2; \ldots$ (1)

9.1.2 $3; 6; 12; 24; \ldots$ (1)

9.1.3 $4; 1; 6; 2; 8; 4; 10; 8; \ldots$ (1)

9.2 A "stair-step" figure is made up of alternating black and white squares in each row. Rows 1 to 4 are shown. All rows begin and end with a white square.



How many black squares are in the $37^{th}$ row? (2)

9.3 Given the pattern $5; 11; 17; 23; 29; \ldots$
Find the difference between the first term and the $201^{st}$ term. (2)

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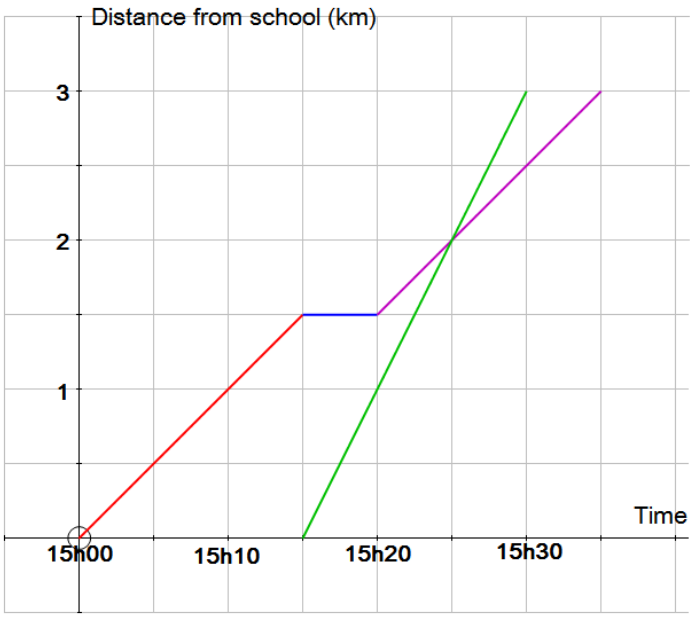
Question 10

Alan left school at 15h00. He walked home. On the way home, he stopped to talk to a friend.

His brother, Barry, left the same school at 15h15. He cycled home using the same route as Alan.

Here are the distance-time graphs for Alan's and Barry's complete journeys.




10.1 How far did Alan walk during the first ten minutes of his journey? (1)

10.2 How long did Alan spend talking to his friend? (1)

10.3 At what time did Barry pass Alan? (1)

10.4 What was Barry's speed in kilometers per hour? (2)

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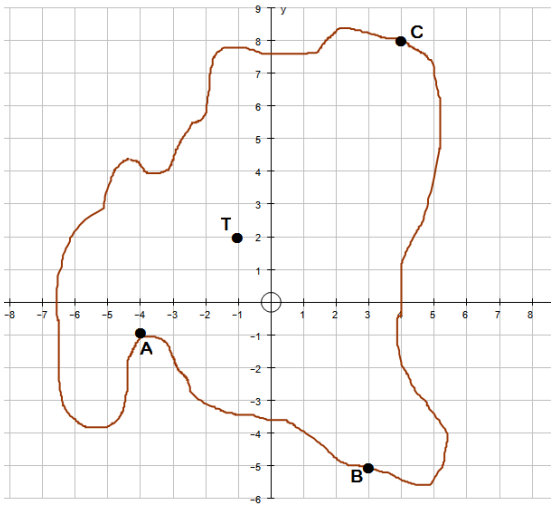
Question 11

**ANSWER THIS QUESTION ON THE ANSWER SHEET**

An island has treasure buried on it at the point $T(-1;2)$. Three contestants arrive at different points on the island. $A$ arrives at $(-4;-1)$, $B$ arrives at $(3;-5)$ and $C$ arrives at $(4;8)$.




They each find a spade with a note attached to it.

Instructions for A:

- Start at $(-4;-1)$
- Translate 5 units right and 2 units down
- Reflect the new point in the $x$-axis.

Instructions for B:

- Start at $(3;-5)$
- Rotate 90° clockwise about the origin
- Translate the new point 3 units right and 5 units up

Instructions for C:

- Start at $(4;8)$
- Enlarge by a scale factor of $\frac{1}{4}$ about the origin
- Reflect the new point in the $y$-axis.

Complete the table on the YELLOW ANSWER SHEET to determine which person, A, B or C reaches the treasure?

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| | | |
|---|---|---|
| RBHS | | 20 November 2014 |
| Grade 8 | Mathematics | 1½ hours |
| Ex: SC | Paper 1 | 100 marks |
| Mod: DG | | |

ANSWER SHEET – STAPLE THIS PAGE TO THE **FRONT** OF YOUR ANSWERS

Name: _____

Maths Teacher: _____

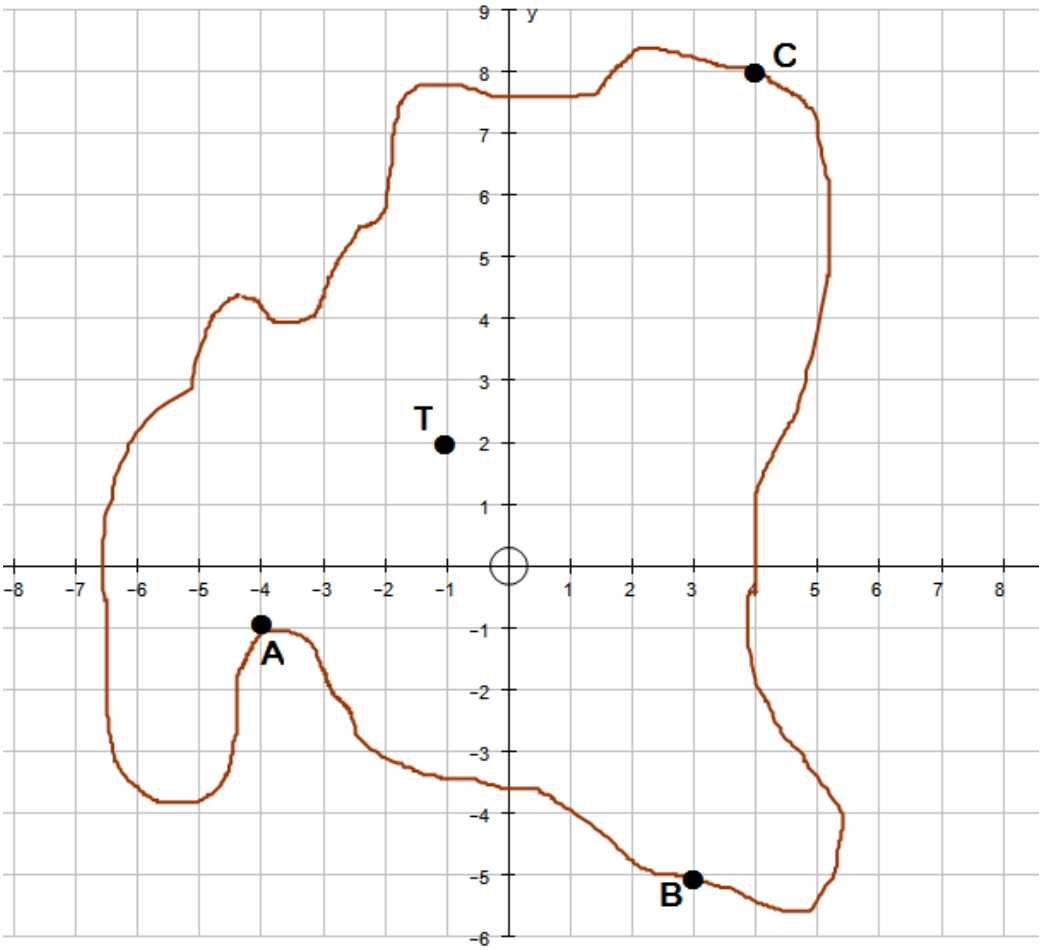
| Question | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Max marks | 4 | 10 | 8 | 8 | 5 | 18 | 9 | 19 | 7 | 5 | 7 | 100 |
| Marks obtained | | | | | | | | | | | | |

Question 1

| | Natural | Integer | Rational | Irrational | Real | Imaginary |
|---|---|---|---|---|---|---|
| $-3$ | | | | | | |
| $4\pi$ | | | | | | |
| $\sqrt{-7}$ | | | | | | |
| $\sqrt{36}$ | | | | | | |

Question 11

Use this map to help you, but you MUST write your answer in the table below.




| | Start | After first transformation | After second transformation |
|---|---|---|---|
| A | $(-4;-1)$ | | |
| B | $(3;-5)$ | | |
| C | $(4;8)$ | | |

Congratulations! _____ reaches the treasure! (Fill in A, B or C)