Education
KwaZulu-Natal Department of Education
REPUBLIC OF SOUTH AFRICA

MATHEMATICS

COMMON TEST

MARCH 2017

NATIONAL
SENIOR CERTIFICATE

GRADE 10

MARKS: 50

TIME : 1 hour

This question paper consists of 5 pages.

INSTRUCTIONS AND INFORMATION

Read the following instructions carefully before answering the questions:

1.   This question paper consists of 5 questions.

2.   Answer ALL the questions.

3.   Clearly show ALL calculations, diagrams, graphs, et cetera, which you have used in determining the answers.

4.   Answers only will NOT necessarily be awarded full marks.

5.   You may use an approved scientific calculator (non-programmable and non-graphical), unless stated otherwise.

6.   If necessary, round off answers to TWO decimal places, unless stated otherwise.

7.   Number the answers correctly according to the numbering system used in this question paper.

8.   Write neatly and legibly.

QUESTION 1

1.1   Determine the product of the following and simplify fully:

$(a+3)(a^2-3a+9)$ (2)

1.2   Simplify the following expression fully:

$$\frac{x^3-8y^3}{x^2-4y^2} \times \frac{x^2+4xy+4y^2}{x^2+2xy+4y^2}$$ (4)

1.3   Factorise the following completely:

$16p^2-25q^2-4p+5q$ (3)

1.4   **Without using a calculator**, determine between which two consecutive integers
        $-\sqrt{13}$ lies.   (2)
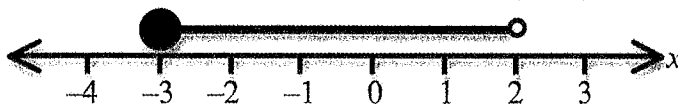
                                                                                                     [11]

QUESTION 2

2.1   Solve for x:

        2.1.1 $2x^2-x-3=0$ (2)

        2.1.2 $(x+2)(x-3)=x(x+1)$ (3)

        2.1.3 $\dfrac{x-p}{x-q}=\dfrac{q}{p}$ (4)

2.2   Solve the following inequality: $5 \le 2x-11$.   (2)

2.3   An inequality is represented in the following diagram.

        2.3.1   Write down the single inequality represented in the number line.   (2)

        2.3.2   Write down the largest integer that satisfies the inequality.   (1)

                                                                                                     [14]
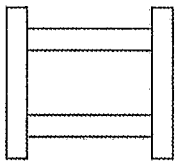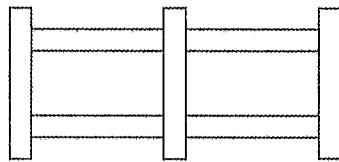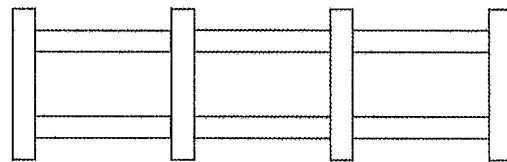
QUESTION 3

3.1   **Without using a calculator,** simplify the following expressions fully:

    3.1.1 $2017^0 + \left(\dfrac{1}{7}\right)^{-2}$ (3)

    3.1.2 $\dfrac{3^{2m} - 2.9^m}{9^{m+1}}$ (4)

3.2   Solve for x: $2^{x+1} = 16$ (2)

                                                   [9]

QUESTION 4

Tom builds fencing from pieces of wood as shown below:

Figure 1   **Figure 2**   **Figure 3**

4.1   Write down a number pattern for the above figures of fencing in terms of the number
       of pieces of wood used in each figure.   (1)

4.2   Write down how many pieces of wood will be used in figure 4 and figure 5.   (2)

4.3   Determine the nth term, T_n, in terms of n.   (2)

4.4   Use the answer in Question 4.3 above to calculate how many pieces of wood will
       be used in figure 20.   (2)

4.5   Use the answer in Question 4.3 above to determine which figure of fencing would
       have 550 pieces of wood.   (2)
                                                    [9]

QUESTION 5

ABCD is a rectangle having sides
AB $= 4x - 5y$, BC $= 9 - 2y$,
CD $= 14x - 20$ and DA $= 5x + y$.
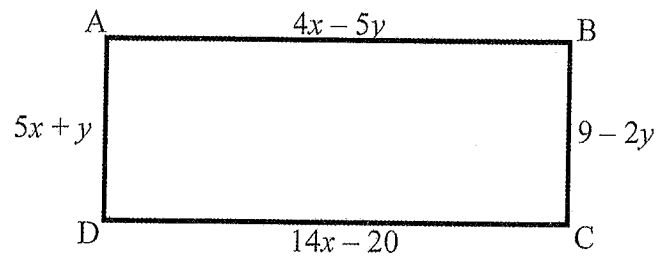
5.1   Calculate the value of x and y.   (5)

5.2   Calculate the area of rectangle ABCD.   (2)

                                              [7]

TOTAL MARKS: [50]

MHICHS + MLII - GR_10

QUESTION 1

1.1	$(a+3)(a^2-3a+9)$		
	$=a^3+27$	✓✓ answer	(2)
1.2	$\dfrac{x^3-8y^3}{x^2-4y^2} \times \dfrac{x^2+4xy+4y^2}{x^2+2xy+4y^2}$		
	$=\dfrac{(x-2y)(x^2+2xy+4y^2)}{(x+2y)(x-2y)} \times \dfrac{(x+2y)(x+2y)}{(x^2+2xy+4y^2)}$	✓ $(x-2y)(x^2+2xy+4y^2)$ ✓ $(x+2y)(x-2y)$ ✓ $(x+2y)(x+2y)$	
	$=x+2y$	✓ answer	(4)
1.3	$16p^2-25q^2-4p+5q$		
	$=(4p+5q)(4p-5q)-(4p-5q)$	✓ $(4p+5q)(4p-5q)$	
	$=(4p-5q)(4p+5q-1)$	✓ $-(4p-5q)$ ✓ answer	(3)
1.4	$-\sqrt{16}<-\sqrt{13}<-\sqrt{9}$		
	$\Rightarrow -4<-\sqrt{13}<-3$	✓ ✓ answer	(2)
			[11]

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MEMORANDUM

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QUESTION 2

2.1.1	$2x^2 - x - 3 = 0$ $(2x-3)(x+1)=0$	✓ factorise	
	$x = \dfrac{3}{2}$ or $x = -1$	✓ both answers	(2)
2.1.2	$(x+2)(x-3)=x(x+1)$	✓ multiply out brackets	
	$x^2 - x - 6 = x^2 + x$	✓ simplification	
	$-2x = 6$ $x = -3$	✓ $x = -3$	(3)
2.1.3	$\dfrac{x-p}{x-q} = \dfrac{q}{p}$		
	$p(x-p)=q(x-q)$	✓ simplification	
	$xp - p^2 = xq - q^2$	✓ rearranging terms	
	$xp - xq = p^2 - q^2$		
	$x(p-q)=(p+q)(p-q)$	✓ factorising	
	$x = \dfrac{(p+q)(p-q)}{(p-q)}$		
	$x = p+q$	✓ answer	(4)
2.2	$5 \le 2x - 11$	✓ rearranging terms	
	$-2x \le -16$ $x \ge 8$	✓ answer	(2)
2.3.1	$-3 \le x < 2$	✓ $-3 \le x$ ✓ $x < 2$	(2)
2.3.2	1	✓ answer	(1)
			[14]

QUESTION 3

3.1.1	$2017^0 + \left(\dfrac{1}{7}\right)^{-2}$		
	$= 1 + (7^{-1})^{-2}$	✓ 1	
	$= 1 + 7^2$	✓ 7^2	
	$= 1 + 49$		
	$= 50$	✓ answer	(3)
3.1.2	$\dfrac{3^{2m} - 2.9^m}{9^{m+1}}$	✓ prime bases	
	$= \dfrac{3^{2m} - 2.3^{2m}}{3^{2m+2}}$	✓ removing common factor ✓ rewriting as product	
	$= \dfrac{3^{2m}(1-2)}{3^{2m}.9}$		
	$= \dfrac{-1}{9}$	✓ answer	(4)
3.2.1	$2^{x+1} = 16$ $2^{x+1} = 2^4$	✓ $16 = 2^4$	
	$x + 1 = 4$ $x = 3$	✓ answer	(2)
			[9]

QUESTION 4

4.1	$4 ; 7 ; 10 ; ...$	✓ answer	(1)
4.2	Figure 4: 13 Figure 5: 16	✓ 13 ✓ 16	(2)
4.3.	$Tn = 3n + 1$	✓✓ answer	(2)
4.4	$T_{20} = 3(20) + 1$ $T_{20} = 61$	✓ substitution ✓ answer	(2)
4.5	$3n + 1 = 550$ $n = 183$	✓ substitution ✓ answer	(2)
			[9]

QUESTION 5

5.1	$4x - 5y = 14x - 20$ $-5y = 10x - 20$ $y = -2x + 4$ $5x + y = 9 - 2y$ $5x + 3y = 9$ $5x + 3(-2x + 4) = 9$ $5x - 6x + 12 = 9$ $-x = -3$ $x = 3$ $y = -2(3) + 4$ $y = -2$	✓ equating sides ✓ simplification ✓ equation ✓ solving simultaneous equations ✓ answer for x and y	(5)
5.2	Length = $14(3) - 20 = 22$ OR Length = $4(3) - 5(-2) = 22$ Breadth = $9 - 2(-2) = 13$ OR Breadth = $5(3) - 2 = 13$ Area = $22 \times 13 = 286$	✓ calculating length and breadth ✓ answer	(2)
			[7]

TOTAL MARKS: [50]