



Basic Education
KwaZulu-Natal Department of Education
REPUBLIC OF SOUTH AFRICA

MATHEMATICS

COMMON TEST

MARCH 2015

**NATIONAL
SENIOR CERTIFICATE**

GRADE 10

MARKS: 50

TIME: 1 hour

This question paper consists of 4 pages.

INSTRUCTIONS AND INFORMATION

Read the following instructions carefully before answering the questions:

1. This question paper consists of 4 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) may be used, 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 expression:

$$(2x - y)(4x^2 + 2xy + y^2) \quad (2)$$

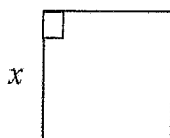
1.2 Simplify the following expressions fully:

$$1.2.1 \quad \frac{y^2 - 16}{2y - 8} \div \frac{y + 4}{4} \quad (4)$$

$$1.2.2 \quad \frac{1}{x^2 - 3x - 4} + \frac{1}{4 - x} \quad (5)$$

A square frame drawn below encloses an area of 190 cm^2 .

1.3



1.3.1 Calculate x , the length of the side of the frame, without using a calculator. (2)

1.3.2 Is the length of the side of the frame a rational or irrational number? (1)

1.3.3 Determine between which two consecutive integers the length will lie. (2)

[16]

QUESTION 2

2.1 Without using a calculator, simplify the following expression fully:

$$\frac{15^x \times 3^{1-x}}{5^x} \quad (3)$$

2.2 Solve for x in the following equations:

$$2.2.1 \quad 2^x = 0,25 \quad (3)$$

$$2.2.2 \quad 5 \cdot 3^x = 5 \quad (3)$$

[9]

QUESTION 3

- 3.1 Solve for x : $(x-3)(2x+9) = 0$ (2)
- 3.2 Solve for x and illustrate the solution on a number line: $-3(x-2) > 21$ (3)
- 3.3 Solve for x and y simultaneously: $x+2y=11$ and $2x-3y=-6$. (4)
- 3.4 Whilst on holiday, a family of 2 adults and 4 children stay at a hotel for 7 days. The hotel charges R300 less per day for a child than an adult. The bill for the 7-day holiday is R21 000. How much does the hotel charge for an adult? Show all your working details. (4)
- 3.5 If $(x^3 + 5x^{-3})^2 = (x^3 - 5x^{-3})^2 + a$, calculate the value of a . (4)
- [17]**

QUESTION 4

Beads are placed next to each other to form the arrangements as shown below:

Arrangement 1



Arrangement 2



Arrangement 3



- 4.1 Write down how many beads will there be in the next two arrangements? (2)
- 4.2 Determine an expression for the n -th term of the arrangement? (2)
- 4.3 Determine how many beads will there be in the 150th arrangement? (2)
- 4.4 Determine the arrangement in which there will be 448 beads? (2)

[8]**TOTAL MARKS: 50**

GR 10 and 11 end of year



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MEMORANDUM

**NATIONAL
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GRADE 10

MARKS: 50

This memorandum consists of 4 pages.

QUESTION 1

| | | | |
|-------|--|--|--------------------|
| 1.1 | $(2x-y)(4x^2+2xy+y^2)$ $= 8x^3 - y^3$ | $\checkmark 8x^3 \checkmark -y^3$ | (2) |
| 1.2.1 | $\frac{y^2-16}{2y-8} \div \frac{y+4}{4}$ $\frac{y^2-16}{2y-8} \times \frac{4}{y+4}$ $= \frac{(y+4)(y-4)}{2(y-4)} \times \frac{4}{y+4}$ $= 2$ | $\checkmark \div \rightarrow \times$ & invert $\checkmark (y+4)(y-4)$ $\checkmark 2(y-4)$ \checkmark answer | (4) |
| 1.2.2 | $\frac{1}{x^2-3x-4} + \frac{1}{4-x}$ $= \frac{1}{(x-4)(x+1)} - \frac{1}{x-4}$ $= \frac{1-1(x+1)}{(x-4)(x+1)}$ $= \frac{1-x-1}{(x-4)(x+1)}$ $= \frac{-x}{(x-4)(x+1)}$ | \checkmark factorising denominator \checkmark change of sign numerator \checkmark denominator \checkmark answer | (5) |
| 1.3.1 | $x^2 = 190$ $x = \sqrt{190}$ | \checkmark side ² = area \checkmark answer | (2) |
| 1.3.2 | Irrational | \checkmark answer | (1) |
| 1.3.3 | $13^2 = 169$ and $14^2 = 196$ $\therefore 13 < \sqrt{190} < 14$ | \checkmark for 169 and 196 \checkmark answer | (2) [16] |

QUESTION 2

| | | | |
|-------|---|--|---------|
| 2.1 | $\frac{15^x \times 3^{1-x}}{5^x}$ $= \frac{(3 \times 5)^x \times 3^{1-x}}{5^x}$ $= \frac{3^x \times 5^x \times 3^{1-x}}{5^x}$ $= 3$ | <ul style="list-style-type: none"> ✓ prime bases ✓ raising powers ✓ answer | (3) |
| 2.2.1 | $2^x = 0,25$ $2^x = \frac{1}{4}$ $2^x = 2^{-2}$ $x = -2$ | <ul style="list-style-type: none"> ✓ decimal to fraction ✓ $\frac{1}{4} = 2^{-2}$ ✓ answer | (3) |
| 2.2.2 | $5.3^x = 5$ $3^x = 1$ $3^x = 3^0$ $x = 0$ | <ul style="list-style-type: none"> ✓ isolate x ✓ $1 = 3^0$ ✓ answer | (3) [9] |

QUESTION 3

| | | | |
|-----|--|--|-----|
| 3.1 | $x = 3$ or $x = \frac{9}{2}$ or $4\frac{1}{2}$ | <ul style="list-style-type: none"> ✓ $x = 3$ ✓ $x = \frac{9}{2}$ or $4\frac{1}{2}$ | (2) |
| 3.2 | $-3(x-2) > 21$ $x-2 < -7$ $x < -5$ | <ul style="list-style-type: none"> ✓ dividing by -3 ✓ answer ✓ graphical solution | (3) |
| 3.3 | $x+2y=11$ $x=11-2y$ $2x-3y=-6$ $2(11-2y)-3y=-6$ $22-4y-3y=-6$ $7y=28$ $y=4$ $x=11-2(4)=3$ | <ul style="list-style-type: none"> ✓ $x=11-2y$ ✓ substitution ✓ $y=4$ ✓ $x=3$ | (4) |

| | | | |
|-----|---|--|----------|
| 3.4 | <p>Let the cost per adult = x</p> <p>∴ the cost per child = x - 300</p> <p>$2x + 4(x - 300) = 21000$</p> <p>$2x + 4x - 1200 = 21000$</p> <p>$6x = 22200$</p> <p>$x = 3700$</p> <p>The hotel charged R3700 per adult</p> | <ul style="list-style-type: none"> ✓ $2x + 4(x - 300)$ ✓ = 21000 ✓ simplification ✓ answer | (4) |
| 3.5 | $(x^3 + 5x^{-3})^2 = (x^3 - 5x^{-3})^2 + a$ $x^6 + 10 + 25x^{-6} = x^6 - 10 + 25x^{-6} + a$ $a - 10 = 10$ $a = 20$ | <ul style="list-style-type: none"> ✓ $x^6 + 10 + 25x^{-6}$ ✓ $x^6 - 10 + 25x^{-6} + a$ ✓ $a - 10 = 10$ ✓ answer | (4) [17] |

QUESTION 4

| | | | |
|-----|---|--|---------|
| 4.1 | 22 beads and 28 beads | ✓ 22 ✓ 28 | (2) |
| 4.2 | $T_n = 6n - 2$ | ✓ $6n$ ✓ -2 | (2) |
| 4.3 | $T_{158} = 6(150) - 2$ $= 898$ beads | <ul style="list-style-type: none"> ✓ substitution ✓ answer | (2) |
| 4.4 | $6n - 2 = 448$ $6n = 450$ $n = 75$ There will be 448 beads in arrangement 75 | <ul style="list-style-type: none"> ✓ substitution ✓ answer | (2) [8] |

TOTAL MARKS: 50