



Basic Education

KwaZulu-Natal Department of Education
REPUBLIC OF SOUTH AFRICA

MATHEMATICS

COMMON TEST

MARCH 2016

**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 6 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:

$$(x-4)(x^2+4x+16) \quad (2)$$

- 1.2 Factorise the following completely:

$$p^2+2pq+q^2-r^2 \quad (3)$$

- 1.3 Simplify the following expression fully:

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

[10]**QUESTION 2**

- 2.1 The total surface area of a closed right cylinder is given by
- $S = 2\pi r^2 + 2\pi rh$
- . Write down
- h
- , the height of the cylinder, in terms of
- S
- ,
- π
- and
- r
- .
- (2)

- 2.2 Solve for
- x
- and
- y
- if:

$$x+2y=4 \quad \text{and} \quad 4x+5y=1 \quad (4)$$

- 2.3 Solve the following inequality:
- $1-5x > 3x-7$
- .

Hence, illustrate your answer on a number line if x is a real number. (4)

- 2.4 Solve for
- x
- :
- $(x-3)(x+2) = -6$
- (4)

- 2.5 The length of a rectangle is 40 cm longer than its breadth. If the area of the rectangle is
- 1200 cm^2
- , calculate the length of the rectangle.
- (4)

[18]

QUESTION 3

If $p + q^{-1} = -3$ and $p^2 + q^{-2} = 6$, calculate the value of $\frac{p}{q}$. [3]

QUESTION 4

4.1 Without using a calculator, simplify the following expressions fully:

4.1.1 $(x - y)^0 + \left(\frac{1}{2}\right)^{-2} - 2^5$ (4)

4.1.2 $\frac{6^{x-2} \cdot 2^{x+2}}{4^x \cdot 3^{x-4}}$ (4)

4.2 Solve for x in each of the following equations:

4.2.1 $5^x = 1$ (1)

4.2.2 $2^{x+1} - 2^x = 16$ (3)

[12]

QUESTION 5

If $5^x = 25$, determine the value of 5^{x-2} . [3]

QUESTION 6

The area of a square is 45 cm^2 .

6.1 Is the length of the side of the square a rational number or an irrational number? Explain your answer. (2)

6.2 Without calculating the length of the side of the square, show that its value lies between 6 and 7. (2)

[4]

TOTAL MARKS: 50



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MATHEMATICS
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MEMORANDUM

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GRADE 10

MARKS: 50

TIME: 1 hours

This memorandum consists of 5 pages.

QUESTION 1

1.1	$(x-4)(x^2+4x+16)$ $= x^3 - 64$	✓ ✓ answer (2)
1.2	$p^2 + 2pq + q^2 - r^2$ $= (p+q)^2 - r^2$ $= (p+q+r)(p+q-r)$	✓ $(p+q)^2$ ✓ $(p+q+r)$ ✓ $(p+q-r)$ (3)
1.3	$\frac{x}{x^2+3x+2} + \frac{x}{x^2-4}$ $= \frac{x}{(x+1)(x+2)} + \frac{x}{(x+2)(x-2)}$ $= \frac{x(x-2) + x(x+1)}{(x+1)(x+2)(x-2)}$ $= \frac{x^2 - 2x + x^2 + x}{(x+1)(x+2)(x-2)}$ $= \frac{2x^2 - x}{(x+1)(x+2)(x-2)}$ $= \frac{x(2-x)}{(x+1)(x+2)(x-2)}$ $= \frac{-x(x-2)}{(x+1)(x+2)(x-2)}$ $= \frac{-x}{(x+1)(x+2)}$	✓ factorising the denominators ✓ writing both fractions in the same denominator ✓ simplification ✓ switching terms around ✓ answer (5)
		10

QUESTION 3

$p + q^{-1} = -3$ $(p + q^{-1})^2 = (-3)^2$ $p^2 + 2\frac{p}{q} + q^{-2} = 9$ $6 + 2\frac{p}{q} = 9$ $2\frac{p}{q} = 3$ $\frac{p}{q} = \frac{3}{2}$	✓ squaring both sides ✓ substitution ✓ answer	3
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QUESTION 2

2.1 $S = 2\pi r^2 + 2\pi rh$ $2\pi rh = S - 2\pi r^2$ $h = \frac{S - 2\pi r^2}{2\pi r}$	✓ $2\pi rh = S - 2\pi r^2$ ✓ $h = \frac{S - 2\pi r^2}{2\pi r}$ N.B. Answer only: full marks (2)	
2.2 $x + 2y = 4$ $\Rightarrow x = 4 - 2y$ $4x + 5y = 1$ $4(4 - 2y) + 5y = 1$ $16 - 8y + 5y = 1$ $-8y + 5y = 1 - 16$ $-3y = -15$ $y = 5$ $x = 4 - 2(5)$ $x = -6$	✓ $x = 4 - 2y$ ✓ substitution ✓ $y = 5$ ✓ $x = -6$	(4)
2.3 $1 - 5x > 3x - 7$ $-5x - 3x > -7 - 1$ $-8x > -8$ $-8x < -8$ $x < 1$	✓ rearranging terms ✓ simplification ✓ answer ✓ number line with all correct values	(4)
2.4 $(x-3)(x+2) = -6$ $x^2 - x - 6 = -6$ $x^2 - x = 0$ $x(x-1) = 0$ $x = 0$ or $x = 1$	✓ multiplying out brackets ✓ RHS = 0 ✓ factorisation ✓ both answers	(4)
2.5 Let the breadth be x . Therefore the length is $x + 40$. $x(x+40) = 1200$ $x^2 + 40x = 1200$ $x^2 + 40x - 1200 = 0$ $(x+60)(x-20) = 0$ $x \neq -60$ or $x = 20$ The length is $20 + 40 = 60$ cm	✓ $x(x+40) = 1200$ ✓ factors: L.H.S. ✓ both answers and rejecting -60 ✓ length = 60	(4)

QUESTION 4

4.1.1 $(x-y)^0 + \left(\frac{1}{2}\right)^{-2} - 2^5$ $= 1 + 4 - 32$ $= -27$	✓ 1 ✓ 4 ✓ -32 ✓ answer	(4)
4.1.2 $\frac{6^{-2} \cdot 2^{+2}}{4^+ \cdot 3^{+4}}$ $= \frac{(2 \times 3)^{-2} \cdot 2^{+2}}{(2^+)^4 \cdot 3^{+4}}$ $= \frac{2^{-2} \cdot 3^{-2} \cdot 2^{+2}}{2^{2 \times 4} \cdot 3^{4}}$ $= \frac{2^{-2+2} \cdot 3^{-2+2}}{2^{8} \cdot 3^4}$ $= \frac{2^0 \cdot 3^0}{2^8 \cdot 3^4}$ or 3^2	✓ prime bases ✓ application of rules ✓ simplification ✓ answer	(4)
4.2.1 $5^x = 1$ $x = 0$	✓ answer	(1)
4.2.2 $2^{x+1} - 2^x = 16$ $2^x \cdot 2^1 - 2^x = 2^4$ $2^x(2-1) = 2^4$ $x = 4$	✓ $16 = 2^4$ ✓ factors ✓ answer	(3)

QUESTION 5

$5^{x-2} = 5^x \cdot 5^{-2}$ $= 25 \left(\frac{1}{25} \right)$ $= 1$ <p style="text-align: center;">OR</p> $5^x = 25$ $5^x = 5^2$ $5^{x-2} = 5^{2-2}$ $= 5^0$ $= 1$	<ul style="list-style-type: none"> ✓ exponent rule ✓ exponent rule ✓ answer ✓ prime base ✓ -2 from each exponent ✓ answer
3	

QUESTION 6

<p>6.1 Irrational number. 45 is not a perfect square.</p>	<ul style="list-style-type: none"> ✓ irrational number ✓ not a perfect square <p style="text-align: right;">(2)</p>
<p>6.2 The length of a side of the square is $\sqrt{45}$</p> $36 < 45 < 49$ $\sqrt{36} < \sqrt{45} < \sqrt{49}$ $6 < \sqrt{45} < 7$ <p>Therefore the length of the side is between 6 and 7.</p>	<ul style="list-style-type: none"> ✓ $36 < 45 < 49$ ✓ $\sqrt{36} < \sqrt{45} < \sqrt{49}$ <p style="text-align: right;">(2)</p>
4	

TOTAL MARKS: 50

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