

Grades 11 + 10.



Basic Education

KwaZulu-Natal Department of Basic Education
REPUBLIC OF SOUTH AFRICA

MATHEMATICS
MEMORANDUM
COMMON TEST
MARCH 2016

NATIONAL
SENIOR CERTIFICATE

GRADE 11

N.B. This memorandum consists of 8 pages including this page.

QUESTION ONE

<p>1.1.1 $\sqrt[3]{3} \cdot 27^{\frac{1}{3}} \cdot \sqrt[3]{3^2}$ $= (3)^{\frac{1}{3}} \cdot (3^{3 \cdot \frac{1}{3}}) \cdot 3^{\frac{2}{3}}$ ✓ $= 3^{\frac{1}{3} + 1 + \frac{2}{3}}$ ✓ $= 3^2$ ✓</p>	<p>1A for converting all terms to base 3 2 for simplifying 1A for correct answer</p> <p>(3)</p>
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<p>1.1.2 $\frac{2^2 \cdot 3^2 \cdot 10^2 \cdot 2^2 \cdot 3^2}{32^2 \cdot 5^2 \cdot 5^2 \cdot 2^2}$ $= \frac{2^{2+2+2} \cdot 3^{2+2} \cdot 5^{2+2}}{2^{2 \cdot 2} \cdot 5^{2 \cdot 2} \cdot 2^2}$ ✓✓ $= \frac{2^{6+2} \cdot 3^4 \cdot 5^4}{2^{6+2} \cdot 5^4}$ ✓ $= \frac{16}{5}$ ✓</p>	<p>2A for writing as base 2 and 5 in denominator and numerator 1A for simplifying 1CA for answer</p> <p>(4)</p>
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<p>1.2 $\text{diagonal}^2 = (\sqrt{5} - 1)^2 + (\sqrt{5} - 1)^2$ ✓ $= 5 + 2\sqrt{5} + 1 + 5 - 2\sqrt{5} + 1$ $= 12$ ✓ Diagonal = $\sqrt{12}$ $= 2\sqrt{3}$ ✓</p>	<p>1M for using Pythagoras 1A for answer 1CA for length of diagonal</p> <p>(3)</p>
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QUESTION TWO

<p>1.3.1</p> $\frac{27^{x+1}}{3^{3x-2}} = \sqrt[3]{81^x}$ $3^{3x-3-x-2} = 3^{\frac{2x}{3}} \checkmark$ $2x-5 = \frac{4x}{3} \checkmark$ $6x-15 = 4x \checkmark$ $2x = 15 \checkmark$ $x = \frac{15}{2} \checkmark$	<p>2A for writing as base 3</p> <p>1 CA for equating indices</p> <p>1 CA for answer</p> <p>(4)</p>
<p>1.3.2</p> $5^{2-x} + 5^{-x} - 130 = 0$ $5^{-x} (5^2 + 1) = 130 \checkmark$ $5^{-x} (26) \checkmark = 130$ $5^{-x} = 5 \checkmark$ $x = -1 \checkmark$	<p>1A for removing 5^{-x} as a common factor</p> <p>1A for simplification</p> <p>1CA for division</p> <p>1CA for correct answer</p> <p>[18]</p> <p>(4)</p>

<p>2.1.1</p> $x(2x-5) = 0 \checkmark$ $x = 0 \checkmark \text{ or } x = \frac{5}{2} \checkmark$	<p>1A for factorizing</p> <p>2A for answer</p> <p>(3)</p>
<p>2.1.2</p> $-7x^2 + 11x - 3 = 0$ $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} \checkmark$ $= \frac{-11 \pm \sqrt{11^2 - 4(-7)(-3)}}{2(-7)} \checkmark$ $= 0,35 \checkmark \text{ or } 1,22 \checkmark$	<p>1M for correct formula</p> <p>1A for correct substitution</p> <p>2CA for answer</p> <p>(4)</p>
<p>2.1.3</p> $\sqrt{x+8} - 2 = x$ $(\sqrt{x+8})^2 = (x+2)^2 \checkmark$ $x^2 + 4x + 4 - x - 8 = 0$ $x^2 + 3x - 4 = 0 \checkmark$ $(x+4)(x-1) = 0$ $x = -4 \text{ or } x = 1 \checkmark$ <p>SS $\{-1\} \checkmark$</p>	<p>1M for squaring both sides</p> <p>1CA for correct trinomial</p> <p>1CA for correct values</p> <p>1CA for choosing the correct solution</p> <p>(4)</p>

<p>2.2.1</p> $x = 0 \checkmark$	<p>1A for correct answer</p> <p>(1)</p>
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2.2.2 $\frac{(x+2)^2}{x} \geq 0$ C V $x = -2$ or $x = 0$ ✓ + - + -2 0 $x/x \in \mathbb{R}, \{x > 0\}$ ✓✓✓	1A for both critical values 3A for correct inequality sign and correct value	(4)
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2.3 $3^{x+7} = 27^{3x-3}$1 $x^2 + 2xy + x - 2y^2 = 0$2 Solve eqn. 1 $3^{x+7} = 3^{3x-3}$ ✓ $x + 7 = 3x - 3$ ✓ $x = 2$ ✓ substitute $x = 2$ in eqn. 2 $2(2)^2 + 2y(2) + 2 - 2y^2 = 0$ ✓ $-2y^2 + 4y + 6 = 0$ $y^2 - 2y - 3 = 0$ $(y - 3)(y + 1) = 0$ ✓ $y = 3$ or $y = -1$ ✓	1A for writing correctly as base 3 1A for equating the indices 1A for correct answer ICA for substitution ICA for correct factors 1A for correct y values	(6)
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2.4 $25^{30} \times 2^{60}$ = $5^{60} \times 2^{60}$ = 16^{60} ✓ Sum of the digits = 1 ✓	1A writing as base 5 1A for writing as base 10 1A for correct answer	(3) 25
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QUESTION 3

3.1			
3.1.1	$AB = \sqrt{9 + 81}$ ✓ = $\sqrt{90}$ = $3\sqrt{10}$ ✓ $AD = \sqrt{16 + 64}$ ✓ = $\sqrt{80}$ = $4\sqrt{5}$ ✓	1A correct substitution 1A simplification 1A correct substitution 1A simplification	(4)
3.1.2	$M = (5\sqrt{7})$ ✓	2A correct values	(2)
3.1.3	$M_{BC} = \frac{3-1}{0-3}$ ✓ = $\frac{1}{-3}$ ✓	1A correct substitution 1A correct answer	(2)
3.1.4	$M_{BM} = 1$ ✓ $y = mx + c$ $2 = 1(0) + c$ ✓ $c = 2$ $y = x + 2$ ✓✓	1A gradient BM 1A correct substitution 2A correct equation	(4)
3.2	$M_{BC} = \frac{-1}{3}$ $M_{AB} = \frac{11-2}{3-6}$ = 3 ✓ $\frac{-1}{3} \times 3 = -1$ ✓ BC is perpendicular to AB	1A gradient AB 1A conclusion	(4)

3.3			
3.3.1.1	$M_{AC} = \frac{2+1}{-4-1}$ $= \frac{3}{-5}$ $RA = 56,31^\circ \checkmark$ $\alpha = 123,69^\circ$ $\theta = 45^\circ \checkmark$	<p>1A for RA</p> <p>1A for θ</p>	
3.3.1.2	$\tan \theta = m$ $\tan 45^\circ = m$ $m = 1 \checkmark$ $2 = 1(-1) + c$ $C = 3 \checkmark$ $y = x + 3 \text{ is the equation of AB } \checkmark$	<p>1A for m</p> <p>1A for c value</p> <p>1A for correct equation</p>	(2) (3)
3.3.2	$D = (-3; 0) \checkmark$	2A correct values	(2)
3.3.3	$-3 = \frac{-1-2}{2}$ $x - 1 = -6$ $x = -5 \checkmark$ $0 = \frac{2+y}{2}$ $y = -2 \checkmark$ $B = (-5; -2)$	<p>1A M</p> <p>1A M</p>	(2)
3.3.4	$M_{BC} = \frac{-2+1}{-8-1}$ $= \frac{1}{9}$ <p>Grad of a line = -6 \checkmark</p> $-2 = -6(-5) + c$ $c = -32 \checkmark$ $y = -6x + 32 \checkmark$	<p>1A gradient BC</p> <p>1A gradient of a line</p> <p>1A value of c</p> <p>1A correct equation</p>	(4)

3.5	$M_{BE} = m_{EF}$ $\frac{5+3}{-4+x} = \frac{5-2}{-4-2} \checkmark$ $\frac{8}{-4+x} = \frac{3}{-6}$ $3x = -36$ $x = -12 \checkmark$	<p>1 M for equating gradients</p> <p>1A for calculating correct gradients</p> <p>1 CA for correct answer</p>	(3) [32]
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TOTAL MARKS: 75