High School
Mathematics Test 2013

Year

Surds

Non Calculator

Skills and Knowledge Assessed:

- Define rational and irrational numbers and perform operations with surds and fractional indices (ACMNA264)

Name_____

Section 1 Short Answer Section

Write all working and answers in the spaces provided on this test paper.

1. Simplify $9\sqrt{2} \times 4\sqrt{7}$.

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2. Simplify $8\sqrt{5} - 3\sqrt{5} + \sqrt{5}$.

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3. Simplify $7\sqrt{6} + 8\sqrt{2} + 4\sqrt{6} - \sqrt{2}$ . .

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.....

4. Simplify $\sqrt{128}$.

.....

5. Simplify $\sqrt{50} - \sqrt{18}$.

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.....

6. Simplify $\dfrac{8\sqrt{26}}{4\sqrt{2}}$.

.....

.....

7. Express with a rational denominator $\frac{4\sqrt{3}}{3\sqrt{5}}$.

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8. Expand $4\sqrt{6}\left(3\sqrt{3}+7\sqrt{5}\right)$. .

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.....

9. Expand and simplify $24+5\sqrt{3}-4\sqrt{6}\left(5\sqrt{2}-\sqrt{6}\right)$.

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10. Express $\frac{2\sqrt{5}-3\sqrt{2}}{3\sqrt{5}}$ with a rational denominator.

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11. Expand and simplify $\left(2\sqrt{3}-4\right)\left(\sqrt{3}+5\right)$.

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12. Express $6\sqrt{5}$ as a complete surd. (i.e as $\sqrt{x}$.)

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Section 2 Multiple Choice Section

Mark all your answers on the accompanying multiple choice answer sheet, not on this test paper. You may do any working out on this test paper. Calculators are allowed for this section.

1. $\left(-2\sqrt{6}\right)^2 = ?$

   A. $-12\sqrt{6}$ B. -12 C. 12 D. 24

2. Completely simplify $\sqrt{192}$.

   A. $8\sqrt{3}$ B. $16\sqrt{3}$ C. $2\sqrt{48}$ D. $4\sqrt{48}$

3. If $9\sqrt{6} = \sqrt{x}$ then $x = ?$

   A. 54 B. 324 C. 486 D. 2 916

4. $3\sqrt{5} - 2\sqrt{6} + \sqrt{5} - 5\sqrt{6} =$

   A. $3\sqrt{5} - 7\sqrt{6}$ B. $4\sqrt{5} - 7\sqrt{6}$ C. $3\sqrt{5} - 4\sqrt{6}$ D. $4\sqrt{5} - 3\sqrt{6}$

5. Express $2\sqrt{6} \times 6\sqrt{10}$ in simplest form.

   A. $12\sqrt{16}$ B. $12\sqrt{60}$ C. $24\sqrt{15}$ D. $24\sqrt{60}$

6. $\dfrac{8\sqrt{15}}{4\sqrt{3}} =$

   A. $2\sqrt{3}$ B. $2\sqrt{5}$ C. $4\sqrt{3}$ D. $4\sqrt{5}$

7. Simplify $5\sqrt{162} + 3\sqrt{128}$.

   A. $8\sqrt{34}$ B. $39\sqrt{2}$ C. $69\sqrt{2}$ D. $8\sqrt{290}$

8. Expand and simplify $5\sqrt{2}\left(3\sqrt{5} - 4\sqrt{2}\right)$.

A. $15\sqrt{10} - 40$ B. $15\sqrt{10} - 80$ C. $30\sqrt{5} - 40$ D. $30\sqrt{5} - 80$

9. $\dfrac{2\sqrt{2} - 5\sqrt{6}}{4\sqrt{2}} =$

A. $\dfrac{2 - 10\sqrt{3}}{8}$ B. $\dfrac{2 - 10\sqrt{3}}{4}$ C. $\dfrac{2 - 5\sqrt{3}}{8}$ D. $\dfrac{2 - 5\sqrt{3}}{4}$

10. Expand $\left(3\sqrt{6} - 5\sqrt{5}\right)^2$.

A. $71 - 15\sqrt{30}$ B. $71 - 30\sqrt{30}$ C. $179 - 15\sqrt{30}$ D. $179 - 30\sqrt{30}$

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Section 3 Longer Answer Section

Write all working and answers in the spaces provided on this test paper.

Marks

1. a) Express $\frac{2\sqrt{6}-3\sqrt{10}}{3-\sqrt{10}}$ with a rational denominator. **2**

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b) Arrange the numbers below in ascending order. **2**

$\sqrt{65}$, $2\sqrt{15}$, $\sqrt{61}$, 8, $3\sqrt{7}$.

……

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Multiple Choice Answer Sheet

Name _____

Completely fill the response oval representing the most correct answer.

1.	A ⬭	B ⬭	C ⬭	D ⬭
2.	A ⬭	B ⬭	C ⬭	D ⬭
3.	A ⬭	B ⬭	C ⬭	D ⬭
4.	A ⬭	B ⬭	C ⬭	D ⬭
5.	A ⬭	B ⬭	C ⬭	D ⬭
6.	A ⬭	B ⬭	C ⬭	D ⬭
7.	A ⬭	B ⬭	C ⬭	D ⬭
8.	A ⬭	B ⬭	C ⬭	D ⬭
9.	A ⬭	B ⬭	C ⬭	D ⬭
10.	A ⬭	B ⬭	C ⬭	D ⬭

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ANSWERS

Section 1	
1.	$9\sqrt{2} \times 4\sqrt{7} = 36\sqrt{14}$
2.	$8\sqrt{5} - 3\sqrt{5} + \sqrt{5} = 6\sqrt{5}$
3.	$7\sqrt{6} + 8\sqrt{2} + 4\sqrt{6} - \sqrt{2} = 11\sqrt{6} + 7\sqrt{2}$
4.	$\sqrt{128} = \sqrt{64} \times \sqrt{2} = 8\sqrt{2}$
5.	$\sqrt{50} - \sqrt{18} = \sqrt{25} \times \sqrt{2} - \sqrt{9} \times \sqrt{2} = 5\sqrt{2} - 3\sqrt{2} = 2\sqrt{2}$
6.	$\frac{8\sqrt{26}}{4\sqrt{2}} = 2\sqrt{13}$
7.	$\frac{4\sqrt{3}}{3\sqrt{5}} = \frac{4\sqrt{3}}{3\sqrt{5}} \times \frac{\sqrt{5}}{\sqrt{5}} = \frac{4\sqrt{15}}{3 \times 5} = \frac{4\sqrt{15}}{15}$
8.	$4\sqrt{6}\left(3\sqrt{3} + 7\sqrt{5}\right) = 12\sqrt{18} + 28\sqrt{30}$ $= 12 \times \sqrt{9} \times \sqrt{2} + 28\sqrt{30}$ $= 36\sqrt{2} + 28\sqrt{30}$
9.	$24 + 5\sqrt{3} - 4\sqrt{6}\left(5\sqrt{2} - \sqrt{6}\right) = 24 + 5\sqrt{3} - 20\sqrt{12} + 4\sqrt{36}$ $= 24 + 5\sqrt{3} - 40\sqrt{3} + 24$ $= 48 - 35\sqrt{3}$
10.	$\frac{2\sqrt{5} - 3\sqrt{2}}{3\sqrt{5}} = \frac{2\sqrt{5} - 3\sqrt{2}}{3\sqrt{5}} \times \frac{\sqrt{5}}{\sqrt{5}}$ $= \frac{10 - 3\sqrt{10}}{15}$
11.	$\left(2\sqrt{3} - 4\right)\left(\sqrt{3} + 5\right) = 2\sqrt{9} + 10\sqrt{3} - 4\sqrt{3} - 20$ $= 6 + 6\sqrt{3} - 20$ $= -14 + 6\sqrt{3}$
12.	$6\sqrt{5} = \sqrt{36} \times \sqrt{5}$ $= \sqrt{180}$

	Section 2
1.	D
2.	A
3.	C
4.	B
5.	C
6.	B
7.	C
8.	A
9.	D
10.	D

Section 3	
1.	a) $\frac{2\sqrt{6}-3\sqrt{10}}{3-\sqrt{10}} = \frac{2\sqrt{6}-3\sqrt{10}}{3-\sqrt{10}} \times \frac{3+\sqrt{10}}{3+\sqrt{10}}$ $= \frac{6\sqrt{6}+2\sqrt{60}-9\sqrt{10}-30}{9-10}$ $= \frac{6\sqrt{6}+4\sqrt{15}-9\sqrt{10}-30}{-1}$ $= 9\sqrt{10}+30-6\sqrt{6}-4\sqrt{15}$
	b) $\sqrt{65}$ $2\sqrt{15} = \sqrt{4} \times \sqrt{15} = \sqrt{60}$ $\sqrt{61}$ $8 = \sqrt{64}$ $3\sqrt{7} = \sqrt{9} \times \sqrt{7} = \sqrt{63}$ In order $2\sqrt{15}$, $\sqrt{61}$, $3\sqrt{7}$, 8, $\sqrt{65}$.

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Multiple Choice Answer Sheet

Name Marking Sheet

Completely fill the response oval representing the most correct answer.

1.	A	○	B	○	C	○	D ●
2.	A	●	B	○	C	○	D ○
3.	A	○	B	○	C	●	D ○
4.	A	○	B	●	C	○	D ○
5.	A	○	B	○	C	●	D ○
6.	A	○	B	●	C	○	D ○
7.	A	○	B	○	C	●	D ○
8.	A	●	B	○	C	○	D ○
9.	A	○	B	○	C	○	D ●
10.	A	○	B	○	C	○	D ●