

# High School Mathematics Test 2015

Year 9

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. Circle the irrational numbers in the list below.

$$\sqrt{49}, \sqrt{15}, 3\sqrt{64}, 2\sqrt{7}, \sqrt[3]{8}, \sqrt{3}, \sqrt[4]{25}.$$

2. Simplify :  $9\sqrt{2} \times 2\sqrt{5}$ .

.....

3. Simplify :  $\frac{8\sqrt{70}}{2\sqrt{10}}$ .

.....

4. Simplify :  $9\sqrt{7} + 12\sqrt{7}$ .

.....

5. Simplify :  $(3\sqrt{6})^2$ .

.....

6. Simplify :  $8\sqrt{3} - 11\sqrt{3} - 6\sqrt{3}$ .

.....

7.	Simplify : $\sqrt{108}$ . .....
8.	Simplify : $\sqrt{54} + \sqrt{150}$ . .....
9.	Simplify : $12\sqrt{5} - \sqrt{7} - 6\sqrt{5} - 9\sqrt{7}$ . .....
10.	Simplify : $3\sqrt{28} - \sqrt{125} + \sqrt{63} + 2\sqrt{45}$ . ..... .....
11.	Express with a rational denominator : $\frac{12}{\sqrt{7}}$ . .....
12.	Express in simplest form, with a rational denominator : $\frac{15\sqrt{3} - 3\sqrt{6}}{5\sqrt{3}}$ . ..... .....
13.	Expand and simplify : $3\sqrt{3} (3\sqrt{2} - 5\sqrt{7})$ . .....

14. Expand and simplify :  $\sqrt{15} (2\sqrt{3} + 6\sqrt{5})$ .

.....  
.....

15. Expand and simplify :  $5\sqrt{2} (8\sqrt{7} + 5\sqrt{2}) - 8 - 3\sqrt{14}$  .

.....  
.....

16. Expand and simplify :  $(2\sqrt{3} - 5\sqrt{6})(\sqrt{6} - \sqrt{3})$ .

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.....

17. If  $3\sqrt{15} (2\sqrt{3} - 4\sqrt{15}) = a + b\sqrt{5}$ , what are the values of  $a$  and  $b$ ?

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.....

18. Arrange the numbers  $4\sqrt{2}$ ,  $6$ ,  $3\sqrt{3}$ ,  $5$  and  $2\sqrt{7}$  in ascending order.

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.....

# High School Mathematics Test 2015

Calculator Allowed

Year 9

## Surds

Name \_\_\_\_\_

### 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.  $16\sqrt{11} - 7\sqrt{11} = ?$

- A.  $-23\sqrt{11}$       B.  $-9\sqrt{22}$       C.  $9\sqrt{11}$       D.  $9\sqrt{22}$

2. Which of the numbers below is a rational number?

- A.  $\sqrt{27}$       B.  $5\sqrt{5}$       C.  $25\sqrt{2}$       D.  $2\sqrt{25}$

3. Simplify  $5\sqrt{6} - 3\sqrt{6} - \sqrt{6}$ .

- A.  $-2\sqrt{6}$       B.  $-\sqrt{6}$       C.  $\sqrt{6}$       D.  $2\sqrt{6}$

4.  $4\sqrt{6} \times 5\sqrt{7} = ?$

- A.  $9\sqrt{13}$       B.  $9\sqrt{42}$       C.  $20\sqrt{13}$       D.  $20\sqrt{42}$

5.  $\frac{48\sqrt{66}}{4\sqrt{3}} = ?$

- A.  $12\sqrt{22}$       B.  $12\sqrt{63}$       C.  $44\sqrt{22}$       D.  $44\sqrt{63}$

6. Completely simplify  $\sqrt{80}$ .

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

7.	$3\sqrt{6} + \sqrt{54} - \sqrt{96} = ?$ A. $-4\sqrt{6}$ B. $2\sqrt{6}$ C. $4\sqrt{6}$ D. $7\sqrt{6}$
8.	If $5\sqrt{3} = \sqrt{w}$ , what is the value of $w$ ? A. $w = 15$ B. $w = 45$ C. $w = 50$ D. $w = 75$
9.	Which of the following has the least value? A. $3\sqrt{10}$ B. $10$ C. $4\sqrt{6}$ D. $7\sqrt{2}$
10.	Express $\frac{4\sqrt{6}}{2\sqrt{3}}$ with a rational denominator. A. $\frac{\sqrt{2}}{2}$ B. $2\sqrt{2}$ C. $6\sqrt{2}$ D. $\frac{18\sqrt{2}}{2}$
11.	Expand and simplify $4\sqrt{5}(\sqrt{5} - 3\sqrt{10})$ . A. $20\sqrt{5} - 4\sqrt{10}$ B. $20\sqrt{5} - 60$ C. $20 - 12\sqrt{10}$ D. $20 - 60\sqrt{2}$
12.	When expressed with a rational denominator $\frac{1 - 3\sqrt{2}}{5\sqrt{2}} = ?$ A. $\frac{\sqrt{2} - 6}{50}$ B. $\frac{\sqrt{2} - 6}{10}$ C. $\frac{2 - 6\sqrt{2}}{10}$ D. $\frac{2\sqrt{2} - 6}{25}$
13.	Expand and simplify $15\sqrt{3} + 4 - 2\sqrt{3}(5 - 3\sqrt{3})$ . A. $-14 + 5\sqrt{3}$ B. $22 + 25\sqrt{3}$ C. $22 + 5\sqrt{3}$ D. $5 - 22\sqrt{3}$

14. Expand and simplify  $(7\sqrt{7} - \sqrt{6})(3\sqrt{7} - 2\sqrt{6})$ .

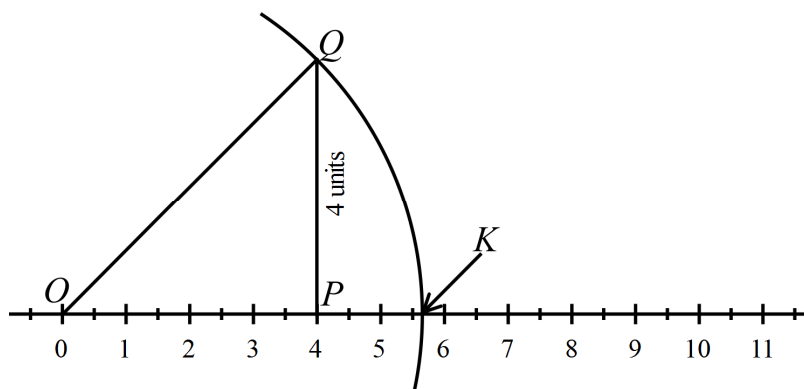
A.  $135 - 17\sqrt{42}$

B.  $135 - 11\sqrt{42}$

C.  $159 - 17\sqrt{42}$

D.  $159 + 11\sqrt{42}$

15. Given that the centre for the arc drawn below is the point O on the number line, and PQ is perpendicular to OP, what number is represented by the point K?



A.  $4\sqrt{2}$

B.  $5\sqrt{2}$

C.  $8\sqrt{2}$

D.  $12\sqrt{2}$

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Name \_\_\_\_\_

### Section 3 Longer Answer Section

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

Marks

1.

- a) Express  $\frac{2\sqrt{5} - 4\sqrt{10}}{4\sqrt{5} - \sqrt{2}}$  with a rational denominator.

2

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.....

- b) Simplify the following, giving your answer as a single fraction in simplest form.

3

$$\frac{5\sqrt{3} - 2\sqrt{6}}{\sqrt{6}} + \frac{1 - \sqrt{3}}{3\sqrt{2}}.$$

.....

.....

.....

.....

- c) Express  $0.\dot{5}3\dot{4}$  as a fraction in simplest form.

2

.....

.....

.....

# *High School Mathematics Test 2015*

## *Multiple Choice Answer Sheet*

### *Surds*

Name \_\_\_\_\_

Completely fill the response oval representing the most correct answer.

- |     |   |                       |   |                       |   |                       |   |                       |
|-----|---|-----------------------|---|-----------------------|---|-----------------------|---|-----------------------|
| 1.  | A | <input type="radio"/> | B | <input type="radio"/> | C | <input type="radio"/> | D | <input type="radio"/> |
| 2.  | A | <input type="radio"/> | B | <input type="radio"/> | C | <input type="radio"/> | D | <input type="radio"/> |
| 3.  | A | <input type="radio"/> | B | <input type="radio"/> | C | <input type="radio"/> | D | <input type="radio"/> |
| 4.  | A | <input type="radio"/> | B | <input type="radio"/> | C | <input type="radio"/> | D | <input type="radio"/> |
| 5.  | A | <input type="radio"/> | B | <input type="radio"/> | C | <input type="radio"/> | D | <input type="radio"/> |
| 6.  | A | <input type="radio"/> | B | <input type="radio"/> | C | <input type="radio"/> | D | <input type="radio"/> |
| 7.  | A | <input type="radio"/> | B | <input type="radio"/> | C | <input type="radio"/> | D | <input type="radio"/> |
| 8.  | A | <input type="radio"/> | B | <input type="radio"/> | C | <input type="radio"/> | D | <input type="radio"/> |
| 9.  | A | <input type="radio"/> | B | <input type="radio"/> | C | <input type="radio"/> | D | <input type="radio"/> |
| 10. | A | <input type="radio"/> | B | <input type="radio"/> | C | <input type="radio"/> | D | <input type="radio"/> |
| 11. | A | <input type="radio"/> | B | <input type="radio"/> | C | <input type="radio"/> | D | <input type="radio"/> |
| 12. | A | <input type="radio"/> | B | <input type="radio"/> | C | <input type="radio"/> | D | <input type="radio"/> |
| 13. | A | <input type="radio"/> | B | <input type="radio"/> | C | <input type="radio"/> | D | <input type="radio"/> |
| 14. | A | <input type="radio"/> | B | <input type="radio"/> | C | <input type="radio"/> | D | <input type="radio"/> |
| 15. | A | <input type="radio"/> | B | <input type="radio"/> | C | <input type="radio"/> | D | <input type="radio"/> |



# High School Mathematics Test 2015

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## Surd

Non Calculator

### Section 1 Short Answer Section

## ANSWERS

No.	WORKING	ANSWER
1.	$\sqrt{49}$ , $\sqrt{15}$ , $3\sqrt{64}$ , $\sqrt{27}$ , $\sqrt[3]{8}$ , $\sqrt{3}$ , $\sqrt[4]{25}$ . <i>N.B.</i> $\sqrt{49} = 7$ , $3\sqrt{64} = 3 \times 8 = 24$ and $\sqrt[3]{8} = 2$ , so are rational.	Circle the surds marked at left
2.	$9\sqrt{2} \times 2\sqrt{5} = 18\sqrt{10}$	$18\sqrt{10}$
3.	$\frac{8\sqrt{70}}{2\sqrt{10}} = 4\sqrt{7}$	$4\sqrt{7}$
4.	$9\sqrt{7} + 12\sqrt{7} = 21\sqrt{7}$	$21\sqrt{7}$
5.	$(3\sqrt{6})^2 = 3^2 \times (\sqrt{6})^2 = 9 \times 6 = 54$	54
6.	$8\sqrt{3} - 11\sqrt{3} - 6\sqrt{3} = -3\sqrt{3} - 6\sqrt{3} = -9\sqrt{3}$	$-9\sqrt{3}$
7.	$\sqrt{108} = \sqrt{9} \times \sqrt{12} = 3\sqrt{12}$ $= 3 \times \sqrt{4} \times \sqrt{3}$ $= 3 \times 2 \times \sqrt{3}$ $= 6\sqrt{3}$	$6\sqrt{3}$
8.	$\sqrt{54} + \sqrt{150} = \sqrt{9} \times \sqrt{6} + \sqrt{25} \times \sqrt{6}$ $= 3\sqrt{6} + 5\sqrt{6}$ $= 8\sqrt{6}$	$8\sqrt{6}$
9.	$12\sqrt{5} - \sqrt{7} - 6\sqrt{5} - 9\sqrt{7} = 12\sqrt{5} - 6\sqrt{5} - \sqrt{7} - 9\sqrt{7}$ $= 6\sqrt{5} - 10\sqrt{7}$	$6\sqrt{5} - 10\sqrt{7}$

10.	$  \begin{aligned}  LHS &= 3\sqrt{28} - \sqrt{125} + \sqrt{63} + 2\sqrt{45} \\  &= 3 \times \sqrt{4} \times \sqrt{7} - \sqrt{25} \times \sqrt{5} + \sqrt{9} \times \sqrt{7} + 2 \times \sqrt{9} \times \sqrt{5} \\  &= 6\sqrt{7} - 5\sqrt{5} + 3\sqrt{7} + 6\sqrt{5} \\  &= 9\sqrt{7} + \sqrt{5}  \end{aligned}  $	$9\sqrt{7} + \sqrt{5}$
11.	$  \begin{aligned}  \frac{12}{\sqrt{7}} &= \frac{12}{\sqrt{7}} \times \frac{\sqrt{7}}{\sqrt{7}} \\  &= \frac{12\sqrt{7}}{7}  \end{aligned}  $	$\frac{12\sqrt{7}}{7}$
12.	$  \begin{aligned}  \frac{15\sqrt{3} - 3\sqrt{6}}{5\sqrt{3}} &= \frac{15\sqrt{3} - 3\sqrt{6}}{5\sqrt{3}} \times \frac{\sqrt{3}}{\sqrt{3}} \\  &= \frac{15\sqrt{9} - 3\sqrt{18}}{5\sqrt{9}} \\  &= \frac{45 - 9\sqrt{2}}{15} \\  &= \frac{9(5 - \sqrt{2})}{15} \\  &= \frac{15 - 3\sqrt{2}}{5}  \end{aligned}  $	$  \begin{aligned}  &\frac{45 - 9\sqrt{2}}{15} \\  &= \frac{15 - 3\sqrt{2}}{5}  \end{aligned}  $ <p>Either answer</p>
13.	$3\sqrt{3} (3\sqrt{2} - 5\sqrt{7}) = 9\sqrt{6} - 15\sqrt{21}$	$9\sqrt{6} - 15\sqrt{21}$
14.	$  \begin{aligned}  \sqrt{15} (2\sqrt{3} + 6\sqrt{5}) &= 2\sqrt{45} + 6\sqrt{75} \\  &= 2 \times \sqrt{9} \times \sqrt{5} + 6 \times \sqrt{25} \times \sqrt{3} \\  &= 6\sqrt{5} + 30\sqrt{3}  \end{aligned}  $	$6\sqrt{5} + 30\sqrt{3}$
15.	$  \begin{aligned}  LHS &= 5\sqrt{2} (8\sqrt{7} + 5\sqrt{2}) - 8 - 3\sqrt{14} \\  &= 40\sqrt{14} + 25\sqrt{4} - 8 - 3\sqrt{14} \\  &= 40\sqrt{14} + 50 - 8 - 3\sqrt{14} \\  &= 37\sqrt{14} + 42  \end{aligned}  $	$37\sqrt{14} + 42$
16.	$  \begin{aligned}  LHS &= (2\sqrt{3} - 5\sqrt{6})(\sqrt{6} - \sqrt{3}) \\  &= 2\sqrt{18} - 2\sqrt{9} - 5\sqrt{36} + 5\sqrt{18} \\  &= 7\sqrt{18} - 6 - 30 \\  &= 7\sqrt{18} - 36 \\  &= 7 \times 3\sqrt{2} - 36 \\  &= 21\sqrt{2} - 36  \end{aligned}  $	$21\sqrt{2} - 36$

17.	$  \begin{aligned}  LHS &= 3\sqrt{15}(2\sqrt{3} - 4\sqrt{15}) \\  &= 6\sqrt{45} - 12 \times \sqrt{225} \\  &= 6 \times \sqrt{9} \times \sqrt{5} - 12 \times 15 \\  &= -180 + 18\sqrt{5} \\  &= a + b\sqrt{5}  \end{aligned}  $ <p>So <math>a = -180</math> and <math>b = 18</math></p>	$a = -180$ $b = 18$
18.	$  \begin{aligned}  4\sqrt{2} &= \sqrt{16} \times \sqrt{2} = \sqrt{32} \\  6 &= \sqrt{36} \\  3\sqrt{3} &= \sqrt{9} \times \sqrt{3} = \sqrt{27} \\  5 &= \sqrt{25} \\  2\sqrt{7} &= \sqrt{4} \times \sqrt{7} = \sqrt{28}  \end{aligned}  $ <p>So in order  <math>\sqrt{25}, \sqrt{27}, \sqrt{28}, \sqrt{32}, \sqrt{36}</math>  <math>5, 3\sqrt{3}, 2\sqrt{7}, 4\sqrt{2}, 6</math></p>	$5, 3\sqrt{3}, 2\sqrt{7}, 4\sqrt{2}, 6$

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## Surds

Calculator Allowed

**Section 2** Multiple Choice Section

### ANSWERS

No.	WORKING	ANSWER
1.	$16\sqrt{11} - 7\sqrt{11} = (16 - 7)\sqrt{11} = 9\sqrt{11}$	C
2.	$2\sqrt{25} = 2 \times 5 = 10$ ( which is rational)	D
3.	$5\sqrt{6} - 3\sqrt{6} - \sqrt{6} = 5\sqrt{6} - 4\sqrt{6}$ $= \sqrt{6}$	C
4.	$4\sqrt{6} \times 5\sqrt{7} = 4 \times 5 \times \sqrt{6 \times 7}$ $= 20\sqrt{42}$	D
5.	$\frac{48\sqrt{66}}{4\sqrt{3}} = \left(\frac{48}{4}\right) \times \sqrt{\frac{66}{3}}$ $= 12\sqrt{22}$	A
6.	$\sqrt{80} = \sqrt{16} \times \sqrt{5}$ $= 4\sqrt{5}$	B
7.	$3\sqrt{6} + \sqrt{9} \times \sqrt{6} - \sqrt{16} \times \sqrt{6} = 3\sqrt{6} + 3\sqrt{6} - 4\sqrt{6}$ $= 2\sqrt{6}$	B
8.	$5\sqrt{3} = \sqrt{25} \times \sqrt{3} = \sqrt{75}$ $\sqrt{w} = \sqrt{75}$ , so $w = 75$ .	D
9.	$3\sqrt{10} = \sqrt{9} \times \sqrt{10} = \sqrt{90}$ $10 = \sqrt{100}$ $4\sqrt{6} = \sqrt{16} \times \sqrt{6} = \sqrt{96}$ $7\sqrt{2} = \sqrt{49} \times \sqrt{2} = \sqrt{98}$ The first (A) is the least value.	A

10.	$\frac{4\sqrt{6}}{2\sqrt{3}} = \frac{4\sqrt{6}}{2\sqrt{3}} \times \frac{\sqrt{3}}{\sqrt{3}}$ $= \frac{4\sqrt{18}}{2 \times 3}$ $= \frac{4 \times 3\sqrt{2}}{6}$ $= \frac{12\sqrt{2}}{6}$ $= 2\sqrt{2}$	B
11.	$4\sqrt{5}(\sqrt{5} - 3\sqrt{10}) = 4\sqrt{25} - 12\sqrt{50}$ $= 20 - 12 \times 5\sqrt{2}$ $= 20 - 60\sqrt{2}$	D
12.	$\frac{1 - 3\sqrt{2}}{5\sqrt{2}} = \frac{1 - 3\sqrt{2}}{5\sqrt{2}} \times \frac{\sqrt{2}}{\sqrt{2}}$ $= \frac{\sqrt{2} - 3 \times 2}{5 \times 2}$ $= \frac{\sqrt{2} - 6}{10}$	B
13.	$15\sqrt{3} + 4 - 2\sqrt{3}(5 - 3\sqrt{3}) = 15\sqrt{3} + 4 - 10\sqrt{3} + 18$ $= 22 + 5\sqrt{3}$	C
14.	$(7\sqrt{7} - \sqrt{6})(3\sqrt{7} - 2\sqrt{6}) = 21 \times 7 - 14\sqrt{42} - 3\sqrt{42} + 2 \times 6$ $= 147 - 14\sqrt{42} - 3\sqrt{42} + 12$ $= 159 - 17\sqrt{42}$	C
15.	<p>Let OK = <math>x</math>  By Pythagoras  <math>x^2 = 4^2 + 4^2 = 16 + 16 = 32</math>  <math>x = \sqrt{32} = \sqrt{16} \times \sqrt{2}</math>  <math>= 4\sqrt{2}</math></p>	A

# High School Mathematics Test 2015

## Multiple Choice Answer Sheet

### Surds

Name ANSWERS

Completely fill the response oval representing the most correct answer.

- |     |   |                                  |   |                                  |   |                                  |   |                                  |
|-----|---|----------------------------------|---|----------------------------------|---|----------------------------------|---|----------------------------------|
| 1.  | A | <input type="radio"/>            | B | <input type="radio"/>            | C | <input checked="" type="radio"/> | D | <input type="radio"/>            |
| 2.  | A | <input type="radio"/>            | B | <input type="radio"/>            | C | <input type="radio"/>            | D | <input checked="" type="radio"/> |
| 3.  | A | <input type="radio"/>            | B | <input type="radio"/>            | C | <input checked="" type="radio"/> | D | <input type="radio"/>            |
| 4.  | A | <input type="radio"/>            | B | <input type="radio"/>            | C | <input type="radio"/>            | D | <input checked="" type="radio"/> |
| 5.  | A | <input checked="" type="radio"/> | B | <input type="radio"/>            | C | <input type="radio"/>            | D | <input type="radio"/>            |
| 6.  | A | <input type="radio"/>            | B | <input checked="" type="radio"/> | C | <input type="radio"/>            | D | <input type="radio"/>            |
| 7.  | A | <input type="radio"/>            | B | <input checked="" type="radio"/> | C | <input type="radio"/>            | D | <input type="radio"/>            |
| 8.  | A | <input type="radio"/>            | B | <input type="radio"/>            | C | <input type="radio"/>            | D | <input checked="" type="radio"/> |
| 9.  | A | <input checked="" type="radio"/> | B | <input type="radio"/>            | C | <input type="radio"/>            | D | <input type="radio"/>            |
| 10. | A | <input type="radio"/>            | B | <input checked="" type="radio"/> | C | <input type="radio"/>            | D | <input type="radio"/>            |
| 11. | A | <input type="radio"/>            | B | <input type="radio"/>            | C | <input type="radio"/>            | D | <input checked="" type="radio"/> |
| 12. | A | <input type="radio"/>            | B | <input checked="" type="radio"/> | C | <input type="radio"/>            | D | <input type="radio"/>            |
| 13. | A | <input type="radio"/>            | B | <input type="radio"/>            | C | <input checked="" type="radio"/> | D | <input type="radio"/>            |
| 14. | A | <input type="radio"/>            | B | <input type="radio"/>            | C | <input checked="" type="radio"/> | D | <input type="radio"/>            |
| 15. | A | <input checked="" type="radio"/> | B | <input type="radio"/>            | C | <input type="radio"/>            | D | <input type="radio"/>            |

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**Section 3**

Longer Answer Section

### ANSWERS

**Marks**

1.

$$\begin{aligned}
 \text{(a)} \quad \frac{2\sqrt{5} - 4\sqrt{10}}{4\sqrt{5} - \sqrt{2}} \times \frac{4\sqrt{5} + \sqrt{2}}{4\sqrt{5} + \sqrt{2}} &= \frac{8\sqrt{25} + 2\sqrt{10} - 16\sqrt{50} - 4\sqrt{20}}{(16\sqrt{25} - \sqrt{4})} \\
 &= \frac{40 + 2\sqrt{10} - 80\sqrt{2} - 8\sqrt{5}}{40 + 2\sqrt{10} - 80\sqrt{2} - 8\sqrt{5}} \\
 &= \frac{(80 - 2)}{40 + 2\sqrt{10} - 80\sqrt{2} - 8\sqrt{5}} \\
 &= \frac{78}{20 + \sqrt{10} - 40\sqrt{2} - 4\sqrt{5}} \\
 &= \frac{39}{39}
 \end{aligned}$$

**2 marks for correct simplified answer.**


**1 mark for a basically correct attempt which has only a minor error or two in algebra or calculation, or is incomplete but has a correct beginning**

$$\begin{aligned}
 \text{(b)} \quad \frac{5\sqrt{3} - 2\sqrt{6}}{\sqrt{6}} + \frac{1 - \sqrt{3}}{3\sqrt{2}} &= \frac{5\sqrt{3} - 2\sqrt{6}}{\sqrt{6}} \times \frac{\sqrt{6}}{\sqrt{6}} + \frac{1 - \sqrt{3}}{3\sqrt{2}} \times \frac{\sqrt{2}}{\sqrt{2}} \\
 &= \frac{5\sqrt{18} - 2\sqrt{36}}{\sqrt{6}} + \frac{\sqrt{2} - \sqrt{6}}{3\sqrt{2}} \\
 &= \frac{15\sqrt{2} - 12}{\sqrt{6}} + \frac{\sqrt{2} - \sqrt{6}}{3\sqrt{2}} \\
 &= \frac{16\sqrt{2} - 12 - \sqrt{6}}{6}
 \end{aligned}$$

**3 marks for correct simplified answer.**

**2 marks for a basically correct attempt which has only a minor error or two in algebra or calculation, or is incomplete but has a correct beginning**

**1 mark for an attempt with some correct working.**



(c) Let  $x = 0.\dot{5}3\dot{4}$   
 $1000x = 534.\dot{5}3\dot{4}$   
 $999x = 534$   
 $x = \frac{534}{999}$   
 $= \frac{178}{333}$

**2 marks for correct simplified answer.**

**1 mark for a basically correct attempt which has only a minor error or two in algebra or calculation, or is incomplete but has a correct beginning**