

Year 9 Term 2 Homework

Student Name: _____	Grade: _____
Date: _____	Score: _____

Table of contents

9	Year 9 Term 2 Week 9 Homework	1
9.1	Surds	1
9.1.1	Simplifying surds	1
9.1.2	Adding and Subtracting surds	3
9.1.3	Multiplication and division of surds	5
9.2	Miscellaneous exercises	6
9.3	Maths challenge	7

This edition was printed on July 13, 2009.

Camera ready copy was prepared with the **L^AT_EX₂ ϵ** typesetting system.

Copyright © 2000 - 2009 Yimin Math Centre (www.yiminmathcentre.com)

9 Year 9 Term 2 Week 9 Homework

9.1 Surds

9.1.1 Simplifying surds

Exercise 9.1.1 Simplify the following expressions:

1. $4\sqrt{72} =$ _____

2. $3\sqrt{128} =$ _____

3. $5\sqrt{75} =$ _____

4. $4\sqrt{63} =$ _____

5. $8\sqrt{28} =$ _____

6. $11\sqrt{48} =$ _____

Exercise 9.1.2 Express in simplest surd form:

1. $\sqrt{128} =$ _____

2. $\sqrt{288} =$ _____

3. $\sqrt{396} =$ _____

4. $\sqrt{275} =$ _____

5. $\sqrt{405} =$ _____

6. $\sqrt{720} =$ _____

Exercise 9.1.3 Express each of the following as an entire surd:

1. $4\sqrt{2} =$ _____

2. $6\sqrt{2} =$ _____

3. $3\sqrt{7} =$ _____

4. $6\sqrt{6} =$ _____

5. $5\sqrt{4} =$ _____

6. $3\sqrt{15} =$ _____

Exercise 9.1.4 Consolidation

1. Find the value of each pronumeral:

(a) $3\sqrt{3} = \sqrt{x}$ _____

(b) $7\sqrt{5} = \sqrt{y}$ _____

(c) $a\sqrt{3} = \sqrt{36}$ _____

(d) $5\sqrt{b} = \sqrt{175}$ _____

(e) $4\sqrt{2b} = \sqrt{192}$ _____

2. Simplify these algebraic surds:

(a) $\sqrt{16a} =$ _____

(b) $\sqrt{a^2b^3} =$ _____

(c) $\sqrt{4a^2b} =$ _____

(d) $\sqrt{12a^4b^2} =$ _____

(e) $\sqrt{48a^2b^5} =$ _____

3. Express the following as entire surds:

(a) $5\sqrt{b} =$ _____

(b) $a\sqrt{b} =$ _____

(c) $b\sqrt{b} =$ _____

(d) $a^2\sqrt{2b} =$ _____

(e) $3a^2b\sqrt{2b} =$ _____

4. Show that $\frac{a-b}{a+b} \sqrt{\frac{a+b}{a-b}} = \sqrt{\frac{a-b}{a+b}}$

5. Without using a calculator, determine which number is greater: $1 + 2\sqrt{3}$ or $8 - 2\sqrt{3}$

9.1.2 Adding and Subtracting surds

- Like surds are surds that have the same number of expression under the radical sign.
- For example: $3\sqrt{3}$ and $5\sqrt{3}$, $3\sqrt{3a}$ and $-5\sqrt{2a}$ are like surds.
- For example: $3\sqrt{2}$ and $3\sqrt{3}$, $2\sqrt{3a}$ and $2\sqrt{2b}$ are unlike surds.
- Only like surds can be added or subtracted.
- To add or subtract surds:
 - express each surd in its simplest form
 - add or subtract the rational parts of like surds
 - keep the same irrational parts.

Example 9.1.1

1. $3\sqrt{5} - 6\sqrt{5} = -3\sqrt{5}$
2. $5\sqrt{a} + 2\sqrt{a} = 7\sqrt{a}$
3. $3\sqrt{18} + 2\sqrt{32} = 9\sqrt{2} - 8\sqrt{2} = \sqrt{2}$

Exercise 9.1.5

1. Evaluate $\sqrt{9}$, $\sqrt{16}$ $\sqrt{25}$. Does $\sqrt{9} + \sqrt{16} = \sqrt{25}$?

2. Does $\sqrt{a} + \sqrt{b} = \sqrt{a+b}$?

3. Simplify the following:

(a) $5\sqrt{3} + 2\sqrt{3} =$ _____

(b) $3\sqrt{7} + 5\sqrt{7} =$ _____

(c) $4\sqrt{2} + 2\sqrt{3} - 2\sqrt{2} + 5\sqrt{3} =$ _____

(d) $-3\sqrt{6} + 2\sqrt{5} - 2\sqrt{6} + 3\sqrt{5} =$ _____

(e) $3\sqrt{20} + 5\sqrt{45} =$ _____

(f) $4\sqrt{63} - 3\sqrt{28} =$ _____

(g) $2\sqrt{18a} + 3\sqrt{8a} =$ _____

Exercise 9.1.6 Further applications

1. Express each surd in simplest surd form, then collect the like surds:

(a) $\sqrt{45} + \sqrt{80} =$ _____

(b) $3\sqrt{6} + \sqrt{96} =$ _____

(c) $5\sqrt{11} - \sqrt{44} =$ _____

(d) $12\sqrt{6} - \sqrt{150} =$ _____

(e) $6\sqrt{13} + 3\sqrt{52} =$ _____

(f) $8\sqrt{45} - 3\sqrt{20} =$ _____

2. Express each of the following in simplest surd form:

(a) $\sqrt{27} + 2\sqrt{12} - 2\sqrt{45} + \sqrt{20} =$ _____

(b) $3\sqrt{8} + 2\sqrt{40} - 2\sqrt{32} + \sqrt{90} =$ _____

(c) $2\sqrt{63} + 2\sqrt{8} - 7\sqrt{2} + 5\sqrt{18} =$ _____

(d) $5\sqrt{a} + 2\sqrt{3b} - 2\sqrt{a} + 5\sqrt{3b} =$ _____

(e) $4\sqrt{a} + 2\sqrt{18b} - 2\sqrt{a} + 5\sqrt{8b} =$ _____

(f) $8\sqrt{ab} + 3\sqrt{18b} - 4\sqrt{ab} + 2\sqrt{2b} =$ _____

3. Simplify the following:

(a) $\sqrt{16x} + 5\sqrt{x} =$ _____

(b) $2\sqrt{y^3} + 3y\sqrt{y} =$ _____

(c) $\sqrt{a^5} + 7a^2\sqrt{a} =$ _____

(d) $\sqrt{49b^3} - 4b\sqrt{b} =$ _____

(e) $2\sqrt{18x^2} - 3\sqrt{8x^2} =$ _____

(f) $\sqrt{27x} - \sqrt{12x} =$ _____

4. Express the following as entire surds:

(a) $3a^2\sqrt{2a} =$ _____

(b) $a^2\sqrt{b} =$ _____

(c) $2ab^2\sqrt{a} =$ _____

(d) $4a^2\sqrt{2ab} =$ _____

(e) $6a^2b\sqrt{3b} =$ _____

(f) $5a^2b^3\sqrt{5ab} =$ _____

9.1.3 Multiplication and division of surds

To multiply or divide surds:

- Multiply or divide the rational parts
- Multiply or divided the irrational parts
- Simplify if possible.

Example 9.1.2

$$1. 3\sqrt{5} \times 2\sqrt{3} = 3 \times 2 \times \sqrt{5 \times 3} = 6\sqrt{15}$$

$$2. \sqrt{10} \times \sqrt{2} = \sqrt{10 \times 2} = 2\sqrt{5}$$

$$3. 24\sqrt{33} \div 6\sqrt{3} = \frac{24}{6} \sqrt{\frac{33}{3}} = 4\sqrt{11}$$

$$4. \sqrt{48} \div \sqrt{3} = \sqrt{\frac{48}{3}} = \sqrt{16} = 4$$

Exercise 9.1.7 Simplify:

$$1. 5\sqrt{2} \times 4\sqrt{3} = \underline{\hspace{10cm}}$$

$$2. 2\sqrt{2} \times 3\sqrt{3} \times 4\sqrt{5} = \underline{\hspace{10cm}}$$

$$3. 2\sqrt{7} \times 4\sqrt{3} \times \sqrt{2} = \underline{\hspace{10cm}}$$

$$4. 3\sqrt{26} \div \sqrt{2} = \underline{\hspace{10cm}}$$

$$5. 54\sqrt{30} \times 6\sqrt{3} = \underline{\hspace{10cm}}$$

Exercise 9.1.8 Consolidation

$$1. \sqrt{12} \times \sqrt{20} = \underline{\hspace{10cm}}$$

$$2. \sqrt{45} \times \sqrt{63} = \underline{\hspace{10cm}}$$

$$3. 3\sqrt{98} \times 5\sqrt{112} = \underline{\hspace{10cm}}$$

$$4. 8\sqrt{120} \div 2\sqrt{3} = \underline{\hspace{10cm}}$$

$$5. 25\sqrt{21} \div 5\sqrt{3} = \underline{\hspace{10cm}}$$

9.2 Miscellaneous exercises

Exercise 9.2.1

1. A box contained red and white marbles. 80% of them were red. Ken removed 20 red marbles and 2 white from the box and put the remaining marbles into groups of 9. In each group of 9 marbles, there were 7 red marbles. How many marbles of each colour were in the box at first?

2. The total number of marbles in box A, box B and box C was 149. I removed $\frac{3}{5}$ of the marbles from Box A, put 20 more marbles into box B. and put in more marbles into box C until the number of marbles in it tripled. The number of marbles in box A, box B and box C is now in the ratio 2 : 5 : 9. How many more marbles are there in box C than box A now?

3. Ken and Tom started off from the same place and drove at uniform speeds in the same direction around a 40 km circular track. Ken completed each round in 40 min. Tom took 50 min to complete each round.

(a) How far behind would Tom be from Ken after one hour?

(b) How long after they started would it take Ken to overtake Tom for the first time?

9.3 Maths challenge

Exercise 9.3.1

1. *Kevin and Daniel shared the cost of a dinner in the ratio 2 : 3 Kevin used up half of his money to pay for his share. After paying for her share, Daniel had \$84 left. The ratio of the amount of money that Kevin and Daniel brought along for the dinner was 3 : 4. How much was the bill for the dinner?*

2. *Bob, the orienteering runner, counts 60 paces per 100 m on open ground and 80 paces per 100 m on rough ground. He count 600 paces on a run which consists of one quarter open ground and three quarter rough ground. How long, in metres was this run?*

3. *Susan and Jenny run a 200 m race which Susan wins by 10 m. Jenny suggests that they run another race, with Susan starting 10 m behind the starting line. If they run the same spaces as in the first race, what is the outcome of the race?*

4. *A class consists of 10 boys and 15 girls. Two of the boys and five of the girls are left-handed. If two students are chosen at random from the class, what is the probability that both are left-handed?*
