Lesson 2

2.1 SURD Manipulation

There are benefits in 'using your wits' to try and spot 'short cuts' and 'clever moves' to avoid long-winded and pedantic solutions.

However, if you need to put in lots of steps to be certain of getting a question right, put them in - it's often quicker to scribble down a few extra lines rather than agonise over a tricky step in your mind.

Also keep in mind that there are often a couple of different methods that could be employed - use what you are comfortable with, which may differ from what your neighbour is doing.

Example

Without using a calculator, calculate $2\sqrt{15} \times 4\sqrt{10}$

Write your answer in the form $a\sqrt{b}$

   where a and b are integers

   and b is as small as possible.

[2 marks]

2.2 Exercise

Any solution based entirely on graphical
or numerical methods is not acceptable
Marks Available : 70

Do NOT use a calculator

Question 1
Calculate each of the following, writing your answers in the form $a\sqrt{b}$
      where a and b are integers
      and b is as small as possible.

(**i**) $3\sqrt{6} \times 7\sqrt{21}$

[2 marks]

(**ii**) $5\sqrt{14} \times 2\sqrt{10}$

[2 marks]

(**iii**) $10\sqrt{22} \times 4\sqrt{6}$

[2 marks]

(**iv**) $3\sqrt{10} \times 4\sqrt{55}$

[2 marks]

Question 2

Simplify:
(i)　　$\sqrt{12}$　　　　　　(ii)　　$\sqrt{20}$　　　　　　(iii)　　$\sqrt{8}$

(iv)　　$\sqrt{3^2 \times 5}$　　　(v)　　$\sqrt{2^4 \times 3}$　　　(vi)　　$\sqrt{242}$

(vii)　　$\sqrt{75}$　　　　(viii)　　$\sqrt{6 \times 27}$　　　(ix)　　$\sqrt{147}$

(x)　　$\sqrt{5^3}$　　　　(xi)　　$\sqrt{567}$　　　　(xii)　　$\sqrt{8 \times 14}$
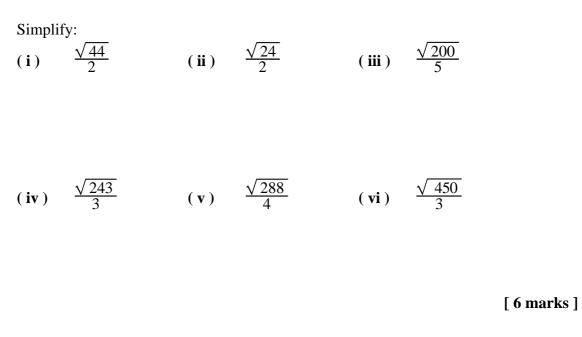
[12 marks]

Question 3

Simplify:
(i)　　$5\sqrt{18}$　　　　(ii)　　$2\sqrt{30 \times 10}$　　　(iii)　　$5\sqrt{54}$

(iv)　　$3\sqrt{2^3 \times 10}$　　　(v)　　$2\sqrt{2^2 \times 5 \times 35}$　　　(vi)　　$2\sqrt{245}$

[6 marks]

Question 4

Simplify:

(i) $\dfrac{\sqrt{44}}{2}$ (ii) $\dfrac{\sqrt{24}}{2}$ (iii) $\dfrac{\sqrt{200}}{5}$

(iv) $\dfrac{\sqrt{243}}{3}$ (v) $\dfrac{\sqrt{288}}{4}$ (vi) $\dfrac{\sqrt{450}}{3}$

[6 marks]

Question 5

Simplify:

(i) $\dfrac{\sqrt{98}}{\sqrt{2}}$ (ii) $\dfrac{\sqrt{500}}{\sqrt{5}}$ (iii) $\dfrac{\sqrt{63}}{\sqrt{7}}$

[3 marks]

Question 6

Simplify:

(i) $\dfrac{\sqrt{10}}{\sqrt{5}}$ (ii) $\dfrac{\sqrt{22}}{\sqrt{11}}$ (iii) $\dfrac{\sqrt{56}}{\sqrt{7}}$

[3 marks]

Question 7
Simplify:
(i) $3\sqrt{75} + 2\sqrt{12}$

[2 marks]

(ii) $2\sqrt{18} + \sqrt{2^3 \times 5^2} - \sqrt{72}$

[2 marks]

(iii) $5\sqrt{20} + 3\sqrt{45} - 4\sqrt{80}$

[2 marks]

(iv) $6\sqrt{6} - \sqrt{24} + 3\sqrt{2 \times 3 \times 7^2}$

[2 marks]

Question 8
Simplify:

(**i**) $5\sqrt{63}$

(**ii**) $7\sqrt{200}$

(**iii**) $10\sqrt{216}$

(**iv**) $2\sqrt{90}$

(**v**) $11\sqrt{3 \times 5^3}$

(**vi**) $12\sqrt{2^5 \times 3^2}$

[6 marks]

Question 9
Write each of the following in the form $a + b\sqrt{c}$ for integer a, b and c.
Furthermore, c is to be square free.
[Your answers to **Question 8** will be helpful...]

(**i**) $\dfrac{18 + 5\sqrt{63}}{3}$

(**ii**) $\dfrac{14 + 7\sqrt{200}}{14}$

(**iii**) $\dfrac{45 + 10\sqrt{216}}{15}$

(**iv**) $\dfrac{12 + 2\sqrt{90}}{3}$

(**v**) $\dfrac{30 - 11\sqrt{375}}{5}$

(**vi**) $\dfrac{36 + 12\sqrt{288}}{9}$

[12 marks]

Question 10

Write in the form $a + b\sqrt{c}$ where a, b and c are integers.

Furthermore, c, is to be □ Free.

(**i**) $\dfrac{200 + 3\sqrt{1000}}{5}$

(**ii**) $\dfrac{-64 + 16\sqrt{88}}{32}$

(**iii**) $\dfrac{2 + 3\sqrt{156}}{2}$

[6 marks]