

1.5 Answers

A-Level Pure Mathematics : Year 1 GCSE (Grades 8 and 9)

Algebra of Surds and Indices I

1.5.1 Solution to 1.1 Example #1)

A division ladder;

$$\begin{array}{r|l} 2 & 2704 \\ 2 & 1352 \\ 2 & 676 \\ 2 & 338 \\ 13 & 169 \\ 13 & 13 \\ & 1 \end{array}$$

Thus;

$$2704 = 2^4 \times 13^2 \quad \text{from the division ladder}$$

$$\begin{aligned} \therefore \sqrt{2704} &= \sqrt{2^4 \times 13^2} \\ &= (2^4 \times 13^2)^{\frac{1}{2}} \\ &= 2^2 \times 13 \\ &= 52 \end{aligned}$$

[3 marks]

1.5.2 Solution to 1.1 Example #2

$$\begin{aligned} \sqrt{11^{102} \times 13^{284}} &= (11^{102} \times 13^{284})^{\frac{1}{2}} \\ &= 11^{51} \times 13^{142} \end{aligned}$$

[2 marks]

1.5.3 Solution to 1.2 Exercise

(i) 63

[3 marks]

(ii) $17^{19} \times 19^{37}$

[2 marks]

1.5.4 Solution to 1.3 Example

$$\begin{aligned} \sqrt{120} &= \sqrt{4} \times \sqrt{30} \\ &= 2\sqrt{30} \end{aligned}$$

[2 marks]

1.5.5 Solutions to 1.4 Exercise

Answer 1

(i) $8 = 4 \times 2$
 $\therefore \sqrt{8} = 2 \sqrt{2}$

(ii) $\sqrt{3^2 \times 3} = 3 \sqrt{3}$

(iii) $48 = 16 \times 3$
 $\therefore \sqrt{48} = 4 \sqrt{3}$

(iv) $98 = 49 \times 2$
 $\therefore \sqrt{98} = 7 \sqrt{2}$

(v) $\sqrt{2^2 \times 2 \times 7} = 2 \sqrt{14}$

(vi) $\therefore \sqrt{11^2 \times 2} = 11 \sqrt{2}$

(vii) $\sqrt{2^8 \times 5} = 2^4 \sqrt{5} = 16 \sqrt{5}$

[7 marks]

Answer 2

Only (i) and (v) are ☐ FREE

[2 marks]

Answer 3

$$\sqrt{5^{52} \times 13^{94} \times 7 \times 13} = 5^{26} \times 13^{47} \times \sqrt{7 \times 13}$$

[3 marks]

Answer 4

(i) $504 = 36 \times 14$
 $\therefore \sqrt{504} = 6 \sqrt{14}$

(ii) $1452 = 484 \times 3$
 $\therefore \sqrt{1452} = 22 \sqrt{3}$

(iii) $15 \sqrt{30}$

(iv) $9 \sqrt{66}$

[2, 3, 2, 3 marks]

Answer 5

12

[4 marks]