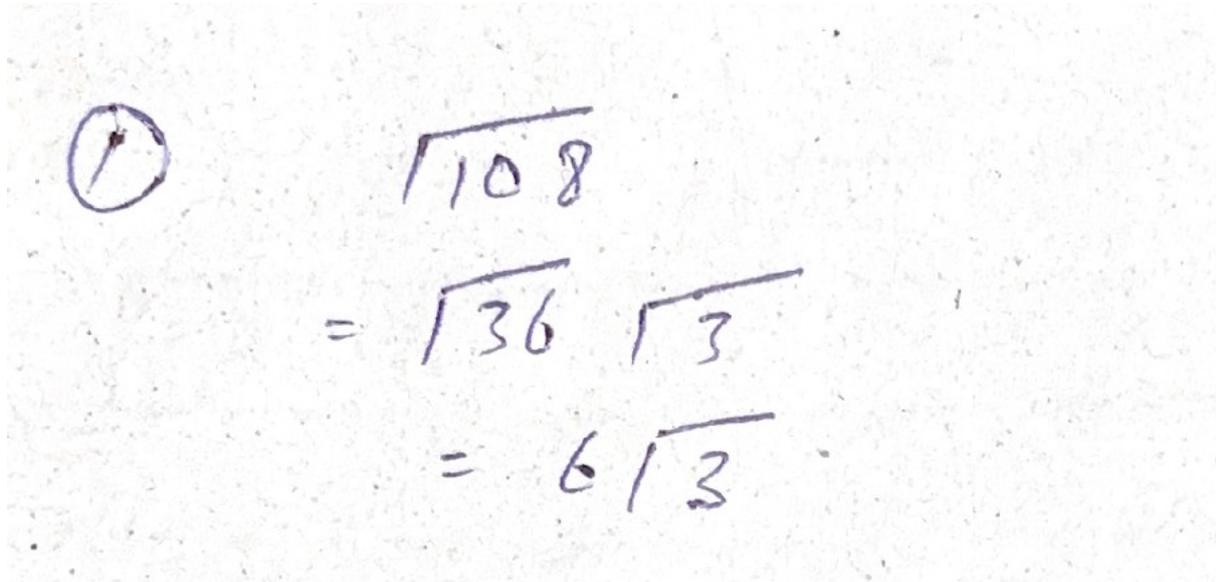


## Answers Sheet

### SURDS

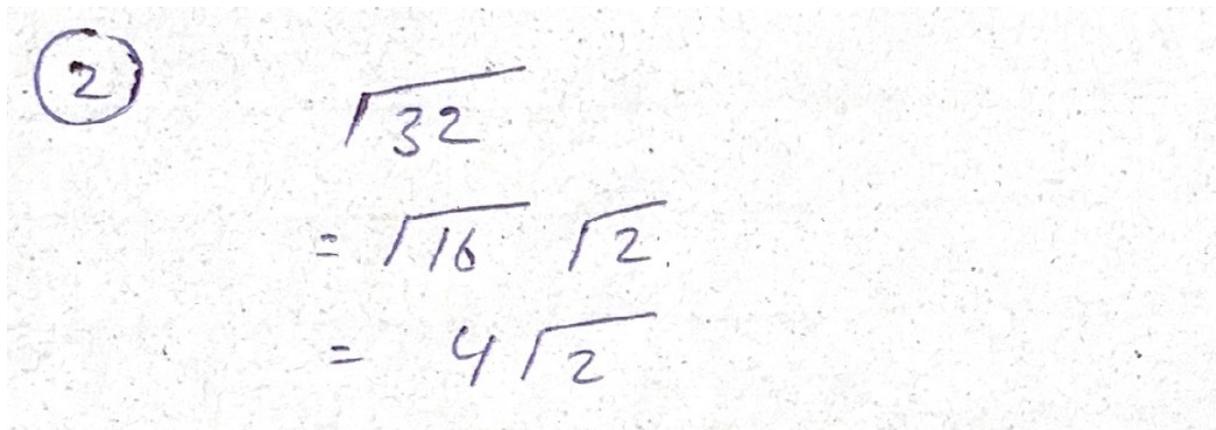
1-



①

$$\begin{aligned}\sqrt{108} \\ &= \sqrt{36} \sqrt{3} \\ &= 6\sqrt{3}\end{aligned}$$

2-



②

$$\begin{aligned}\sqrt{32} \\ &= \sqrt{16} \sqrt{2} \\ &= 4\sqrt{2}\end{aligned}$$

3-

$$\begin{aligned} \textcircled{3} \quad & 5\sqrt{108} \\ &= 5(\sqrt{36}\sqrt{3}) \\ &= 5(6\sqrt{3}) \\ &= 30\sqrt{3} \end{aligned}$$

4-

$$\begin{aligned} \textcircled{4} \quad & 8\sqrt{20} \\ &= 7(\sqrt{4}\sqrt{5}) \\ &= 7(2\sqrt{5}) \\ &= 14\sqrt{5} \end{aligned}$$

5-

$$\begin{aligned} \textcircled{5} \quad & (3 + \sqrt{2})(3 - \sqrt{2}) \\ &= 9 - 3\sqrt{2} + 3\sqrt{2} - 2 \\ &= 7 \end{aligned}$$

6-

$$\begin{aligned} \textcircled{6} \quad & (4 + \sqrt{5})^2 \\ &= (4 + \sqrt{5})(4 + \sqrt{5}) \\ &= 16 + 4\sqrt{5} + 4\sqrt{5} + 5 \\ &= 21 + 8\sqrt{5} \end{aligned}$$

7-

$$\begin{aligned} \textcircled{7} \quad & (3 + \sqrt{5})(2 - \sqrt{5}) \\ &= 6 - 3\sqrt{5} + 2\sqrt{5} - 5 \\ &= 1 - 3\sqrt{5} + 2\sqrt{5} \\ &= 1 - \sqrt{5} \end{aligned}$$

8-

$$\begin{aligned} \textcircled{8} \quad & (4 - \sqrt{2})^2 \\ &= (4 - \sqrt{2})(4 - \sqrt{2}) \\ &= 16 - 4\sqrt{2} - 4\sqrt{2} + 2 \\ &= 18 - 8\sqrt{2} \end{aligned}$$

9-

$$\begin{aligned} & \textcircled{9} \quad (4 + \sqrt{3})^2 - (4 - \sqrt{3})^2 \\ &= [(4 + \sqrt{3})(4 + \sqrt{3})] - [(4 - \sqrt{3})(4 - \sqrt{3})] \\ &= [16 + 4\sqrt{3} + 4\sqrt{3} + 3] - [16 - 4\sqrt{3} - 4\sqrt{3} + 3] \\ &= [19 + 8\sqrt{3}] - [19 - 8\sqrt{3}] \\ &= 19 + 8\sqrt{3} - 19 + 8\sqrt{3} \\ &= 16\sqrt{3} \end{aligned}$$

10-

$$\begin{aligned} & \textcircled{10} \quad \frac{9}{\sqrt{3}} \\ &= \frac{9}{\sqrt{3}} \times \frac{\sqrt{3}}{\sqrt{3}} \\ &= \frac{9\sqrt{3}}{3} \\ &= 3\sqrt{3} \end{aligned}$$

$\therefore$  dividing and multiplying with  $\sqrt{3}$

11-

$$\begin{aligned} & \textcircled{11} \quad \frac{y}{\sqrt{y}} \\ & = \frac{y}{\sqrt{y}} \times \frac{\sqrt{y}}{\sqrt{y}} \\ & = \frac{y \sqrt{y}}{y} \\ & = \sqrt{y} \end{aligned}$$

12-

$$\begin{aligned} & \textcircled{12} \quad \frac{2 + \sqrt{5}}{\sqrt{2}} \\ & = \frac{2 + \sqrt{5}}{\sqrt{2}} \times \frac{\sqrt{2}}{\sqrt{2}} \\ & = \frac{2\sqrt{2} + \sqrt{10}}{2} \end{aligned}$$

13-

(13)

$$\begin{aligned}
 & \frac{4 + \sqrt{6}}{\sqrt{2}} \\
 &= \frac{4 + \sqrt{6}}{\sqrt{2}} \times \frac{\sqrt{2}}{\sqrt{2}} \\
 &= \frac{4\sqrt{2} + \sqrt{12}}{2} \\
 &= \frac{4\sqrt{2} + \sqrt{4}\sqrt{3}}{2} \\
 &= \frac{4\sqrt{2} + 2\sqrt{3}}{2} \\
 &= 2(2\sqrt{2} + \sqrt{3}) \\
 &= 2\sqrt{2} + \sqrt{3}
 \end{aligned}$$

14-

(14)

$$\begin{aligned}
 & \frac{(5 + 2\sqrt{3})(5 - 2\sqrt{3})}{\sqrt{18}} \\
 &= \frac{25 - 10\sqrt{3} + 10\sqrt{3} - 4(3)}{\sqrt{18}} \\
 &= \frac{13}{\sqrt{18}} \times \frac{\sqrt{18}}{\sqrt{18}} \\
 &= \frac{13\sqrt{18}}{18}
 \end{aligned}$$

15-

(15)

$$\begin{aligned} & \frac{6 + 2\sqrt{3}}{2 + \sqrt{3}} \\ &= \frac{(6 + 2\sqrt{3})}{(2 + \sqrt{3})} \times \frac{(2 - \sqrt{3})}{(2 - \sqrt{3})} \\ &= \frac{12 - 6\sqrt{3} + 4\sqrt{3} - 2(3)}{4 - 2\sqrt{3} + 2\sqrt{3} - 3} \\ &= \frac{6 - 2\sqrt{3}}{1} \\ &= 6 - 2\sqrt{3} \quad (\text{can be written}) \end{aligned}$$

16-

(16)

$$\begin{aligned} & \frac{2\sqrt{2} + 2}{2 + \sqrt{2}} \\ &= \frac{(2\sqrt{2} + 2)}{(2 + \sqrt{2})} \times \frac{(2 - \sqrt{2})}{(2 - \sqrt{2})} \\ &= \frac{4\sqrt{2} - 2(2) + 4 - 2\sqrt{2}}{4 - 2\sqrt{2} + 2\sqrt{2} - 2} \\ &= \frac{4\sqrt{2} - 4 + 4 - 2\sqrt{2}}{2} \\ &= \frac{2\sqrt{2}}{2} \\ &= \sqrt{2} \quad \therefore \text{can be written} \end{aligned}$$

17-

(17)

$$\frac{1}{\frac{1}{\sqrt{3}} + \sqrt{3}} \longrightarrow \frac{1}{\sqrt{3}} + \frac{\sqrt{3} \times \sqrt{3}}{1 \times \sqrt{3}}$$
$$= 1 \div \frac{4}{\sqrt{3}}$$
$$= 1 \times \frac{\sqrt{3}}{4}$$
$$= \frac{\sqrt{3}}{4}$$
$$= \frac{1}{\sqrt{3}} + \frac{3}{\sqrt{3}}$$
$$= \frac{4}{\sqrt{3}}$$

18-

(18)

$$\begin{aligned} & \frac{2}{\left(\frac{1}{\sqrt{2}} + 1\right)} \longrightarrow \frac{1}{\sqrt{2}} + \frac{1}{1} \times \sqrt{2} \\ & = \frac{1}{\sqrt{2}} + \frac{\sqrt{2}}{\sqrt{2}} \\ & = \frac{1 + \sqrt{2}}{\sqrt{2}} \\ & = 2 \times \frac{\sqrt{2}}{1 + \sqrt{2}} \\ & = \frac{2\sqrt{2} \times (1 - \sqrt{2})}{(1 + \sqrt{2})(1 - \sqrt{2})} \\ & = \frac{2\sqrt{2} - 2(2)}{1 - \sqrt{2} + \sqrt{2} - 2} \\ & = \frac{2\sqrt{2} - 4}{-1} \\ & = -2\sqrt{2} + 4 \\ & = 4 - 2\sqrt{2} \\ & \text{OR} \quad 2(2 - \sqrt{2}) \end{aligned}$$

19-

$$\begin{aligned} & (19) \quad (\sqrt{x} + \sqrt{y})(\sqrt{x} - \sqrt{y}) \\ & = x - \sqrt{xy} + \sqrt{xy} - y \\ & = x - y \end{aligned}$$

20-

(20)

$$(2x + \sqrt{y})^2$$

$$= (2x + \sqrt{y})(2x + \sqrt{y})$$

$$= 4x^2 + 2x\sqrt{y} + 2x\sqrt{y} + y$$

$$= 4x^2 + 4x\sqrt{y} + y$$