Try it 1A

1a $5x^3 \times 2x^7 = 5 \times 2 \times x^{3+7}$

$\qquad\qquad = 10x^{10}$

1b $18x^9 \div 3x^2 = \dfrac{18x^9}{3x^2}$

$\qquad\qquad = \dfrac{18}{3}x^{9-2}$

$\qquad\qquad = 6x^7$

1c $(2x^6)^4 = 2^4 \times x^{6\times4}$

$\qquad\qquad = 2 \times 2 \times 2 \times 2 \times x^{6\times4}$

$\qquad\qquad = 16x^{24}$

1d $\left(\dfrac{x^3}{3}\right)^2 = \dfrac{x^{3\times2}}{3^2}$

$\qquad\qquad = \dfrac{x^6}{9}$

2a $36^{\frac{1}{2}} = \sqrt{36}$

$\qquad\quad = 6$

2b $27^{\frac{2}{3}} = \left(27^{\frac{1}{3}}\right)^2$

$\qquad\quad = \left(\sqrt[3]{27}\right)^2$

$\qquad\quad = 3^2$

$\qquad\quad = 9$

2c $64^{-0.5} = \left(64^{-1}\right)^{\frac{1}{2}}$

$\qquad\qquad = \dfrac{1}{64^{\frac{1}{2}}}$

$\qquad\qquad = \dfrac{1}{\sqrt{64}}$

$\qquad\qquad = \dfrac{1}{8}$

2d $\left(\dfrac{1}{2}\right)^4 = \dfrac{1}{2^4}$

$\qquad\qquad = \dfrac{1}{2\times2\times2\times2}$

$\qquad\qquad = \dfrac{1}{16}$

3a $\sqrt[5]{x^2} = \left(x^2\right)^{\frac{1}{5}}$

$\qquad\quad = x^{\frac{2}{5}}$

3b $\dfrac{3}{\sqrt{x}} = \dfrac{3}{x^{\frac{1}{2}}}$

$\qquad\quad = 3x^{-\frac{1}{2}}$

3c $\dfrac{3x^2}{\sqrt{x}} = 3 \times \dfrac{x^2}{x^{\frac{1}{2}}}$

$\qquad\quad = 3 \times x^2 x^{-\frac{1}{2}}$

$\qquad\quad = 3 \times x^{2-\frac{1}{2}}$

$\qquad\quad = 3x^{\frac{3}{2}}$

3d $\dfrac{\sqrt{x}}{3x} = \dfrac{x^{\frac{1}{2}}}{3x}$

$\qquad\quad = \dfrac{x^{\frac{1}{2}}}{3}x^{-1}$

$\qquad\quad = \dfrac{1}{3}x^{\frac{1}{2}-1}$

$\qquad\quad = \dfrac{1}{3}x^{-\frac{1}{2}}$

4a $\sqrt{28} = \sqrt{4}\sqrt{7}$

$\qquad\quad = 2\sqrt{7}$

$\qquad$ so $3\sqrt{28} = 6\sqrt{7}$

$\qquad$ So $3\sqrt{28} - \sqrt{7} = 6\sqrt{7} - \sqrt{7}$

$\qquad\qquad\qquad = 5\sqrt{7}$

4b $\dfrac{4}{\sqrt{3}} = \dfrac{4\sqrt{3}}{\sqrt{3}\sqrt{3}}$

$\qquad\quad = \dfrac{4\sqrt{3}}{3}$

4c $\dfrac{3}{1+\sqrt{2}} = \dfrac{3(1-\sqrt{2})}{(1+\sqrt{2})(1-\sqrt{2})}$

$\qquad\qquad = \dfrac{3(1-\sqrt{2})}{1-\sqrt{2}+\sqrt{2}-2}$

$\qquad\qquad = \dfrac{3(1-\sqrt{2})}{-1}$

$\qquad\qquad = -3+3\sqrt{2}$

4d $\dfrac{\sqrt{5}}{\sqrt{5}-2}=\dfrac{\sqrt{5}(\sqrt{5}+2)}{(\sqrt{5}-2)(\sqrt{5}+2)}$

$\qquad\quad =\dfrac{5+2\sqrt{5}}{5+\,2\sqrt{5}-2\sqrt{5}-4}$

$\qquad\quad =\dfrac{5+2\sqrt{5}}{5-4}$

$\qquad\quad =5+2\sqrt{5}$

Bridging Exercise 1A

1a $49^{\frac{1}{2}}=\sqrt{49}$

$\qquad =7$

1b $27^{\frac{1}{3}}=\sqrt[3]{27}$

$\qquad =3$

1c $5^{-1}=\dfrac{1}{5}$

1d $64^{-\frac{1}{3}}=\dfrac{1}{64^{\frac{1}{3}}}$

$\qquad\quad =\dfrac{1}{\sqrt[3]{64}}$

$\qquad\quad =\dfrac{1}{4}$

1e $9^{\frac{3}{2}}=\left(9^{\frac{1}{2}}\right)^{3}$

$\qquad =\left(\sqrt{9}\right)^{3}$

$\qquad =3^{3}$

$\qquad =27$

1f $16^{\frac{3}{4}}=\left(16^{\frac{1}{4}}\right)^{3}$

$\qquad =\left(\sqrt[4]{16}\right)^{3}$

$\qquad =2^{3}$

$\qquad =8$

1g $125^{-\frac{2}{3}}=\dfrac{1}{\left(125^{\frac{1}{3}}\right)^{2}}$

$\qquad\qquad =\dfrac{1}{\left(\sqrt[3]{125}\right)^{2}}$

$\qquad\qquad =\dfrac{1}{5^{2}}$

$\qquad\qquad =\dfrac{1}{25}$

1h $\left(\dfrac{1}{2}\right)^{3}=\dfrac{1^{3}}{2^{3}}$

$\qquad\quad =\dfrac{1}{8}$

1i $\left(\dfrac{1}{9}\right)^{-2}=9^{2}$

$\qquad\quad =81$

1j $\left(\dfrac{4}{9}\right)^{\frac{1}{2}}=\dfrac{4^{\frac{1}{2}}}{9^{\frac{1}{2}}}$

$\qquad\quad =\dfrac{\sqrt{4}}{\sqrt{9}}$

$\qquad\quad =\dfrac{2}{3}$

1k $\left(\dfrac{9}{16}\right)^{-0.5}=\left(\dfrac{16}{9}\right)^{0.5}$

$\qquad\qquad =\dfrac{16^{0.5}}{9^{0.5}}$

$\qquad\qquad =\dfrac{\sqrt{16}}{\sqrt{9}}$

$\qquad\qquad =\dfrac{4}{3}$

1l $\left(\dfrac{27}{8}\right)^{-\frac{2}{3}}=\left(\dfrac{8}{27}\right)^{\frac{2}{3}}$

$\qquad\qquad =\left(\sqrt[3]{\dfrac{8}{27}}\right)^{2}$

$\qquad\qquad =\left(\dfrac{\sqrt[3]{8}}{\sqrt[3]{27}}\right)^{2}$

$\qquad\qquad =\left(\dfrac{2}{3}\right)^{2}$

$\qquad\qquad =\dfrac{2^{2}}{3^{2}}$

$\qquad\qquad =\dfrac{4}{9}$

2a $\sqrt{8}=\sqrt{4}\,\sqrt{2}$

$\qquad =2\sqrt{2}$

2b $\sqrt{75}=\sqrt{25}\,\sqrt{3}$

$\qquad\;\; =5\sqrt{3}$

2c $2\sqrt{24}=2\sqrt{4}\,\sqrt{6}$

$\qquad\quad =2\times2\sqrt{6}$

$\qquad\quad =4\sqrt{6}$

2d
$$3\sqrt{48} = 3\sqrt{16}\sqrt{3}$$
$$= 3 \times 4\sqrt{3}$$
$$= 12\sqrt{3}$$

2e
$$\sqrt{20} + \sqrt{5} = \sqrt{4}\sqrt{5} + \sqrt{5}$$
$$= 2\sqrt{5} + \sqrt{5}$$
$$= 3\sqrt{5}$$

2f
$$\sqrt{27} - \sqrt{12} = \sqrt{9}\sqrt{3} - \sqrt{4}\sqrt{3}$$
$$= 3\sqrt{3} - 2\sqrt{3}$$
$$= \sqrt{3}$$

2g
$$5\sqrt{32} - 3\sqrt{8} = 5\sqrt{16}\sqrt{2} - 3\sqrt{4}\sqrt{2}$$
$$= 5 \times 4\sqrt{2} - 3 \times 2\sqrt{2}$$
$$= 20\sqrt{2} - 6\sqrt{2}$$
$$= 14\sqrt{2}$$

2h
$$\sqrt{50} + 3\sqrt{125} = \sqrt{25}\sqrt{2} + 3\sqrt{25}\sqrt{5}$$
$$= 5\sqrt{2} + 15\sqrt{5}$$

2i
$$\sqrt{68} + 3\sqrt{17} = \sqrt{4}\sqrt{17} + 3\sqrt{17}$$
$$= 2\sqrt{17} + 3\sqrt{17}$$
$$= 5\sqrt{17}$$

2j
$$3\sqrt{72} - \sqrt{32} = 3\sqrt{36}\sqrt{2} - \sqrt{16}\sqrt{2}$$
$$= 3 \times 6\sqrt{2} - 4\sqrt{2}$$
$$= 18\sqrt{2} - 4\sqrt{2}$$
$$= 14\sqrt{2}$$

2k
$$4\sqrt{18} - 2\sqrt{3} = 4\sqrt{9}\sqrt{2} - 2\sqrt{3}$$
$$= 4 \times 3\sqrt{2} - 2\sqrt{3}$$
$$= 12\sqrt{2} - 2\sqrt{3}$$

2l
$$6\sqrt{5} + \sqrt{50} = 6\sqrt{5} + \sqrt{25}\sqrt{2}$$
$$= 6\sqrt{5} + 5\sqrt{2}$$

3a
$$\frac{1}{\sqrt{7}} = \frac{\sqrt{7}}{\sqrt{7}\sqrt{7}}$$
$$= \frac{\sqrt{7}}{7}$$

3b
$$\frac{2}{\sqrt{8}} = \frac{2}{\sqrt{4}\sqrt{2}}$$
$$= \frac{2}{2\sqrt{2}}$$
$$= \frac{2\sqrt{2}}{2\sqrt{2}\sqrt{2}}$$
$$= \frac{\sqrt{2}}{2}$$

3c
$$\frac{12}{\sqrt{3}} = \frac{12\sqrt{3}}{\sqrt{3}\sqrt{3}}$$
$$= \frac{12\sqrt{3}}{3}$$
$$= 4\sqrt{3}$$

3d
$$\frac{\sqrt{8}}{\sqrt{12}} = \frac{\sqrt{4}\sqrt{2}}{\sqrt{4}\sqrt{3}}$$
$$= \frac{2\sqrt{2}}{2\sqrt{3}}$$
$$= \frac{\sqrt{2}}{\sqrt{3}}$$
$$= \frac{\sqrt{2}\sqrt{3}}{\sqrt{3}\sqrt{3}}$$
$$= \frac{\sqrt{6}}{3}$$

3e
$$\frac{1}{1+\sqrt{3}} = \frac{1-\sqrt{3}}{(1+\sqrt{3})(1-\sqrt{3})}$$
$$= \frac{1-\sqrt{3}}{1-\sqrt{3}+\sqrt{3}-3}$$
$$= \frac{1-\sqrt{3}}{-2}$$
$$= \frac{1}{2}(\sqrt{3}-1)$$

3f
$$\frac{2}{1+\sqrt{2}} = \frac{2(1-\sqrt{2})}{(1+\sqrt{2})(1-\sqrt{2})}$$
$$= \frac{2(1-\sqrt{2})}{1-\sqrt{2}+\sqrt{2}-2}$$
$$= \frac{2(1-\sqrt{2})}{-1}$$
$$= -2(1-\sqrt{2})$$
$$= 2(\sqrt{2}-1)$$

3g
$$\frac{8}{1-\sqrt{5}} = \frac{8(1+\sqrt{5})}{(1-\sqrt{5})(1+\sqrt{5})}$$
$$= \frac{8(1+\sqrt{5})}{1+\sqrt{5}-\sqrt{5}-5}$$
$$= \frac{8(1+\sqrt{5})}{-4}$$
$$= -2(1+\sqrt{5})$$

3h $\dfrac{2}{\sqrt{5}-1}=\dfrac{2(\sqrt{5}+1)}{(\sqrt{5}-1)(\sqrt{5}+1)}$

$\qquad\quad=\dfrac{2(\sqrt{5}+1)}{5+\sqrt{5}-\sqrt{5}-1}$

$\qquad\quad=\dfrac{2(\sqrt{5}+1)}{4}$

$\qquad\quad=\dfrac{1}{2}(\sqrt{5}+1)$

3i $\dfrac{\sqrt{2}}{2+\sqrt{3}}=\dfrac{\sqrt{2}(2-\sqrt{3})}{(2+\sqrt{3})(2-\sqrt{3})}$

$\qquad\quad=\dfrac{\sqrt{2}(2-\sqrt{3})}{4-2\sqrt{3}+2\sqrt{3}-3}$

$\qquad\quad=\dfrac{\sqrt{2}(2-\sqrt{3})}{1}$

$\qquad\quad=2\sqrt{2}-\sqrt{6}$

3j $\dfrac{2\sqrt{3}}{\sqrt{6}-2}=\dfrac{2\sqrt{3}(\sqrt{6}+2)}{(\sqrt{6}-2)(\sqrt{6}+2)}$

$\qquad\quad=\dfrac{2\sqrt{3}(\sqrt{6}+2)}{6+2\sqrt{6}-2\sqrt{6}-4}$

$\qquad\quad=\dfrac{2\sqrt{3}(\sqrt{6}+2)}{2}$

$\qquad\quad=\sqrt{3}(\sqrt{6}+2)$

$\qquad\quad=\sqrt{18}+2\sqrt{3}$

$\qquad\quad=3\sqrt{2}+2\sqrt{3}$

3k $\dfrac{1+\sqrt{2}}{1-\sqrt{2}}=\dfrac{(1+\sqrt{2})(1+\sqrt{2})}{(1-\sqrt{2})(1+\sqrt{2})}$

$\qquad\quad=\dfrac{1+\sqrt{2}+\sqrt{2}+2}{1+\sqrt{2}-\sqrt{2}-2}$

$\qquad\quad=\dfrac{3+2\sqrt{2}}{-1}$

$\qquad\quad=-3-2\sqrt{2}$

3l $\dfrac{3+\sqrt{5}}{\sqrt{5}-3}=\dfrac{(3+\sqrt{5})(\sqrt{5}+3)}{(\sqrt{5}-3)(\sqrt{5}+3)}$

$\qquad\quad=\dfrac{3\sqrt{5}+9+5+3\sqrt{5}}{5+3\sqrt{5}-3\sqrt{5}-9}$

$\qquad\quad=\dfrac{6\sqrt{5}+14}{-4}$

$\qquad\quad=-\dfrac{3}{2}\sqrt{5}-\dfrac{7}{2}$

4a $(1+\sqrt{2})(3+\sqrt{2})=3+\sqrt{2}+3\sqrt{2}+2$

$\qquad\qquad\qquad\quad=5+4\sqrt{2}$

4b $(1+\sqrt{2})(3-\sqrt{2})=3-\sqrt{2}+3\sqrt{2}-2$

$\qquad\qquad\qquad\quad=1+2\sqrt{2}$

4c $(1-\sqrt{2})(3+\sqrt{2})=3+\sqrt{2}-3\sqrt{2}-2$

$\qquad\qquad\qquad\quad=1-2\sqrt{2}$

4d $(1-\sqrt{2})(3-\sqrt{2})=3-\sqrt{2}-3\sqrt{2}+2$

$\qquad\qquad\qquad\quad=5-4\sqrt{2}$

4e $(\sqrt{3}+2)(4+\sqrt{3})=4\sqrt{3}+3+8+2\sqrt{3}$

$\qquad\qquad\qquad\quad=6\sqrt{3}+11$

4f $(\sqrt{3}+2)(4-\sqrt{3})=4\sqrt{3}-3+8-2\sqrt{3}$

$\qquad\qquad\qquad\quad=2\sqrt{3}+5$

4g $(\sqrt{3}-2)(4+\sqrt{3})=4\sqrt{3}+3-8-2\sqrt{3}$

$\qquad\qquad\qquad\quad=2\sqrt{3}-5$

4h $(\sqrt{3}-2)(4-\sqrt{3})=4\sqrt{3}-3-8+2\sqrt{3}$

$\qquad\qquad\qquad\quad=6\sqrt{3}-11$

4i $(\sqrt{6}+1)(\sqrt{2}+3)=\sqrt{12}+3\sqrt{6}+\sqrt{2}+3$

$\qquad\qquad\qquad\quad=2\sqrt{3}+3\sqrt{6}+\sqrt{2}+3$

4j $(\sqrt{6}+1)(\sqrt{2}-3)=\sqrt{12}-3\sqrt{6}+\sqrt{2}-3$

$\qquad\qquad\qquad\quad=2\sqrt{3}-3\sqrt{6}+\sqrt{2}-3$

4k $(\sqrt{6}-1)(\sqrt{2}+3)=\sqrt{12}+3\sqrt{6}-\sqrt{2}-3$

$\qquad\qquad\qquad\quad=2\sqrt{3}+3\sqrt{6}-\sqrt{2}-3$

4l $(\sqrt{6}-1)(\sqrt{2}-3)=\sqrt{12}-3\sqrt{6}-\sqrt{2}+3$

$\qquad\qquad\qquad\quad=2\sqrt{3}-3\sqrt{6}-\sqrt{2}+3$

5a $x^3\times x^7=x^{3+7}$

$\qquad\qquad\;=x^{10}$

5b $7x^5\times 3x^6=7\times 3\times x^{5+6}$

$\qquad\qquad\quad=21x^{11}$

5c $5x^4\times 8x^7=5\times 8\times x^{4+7}$

$\qquad\qquad\quad=40x^{11}$

5d $x^8\div x^2=x^{8-2}$

$\qquad\qquad\;=x^6$

5e $8x^7\div 2x^9=\dfrac{8}{2}\times x^{7-9}$

$\qquad\qquad\quad=4x^{-2}$

5f $3x^8\div 12x^7=\dfrac{3}{12}\times x^{8-7}$

$\qquad\qquad\quad=\dfrac{1}{4}x$

5g $(x^5)^7=x^{5\times 7}$

$\qquad\qquad=x^{35}$

5h $(x^2)^{-5}=x^{2\times(-5)}$

$\qquad\qquad\;=x^{-10}$

5i $(3x^2)^4 = 3^4 \times x^{2 \times 4}$

$= 81x^8$

5j $(6x^5)^2 = 6^2 \times x^{5 \times 2}$

$= 36x^{10}$

5k $\sqrt{x^3} = (x^3)^{\frac{1}{2}}$

$= x^{\frac{3}{2}}$

5l $\sqrt[4]{x^5} = (x^5)^{\frac{1}{4}}$

$= x^{\frac{5}{4}}$

5m $\dfrac{5\sqrt{x}}{x} = \dfrac{5x^{\frac{1}{2}}}{x^1}$

$= 5 \times x^{\frac{1}{2}} x^{-1}$

$= 5 \times x^{\frac{1}{2}-1}$

$= 5x^{-\frac{1}{2}}$

5n $2x\sqrt{x} = 2 \times x^1 \times x^{\frac{1}{2}}$

$= 2 \times x^{1+\frac{1}{2}}$

$= 2x^{\frac{3}{2}}$

5o $\dfrac{x^2}{3\sqrt{x}} = \dfrac{x^3}{3x^{\frac{1}{2}}}$

$= \dfrac{1}{3} \times x^{3-\frac{1}{2}}$

$= \dfrac{1}{3} x^{\frac{3}{2}}$

5p $x^3(x^5 - 1) = x^{3+5} - x^3$

$= x^8 - x^3$

5q $x^3(\sqrt{x} + 2) = x^3(x^{\frac{1}{2}} + 2)$

$= x^{3+\frac{1}{2}} + 2x^3$

$= x^{\frac{7}{2}} + 2x^3$

5r $\dfrac{x+2}{x^3} = \dfrac{x}{x^3} + \dfrac{2}{x^3}$

$= x^{1-3} + 2x^{-3}$

$= x^{-2} + 2x^{-3}$

5s $\dfrac{\sqrt{x}+3}{x} = \dfrac{x^{\frac{1}{2}} + 3}{x^1}$

$= \dfrac{x^{\frac{1}{2}}}{x^1} + \dfrac{3}{x^1}$

$= x^{\frac{1}{2}-1} + 3x^{-1}$

$= x^{-\frac{1}{2}} + 3x^{-1}$

5t $\dfrac{3-x^3}{\sqrt{x}} = \dfrac{3-x^3}{x^{\frac{1}{2}}}$

$= \dfrac{3}{x^{\frac{1}{2}}} - \dfrac{x^3}{x^{\frac{1}{2}}}$

$= 3x^{-\frac{1}{2}} - x^{3-\frac{1}{2}}$

$= 3x^{-\frac{1}{2}} - x^{\frac{5}{2}}$

5u $(\sqrt{x}+3)^2 = x + 3\sqrt{x} + 3\sqrt{x} + 9$

$= x + 6\sqrt{x} + 9$

5v $\dfrac{3+\sqrt{x}}{x^2} = \dfrac{3}{x^2} + \dfrac{x^{\frac{1}{2}}}{x^2}$

$= 3x^{-2} + x^{\frac{1}{2}-2}$

$= 3x^{-2} + x^{-\frac{3}{2}}$

5w $\dfrac{1-x}{2\sqrt{x}} = \dfrac{1}{2x^{\frac{1}{2}}} - \dfrac{x}{2x^{\frac{1}{2}}}$

$= \dfrac{1}{2} \times \dfrac{1}{x^{\frac{1}{2}}} - \dfrac{1}{2} \times x^{1-\frac{1}{2}}$

$= \dfrac{1}{2} x^{-\frac{1}{2}} - \dfrac{1}{2} x^{\frac{1}{2}}$

5x $\dfrac{\sqrt{x}+2}{3x^3} = \dfrac{x^{\frac{1}{2}}}{3x^3} + \dfrac{2}{3x^3}$

$= \dfrac{1}{3} \times x^{\frac{1}{2}-3} + \dfrac{2}{3} \times x^{-3}$

$= \dfrac{1}{3} x^{-\frac{5}{2}} + \dfrac{2}{3} x^{-3}$

Try it 1B

1 $3x + 8 = 5x - 6$

$8 = 2x - 6 \Rightarrow 2x = 14$

$\Rightarrow x = 7$

2 $7x - 4 > x + 8$

$6x - 4 > 8 \Rightarrow 6x > 12$

$\Rightarrow x > 2$