A.APR.D.7: Rationalizing Denominators 1

1 Which expression represents the sum of $\frac{1}{\sqrt{3}} + \frac{1}{\sqrt{2}}$?

1) $\frac{2\sqrt{3}+3\sqrt{2}}{6}$ 2) $\frac{2}{\sqrt{5}}$ 3) $\frac{\sqrt{3}+\sqrt{2}}{3}$

4) $\frac{\sqrt{3}+\sqrt{2}}{2}$

2 What is $\sqrt{\frac{4}{3}} - \sqrt{\frac{3}{4}}$ expressed in simplest form?

1) 1 2) 0 3) $\frac{\sqrt{3}}{6}$ 4) $2\sqrt{3}$

3 The expression $\frac{3-\sqrt{8}}{\sqrt{3}}$ is equivalent to

1) $\frac{\sqrt{3}-2\sqrt{6}}{\sqrt{3}}$ 2) $-\sqrt{3}+\frac{2}{3}\sqrt{6}$ 3) $\frac{3-\sqrt{24}}{3}$

4) $\sqrt{3}-\frac{2}{3}\sqrt{6}$

4 Which expression is equivalent to $\frac{4}{3+\sqrt{2}}$?

1) $\frac{12+4\sqrt{2}}{7}$ 2) $\frac{12+4\sqrt{2}}{11}$ 3) $\frac{12-4\sqrt{2}}{7}$

4) $\frac{12-4\sqrt{2}}{11}$

5 The expression $\frac{7}{2-\sqrt{3}}$ is equivalent to

1) $14-7\sqrt{3}$ 2) $14+7\sqrt{3}$ 3) $\frac{2+\sqrt{3}}{7}$

4) $\frac{14+\sqrt{3}}{7}$

6 The expression $\frac{11}{\sqrt{3}-5}$ is equivalent to

1) $\frac{-\sqrt{3}-5}{2}$ 2) $\frac{-\sqrt{3}+5}{2}$ 3) $\frac{\sqrt{3}-5}{2}$

4) $\frac{\sqrt{3}+5}{2}$

7 The expression $\frac{7}{3-\sqrt{2}}$ is equivalent to

1) $\frac{3+\sqrt{2}}{7}$ 2) $\frac{21+\sqrt{2}}{7}$ 3) $3+\sqrt{2}$

4) $3-\sqrt{2}$

8 The expression $\frac{1}{5-\sqrt{13}}$ is equivalent, to

1) $\frac{5+\sqrt{13}}{12}$ 2) $\frac{5+\sqrt{13}}{-12}$ 3) $\frac{5+\sqrt{13}}{8}$

4) $\frac{5+\sqrt{13}}{-8}$

9 The expression $\frac{5}{\sqrt{5}-1}$ is equivalent to

1) $\frac{5}{4}$ 2) $\frac{5\sqrt{5}+5}{4}$ 3) $\frac{5\sqrt{5}-5}{4}$ 4) $\frac{5\sqrt{5}-5}{6}$

10 The expression $\frac{12}{3+\sqrt{3}}$ is equivalent to

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

11 The expression $\frac{4}{5-\sqrt{13}}$ is equivalent to

1) $\frac{4\sqrt{13}}{5\sqrt{13}-13}$ 2) $\frac{4(5-\sqrt{13})}{38}$ 3) $\frac{5+\sqrt{13}}{3}$
4) $\frac{4(5+\sqrt{13})}{38}$

12 The fraction $\frac{3}{\sqrt{6}-1}$ is equivalent to

1) $3\sqrt{6}+3$ 2) $3\sqrt{6}-3$ 3) $\frac{3\sqrt{6}+3}{5}$
4) $\frac{3\sqrt{6}-3}{5}$

13 The expression $\frac{2}{1-\sqrt{3}}$ is equivalent to

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

14 The expression $\frac{5}{3+\sqrt{2}}$ is equivalent to

1) $\frac{\sqrt{2}-15}{3}$ 2) $\frac{5\sqrt{2}-15}{5}$ 3) $\frac{15-5\sqrt{2}}{7}$
4) $15-5\sqrt{2}$

15 The expression $\frac{1}{7-\sqrt{11}}$ is equivalent to

1) $\frac{7+\sqrt{11}}{38}$ 2) $\frac{7-\sqrt{11}}{38}$ 3) $\frac{7+\sqrt{11}}{60}$
4) $\frac{7-\sqrt{11}}{60}$

16 The expression $\frac{5}{4-\sqrt{11}}$ is equivalent to

1) $4+\sqrt{11}$ 2) $\frac{20+5\sqrt{11}}{27}$ 3) $4-\sqrt{11}$
4) $\frac{20-5\sqrt{11}}{27}$

17 The expression $\frac{\sqrt{5}}{7-\sqrt{5}}$ is equivalent to

1) $\frac{7\sqrt{5}+5}{54}$ 2) $\frac{7\sqrt{5}-5}{54}$ 3) $\frac{7\sqrt{5}+5}{44}$
4) $\frac{7\sqrt{5}-5}{44}$

18 Which expression is equivalent to $\frac{\sqrt{3}+5}{\sqrt{3}-5}$?

1) $-\frac{14+5\sqrt{3}}{11}$ 2) $-\frac{17+5\sqrt{3}}{11}$ 3) $\frac{14+5\sqrt{3}}{14}$

4) $\frac{17+5\sqrt{3}}{14}$

19 Which expression is equal to $\frac{2+\sqrt{3}}{2-\sqrt{3}}$?

1) $\frac{1-4\sqrt{3}}{7}$ 2) $\frac{7+4\sqrt{3}}{7}$ 3) $1-4\sqrt{3}$

4) $7+4\sqrt{3}$

20 The expression $\frac{5+\sqrt{7}}{5-\sqrt{7}}$ is equivalent to

1) $\frac{16+5\sqrt{7}}{16}$ 2) $\frac{16+5\sqrt{7}}{9}$ 3) $\frac{16-5\sqrt{7}}{16}$

4) $\frac{16-5\sqrt{7}}{9}$

21 Which expression is equivalent to $\frac{\sqrt{7}+\sqrt{2}}{\sqrt{7}-\sqrt{2}}$?

1) $\frac{9}{5}$ 2) -1 3) $\frac{9+2\sqrt{14}}{5}$ 4) $\frac{11+\sqrt{2}}{14}$

22 Express $\frac{5}{3-\sqrt{2}}$ with a rational denominator, in simplest radical form.

23 Express the reciprocal of $3-\sqrt{7}$ in simplest radical form with a rational denominator.

A.APR.D.7: Rationalizing Denominators 1
Answer Section

1 ANS: 1

$$\frac{1}{\sqrt{3}}+\frac{1}{\sqrt{2}}=\frac{\sqrt{2}+\sqrt{3}}{\sqrt{6}}=\frac{\sqrt{2}+\sqrt{3}}{\sqrt{6}}\cdot\frac{\sqrt{6}}{\sqrt{6}}=\frac{\sqrt{12}+\sqrt{18}}{6}=\frac{\sqrt{4}\sqrt{3}+\sqrt{9}\sqrt{2}}{6}=\frac{2\sqrt{3}+3\sqrt{2}}{6}$$

REF: 080210b

2 ANS: 3

$$\frac{\sqrt{4}}{\sqrt{3}}-\frac{\sqrt{3}}{\sqrt{4}}=\frac{2}{\sqrt{3}}-\frac{\sqrt{3}}{2}=\frac{4-3}{2\sqrt{3}}=\frac{1}{2\sqrt{3}}\cdot\frac{\sqrt{3}}{\sqrt{3}}=\frac{\sqrt{3}}{6}$$

REF: 080910b

3 ANS: 4

$$\frac{3-\sqrt{8}}{\sqrt{3}}\cdot\frac{\sqrt{3}}{\sqrt{3}}=\frac{3\sqrt{3}-\sqrt{24}}{3}=\frac{3\sqrt{3}-2\sqrt{6}}{3}=\sqrt{3}-\frac{2}{3}\sqrt{6}$$

REF: 081518a2

4 ANS: 3

$$\frac{4}{3+\sqrt{2}}\cdot\frac{3-\sqrt{2}}{3-\sqrt{2}}=\frac{12-4\sqrt{2}}{9-3\sqrt{2}+3\sqrt{2}-2}=\frac{12-4\sqrt{2}}{7}$$

REF: 060305b

5 ANS: 2

$$\frac{7}{2-\sqrt{3}}\cdot\frac{2+\sqrt{3}}{2+\sqrt{3}}=\frac{14+7\sqrt{3}}{4+2\sqrt{3}-2\sqrt{3}-3}=14+7\sqrt{3}$$

REF: 010405b

6 ANS: 1

$$\frac{11}{\sqrt{3}-5}\cdot\frac{\sqrt{3}+5}{\sqrt{3}+5}=\frac{11\sqrt{3}+55}{3+5\sqrt{3}-5\sqrt{3}-25}=\frac{11\sqrt{3}+55}{-22}=\frac{11(\sqrt{3}+5)}{11(-2)}=\frac{\sqrt{3}+5}{(-2)}=\frac{-\sqrt{3}-5}{2}$$

REF: 080420b

7 ANS: 3

$$\frac{7}{3-\sqrt{2}}\cdot\frac{3+\sqrt{2}}{3+\sqrt{2}}=\frac{21+7\sqrt{2}}{9+3\sqrt{2}-3\sqrt{2}-2}=\frac{21+7\sqrt{2}}{7}=\frac{7(3+\sqrt{2})}{7}=3+\sqrt{2}$$

REF: 010516b

8 ANS: 1

$$\frac{1}{5-\sqrt{13}}\cdot\frac{5+\sqrt{13}}{5+\sqrt{13}}=\frac{5+\sqrt{13}}{15+5\sqrt{13}-5\sqrt{13}-13}=\frac{5+\sqrt{13}}{12}$$

REF: 080506b

9 ANS: 2

$$\frac{5}{\sqrt{5}-1}\cdot\frac{\sqrt{5}+1}{\sqrt{5}+1}=\frac{5\sqrt{5}+5}{5+\sqrt{5}-\sqrt{5}-1}=\frac{5\sqrt{5}+5}{4}$$

REF: 010613b

10 ANS: 2

$$\frac{12}{3+\sqrt{3}}\cdot\frac{3-\sqrt{3}}{3-\sqrt{3}}=\frac{36-12\sqrt{3}}{9-3\sqrt{3}+3\sqrt{3}-3}=\frac{6(6-2\sqrt{3})}{6}=6-2\sqrt{3}$$

REF: 080606b

11 ANS: 3

$$\frac{4}{5-\sqrt{13}}\cdot\frac{5+\sqrt{13}}{5+\sqrt{13}}=\frac{4(5+\sqrt{13})}{25-13}=\frac{5+\sqrt{13}}{3}$$

REF: 061116a2

12 ANS: 3

$$\frac{3}{\sqrt{6}-1}\cdot\frac{\sqrt{6}+1}{\sqrt{6}+1}=\frac{3\sqrt{6}+3}{6+\sqrt{6}-\sqrt{6}-1}=\frac{3\sqrt{6}+3}{5}$$

REF: 060709b

13 ANS: 4

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

REF: 080716b

14 ANS: 3

$$\frac{5}{3+\sqrt{2}}\cdot\frac{3-\sqrt{2}}{3-\sqrt{2}}=\frac{15-5\sqrt{2}}{9-2}=\frac{15-5\sqrt{2}}{7}$$

REF: 010902b

15 ANS: 1

$$\frac{1}{7-\sqrt{11}}\cdot\frac{7+\sqrt{11}}{7+\sqrt{11}}=\frac{7+\sqrt{11}}{49-11}=\frac{7+\sqrt{11}}{38}$$

REF: 011404a2

16 ANS: 1

$$\frac{5}{4-\sqrt{11}}\cdot\frac{4+\sqrt{11}}{4+\sqrt{11}}=\frac{5(4+\sqrt{11})}{16-11}=\frac{5(4+\sqrt{11})}{5}=4+\sqrt{11}$$

REF: 061509a2

17 ANS: 3

$$\frac{\sqrt{5}}{7-\sqrt{5}} \cdot \frac{7+\sqrt{5}}{7+\sqrt{5}} = \frac{7\sqrt{5}+5}{49-5} = \frac{7\sqrt{5}+5}{44}$$

REF: 061603a2

18 ANS: 1

$$\frac{\sqrt{3}+5}{\sqrt{3}-5} \cdot \frac{\sqrt{3}+5}{\sqrt{3}+5} = \frac{3+5\sqrt{3}+5\sqrt{3}+25}{3-25} = \frac{28+10\sqrt{3}}{-22} = -\frac{14+5\sqrt{3}}{11}$$

REF: 061012a2

19 ANS: 4

$$\frac{2+\sqrt{3}}{2-\sqrt{3}} \cdot \frac{2+\sqrt{3}}{2+\sqrt{3}} = \frac{4+2\sqrt{3}+2\sqrt{3}+3}{4+2\sqrt{3}-2\sqrt{3}-3} = 7+4\sqrt{3}$$

REF: 080307b

20 ANS: 2

$$\frac{5+\sqrt{7}}{5-\sqrt{7}} \cdot \frac{5+\sqrt{7}}{5+\sqrt{7}} = \frac{25+5\sqrt{7}+5\sqrt{7}+7}{25-7} = \frac{32+10\sqrt{7}}{18} = \frac{16+5\sqrt{7}}{9}$$

REF: 060905b

21 ANS: 3

$$\frac{\sqrt{7}+\sqrt{2}}{\sqrt{7}-\sqrt{2}} \cdot \frac{\sqrt{7}+\sqrt{2}}{\sqrt{7}+\sqrt{2}} = \frac{7+\sqrt{14}+\sqrt{14}+2}{7+\sqrt{14}-\sqrt{14}-2} = \frac{9+2\sqrt{14}}{5}$$

REF: fall9906b

22 ANS:

$$\frac{5(3+\sqrt{2})}{7} \cdot \frac{5}{3-\sqrt{2}} \times \frac{3+\sqrt{2}}{3+\sqrt{2}} = \frac{5(3+\sqrt{2})}{9-2} = \frac{5(3+\sqrt{2})}{7}$$

REF: fall0928a2

23 ANS:

$$\frac{3+\sqrt{7}}{2}$$

REF: 011026b