

Foil and Division with Radicals - NOTES

Simplify.

1) $(4\sqrt{3} - 2\sqrt{2})(5\sqrt{2} - \sqrt{2})$

$$= 20\sqrt{6} - 4\sqrt{6} - 10\sqrt{4} + 2\sqrt{4}$$

$$= 16\sqrt{6} - 8\sqrt{4}$$

$$= 16\sqrt{6} - 8 \cdot 2$$

$$= \boxed{16\sqrt{6} - 16}$$

2) $(-\sqrt{2} + 5\sqrt{3})(3\sqrt{2} + 4\sqrt{2})$

$$= -3\sqrt{4} - 4\sqrt{4} + 15\sqrt{6} + 20\sqrt{6}$$

$$= \boxed{-7\sqrt{4} + 35\sqrt{6}}$$

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

$$= -2 - 3\sqrt{3} - 6\sqrt{3} - 9\sqrt{9}$$

$$= -2 - 9\sqrt{3} - 9 \cdot 3$$

$$= -2 - 9\sqrt{3} - 27$$

$$= \boxed{-29 - 9\sqrt{3}}$$

4) $(-\sqrt{3} + 5\sqrt{2})(3\sqrt{3} + 3\sqrt{2})$

$$= -3\sqrt{9} - 3\sqrt{6} + 15\sqrt{6} + 15\sqrt{4}$$

$$= -3 \cdot 3 + 12\sqrt{6} + 15 \cdot 2$$

$$= -9 + 12\sqrt{6} + 30$$

$$= \boxed{21 + 12\sqrt{6}}$$

5) For a final answer in math, radicals are not allowed to be: IN THE DENOMINATOR
(THE BOTTOM OF THE FRACTION)

To fix this, we do something called: RATIONALIZING THE DENOMINATOR

This is really just MULTIPLICATION (OF THE "CONJUGATE") (SWITCH THE + or - SIGN)

Simplify.

$$6) \frac{\sqrt{4}}{\sqrt{6}} \cdot \frac{\sqrt{6}}{\sqrt{6}} = \frac{\sqrt{24}}{6} = \frac{\sqrt{4 \cdot 6}}{6} = \frac{2\sqrt{6}}{6} = \boxed{\frac{\sqrt{6}}{3}}$$

$$7) -\frac{2}{\sqrt{5}} \cdot \frac{\sqrt{5}}{\sqrt{5}} = \boxed{\frac{-2\sqrt{5}}{5}}$$

$$8) \frac{4\sqrt{5}}{2\sqrt{3}} \cdot \frac{\sqrt{3}}{\sqrt{3}} = \frac{4\sqrt{15}}{2 \cdot 3} = \boxed{\frac{2\sqrt{15}}{3}}$$

$$9) \frac{4\sqrt{6}}{3\sqrt{15}} \cdot \frac{\sqrt{15}}{\sqrt{15}} = \frac{4\sqrt{90}}{3 \cdot 15} = \frac{4\sqrt{9 \cdot 10}}{45} = \frac{4 \cdot 3\sqrt{10}}{45} = \frac{12\sqrt{10}}{45} = \boxed{\frac{4\sqrt{10}}{15}}$$

$$10) \frac{5}{3+3\sqrt{2}} \cdot \frac{(3-3\sqrt{2})}{(3-3\sqrt{2})} = \frac{15-15\sqrt{2}}{9-9\sqrt{2}+9\sqrt{2}-9\sqrt{4}}$$

$$= \frac{15-15\sqrt{2}}{9-9 \cdot 2} = \frac{15-15\sqrt{2}}{9-18} = \boxed{\frac{15-15\sqrt{2}}{-9}} \div 3$$

$$= \boxed{\frac{5-5\sqrt{2}}{-3}}$$

$$11) \frac{\sqrt{3}}{2-\sqrt{3}} \cdot \frac{2+\sqrt{3}}{2+\sqrt{3}} = \frac{2\sqrt{3}+\sqrt{9}}{4+2\sqrt{3}-2\sqrt{3}-19} = \frac{2\sqrt{3}+3}{-1-3}$$

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

$$12) \frac{5}{5-4\sqrt{3}} \cdot \frac{5+4\sqrt{3}}{5+4\sqrt{3}} = \frac{25+20\sqrt{3}-20\sqrt{3}-16 \cdot 9}{25-16 \cdot 9}$$

$$= \frac{25-144}{25-144} = \boxed{\frac{25-144}{-119}}$$

$$13) \frac{5}{4-4\sqrt{3}} \cdot \frac{4+4\sqrt{3}}{4+4\sqrt{3}} = \frac{20+20\sqrt{3}}{16+16\sqrt{3}-16\sqrt{3}-16 \cdot 9}$$

$$= \frac{20+20\sqrt{3}}{16-144} = \frac{20+20\sqrt{3}}{-128} = \boxed{\frac{20+20\sqrt{3}}{-128}} \div 4$$

$$= \boxed{\frac{5+5\sqrt{3}}{-32}}$$

$$14) \frac{5}{-5+2\sqrt{3}} \cdot \frac{-5-2\sqrt{3}}{-5-2\sqrt{3}} = \frac{-25-10\sqrt{3}}{25+10\sqrt{3}-10\sqrt{3}-4 \cdot 9}$$

$$= \frac{-25-10\sqrt{3}}{25-36} = \boxed{\frac{-25-10\sqrt{3}}{-11}}$$

$$15) \frac{5}{\sqrt{5}+5} \cdot \frac{\sqrt{5}-5}{\sqrt{5}-5} = \frac{5\sqrt{5}-25}{\sqrt{25}-5\sqrt{5}+5\sqrt{5}-25}$$

$$= \frac{5\sqrt{5}-25}{5-25} = \boxed{\frac{5\sqrt{5}-25}{-20}} \div 5$$

$$= \boxed{\frac{\sqrt{5}-5}{-4}}$$