

Unit : Product and Quotient
of Algebraic
Fractions.

Recall:
How to multiply numeric fractions:

$$\frac{2}{3} \times \frac{1}{4} = \frac{2}{12} = \frac{\cancel{2} \cdot 1}{\cancel{2} \cdot 6} = \frac{1}{6}$$

multiply tops
and bottoms
together

Simplify
where
possible

Steps of multiplying algebraic Fractions

Step ① : FACTOR

Step ② : Simplify where possible

Step ③ : Perform Operation

Step ④ : FACTOR AGAIN (where possible)

Step ⑤ : Simplify where possible

Ex 2
p 2.3

Perform the operation

$$\textcircled{1} \frac{8}{x^2 - 36} \times \textcircled{2} \frac{(x+6)}{4x+4}$$

$$\textcircled{1} x^2 - 36$$

$\sqrt{x^2} = x$ $(x+6)(x-6)$
 $\sqrt{36} = 6$

$$\textcircled{2} \frac{\cancel{4}x + \cancel{4}}{\cancel{4}(x+1)}$$

gcf: 4
Divide
Product

$$\frac{8}{(x+6)(x-6)} \times \frac{(x+6)}{4(x+1)}$$

$$\frac{\cancel{4} \cdot 2 \cancel{(x+6)}}{\cancel{(x+6)}(x-6)\cancel{4}(x+1)} = \frac{2}{(x-6)(x+1)}$$

$$\textcircled{1} \frac{y^2 + 6y + 5}{7y^2 - 63} \times \textcircled{3} \frac{7y + 21}{(5+y)^2} \times \frac{(3-y)}{(1+y)}$$

① $y^2 + 6y + 5$
 $1 \times 5 = 5$
 $y^2 + y + 5y + 5$
 $y(y+1) + 5(y+1)$
 $(y+5)(y+1)$

② $7y^2 - 63$
 $7(y^2 - 9)$
 $7(y+3)(y-3)$

difference of square
 $\sqrt{y^2} = y$
 $\sqrt{9} = 3$

③ $7y + 21$
 $7(y+3)$

gcf 7

$$\frac{(y+5)(y+1)}{7(y+3)(y-3)} \times \frac{7(y+3)}{(5+y)(5+y)} \times \frac{(3-y)}{(1+y)}$$

$$\frac{(y+5)(y+1) \cancel{7}(y+3)(3-y)}{\cancel{7}(y+3)(y-3)(5+y)(5+y)(1+y)}$$

$$\frac{-1(3-y)}{(y-3)(5+y)}$$

Strategy:
 FACTOR OUT
 an "-1"

$$\frac{-1(-3+y)}{(y-3)(5+y)} = \frac{-1(y-3)}{(y-3)(5+y)}$$

$$\frac{-1}{(5+y)}$$

Recall:
How to divide numeric fractions

$$\frac{2}{3} \div \frac{1}{4} = \frac{2}{3} \times \frac{4}{1} = \frac{8}{3}$$

flip 2nd fraction
and change sign to multiplication.

Proceed with multiplication

$$\frac{2}{3} \times \frac{4}{1} \times \frac{2}{1} = \frac{16}{3}$$

B
M
D
M
B
S
S

$$\begin{aligned} \frac{2}{3} \div \frac{1}{4} \div \frac{1}{2} &= \frac{2}{3} \div \frac{1}{4} \times \frac{2}{1} \\ &= \frac{2}{3} \div \frac{2}{4} = \frac{2}{3} \div \frac{1}{2} \\ \frac{2}{3} \times \frac{4}{1} \div \frac{1}{2} &= \frac{8}{3} \div \frac{1}{2} = \frac{8}{3} \times \frac{2}{1} = \frac{16}{3} \\ \frac{8}{3} \div \frac{1}{2} &= \frac{16}{3} \end{aligned}$$

Perform operations left to right.

$$\frac{5a^2}{b^2 - 36} \quad \frac{25ab - 25a}{b^2 - 7b + 6}$$

① $b^2 - 36$
 $\sqrt{b^2} = b$ $(b+6)(b-6)$
 $\sqrt{36} = 6$

② $\frac{25ab - 25a}{25a(b-1)}$

gcf: 25a
 Divide
 Product

③ $b^2 - 7b + 6$
 $ax^2 + bx + c$
 $1 \times 6 = 6$

6: 1, 6
 $(-1, -6)$

$b^2 - b - 6b + 6$
 $b(b-1) - 6(b-1)$

gcf: -6

$(b-1)(b-6)$

$\frac{5a^2}{(b+6)(b-6)} \times \frac{(b-1)(b-6)}{25a(b-1)}$
 $\frac{5a^2}{(b+6)(b-6)} \times \frac{(b-6)}{25a}$
 $\frac{5a^2(b-6)}{(b+6)(b-6)25a}$
 $\frac{a}{5(b+6)}$