

Starter

Rationalise the denominator:

1)  $\frac{2}{\sqrt{5}} \times \frac{\sqrt{5}}{\sqrt{5}}$

$= \frac{2\sqrt{5}}{5}$

2)  $\frac{1}{4\sqrt{3}} \times \frac{\sqrt{3}}{\sqrt{3}}$

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

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

$\frac{3+\sqrt{2}}{9+3\sqrt{2}-3\sqrt{2}-2}$

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

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

$\frac{2(\sqrt{6}-\sqrt{3})}{6+\sqrt{18}-\sqrt{18}-3}$

$= \frac{2(\sqrt{6}-\sqrt{3})}{3}$

Today's Learning:

To revise the addition, subtraction, multiplication and division of numerical fractions.

+ - x ÷ Fractions

e.g. 1)  $\frac{2}{5} + \frac{3}{4}$

$= \frac{8}{20} + \frac{15}{20}$

$= \frac{23}{20}$

3)  $\frac{15}{12} \times \frac{4}{10}$

$= \frac{60}{120} = \frac{1}{2}$

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

$= \frac{12}{7} - \frac{5}{3}$

$= \frac{36}{21} - \frac{35}{21}$

$= \frac{1}{21}$

4)  $\frac{10}{8} \div \frac{7}{10}$  *flip 2nd fraction*

$\frac{5 \cancel{10}}{4 \cancel{8}} \times \frac{10}{7}$

$= \frac{50}{28} = \frac{25}{14}$

Starter

Factorise fully:

1)  $2x^2 + 14x$

$2(x^2 + 7x)$   
 $2x(x+7)$

2)  $x^2 - 8x + 15$

$(x-3)(x-5)$   
 $x^2 - 5x - 3x + 15$

3)  $2x^2 - 8$

$2(x^2 - 4)$   
 $= 2(x-2)(x+2)$

4)  $3x^2 + 2x - 5$

$(3x+5)(x-1)$   
 $3x^2 - 3x + 5x - 5$

Challenge:

Simplify these fractions as much as possible:

a)  $\frac{16}{48} \div \frac{16}{16}$

$= \frac{1}{3}$

b)  $\frac{-24t}{-12t} \div \frac{12}{12}$

$\frac{-2t}{-t}$   
 $= \frac{2t}{t} \div \frac{t}{t}$   
 $= 2$

c)  $\frac{2mn}{8m^2n} \div \frac{2}{2}$

$= \frac{mn}{4m^2n} \div \frac{m}{m}$   
 $= \frac{n}{4mn} \div \frac{n}{n}$   
 $= \frac{1}{4m}$

Today's Learning:

To simplify fractions involving algebra.

**Simplifying Fractions**

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We can cancel by dividing the top and bottom by a common factor.

⇒ Keep going until the top and bottom have no common factors.

e.g. 1)  $\frac{8x}{44xy} \div 2$   
 $= \frac{4x}{22xy} \div 2$   
 $= \frac{4 \div 2}{22y \div 2} = \frac{2}{11y}$

2)  $\frac{6ab^2c}{16ac^2} \div a$   
 $= \frac{6b^2c}{16c^2} \div 2$   
 $= \frac{3b^2c}{8c^2} \div c$   
 $= \frac{3b^2}{8c}$

3)  $\frac{qr}{4qr^2} \div qr$   
 $= \frac{1}{4r}$

**\* Factorise before you simplify \***

e.g. 4)  $\frac{6x^2 - 9x}{3x}$   
 $= \frac{3x(2x-3)}{3x}$   
 $= \frac{2x-3}{1}$   
 $= 2x-3$

5)  $\frac{10c}{5ac + 30c^3}$   
 $= \frac{10c}{5c(a+6c^2)}$   
 $= \frac{2}{a+6c^2}$

6)  $\frac{4bc + 6b}{8b^2 - 2ab}$   
 $= \frac{2b(2c+3)}{2b(4b-a)} = \frac{2c+3}{4b-a}$

**Starter**

Simplify the fractions by taking common factors:

1)  $\frac{21a^2b}{14ab^2 - 7ab} \div 7$   
 $= \frac{3a^2b}{2b(2b-1)} \div 2b$   
 $= \frac{3a^2}{2b-1}$

2)  $\frac{20xy + 30x}{15xy^2 + 10x} \div 5a$   
 $= \frac{5a(16a+5)}{20a} \div 5a$   
 $= \frac{16a+5}{4}$

3)  $\frac{80a^2 + 25a}{20a} \div 5a$   
 $= \frac{12(2m+3)}{6(m+2n)} \div 5a$   
 $= \frac{2(2m+3)}{m+2n}$

4)  $\frac{24m + 36}{6m + 12n} \div 5a$

**Today's Learning:**

To add and subtract fractions with algebra.

**Challenge:**

Add these fractions:

1)  $\frac{2}{6} + \frac{1}{2}$   
 $= \frac{4}{12} + \frac{6}{12}$   
 $= \frac{10}{12} = \frac{5}{6}$

2)  $\frac{3}{y} + \frac{5}{y}$   
 $= \frac{8}{y}$

3)  $\frac{2}{m} + \frac{1}{2m}$   
 $= \frac{4}{2m} + \frac{1}{2m}$   
 $= \frac{5}{2m}$

**Adding Algebraic Fractions**

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When adding fractions, we always need a common denominator.

e.g. 1)  $\frac{8}{a} + \frac{p}{a}$   
 $= \frac{8+p}{a}$

2)  $\frac{1}{2x} + \frac{3}{x^2}$   
 $= \frac{x}{2x^2} + \frac{6}{2x^2}$   
 $= \frac{x+6}{2x^2}$

3)  $\frac{1}{4x^2} + \frac{3x}{3x^3}$   
 $= \frac{3x^3}{12x^5} + \frac{12x^3}{12x^5}$   
 $= \frac{3x^3 + 12x^3}{12x^5}$   
 $= \frac{3x^3(1+4)}{12x^5}$   
 $= \frac{5}{4x^2}$

**Starter**  
Factorise the numerators and denominators and simplify where possible:

1)  $\frac{2x+6}{x^2+2x-3}$

2)  $\frac{x^2-16}{x^2-3x-4}$   
 $= \frac{(x-4)(x+4)}{(x-4)(x+1)}$   
 $= \frac{x+4}{x+1}$

3)  $\frac{2x^2-18}{2x-6}$   
 $= \frac{2(x^2-9)}{2(x-3)}$   
 $= \frac{x^2-9}{x-3}$   
 $= \frac{(x+3)(x-3)}{x-3}$   
 $= \frac{x+3}{1} = x+3$

4)  $\frac{4x-36}{x^2-8x-9}$   
 $= \frac{4(x-9)}{(x-9)(x+1)}$   
 $= \frac{4}{x+1}$

**Subtracting Algebraic Fractions**

e.g. 1)  $\frac{5}{3m} - \frac{2}{n}$   
 $= \frac{5n}{3mn} - \frac{6m}{3mn}$   
 $= \frac{5n-6m}{3mn}$

2)  $\frac{x+1}{2} - \frac{x}{3}$   
 $= \frac{3(x+1)}{6} - \frac{2x}{6}$   
 $= \frac{3x+3-2x}{6}$   
 $= \frac{x+3}{6}$

3)  $\frac{3}{(x-1)(x+2)} - \frac{1}{(x-1)(x+2)}$   
 $= \frac{3(x+2)}{(x-1)(x+2)} - \frac{1(x-1)}{(x-1)(x+2)}$   
 $= \frac{3(x+2)-1(x-1)}{(x-1)(x+2)}$   
 $= \frac{3x+6-x+1}{(x-1)(x+2)} = \frac{2x+7}{(x-1)(x+2)}$

$\frac{3}{8} = \frac{1}{4}$

**Starter**

Simplify the following fractions:

1)  $\frac{2m}{4mn-8m^2}$

2)  $\frac{2b^2-8}{b^2-2b-8}$

$\frac{1}{2n-4m} = \frac{1}{2(n-2m)}$

3)  $\frac{3n-3}{6n-12} = \frac{3(n-1)}{3(2n-4)} = \frac{n-1}{2n-4}$

**Practice:**

1)  $\frac{4}{3x^2} - \frac{2}{x^3}$

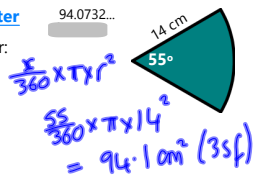
2)  $\frac{(x+1)}{2} - \frac{1}{3x}$

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

$= \frac{4x}{3x^3} - \frac{6}{3x^3}$   
 $= \frac{4x-6}{3x^3}$   
 $= \frac{2(2x-3)}{3x^3}$

$= \frac{3x(x+1)}{6x} - \frac{2}{6x}$   
 $= \frac{3x(x+1)-2}{6x}$   
 $= \frac{3x^2+3x-2}{6x}$

**Starter**  
1) Find the area of the sector:



2) Calculate  $\frac{5}{x^3} + \frac{1}{2x^2}$

$= \frac{10}{2x^3} + \frac{x}{2x^3}$   
 $= \frac{10+x}{2x^3}$

3) Write in completed square form:  $x^2+6x-10$

$(x+3)(x+3) = x^2+3x+3x+9$   
 $(x+3)^2 - 19$

4) Simplify  $\sqrt{72}$

$= \sqrt{9 \times 8}$   
 $= \sqrt{9} \times \sqrt{8}$   
 $= 3\sqrt{8}$   
 $= 3\sqrt{4 \times 2}$   
 $= 3 \times 2 \times \sqrt{2}$   
 $= 6\sqrt{2}$

1) Simplify: a)  $\frac{2}{g} + \frac{3}{4g}$  **Starter** b)  $\frac{3}{2m} - \frac{1}{(m+1)}$

$= \frac{8g}{4g^2} + \frac{3g}{4g^2}$   
 $= \frac{11g}{4g^2} = \frac{11}{4g}$

2) Factorise fully:  $2m^2 - 7m - 4$

$(2m+1)(m-4)$

3) Simplify:  $\sqrt{48}$

$= \sqrt{4 \times 12} = \sqrt{4} \times \sqrt{12}$   
 $= 2\sqrt{12}$   
 $= 2\sqrt{4 \times 3}$   
 $= 2 \times \sqrt{4} \times \sqrt{3}$   
 $= 2 \times 2 \times \sqrt{3} = 4\sqrt{3}$

4) Simplify: a)  $b^4 \times b^1$

$b^5$

b)  $(e^2)^3 \times e$

$e^6 \times e^1 = e^7$

c)  $3g^7p^4 \div g^4p^4$

$3g^3p^0 = 3g^3$

**Today's Learning:**

To multiply and divide algebraic fractions.

**Challenge:**

Calculate:

$$\frac{5}{6} \times \frac{12}{5} = \frac{2}{1} = 2$$

$$= \frac{60}{30} = 2$$

$$\frac{12}{6} \times \frac{5}{5} = \frac{12}{6} \times \frac{5}{5} = 2$$

**x ÷ Algebraic Fractions**

e.g. 1)  $\frac{3m}{4} \times \frac{2}{m}$   $= \frac{3}{2}$

2)  $\frac{4T}{T^2} \div \frac{4}{T}$   $= \frac{4T}{T^2} \times \frac{T}{4} = \frac{4T^2}{4T^2} = 1$

3)  $\frac{6ab^2}{y^3} \times \frac{9y^4}{4a^2b}$   $= \frac{6ab^2}{y^3} \times \frac{9y^4}{4a^2b} = \frac{27b}{2ay^2}$