

Factorising and Algebraic Fractions: Quick Questions

Mini whiteboard questions, with solutions

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Factorising into single brackets

تجزیہ کرنا

بریکٹ

True or false?

$$6x + 9 = 3(2x + 3)$$

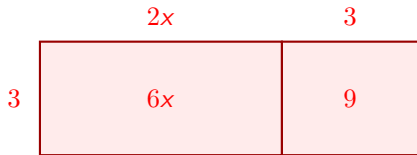
True or false?

$$6x + 9 = 3(2x + 3)$$

سب سے بڑا مشترک عامل

True. The highest common factor of $6x$ and 9 is 3 , and $3 \times 2x = 6x$,

$$3 \times 3 = 9.$$



True or false?

$8x + 12$ is fully ^{تجزیہ کرنا} factorised as $2(4x + 6)$

True or false?

$8x + 12$ is fully **factorised** as $2(4x + 6)$ تجزیہ کرنا

False. مشترک عامل 2 is a common factor of $8x$ and 12, but it is not the سب سے بڑا مشترک عامل highest common factor, اظہار so the expression is not fully **factorised**. تجزیہ کرنا

سب سے بڑا مشترک عامل The highest common factor of $8x$ and 12 is 4, so $8x + 12 = 4(2x + 3)$.

True or false?

$$5x + 10y = 5(x + 10y)$$

True or false?

$$5x + 10y = 5(x + 10y)$$

False. Every ^{رکن} term ^{بریکٹ} inside the bracket must be ^{تقسیم کرنا} divided by the ^{مشترک عامل} common factor, not only the first ^{رکن} term.

$$10y \div 5 = 2y, \text{ so } 5x + 10y = 5(x + 2y).$$

True or false?

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

True or false?

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

False. $x(x)$ is x^2 , so the second ^{رکن} term has been lost.

$$x \div x = 1, \text{ so } x^2 + x = x(x + 1).$$

True or false?

$$3x + 3 = 3(x + 1)$$

True or false?

$$3x + 3 = 3(x + 1)$$

True. The second ^{رکن} term is entirely the ^{مشترک عامل} common factor, and

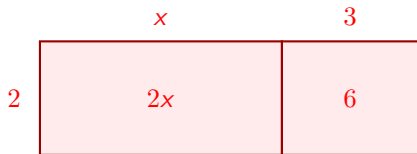
$3 \div 3 = 1$, so a 1 is left inside the ^{بریکٹ} bracket.

تجزیہ کرنا
Factorise $2x + 6$

تجزیہ کرنا Factorise $2x + 6$

سب سے بڑا مشترک عامل
The highest common factor of $2x$ and 6 is 2 .

$$2x + 6 = 2(x + 3)$$



تجزیہ کرنا
Factorise $9x + 24$

تجزیہ کرنا Factorise $9x + 24$

سب سے بڑا مشترک عامل
The highest common factor of $9x$ and 24 is 3 .

$$9x \div 3 = 3x \text{ and } 24 \div 3 = 8.$$

$$9x + 24 = 3(3x + 8)$$

تجزیہ کرنا
Factorise $6y - 15$

تجزیہ کرنا
Factorise $6y - 15$

سب سے بڑا مشترک عامل
The highest common factor of $6y$ and 15 is 3 .

$$6y - 15 = 3(2y - 5)$$

تجزیہ کرنا
Factorise $10a + 15b$

تجزیہ کرنا
Factorise $10a + 15b$

سب سے بڑا مشترک عامل
The highest common factor of $10a$ and $15b$ is 5.

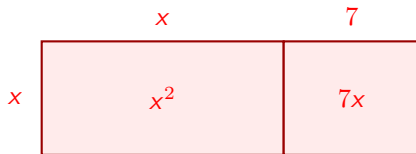
$$10a + 15b = 5(2a + 3b)$$

تجزیہ کرنا
Factorise $x^2 + 7x$

تجزیہ کرنا Factorise $x^2 + 7x$

سب سے بڑا مشترک عامل
The highest common factor of x^2 and $7x$ is x .

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

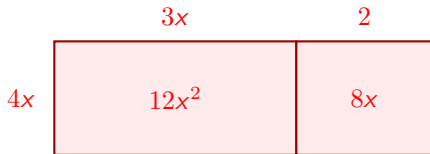


تجزیہ کرنا
Factorise $12x^2 + 8x$

تجزیہ کرنا Factorise $12x^2 + 8x$

سب سے بڑا مشترک عامل
The highest common factor of $12x^2$ and $8x$ is $4x$.

$$12x^2 + 8x = 4x(3x + 2)$$



تجزیہ کرنا
Factorise $6x^3 - 9x^2$

تجزیہ کرنا
Factorise $6x^3 - 9x^2$

سب سے بڑا مشترک عامل
The highest common factor of the numbers is 3 and

قوت
of the powers of x is x^2 , so the

سب سے بڑا مشترک عامل
highest common factor is $3x^2$.

$$6x^3 - 9x^2 = 3x^2(2x - 3)$$

تجزیہ کرنا
Factorise $4x^2y + 6xy^2$

تجزیہ کرنا
Factorise $4x^2y + 6xy^2$

رکن
Both terms contain 2, x and y, so the

سب سے بڑا مشترک عامل
highest common factor is $2xy$.

$$4x^2y + 6xy^2 = 2xy(2x + 3y)$$

تجزیہ کرنا
Factorise $8x^3 + 12x^2 + 20x$

تجزیہ کرنا
Factorise $8x^3 + 12x^2 + 20x$

سب سے بڑا مشترک عامل
The highest common factor of $8x^3$, $12x^2$ and $20x$ is $4x$.

$$8x^3 + 12x^2 + 20x = 4x(2x^2 + 3x + 5)$$

	$2x^2$	$3x$	5
$4x$	$8x^3$	$12x^2$	$20x$

تجزیه کرنا
Factorise $5(x + 1) + x(x + 1)$

تجزیہ کرنا
Factorise $5(x + 1) + x(x + 1)$

بریکٹ مشترک عامل رکن
The bracket $(x + 1)$ is a common factor of both terms.

$$5(x + 1) + x(x + 1) = (x + 1)(x + 5)$$

	x	5
$x + 1$	$x(x + 1)$	$5(x + 1)$

تجزیہ کرنا Factorising into double brackets

True or false?

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

True or false?

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

توسیع کرنا

False. $(x - 3)(x - 3)$ expands to $x^2 - 6x + 9$.

علامت

The signs must be opposite: $x^2 - 9 = (x + 3)(x - 3)$.

	x	3
x	x^2	$3x$
-3	$-3x$	-9

True or false?

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

True or false?

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

False. $(x + 3)(x + 3)$ ^{توسیع کرنا} expands to $x^2 + 6x + 9$.

$x^2 + 9$ is a ^{حاصل جمع} sum of two ^{مربع} squares, and it does not ^{تجزیہ کرنا} factorise.

True or false?

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

True or false?

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

True. $5 \times (-3) = -15$ and $5 + (-3) = 2$.

True or false?

$$x^2 - 2x - 8 = (x + 4)(x - 2)$$

True or false?

$$x^2 - 2x - 8 = (x + 4)(x - 2)$$

False. $(x + 4)(x - 2)$ ^{توسیع کرنا} expands to $x^2 + 2x - 8$, so the ^{علامت} signs

are the wrong way round.

$$x^2 - 2x - 8 = (x - 4)(x + 2)$$

True or false?

To ^{تجزیہ کرنا}factorise $x^2 + 7x + 12$ we need two numbers

that ^{ضرب دینا}multiply to 12 and ^{جمع کرنا}add to 7

True or false?

To ^{تجزیہ کرنا} factorise $x^2 + 7x + 12$ we need two numbers

that ^{ضرب دینا} multiply to 12 and ^{جمع کرنا} add to 7

True. The two numbers ^{ضرب دینا} multiply to the ^{مستقل حد} constant term and ^{جمع کرنا} add to the ^{عددی سر} coefficient of x .

The numbers are 3 and 4, so $x^2 + 7x + 12 = (x + 3)(x + 4)$.

تجزیہ کرنا
Factorise $x^2 + 5x + 6$

تجزیہ کرنا Factorise $x^2 + 5x + 6$

جمع کرنا ضرب دینا
Two numbers that multiply to 6 and add to 5: 2 and 3.

$$x^2 + 5x + 6 = (x + 2)(x + 3)$$

	x	2
x	x^2	$2x$
3	$3x$	6

تجزیہ کرنا
Factorise $x^2 + 9x + 20$

تجزیہ کرنا
Factorise $x^2 + 9x + 20$

ضرب دینا
جمع کرنا
Two numbers that multiply to 20 and add to 9: 4 and
5.

$$x^2 + 9x + 20 = (x + 4)(x + 5)$$

تجزیہ کرنا
Factorise $x^2 + 3x - 10$

تجزیہ کرنا Factorise $x^2 + 3x - 10$

جمع کرنا ضرب دینا
Two numbers that multiply to -10 and add to 3 : 5 and -2 .

$$x^2 + 3x - 10 = (x + 5)(x - 2)$$

	x	5
x	x^2	$5x$
-2	$-2x$	-10

تجزیہ کرنا
Factorise $x^2 - 7x + 12$

تجزیہ کرنا Factorise $x^2 - 7x + 12$

مستقل حد The constant term is positive and the عددی سر coefficient of x is negative, so both numbers are negative: -3 and -4 .

$$x^2 - 7x + 12 = (x - 3)(x - 4)$$

تجزیہ کرنا
Factorise $x^2 - 2x - 15$

تجزیہ کرنا
Factorise $x^2 - 2x - 15$

ضرب دینا
جمع کرنا
Two numbers that multiply to -15 and add to -2 :

-5 and 3 .

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

تجزیہ کرنا
Factorise $x^2 - 49$

تجزیہ کرنا
Factorise $x^2 - 49$

دو مربعوں کا فرق
This is a difference of two squares, with $x^2 = (x)^2$

and $49 = 7^2$.

$$x^2 - 49 = (x + 7)(x - 7)$$

تجزیہ کرنا
Factorise $2x^2 + 7x + 3$

تجزیہ کرنا Factorise $2x^2 + 7x + 3$

The $2x^2$ comes from $2x \times x$, and the 3 from 1×3 .

$$2x^2 + 7x + 3 = (2x + 1)(x + 3)$$

	$2x$	1
x	$2x^2$	x
3	$6x$	3

تجزیہ کرنا
Factorise $2x^2 + 10x + 12$

تجزیہ کرنا Factorise $2x^2 + 10x + 12$

مشترک عامل

Take the common factor of 2 out first.

$$2x^2 + 10x + 12 = 2(x^2 + 5x + 6)$$

$$x^2 + 5x + 6 = (x + 2)(x + 3), \text{ so } 2x^2 + 10x + 12 = 2(x + 2)(x + 3).$$

	x^2	$5x$	6
2	$2x^2$	$10x$	12

تجزیہ کرنا
Factorise $9x^2 - 16$

تجزیہ کرنا
Factorise $9x^2 - 16$

دو مربعوں کا فرق
This is a difference of two squares, with $9x^2 = (3x)^2$

and $16 = 4^2$.

$$9x^2 - 16 = (3x + 4)(3x - 4)$$

تجزیہ کرنا
Factorise $6x^2 - x - 12$

تجزیہ کرنا Factorise $6x^2 - x - 12$

The $6x^2$ comes from $3x \times 2x$, and the -12 from $4 \times (-3)$.

$$6x^2 - x - 12 = (3x + 4)(2x - 3)$$

	$3x$	4
$2x$	$6x^2$	$8x$
-3	$-9x$	-12

Simplifying algebraic fractions with single brackets

سادہ کرنا الجبری کسر بریکٹ

True or false?

$$\frac{x + 2}{2} = x$$

True or false?

$$\frac{x + 2}{2} = x$$

False. The 2 on the bottom **divides** the whole numerator, not the term 2 on its own.

$x + 2$ has no common factor, so $\frac{x + 2}{2}$ does not simplify.

When $x = 4$: $\frac{4 + 2}{2} = 3$, not 4.

True or false?

$$\frac{3x + 6}{3} = x + 2$$

True or false?

$$\frac{3x + 6}{3} = x + 2$$

True. 3 is a ^{عامل} factor of the whole ^{صورت} numerator: $3x + 6 = 3(x + 2)$.

$$\frac{\cancel{3}(x + 2)}{\cancel{3}} = x + 2$$

True or false?

$$\frac{x+3}{x} = 3$$

True or false?

$$\frac{x+3}{x} = 3$$

False. x is a **term** of the numerator, not a **factor** of the whole numerator.

$\frac{x+3}{x}$ does not **simplify**.

When $x = 1$: $\frac{1+3}{1} = 4$, not 3.

True or false?

$$\frac{6x + 9}{3} = 2x + 9$$

True or false?

$$\frac{6x + 9}{3} = 2x + 9$$

False. Every ^{رکن} term of the ^{صورت} numerator is ^{تقسیم کرنا} divided by 3, not the first ^{رکن} term on its own.

$6x + 9 = 3(2x + 3)$, so the ^{سادہ کرنا} fraction ^{کسر} simplifies to $2x + 3$.

True or false?

$$\frac{5x + 10}{5x} = \frac{x + 2}{x}$$

True or false?

$$\frac{5x + 10}{5x} = \frac{x + 2}{x}$$

True. 5 is a common factor of the whole numerator and the whole denominator.

صورت
مشتراك عامل
مخرج

$$\frac{\cancel{5}(x + 2)}{\cancel{5}x} = \frac{x + 2}{x}$$

سادہ کرنا
Simplify $\frac{2x + 10}{2}$

سادہ کرنا
Simplify $\frac{2x + 10}{2}$

تجزیہ کرنا صورت
Factorise the numerator.

$$\frac{2x + 10}{2} = \frac{2(x + 5)}{2} = x + 5$$

	x	5
2	2x	10

سادہ کرنا
Simplify $\frac{5x - 15}{5}$

سادہ کرنا
Simplify $\frac{5x - 15}{5}$

صورت سب سے بڑا مشترک عامل
The highest common factor of the numerator is 5.

$$\frac{5(x - 3)}{5} = \frac{\cancel{5}(x - 3)}{\cancel{5}} = x - 3$$

سادہ کرنا
Simplify $\frac{2x + 8}{x + 4}$

سادہ کرنا
Simplify $\frac{2x + 8}{x + 4}$

تجزیہ کرنا صورت
Factorise the numerator.

$$\frac{2x + 8}{x + 4} = \frac{2(\cancel{x+4})}{(\cancel{x+4})} = 2$$

	x	4
2	2x	8

سادہ کرنا
Simplify $\frac{3x - 12}{x - 4}$

سادہ کرنا
Simplify $\frac{3x - 12}{x - 4}$

تجزیہ کرنا صورت
Factorise the numerator: $3x - 12 = 3(x - 4)$.

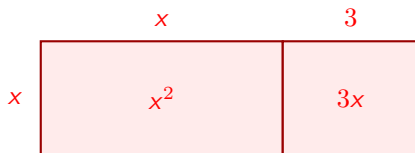
$$\frac{3(\cancel{x - 4})}{(\cancel{x - 4})} = 3$$

سادہ کرنا
Simplify $\frac{x^2 + 3x}{x}$

سادہ کرنا
Simplify $\frac{x^2 + 3x}{x}$

صورت سب سے بڑا مشترک عامل
The highest common factor of the numerator is x .

$$\frac{x(x+3)}{x} = \frac{\cancel{x}(x+3)}{\cancel{x}} = x+3$$



سادہ کرنا
Simplify $\frac{3x^2 + 6x + 9}{3}$

سادہ کرنا
Simplify $\frac{3x^2 + 6x + 9}{3}$

صورت رکن عامل
3 is a factor of all three terms of the numerator.

$$\frac{\cancel{3}(x^2 + 2x + 3)}{\cancel{3}} = x^2 + 2x + 3$$

	x^2	$2x$	3
3	$3x^2$	$6x$	9

سادہ کرنا
Simplify $\frac{4x^2 + 6x}{2x}$

سادہ کرنا
Simplify $\frac{4x^2 + 6x}{2x}$

صورت سب سے بڑا مشترک عامل
The highest common factor of the numerator is $2x$.

$$\frac{2x(2x + 3)}{2x} = \frac{\cancel{2x}(2x + 3)}{\cancel{2x}} = 2x + 3$$

	$2x$	3
$2x$	$4x^2$	$6x$

سادہ کرنا
Simplify $\frac{4x + 12}{6x + 18}$

سادہ کرنا
Simplify $\frac{4x + 12}{6x + 18}$

تجزیہ کرنا صورت مخرج
Factorise the numerator and the denominator.

$$\frac{4x + 12}{6x + 18} = \frac{4(x + 3)}{6(x + 3)}$$

$$\frac{\cancel{4(x + 3)}}{\cancel{6(x + 3)}} = \frac{4}{6} = \frac{2}{3}$$

سادہ کرنا
Simplify $\frac{10}{5x + 20}$

سادہ کرنا
Simplify $\frac{10}{5x + 20}$

تجزیہ کرنا
Factörise the denominator: $5x + 20 = 5(x + 4)$.

$$\frac{\cancel{5} \times 2}{\cancel{5}(x + 4)} = \frac{2}{x + 4}$$

سادہ کرنا
Simplify $\frac{6x^2 + 9x}{4x^2 + 6x}$

سادہ کرنا
Simplify $\frac{6x^2 + 9x}{4x^2 + 6x}$

سب سے بڑا مشترک عامل
The highest common factor is $3x$ on the top and $2x$ on the bottom.

$$\frac{6x^2 + 9x}{4x^2 + 6x} = \frac{3x(2x + 3)}{2x(2x + 3)}$$

$$\frac{\cancel{3x}(2x + 3)}{\cancel{2x}(2x + 3)} = \frac{3}{2}$$

Simplifying algebraic fractions with double brackets

سادہ کرنا الجبری کسر بریکٹ

True or false?

$$\frac{x^2 + 5x + 6}{x + 2} = x + 3$$

True or false?

$$\frac{x^2 + 5x + 6}{x + 2} = x + 3$$

True. $x^2 + 5x + 6 = (x + 2)(x + 3)$, so $(x + 2)$ is a ^{عامل} factor of the whole
^{حذف کرنا صورت} numerator and cancels.

$$\frac{\cancel{(x + 2)}(x + 3)}{\cancel{(x + 2)}} = x + 3$$

True or false?

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

True or false?

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

False. x^2 is a ^{رکن} term, not a ^{عامل} factor of the whole ^{صورت} numerator, so it cannot be ^{حذف کرنا} cancelled.

$$\frac{x(x + 7)}{x(x + 2)} = \frac{x + 7}{x + 2}$$

True or false?

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

True or false?

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

بریکٹ

False. The two brackets are not the same: $3-x = -(x-3)$.

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

When $x = 5$: $\frac{2}{-2} = -1$.

True or false?

$$\frac{x^2 - 25}{x - 5} = x + 5$$

True or false?

$$\frac{x^2 - 25}{x - 5} = x + 5$$

صورت

دو مربعوں کا فرق

True. The numerator is a difference of two squares:

$$x^2 - 25 = (x - 5)(x + 5).$$

$$\frac{\cancel{(x - 5)}(x + 5)}{\cancel{(x - 5)}} = x + 5$$

True or false?

$$\frac{x^2 - 16}{x^2 + 8x + 16} = 1$$

True or false?

$$\frac{x^2 - 16}{x^2 + 8x + 16} = 1$$

False. $(x - 4)$ and $(x + 4)$ are different ^{بریکٹ}brackets and do not ^{حذف کرنا}cancel.

$$\frac{(x - 4)(x + 4)}{(x + 4)(x + 4)} = \frac{x - 4}{x + 4}$$

سادہ کرنا
Simplify $\frac{x^2 + 8x + 15}{x + 5}$

سادہ کرنا
Simplify $\frac{x^2 + 8x + 15}{x + 5}$

تجزیہ کرنا صورت حاصل جمع
Factorise the numerator. Two numbers with a sum of 8 and a
حاصل ضرب
product of 15: 3 and 5.

$$\frac{(x + 3)\cancel{(x + 5)}}{\cancel{(x + 5)}} = x + 3$$

سادہ کرنا
Simplify $\frac{x^2 + 7x + 12}{x + 3}$

سادہ کرنا
Simplify $\frac{x^2 + 7x + 12}{x + 3}$

Two numbers with a حاصل جمع sum of 7 and a حاصل ضرب product of 12: 3 and 4.

$$\frac{\cancel{(x+3)}(x+4)}{\cancel{(x+3)}} = x + 4$$

سادہ کرنا
Simplify $\frac{x^2 - 36}{x + 6}$

سادہ کرنا
Simplify $\frac{x^2 - 36}{x + 6}$

دو مربعوں کا فرق
صورت
The numerator is a difference of two squares: $x^2 - 36 = (x + 6)(x - 6)$.

$$\frac{\cancel{(x + 6)}(x - 6)}{\cancel{(x + 6)}} = x - 6$$

سادہ کرنا
Simplify $\frac{x^2 + 2x - 8}{x - 2}$

سادہ کرنا
Simplify $\frac{x^2 + 2x - 8}{x - 2}$

Two numbers with a حاصل جمع sum of 2 and a حاصل ضرب product of -8 : 4 and -2 .

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

	x	4
x	x^2	$4x$
-2	$-2x$	-8

سادہ کرنا
Simplify

$$\frac{x^2 + 6x + 8}{x^2 + 5x + 4}$$

سادہ کرنا
Simplify $\frac{x^2 + 6x + 8}{x^2 + 5x + 4}$

تجزیہ کرنا صورت مخرج
Factorise the numerator and the denominator.

$$\frac{x^2 + 6x + 8}{x^2 + 5x + 4} = \frac{(x + 2)(x + 4)}{(x + 1)(x + 4)}$$

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

سادہ کرنا
Simplify $\frac{x^2 - x - 6}{x^2 - 9}$

سادہ کرنا
Simplify $\frac{x^2 - x - 6}{x^2 - 9}$

دو مربعوں کا فرق
مخرج
The denominator is a difference of two squares.

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

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

سادہ کرنا
Simplify $\frac{3x + 6}{x^2 + 5x + 6}$

سادہ کرنا
Simplify $\frac{3x + 6}{x^2 + 5x + 6}$

تجزیہ کرنا مخرج مشترک عامل صورت
The numerator has a common factor of 3; the denominator factorises into
بریکٹ
two brackets.

$$\frac{3x + 6}{x^2 + 5x + 6} = \frac{3(x + 2)}{(x + 2)(x + 3)}$$

$$\frac{\cancel{3(x + 2)}}{\cancel{(x + 2)}(x + 3)} = \frac{3}{x + 3}$$

سادہ کرنا
Simplify $\frac{2x^2 + 7x + 3}{x + 3}$

سادہ کرنا
Simplify $\frac{2x^2 + 7x + 3}{x + 3}$

بریکٹ
عدوی سر
The coefficient of x^2 is 2, so one bracket starts with $2x$.

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

	$2x$	1
x	$2x^2$	x
3	$6x$	3

سادہ کرنا
Simplify $\frac{2x^2 - 8}{x^2 + 4x + 4}$

سادہ کرنا
Simplify $\frac{2x^2 - 8}{x^2 + 4x + 4}$

مشترک عامل صورت
Take the common factor of 2 out of the numerator first.

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

$$\frac{2(x^2 - 4)}{(x + 2)(x + 2)} = \frac{2(x - 2)\cancel{(x + 2)}}{(x + 2)\cancel{(x + 2)}}$$

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

سادہ کرنا
Simplify $\frac{6x^2 + x - 2}{4x^2 - 1}$

سادہ کرنا
Simplify $\frac{6x^2 + x - 2}{4x^2 - 1}$

دو مربعوں کا فرق
مخرج
The denominator is a difference of two squares.

$$6x^2 + x - 2 = (3x + 2)(2x - 1)$$

$$4x^2 - 1 = (2x - 1)(2x + 1)$$

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

Adding and subtracting algebraic fractions

جمع کرنا

تفریق کرنا

الجبری

کسر

True or false?

$$\frac{2}{x} + \frac{3}{x} = \frac{5}{2x}$$

True or false?

$$\frac{2}{x} + \frac{3}{x} = \frac{5}{2x}$$

False. The ^{مخرج}denominators are already the same, so only the

^{صورت}numerators ^{جمع کرنا}are added.

$$\frac{2}{x} + \frac{3}{x} = \frac{5}{x}$$

True or false?

$$\frac{x}{3} + \frac{x}{4} = \frac{7x}{12}$$

True or false?

$$\frac{x}{3} + \frac{x}{4} = \frac{7x}{12}$$

مشتراك مخرج

True. The common denominator is 12.

$$\frac{4x}{12} + \frac{3x}{12} = \frac{7x}{12}$$

True or false?

$$\frac{1}{x} + \frac{1}{y} = \frac{1}{x+y}$$

True or false?

$$\frac{1}{x} + \frac{1}{y} = \frac{1}{x+y}$$

False. Test it with $x = 2$ and $y = 3$: the left side is $\frac{5}{6}$ and the right side is $\frac{1}{5}$.

مشترک مخرج

The common denominator is xy , so the answer is $\frac{x+y}{xy}$.

True or false?

$$\frac{4}{x} - \frac{x-3}{x} = \frac{4-x-3}{x}$$

True or false?

$$\frac{4}{x} - \frac{x-3}{x} = \frac{4-x-3}{x}$$

علامت

صورت

False. The minus sign applies to the whole second numerator, so the -3 becomes $+3$.

$$\frac{4 - (x - 3)}{x} = \frac{4 - x + 3}{x} = \frac{7 - x}{x}$$

True or false?

The ^{مشتراك مخرج} common denominator of $\frac{1}{x+1}$ and $\frac{2}{x+3}$ is

$$(x+1)(x+3)$$

True or false?

The ^{مشترک مخرج} common denominator of $\frac{1}{x+1}$ and $\frac{2}{x+3}$ is

$$(x+1)(x+3)$$

^{جمع کرنا} True. The ^{ضرب دینا} denominators are multiplied, not ^{مخرج} added.

The ^{مشترک مخرج} common denominator is $(x+1)(x+3)$, not $x+4$.

Write as a single  fraction

$$\frac{3}{x} + \frac{4}{x}$$

Write as a single ^{کسر}fraction

$$\frac{3}{x} + \frac{4}{x}$$

مخرج صورت جمع کرنا
The denominators are the same, so the numerators are added.

$$\frac{3}{x} + \frac{4}{x} = \frac{7}{x}$$

Write as a single  fraction

$$\frac{x}{2} + \frac{x}{5}$$

Write as a single fraction

$$\frac{x}{2} + \frac{x}{5}$$

مشتراك مخرج

The common denominator is 10.

$$\frac{x}{2} + \frac{x}{5} = \frac{5x}{10} + \frac{2x}{10}$$

$$\frac{5x}{10} + \frac{2x}{10} = \frac{7x}{10}$$

Write as a single  fraction

$$\frac{x}{4} + \frac{3x}{8}$$

Write as a single ^{کسر}fraction

$$\frac{x}{4} + \frac{3x}{8}$$

مضاعف

مشترک مخرج

8 is a multiple of 4, so the common denominator is 8.

$$\frac{x}{4} + \frac{3x}{8} = \frac{2x}{8} + \frac{3x}{8}$$

$$\frac{2x}{8} + \frac{3x}{8} = \frac{5x}{8}$$

Write as a single  fraction

$$\frac{2x}{5} - \frac{x}{3}$$

Write as a single fraction

$$\frac{2x}{5} - \frac{x}{3}$$

مشتراك مخرج

The common denominator is 15.

$$\frac{2x}{5} - \frac{x}{3} = \frac{6x}{15} - \frac{5x}{15}$$

$$\frac{6x}{15} - \frac{5x}{15} = \frac{x}{15}$$

Write as a single  fraction

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

Write as a single ^{كسر}fraction

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

مشتراك مخرج ضرب دينا صورت
The common denominator is 6. Each numerator is multiplied by the same
عامل مخرج
factor as its denominator.

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

$$\frac{3x+3+2x+4}{6} = \frac{5x+7}{6}$$

Write as a single  fraction

$$\frac{2x + 3}{4} - \frac{x - 1}{6}$$

Write as a single fraction

$$\frac{2x + 3}{4} - \frac{x - 1}{6}$$

المشترك مخرج
The common denominator is 12. The minus علامت sign applies to the whole صورت second numerator.

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

$$\frac{6x + 9 - 2x + 2}{12} = \frac{4x + 11}{12}$$

Write as a single  fraction

$$\frac{2}{x} + \frac{3}{y}$$

Write as a single fraction

$$\frac{2}{x} + \frac{3}{y}$$

مشتراك مخرج

The common denominator is xy .

$$\frac{2}{x} + \frac{3}{y} = \frac{2y}{xy} + \frac{3x}{xy}$$

$$\frac{2y}{xy} + \frac{3x}{xy} = \frac{3x + 2y}{xy}$$

Write as a single  fraction

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

Write as a single fraction

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

مشتراك مخرج

The common denominator is $(x+1)(x+3)$.

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

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

Write as a single  fraction

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

Write as a single **fraction**

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

The **common denominator** is $(x-1)(x+2)$. The minus **sign** applies to the whole second **numerator**.

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

$$\frac{3x+6-2x+2}{(x-1)(x+2)} = \frac{x+8}{(x-1)(x+2)}$$

Write as a single  fraction

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

Write as a single fraction

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

تجزیہ کرنا

مخرج

Factorise the second denominator, then write both fractions over $(x-2)(x+2)$.

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

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

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

Multiplying and dividing algebraic fractions

True or false?

To work out $\frac{a}{b} \div \frac{c}{d}$ you turn the first  fraction upside down

True or false?

To work out $\frac{a}{b} \div \frac{c}{d}$ you turn the first **fraction** upside down

False. It is the second **fraction** that is turned upside down, and the two **fractions** are then **multiplied**.

$$\frac{a}{b} \div \frac{c}{d} = \frac{a}{b} \times \frac{d}{c}$$

True or false?

$\frac{x}{2} \times \frac{3}{5}$ can be worked out without finding a

مشتراك مخرج
common denominator

True or false?

$\frac{x}{2} \times \frac{3}{5}$ can be worked out without finding a

مشتک مخرج
common denominator

تفریق کرنا جمع کرنا مشترک مخرج
True. A common denominator is needed for adding and subtracting, not
ضرب دینا
for multiplying.

ضرب دینا مخرج ضرب دینا صورت
The numerators are multiplied and the denominators are multiplied, so the

answer is $\frac{3x}{10}$.

True or false?

$$\frac{a}{b} \times \frac{c}{d} = \frac{a + c}{b + d}$$

True or false?

$$\frac{a}{b} \times \frac{c}{d} = \frac{a+c}{b+d}$$

False. Test it with $\frac{1}{2} \times \frac{1}{2}$: the left side is $\frac{1}{4}$ and the right side is $\frac{2}{4} = \frac{1}{2}$.

$$\frac{a}{b} \times \frac{c}{d} = \frac{ac}{bd}$$

True or false?

$$\frac{x}{4} \div 2 = \frac{x}{2}$$

True or false?

$$\frac{x}{4} \div 2 = \frac{x}{2}$$

False. The whole number 2 is the ^{كسر}fraction $\frac{2}{1}$, so it is turned upside down
ضرب دينا
and the two are multiplied.

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

When $x = 8$: $2 \div 2 = 1$, not 4.

True or false?

$$\frac{x+1}{4} \times \frac{8}{x+1}$$

سادہ کرنا simplifies to 2

True or false?

$$\frac{x+1}{4} \times \frac{8}{x+1} \overset{\text{سادہ کرنا}}{\text{simplifies}} \text{ to } 2$$

True. ^{حذف کرنا} Cancell^{علامت}ing across a multiplication sign is allowed, because $x+1$ is ^{عامل} a factor of a whole ^{صورت} numerator and of a whole ^{مخرج} denominator.

$$\frac{8\cancel{(x+1)}}{4\cancel{(x+1)}} = \frac{8}{4} = 2$$

سادہ کرنا
Simplify

$$\frac{x}{2} \times \frac{3}{x}$$

سادہ کرنا Simplify

$$\frac{x}{2} \times \frac{3}{x}$$

ضرب دینا صورت ضرب دینا مخرج حذف کرنا
Multiply the numerators and multiply the denominators, then cancel the
مشترک عامل
common factor x .

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

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

سادہ کرنا
Simplify

$$\frac{3x}{4} \times \frac{8}{9x}$$

سادہ کرنا Simplify

$$\frac{3x}{4} \times \frac{8}{9x}$$

$$\frac{3x}{4} \times \frac{8}{9x} = \frac{24x}{36x}$$

$$\frac{24\cancel{x}}{36\cancel{x}} = \frac{24}{36}$$

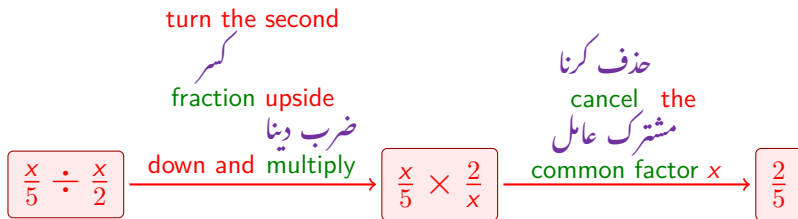
$$\frac{24}{36} = \frac{2}{3}$$

سادہ کرنا
Simplify

$$\frac{x}{5} \div \frac{x}{2}$$

سادہ کرنا Simplify

$$\frac{x}{5} \div \frac{x}{2}$$

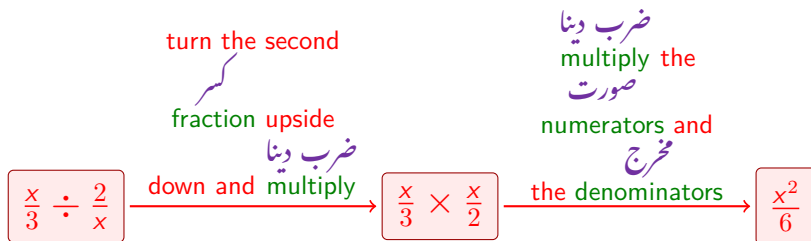


سادہ کرنا
Simplify

$$\frac{x}{3} \div \frac{2}{x}$$

سادہ کرنا Simplify

$$\frac{x}{3} \div \frac{2}{x}$$



سادہ کرنا
Simplify

$$\frac{x+1}{3} \times \frac{6}{x+2}$$

سادہ کرنا Simplify

$$\frac{x+1}{3} \times \frac{6}{x+2}$$

بریکٹ

حذف کرنا

The two brackets are different, so only the numbers cancel.

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

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

سادہ کرنا
Simplify

$$\frac{x+2}{5} \div \frac{x+2}{10}$$

سادہ کرنا Simplify

$$\frac{x+2}{5} \div \frac{x+2}{10}$$

کسر ضرب دینا
Turn the second fraction upside down and multiply.

$$\frac{x+2}{5} \div \frac{x+2}{10} = \frac{x+2}{5} \times \frac{10}{x+2}$$

$$\frac{x+2}{5} \times \frac{10}{x+2} = \frac{10(x+2)}{5(x+2)}$$

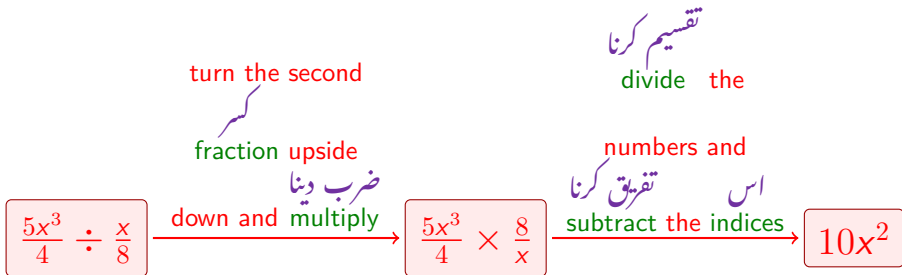
$$\frac{10\cancel{(x+2)}}{5\cancel{(x+2)}} = 2$$

سادہ کرنا
Simplify

$$\frac{5x^3}{4} \div \frac{x}{8}$$

سادہ کرنا Simplify

$$\frac{5x^3}{4} \div \frac{x}{8}$$



سادہ کرنا
Simplify

$$\frac{x^2 - 9}{x + 1} \times \frac{x + 1}{x - 3}$$

سادہ کرنا Simplify

$$\frac{x^2 - 9}{x + 1} \times \frac{x + 1}{x - 3}$$

دو مربعوں کا فرق

$x^2 - 9$ is the difference of two squares.

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

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

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

سادہ کرنا
Simplify

$$\frac{x^2 + 7x + 10}{x - 1} \div \frac{x + 2}{x - 1}$$

سادہ کرنا Simplify

$$\frac{x^2 + 7x + 10}{x - 1} \div \frac{x + 2}{x - 1}$$

تجزیہ کرنا

دو درجی

کسر

ضرب دینا

Factorise the quadratic, then turn the second fraction upside down and multiply.

$$x^2 + 7x + 10 = (x + 2)(x + 5)$$

$$\frac{(x + 2)(x + 5)}{x - 1} \div \frac{x + 2}{x - 1} = \frac{(x + 2)(x + 5)}{x - 1} \times \frac{x - 1}{x + 2}$$

$$\frac{\cancel{(x + 2)}(x + 5)\cancel{(x - 1)}}{\cancel{(x - 1)}\cancel{(x + 2)}} = x + 5$$

سادہ کرنا
Simplify

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

سادہ کرنا Simplify

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

تجزیہ کرنا

دو درجی

کسر

ضرب دینا

Factorise all four quadratics, then turn the second fraction upside down and multiply.

$$x^2 + 3x + 2 = (x + 1)(x + 2)$$

$$x^2 - 1 = (x + 1)(x - 1)$$

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

$$x^2 - x = x(x - 1)$$