Cheatography

MATH 1002 Lecture one Cheat Sheet

by foxxer via cheatography.com/60942/cs/16563/

Collection Of Like Terms

Example 1.2.

$5a^3b + 7xy$ is an algebraic expression. If $a = 2$, $b = 5$, $x = 8$ and $y = \frac{1}{4}$ the expression would have the value:

$$\begin{aligned} 5a^3b + 7xy &= 5 \times (2)^3 \times 5 + 7 \times 8 \times \frac{1}{4} \\ &= 5 \times 8 \times 5 + 7 \times 8 \times \frac{1}{4} \\ &= 200 + 14 \\ &= 214 \end{aligned}$$

Collection of like terms, like terms involve the same variables. To simplify these we must follow certain rules.

Example 1.3.

$$4ab \times 3c = 12abc$$

but $4ab + 3c$ cannot be simplified. We may only combine terms which are of the same type, i.e. "like terms"

$$6ab + 2ab + c = 8ab + c$$

$$2x^2 + x + 3x^2 = 5x^2 + x$$

Expanding Grouping Symbols

Expanding in this case means to remove the grouping symbols and to do this we multiple every term inside the grouping symbol by the term outside.

Example 1.4.

1.

$$\begin{aligned} 5(4p - q) &= 5 \times 4p - 5 \times q \\ &= 20p - 5q \end{aligned}$$

2.

$$\begin{aligned} -2(8x^2 - 4x^3) &= -2 \times 8x^2 - 2 \times (-4x^3) \\ &= -16x^2 + 8x^3 \end{aligned}$$

3.

$$-(a - b - c) = -a + b + c$$

Cancelling Terms

If numerator and denominator have common factors, then you can cancel to simplify.

Take for example $\frac{70}{100}$. This is the same as $\frac{7 \times 10}{10 \times 10}$, since there is a common factor on the top and bottom we could 'cancel' them and write $\frac{7}{10}$, but what we have really done is divide the top by 10 and divide the bottom by 10.

$$\frac{70}{100} = \frac{70 \div 10}{100 \div 10} = \frac{7}{10}$$

EXAMPLE

$$\begin{aligned} \frac{2x + 12y}{24x} &= \frac{(2x + 12y) \div 2}{24x \div 2} \\ &= \frac{x + 6y}{12x} \end{aligned}$$

RULE

$(a + b) \div c = a \div c + b \div c$ or equivalently $\frac{a+b}{c} = \frac{a}{c} + \frac{b}{c}$.

EXAMPLES

$$\begin{aligned} \frac{5ab + 15bc + 5b}{25abc + 10b} &= \frac{(5ab + 15bc + 5b) \div 5b}{(25abc + 10b) \div 5b} \\ &= \frac{a + 3c + 1}{5ac + 2} \end{aligned}$$

$$\begin{aligned} \frac{7(m + n)(m - n)}{4(m + n)(m + n)} &= \frac{7(m + n)(m - n) \div (m + n)}{4(m + n)(m + n) \div (m + n)} \\ &= \frac{7(m - n)}{4(m + n)} \end{aligned}$$

It is important to realise that when you cancel, terms don't just disappear, the common factors actually become 1's. It is just we only write the number 1 when it is a single term, since $1x$ is normally just written as x.

$$\begin{aligned} \frac{x + ax + x(b + c)}{2x} &= \frac{(x + ax + x(b + c)) \div x}{2x \div x} \\ &= \frac{1 + a + (b + c)}{2} \end{aligned}$$

Algebra

Binomial Products

Binomial Products are expressions which involve multiplying two term expressions by each other. USE FOIL METHOD.

If both binomial terms are the same

for example (2x+y)(2x+y) we may write it as $(2x + y)^2$

We may remember the formula for these expressions as:

$(a + b)^2 = a^2 + 2ab + b^2$

$(a−b)^2 = a^2 −2ab + b^2$

We can now simplify an example such as

$(2x + 2y)^2 + (x−2y)^2 = 4x^2 + 8xy + 4y^2 + x^2 −4xy + 4y^2$

$= 5x^2 + 4xy + 8y^2$

Sum Times The Difference

We should notice that when we expand an expression such as (3x+2y)(3x−2y) we get a special result.

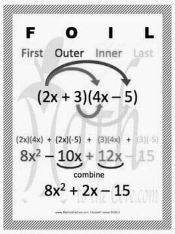
$(3x + 2y)(3x−2y) = 9x^2 −6xy + 6xy−4y^2$

$= 9x^2 −4y$

So We Have A Special Rule

$(a+b) (a-b) = a^2 - b^2$

Algebra



MISC

×	1	2	3	4	5	6	7	8	9	10	11	12
1	1	2	3	4	5	6	7	8	9	10	11	12
2	2	4	6	8	10	12	14	16	18	20	22	24
3	3	6	9	12	15	18	21	24	27	30	33	36
4	4	8	12	16	20	24	28	32	36	40	44	48
5	5	10	15	20	25	30	35	40	45	50	55	60
6	6	12	18	24	30	36	42	48	54	60	66	72
7	7	14	21	28	35	42	49	56	63	70	77	84
8	8	16	24	32	40	48	56	64	72	80	88	96
9	9	18	27	36	45	54	63	72	81	90	99	108
10	10	20	30	40	50	60	70	80	90	100	110	120
11	11	22	33	44	55	66	77	88	99	110	121	132
12	12	24	36	48	60	72	84	96	108	120	132	144

SQUARE

Chart of Perfect Squares 1 to 30

$1^2 = 1$	$11^2 = 121$	$21^2 = 441$
$2^2 = 4$	$12^2 = 144$	$22^2 = 484$
$3^2 = 9$	$13^2 = 169$	$23^2 = 529$
$4^2 = 16$	$14^2 = 196$	$24^2 = 576$
$5^2 = 25$	$15^2 = 225$	$25^2 = 625$
$6^2 = 36$	$16^2 = 256$	$26^2 = 676$
$7^2 = 49$	$17^2 = 289$	$27^2 = 729$
$8^2 = 64$	$18^2 = 324$	$28^2 = 784$
$9^2 = 81$	$19^2 = 361$	$29^2 = 841$
$10^2 = 100$	$20^2 = 400$	$30^2 = 900$

Fractions

Fraction Rules

If working with a MIXED NUMBER, change to an IMPROPER FRACTION first!

Addition: (same denominators)

$$\frac{A}{B} + \frac{C}{B} = \frac{A + C}{B}$$

Subtraction: (same denominators)

$$\frac{A}{B} - \frac{C}{B} = \frac{A - C}{B}$$

Multiplication:

$$\frac{A}{B} \times \frac{C}{D} = \frac{AC}{BD}$$

Addition: (different denominators)

$$\frac{A}{B} + \frac{C}{D} = \frac{AD}{BD} + \frac{BC}{BD} = \frac{AD + BC}{BD}$$

Subtraction: (different denominators)

$$\frac{A}{B} - \frac{C}{D} = \frac{AD}{BD} - \frac{BC}{BD} = \frac{AD - BC}{BD}$$

Division:

$$\frac{A}{B} \div \frac{C}{D} = \frac{A}{B} \times \frac{D}{C} = \frac{AD}{BC}$$

Algebraic Fractions

Addition (add when Denominators are equal)

$$\begin{aligned} \frac{a}{2} + \frac{a}{3} &= \frac{3a + 2a}{6} \\ &= \frac{5a}{6} \end{aligned}$$

Example $\frac{x}{5} - \frac{y}{10} = \frac{2x - y}{10}$

Multiplication:

$$\begin{aligned} \frac{a}{2} \times \frac{4b}{5} &= \frac{4ab}{10} \\ &= \frac{2ab}{5} \end{aligned}$$

Division:

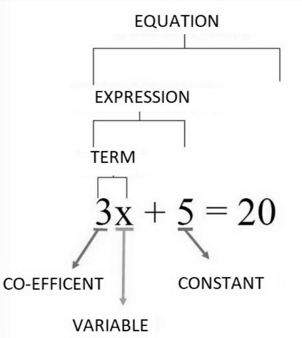
K - keep the first fraction the same.

F - Flip the second fraction

C - Change The Division sign to a multiplication.

$$\begin{aligned} \frac{a}{2} \div \frac{4b}{5} &= \frac{a}{2} \times \frac{5}{4b} \\ &= \frac{5a}{8b} \end{aligned}$$

Coefficient first then variables follow


EQUATION
EXPRESSION
TERM
3x + 5 = 20
CO-EFFICENT
CONSTANT
VARIABLE