AMS mathematical structures

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Fraction commands: display style in text style — $\frac{1}{2}$

$$\binom{n}{k} \quad \tbinom{n}{k} \tag{1}$$

$$\tfrac{1}{2} \quad a+\cfrac{1}{b+\cfrac{1}{c+\cfrac{1}{d+\cfrac{1}{e+\cfrac{1}{f+\cfrac{1}{g+\dfrac{1}{h}}}}}}} \tag{2}$$

Matrices can be displayed in text $\left(\begin{smallmatrix} a & b & c \\ d & e & f \end{smallmatrix}\right)$ or in display with 6 different commands

$$\begin{matrix} r & s & t \\ u & v & w \\ x & y & x \end{matrix} \quad \begin{pmatrix} r & s & t \\ u & v & w \\ x & y & x \end{pmatrix} \quad \begin{bmatrix} r & s & t \\ u & v & w \\ x & y & x \end{bmatrix}$$

$$\begin{Bmatrix} r & s & t \\ u & v & w \\ x & y & x \end{Bmatrix} \quad \begin{vmatrix} r & s & t \\ u & v & w \\ x & y & x \end{vmatrix} \quad \begin{Vmatrix} r & s & t \\ u & v & w \\ x & y & x \end{Vmatrix}$$

Vertical bars

$$\left|\frac{1}{2}\right| \left\|\frac{1}{2}\right\| \tag{3}$$

1 Split

Meant for single equations which do not fit on one line but allows alignment between lines. Split is used when already in mathmode and any numbering from the external mode will apply to the entire split as one line.

$$\begin{aligned} \sum_{i=1}^{15} x_i^2 =& x_1^2 + x_2^2 + x_3^2 + x_4^2 + x_5^2 \\ &+ x_6^2 + x_7^2 + x_8^2 + x_9^2 + x_{10}^2 + x_{11}^2 + x_{12}^2 + x_{13}^2 + x_{14}^2 + x_{15}^2 \end{aligned} \tag{4}$$

2 Gather

Switches to mathmode and centers each line without alignment.

$$\sum_{i=1}^{15} x^i = x^1 + x^2 + x^3 + x^4 + x^5 + x^6 + x^7 + x^8 + x^9 + x^{10} + x^{11} + x^{12} + x^{13} + x^{14} + x^{15} \tag{5}$$

$$2^1 + 2^2 + 2^3 + 2^4 + 2^5 + 2^6 + 2^7 + 2^8 + 2^9 + 2^{10} + 2^{11} + 2^{12} + 2^{13} + 2^{14} + 2^{15}$$

3 Align

Because of the problems with MathJax and eqnarray (unstarred) and because so many people use the align environment I think that we should say, yes, it is available for "basic" use (i.e. equivalent use to eqnarray effectively) and that any use beyond that is the unknown.

For use with multiple equations with horizontal alignment (usually on the equals sign or equivalent). Each line is split into aligned columns with the odd numbered columns being right justified and the even numbered left justified {rl rl rl...}. There is an unnumbered variant (use *).

$$\sum_{i=1}^{13} 2^i = 2^1 + 2^2 + 2^3 + 2^4 + 2^5 + 2^6 + 2^7 + 2^8 + 2^9 + 2^{10} + 2^{11} + 2^{12} + 2^{13} \tag{6}$$

some calculator use later:

$$= 2 + 4 + 8 + 16 + 32 + 64 + 128 + 256 + 512 + 1024 + 2048 + 4096 + 8192$$

$$= 16382 \qquad \text{text in formulas does not break} \tag{7}$$

4 Cases

Easier way to produce equations with cases. Used when already in mathmode.

$$f(x) = \begin{cases} x^2 & \text{if } x \geq 0 \\ -x & \text{if } x < 0 \end{cases}$$

We can reference the equations: (4), (5), (6).