

h.ms, d.ms and .ms: Differences between C43 and WP43S 2021-02-20

The major differences are that:

1. WP43S has 2 buttons (**f[d.ms]**, **f[h.ms]**).
2. C43 has one button, i.e. **g[.ms]**, which does change to the time data type, as well as to dms angle mode.
3. WP43S considers the **f[d.ms]** two-fold:
 - a. With a closed input it ONLY changes the ADM to D.MS which is an angular mode, but it does not appear with DEG, RAD, GRAD & MUL π in the MODE menu.

This means that **f[d.ms]** does not do anything except setting the ADM to d.ms.
 - b. While typing an angle, **f[d.ms]** closes the input and takes the digits to mean the following: D.MMSSffffff, where D is the whole degrees, MM the minutes, SS seconds and fff... the fractional seconds. See examples below.
4. C43 considers **g[.ms]** to be the generic sexagesimal input and convert button.
 - a. With closed input, it does not change the ADM. ADM is changed in MODE menu with DEG, RAD, etc.
 - b. With closed input it first changes long integers or reals to time, in the format H.MM.SSffffff where H is the whole hours, MM minutes, SS seconds and fff... the fractional seconds.
 - c. If the closed input X contains a time in HMS, it changes that to DMS degrees.
 - d. If the closed input X contains an angle in DMS, it changes that to time, HMS.
 - e. While typing digits, **g[.ms]** closes the input and takes the HMS digits as per 4b above.

Writing angles in h.ms and time in d.ms back to real numbers

WP43S:

f [d.ms]

WP43S angle display mode is based on a Real number angle, is displayed as the DEG, RAD, GRAD, MUL π or DMS tag is set. Both being degrees, DMS is similar to DEG, but shows minutes & seconds instead of decimal hours, for example, let's illustrate the Angle Display Mode (ADM) by comparing the angles produced by ArcSin(0.9):

- With ADM = DEG: **0.9 ASIN** gives 64.158067°; **[.d]** gives 64.158067
- With ADM = d.ms: **0.9 ASIN** gives 64°9'29.04"; **[.d]** gives 64.158067

DMS is a tag attached to the REAL type, the tag can be any of °, ′, ″, π, “, see OM Uv0.17 p131/334 (heading: “Angles and Trigonometric Functions”).

When **f [d.ms]** operates on the closed X-register, it changes the currently selected global angle display mode (ADM) to DMS (indicated in the status bar as “), not altering the X-Register. This is similar to the softmenu commands DEG, RAD, etc. in **[MODE]**.

However, direct entry of sexagesimal (in format d.mmss), and closing entry by **f [d.ms]** produces: **1.5 f [d.ms]** gives **1°50' 0.00''** (always in degrees, regardless of ADM).

Conversion of the X-register from a decimal angle to sexagesimal by keyboard is not supported, but is possible only from softmenu, e.g. **1.5 g [←→] [→D.MS]** gives **1°30' 0.00''** (always in degrees, regardless of ADM).

f [h.ms]

WP43S TIME is a different data type, similar to REAL, scaled for the decimal ranges used for time.

Time is displayed as h.ms, see OM Uv0.17 p193/334, (heading: “Times”).

f [h.ms] changes a long integer or real in the X-register, to a time data type, both for direct entry of sexagesimal, and conversion from decimal hours to sexagesimal hours.

Direct entry to sexagesimal: **1.5 f [h.ms]** gives **1:50:00**

Conversion of X from decimal hours to sexagesimal: **1.5 ENTER f [h.ms]** gives **1:30:00**

C43:

g [.ms]

C43 has a single function key on the keyboard to do both d.ms and h.ms functions, the key marked as **[.ms]**. This button converts to d.ms, not as WP43S only does ADM change to d.ms.

Similar to **f [→I]**, which toggles between long and short integers, and **g [a b/c]**, which toggles between fraction modes, **g [.ms]** converts and toggles between the two types of sexagesimal displays, i.e. angle in d.ms, and time in h.ms. Changing between the two different types is not only a simple display mode change, but behind the scenes a number type change. **g [.ms]** does one of the following:

- If direct entry, it accepts direct **h.mmss** input as a time, and displays it as h:mm:ss,
- If X is Real or Integer, it converts decimal time in X, to the equivalent h:mm:ss,
- If X already is time (h:mm:ss), change time to a real angle, tagged as d°mm'ss",
- If X already is angle, in d°mm'ss", toggle back to time in h:mm:ss, regardless of ADM.

g [.ms] enters and changes to sexagesimal time, and toggles between h.ms and d.ms.

Direct entry to sexagesimal time: **1.5 g [.ms]** gives **1:50:00**

Direct entry to sexagesimal angle: **1.5 g [.ms] g [.ms]** gives **1°50' 0.00''**

Decimal time in hours in X, to sexagesimal time: **1.5 ENTER g [.ms]** gives **1:30:00**

- Subsequent conversion of X, time to angle: **g [.ms]** toggles to **1°30' 0.00''**
- Subsequent conversion of X, angle to time: **g [.ms]** toggles to **1:30:00**

<p>WP43S f [.d]</p> <p>Set angle and time (and fraction, short integer & long integer) back to decimal.</p> <p>The angle tag ($^{\circ}$, $^{\prime}$, $^{\prime\prime}$, $^{\circ}$) is simply stripped of the tag and without conversion it becomes the equivalent real number in X, eg:</p> <p>If X contains $1^{\circ}30' 0.00''$, then [.d] gives 1.5, regardless of ADM. Note that this is not the logical reverse of entering D.MMSSssss [$>$D.MS], and care must be taken not to confuse the result: The result is in decimal degrees, not D.MMSSssss.</p> <p>Time example: If X contains 1:30:00, then [.d] gives 1.5.</p>	<p>C43 g [.d]</p> <p>Set angle and time (and fraction, short integer & long integer) back to decimal.</p> <p>The angle tag ($^{\circ}$, $^{\prime}$, $^{\prime\prime}$, $^{\circ}$) is simply stripped of the tag and without conversion becomes the equivalent real number in X, eg:</p> <p>The angle tag ($^{\circ}$)(d.ms) is converted to decimal degrees, to prevent ensure it is noticed that the result is in decimal degrees, not in D.MMSSssss.</p> <p>If X contains $1^{\circ}30' 0.00''$, then [.d] gives 1.5°, regardless of ADM. Press [.d] again for conversion of angle in degrees to Real 1.5. this double press of [.d] ensures no confusion if D.MMSSssss is written as a Real.</p> <p>If X contains 1:30:00, then [.d] gives 1.5.</p>
<p>Arithmetic Example WP43S</p> <p>Example: Add sexagesimal values: to add $1\frac{1}{2}$ hour to $1\frac{1}{4}$ hour in sexagesimal: 1:30:00 [ENTER] 1:15:00 [+] would be done this way: 1.30 g [.ms] 1.15 g [.ms] + [.d] which results in 2.75 hour.</p>	<p>Arithmetic Example C43</p> <p>Example: Add sexagesimal values: to add $1\frac{1}{2}$ hour to $1\frac{1}{4}$ hour in sexagesimal: 1:30:00 [ENTER] 1:15:00 [+] would be done this way: 1.30 g [.ms] 1.15 g [.ms] + [.d] which results in 2.75 hour.</p>

Angle settings, and conversions:

C43 / WP43S: [MODE] menu and key presses

WP43S:

g [MODE]

		RM		SETSTG	DENMAX
SF	DEG	RAD	GRAD	MUL π	CF

ADM Selection:

DEG, RAD, GRAD, MUL π ,

change only the currently selected global mode (ADM). It does not change the X register.

D.MS is set by key **f** [**d.ms**], only changing ADM. There is no menu item for **D.MS**.

C43:

f [MODE]

reserv				RECT \odot	POLAR \circ
\gg DEG	\gg RAD	\gg GRAD	\gg MUL π	\gg d.ms	TRIG
DEG \circ	RAD \circ	GRAD \circ	MUL π \circ	d.ms \odot	CFG

ADM Selection:

DEG, RAD, GRAD, MUL π , d.ms,

change only the currently selected global mode (ADM). It does not change the X register.

Note: The [d.ms] menu item is the 43S key **f** [**d.ms**]

X-Register conversion & ADM Selection

\gg DEG, \gg RAD, \gg GRAD, \gg MUL π , \gg d.ms,

change the X-register to the new angle mode, **and** set the ADM to the same mode.

Examples:

A. Ways to enter sexagesimal degrees:

or [DEG] 1.383333 [\gg d.ms] gives 1°23'00",
 or [RAD] 0.024144 [\gg d.ms] gives 1°23'00",
 or [GRAD] 1.53704 [\gg d.ms] gives 1°23'00",
 or [MUL π] 0.0076852 [\gg d.ms] gives 1°23'00",
 or [d.ms] 1.2300 [\gg d.ms] gives 1°23'00",
 or 1.23 **g** [.ms] **g** [.ms] gives 1°23'00"

B. Arithmetic with different angle modes

Enter 1¼ degrees in sexagesimal, add 1 radian, write in DMS, change to decimal and subtract 1/ π *180. Confirm you get 1.75:

Set deg: [DEG] (MODE menu)

Direct: 1.45 **g** [.ms] **g** [.ms] (using keys)
 or closed: 1.75 ENTER **g** [.ms] **g** [.ms] (CONV menu)

Convert 1 to radians and add:

1 [RAD>D] + results in 59.0458° (CONV menu)

Convert to DMS and set ADM to DMS:

[>D.MS] results in 59° 2' 44.80" (CONV menu)

Change to a real number:

g [.d] results in 59.04577951° (in deg, not D.MMSS)

g [.d] results in 59.04577951

Subtract manually converted 1 radian:

π [1/x] 180 \times - results in 1.75

Angle settings, and conversions:

C43 / WP43S: [CONV] / [↵] menu and key presses

WP43S:				C43:			
g [↵]				f [CONV]			
D→R	R→D		D→D.MS	D.MS→D			
DEG→	RAD→	GRAD→		D.MS→	MULπ→		
→DEG	→RAD	→GRAD		→D.MS	→MULπ		
Note: 43S has no duplications of keys into menus				Note: <ul style="list-style-type: none"> The [.ms] menu item is the C43 key g [.ms] The [→h.ms] menu item is the 43S key f [h.ms] 			
Examples, all starting from closed input in the X-Register:				Examples, all starting from closed input in the X-Register:			
ADM=DEG	1°30'0''	1.5	1:30:00	ADM=DEG	1°30'0''	1.5	1:30:00
[D→R]	Invalid	0.026r	Invalid	[D→R]	Invalid	0.026r	Invalid
[R→D]	Invalid	85.944°	Invalid	[R→D]	Invalid	85.944°	Invalid
[D→D.MS]	Invalid	1°30'0''	Invalid	[D→D.MS]	Invalid	1°30'0''	Invalid
[D.MS→D]	1.5°	1.8333°	Invalid	[D.MS→D]	1.5°	1.8333°	Invalid
[.d]				[.d]	1.5°	1.5	1.5
[DEG→]	Invalid	Invalid	Invalid	[DEG→]	Invalid	Invalid	Invalid
[RAD→]	Invalid	Invalid	Invalid	[RAD→]	Invalid	Invalid	Invalid
[GRAD→]	Invalid	Invalid	Invalid	[GRAD→]	Invalid	Invalid	Invalid
[D.MS→]	1.5°	Invalid	Invalid	[D.MS→]	1.5°	Invalid	Invalid
[MULπ→]	Invalid	Invalid	Invalid	[MULπ→]	Invalid	Invalid	Invalid
[.ms]				[.ms]	1:30:00	1:30:00	1°30'0''
[→DEG]	1.5°	1.5°	Invalid	[→DEG]	1.5°	1.5°	Invalid
[→RAD]	0.026r	0.026r	Invalid	[→RAD]	0.026r	0.026r	Invalid
[→GRAD]	1.667g	1.667g	Invalid	[→GRAD]	1.667g	1.667g	Invalid
[→D.MS]	1°30'0''	1°30'0''	Invalid	[→D.MS]	1°30'0''	1°30'0''	Invalid
[→MULπ]	0.008π	0.008π	Invalid	[→MULπ]	0.008π	0.008π	Invalid
[→h.ms]				[→h.ms]	Invalid	1:30:00	1:30:00
f [d.ms]	ADM changed	ADM changed	ADM changed	g [.ms]	1:30:00	1:30:00	1°30'0''
				ADM unchanged	unchanged	unchanged	unchanged
				g [.ms] g [.ms]	1°30'0''	1°30'0''	1°30'0''
				ADM unchanged	unchanged	unchanged	unchanged
In number entry mode, 1.23 typed; then on value X:				In number entry mode, 1.23 typed; then on value X:			
ADM =	DEG °	DMS ''	RAD r	ADM =	DEG °	DMS ''	RAD r
f [h.ms]	1:23:00	1:23:00	1:23:00	g [.ms]	1:23:00	1:23:00	1:23:00
x: f [.d]	1.383	1.383	1.383	x: g [.d]	1.383	1.383	1.383
				g [.ms]	1:23:00	1:23:00	1:23:00
				x: g [.ms]	1°23'0''	1°23'0''	1°23'0''
				x: g [.d]	1.383°	1.383	1.383
				x: g [.d]	1.383	1.383	1.383
				[→D.MS]	1°13'48''	1°23'0''	70°28'26''
x: f [.d]	1.23	1.383	70.474	x: f [.d]	1.23°	1.383	70.474
				x: f [.d]	1.23	1.383	70.474
(All seconds rounded to seconds)				(All seconds rounded to seconds)			

Angle settings, and conversions:
C43 / WP43S: [CLK] menu and functions

WP43S

f[CLK]

J→D	D→J	DAY	MONTH	YEAR	
DATE	→DATE	DATE→	WDAY	TIME	x→DATE

Examples, all starting from **closed input** in the X-Register:

1721058 1.0101 2055-12-13

[x→DATE] Invalid 0001-01-01 Invalid

[J→D] 0000-01-01 Invalid Invalid

[D→J] Invalid Invalid 2471980

[DAY] Invalid Invalid 13

[MONTH] Invalid Invalid 12

[YEAR] Invalid Invalid 2055

[WDAY] Invalid Invalid 1

Executed in succession maintaining X:

[DATE] current: 2021-02-20

[DATE→] X=20, Y=2, Z=2021

[→DATE] 2021-02-20

[TIME] current: 22:28:20

C43

g[CLK]

→h.ms	x→DATE	WDAY	J→D	D→J	
TIME	TIME→	→TIME	SEC	MIN	HOUR
DATE	DATE→	→DATE	DAY	MONTH	YEAR

Examples, all starting from **closed input** in the X-Register:

1721058 1.0101 2055-12-13

[→h.ms] 1721058:00:00 1:00:36.36 Invalid

[x→DATE] Invalid 0001-01-01 Invalid

[WDAY] Invalid Invalid 1

[J→D] 0000-01-01 Invalid Invalid

[D→J] Invalid Invalid 2471980

Executed in succession maintaining X:

[TIME] current: 22:28:20

[TIME→] X=20., Y=28., Z=22.

[→TIME] 22:28:20

[SEC] 20

[MIN] 28

[HOUR] 22

Executed in succession maintaining X:

[DATE] current: 2021-02-28

[DATE→] X=28., Y=2., Z=2021.

[→DATE] 2021-02-28

[DAY] 28

[MONTH] 2

[YEAR] 2021