You MUST use the menu item View / Header and Footer to insert
- Lecture 1 / Homework 1,
- Your Name,
- Lesson Date / Due Date,
in the left/center/right header and
- Page {n} of {nn}
in the footer. Do NOT put them on the worksheet.

SAVE EVERY 5 MINUTES. Click on the disk, or hit s while holding Ctrl.

BASIC TEXT AND MATH ENTERING

To enter text, first type a double quote. Note that the cursor is red in text!
But the cursor is blue in math. To enter a simple math expression, click on an empty
spot below and type "2+3=" (without quotes or spaces). You get:

$2 + 3 = 5$ Note the blue cursor. Next type "2 + 3 =" (with the spaces):

$2 + 3 =$ The cursor turned red when you typed the first space. This is text, not math.

Use Ctrl+z (hit z while holding Ctrl) to undo what you typed last. In simple cases, the
Backspace and Delete keys are easier.

In math, you should use the space bar to select groupings. To see how, first type
"2+1/2+3=" and then "2+1/2 +3=" (with a space). Watch what the blue cursor is selecting:

$$2 + \frac{1}{2 + 3} = 2.2 \quad \text{but} \quad 2 + \frac{1}{2} + 3 = 5.5$$

To move an equation or text area, drag the mouse from outside its area into it. This selects
it and you can now move it with the cursor keys or drag it with the mouse. To resize a text
area, click in it and then drag the right middle marker to the desired position.

SIMPLE USE OF VARIABLES

You can define variables:

$a := 2$ Use a colon, :, not equals, =, to give values to variables.

$b := \frac{1}{2}$

$sum := a + b + 3$ But still use an equals, =, to get the value.

$sum = 5.5$ If you go back and change the value of a above, that of sum changes too!

$a := 5$ But if you change the value of a here, sum above does not change.
                  Matlab is left-to-right, top-to-bottom!
                  The green wiggly line tells you you are messing up a previous value of a!
                  Click a and see the warning.

PREDEFINED VARIABLES

I did not want to use variable name "c" above instead of "sum" because c already *has* a value:

$c = 2.998 \times 10^8 \dfrac{m}{s}$ c is the speed of light!

$c := a + b + 3$

$c = 8.5$ I have lost the value of the speed of light!

Other predefined variables:

$g = 9.807 \dfrac{m}{s^2}$ $e = 2.718$ $\% = 0.01$ Use the Tab key to put things next to each other on the same line.

$\pi = 3.142$ Unless you know Greek, use menu View / Toolbars / Greek, or click the $\alpha\beta$ button, to enter Greek symbols. If a toolbar gets hidden, look at the bottom of your screen. Or use Alt-Tab.

$\pi = 3.14159$ Use menu Format / Result to change the amount of significant digits shown, either for a specific result, or in general.

$\infty = 1 \times 10^{307}$ Infinity can be found on View / Toolbars / Calculus.
And yes, that is wrong, only Mathcad thinks it is 10^{307}!

UNITS

$g = 9.807 \dfrac{m}{s^2}$ To convert that to ft/s^2, click on the placeholder (little square behind the m/s^2) and type in ft/s^2:

$g = 32.174 \cdot \dfrac{ft}{s^2}$ Note how Mathcad figured out those units all by itself!
Let's now find it in m^2/s (wrong):

$g = 9.807 \dfrac{1}{m \cdot s} \cdot \dfrac{m^2}{s}$ Mathcad corrects. Note that the correction factor is in front of the m^2/s I typed. Units cm/m s^2 are wrong too:

$g = 9.807 \times 10^{-4} \cdot \dfrac{cm}{ms^2}$ Why no correction factor??

Build in units can be found by clicking the measuring cup in the Standard Toolbar.

You can define your own units if needed. The "hand" is a British unit equal to 4 inch. Let's use that:

$hand := 4 \cdot in = 0.102 \, m$

$$\boxed{g = 96.522 \cdot \frac{\text{hand}}{s^2}}$$

You MUST show borders around your final answers. Right-click the equation, select Properties, then Show Border.

If you are in ME Tools, you may want to define kJ: $kJ := 1000J = 1 \times 10^3 J$

$P := 1\text{poise} = 0.1 \frac{kg}{m \cdot s}$ $mP := 0.001P = 1 \times 10^{-4} \frac{kg}{m \cdot s}$

ALL NORMAL SCIENTFIC FORMULAE USE ABSOLUTE TEMPERATURES (KELVIN OR RANKINE) INSTEAD OF CENTIGRADE OR FAHRENHEIT. Mathcad will convert:

Get degrees from the measuring cup / temperature:

$0\,°C = 273.15\,K$ $0\,°F = 459.67 \cdot R$ $200K + 0\,°C = 473.15\,K$ $80\,°C - 20\,°C = 60\,K$

For *differences* in temperature, use $\Delta\,°C$ $(80 - 20)\,°C = 333.15\,K$ $(80 - 20)\Delta\,°C = 60\,K$
:

REFERENCE TABLES

Let's compute the mass of a cylindrical pan of water of 5ft radius and 2m height:

Reference Tables are under menu item Help. Look up the density of water:

$\rho_w := 997.1 \frac{kg}{m^3}$ Use a point to enter a text subscript.

$r := 5ft$ $h := 2m$

$V := \pi \cdot r^2 \cdot h$ The formula is in the Reference Tables.

$m := \rho_w \cdot V$

$$\boxed{m = 1.455 \times 10^4\,kg}$$

Let's double the height now to 4 meter:

$h_2 := 4m$

$V_2 := \pi \cdot r^2 \cdot h_2$

$m_2 := \rho_w \cdot V_2$

$m_2 = 4.235 \times 10^8 \frac{kg^2}{m}$ Oops. Not a mass? What happened??!

ALWAYS WATCH YOUR UNITS!
WATCH COMPACT VARIABLE NAMES! $m := 100cm = 1\,m$ $V := 1000mV = 1\,V$
ESPECIALLY ON THE EXAM.