EGR111 – Introduction to Computer Science (C Language)

Solar Panel Calculator Project Rev 1.3

Overview:

In this activity, you will research size and weight specifications for solar panels and then create a solar panel calculator solution that determines the number of panels required and weight specifications for an installation given building dimensions entered by the user.

Prerequisites:

Prior to beginning the instruction provided in this lesson you must have completed the following:

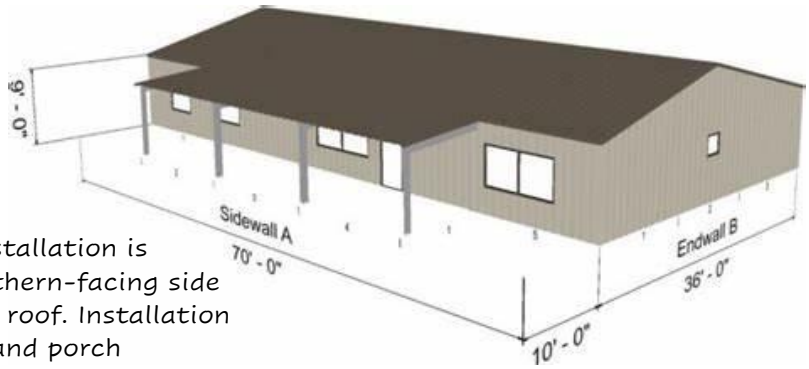
1. C Programming Introduction
2. Variables and Data Types
3. Simple Input and Output
4. Basic Operators

Performance Outcomes:

1. Create constant representing fix attributes.
2. Declare integer and double variables.
3. Input values using the scanf() function along with required format specifier.
4. Solve problems using C expressions.
5. Explicitly cast double values to integer values.
6. Research and use a selection structure (if/else).
7. Control the number of decimal places displayed using format specifiers.
8. Use VS Code to create, edit, run, and debug a solution.

Resources:

1. Size and Weight of Solar Panels (See end of document)
2. Example Building



Note: Panel installation is limited to southern-facing side of the building roof. Installation on overhangs and porch covering is not allowed due to load restrictions.

Figure 1

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Directions:

1. Research the size and weight of solar panels using the link provided in the Resource section. Determine values for the length, width, and weight of both residential and commercial solar panels.
2. Create a **solar_panel_calc.c** solution file in this week's folder.
3. Included comment lines at the top displaying the assignment title, a brief description, your name, and creation date.
4. Review use of the #define macro and the const qualifier here. The const qualifier is preferred when defining constant values.
5. Review panel attributes listed in Table 1. Create constants for each using the name provided. Include the const keyword and use upper case when specifying the variable name as shown – these values do not change. You'll include details for both residential and commercial panels, but this solution will use residential values.

Table 1 Solar Panel Attributes

Panel Attribute	**Description**
PANEL_WIDTH	Average width of a solar panel in inches
PANEL_HEIGHT_RES	Average height of a residential solar panel in inches
PANEL_HEIGHT_COM	Average height of a commercial solar panel in inches
PANEL_WEIGHT_RES	Typical weight for a residential solar panel in pounds
PANEL_WEIGHT_COM	Typical weight for a commercial solar panel in pounds

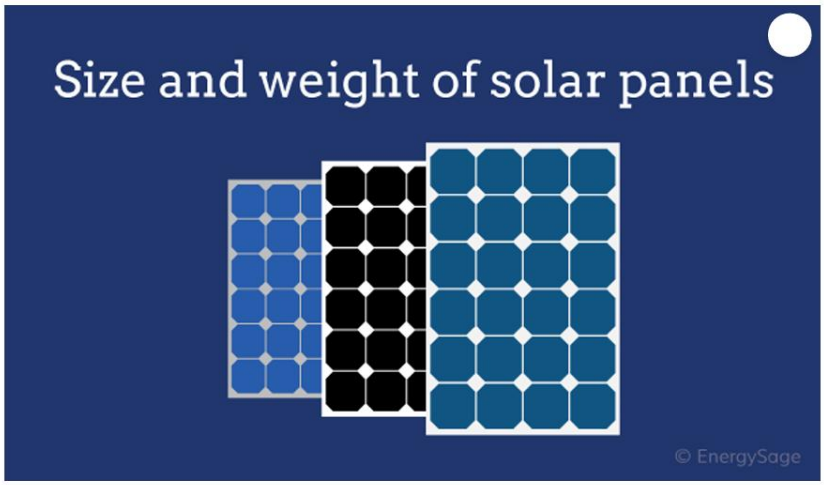
6. Declare variables listed in Table 1 using the names provided. **Define building dimensions and weights as doubles.** (Note: In future projects you will create variables on your own. This initial activity specifies values to model code expectations.)

Table 2 Solution Variables

Panel Attribute	**Description**
sidewall, endwall	Building dimensions – see Figure 1
panel_cnt_vert_orientV	Number of panels stacked on roof with panels in the vertical orientation. See note in Figure 1.
panel_cnt_hor_orientV	Number of panels across the length of building with panels in the vertical orientation.
panel_cnt_vert_orientH	Number of panels stacked on roof with panels in the horizontal orientation. See note in Figure 1.
panel_cnt_hor_orientH	Number of panels across the length of building with panels in the horizontal orientation.
panel_cnt_total_orientV,	Total panel count with panels in vertical orientation.

panel_cnt_total_orientH;	Total panel count with panels in horizontal orientation.
panel_cnt_total	Final panel count based on most effective panel orientation.
panel_weight_total	Total weight of installation.
weight_per_sq_ft	Roof load of installation in pounds per square foot.

7. Display the solution title to the user and prompt for the dimensions of the building sidewall and endwall. Use the scanf() function. Review prior lesson resources to determine the format specifier for a double.
8. Calculate panels count for both vertical panel orientation and horizontal panel orientation. Assume a residential installation. You will divide the length and width of the roof section by solar panel size to determine counts. The roof dimensions are doubles. Dividing by solar panel size results in a double value, but fractional solar panels are not possible. Use the (int) cast operator to convert the double result to an integer value. See this link discussing explicit casting in C.
9. Using sources from prior lessons, other Web resources, or AI prompting research the use and syntax of a conditional or selection structure in C (if/else). Using this structure determines which panel orientation provides the most panels. Set the total panel count value based on this test.
10. Determine the total weight of the installation. Add 5% to account for installation hardware.
11. Calculate the load on the roof structure as pounds per square foot.
12. Output the results to the user including total panel count, total weight, and load. Limit the decimal places displayed by using **%.1lf** when printing double values.
13. Run your solution and test. Verify your results and compare the pounds per square foot load values to typical values discussed in the resource.
14. Submit your solution to the instructor using the procedure presented in class.



Solar panel size and weight explained: how big are solar panels?

Reading Time: 6 mins

Solar panel systems are an increasingly common sight on rooftops all across the U.S., but unless you climb up onto a roof, it can be difficult to figure out how big solar panels are and how much they weigh. In this article, we'll help you understand solar panel size, solar panel weight, and whether your roof can support a solar panel system that produces enough wattage to meet the daily energy needs of your household.

Key takeaways about the size of solar panels

- Solar panels are roughly **5 feet long and 3 feet wide**, with some small variation by manufacturer
- Solar panels usually weigh about **40 pounds each**
- Professional solar installers on the EnergySage Marketplace are experts at designing and installing a system for your unique property

What's in this article?

How big is a solar panel?

For residential solar panels, the standard dimensions are 66×40 inches for the panel, about 1.25×1.6 inches for the frame, and each panel usually weighs about 42 pounds. While this may vary from brand to brand, it's typically the same for all residential solar panels. The smaller size makes them ideal for rooftop residential installations. Read our article to learn more about how many solar panels you'll need to power your home.

What is the area of a solar panel?

While residential solar panels tend to be around 5.5 feet long and a little over 3 feet wide for an area of around 15 feet, the dimensions of commercial panels are typically larger at around 6.5 feet long, and they usually weigh 50 pounds or more. Like residential solar panels, size can vary depending on the manufacturer and how the solar panel is made. Commercial solar systems tend to produce more power than residential systems.

Types of solar panels

Solar panels can also be composed of different materials–either monocrystalline, polycrystalline or thin-film. The main difference between the technologies is the type of silicon solar cell they use: monocrystalline solar panels have solar cells made from a single crystal of silicon, while polycrystalline solar panels have solar cells made from many silicon fragments melted together. While their composition doesn't inherently affect their size or weight, monocrystalline cells are more efficient overall so less of them will need to be used for the same overall output.

Regardless of its application, residential and commercial solar panels are made the same way. Each solar panel is made up of individual solar photovoltaic (PV) cells. PV solar cells come in a standard size of 156 mm by 156 mm, which is approximately 6 inches long and 6 inches wide. Most solar panels for rooftop solar installations are made up of 60 solar cells, while the standard for commercial solar installations is 72 cells (and can go up to 98 cells or more). Learn more about solar cells in this article.

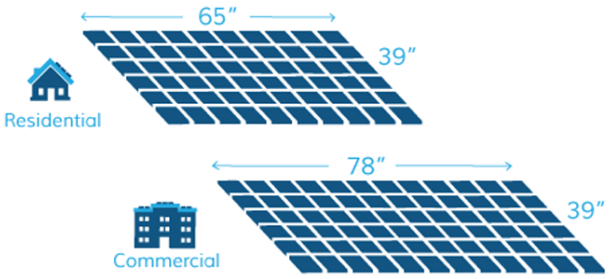
For example, the most popular solar panel on the EnergySage Marketplace, the Panasonic EverVolt WBS EVPV370 WBS which is made from monocrystalline cells, is 1721.0 mm (5.6 ft) long and 1016.0 mm (3.3 ft) wide for an area of 18.5 ft^2 and weighs roughly 45 lbs.

Solar panel size and weight, residential and commercial panels

FEATURE	RESIDENTIAL PANELS	COMMERCIAL PANELS
# of Solar Cells	60	72
Average Length (inches)	65	78
Average Width (inches)	39	39
Average Depth (inches)	1.5 - 2	1.5 - 2

The number of solar cells on one panel is directly related to its length. 72-cell commercial solar panels are approximately 13 inches longer than 60-cell residential panels.

Residential vs. Commercial Solar Panel Size Comparison



If an average solar panel measures at 65 inches by 39 inches, how does that translate to a full-sized rooftop solar panel system?

Take a system size of 6 kilowatts (kW). If you install a 6 kW system with 20 average-sized panels, your system will likely measure approximately 27 feet wide by 13 feet long – 352 square feet in all. This assumes that your panels can be placed close together and that there are no obstructions on your roof–in reality, you'll usually need a little more space than that to accommodate for the unique shape and orientation of your roof.

Importantly, the way your solar panel system is designed impacts the price you'll pay for solar – a simpler, more compact setup will almost always cost less than a more complex installation.

How much do solar panels weigh?

Understanding how much solar panels weigh is another important factor to keep in mind if you're planning on installing a rooftop solar system. Knowing a solar panel's weight is the best way to be certain that your roof can support a full installation.

EnergySage reviewed product specifications for the top 10 solar panel brands most frequently offered to homeowners in the EnergySage Solar Marketplace and compared the weight of their standard 60-cell residential solar panels. While there is some variation from brand to brand, most panels weigh somewhere in the neighborhood of 40 pounds.

Of the top brands that we compared, the lightest was SunPower, with some panels weighing as little as 33 pounds. The heaviest was Canadian Solar, which has panels that weigh as much as 50 pounds. Click here to see our full breakdown of the best solar panels, including panel efficiency and cost per watt.

Solar panel weight by manufacturer

SOLAR PANEL MANUFACTURER	SOLAR PANEL WEIGHT (60-CELL RESIDENTIAL PANELS)
SolarWorld	40 - 47 lbs
LG	38 lbs
Canadian Solar	40 - 51 lbs
Hyundai	38 - 41 lbs
Hanwha SolarOne	40 - 42 lbs
Hanwha Q CELLS	41 lbs
Trina	41 - 50 lbs
SunPower	33 - 41 lbs
Axitec	39 - 41 lbs
Kyocera	42 - 44 lbs

Can your roof support a solar panel system?

Armed with the knowledge of solar panel size and solar panel weight, we can make a calculation about how much a whole solar panel system weighs – which in turn can help you understand whether your roof can support a new solar panel system or not.

In a 6 kilowatt solar installation made up of 20 solar panels, the panels alone will weigh approximately 800 pounds (20 panels x 40 lbs). Based on our calculation above, we know that this same system measures at 352 square feet, which works out to a weight of 2.3 pounds per square foot (800 pounds ÷ 352 sq ft). When you include the mounting hardware and other equipment for your panels, the total weight will be closer to 3-4 pounds per square foot.

The roofs on most newer homes can handle significantly more than 3 pounds per square foot of weight. However, if you have an older roof or are in any way concerned about whether your roof can support the additional weight of solar panels, talk to a roofing company. A straightforward roof inspection can help you determine whether the additional weight of solar panels are a viable option for your home.

Frequently asked questions about solar panel size

What is a standard solar panel size?
A residential solar panel is typically around 5.5 feet long and just over 3 feet wide. Commercial solar panels, on the other hand, are typically 78 by 39 inches.

How big is a 300W solar panel?
Many residential solar panels, which are around 5.5 feet long and 3 feet wide, are rated for 300W per panel. The actual power produced by a panel varies depending on a few factors, such as geographical location and the tilt of the panels.

What is the best size of solar panels?
This depends largely on the space you have available. Large panels are more suitable for commercial installations, houses with large roofs, or any other area with a lot of open space. On the other hand, small solar panels are best if you have a small or otherwise complicated rooftop.

How big is a 500W solar panel?
In the past, the rule of thumb with solar panels was that a bigger size equaled higher wattage. Recently, however, many manufacturers have increased their efficiency, meaning there isn't a hard and fast rule regarding size. Read our article about 500W solar panels to learn more.

Are there multiple sizes of solar panels?
Solar panels vary in size, largely based on project type – i.e., commercial or residential. However, solar panels are typically built with either 60 or 72 cells, the two most common configurations. There are smaller sizes though, such as 100W solar panels for RVs, that are designed to fit in a smaller area or be used on the go.

What can a 400W solar panel run?
Appliances such as air conditioner window units can be run off of a 400W solar panel. What a solar panel of this size can run depends on the specific energy requirements of the appliance you're trying to power.

What can a 100W solar panel run?
100W solar panels aren't designed to run a household, but they are ideal for smaller setups like appliances in an RV, for example. A single 100W solar panel isn't designed to run larger appliances, but might be a good option for on-the-go power.

Find the solar option that's best for your home by comparing multiple quotes

Solar installers are used to customizing their system designs to meet the specific needs of each individual property. However, if you are considering installing solar panels on your roof, finding an installer that's the right fit for your home may take a little shopping around. You can use the EnergySage Solar Marketplace to easily solicit and compare multiple offers from installers near you. If you have any questions or concerns about your roof, simply add a note in your profile when you register.