

Calculated Fields – REDCap How-To Guide

Help and FAQs page: Calculations

https://redcap.ctsi.ufl.edu/redcap/index.php?action=help#ss78

What are calculated fields?

REDCap has the ability to make real-time calculations on data entry forms and surveys, however it is recommended that calculation field types are not *excessively* utilized on REDCap data collection instruments as they can slow down the webpages.

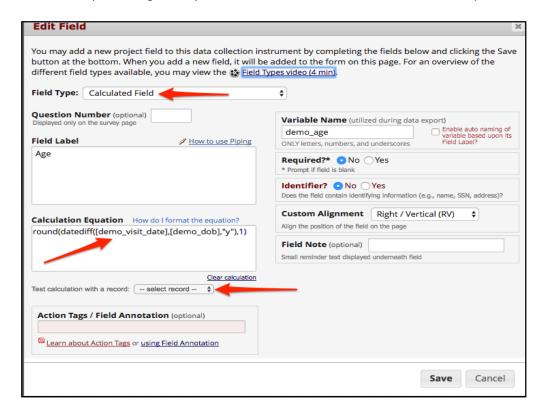
How do I format calculated fields?

In order for the calculated field to function, it will need to be formatted in a particular way. This is somewhat similar to constructing equations in Excel or with certain scientific calculators. The variable names/field names can be used as variables in the equation, but you must place [] brackets around each variable. Please be sure that you follow the mathematical order of operations when constructing the equation or else your calculated results might end up being incorrect.

Calculations in REDCap are formatted the same way as Excel, but instead of using the cell names ([A2]+[A3]), the variable names are used ([bpi_q1]+[bpi_q2]).

How do I create a calculated field?

On the Online Designer page, you would select *Calculated Field* as the field type. Type the calculation into the *Calculation Equation* box. If you have test data in the project, you can test the calculation to see if it's valid by selecting a study ID from the *Test calculation with a record* dropdown list.





Can I create a calculation that returns text or a date as a result (Ex: "True" or "False," "[visit_date] + 30 days")?

No, calculations can only result in **numbers**.

What mathematical operations are available for calculated fields?

+	Add
=	Subtract
*	Multiply
/	Divide

Null or blank values can be referenced using "" or "NaN"

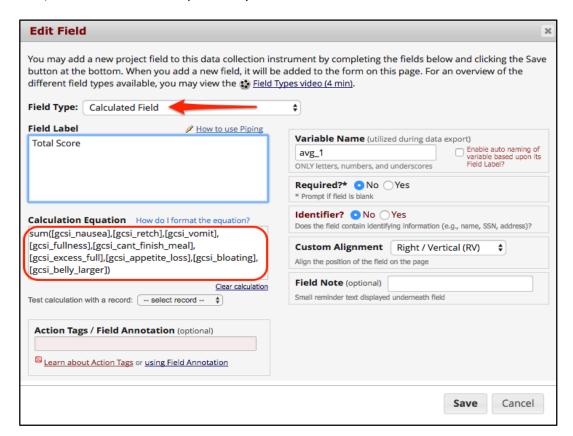
Performing calculations on multiple choice questions (Radio Buttons or Dropdown Lists):

REDCap uses the numerical value assigned to the answer as the answer's value/score.

- 0. Never
- 1, Occasionally
- 2, Often
- 3, Always

In this case, REDCap will score Never as '0,' Occasionally as '1,' Often as '2,' and Always as '3.'

For scoring questions that are radio buttons/dropdown lists, the *Calculation Equation* would contain the field/variable names of the questions you want to sum.





<u>Note:</u> If two or more answers need to have the same scoring, i.e., both *Never* and *Always* have a score of '4', conditional logic will have to be used instead since REDCap will not allow two answer choices to have the same values/scores.

Performing calculations on multiple choice questions (Checkboxes – select all that apply):

Calculations for Checkbox field types are tricky because they are given a value of '1' if checked and '0' if unchecked. If possible, avoid use calculations for Checkbox field types.

Although the field ('exercise') looks like this:

- 1, Monday
- 2, Tuesday
- 3, Wednesday
- 4, Thursday
- 5, Friday

The data comes out like this:

So even though Friday has a value of '5' its values are either '0' or '1.' The '5' only refers to it being the 5^{th} choice on the list. This is because statistical packages would not understand [exercise] = '1' and '3.'

To score this field, each answer choice will need its own calculation, which afterwards can be summed: [variablename(code)] ('code' refers to the position on the list, aka the value assigned to the answer)

```
if([exercise(1)] = 1, 1, 0) (if Monday is selected, give me 1, otherwise give me 0) if([exercise(2)] = 1, 1, 0) (if Tuesday is selected, give me 1, otherwise give me 0) if([exercise(3)] = 1, 1, 0) (if Wednesday is selected, give me 1, otherwise give me 0) if([exercise(4)] = 1, 1, 0) (if Thursday is selected, give me 1, otherwise give me 0) if([exercise(5)] = 1, 1, 0) (if Friday is selected, give me 1, otherwise give me 0)
```

Then you could sum the five fields above, thereby creating a sixth calculated field.

Can I use conditional logic in a calculated field?

Yes, you may use conditional logic (i.e. an IF/THEN/ELSE statement) by using the function: if(CONDITION, value if condition is TRUE, value if condition is FALSE)

This construction is similar to "IF" statements in Excel. Provide the condition first (e.g. [weight] = 4), then give the resulting value if it is true, and lastly give the resulting value if the condition is false.

if([weight] > 100, 44, 11)

In this example, if the value of the field 'weight' is greater than 100, then it will give a value of 44, but if 'weight' is less than or equal to 100, it will give 11 as the result.



Consider the question ('xxx') with the following answers:

- 0, Never
- 1, Occasionally
- 2, Often
- 3, Always
- 99, N/A

If someone selects 'N/A' as an answer and you do not want REDCap to score that value as '99,' you want the value to be *blank*, you would use the conditional logic:

if([xxx] < 99, [xxx], "NaN")

In this example, if the value of 'xxx' is less than 99, then it will give the value of the answer that was chosen (0-3), but if 'xxx' is equal to 99 then it will give "NaN" (blank) as the result.

Using the "sum" function vs. the "+" function:

sum([q1],[q2],[q3],[q4]) will give the sum of questions 1-4, even if one of the values is blank. <u>NOTE</u>: All blank values will be ignored and thus will only return the sum total computed from all numerical, non-blank values.

[q1]+[q2]+[q3]+[q4] will give the sum of questions 1-4 but only if *every* question has a value. NOTE: Blank values will not be ignored and thus will only return the sum total if all the fields in the equation have values.

Weather to use the "+" or "sum" function depends upon how that particular instrument should be scored.

BMI Calculation:

[weight]*10000/([height]*[height]) = units in kilograms and centimeters ([weight]/([height]*[height]))*703 = units in pounds and inches

<u>Note</u>: 'weight' and 'height' need to be field names in your project. If you called these fields something else, use the names you called those fields instead of the ones listed above.

Calculate the difference between two dates or datetimes (i.e., age at enrollment based upon DOB and date of enrollment, length of hospital stay based on admit and discharge dates): datediff([date1],[date2], "units", "date format", Return Signed Value)

units

"у"	years	1 year = 365.2425 days
"M"	months	1 month = 30.44 days
"d"	days	
"h"	hours	
"m"	minutes	
"s"	seconds	



date format

"ymd"	Y-M-D (default)		
"mdy"	M-D-Y		
"dmy"	D-M-Y		

- If the date format is not provided, it will default to "ymd".
- Both dates MUST be in the format specified in order to work.

Return Signed Value

false (default)

• The parameter Return Signed Value denotes the result to be signed or unsigned (absolute value), in which the default value is "false", which returns the absolute value of the difference. For example, if [date1] is larger than [date2], then the result will be negative if Return Signed Value is set to true. If Return Signed Value is not set or is set to false, then the result will ALWAYS be a positive number. If Return Signed Value is set to false or not set, then the order of the dates in the equation does not matter because the resulting value will always be positive (although the + sign is not displayed but implied).

Examples:

T	
datediff([dob],[date_enrolled],"y")	Yields the number of years between the dates for
	the date_enrolled and dob fields, which must be
	in Y-M-D format
datediff([dob],"05-31-2007","h","mdy",true)	Yields the number of hours between May 31,
	2007, and the date for the dob field, which must
	be in M-D-Y format. Because returnSignedValue
	is set to true, the value will be negative if the dob
	field value is more recent than May 31, 2007.
datediff([dob],[visit_date], "y", "mdy")	Yields the number of years between the dates for
	the dob and visit_date fields, in the M-D-Y
	format.
datediff("today",[screen_date],"m")	Yields the number of months since the dates for
	the screen_date and today's date.
	NOTE: The "today" variable can ONLY be used
	with date fields and NOT with time, datetime, or
	datetime_seconds fields.
	It is strongly recommended, HOWEVER, that you do
	not use "today" in calculated fields. This is because
	every time you access and save the form, the
	calculation will run. For example, if you calculate the
	age as of today, then a year later you access the form
	to review or make updates, the elapsed time as of "today" will also be updated (+1 yr). Most users
	calculate time off of another field (e.g. screening date,
	enrollment date).



Can fields from different EVENTS be used in calculated fields (longitudinal only)?

Yes, for longitudinal projects (i.e. with multiple events defined), a calculated field's equation may utilize fields from other events (i.e. visits, time-points). The equation format is somewhat different from the normal format because the unique event name must be specified in the equation for the target event. The unique event name must be prepended (in square brackets) to the beginning of the variable name (in square brackets), i.e. [unique_event_name][variable_name]. Unique event names can be found listed on the project's Define My Event's page on the right-hand side of the events table, in which the unique name is automatically generated from the event name that you have defined.

For example, if the first event in the project is named "Enrollment", in which the unique event name for it is "enrollment_arm_1", then we can set up the equation as follows to perform a calculation utilizing the "weight" field from the Enrollment event: [enrollment_arm_1][weight]/[visit_weight]. Thus, presuming that this calculated field exists on a form that is utilized on multiple events, it will always perform the calculation using the value of weight from the Enrollment event while using the value of visit_weight for the current event the user is on.

Can REDCap perform advanced functions in calculated fields?

Yes, it can perform many, which are listed below. NOTE: All function names (e.g. roundup, abs) listed below are case sensitive.

Function	Name/Type of function	Notes / examples
round(number,decimal places)	Round	If the "decimal places" parameter is not provided, it defaults to 0. E.g. To round 14.384 to one decimal place: round(14.384,1) will yield 14.4
roundup(number,decimal places)	Round Up	If the "decimal places" parameter is not provided, it defaults to 0. E.g. To round up 14.384 to one decimal place: roundup(14.384,1) will yield 14.4
rounddown(number,decimal places)	Round Down	If the "decimal places" parameter is not provided, it defaults to 0. E.g. To round down 14.384 to one decimal place: rounddown(14.384,1) will yield 14.3
sqrt(number)	Square Root	E.g. sqrt([height]) or sqrt(([value1]*34)/98.3)
(number)^(exponent)	Exponents	Use caret ^ character and place both the number and its exponent inside parentheses: For example, (4)^(3) or ([weight]+43)^(2)
abs(number)	Absolute Value	Returns the absolute value (i.e. the magnitude of a real number without regard to its sign). E.g. abs(-7.1) will return 7.1 and abs(45) will return 45.
min(number,number,)	Minimum	Returns the minimum value of a set of values in the format min([num1],[num2],[num3],)
max(number,number,)	Maximum	Returns the maximum value of a set of values in the format max([num1],[num2],[num3],).
mean(number,number,)	IVIean	Returns the mean (i.e. average) value of a set of values in the format mean([num1],[num2],[num3],).
median(number,number,)	Median	Returns the median value of a set of values in the format median([num1],[num2],[num3],).



sum(number,number,)	Sum	Returns the sum total of a set of values in the format sum([num1],[num2],[num3],).
stdev(number,number,)		Returns the standard deviation of a set of values in the format stdev([num1],[num2],[num3],).