Answer Key

Calculating growth rates for cattle, pigs, and small ruminants

Using the provided sample database, answer the following questions:

Q1: Using the sample dataset from the previous module, calculate the daily liveweight gain for each animal.

Solution 1: Using a "Weight Gain" column

In the last module we created this spreadsheet, with the "**Birth Weight (kg)**", "**Weaning Age (days)**", "**Weaning Weight (kg)**" and "**Weight Gain (kg)**" as shown below. We can use this to calculate the "**Daily Live Weight Gain (kg/day)**" for each animal.

	A	B	C	D	E	F	G	H	I	J
	Cow ID	Calf ID	Date of birth	Calf sex	Birth weight (kg)	Weaning age (days)	Weaning weight (kg)	Weight Gain (kg)		
1	Cow ID	Calf ID	Date of birth	Calf sex	(kg)	(days)	(kg)	Gain (kg)		
2	5862	7400	230406	bull	39.2	230	300	260.8		
3	3630	2318	230406	heifer	51.7	230	227	175.3	Average Birth Weight (kg)	44.057
4	7856	5765	230406	bull	38.8	230	291	252.2	Minimum Birth Weight (kg)	37
5	5116	7634	230407	bull	40.4	229	245	204.6	Maximum Birth Weight (kg)	52
6	7248	4093	230407	bull	47.9	229	259	211.1		
7	4570	9192	230407	heifer	38	228	313	275	Average Weaning Weight (kg)	271.94
8	8703	2609	230407	bull	39.3	227	289	249.7	Minimum Weaning Weight (kg)	200
9	7744	3675	230408	heifer	41.7	226	336	294.3	Maximum Weaning Weight (kg)	340
10	3333	4435	230408	heifer	42.5	226	259	216.5		
11	2235	5328	230410	bull	38.4	226	280	241.6	Average Weight Gain (kg)	227.883
12	5053	8873	230410	heifer	42.4	226	311	268.6		
13	2999	4414	230410	bull	37	225	208	171		
14	6932	8704	230410	bull	44.5	225	221	176.5		
15	6384	2746	230411	bull	39.3	224	247	207.7		
16	8686	3490	230412	heifer	45.8	224	256	210.2		

To find the "**Daily Live Weight Gain (DLWG)**" for each animal we need to divide the **weight gain** by the **number of days** over which the weight gain occurred. We can do this in Excel using a formula.

First add a column for the DLWG, specifying units of "kg/day":

	A	B	C	D	E	F	G	H	I
1	Cow ID	Calf ID	Date of birth	Calf sex	Birth weight (kg)	Weaning age (days)	Weaning weight (kg)	Weight Gain (kg)	DLWG (kg/day)
2	5862	7400	230406	bull	39.2	230	300	260.8	
3	3630	2318	230406	heifer	51.7	230	227	175.3	
4	7856	5765	230406	bull	38.8	230	291	252.2	
5	5116	7634	230407	bull	40.4	229	245	204.6	
6	7248	4093	230407	bull	47.9	229	259	211.1	
7	4570	9192	230407	heifer	38	228	313	275	
8	8703	2609	230407	bull	39.3	227	289	249.7	
9	7744	3675	230408	heifer	41.7	226	336	294.3	
10	3333	4435	230408	heifer	42.5	226	259	216.5	

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Select the first cell in the DLWG column and type in "**=(**" to tell Excel we wish to use a formula:

Select the first cell in the corresponding "**Weight Gain**" column:

Enter the divide symbol "**/**" and select the first cell in the corresponding "**Weaning Age**" column:

Type a closing bracket "**)**". Now your formula should be similar to this one, with the corresponding cells highlighted:

Press **Enter** and Excel will perform the calculation.

To calculate the DLWG for the entire column select the cell in the row and double click on the small square in the corner:

You may want to change the number of decimal places of the DLWG to make it a bit easier to read.

First, change the format of the data from "**General**" to "**Number**". To do this select the column with the DLWG data in it using the column identifier. Then in the ribbon at the top of the screen click on the arrow in the box that says "**General**" to open the drop down menu as shown and select "**Number**".
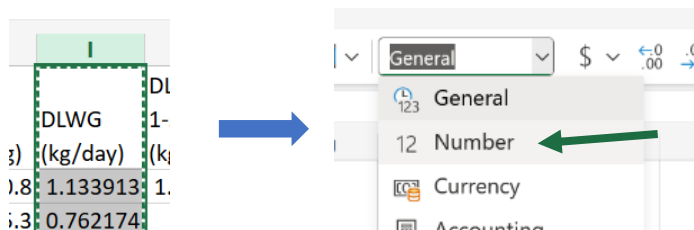
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Then use the "**decrease decimal**" buttons in the tool bar as shown below:
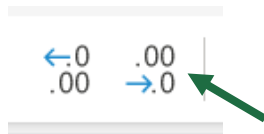
We recommend two decimal places as a good balance between accuracy and readability.

Solution 2: Calculating DLWG without a "Weight Gain" column

We can also calculate the DLWG directly from the "**Birth Weight**", "**Weaning Weight**" and "**Weaning Age**".

Make a column to store the results:

Now, enter "**=((**" into the first cell in the new column:

Select the first cell in the "**Weaning Weight**" column:

Type a minus sign "**-**" and select the first cell in the "**Birth Weight**" column:

Type a closing bracket "**)**" followed by a division sign "**/**":

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Select the first cell in the "**Weaning Age**" column and type a closing bracket "**)**":

The final formula looks like this for our example:

This formula takes the "**Weaning Weight**" (G2) and subtracts the "**Birth Weight**" (E2), before dividing it by the "**Weaning Age**" (F2) all in one step. Make sure to include all brackets, as below:

			fx	=((G2-E2)/F2)					
C	D	E	F	G	H	I	J	K
ate of irth	Calf sex	Birth weight (kg)	Weaning age (days)	Weaning weight (kg)	Weight Gain (kg)	DLWG (kg/day)	DLWG 1-step (kg/day)	
230406	bull	39.2	230	300	260.8	1.13	=((G2-E2)/F2)	
230406	heifer	51.7	230	227	175.3	0.76		Average Birth Weight (kg)

Again, you will see how the colours of the formula reference back to the highlighted cells.

Press "**Enter**".

Like before, select the cell you have just performed the calculation in and double click on the small square in the bottom right corner to fill in the values for all the other rows.

You can change the format of the data in the column by clicking the column identifier at the top of the column and selecting "**Number**" from the data format window in the ribbon:

You can adjust the number of decimal places as above, on page 3.
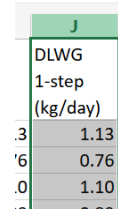
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Q2. Using the daily liveweight gain calculated in Question 1, find the:
    a. **slowest growth rate *0.76kg/day***
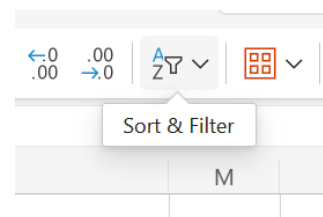   b. **fastest growth rate *1.51kg/day***

We will use the **SORT** function in Excel to find the slowest and fastest growth rates.

Select the entire column with the values you want to sort the data on, by clicking on the column identifier. For this question, we will use the data in the DLWG column:
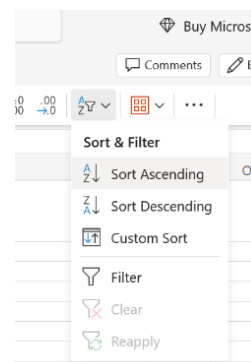
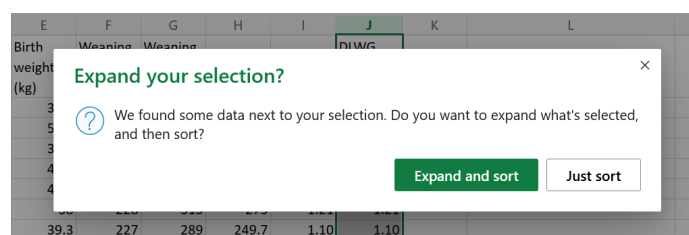|	J
	DLWG 1-step (kg/day)
.3	1.13
'6	0.76
.0	1.10

Click on the "**Sort & Filter**" button in the Excel ribbon:

Select "**Sort Ascending**" from the drop down menu

This pop up will appear asking if you wish to "**Expand your selection**". It is **VERY IMPORTANT** you select "**Expand and sort**" rather than "Just sort"

The data will now be arranged with the calves with the slowest growth rate at the top and the calves with the fastest growth rate at the bottom.
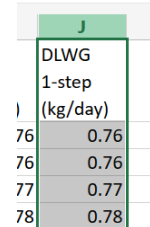
	A	B	C	D	E	F	G	H	I	J	K
1	Cow ID	Calf ID	Date of birth	Calf sex	Birth weight (kg)	Weaning age (days)	Weaning weight (kg)	Weight Gain (kg)	DLWG (kg/day)	DLWG 1-step (kg/day)	
2	2999	4414	230410	bull	37	225	208	171	0.76	0.76	
3	3630	2318	230406	heifer	51.7	230	227	175.3	0.76	0.76	
4	3841	8956	230429	bull	49.1	210	210	160.9	0.77	0.77	
5	4798	8043	230430	heifer	41.5	210	206	164.5	0.78	0.78	

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From this we can see that the Calves with Calf IDs **4414** and **2318** both have the lowest DLWG, or growth rate, which is **0.76kg/day**.
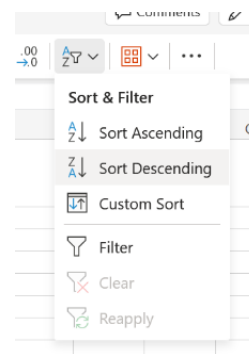
To find the fastest growth rate we could scroll to the bottom of the table.
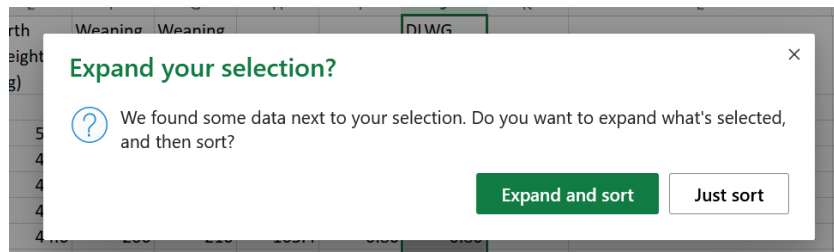
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DLWG 1-step (kg/day)

76	0.76
76	0.76
77	0.77
78	0.78

Alternatively, you can again select the column with the DLWG in using the column identifier.
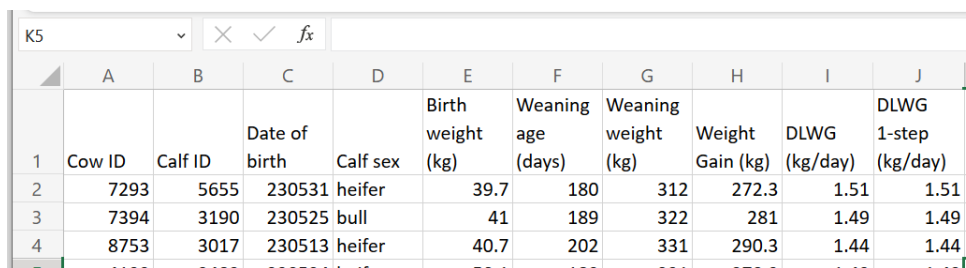
Click the "**Sort & Filter**" button in the Excel ribbon, but this time select "**Sort Descending**" from the drop down menu:

When this pop up appears it is **ESSENTIAL** you click "**Expand and Sort**" as before

Expand your selection?

We found some data next to your selection. Do you want to expand what's selected, and then sort?

Expand and sort   Just sort

The data will now be sorted with the rows containing the data for the calves with the fastest growth rate at the top:

	A	B	C	D	E	F	G	H	I	J
1	Cow ID	Calf ID	Date of birth	Calf sex	Birth weight (kg)	Weaning age (days)	Weaning weight (kg)	Weight Gain (kg)	DLWG (kg/day)	DLWG 1-step (kg/day)
2	7293	5655	230531	heifer	39.7	180	312	272.3	1.51	1.51
3	7394	3190	230525	bull	41	189	322	281	1.49	1.49
4	8753	3017	230513	heifer	40.7	202	331	290.3	1.44	1.44

From this we can see that the Calf with the Calf ID **5655** has the fastest growth rate of **1.51kg/day**