17 exercises for Beer Calculation using

The Scandinavian Beer Calculator

ABBREVIATIONS

hl	=	Beer volume	In hectoliter, 100 liter
OE%P	=	Extract in Original Wort	In % Plato, g/100 g
ER%	=	Real Extract	In %, g/100 g
EA%	=	Apparent Extract	In %, g/100 g
A%mas	=	Alcohol content by mass	In %, g/100 g
A%vol	=	Alcohol content by volume	In %, ml/100 ml
RDF%	=	Real Degree of Fermentation	In %, g/100 g
ADF%	=	Apparent Degree of Fermentation	In %, g/100 g
SGA	=	Specific Gravity of distillate	
SGE	=	Specific Gravity of Reminiscence	
SGBeer	=	Specific Gravity of Beer	
NUTV	=	Nutritive Value of Beer	In kJoule/100 ml
CALV	=	Calorific Value of Beer	In kCal/100 ml
FRZP^o	=	Freezing Point of Beer	In degree Celsius
TMXD^o	=	Temperature of Max. Density	In degree Celsius
BOD5	=	Biological Oxygen Demand	In mg/liter
OEkg	=	Kg of Original Extract,	In kg

Beer Calculations made by The Scandinavian Beer Calculator.

Adjust to "View / Full screen"   and activate "Decimals" to make the screen easy to see.

Exercise 1.   **Calculate RDF% ASBC and RDF%Classic, when OE%P = 10 and ER% = 5**
Enter OE%P=10   and   ER%=5
Calculate and read: RDF% ASBC= 51.3 and RDF% Classic = 50

Exercise 2   **Calculate ADF%, when OE%P = 10 and EA% = 5**
Enter OE% P= 10,   and   EA% = 5
Calculate and read: ADF% =50

Exercise 3   **Find the composition of beer which has SGBeer = 1 and OE%P = 12**
Enter: OE%P = 12   and   SGBeer = 1
Calculate and read: RDF% = 81.8 and ADF% = 100.0

Exercise 4   **Find a composition of beer which has SGBeer = 1 and OE%P = 20**
Enter: OE%P = 20   and   SGBeer = 1
Calculate and Read: RDF% = 82.4 and ADF% = 100.0
When SGBeer =1   then RDF% will always be near 82!

The Scandinavian Beer Calculator

Main menu	Doc. id:	Beer calcu.	Calc No. 1	Calc No. 2	Calc No. 3	Calc No. 4	Calc No. 5	Total Blend	Target
Calculator	Beer sample:		Exercise 1	Exercise 2	Exercise 3	Exercise 4			for blending
Instructions	OE%P	%P	10.0000082	9.99999274	12.000006	19.9999983			
About	ER%	%P	5	5.95	2.28	3.85			
Contact	EA%	%P	3.82	5.00000276	-0.00	-0.00			
Printer-friendly	RDF%ASBC	%	51.3	41.8	82.0	82.4			
Export to Excel	RDF%Classic	%	50.0	40.5	81.0	80.7			
	ADF%	%	61.8	50.0	100.0	100.0			
Errors	A%mas	g/100 g	2.55	2.07	5.01	8.71			
Less than 2 yellow numbers: Calc No. 5	A%vol	ml/100 ml	3.27	2.66	6.34	11.02			
	SGA		0.99529	0.99616	0.99113	0.98544			
	SGE		1.01968	1.02350	1.00891	1.01511			
	SGBeer		1.01500	1.01968	1	0.99999999			
	TMXD°	°C	1.4	0.6	3.7	3.6			
	FRZP°	°C	-1.7	-1.5	-2.8	-4.7			
	CalVal	kCal/100 ml	38	39	45	77			
	Energy	kJ/100 ml	159	160	185	320			
	BOD%	mg/liter	99.9	100.8	117.3	202.7			
	hl beer	hl	○	○	○	○	○		⊙ Variable
	Color								
	Bitterness								
	kgBeer	kg							
	kgOE	kg							
	kgER	kg							
	kgAlcohol	kg							
	kgBOD5	kg							
	Calculate		Delete	Delete	Delete	Delete	Delete	New col	Decimals

Den Skandinaviske Bryggerhøjskole
The Scandinavian School of Brewing

Exercise 5 **How many hl of beer (ER% = A%mas=5.00) is required to contain 1,000 kg Alcohol?**

Enter: A%mas = 5   ER% = 5
Adjust hl to get Akg = 1,000
Read: hl=1978.6   and   RDF%= 67.4

Exercise 6 **Calculate RDF% ASBC for a beer having ER% = A%mas = 3, and compare with the above.**

Enter: A%mas = 3   ER% = 3
Read: RDF%ASBC = 67.4,   which is the same as above

Exercise 7 **Calculate the composition of beer, when ER% = 5 and EA% = 4**
How correct is the formula: ER%-EA% = 0.46 x A%mas?

Enter: ER% = 5   EA% = 4
Read: A%mas = 2.1545   (which will justify ER% -EA% = 0.46 x A%mas)
For this beer the formula is good!

Exercise 8 **Calculate the composition of beer, when ER% = 10 and A%mas = 8**
How correct is the formula: ER%-EA% = 0.46 x A%mas?

Enter: ER% = 10   EA% = 8
Read: A%mas =4.611 %   (which only will justify: ER% -EA% = 0.43 x A%mas)
*This formula is **not** acceptable for strong beer.*

Doc. id:	Beer calcul,	Calc No. 1	Calc No. 2	Calc No. 3	Calc No. 4
Beer sample:		Exercise 5	Exercise 6	Ecercise 7	Exercise 8
OE%P	%P	14.56	8.91	9.24	18.61
ER%	%P	5	3	5	10
EA%	%P	2.76	1.61	4.0000019	7.99999852
RDF%ASBC	%	67.4	67.4	47.1	48.8
RDF%Classic	%	65.7	66.3	45.9	46.3
ADF%	%	81.0	82.0	56.7	57.0
A%mas	g/100 g	5	3	2.15	4.61
A%vol	ml/100 ml	6.39	3.82	2.77	6.01
SGA		0.99115	0.99451	0.99600	0.99179
SGE		1.01968	1.01174	1.01968	1.04003
SGBeer		1.01080	1.00627	1.01570	1.03181
TMXD°	°C	2.0	2.8	1.3	-1.4
FRZP°	°C	-2.9	-1.8	-1.5	-2.9
CalVal	kCal/100 ml	56	33	35	73
Energy	kJ/100 ml	230	138	147	303
BOD%	mg/liter	146.0	87.2	92.4	193.5
hl beer	hl	1978,6			
Color					
Bitterness					
kgBeer	kg	199997			
kgOE	kg	29112			
kgER	kg	10000			
kgAlcohol	kg	10000			
kgBOD5	kg	28890			
Calculate		Delete	Delete	Delete	Delete

Exercise 9 **Which values for OE%P and ER% will we get, when we mix 1,000 hl beer having OE%P=20.00 and ER%=6.00 with 1000 hl D-water?**

Enter in the first column: *ER%=6.00* *OE%P=20.00* *hl=1000*
and in the second column : *OE%P = 0* *A%mas = 0* *hl=1000   (Water!)*
Read for Total Blend: *OE%P=10.44* *ER% = 3.02*

Exercise 10 **Which values for OE%P will we get, when we mix 1,000 hl beer having OE%P=20.00 and ER%=6.00 with 1,000 hl beer having OE%P=10.00 and ER%=3.00?**

Enter in the first column: *ER% = 6.00* *OE%P=20.00* *hl=1000*
and in the second column : *ER% = 3.00* *OE%P=10.00* *hl=1000*
Read for Total Blend: *OE%P=15.11*

Doc. id:	Beer calcul.	Calc No. 1	Calc No. 2	Total Blend
Beer sample:		Exercise 9		
OE%P	%P	19.9999994	0	10.44
ER%	%P	6	0.00	3.02
EA%	%P	2.69	-0.00	1.27
RDF%ASBC	%	72.2	0.0	72.2
RDF%Classic	%	70.0	0.0	71.1
ADF%	%	86.5	0.0	87.8
A%mas	g/100 g	7.55	0	3.80
A%vol	ml/100 ml	9.65	0.00	4.82
SGA		0.98716	1.00000	0.99314
SGE		1.02370	1.00000	1.01180
SGBeer		1.01053	1.00000	1.00496
TMXD°	°C	1.9	4.0	3.0
FRZP°	°C	-4.2	0.0	-2.2
CalVal	kCal/100 ml	78	0	39
Energy	kJ/100 ml	322	0	162
BOD%	mg/liter	204.7	0.0	102.3
hl beer	hl	1000	1000	2001
Color				0.00
Bitterness				0.0
kgBeer	kg	101053	100000	201053
kgOE	kg	20211	0	20989
kgER	kg	6063	0	6063
kgAlcohol	kg	7634	0	7634
kgBOD5	kg	20471	0	20471

Doc. id:	Beer calcul.	Calc No. 1	Calc No. 2	Total Blend
Beer sample:		Exercise 10		
OE%P	%P	19.9999994	9.99999638	15.11
ER%	%P	6	3	4.50
EA%	%P	2.69	1.35	2.02
RDF%ASBC	%	72.2	71.1	71.9
RDF%Classic	%	70.0	70.0	70.2
ADF%	%	86.5	86.5	86.7
A%mas	g/100 g	7.55	3.57	5.57
A%vol	ml/100 ml	9.65	4.54	7.09
SGA		0.98716	0.99353	0.99023
SGE		1.02370	1.01174	1.01770
SGBeer		1.01053	1.00529	1.00787
TMXD°	°C	1.9	2.9	2.4
FRZP°	°C	-4.2	-2.1	-3.1
CalVal	kCal/100 ml	78	37	58
Energy	kJ/100 ml	322	155	239
BOD%	mg/liter	204.7	97.9	151.3
hl beer	hl	1000	1000	2000
Color				0.00
Bitterness				0.0
kgBeer	kg	101053	100529	201582
kgOE	kg	20211	10053	30466
kgER	kg	6063	3016	9079
kgAlcohol	kg	7634	3591	11225
kgBOD5	kg	20471	9794	30265

Exercise 11 **How much D-water shall we mix into 1,000 hl HGB-beer having OE%P=20.00 and ER% = 6.00 to get OE%P=10.00 in the blend?**
Will the water change RDF%Classic or RDF% ASBC?

Enter in the first column: ER% = 6.00   OE%P=20   hl=1000
and in the second column :   OE%P = 0   A%mas = 0   (Water)
Enter OE%P=10.00 as "Target for blending".
Calculate and read: hl=1,092 (water) and RDF%ASBC = 72.2 (unchanged).
Read the result of dilution for RDF% Classic. It is increased from 70.0 to 71.2%!
Only RDF%ASBC remains unchanged at dilution!

Doc. id:	Beer calcul.	Calc No. 1	Calc No. 2	Total Blend	Target
Beer sample:		Exercise 11			for blending
OE%P	%P	19.9999994	0	10.00	10
ER%	%P	6	0.00	2.88	
EA%	%P	2.69	-0.00	1.21	
RDF%ASBC	%	72.2	0.0	72.2	
RDF%Classic	%	70.0	0.0	71.2	
ADF%	%	86.5	0.0	87.9	
A%mas	g/100 g	7.55	0	3.63	
A%vol	ml/100 ml	9.65	0.00	4.61	
SGA		0.98716	1.00000	0.99342	
SGE		1.02370	1.00000	1.01128	
SGBeer		1.01053	1.00000	1.00473	
TMXD°	°C	1.9	4.0	3.0	
FRZP°	°C	-4.2	0.0	-2.1	
CalVal	kCal/100 ml	78	0	37	
Energy	kJ/100 ml	322	0	155	
BOD%	mg/liter	204.7	0.0	97.8	
hl beer	hl	1000 ○	1091,949 ○	2093	⊙ Variable
Color				0.00	
Bitterness				0.0	
kgBeer	kg	101053	109195	210248	
kgOE	kg	20211	0	21025	
kgER	kg	6063	0	6063	
kgAlcohol	kg	7634	0	7634	
kgBOD5	kg	20471	0	20471	
Calculate		Delete	Delete	New col	Decimals

Exercise 12

A beer tank contains 780 hl beer (Brand A) having OE%P = 12.75
and A%mas = 4.32
The strength should be OE%P = 13.00
How much of Brand B (OE%P = 15.67 and A%mas = 5.23) shall we mix
into brand A?

Enter in the first column: OE%P = 12.75   A%mas = 4.32   hl=780
and in the second column: OE%P = 15.67   A%mas = 5.23
Enter as "Target for blending": QE%P = 13
Indicate that the volume of Brand B in the second box is variable (Click in the ring)
Calculate and read: hl =75   (Brand B in the second box)

Doc. id:	Beer calcul.	Calc No. 1	Calc No. 2	Total Blend	Target
Beer sample:		Exercise 12			for blending
OE%P	%P	12.7500017	15.5700021	13.00	13
ER%	%P	4.41	5.63	4.52	
EA%	%P	2.46	3.31	2.53	
RDF%ASBC	%	66.9	65.7	66.8	
RDF%Classic	%	65.4	63.8	65.2	
ADF%	%	80.7	78.8	80.5	
A%mas	g/100 g	4.32	5.23	4.40	
A%vol	ml/100 ml	5.51	6.70	5.62	
SGA		0.99227	0.99078	0.99213	
SGE		1.01733	1.02221	1.01776	
SGBeer		1.00960	1.01294	1.00989	
TMXD°	°C	2.2	1.6	2.1	
FRZP°	°C	-2.5	-3.0	-2.6	
CalVal	kCal/100 ml	48	60	49	
Energy	kJ/100 ml	200	248	205	
BOD%	mg/liter	126.9	157.1	129.6	
hl beer	hl	780	74,92915	855	⊙ Variable
Color				0.00	
Bitterness				0.0	
kgBeer	kg	78749	7590	86339	
kgOE	kg	10040	1182	11224	
kgER	kg	3473	427	3900	
kgAlcohol	kg	3402	397	3799	
kgBOD5	kg	9900	1177	11077	
Calculate		Delete	Delete	New col	Decimals

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Exercise 13

To a tank of 567 hl beer (OE%P=10.11 and EA% = 1.67) wort (OE%P = 13.00 and A%mas = 0) shall be added to give ER%=4.00
Calculate how many hl cold wort will be required.

> *Enter in the first column:*   *OE%P=10.11*   *EA% = 1.67*   *hl=567*
> *and in the second column:*   *A%mas = 0*   *OE%P=13.00*
> *Enter as "Target for blending":*   *ER = 4*
> *Indicate that the volume of wort in the second box is variable (Enter a dot in the ring)*
> *Calculate and read:*   *hl = 44 (of wort in the second box)*

Doc. id:	Beer calcul.	Calc No. 1	Calc No. 2	Total Blend	Target for blending
Beer sample:		Exercise 1			
OE%P	%P	10.1099865	13		
ER%	%P	3.28	13.00		4
EA%	%P	1.67000055	13.00		
RDF%ASBC	%	68.8	0.0		
RDF%Classic	%	67.6	0.0		
ADF%	%	83.5	-0.0		
A%mas	g/100 g	3.49	0		
A%vol	ml/100 ml	4.44	0.00		
SGA		0.99367	1.00000		
SGE		1.01283	1.05259		
SGBeer		1.00652	1.05259		
TMXD°	°C	2.7	-4.5		
FRZP°	°C	-2.1	-0.7		
CalVal	kCal/100 ml	38	53		
Energy	kJ/100 ml	157	218		
BOD%	mg/liter	99.3	137.9		
hl beer	hl	567 ○	43,62693 ○		⊙ Variable
Color					
Bitterness					
kgBeer	kg	57069	4592		
kgOE	kg	5770	597		
kgER	kg	1869	597		
kgAlcohol	kg	1991	0		
kgBOD5	kg	5630	602		
Calculate		Delete	Delete	New col	Decimals

Exercise 14

**To 678 hl beer (OE%P=12.34 and EA% = 1.67) shall we add 222 hl beer to fill up the tank.
Which composition shall this beer have to make OE%P = 13 and A%mas = 4 in the final blend?**

We make this calculation by subtraction of the first beer from the final blend.

. *Enter the final blend in the first column: OE%P =13   A%mas = 4   hl=678+222 = 900
And the original beer in the second column: OE%P = 12.34   EA% = 1.67   **hl = -678***

Calculate and read the composition of the added beer as "Total blend":
OE%P = 15.00   and   RDF%ASBC = only 35! (This is not a fully fermented beer!).

*Note that **The Scandinavian Beer Calculator** will accept negative volumes!*

Doc. id:	Beer calcul.	Calc No. 1	Calc No. 2	Total Blend
Beer sample:		Exercise 14		
OE%P	%P	13	12.3399989	15.00
ER%	%P	5.29	3.70	10.01
EA%	%P	3.48	1.66999679	8.85
RDF%ASBC	%	61.0	71.4	35.0
RDF%Classic	%	59.3	70.0	33.2
ADF%	%	73.2	86.5	41.0
A%mas	g/100 g	4	4.47	2.61
A%vol	ml/100 ml	5.13	5.68	3.42
SGA		0.99280	0.99202	0.99518
SGE		1.02083	1.01450	1.04009
SGBeer		1.01365	1.00652	1.03530
TMXD°	°C	1.5	2.7	-1.9
FRZP°	°C	-2.4	-2.6	-1.9
CalVal	kCal/100 ml	50	47	59
Energy	kJ/100 ml	206	193	244
BOD%	mg/liter	130.3	122.1	155.4
hl beer	hl	900	-678	222
Color				0.00
Bitterness				0.0
kgBeer	kg	91228	-68242	22987
kgOE	kg	11860	-8421	3447
kgER	kg	4825	-2523	2302
kgAlcohol	kg	3649	-3048	601
kgBOD5	kg	11727	-8277	3450
Calculate		Delete	Delete	New col

EXERCISE 15

Brand A has a composition of   **OE%P = 12.2**   **ER% = 4.3**   **and Bitterness = 18**
How much of Brand B   **OE%P = 12.4**   **ER% = 3.9**   **and Bitterness = 24**
shall we mix into 567 hl of Brand A to make Bitterness = 20.5 in the blend?

Enter in the first column: *OE%P=12.2*   *ER% = 4*   *Bitterness = 24*   *hl = 678*
and in the second column: *OE%P=12*   *A%mas = 4*   *Bitterness = 17*
Enter as "Target for blending":   *Bitterness = 22*
Indicate that the volume of Brand B in the second box is variable (Enter a dot in the ring)
Calculate and read: *hl = 272   (of Brand B in the second column)*

Doc. id:	Beer calcul.	Calc No. 1	Calc No. 2	Total Blend	Target
Beer sample:		Exercise 15			for blending
OE%P	%P	12.1999944	12.4000017	12.26	
ER%	%P	4.3	3.9	4.19	
EA%	%P	2.45	1.91	2.29	
RDF%ASBC	%	66.2	70.0	67.3	
RDF%Classic	%	64.8	68.5	65.9	
ADF%	%	79.9	84.6	81.3	
A%mas	g/100 g	4.08	4.39	4.17	
A%vol	ml/100 ml	5.21	5.60	5.32	
SGA		0.99267	0.99214	0.99252	
SGE		1.01689	1.01530	1.01643	
SGBeer		1.00957	1.00744	1.00896	
TMXD°	°C	2.2	2.5	2.3	
FRZP°	°C	-2.4	-2.5	-2.4	
CalVal	kCal/100 ml	46	47	46	
Energy	kJ/100 ml	192	194	192	
BOD%	mg/liter	121.2	122.9	121.7	
hl beer	hl	678 ○	271,7719 ○	950	⊙ Variable
Color				0.00	
Bitterness		24	17	22.0	22
kgBeer	kg	68449	27379	95828	
kgOE	kg	8351	3395	11746	
kgER	kg	2943	1068	4011	
kgAlcohol	kg	2793	1203	3996	
kgBOD5	kg	8220	3340	11559	
Calculate		Delete	Delete	New col	Decimals

Exercise 16

Calculate the density of alcohol, when dissolved in beer.

Enter in the first column figures for a normal beer:

$$OE\%P = 12.00 \quad ER\% = 3.00 \quad hl = 1000$$

Enter in second column figures for an alcohol solution:

$$A\%mas = 10.00 \quad ER\% = 0 \quad hl = 100$$

Subtract in the third column the mass of water contained in the alcohol solution (9827.084 – 982.708 = 8844.37 kg = 88.4437 hl):

Enter in the third column: $\qquad A\%mas = 1 \qquad ER\% = 0 \qquad hl = -88.4437$

Read: The Increase in volume = 11.4789 hl (Total blend – beer in first column)
Read: Mass of Alcohol added in the second column= 982.708 kg
Density: 982.708/1147.89 = 0.87 g/ml
(The table value for the density of pure alcohol is 0.781 g/ml. Alcohol in solution changes the molecule structure of the water in the beer and makes it more dense.)

Doc. id:	Beer calcul.	Calc No. 1	Calc No. 2	Calc No. 3	Total Blend	Target
Beer sample:		Exercise 16				for blending
OE%P	%P	12.0000053	18.6734739	0.00000000	13.6647967	
ER%	%P	3	0	0	2.97090567	
EA%	%P	0.88682225	-4.4337347	-0.0000000	0.45828067	
RDF%ASBC	%	76.1788634	99.9994644	0.00000000	79.4767225	
RDF%Classic	%	74.9993860	99.9994644	0.00000000	78.2581183	
ADF%	%	92.6090460	123.742829	0.00000005	96.6455606	
A%mas	g/100 g	4.64272000	10	0	5.56751679	
A%vol	ml/100 ml	5.88973957	12.4236211	0.00000000	7.05116207	
SGA		0.99173398	0.98359303	1.00000000	0.99023597	
SGE		1.01173899	1.00000131	1.00000131	1.01162407	
SGBeer		1.00346004	0.98270843	1.00000131	1.00178758	
TMXD°	°C	3.16425280	6.40000000	4.00000000	3.40511534	
FRZP°	°C	-2.6285633	-5.1463670	0.00000000	-3.0838835	
CalVal	kCal/100 ml	44.9440304	70.7000000	0.00000000	51.3648026	
Energy	kJ/100 ml	186.317480	293.090000	0.00000000	212.935077	
BOD%	mg/liter	117.976358	184.847456	0.00000000	134.912457	
hl beer	hl	1000	100	-88,4437	1011.47890	⦿ Variable
Color					0.00000000	
Bitterness					0.00000000	
kgBeer	kg	100346.004	9827.08434	-8844.3875	101328.700	
kgOE	kg	12041.5258	1835.05803	0.00000000	13846.3610	
kgER	kg	3010.38012	0.00000000	0.00000000	3010.38012	
kgAlcohol	kg	4658.78400	982.708434	0.00000000	5641.49244	
kgBOD5	kg	11797.6358	1848.47456	0.00000000	13646.1104	
Calculate		Delete	Delete	Delete	New col	Decimals

EXERCISE 17

Check the quality of interpolation in the applied Alcohol Table.

The Scandinavian Beer Calculator calculates SGA from A%mas by looking-up
the value in a special version of the "OIML-EBC- Table".

A section of this table is as follows:

A%mas :	5.67	5.68	5.69	5.70	5.71
SGA:	0.99007233	0.99005643	0.99004054	0.99002467	0.99000880

The table has only 2 decimals for A%mas. The interpolation should do up for further decimals.
To check the quality of this interpolation we will enter ER%mas = 0 and the following series of A%mas
values stepping up constantly with 0.003:
5.673 – 5.676 – 5.679 – 5.682 – 5.685

The figures on the screen are presented in an Excel spreadsheet, when **"Export to Excel"** is chosen in the
Main menu. The less interesting part of the spread sheet is eliminated, and the stepping-down values for
SGA are calculated:

	A	B	C	D	E	F	G
1							
2	OE%P	%P	11.05	11.06	11.07	11.07	11.08
3	ER%	%P	0	0	0	0	0
4	A%mas	g/100g	5.6730	5.6760	5.6790	5.6820	5.6850
5							
6	SGA		0.990067566	0.990062795	0.990058024	0.990053256	0.990048490
7	SGE		1.00000	1.00000	1.00000	1.00000	1.00000
8	SGBeer		0.990	0.990	0.990	0.990	0.990
9							
10	Stepping down in SGA:			-0.000004771	-0.000004771	-0.000004768	-0.000004766

As seen above, **fairly uniform steps for SGA** have been calculated. This indicates a satisfactory quality of
interpolation.

<div align="center">-End of 17 Exercises-</div>