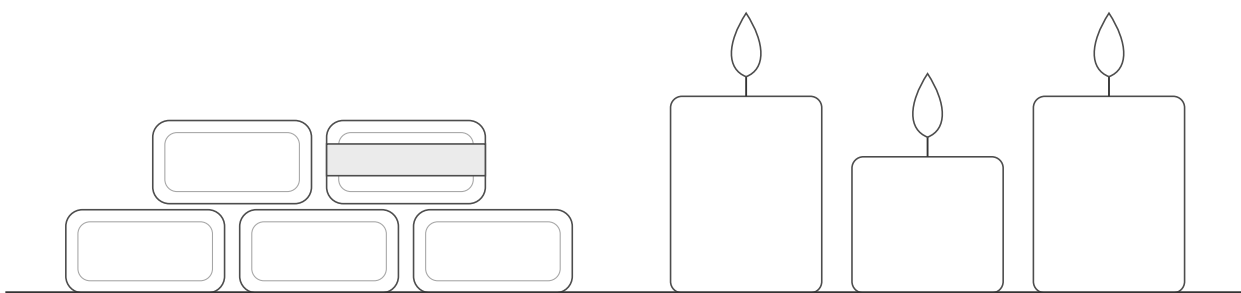


CRAFT & STUDIO • BOOK 2

Vegan Soap & Candle Math

**Lye, Scent, Wicks, Cost and Profit, Worked Out Step by Step
— Palm-Free Soap and Plant-Wax Candles for Gifts,
Markets and a Small Home Business**



Weigh it, work it out, price it fairly.

SIZU RIATTO

How to use these sheets

Print as many copies as you like, one set for each batch, and keep the book away from the lye and the wax. **Template A** is the shopping list: what one batch needs, the pack you buy, and how many batches each pack covers. **Template B** is the make-day plan: the test burn, the two make days, and the cure log. **Template C** is the batch sheet: the recipe, the lye worked oil by oil, the water, the scent, the cut, and the candle run. **Template D** is the pricing sheet: cost per unit, price, markup and margin, and the break-even count.

Each sheet is explained, with the book's own Market Batch worked in full, in the chapters: the mold and recipe in Chapter 2, the lye in Chapter 3, the water in Chapter 4, the scent in Chapter 6, the cure in Chapter 7, the candles in Chapters 8 to 10, the costs in Chapter 11, the prices in Chapter 12, and the plan in Chapter 13. The calculators at **mathworkbook.netlify.app/calculators** do the same arithmetic with your numbers.

These are planning sheets, not a safety assessment. Check every lye number in a lye calculator before you weigh, and follow the suppliers' data sheets and the rules where you sell.

Quick Reference

Two pages to photocopy and pin up by the scale.

■ QUICK REFERENCE

The Rules of Thumb, chapter by chapter

- 1.** The mold's water (g) = base (g). Melt 5 % more; scent within the supplier's maximum.
- 2.** Oils (g) = **0.70 × mold mL** (oz = **0.40 × in³**). Each oil = its % × oils; percents add to 100.
- 3.** Lye oil by oil. SAP charts are KOH unless they say NaOH. **5 %** superfat. Know your lye's purity.
- 4.** **33 %** lye concentration (28 % coconut-heavy, 40 % slow olive). Water outweighs lye.
- 5.** Quality = Σ (share × oil's number). Cleansing first; linoleic + linolenic about **15 %** at most.
- 6.** Say "of what": certificates use % of the soap; the lower number wins; allergens **0.01 %**.
- 7.** Bar = loaf ÷ bars. Plan **12 %** cure loss, then weigh; label the lightest, rounded down twice.
- 8.** Wax (g) = mL to the fill line × **0.887**, never from the brim. Keep about 3.6 % to top up.
- 9.** Write "% of wax" or "% of the candle". Weigh it. The lowest of the limits wins.
- 10.** Wick chart first, smaller size first. Four burns; pool within 6 mm of the glass by hour 3 or 4.
- 11.** Price per gram, then grams. Count every box and label, the kit once, and your minutes.
- 12.** Price from the market down, check from the cost up. Say markup or margin; keystone is a check.

QUICK REFERENCE

The formulas

Lye. $\text{NaOH} = \Sigma (\text{oil g} \times \text{SAP as NaOH}) \times (1 - \text{superfat})$; $\text{SAP as NaOH} = \text{KOH}$
 $\text{SAP} \div 1,000 \div 1.4025$. **Check it in a lye calculator before you weigh.** True
 superfat = $1 - (\text{lye} \times \text{purity} \div \text{lye at } 0 \%)$.

Water. $\text{Water} = \text{lye} \times (100 - \text{concentration}) \div \text{concentration}$ (at 33 %, **2.03 × lye**).
 Ratio = $\text{water} \div \text{lye}$.

Batch. Oils + lye + water + scent; batter about **1.02 g per mL**. Cured bar $\approx$
 wet bar $\times (1 - \text{cure loss})$.

Wax. $\text{Jar mL} = \pi \times r^2 \times h \text{ (mm)} \div 1,000$. Wax per jar = $\text{mL} \times 0.887$ (set wax
 about 0.92). Wax = $\text{fill} \div (1 + \text{load})$; content = $\text{load} \div (1 + \text{load})$.

Burn. Rate = $\text{weight lost} \div \text{hours}$. Time = $(\text{fill} - \text{wax left at } 13 \text{ mm}) \div \text{rate}$,
 rounded down. First burn: 1 hour per inch.

Cost. Price per gram = $\text{pack price} \div \text{pack grams}$. Unit cost = $\Sigma (\text{g} \times \text{price per g}) \div$
 $\text{units} + \text{pieces} + \text{minutes} \times \text{rate} \div 60$.

Price. Markup = $\text{profit} \div \text{cost}$; margin = $\text{profit} \div \text{price} = \text{markup} \div (1 +$
 markup). Keystone: $\text{cost to make} \times 2 \times 2$.

Break-even. Units = $\text{fixed costs} \div (\text{price} - \text{variable cost})$, **rounded up**.

QUICK REFERENCE

Safety, every time

Lye. Goggles, long gloves, long sleeves; children and pets out. **Lye into wa-**
ter, never water onto lye. Polypropylene (#5) or HDPE (#2), stainless steel,
never aluminum. A splash: running water for at least 15 minutes, then help;
 never vinegar.

Wax and candles. Never leave melting wax or a burning candle unattended.
 Wax fire: **lid on, heat off, never water.** Burns of 4 hours at most; out at 13
 mm (½ in) of wax.

Stop. Selling soap in the UK or EU, any claim beyond "soap", the word "or-
 ganic", an untested candle: Chapter 12 first.

Template A — The Shopping List

A clean printable copy is at mathworkbook.netlify.app/go/soap-shopping-list.

Batch: _____ Bars and candles: _____

Supplier: _____ Date of prices: _____

Ask every supplier, in writing, whether each item is vegan and palm-free, and keep the reply with this sheet.

Kit, bought once

Kit	Have it?	Price	Notes
Splash goggles and long gloves			
Lye jug, polypropylene (5) or HDPE (2), never aluminum			
Scale, 0.1 g (lye, scent)			
Scale, 1 g (oils, wax)			
Thermometer			
Stick blender			
Soap mold			
Double boiler or pouring pitcher			
Cure rack			
Total			

The batch

What	One batch needs	Pack to buy	Pack price	Batches per pack	Vegan, palm-free?
Melt-and-pour base					
Oil 1					
Oil 2					
Oil 3					
Oil 4					
Oil 5					
Sodium hydroxide (lye)					
Distilled water					
Essential oil (soap)					
Color or additives					
Candle wax, with spare					
Fragrance oil (candles)					
Wicks, plus test jars					
Jars (and lids), plus test jars					
Warning labels					
Soap boxes or bands					
Product labels					
Shipping					
Total					

Batches per pack = what the pack holds ÷ what one batch needs. The packs that run out first (wax, fragrance, base) go on every list; the oils and the lye, rarely.

Template B — The Make-Day Plan

A clean printable copy is at mathworkbook.netlify.app/go/soap-make-day-plan.

Market date: _____ Cure ends (6 weeks after Day 1): _____

Time your first loaf and your first candle run, and put your own minutes in place of the book's.

The week before: the test jars

Date	Job	Time	Done / notes
	Pour two test jars: same jar, wax, fragrance, load and wick		
	Wait 48 hours before the first burn		
	Test burns, 4 hours each, within sight: weigh before and after		
	Wick passed after four burns, or change size and start again		

Day 1: soap

Before the lid comes off the lye: goggles, gloves, long sleeves; children and pets out; running water in reach; the lye **checked in a lye calculator** (Template C).

Time	Job	Minutes	Done / notes
	Lye into the water, slowly, stirring; set it aside to cool		
	Weigh the oils, taring between each; melt the butters		
	Weigh the essential oil		
	Mix to trace; add the scent; pour; label the mold		
	Melt-and-pour guest soaps		
	Clean up; lye locked away		

Day 2: cut, and candles

Never leave melting wax unattended. A lid within reach: a wax fire means lid on, heat off, never water.

Time	Job	Minutes	Done / notes
	Unmold, weigh the loaf, cut the bars, onto the rack		
	Melt the wax in a double boiler, with a thermometer		
	Add fragrance at the data sheet's temperature; stir		
	Pour at the data sheet's temperature; wicks centered		
	Top-up pour as the wax sets		
	Trim wicks; warning labels on		

The cure log

Weigh the same three bars each week, on the same scale. Label the **lightest** bar, rounded down (Chapter 7).

Vegan Soap & Candle Math

Week	Date	Bar 1 (g)	Bar 2 (g)	Bar 3 (g)	Loss %
0 (cut)					0
1					
2					
3					
4					
5					
6					

Loss % = (week 0 weight – this week's weight) ÷ week 0 weight × 100.

Label weight, rounded down: _____g _____oz

Market day

Job	Done	Notes
Bars weighed, labeled, boxed		
Candles labeled: weight, burn time, warning		
Price cards (Template D)		
Cash box and change; insurance papers		
Tally: what sold, what didn't		

Template C — The Batch Sheet

A clean printable copy is at mathworkbook.netlify.app/go/soap-batch-sheet.

Recipe: _____ Batch number: _____ Date made: _____

The mold

Step	The book's loaf	Yours
Inside length × width × height (mm)	254 × 85.7 × 63.5	
Volume (mL) = L × W × H ÷ 1,000, or the water fill (g)	1,383	
Oils by the rule: 0.70 × mL	968	
Oils you will use (g), rounded down	960	

The oils and the lye

SAP values from a source you name (the book uses SoapCalc's data, cross-checked against From Nature With Love). For each oil: NaOH at 0 % = grams × SAP ÷ 1,000 ÷ 1.4025 when the SAP is in KOH.

Oil	% of oils	Grams	SAP, and its source	NaOH at 0% (g)	Weighed (g)
Total	100				

Lye	The book's loaf	Yours
NaOH at 0 % superfat (total of the column above)	139.6 g	
Superfat	5 %	
Lye to weigh = NaOH at 0 % $\times$ (1 – superfat)	132.6 g	
Lye purity, from your lye's spec sheet	98 %	
True superfat = 1 – (lye $\times$ purity $\div$ NaOH at 0 %)	6.9 %	

Checked in a lye calculator before I weighed. Every batch, every time.

Checked: yes / no	Which calculator	Date	Its lye (g)	Mine (g)
yes / no				

More than about a gram apart? Do not weigh: stop and find the line that is wrong (Chapter 3).

The water

Water	The book's loaf	Yours
Lye concentration (28 to 40 %)	33 %	
Water = lye $\times$ (100 – concentration) $\div$ concentration	269.2 g	
The same as % of oils, and as a water : lye ratio	28 %, 2.03	

Lye into water, never water onto lye. Goggles, gloves, long sleeves; children and pets out.

Scent, color and the label check

Scent	The book's loaf	Yours
Essential or fragrance oil, and its rate (% of oils)	lavender, 3 %	
Grams = rate × oils	28.8 g	
As % of the finished soap = grams ÷ batch × 100	2.1 %	
Certificate maximum, IFRA Category 9 (the lower wins)	from your certificate	
Allergens above 0.01 % of the bar (UK and EU)	from the SDS	
Color or additives, and grams		

The batch and the bars

Batch	The book's loaf	Yours
Batch = oils + lye + water + scent	1,390.6 g	
Batter volume = batch ÷ 1.02 (does it fit the mold?)	1,363 mL	
Loaf weighed before cutting		
Bars, and slice thickness	10, 25.4 mm	
Bar weight = loaf ÷ bars	139.1 g	
Planned cure loss, then weighed (Template B)	12 %	
Label weight, rounded down	120 g (4.2 oz)	

The candle run

Candles	The book's jars	Yours
Jar: inside diameter and fill depth	70 mm, 72 mm	
Fill volume = $\pi \times r^2 \times \text{depth} \div 1,000$, or water to the line	277.1 mL	
Fill weight = volume $\times$ 0.887	245.8 g	
Fragrance load (% of wax)	8 %	
Wax = fill $\div$ (1 + load); fragrance = fill – wax	227.6 g, 18.2 g	
Jars, plus spare; wax and fragrance for the run	12, 5 %	
Wick, from the maker's chart (then tested)	CD-12	

The test-burn log

Never leave a burning candle unattended. Burns of 4 hours; the pool should reach within 6 mm of the glass by hour 3 or 4.

Burn	Hours	Before (g)	After (g)	Pool width	Flame	Notes
1						
2						
3						
4						

Burn rate = weight lost $\div$ hours: _____g an hour Burnable wax = fill – wax left at 13 mm: _____g

Burn time = burnable $\div$ rate, rounded down: _____hours (The book's example: 6.5 g an hour, about 30 hours.)

Template D — The Pricing Sheet

A clean printable copy is at mathworkbook.netlify.app/go/soap-pricing-sheet.

Product: _____ Units per batch: _____ Date of prices: _____

Every price is yours: write down what you paid, with shipping.

Cost per unit: the ingredients

Price per gram = pack price ÷ grams in the pack. Cost per unit = grams per batch × price per gram ÷ units per batch.

Ingredient	Pack price	Grams in pack	Price per gram	Grams per batch	Cost per batch
Total, one batch					

Cost per unit: the rest

Line	The book's bar / candle	Yours
Ingredients ÷ units per batch	1.46 / 2.70	
Box, band, jar, lid	0.32 / 0.90	
Wick, warning label	— / 0.16	
Product label	0.10 / 0.10	
Materials per unit	1.88 / 3.86	
Your time: minutes per batch × your rate ÷ 60 ÷ units	3.00 / 4.17	
Cost to make per unit	4.88 / 8.02	

The price

Check	The book's bar	Yours
What the stalls around you charge (the market's ceiling)		
Keystone check: cost to make × 2 × 2	19.52	
Your price	9	
Fees per unit (stall share, platform, payment)		
Profit over materials = price – materials	7.12	
Markup = profit ÷ cost	378.7 %	
Margin = profit ÷ price	79.1 %	
Profit over cost to make, and its margin	4.12, 45.8 %	

Say which you mean: a markup and a margin on the same profit are never the same number.

Fixed costs for a year

Fixed cost	The book's year	Yours
Insurance	550.00	
Stall fees (days × fee)	360.00	
Kit: molds, scales, thermometer, safety gear	134.60	
Stick blender	30.00	
Other: website, fees, sample batches		
Fixed costs	1,074.60	

Break-even

Break-even units = fixed costs ÷ (price – variable cost per unit), **rounded up**.

Break-even	The book's	Yours
Bars alone: fixed ÷ (bar price – bar materials)	151 bars	
Candles alone: fixed ÷ (candle price – candle materials)	60 candles	
Batches: fixed ÷ (one batch's takings – its materials)	4 batches	

Before you print a price or a word on a label, read Chapter 12's Stop Line: what you say a product does can change what it is in law.