

DESSERT ISLE UNIT ANALYSIS

Stranded Standards for Coconauts

Mr. Merrick

On the fabled *Dessert Isle*, shipwrecked scientist pirates standardized measurement using whatever they had: coconuts, bananas, ropes, hammocks, and drumbeats. These **Dessert Units** are *made up but internally consistent*. Your job is to apply unit analysis to convert between Dessert Units and familiar SI/US units, and to chain conversions through density, energy, power, and time. Keep the **Master Table** and the **Data Box** open while you work.

MASTER TABLE

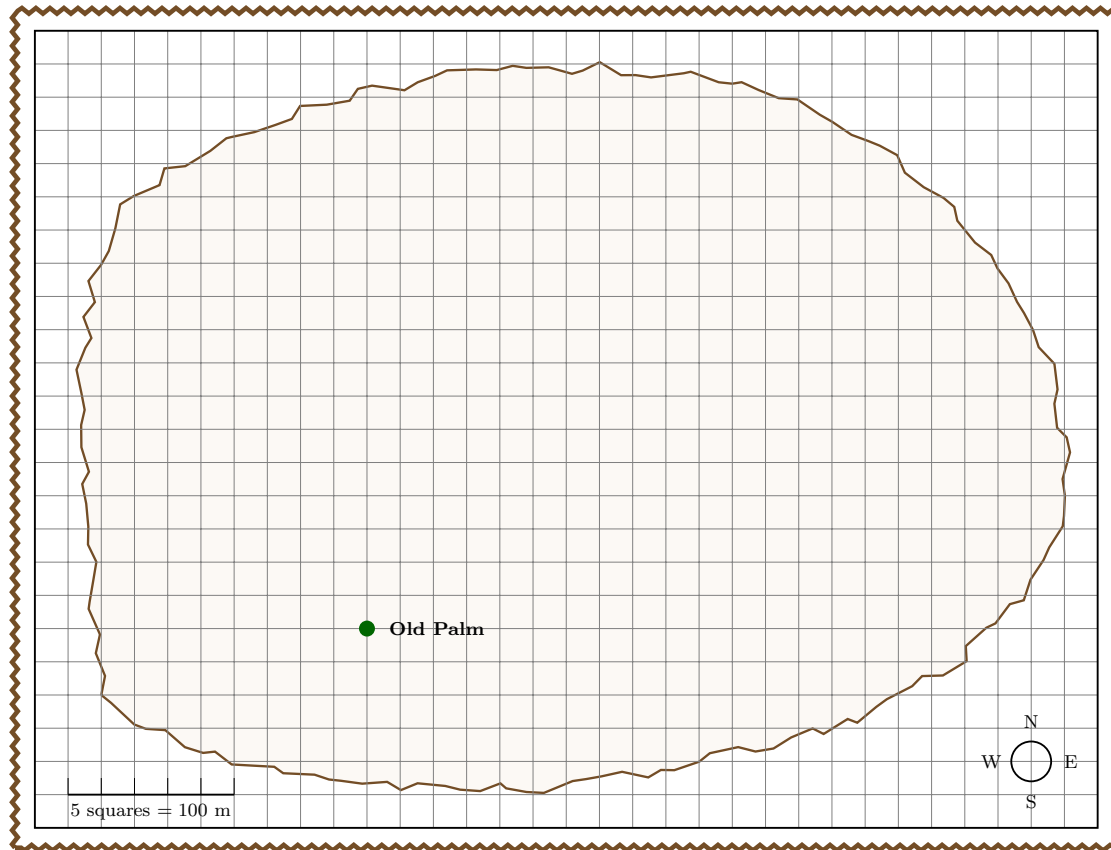
Quantity	Dessert Unit (symbol)	Equivalence (exact unless noted)
<i>Length</i>		
Banana (ba)	1 ba	= 0.20 m
Palm (pl)	1 pl	= 0.50 m
Coconut rope (crp)	1 crp	= 2.00 m
Island mile (imi)	1 imi	= 800 m
<i>Area</i>		
Hammock (hmk)	1 hmk	= 2.0 m ²
Sandpatch (spd)	1 spd	= 1.5 m ²
Leaf-mat (lmt)	1 lmt	= 0.50 m ²
<i>Volume</i>		
Coconut shell (csh)	1 csh	= 0.60 L
Gourd (grd)	1 grd	= 2.4 L = 4 csh
Island barrel (ibr)	1 ibr	= 25 L ≈ 6.58 US gal
<i>Mass</i>		
Coconut (cn)	1 cn	= 1.40 kg
Mango (mgo)	1 mgo	= 0.35 kg = 350 g
Crab (crb)	1 crb	= 0.12 kg
Stone (stn)	1 stn	= 2.50 kg
<i>Time</i>		
Drumbeat (db)	1 db	= 0.75 s
Sunset (sst)	1 sst	= 12 min = 720 s
Nap (np)	1 np	= 20 min
Tide (td)	1 td	= 5 h = 300 min
<i>Derived / Reference</i>		
Scurry (scy)	1 scy	= (1 pl)/(1 db) = $\frac{0.50 \text{ m}}{0.75 \text{ s}}$ = 0.667 m/s
Firechip (fch)	1 fch	= 1.00 MJ = 10 ⁶ J
Torch (trc)	1 trc	= 50 W = 50 J/s
Coco-milk density	ρ_{cmilk}	= 1050 kg/m ³ (use when cited)
Dry wood energy (ref)	e_{wood}	≈ 16 MJ/kg (use when cited)

Dessert Isle Data Box: Quick Equivalences

1 L = 1000 mL = 1000 cm³; 1 m³ = 1000 L
 1 in = 2.54 cm; 1 ft = 0.3048 m; 1 mi = 1609 m
 1 US gal = 3.785 L; 1 lb = 0.4536 kg
 1 kWh = 3.6 × 10⁶ J; 1 BTU ≈ 1055.06 J

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Captain Pi-rate Gaussbeard has left movement instructions. Convert each instruction to *squares*. Mark the treasure with an ✕.



1. From the **Old Palm**, walk **260 pl** straight **north**.
 2. Then go **300 ba** **east**.
 3. Next, head **40 crp** toward the **northeast** at 45° .
 4. Travel **0.08 imi** **south**.
 5. Go **100 ba** **west**.
 6. Move **east** at **25 crp/min** for **60 s**.
 7. Go **north** for **0.08 sst** at **1.4 scy**.
 8. Head **30 crp** toward the **southwest** at 45° .
 9. For **180 db** at **1.3 scy**, move **east**.
 10. Finally, advance **22 crp** toward the **northeast** at 45° .
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Practice — Dessert Isle Conversions

Use only the Master Table and the Data Box. Show unit cancellation at every step.

1. **Banana highway.** The beach loop is 1.75 imi. Express its length in palms (pl) and in bananas (ba).
2. **Hammock zoning with conversion.** A rectangular lot is 18 pl by 35 ba. Compute its area in m^2 , hmk, and ft^2 .
3. **Coco-milk mass from volume.** A keg holds 12 grd of coco-milk. Using ρ_{cmilk} , find the mass in kg and in mangos (mgo).
4. **Flow over a tide.** A still produces 4.2 ibr every tide. Report the average flow in L/s and in US gal/min.

5. **Pace to mph.** A runner holds 2.0 scy for one sunset (sst). Give the distance in meters and the average speed in mph.
6. **Fire to light (energy chain).** The beacon runs at 3.5 trc for 1.5 td. How many firechips (fch), kWh, and BTU is that?
7. **Wood-to-heat estimate.** If dry wood has $e_{\text{wood}} \approx 16$ MJ/kg, how many kilograms of wood are equivalent to 18 fch? Also report in pounds.
8. **Raft displacement (density + geometry).** A rectangular raft is 40 pl long and 60 ba wide. It sits so that an average of 1.5 lmt of underside area per meter of length is in contact with water. Approximate the displaced water volume if the draft is 0.12 m. (Answer in L.)
9. **Market basket (mixed units).** A trader brings 18 crb, 12 mgo, and 6 cn. Find the total mass in kg and in stones (stn).

10. **Lagoon in bananas (two ways).** A lagoon is labelled 0.62 imi. Compute its length in bananas (ba) using (i) direct conversion, and (ii) via meters then bananas.
11. **From barrels to pace.** A drip system delivers 0.85 ibr per nap. How many csh per minute is that? Then, if each person drinks 3 csh per sunset, how many people can you serve continuously?
12. **Energy to distance.** A cart (plus rider) of 95 kg rolls with negligible loss. If the cook burns 9.0 fch running a 2.0 trc motor for acceleration, and the cart reaches a steady 2.5 scy and maintains it for one tide, estimate the total mechanical energy used by the motor (J), then *if* all of it became kinetic energy initially, what speed (m/s) would that imply (compare to 2.5 scy)?