GRADE 7 ACCELERATED · UNIT 5

Reference Sheet

Multi-Step Proportional Relationships — keep this in your binder

Name_____
Date_____
Period_____

The conversion ratios on this page are printed exactly as the FAST reference sheet prints them (the grade 7 and grade 8 sheets carry the same lines), and the FAST gives you that sheet. On this unit's test you will not have it — every conversion item prints the ratio it needs. The rules around the ratios are the unit's own, and they are tested from memory.

1. Scale Drawings and Scale Factors

Lessons 5.01–5.04 · k is one number, and every length gets it

The scale factor k is copy ÷ original. Every corresponding length is multiplied by the same k. A copy that is smaller has k less than 1: a 10 cm side that becomes 4 cm has k = 0.4, not 2.5. Angles are not lengths and do not change.

What	Multiply by	Why
a length	k	that is what k is
the perimeter	k	a sum of lengths
the area	k^2	two lengths multiplied, so k is used twice
an angle	nothing	an angle is not a length

From two areas back to k: a square root. Areas 20 and 180 give 180 ÷ 20 = 9 = k^2, so k = 3. Every area ratio on this test is a perfect square.

A scale with two units is a rate — write it per 1 unit of drawing first. ¼ in : 1 ft is 1 in : 4 ft. Then drawing × rate = real, and real ÷ rate = drawing.

Area from a plan: real dimensions first. A room 1.5 in by 2 in at 1 in : 6 ft is 9 ft by 12 ft, 108 ft^2 — never 3 in^2 × 6. The rate is used twice for an area, which is k^2 again. (With one unit, 1 in : 6 ft is 1 : 72, and 72 is the scale factor.)

2. The Conversion Ratios (the FAST reference sheet's)

Lessons 5.06–5.09 · never memorized, always printed

Customary → Metric	Metric → Customary	Inside one system
1 in = 2.54 cm	1 cm = 0.39 in	1 ft = 12 in · 1 yd = 3 ft
1 ft = 0.305 m	1 m = 3.28 ft	1 mi = 5,280 ft · 1 mi = 1,760 yd
1 mi = 1.61 km	1 km = 0.62 mi	1 c = 8 fl oz · 1 pt = 2 c
1 c = 0.24 L	1 L = 4.23 c	1 qt = 2 pt · 1 gal = 4 qt
1 gal = 3.785 L	1 L = 0.264 gal	1 lb = 16 oz · 1 ton = 2,000 lb
1 oz = 28.35 g	1 g = 0.0352 oz	1 m = 100 cm · 1 m = 1,000 mm · 1 km = 1,000 m
1 lb = 0.454 kg	1 kg = 2.204 lb	1 L = 1,000 mL · 1 kg = 1,000 g · 1 g = 1,000 mg

A conversion ratio is a form of 1. 2.54 cm over 1 in equals 1 — the same length in two units — so multiplying by it changes the unit and not the amount. Pick the ratio whose 1 is the unit you HAVE, so that unit cancels.

Estimate first. A centimeter is shorter than an inch, so 50 cm is fewer than 50 inches: 19.5, never 127. The estimate is what catches the ratio the wrong way round.

Both directions are on the sheet, and both are accepted. 50 cm × 0.39 = 19.5 in and 50 ÷ 2.54 = 19.7 in are both the sheet's answer. Show which ratio you used.

Some paths take two steps. Yards to centimeters goes through feet and inches. Fluid ounces to liters go through cups (8 fl oz = 1 c, 1 c = 0.24 L) — there is no fluid-ounce-to-milliliter line on the sheet. An ounce (weight) and a fluid ounce (volume) are two different units.

3. Square Units, Cubic Units, Money

Lessons 5.07 and 9 · the ratio once, twice, three times

Unit	The length ratio is used	Example
length (ft → in)	once	3 ft = 36 in
area (ft^2 → in^2)	twice: $12^2 = 144$	3 ft^2 = 432 in^2
volume (ft^3 → in^3)	three times: $12^3 = 1{,}728$	2 ft^3 = 3,456 in^3
area (m^2 → cm^2)	twice: $100^2 = 10{,}000$	1 m^2 = 10,000 cm^2, not 100
area (ft^2 → m^2)	twice: $0.305^2 = 0.093$	20 ft^2 = 1.86 m^2 — the sheet's length ratio, squared

Money converts like length, but the rate is on the problem, not the sheet. An exchange rate changes daily, so it is printed and dated on the item. Dollars to euros at 0.92: multiply. Euros back to dollars: divide.

4. Multi-Step Problems

Lessons 5.10–5.11 · one rate, used again; same unit first

A multi-step problem is one unit rate used more than once — name what each step finds. 23 mi per gallon × 17.5 gal = 402.5 mi per tank; 1,207 mi ÷ 402.5 = 2.998, so 3 tanks. A part of a tank is still a tank the trip uses — the paper says so when it asks.

Two rates in different units cannot be compared until they are in one unit. 100 km/h × 0.62 = 62 mi/h, so 65 mi/h is faster even though 100 is the bigger number. Convert first; the answer is a sentence with both speeds in the same unit.

A recipe scales by k = new yield ÷ old yield, and k multiplies every ingredient. Then answer the question that was asked: what is on hand ÷ the recipe's amount gives how many recipes, and that × the yield gives servings.

A part-to-whole mixture: k from the part you know, then the whole. Paint 2 : 4 : 5 with 8 gal of white has k = 4 and 11 parts, so 44 gal.

5. Vocabulary

scale factor (k) — the one number every length of a figure is multiplied by to make its scale copy; copy ÷ original

scale drawing — a drawing whose lengths are all the real lengths × one scale factor

corresponding sides — a side of the original and the side of the copy that matches it

scale (two units) — a ratio such as $\frac{1}{4}\,\text{in} : 1\,\text{ft}$ — a drawing length and the real length it stands for; read it per 1 unit of drawing

conversion ratio — a pair of equal measures, such as $1\,\text{in} = 2.54\,\text{cm}$, written as a fraction that equals 1

customary / metric — the inch–mile–pound–gallon system; the centimeter–kilometer–kilogram–liter system

exchange rate — how much of one currency one unit of another buys; set by someone, printed on the problem

fluid ounce — a volume ($8\,\text{fl oz} = 1\,\text{c}$); the ounce on a scale is a weight ($16\,\text{oz} = 1\,\text{lb}$) — two units that share a word

square units / cubic units — an area, which uses the length ratio twice; a volume, which uses it three times

unit rate — how much of one quantity per 1 of the other — 23 miles per gallon

proportional — two quantities whose ratio stays the same: double one and the other doubles