GRADE 7 ACCELERATED · UNIT 5 · LESSONS 8–9

Converting Mass, Area and Volume

MA.7.AR.3.3

I can convert mass, volume and area between systems, and square the length ratio for area.

Warm-Up

1. $1\text{ in} = 2.54\text{ cm}$. How many centimeters is 12 in?
2. A figure of area 7 cm^2 is scaled by $k = 3$. The copy's area?
3. Find the product: -2.5×4
4. $1\text{ ft} = 12\text{ in}$. A 1-ft square has what area in square inches?

Warm-Up

1. $1\text{ in} = 2.54\text{ cm}$. How many centimeters is 12 in? **30.48 cm**
2. A figure of area 7 cm^2 is scaled by $k = 3$. The copy's area?

   63 cm²
3. Find the product: -2.5×4 **–10**
4. $1\text{ ft} = 12\text{ in}$. A 1-ft square has what area in square inches?

   144 in²

Vocabulary

mass and weight

pounds and kilograms — one word on this test

ounce (oz)

a weight: $1\text{ lb} = 16\text{ oz}$, $1\text{ oz} = 28.35\text{ g}$

fluid ounce (fl oz)

a volume: $1\text{ c} = 8\text{ fl oz}$ — not the same unit as the ounce

square units

ft^2, cm^2, m^2 — an area; the length ratio is used twice

cubic units

ft^3, in^3 — a volume; the length ratio is used three times

Notes

I. Mass and volume: the same move as length

Find the sheet's ratio whose 1 is the unit you have — a form of 1, like 1 in = 2.54 cm.

Estimate first (a kilogram is heavier than a pound: fewer kilograms), then multiply by the ratio.

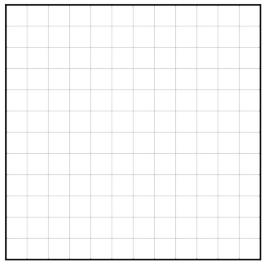
$$1\ \text{lb} = 0.454\ \text{kg}: \quad 50\ \text{lb} \times 0.454 = 22.7\ \text{kg}$$

$$1\ \text{gal} = 3.785\ \text{L}: \quad 2\ \text{gal} \times 3.785 = 7.57\ \text{L}$$

Notes

II. Area: square units, square the ratio

1 ft = 12 in, but a square foot is a 12 in by 12 in square: 144 in², not 12. Area is two lengths, so the length ratio is used twice — square it.



1 ft² is 12 in by 12 in: 144 in²

$$1\ \text{ft}^2 = 12 \times 12 = 144\ \text{in}^2 \qquad 3\ \text{ft}^2 = 3 \times 144 = 432\ \text{in}^2$$

$$1\ \text{ft} = 0.305\ \text{m}, \text{ so } 1\ \text{ft}^2 = 0.305 \times 0.305 \approx 0.093\ \text{m}^2$$

Notes

III. Fluid ounces go through cups

The sheet has no line from fluid ounces to liters — only 1 c = 8 fl oz and 1 c = 0.24 L. So go in two steps: fluid ounces → cups → liters.

A fluid ounce measures volume (a drink); the ounce on a scale measures weight. Two different units.

$$12 \text{ fl oz} \div 8 = 1.5 \text{ c} \qquad 1.5 \text{ c} \times 0.24 = 0.36 \text{ L}$$

Length: the ratio once. Area: twice. Volume: three times.

Example 1

1 lb = 0.454 kg. A suitcase weighs 70 lb.

How many kilograms is that?

Example 1

$$70 \times 0.454 = 31.78$$

Answer: 31.78 kg

Your Turn

1 lb = 0.454 kg. A crate weighs 90 lb.

How many kilograms is that?

Your Turn

1 lb = 0.454 kg. A crate weighs 90 lb.

How many kilograms is that?

$$90 \times 0.454 = 40.86$$

Answer: 40.86 kg (about 40.9)

Example 2

$1\text{ ft} = 12\text{ in}$. A tile is 5 ft^2 in area.

How many square inches is that?

Example 2

$1\ ft^2 = 12^2 = 144\ in^2$

$5 \times 144 = 720$

Answer: 720 in^2

Your Turn

$1\,\text{yd} = 3\,\text{ft}$. A patio is $5\,\text{yd}^2$ in area.

How many square feet is that?

Your Turn

1 yd = 3 ft. A patio is $5\ \text{yd}^2$ in area.

How many square feet is that?

$3^2 = 9\ \text{ft}^2$ in a square yard

$5 \times 9 = 45$

Answer: 45 ft²

Whiteboards · Question 1 of 9

1 kg = 2.204 lb. A bag of rice is 10 kg.

How many pounds is that?

Answer it.

Whiteboards · Question 1 of 9

1 kg = 2.204 lb. A bag of rice is 10 kg.

How many pounds is that?

$$10 \times 2.204 = 22.04$$

Answer: 22.04 lb

Whiteboards · Question 2 of 9

1 gal = 3.785 L. A cooler holds 4 gal.

How many liters is that?

Answer it.

Whiteboards · Question 2 of 9

1 gal = 3.785 L. A cooler holds 4 gal.

How many liters is that?

$$4 \times 3.785 = 15.14$$

Answer: 15.14 L

Whiteboards · Question 3 of 9

1 L = 0.264 gal. A tank holds 10 L.

How many gallons is that?

Answer it.

Whiteboards · Question 3 of 9

1 L = 0.264 gal. A tank holds 10 L.

How many gallons is that?

$$10 \times 0.264 = 2.64$$

Answer: 2.64 gal

Whiteboards · Question 4 of 9

$1\,\text{yd} = 3\,\text{ft}$.

A patch of lawn is $2\,\text{yd}^2$ in area.

How many square feet is that?

A. $12\ \text{ft}^2$

B. $18\ \text{ft}^2$

C. $9\ \text{ft}^2$

D. $6\ \text{ft}^2$

Answer it.

Whiteboards · Question 4 of 9

$1\text{ yd} = 3\text{ ft}$.

A patch of lawn is 2 yd^2 in area.

How many square feet is that?

$3^2 = 9\text{ ft}^2$ in a square yard

$2 \times 9 = 18$

Answer: B — 18 ft²

Whiteboards · Question 5 of 9

$1\text{ c} = 8\text{ fl oz}$ and $1\text{ c} = 0.24\text{ L}$.

A bottle holds 16 fl oz.

How many liters is that?

Answer it.

Whiteboards · Question 5 of 9

$1\text{ c} = 8\text{ fl oz}$ and $1\text{ c} = 0.24\text{ L}$.

A bottle holds 16 fl oz.

How many liters is that?

$$16 \div 8 = 2\text{ c}$$

$$2 \times 0.24 = 0.48$$

Answer: 0.48 L

Whiteboards · Question 6 of 9

$1\,\text{m} = 100\,\text{cm}$.

How many square centimeters is $1\,\text{m}^2$?

A. 1,000

B. 200

C. 10,000

D. 100

Answer it.

Whiteboards · Question 6 of 9

$1\text{ m} = 100\text{ cm}$.

How many square centimeters is 1 m^2?

$$100 \times 100 = 10{,}000$$

Answer: C — 10,000 cm²

Whiteboards · Question 7 of 9

$1\text{ kg} = 2.204\text{ lb}$.

A 5-lb bag of flour and a 2.5-kg bag of sugar.

Which is heavier, and by how much?

Answer it.

Whiteboards · Question 7 of 9

$1\text{ kg} = 2.204\text{ lb}$.

A 5-lb bag of flour and a 2.5-kg bag of sugar.

Which is heavier, and by how much?

$$2.5 \times 2.204 = 5.51\text{ lb}$$

$$5.51 - 5 = 0.51$$

Answer: The sugar, by 0.51 lb

Whiteboards · Question 8 of 9

$1\ \text{gal} = 3.785\ \text{L}$.

A 20-gal fish tank, bought for $45, is being filled.

How many liters does it hold?

Answer it.

Whiteboards · Question 8 of 9

$1\ \text{gal} = 3.785\ \text{L}$.

A 20-gal fish tank, bought for $45, is being filled.

How many liters does it hold?

$$20 \times 3.785 = 75.7$$

Answer: 75.7 L

Whiteboards · Question 9 of 9

$1\ \text{ft} = 12\ \text{in}.$

Priya says $2\ \text{ft}^3$ is $24\ \text{in}^3$, because $2 \times 12 = 24$.

Name the error and fix it.

Write your answer in sentences.

Whiteboards · Question 9 of 9

$1\text{ ft} = 12\text{ in.}$

Priya says 2 ft^3 is 24 in^3, because $2 \times 12 = 24$.

Name the error and fix it.

$$12^3 = 1{,}728 \qquad 2 \times 1{,}728 = 3{,}456$$

Answer: She used the ratio once. A cubic foot is 12 × 12 × 12 = 1,728 in³, so 2 ft³ = 3,456 in³.

Independent Set

1. $1\text{ lb} = 0.454\text{ kg}$. How many kilograms is 30 lb?
2. $1\text{ kg} = 2.204\text{ lb}$. How many pounds is 25 kg?
3. $1\text{ gal} = 3.785\text{ L}$. How many liters is 6 gal?
4. $1\text{ ft} = 12\text{ in}$. How many square inches is 9 ft^2?
5. $1\text{ c} = 8\text{ fl oz}$ and $1\text{ c} = 0.24\text{ L}$. How many liters is 24 fl oz?
6. $1\text{ ft} = 0.305\text{ m}$. How many square meters is 30 ft^2? (Round to two places.)

IXL

1. Open IXL and start today's skills.
2. Work on paper where the question needs work. The answer box does not show it.
3. Every skill listed is required, to a SmartScore of 67. Due by the Unit 5 test.

Today's skills — all required

Convert between customary and metric systems — E8Z
Compare and convert customary units — 4B8
Compare and convert metric units — HW2