

Algebra 1 · Units, Quantities and Modeling · Worksheet Answer Key

Common Core N-Q.A.1, N-Q.A.2, N-Q.A.3 · mathovore.fr

Every solution below shows the unit chain, so check that your units cancel the same way. Compare your numbers step by step, and review the lesson if a conversion factor was flipped or a rounded value was used too early.

Algebra 1 Common Core: N-Q.A.1 · N-Q.A.2 · N-Q.A.3

Problem 1: Miles to feet

Multiply by the factor that cancels miles: $5 \text{ mi} \times \frac{5280 \text{ ft}}{1 \text{ mi}} = 26,400 \text{ ft}.$

26,400 ft

Problem 2: Hours to seconds

$3.5 \text{ h} \times \frac{60 \text{ min}}{1 \text{ h}} \times \frac{60 \text{ s}}{1 \text{ min}} = 3.5 \times 3600 \text{ s} = 12,600 \text{ s}.$

12,600 s

Problem 3: Inches to yards

$72 \text{ in} \times \frac{1 \text{ yd}}{36 \text{ in}} = 2 \text{ yd}.$

2 yd

Problem 4: Miles per hour to feet per second

$45 \frac{\text{mi}}{\text{h}} \times \frac{5280 \text{ ft}}{1 \text{ mi}} \times \frac{1 \text{ h}}{3600 \text{ s}} = \frac{237,600 \text{ ft}}{3600 \text{ s}} = 66 \frac{\text{ft}}{\text{s}}.$



Hours cancel and seconds replace them.

66 ft/s

Problem 5: Gallons to cups

$$2.5 \text{ gal} \times \frac{4 \text{ qt}}{1 \text{ gal}} \times \frac{4 \text{ cups}}{1 \text{ qt}} = 2.5 \times 16 = 40 \text{ cups}.$$

40 cups

Problem 6: Units of a product

$$\frac{\$14}{1 \text{ h}} \times \frac{18 \text{ h}}{1 \text{ week}} \times 6 \text{ weeks: hours cancel and weeks cancel, leaving dollars.}$$

$$14 \times 18 \times 6 = 1512.$$

\$1,512

Problem 7: Cost per mile

$$\frac{\$3.50}{1 \text{ gal}} \times \frac{1 \text{ gal}}{28 \text{ mi}} = \frac{\$3.50}{28 \text{ mi}} = \$0.125 \text{ per mi}.$$

\$0.125 per mile (12.5 cents)

Problem 8: Weight of water

$$62.4 \frac{\text{lb}}{\text{ft}^3} \times 8 \text{ ft}^3 = 499.2 \text{ lb; cubic feet cancel.}$$

499.2 lb

Problem 9: Acres of a field

$$\text{Area: } 330 \times 330 = 108,900 \text{ ft}^2.$$

$$108,900 \text{ ft}^2 \times \frac{1 \text{ acre}}{43,560 \text{ ft}^2} = 2.5 \text{ acres}.$$

2.5 acres

Problem 10: Square feet to square yards

$$1 \text{ yd} = 3 \text{ ft, so } 1 \text{ yd}^2 = 9 \text{ ft}^2.$$

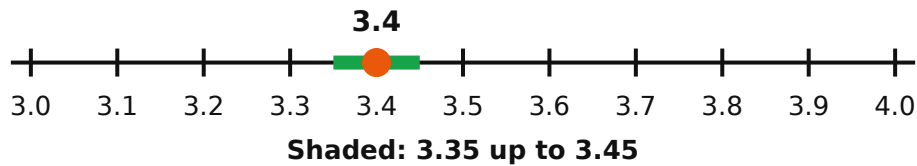
$$540 \text{ ft}^2 \times \frac{1 \text{ yd}^2}{9 \text{ ft}^2} = 60 \text{ yd}^2.$$

60 yd²

Problem 11: Reading a measurement

The ruler is accurate to the nearest tenth, so the true length is within half a tenth, 0.05 in, of 3.4.

$$3.4 - 0.05 \leq L < 3.4 + 0.05.$$



The shaded part of the number line is the possible length.

$$3.35 \leq L < 3.45$$

Problem 12: Choosing a vertical scale

Data range: $340 - 310 = 30$.

Graph A: axis height $400 - 0 = 400$, and $\frac{30}{400} = 0.075 = 7.5\%$.

Graph B: axis height $350 - 300 = 50$, and $\frac{30}{50} = 0.6 = 60\%$.

Graph A: 7.5%. Graph B: 60%. Graph B shows the changes much more clearly.

Problem 13: Choosing an origin

(a) $2026 - 2010 = 16$, so $x = 16$.

(b) P is in thousands: $48.3 \times 1000 = 48,300$. **The population is 48,300 people.**

(c) $2010 + 22 = 2032$. **2032**

Problem 14: Defining a quantity

Let h be the rental time in hours and C the total cost in dollars. The equation is $C = 8 + 12h$.

For $h = 3$: $C = 8 + 36 = 44$. For $C = 80$: $12h = 72$, so $h = 6$.

\$44 for 3 hours; 6 hours for \$80

Problem 15: Rounding a product

Each measurement has two significant digits, so the area should not show more than two:
 $35.04 \approx 35$.

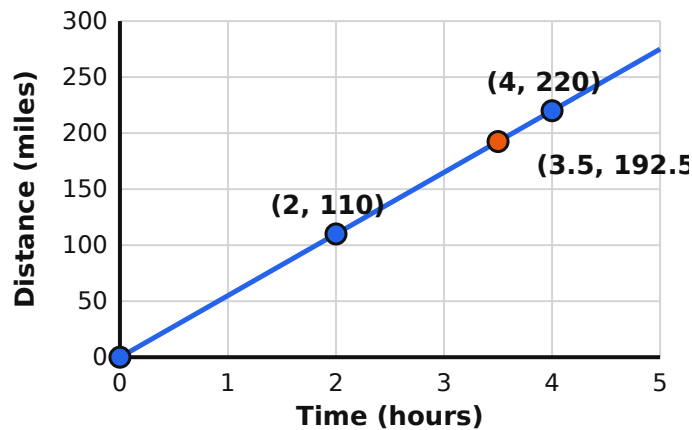
About 35 in^2

Problem 16: Units of a slope

(a) Use $(0,0)$ and $(2,110)$: $\frac{110-0}{2-0} = 55$.

(b) Slope units are $\frac{\text{miles}}{\text{hours}}$: the truck travels 55 miles per hour.

(c) $d = 55 \times 3.5 = 192.5$.



The point $(3.5, 192.5)$ lies on the line.

(a) 55 (b) 55 mi/h (c) 192.5 mi

Problem 17: Gallons in a tank

Volume: $4 \times 3 \times 2 = 24 \text{ ft}^3$.

$$24 \text{ ft}^3 \times \frac{7.48 \text{ gal}}{1 \text{ ft}^3} = 179.52 \text{ gal.}$$

About 179.5 gallons

Problem 18: Percent error of a length

The greatest error is half of the smallest division: 0.05 ft .

$$\frac{0.05}{12.5} = 0.004 = 0.4\%.$$

0.05 ft , or 0.4%

Problem 19: Speed of sound

$$1125 \frac{\text{ft}}{\text{s}} \times \frac{1 \text{ mi}}{5280 \text{ ft}} \times \frac{3600 \text{ s}}{1 \text{ h}} = \frac{4,050,000}{5280} \frac{\text{mi}}{\text{h}} \approx 767.05 \frac{\text{mi}}{\text{h}}.$$

About 767 mi/h

Problem 20: Walking time

$$8 \text{ mi} \times \frac{1 \text{ h}}{3.2 \text{ mi}} = 2.5 \text{ h}.$$

$$0.5 \text{ h} = 30 \text{ min}.$$

2.5 h, or 2 h 30 min

Problem 21: Filling the gas tank

$$(a) 12 \text{ gal} \times \frac{\$3.80}{1 \text{ gal}} = \$45.60.$$

$$(b) 12 \text{ gal} \times \frac{32 \text{ mi}}{1 \text{ gal}} = 384 \text{ mi}.$$

$$(c) 100 \text{ mi} \times \frac{1 \text{ gal}}{32 \text{ mi}} \times \frac{\$3.80}{1 \text{ gal}} = \$11.875 \approx \$11.88.$$

(a) \$45.60 (b) 384 mi (c) \$11.88

Problem 22: Filling a pool

$$\text{Time: } 6000 \text{ gal} \times \frac{1 \text{ min}}{12 \text{ gal}} = 500 \text{ min. } 500 = 8 \times 60 + 20, \text{ so } 8 \text{ h } 20 \text{ min}.$$

$$\text{Cost: } 6 \times \$4.50 = \$27.00.$$

8 h 20 min; \$27.00

Problem 23: Printing a packet

$$\text{Time: } 2700 \text{ pages} \times \frac{1 \text{ min}}{18 \text{ pages}} = 150 \text{ min} = 2.5 \text{ h}.$$

$$\text{Sheets: } 2700 \div 2 = 1350. \text{ Reams: } 1350 \div 500 = 2.7, \text{ so Noah must buy 3 whole reams.}$$

$$\text{Cost: } 3 \times \$6.25 = \$18.75.$$

2.5 hours; \$18.75