Unit 1

A concise cheat sheet to tackle various word problems, including financial, statistical, and everyday scenarios. Learn how to identify key information, set up equations, and solve for the unknown.

Financial Word Problems

Earnings & Savings

Hourly Wage: `Earnings = (Wage/Hour) × (Hours/Week) × (Weeks)`	**Example:** $10.79/hour, 21 hours/week, 18 weeks Earnings = 10.79 × 21 × 18 = $4,078.62
Simple Interest: `Total Boxes = Total Cost / (Cost / Box)`	**Example:** $74 interest, $3/box Boxes = 74 / 3 = 24.66… Round down to 24 boxes
Sale Savings: `Savings = (Normal Price) - (Sale Price)`	**Example:** Regular $3.50, Sale 3 for $10 Savings = (3 × 3.50) - 10 = $0.50
Total Revenue: `Revenue = (Quantity) × (Price/Unit)`	**Example:** 174 steers, $2,062.50/steer Revenue = 174 × 2062.50 = $358,875.00
Cost-Benefit Analysis: `Breakeven Visits = (Annual Cost) / (Cost per visit)`	**Example:** Annual pass $1,149, Visit cost $113.34 Visits = 1149 / 113.34 ≈ 10.14 Round up to 11 visits
Savings with Kiosk: `Total Saving = (Number of Kiosks) * (Saving Per Kiosk)`	**Example:** 6,454 kiosks, $28,800 saving/year Saving = 6454 * 28800 = $185,875,200

Payment Calculations

Production Output: `Total Energy = (Energy / Area) × (Area)`	**Example:** 9.5 kWh/sq ft, 500 sq ft Energy = 9.5 × 500 = 4,750 kWh
Lost income: `(Wage/Hour) * (Hours Lost)`	**Example:** $15/hour, 54.17 hours Lost Income = 54.17 * 15 = $812.50
Moving Company Payment: `Total Pay = Base + (Safe Pots * Pay per Pot) - (Damaged Pots * Deduction per Pot)`	**Example:** Base $150, $1/safe pot, $5 deduction/broken pot Total = 150 + (574 * 1) - (6 * 5) = $694

Percentage & Fraction Word Problems

Percentage Calculations

Percentage Calculation: `Percentage = (Part ÷ Whole) × 100`	**Example:** 294 women out of 558 athletes Percentage = (294 / 558) × 100 = 52.7%
Percentage Increase: `% Increase = ((New Value - Old Value) ÷ Old Value) × 100`	**Example:** 1968: 2,614,340 members, 2018: 16,118,169 % increase = ((16,118,169 - 2,614,340) / 2,614,340) × 100 ≈ 517%
Required Quantity: `Required = Total × Percentage`	**Example:** 3,500 seniors, 80% graduation rate Required grads = 3500 × 0.80 = 2,800
Conversion to Percent: `Percent = Decimal × 100`	**Example:** Batting average 0.305 Percent = 0.305 * 100 = 30.5%
Accuracy Percentage: `Accuracy % = (Successes ÷ Attempts) × 100`	**Example:** 29 goals out of 115 shots Accuracy = (29/115) × 100 = 25.2%
Winning Percentage: `Win % = (Wins ÷ Total Games) × 100`	**Example:** 72 wins out of 82 games Win = (72/82) × 100 = 87.8%

Fraction Calculations

Fraction of Population: `Fraction = (Part) ÷ (Whole)`	**Example:** 80.7 million out of 7.2 billion Fraction = 80.7M / 7.2B = 269/24000
Finding the Total: `Total = Known Value ÷ Known Fraction`	**Example:** 200 homes = 20% of energy Total homes = 200 / 0.20 = 1000
Combined Fractions: Food fraction = (1/3) * (1/2)	**Example:** 1/3 budget on housing, 1/2 of that on food Food Fraction = (1/3) * (1/2) = 1/6
Fraction of Total: `Fraction = Total Educated ÷ Total People`	**Example:** 99/100 + 162/180. Total educated 261/280
Estimating Total: `Total Population = Known Population/Known Fraction`	**Example:** NY Muslim population 770770 equals 1/4 of America's Muslim population Total population = 770770 / (1/4) = 3,083,080
Fraction of Recipe: `New Amount = Fraction of recipe * Recipe Yield`	**Example:** Recipe: 2½ cups flour → 48 cookies. You have 2 cups Cookies = 48 * (2/2.5) = 38 cookies

Conversion & Rate Word Problems

Unit Conversion

Distance Conversion: `Total Blocks = Total Miles / Miles per Block`	**Example:** 8 miles, 0.11 miles/block Blocks = 8 / 0.11 = 72.73 blocks
Weight Conversion: `Total Ounces = Total Pounds * 16 Ounces per Pound`	**Example:** Recipe: 1.5 lb chicken with 7oz pieces Pieces = (1.5*16) / 7 = 4 pieces
Calculating Gallons from Ounces: `Gallons = Total Ounces / 128 Ounces per Gallon`	**Example:** 10 six-packs of 12oz cans gives 720oz Gallons = 720/128 = 5.63 gallons
Calculating Miles per Hour: `Speed = Distance (miles) / Time (hours)`	**Example:** Marathon distance 26.2 miles in 2.133 hours Speed = 26.2 / 2.133 = 12.281 mph
Pounds per Gallon: `Pounds per gallon = Total Pounds / Gallons`	**Example:** Gigi the Cow produced 75,000 lbs of milk = 8,700 gallons Pounds per gallon = 75000/8700 = 8.6 lb/gal

Rates and Ratios

Annual Panels: `Homes = Total Homes * (Homes Powered with Panels / Total Panels)`	**Example:** Total Panels power 200 homes or 20% of the total Total homes that can be powered with 100% of panels = 200/0.2 = 1000
Annual Panels: `Required = Total Shots * Accuracy`	**Example:** 15 shots, average 0.433 Minimum makes to reach average = 15*0.433 = 7 shots
Calculating Yearly Percentage: `Injury Range = Annualy Injured * ( Injury Percentage Range )`	**Example:** 1/3 fall, injury range 20-30% % of 65+ suffer moderate/severe injury annually = (1/3)*(20-30)% = 6.66%

Determining Power Consumption Cost:
`Energy Use (kWh) = (Wattage / 1000) * Hours Used`
`Cost = Energy Use * Rate per kWh`
	Example:
	1,875-watt hair dryer for 15 minutes/day, rate = $0.0860 per kWh
	Cost = (1.875*0.25)*0.0860= $0.0403/day

Calculating Megapixels for Print:
`Total Pixels = (Width * DPI) * (Height * DPI)`
`Megapixels = Total Pixels / 1,000,000`
	Example:
	Print an 11″×14″ photo at 300 dpi
	Megapixels = (11*300)*(14*300) / 1000000 = 13.9 MP

Time and Percentage Change Calculations

Time Calculations

Marathon Time Decrease:
`Time Decrease = Original Time - New Time`
`% Decrease = (Time Decrease / Original Time) × 100`
	Example:
	Fastest marathon time fell from 2:08:16 (1990) to 2:04:15 (2012)
	% decrease = ((2.1378 - 2.0708) / 2.1378) × 100 ≈ 3.13%

Adjust Recipe Based on Quantity

Adjusting a Recipe: `New Amount = Fraction of recipe * Recipe Yield`	**Example:** Recipe: 2½ cups flour → 48 cookies. You have 2 cups Cookies = 48 * (2/2.5) = 38 cookies

Find Value After Change

Finding the Original Value: `Original = 31,667 / 1.92 ≈ 16,493 students`	**Example:** Original = Value at present / (1 + Change percentage)