

Exercise walk-through

3.3.1

Compound Rates

AQA · GCSE · Mathematics

37. Rates, unit prices, density and pressure · Foundation

Rates, unit prices, density and pressure · Foundation

A compound rate divides one quantity by another: $\text{speed} = d/t$, $\text{pay} = \text{earnings}/\text{time}$, $\text{unit price} = \text{cost}/\text{amount}$, $\text{density} = \text{mass}/\text{volume}$ and $\text{pressure} = \text{force}/\text{area}$. Rearrange these equations before substituting. Convert each dimension separately; converting cm^2 to m^2 uses a squared length factor. Comparisons must use the same units and conditions.

39. Rates, unit prices, density and pressure · Foundation

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A 750 g pack costing 18 yuan has unit price $18/0.75=24$ yuan/kg. A 1.2 kg pack at 30 yuan costs 25 yuan/kg, so the first is better value if quality and waste are equal. A block of mass 540 g and volume 200 cm^3 has density 2.7 g/cm^3 ; a 50 cm^3 piece of that material has mass 135 g. Since $1\text{ g}=0.001\text{ kg}$ and $1\text{ cm}^3=0.000001\text{ m}^3$, $2.7\text{ g/cm}^3=2700\text{ kg/m}^3$. A 120 N force over 0.03 m^2 gives pressure $4000\text{ N/m}^2=4000\text{ Pa}$. At fixed force, halving the area doubles pressure. An hourly pay rate of 48 yuan/hour gives 120 yuan for 2.5 hours.

56. Simple interest, compound growth and decay · Foundation

Simple interest, compound growth and decay · Foundation

At 10% per year, 1000 yuan earns simple interest 100 per year: after two years interest is 200 and balance is 1200. Compound balances are 1100 after year one and 1210 after year two. A machine worth 800 yuan losing 20% each year becomes 640 then 512, not 480: the second loss is 20% of 640. An 800-yuan sale price after a 20% reduction corresponds to original price $800/0.8=1000$. Growth from 50 to 65 is $(65-50)/50 \times 100 = 30\%$; 65 is 130% of 50. If a compound balance must first exceed 1300 at 10%, year two gives 1210 and year three 1331, so three whole years are needed.

Exercises 2.1·2.3

2.1 (Foundation) Find density for mass 540 g and volume 200 cm³.

2.2 (Foundation) Find pressure in Pa for 120 N on 0.03 m².

2.3 (Foundation) Find the unit price in yuan/kg for 750 g at 18 yuan.

3 Exam-style questions

Exercises 2.1·2.3

2.1 (Foundation) Find density for mass 540 g and volume 200 cm³.

2.1 Density = $540/200 = 2.7 \text{ g/cm}^3$.

2.2 (Foundation) Find pressure in Pa for 120 N on 0.03 m².

2.2 Pressure = force/area = $120/0.03 = 4000$.

2.3 (Foundation) Find the unit price in yuan/kg for 750 g at 18 yuan.

3 Exam-style questions

2.3 750 g = 0.75 kg, so $18/0.75 = 24$.

Exercise 3.1

3.1 Decide whether this claim is true. Justify with a concrete calculation or counterexample: Converting density from g/cm^3 to kg/m^3 leaves its numerical value unchanged.

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3.1 False. $1 \text{ g/cm}^3 = (0.001 \text{ kg}) / (0.000001 \text{ m}^3) = 1000 \text{ kg/m}^3$. Convert both mass and volume.

Local review guidance: show the chosen method; give the checked result; explain the condition or failed shortcut. This is authored classroom guidance.