Practical simultaneous/inequality models and checks

6 questions | 20 marks

Equivalent correct methods earn the corresponding marks.

1. One smoothie and two juices cost 14 dollars. Two smoothies and two juices cost 20 dollars. Find both prices. [3 marks]

Subtract the totals to find a smoothie, then solve for two juices.

Answer: Smoothie: 6 dollars; juice: 4 dollars.

2. A car park has 18 vehicles, all cars or motorbikes. There are 58 wheels. Find each number. [3 marks]

$c+m=18$ and $4c+2m=58$; subtract twice the first to get $2c=22$.

Answer: 11 cars and 7 motorbikes.

3. A hire fee is 25 dollars plus 6 dollars per hour. Write the cost condition for a budget of at most 70 dollars, then find the greatest whole number of hours. [3 marks]

$h \leq 7.5$; 8 whole hours would exceed the budget.

Answer: $25+6h \leq 70$; 7 whole hours.

4. A recipe uses 3 units of flour and 2 units of sugar per batch A, or 1 unit of flour and 3 units of sugar per batch B. Exact totals of 17 flour units and 16 sugar units are used. Find the batch counts. [4 marks]

$3a + b = 17$, $2a + 3b = 16$; substitution gives $7a = 35$.

Answer: 5 batches of A and 2 batches of B.

5. A model gives 7.5 buses for transporting a group. Explain why this is not a directly usable bus count and what extra information is needed. [3 marks]

Rounding down may leave passengers behind; do not round without checking the capacity constraint.

Answer: Whole buses are required. The capacity per bus and whether all buses must have the same capacity are needed to choose a feasible whole-number plan.

6. A council must buy at least 12 benches and tables in total. Benches cost 80 dollars and tables cost 120 dollars; the budget is 1200 dollars. Define variables, write constraints and test 9 benches with 3 tables. [4 marks]

It provides 12 items.

Its cost is $720 + 360 = 1080$ dollars.

Answer: $b + t \geq 12$, $80b + 120t \leq 1200$, nonnegative integer b, t; the plan is feasible.