4.2 Measures, bearings and compound rates

Name: _____ Class: _____ Date: _____ **Total: 22 marks**

KEY WORDS bearing • density

Measures, bearings and compound rates

Objective

Read scales and estimate measures, use 12- and 24-hour time, work with three-figure bearings, and use speed, density and pressure as compound measures (objectives Foundation 4.4 A–G).

1 Key knowledge and worked examples

Bearings. Three figures, clockwise from north: 040° not 40°. A return bearing adds 180° (mod 360): if Q bears 040° from P, then P bears 220° from Q. Sketch the north line at each point before touching angles.

Compound measures. Speed is distance over time; density is mass over volume; pressure is force over area. Rearrange the triangle relationship and convert units first: 2 h 36 min is 2.6 h; 234 km in 2.6 h averages 90 km/h.

2 Practice

2.1 A ship sails from P on a bearing of 040° to Q. Write down the bearing of P from Q. [2]

2.2 A car covers 234 km in 2 hours 36 minutes. Find its average speed in km/h. [3]

2.3 A metal block of mass 96 g has volume 12 cm^3. Find its density in g/cm^3. [2]

2.4 A force of 50 N acts on an area of 2.5 m^2. Find the pressure in N/m^2. [2]

2.5 Write 7:40 p.m. in 24-hour clock time. [1]

3 Exam-style questions

3.1 *(Original.)* A, B and C are ports. The bearing of B from A is 048°, and the bearing of C from B is 138°. (a) Write down the bearing of A from B. (b) Hence show that angle $ABC = 90°$. [3]

3.2 *(Original.)* A cuboid of gold is 4 cm by 2 cm by 1.5 cm and has mass 231 g. (a) Find its volume. (b) Find its density in g/cm^3. (c) A second cube of the same gold has edge 3 cm; find its mass. [5]

3.3 *(Original.)* A train leaves at 19 42 and arrives at 01 18 the next day. (a) Find the journey time in hours and minutes. (b) The distance is 420 km. Find the average speed in km/h. [4]

Solutions

2.1 $040 + 180 = 220°$.

2.2 2 h 36 min = 2.6 h; $234 \div 2.6 = 90$ km/h.

2.3 $96 \div 12 = 8$ g/cm^3.

2.4 $50 \div 2.5 = 20$ N/m^2.

2.5 19:40.

3.1 (a) Back-bearing: $048 + 180 = 228°$. (b) At B, the direction to A bears 228° and the direction to C bears 138°; the angle between them is $228 - 138 = 90°$. ✓

3.2 (a) $4 \times 2 \times 1.5 = 12$ cm^3. (b) $231 \div 12 = 19.25$ g/cm^3. (c) Cube volume 27 cm^3; mass $= 27 \times 19.25 = 519.75$ g.

3.3 (a) From 19:42 to 01:18 is 5 h 36 min. (b) 5.6 h; $420 \div 5.6 = 75$ km/h.

Local review guidance: the compound-measure triangle written before substitution; correct units on every answer; bearing sketches with north lines. This is authored classroom guidance.