S4 Geography Practice Paper: Rivers, Slopes, Coasts, Population, Urban Land Use and Climate

S4 Geography | Time allowed: 90 minutes | Total: 100 marks | 24 questions

A. River Discharge and Catchments (17 marks)

Assume a rectangular channel cross-section. Give answers to 3 significant figures.

1. A river reach is 12 m wide with a mean depth of 1.5 m and a mean velocity of 0.8 m s^{-1}. Find its discharge. (4 marks)

> **Answer:** Area = 12 × 1.5 = 18 m^2; Q = 18 × 0.8 = 14.4 m^3 s^{-1}.

2. A catchment of 240 km^2 receives 1 800 mm of rain a year and yields 2.16 × 10^8 m^3 of runoff. Find the runoff coefficient as a percentage. (4 marks)

> **Answer:** Rainfall volume = 240 × 10^6 × 1.8 = 4.32 × 10^8 m^3; runoff coefficient = 2.16 / 4.32 = 0.5, i.e. 50%.

3. A river falls from 620 m to 180 m above sea level over a horizontal distance of 88 km. Find its average gradient in m km^{-1}. (4 marks)

> **Answer:** Gradient = (620 - 180) / 88 = 5 m km^{-1}.

4. The peak discharge at a gauging station has a return period of 50 years. Find the probability that a flood of this size or larger occurs in any one year. (5 marks)

> **Answer:** Probability = 1 / 50 = 0.02, i.e. 2% per year.

B. Contours and Slopes (17 marks)

Show your working in all answers.

5. On a 1:25 000 map two points are 4 cm apart. Find the actual distance between them in km. (4 marks)

> **Answer:** 4 cm × 25 000 = 100 000 cm = 1 km.

6. A road climbs 120 m over a horizontal distance of 1.5 km. Find its gradient as a percentage and its angle of slope. (4 marks)

> **Answer:** Gradient = 120 / 1 500 = 0.08, i.e. 8%; angle = $\tan^{-1}$ 0.08 = 4.57°.

7. On a 1:20 000 map a slope 6 cm long joins two contours 20 m apart in height. Find the average angle of the slope. (4 marks)

> **Answer:** Horizontal distance = 6 × 20 000 = 120 000 cm = 1 200 m; angle = $\tan^{-1}$(20 / 1 200) = 0.95°.

8. On a 1:50 000 map a wood measures 4 cm by 3 cm. Find its actual area in km^2. (5 marks)

> **Answer:** 4 cm → 2 km and 3 cm → 1.5 km; area = 2 × 1.5 = 3 km^2.

C. Coastal Landforms and Sediment Transport (16 marks)

Assume the cliff height and the length of coast are constant over the section considered.

9. A 40 m high sea cliff retreats as 24 000 m^3 of rock is removed along 100 m of coast. Find the average rate of cliff retreat. (4 marks)

> **Answer:** Retreat = 24 000 / (40 × 100) = 6 m.

10. Waves in a bay have a wavelength of 60 m and a period of 8 s. Find the wave speed. (4 marks)

> **Answer:** Speed = 60 / 8 = 7.5 m s^{-1}.

11. Longshore drift deposits 30 000 m^3 of sand each year on a beach 500 m long and 20 m wide. Find the average rise in beach level. (4 marks)

> **Answer:** Rise = 30 000 / (500 × 20) = 3 m.

12. The longshore drift rate is measured as 0.05 m^3 s^{-1}. Find the total volume of sand moved in one year of 365 days, to 3 significant figures. (4 marks)

> **Answer:** 0.05 × 86 400 × 365 = 1576800 m^3, i.e. 1.58 × 10^6 m^3.

D. Population Structure and Dependency Ratios (17 marks)

Give all ratios as percentages to 1 decimal place.

13. A place has a mid-year population of 7.5 million, of whom 0.9 million are aged 0-14 and 0.6 million are aged 65 or over. Find the total dependency ratio. (5 marks)

> **Answer:** Dependants = 0.9 + 0.6 = 1.5 million; working-age population = 7.5 - 1.5 = 6.0 million; ratio = 1.5 / 6.0 × 100% = 25%.

14. In one year a place records 45 000 births with a mid-year population of 7.5 million and a death rate of 7.5 per thousand. Find the crude birth rate and the rate of natural increase. (4 marks)

> **Answer:** CBR = 45 000 / 7 500 000 × 1 000 = 6 per thousand; natural increase = 6 - 7.5 = -1.5 per thousand.

15. A new town has a population of 480 000 living in 12 km^2. Find its population density. (4 marks)

> **Answer:** Density = 480 000 / 12 = 40000 persons per km^2.

16. In a place 18%% of the population is aged 65 or over and 65%% is aged 15-64, with a total population of 6.0 million. Find the number of elderly people and the old-age dependency ratio. (4 marks)

> **Answer:** Elderly = 6.0 million × 0.18 = 108 × 10 000; old-age dependency ratio = 18 / 65 × 100% = 27.69%.

E. Urban Land Use and Commuting (16 marks)

Assume the land uses do not overlap.

17. A city covers 120 km², of which 45 km² is residential. Find the percentage of land used for housing. (4 marks)

> **Answer:** 45 / 120 × 100% = 37.5%.

18. A shop of 200 m² is let at $240 000 per month. Find the rent per square metre per month. (4 marks)

> **Answer:** 240 000 / 200 = $1200 per m² per month.

19. A site of 1 200 m² carries a building with a total floor area of 14 400 m². Find the plot ratio. (4 marks)

> **Answer:** 14 400 / 1 200 = 12.

20. A commuter travels 25 km to the city centre, by car at an average of 20 km h^{-1} or by rail at 50 km h^{-1}. Find the journey time by each mode and the time saved in minutes. (4 marks)

> **Answer:** Car = 25 / 20 × 60 = 75 min; rail = 25 / 50 × 60 = 30 min; time saved = 45 min.

F. Climate Data and Agriculture (17 marks)

Rainfall is in mm and temperature in °C.

21. The warmest month at a place averages 31.5 °C and the coolest 14.2 °C. Find the annual range of temperature. (4 marks)

> **Answer:** 31.5 - 14.2 = 17.3 °C.

22. A place receives 1 750 mm of rain a year, of which 1 050 mm falls in the six wet months. Find the percentage of the annual rainfall that falls in the wet season. (4 marks)

> **Answer:** 1 050 / 1 750 × 100% = 60%.

23. A farm has 250 hectares of paddy field yielding 6.4 tonnes of rice per hectare, sold at $4 500 per tonne. Find the total yield and the total income. (4 marks)

> **Answer:** Yield = 250 × 6.4 = 1600 tonnes; income = 1 600 × 4 500 = $7,200,000.

24. A 40 hectare field needs 8 mm of irrigation water each day. Find the daily water requirement in m³. (5 marks)

> **Answer:** 40 ha = 400 000 m²; 8 mm = 0.008 m; volume = 400 000 × 0.008 = 3200 m³.