S6 Geography Practice Paper | runoff and peak discharge, dependency ratio, bid rent, rice yield, earthquake energy and carrying capacity

Senior Secondary Geography

S6 Geography practice paper with answers: runoff and peak discharge, dependency ratio, bid rent, rice yield, earthquake energy and carrying capacity. Free PDF.

Question 1 Catchment runoff and peak discharge

A catchment of 250 square kilometres receives 180 mm of rain in one storm. Its runoff coefficient is 0.35 and all runoff leaves the catchment within 6 hours.

#	Question	Answer and marking notes
1	(a) Calculate the rainfall volume and the runoff volume in cubic metres.	Answer: rainfall volume = 45,000,000 cubic metres; runoff volume = 15,750,000 cubic metres.
2	(b) Assuming steady release, calculate the mean peak discharge in cubic metres per second.	Answer: discharge = 15,750,000 / 21,600 = 729.2 cubic metres per second.
3	(c) Urbanisation raises the runoff coefficient to 0.55. Calculate the new runoff volume and discharge.	Answer: runoff volume = 24,750,000 cubic metres; discharge = 1,145.8 cubic metres per second.
4	(d) Find the percentage rise in discharge and suggest two drainage measures that reduce the flood peak.	Answer: a rise of 57.1 per cent; measures include detention ponds with permeable paving, and enlarging storm drains while diverting upstream runoff.

Question 2 Dependency ratio and elderly services

A city has a population of 7,500,000. People aged 0 to 14 make up 12 per cent and those aged 65 or above make up 20 per cent.

#	Question	Answer and marking notes
5	(a) Calculate the dependency ratio as a percentage.	Answer: dependency ratio = (12 + 20) / 68 x 100 = 47.1 per cent.
6	(b) Find the number of people of working age.	Answer: working age population = 5,100,000.
7	(c) If the share aged 65 or above rises to 24 per cent while total population and the youth share stay the same, find the new dependency ratio.	Answer: new dependency ratio = 56.2 per cent.
8	(d) Find the increase in the number of elderly people and the extra subsidised places needed at 40 places per 1000 elderly.	Answer: an extra 300,000 elderly people; 12,000 extra places are needed.

Question 3 Bid rent curves and land use

In a city the commercial bid rent is R = 120 - 8d and the residential bid rent is R = 60 - 3d, where R is in thousand dollars per square metre per year and d is distance from the centre in kilometres.

#	Question	Answer and marking notes
9	(a) Find the crossover distance of the two curves and the rent there.	Answer: d = 12.0 km and R = 24.0 thousand dollars per square metre per year.
10	(b) At 6 km, calculate both rents and state the land use there.	Answer: commercial 72.0 and residential 42.0 thousand dollars; commercial use wins, so the land is commercial.
11	(c) At 15 km, find both rents and explain the change in land use.	Answer: commercial 0.0 and residential 15.0 thousand dollars; commercial bidding falls to zero or below, so the land becomes residential.
12	(d) If the commercial intercept rises by 20 per cent, find the new crossover distance and its increase.	Answer: new intercept 144, crossover at 16.8 km, an increase of 4.8 km.

Question 4 Rice yield and food security

A farm has 40 hectares of paddy, each hectare yields 6.5 tonnes per crop, two crops are grown per year, post harvest loss is 15 per cent and each person consumes 0.13 tonnes a year.

#	Question	Answer and marking notes
13	(a) Calculate the annual gross yield and the edible yield after losses.	Answer: gross yield = 520 tonnes; edible yield = 442 tonnes.
14	(b) Calculate how many people the rice can feed.	Answer: 3,400 people.
15	(c) If the population rises by 20 per cent, find the paddy area needed, other things unchanged.	Answer: 48.0 hectares.
16	(d) If the loss rate falls to 8 per cent, find the extra people fed and the percentage rise in edible yield.	Answer: edible yield 478.4 tonnes, an extra 280 people and a rise of 8.2 per cent.

Question 5 Earthquake energy and wave travel time

An earthquake of magnitude 7.2 occurs; another in the same region has magnitude 5.2. P waves travel at 6.5 km per second and S waves at 3.7 km per second. At a station the P and S arrivals differ by 24 seconds.

#	Question	Answer and marking notes
17	(a) Find the energy ratio and amplitude ratio of the two events, given that each magnitude step raises energy by about 31.622776601683793 times.	Answer: energy ratio 1,000 times and amplitude ratio 100 times.
18	(b) Use the time difference to find the distance from the station to the focus.	Answer: distance = 206.1 km.
19	(c) Find the travel time of the P wave and of the S wave.	Answer: P wave 31.7 seconds and S wave 55.7 seconds.

#	Question	Answer and marking notes
20	(d) If the station is 160 km from the focus, find the time difference and explain its use in early warning.	Answer: 18.6 seconds; the few seconds after the P wave allow automatic gas valve shut off and lift parking.

Question 6 Tourism carrying capacity and revenue

A site has 12 hectares of usable ground and each visitor needs 15 square metres. It opens 10 hours a day, visitors stay 2 hours on average, the ticket is 60 dollars and daily operating cost is 48,000 dollars.

#	Question	Answer and marking notes
21	(a) Calculate the instantaneous carrying capacity.	Answer: 8,000 visitors at one time.
22	(b) Calculate the maximum daily visitor arrivals.	Answer: 40,000 visits per day.
23	(c) Find the maximum ticket revenue and the net income after operating cost.	Answer: revenue 2,400,000 dollars and net income 2,352,000 dollars.
24	(d) To protect the site only 70 per cent of capacity is used. Find the daily visits, revenue and the fall in revenue against the ceiling.	Answer: 28,000 visits, revenue 1,680,000 dollars, a fall of 30.0 per cent.