Eight maths questions for Economists

40 marks; 30 minutes

GO LIKE THE WIND

1a) Give a formula for calculating the multiplier. (1)

1b) Calculate the multiplier if the marginal propensity to consume is 75%.   (4)

2. The U.S. census bureau reports that mean average personal incomes in the U.S. in 2021 were $44,510. The U.S. median personal income that year was $30,240.

2a) Calculate the ratio of mean income to median income in 2021. (2)

2b) Briefly explain why these two averages came up with a different result in this case. (3)

3. Last year Volvic sold 91.5 million litres in the UK at an average price of 72.9p per litre. This year sales have slipped to 80.7 million litres, pushing total revenue down to £65m.

3a) Calculate the apparent price elasticity of demand for Volvic. (3)

3b) What term is used to describe this type of price elasticity? (1)

4. The UK's current account deficit was 3.4% of GDP in Q1 last year. It widened to 5.2% of GDP in Q1 this year. Calculate the % change and % point change. (4)

5. The February 2017 CPI was 2.3%. In February 2016 it was 0.3%. Which **one** of these statements is true? (1)

5.1 Inflation was 2% in the year to February 2017.

5.2 The U.S. increase in interest rates is now affecting the UK as well.

5.3 Inflation was 2.3% in the year to February 2017.

5.4 As average wages have risen by 2.2%, people are 0.2% better off than a year ago.

6. Among the top quartile of income earners, savings ratios are double those in the third quartile.

6a) Explain what this means. (3)

6b) Explain why it might be important to economists. (3)

7. At Raj's Store, a price cut on Lucozade from £1 to 80p has seen Sprite sales fall by 30%, but Walkers sales up 10%.

7a) Calculate the cross-price elasticity between Lucozade and Sprite. (3)

7b) Calculate the cross-price elasticity between Lucozade and Walkers. (3)

7c) State whether Sprite is a complementary or substitute in relation to Lucozade. (1)

8. In Northern Siberia household spending goes 50% on potatoes, 30% on vodka and 20% on beer. In the last 4 years prices have changes as follows in these 3 categories:

(Prices in roubles)	Potatoes	Vodka	Beer
January 20X4	R40 per kilo	R500 a bottle	R25 a bottle
January 20X5	R46 per kilo	R500 a bottle	R25 a bottle
January 20X6	R48 per kilo	R560 a bottle	R25 a bottle
January 20X7	R46 per kilo	R560 a bottle	R30 a bottle

Taking January 20X4 as the base year, calculate the Consumer Prices Index for January 20X6 and for January 20X7. The figure for January 20X5 is 107.5. (8)

Test ends

ANSWERS

1a) Give a formula for calculating the multiplier.

- $1/(1 - MPC)$ or $1/MPW$

1b) Calculate the multiplier if the marginal propensity to consume is 75%.

- $1 - MPC = 1 - 0.75 = 0.25$.
- $1 / 0.25 = 4$ (ANS)

2a) Calculate the ratio of mean income to median income in 2021. (2)

$44,510: $30,240 is 1.47:1 (ANS)

2b) Briefly explain why these two averages came up with a different result in this case. (3)

- The mean average is skewed by some huge incomes by a relatively few wealthy Americans (Elon Musk, perhaps, or Donald Trump). Those big figures pull the average upwards
- The median finds the middle person within a rank ordering of the whole population's income levels. The size of income of those at the top is irrelevant. So the median is lower than the mean.

3. Last year Volvic sold 91.5 million litres in the UK at an average price of 72.9p per litre. This year sales have slipped to 80.7 million litres, pushing total revenue down to £65m.

3a) Calculate the apparent price elasticity of demand for Volvic. (4)

- PED = % change in demand / % change in price
- % change in demand = - 11.8%
- % change in price = Last year 72.9p to 80.5p this year (£65m / 80.7m) = Price + 11.0%
- So ANS is – 11.8% / +11.0% = -1.07

3b) What term is used to describe this type of price elasticity? (1)

- Unitary price elasticity (approx. 1)

4. The UK's current account deficit was 3.4% of GDP in Q1 last year. It widened to 5.2% of GDP in Q1 this year. Calculate the % change and % point change. (4)

- % change is change/original x 100
- That's 1.8% / 3.4% = a 52.9% change
- But the % point change is a deterioration of 1.8 percentage points.

5. The February 2017 CPI was 2.3%. In February 2016 it was 0.3%. Which **one** of these statements is true? (1)

- 5.3 Inflation was 2.3% in the year to February 2017.

6. Among the top quartile of income earners, savings ratios are double those in the third quartile.

6a) Explain what this means.

- Among the top 25% of income earners there's a tendency to save twice the proportion of income as among below-average earners (those earning between 25 and 49% of the average)

6b) Explain why it might be important to economists.

- It shows that tax cuts among the less well-off will have a higher multiplier effect on the economy than tax cuts among the rich – because the better-off are able to save a higher proportion of their incomes

7. At Raj's Store, a price cut on Lucozade from £1 to 80p has seen Sprite sales fall by 30%, but Walkers sales up 10%.

7a) Calculate the cross-price elasticity between Lucozade and Sprite.

XED = % change in demand for good B / % change in price of good A

Sprite – 30% / Lucozade price – 20% = +1.5

7b) Calculate the cross-price elasticity between Lucozade and Walkers.

XED = % change in demand for good B / % change in price of good A

Walkers + 10% / Lucozade price – 20% = -0.5

7c) State whether Sprite is a complementary or substitute in relation to Lucozade.

Sprite is a substitute as its XED is positive.

8. In Northern Siberia household spending goes 50% on potatoes, 30% on vodka and 20% on beer. In the last 4 years prices have changes as follows in these 3 categories:

(Prices in roubles)	Potatoes	Vodka	Beer
January 20X4	R40 per kilo	R500 a bottle	R25 a bottle
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January 20X7	R46 per kilo	R560 a bottle	R30 a bottle

Taking January 20X4 as the base year, calculate the Consumer Prices Index for January 20X6 and for January 20X7. The figure for January 20X5 is 107.5.

January 20X6 = 100 + (+20% x 0.5) + (+12% x 0.3) + (0 x 0.2) = 114.0

January 20X7 = 100 + (+15% x 0.5) + (+12% x 0.3) + (+20% x 0.2) = 115.5