



H24-30min Weighted and Chain Base Index Numbers: 30-minute Pack

EDEXCEL 1ST0 · Calculator allowed · about 30 minutes

Total Marks

Name: _____ Date: ____ / ____ / ____

Answer ALL questions. Show all your working.

- 1** A gym records its total number of members at the end of each month:

Month	Members
January	240
February	258
March	300
April	276

A chain-base index number compares each month with the month immediately before it:

chain-base index number = (this month's members / previous month's members) x 100

- (a) Show that the chain-base index number for February (compared with January) is 107.5. (2)

- (b) Work out the chain-base index number for March (compared with February), giving your answer correct to 1 decimal place. (2)

- (c) Work out the chain-base index number for April (compared with March). (2)

- (d) Write down which month had fewer members than the month before it. (1)

(Total for Question 1 is 7 marks)

- 2** A statistician builds a simple household 'cost of living index' from three categories of spending. Each category has its own price sub-index for this year (base year = 100), and a weight reflecting how much of a typical household's budget goes on that category:

Category	Weight	Sub-index this year
Housing	5	130
Food	3	110
Transport	2	120

The weighted index number is defined as:

weighted index = (sum of (weight x sub-index)) / (sum of weights)

- (a)** Work out the sum of (weight x sub-index) for the three categories. (2)

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(b) Hence work out the weighted cost of living index for this year. (2)

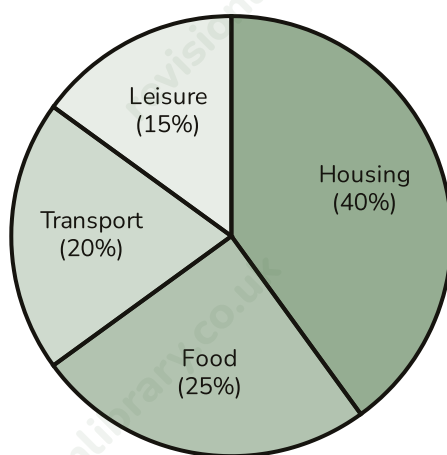
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(c) Write down what the weighted index number of 122 tells you about the cost of living for a typical household. (1)

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(d) The statistician originally forgot to use the weights, and instead worked out the simple (unweighted) mean of the three sub-indices. Work out this unweighted mean, and explain why the weighted index in part (b) is more appropriate for measuring a typical household's cost of living. (3)

(Total for Question 2 is 8 marks)

- 3** The pie chart shows how a typical household splits its monthly spending across four categories. These percentages are used as the weights for a weighted price index. The table shows the price sub-index for each category this year (base year = 100).

Category	Sub-index this year
Housing	112
Food	106
Transport	118
Leisure	102



Household spending by category (used as weights)

- (a) Use the pie chart to write down the weight (as a percentage) for Transport. (1)
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- (b) Use the percentages from the pie chart as weights to work out the weighted price index for this household's typical spending, giving your answer correct to 1 decimal place. (3)
-
- (c) A different household spends a much larger share of its budget on transport than shown in the pie chart (and correspondingly less on the other categories). Given that transport has the highest sub-index (118) of the four categories, explain, without recalculating, whether this household's overall weighted index is likely to be higher or lower than 110.2. (2)

(Total for Question 3 is 6 marks)

- 4** A local council wants to build its own weighted 'Local High Street Price Index' to track the cost of living for residents, rather than relying only on the national Consumer Price Index (CPI). It plans to follow the statistical enquiry cycle.

(a) (Plan) State two decisions the council must make before it can construct its weighted local price index. (2)

(b) (Collect) The council decides to collect price data quarterly from a sample of local shops. Give one reason why the council should collect prices from more than one shop for each category, rather than from just one shop. (1)

(c) (Process) The council collects the following weights and sub-indices for its first year: (3)

Category	Weight	Sub-index
Housing	6	108
Food	3	115
Leisure	1	122

Calculate the local weighted price index.

(d) (Interpret) The national CPI for the same period is 106. Compare the council's local index to the national CPI, and suggest one reason why the local figures might differ. (2)

(Total for Question 4 is 8 marks)

- 5** A weighted index has two categories. Category 1 has a sub-index of 108 and a weight of w . Category 2 has a sub-index of 124 and a weight of $(10-w)$. The overall weighted index for the two categories combined is 118.

(a) Show that $108w + 124(10-w) = 1180$. (2)

(b) Solve the equation to find w , and hence state the weight given to Category 2. (3)

(Total for Question 5 is 5 marks)

Mark scheme · H24-30min Weighted and Chain Base Index Numbers: 30-minute Pack

Question 1

- (a) **M1** 258/240, oe
- (a) **A1** 107.5 cso
- **(a) Answer: 107.5**
- (b) **M1** 300/258, oe
- (b) **A1** 116.3 awrt (from 116.279...)
- **(b) Answer: 116.3**
- (c) **M1** 276/300, oe
- (c) **A1** 92 cao
- **(c) Answer: 92**
- (d) **B1** April cao, ft from (c) (chain-base index below 100)
- **(d) Answer: April**

Question 2

- (a) **M1** 5×130 , 3×110 , 2×120 (=650, 330, 240), oe
- (a) **A1** 1220 cao
- **(a) Answer: 1220**
- (b) **M1** $1220 / (5+3+2)$, ft from (a)
- (b) **A1** 122 cao
- **(b) Answer: 122**
- (c) **B1** the overall cost of living has risen by 22% since the base year, taking into account how much of the budget goes on each category, oe
- **(c) Answer: The overall cost of living has risen by 22% since the base year, once the different amounts spent on housing, food and transport are taken into account.**
- (d) **M1** $(130+110+120)/3$, oe
- (d) **A1** 120 cao
- (d) **B1** housing takes up the largest share of a typical household's spending (weight 5, the highest) and also rose the most (sub-index 130, the highest), so the weighted index (122) correctly reflects its greater importance, unlike the unweighted mean (120) which treats all three categories as equally important, oe
- **(d) Answer: Unweighted mean = 120. The weighted index (122) is more appropriate because it reflects that housing takes up the largest share of typical spending and rose the most, whereas the unweighted mean treats housing, food and transport as equally important, which does not match real spending patterns.**

Question 3

- (a) **B1** 20 (%) cao
- **(a) Answer: 20%**
- (b) **M1** 40×112 , 25×106 , 20×118 , 15×102 (=4480, 2650, 2360, 1530), oe
- (b) **M1** $(4480+2650+2360+1530)/100$, dep
- (b) **A1** 110.2 cao
- **(b) Answer: 110.2**
- (c) **B1** higher, oe
- (c) **B1** because more weight is being placed on transport, which has the highest sub-index (118) of the four categories, this pulls the weighted average up above 110.2, oe
- **(c) Answer: Higher. Giving transport a greater weight pulls the weighted index towards transport's sub-index (118), which is the highest of the four, so the overall weighted index would rise above 110.2.**

Question 4

- (a) **B1** which categories of goods and services to include (the 'basket'), oe
- (a) **B1** what weight to give each category, based on typical local spending patterns, oe; accept 'which base period to use'
- (a) **Answer: Which categories of goods and services to include in the basket, and what weight to give each category based on typical local spending.**
- (b) **B1** to get a more representative typical price for each category, reducing the effect of any one shop's unusually high or low price, oe
- (b) **Answer: Using more than one shop gives a more representative average price for each category, rather than being skewed by one shop's unusually high or low prices.**
- (c) **M1** $6 \times 108, 3 \times 115, 1 \times 122$ (=648, 345, 122), oe
- (c) **M1** $(648 + 345 + 122) / (6 + 3 + 1)$, dep
- (c) **A1** 111.5 cao
- (c) **Answer: 111.5**
- (d) **B1** the local cost of living has risen by more (11.5%) than the national average (6%), oe
- (d) **B1** a plausible reason, e.g. local housing costs (which carry the largest local weight, 6 out of 10) may have risen faster than the national average, or the local basket/weights differ from the national CPI's, oe
- (d) **Answer: The local index (111.5) shows a bigger rise than the national CPI (106): 11.5% locally compared with 6% nationally. This could be because local housing costs, which carry the largest weight (6 out of 10) in the local index, have risen faster than the national average, or because the local basket and weights differ from the national CPI's.**

Question 5

- (a) **M1** weighted index = $(108w + 124(10 - w)) / 10 = 118$, oe
- (a) **A1** $108w + 124(10 - w) = 1180$ cso, from multiplying both sides by 10
- (a) **Answer: $108w + 124(10 - w) = 1180$**
- (b) **M1** $108w + 1240 - 124w = 1180$, oe (expands the bracket)
- (b) **M1** $-16w = -60$, dep (collects terms)
- (b) **A1** $w = 3.75$, so Category 2's weight = 6.25 cao
- (b) **Answer: $w = 3.75$ (Category 1's weight); Category 2's weight = 6.25**