3.12 Best Buy Questions: Test Pack

EDEXCEL 1MA1 · Calculator allowed · about 70 minutes

Total Marks

Name: _____ Date: ____ / ____ / _____

Answer ALL questions. Show all your working.

1 Which is the better buy: 3 apples for 90p or 5 apples for £1.40? Work out the cheaper price per apple.

(Total for Question 1 is 1 mark)

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2 A supermarket sells orange squash in two sizes: a 1.2 litre bottle for £1.68, or a 2 litre bottle for £2.60. Give the cheaper price per litre and state which bottle it is.

(Total for Question 2 is 1 mark)

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3 Two sizes of milk are available.
- Small: 1.2 litres for 1.08
- Large: 2 litres for 1.75

Which is the better buy? Show your working.

(Total for Question 3 is 2 marks)

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4 Compare three jars of jam and state which is best value per 100 g.
Small: 340 g for £1.65. Medium: 500 g for £2.40. Large: 1 kg for £4.25. Work out the price per 100 g for each and give the best value.

(Total for Question 4 is 3 marks)

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5 A multipack of 12 bottles of water costs 4.08. There is a special offer: buy one multipack and get a second multipack for half price.
Work out the cost per bottle if a customer buys two multipacks under this offer. Show your working.

(Total for Question 5 is 4 marks)

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6 A student compares two boxes of cereal bars.
Box A: 8 bars for £2.40. Box B: 5 bars for £1.55.
The student's working: "Box A: 240 divide by 8 = 30p per bar. Box B: 155 divide by 5 = 29p per bar. Box B is better value."
The student has made an error. Find the error, correct it, and state which box is actually better value.

(Total for Question 6 is 3 marks)

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7 A fruit juice is sold in two sizes.
- Carton A: 750 ml for 1.20
- Carton B: 1.5 litres for 2.35

A family needs 3.75 litres of juice for a party.
Calculate the least cost way to buy at least 3.75 litres. You may buy a mix of cartons. Show all working and give the total cost.

(Total for Question 7 is 6 marks)

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8 Show that the cheapest way to buy at least 2.5 litres of paint is to buy one 2 litre tin and one 750 ml pot.
750 ml pot costs £4.50. 2 litre tin costs £11.00. You must show costs for feasible combinations that reach at least 2.5 litres.

(Total for Question 8 is 3 marks)

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9 Kwame is deciding between two electricity tariffs.
Tariff X: 120 units at £0.18 per unit, plus standing charge of £9.50.
Tariff Y: 100 units at £0.20 per unit, plus standing charge of £5.00, plus a discount voucher of £8.00 applied to the bill.
Calculate the total bill for each tariff and state which is cheaper and by how much. Give answers to the nearest penny.

(Total for Question 9 is 5 marks)

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10 Show that for any integer n, buying n items at a 'buy 2 get 1 free' offer gives an average price per item of (2/3) of the single-item price p when n is a multiple of 3.
You must show the algebraic steps and give the final average price per item.

(Total for Question 10 is 6 marks)

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11 Oliwia runs a market stall in Nottingham selling loose-leaf tea.
Standard tea costs £8.40 per kg. Premium tea costs £15.60 per kg.
Oliwia mixes Standard and Premium tea in the ratio 5:3 by weight to make a house blend.
Work out the cost per kg to Oliwia of making the house blend. She plans to sell the blend for £12.00 per kg: state, with a reason, whether this price covers the cost of making it, and give the profit margin per kg if it does.

(Total for Question 11 is 6 marks)

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12 A shop increases the price of an item, P pounds, by a%, then decreases the new, increased price by the same percentage, a%. Show all working.

(a) Show that the final price after both changes is $P(1 - a^2/10000)$ pounds. **(3)**

(b) The original price is £250 and a = 10. Work out the final price and the overall percentage change from the original price. **(3)**

(Total for Question 12 is 6 marks)

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13 A photo-printing shop charges 12p for each of the first 20 photos in an order. Every additional photo beyond the 20th costs 60% of the standard 12p rate. Nia orders n photos, where n > 20.

(a) Show that the total cost, C pence, of an order of n photos (n > 20) is given by C = 240 + 7.2(n - 20). **(2)**

(b) Find the range of values of n for which Nia's local shop is cheaper than a rival shop charging a flat rate of 9p per photo. Give your answer as an inequality, and state the smallest whole number of photos for which the local shop is cheaper. **(5)**

(Total for Question 13 is 7 marks)

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Mark scheme · 3.12 Best Buy Questions: Test Pack

Question 1

Identify 5 for £1.40 is better value, 140p/5 = 28p each cao **B1**

Answer: 5 for £1.40 (28p each). 3 for 90p is 30p each, 5 for £1.40 is 28p each (better). 28p cao

Question 2

2 litre bottle cheaper, 260/2 = 130p per litre cao **B1**

Answer: 2 litre bottle, 130p per litre (cheaper than 140p per litre for the 1.2 litre bottle).

Question 3

correct unit price for at least one size shown, e.g. 1.08/1.2 = 0.90 or 1.75/2 = 0.875 **M1**

Large is better buy with unit price 0.875 compared to 0.90 cao **A1**

Answer: Large, price per litre 0.875 vs 0.90 (large is cheaper)

Question 4

Calculate two unit prices, e.g. small 165p/340*100 = 48.53p, medium 240p/500*100 = 48p **M1**

Calculate large: 425p/1000*100 = 42.5p **M1**

Large jar is best value, 42.5p per 100 g cao **A1**

Answer: Small approx 48.53p per 100 g, Medium = 48p per 100 g, Large = 42.5p per 100 g. Best value = Large, 42.5p per 100 g.

Question 5

cost of two packs shown: 4.08 + 4.08/2 = 4.08 + 2.04 = 6.12 **M1**

total bottles 24 identified **M1**

method to find unit price 6.12/24 shown **M1**

0.255 or 25.5p cao **A1**

Answer: 0.255 (25.5p)

Question 6

Recompute Box B unit price correctly: 155/5 = 31p per bar **M1**

State the student's error is in the Box B division (155/5 is not 29p) **B1**

State Box A is actually the better value, 30p per bar cao **A1**

Answer: The student's Box B calculation is wrong: 155/5 = 31p per bar, not 29p. Box A (30p per bar) is actually the better value, not Box B.

Question 7

convert litres to ml or convert sizes to common unit and show understanding (1.5 litres = 1500 ml, 3.75 litres = 3750 ml) **M1**

find unit prices: 1.20/750 = 0.0016 per ml and 2.35/1500 = 0.001566... per ml or equivalent per litre **M1**

use unit prices to note carton B is cheaper per ml and attempt combinations using whole cartons that reach at least 3750 ml **M1**

identify that 2 x Carton B (3000 ml) plus 1 x Carton A (750 ml) reaches exactly 3750 ml with no waste **M1**

calculate total cost for chosen option: 2 x 2.35 + 1 x 1.20 = 4.70 + 1.20 = 5.90, and compare against other combinations (e.g. 3 x Carton B = 7.05, 5 x Carton A = 6.00) to confirm it is cheapest **M1**

state least cost option and total 5.90 cao **A1**

Answer: Buy 2 of Carton B and 1 of Carton A: total 5.90 (gives exactly 3.75 L, cheapest combination)

Question 8

Calculate cost of 4 x 750 ml = 4 * £4.50 = £18.00 cso **dM1**

Calculate cost of 1 x 2 L + 1 x 750 ml = £11.00 + £4.50 = £15.50 cso **dM1**

Conclude cheapest is 2 L + 750 ml = £15.50 cao **A1**

Answer: 1 x 2 L + 1 x 750 ml costs £15.50 and gives 2.75 L. Alternative 4 x 750 ml costs £18.00 (3.0 L). Therefore the cheapest way to get at least 2.5 L is 2 L + 750 ml costing £15.50.

Question 9

calculate Tariff X: 120*0.18 + 9.50 **M1**

calculate Tariff Y before voucher: 100*0.20 + 5.00, then apply -8.00 **M1**

Tariff X = 21.6 + 9.50 = £31.10 **A1**

Tariff Y = 20.00 + 5.00 - 8.00 = £17.00 **A1**

state Tariff Y is cheaper by £14.10 cao **B1**

Answer: Tariff X = 120*0.18 + 9.50 = 21.60 + 9.50 = £31.10. Tariff Y = 100*0.20 + 5.00 - 8.00 = 20.00 + 5.00 - 8.00 = £17.00. Tariff Y is cheaper by £14.10. Working check: recompute totals as shown.

Question 10

express number of paid items for n divisible by 3: for n = 3k you pay for 2k items **M1**

total cost = 2k * p, number of items = 3k **M1**

average price per item = (2k*p)/(3k) **M1**

simplify to (2/3) p cao **A1**

clear statement for any integer k > 0 so n = 3k, the average is (2/3) p **B1**

final boxed conclusion: average = (2/3) p **A1**

Answer: Let n = 3k where k is a positive integer. Number paid = 2k so total cost = 2kp. Average per item = (2kp)/(3k) = (2/3) p. Hence the average price per item is (2/3) p. Working check: for k = 1, pay 2p for 3 items -> 2/3 p each.

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Question 11

recognise the ratio 5:3 as 8 total parts, e.g. use 5 kg Standard and 3 kg Premium **M1**

cost of 5 kg Standard = 5 * 8.40 (= 42.00) and cost of 3 kg Premium = 3 * 15.60 (= 46.80) **M1**

divide total cost by total mass: (42.00 + 46.80) / 8 **M1**

blend cost = £11.10 per kg cao **A1**

compare £11.10 per kg with the selling price of £12.00 per kg **M1**

correct conclusion with reason: £12.00 covers the cost, giving a margin of £0.90 per kg cao **A1**

Answer: Cost of blend = (5*8.40 + 3*15.60) / 8 = (42.00 + 46.80) / 8 = 88.80 / 8 = £11.10 per kg. Selling at £12.00 per kg covers the cost, with a margin of 12.00 - 11.10 = £0.90 per kg. Working check: 5 + 3 = 8 parts; 42.00 + 46.80 = 88.80; 88.80 / 8 = 11.10.

Question 12

(a) increased price = P(1 + a/100), or equivalent **M1**

(a) multiply by (1 - a/100) to apply the decrease: P(1 + a/100)(1 - a/100) **M1**

(a) expand using difference of two squares to P(1 - a^2/10000) cso **A1**

(a) Answer: P(1 + a/100)(1 - a/100) = P(1 - (a/100)^2) = P(1 - a^2/10000), as required.

(b) substitute a = 10 and P = 250, either into part (a)'s formula or by computing 250 * 1.1 * 0.9 **M1**

(b) final price = £247.50 cao **A1**

(b) state the overall change is a decrease of 1% (or -1%) cao **B1**

(b) Answer: Final price = 250 * 1.1 * 0.9 = £247.50. This is a decrease of 1% on the original £250.

Question 13

(a) cost of the first 20 photos = 20 * 12 (= 240), and cost per extra photo = 0.6 * 12 (= 7.2) **M1**

(a) C = 240 + 7.2(n - 20) cso **A1**

(a) Answer: C = 240 + 7.2(n - 20) pence, as required.

(b) form the rival shop's cost: 9n **M1**

(b) form the inequality 240 + 7.2(n - 20) < 9n **M1**

(b) expand and simplify: 96 + 7.2n < 9n (dependent on the previous M1) **M1**

(b) correctly rearrange to n > 53.33 (recurring), or equivalent, e.g. n > 96/1.8 **A1**

(b) since n must be a whole number of photos, state the local shop is cheaper for n ≥ 54 **B1**

(b) Answer: n > 53.33 (recurring), so since n is a whole number, Nia's local shop is cheaper for n ≥ 54 photos.

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