5.3 Probability and distributions

Name: _____ Class: _____ Date: _____ **Total: 16 marks**

KEY WORDS binomial distribution • normal distribution

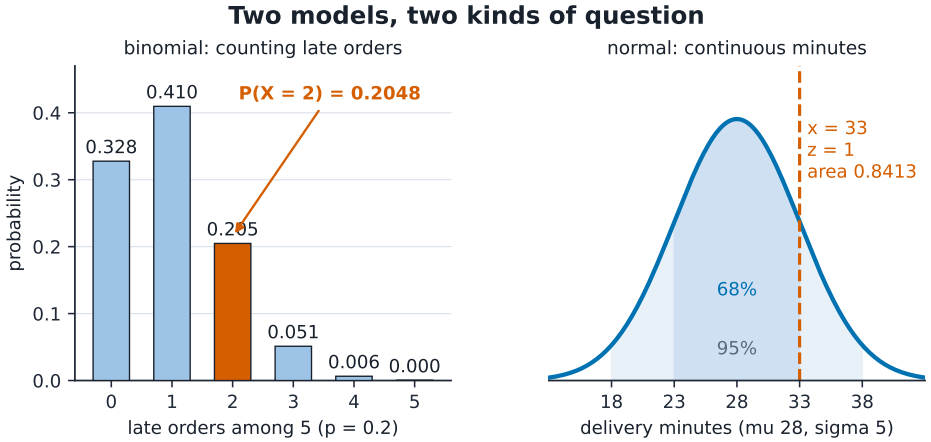
Objective

Apply probability rules; compute binomial and normal probabilities with the model justified; standardise and read tables correctly.

1 Key knowledge and worked examples

■ **Two models, matched to questions**

Counts of successes → **binomial** : $\binom{n}{k}p^k(1-p)^{n-k}$. Symmetric continuous measurements → **normal** : standardise with $z = (x-\mu)/\sigma$ and read Φ. Justify the model before computing.



Counts on the left; continuous minutes on the right

■ **Worked example. The 30-minute promise**

$\mu = 28$, $\sigma = 5$: $P(X > 30) = 1 - \Phi(0.4) = 0.345$ – a third of orders claim the free dessert ✓. Speeding the kitchen to $\mu = 26$ still leaves 0.212. The promise's cost is a probability.

2 Practice

2.1 P(rain) = 0.3, P(rush hour) = 0.4, both together 0.12. Compute P(rain or rush), and state whether the two are independent. [3]

2.2 An order is late with probability 0.15. For the next 6 orders, compute P(exactly 1 late) and P(none late). [4]

2.3 Delivery minutes follow N(26, 4). Compute P(an order exceeds 32) and P(it finishes within ±6 minutes of the mean). [4]

2.4 In two lines: why is the binomial the wrong model for "P(this specific order is late)" and what IS the right framing? [2]

2.5 Match each question to its model with one reason each: (a) at least 3 of 25 orders complain; (b) a single order's total weight in grams; (c) which of 4 riders gets the north route. [3]