Test - Conditional probability and the Normal distribution

Year: Year 13 · Duration: 40 minutes · /20

Name:	Date:	**Mark: /20**

Question	1	2	3	4	5	Total
marks	4	5	4	4	3	**20**
Mark						

Show your working.

Question 1 (4 marks)

Question 1 – Two-way table

80 students were asked whether they attend the gym.

	Gym	No gym	Total
Year 12	18	22	40
Year 13	24	16	40
Total	42	38	80

a. Find the probability that a randomly chosen student attends the gym. [1 mark]
b. Find the probability that a student is in Year 13 given that they attend the gym. [1 mark]
c. Determine, with working, whether "attends the gym" and "Year 12" are independent. [2 marks]

Question 2 (5 marks)

Question 2 – Late for school

Tom travels to school by bus with probability 0.6 and by bicycle otherwise. He is late with probability 0.1 when he takes the bus and 0.05 when he cycles.

a. Find the probability that Tom is late on a particular day. [2 marks]
b. Given that Tom is late, find the probability that he took the bus. [2 marks]
c. Find the probability that Tom is not late on any day of a 5-day week, assuming days are independent. [1 mark]

Question 3 (4 marks)

Question 3 – Tomato masses

The mass of a tomato is modelled by $X \sim N(64, 9^2)$ grams.

a. Find $P(X > 70)$. [1 mark]
b. Find $P(55$. [1 mark]
c. Find the mass k such that 20% of tomatoes have mass less than k. [2 marks]

Question 4 (4 marks)

Question 4 – Finding the parameters

$X \sim N(\mu, \sigma^2)$ with $P(X$ and $P(X > 30) = 0.4$.

a. Write down two equations connecting μ and σ. [2 marks]
b. Find μ and σ. [2 marks]

Question 5 (3 marks)

Question 5 – Normal approximation

$X \sim B(150, 0.3)$. Use a Normal approximation with a continuity correction to estimate $P(X \leq 40)$, and state the parameters of the approximating distribution.