Practice test 2 - cumulative models and cut-offs

Name: _____ Date: _____

10 questions | 42 marks | 65 minutes

Use changing density shapes, CDFs, reverse normal calculations and weighted measurements.

Use a graphics calculator or appropriate digital tool for labelled tasks.

1. Let $f(x) = k(2 - x)$ on [0,2], zero elsewhere. [4 marks]

(a) Find k. [2 marks]

(b) Find P(X<1). [2 marks]

2. For density $1 - x/2$ on [0,2], [5 marks]

(a) find the CDF on the whole real line. [3 marks]

(b) find the median. [2 marks]

3. A density equals c on [0,1] and 2c on (1,2], and is zero elsewhere. [4 marks]

(a) Find c and P(X<0.5). [2 marks]

(b) Does the CDF jump at x=1? Explain. [2 marks]

4. U is uniform on [-2,4]. [5 marks]

(a) Find E(U), Var(U) and SD(U). [3 marks]

(b) Find the mean and variance of V=3U+2. [2 marks]

5. $X \sim N(24, 2.25)$ models filling time in seconds. [4 marks]

(a) Find P(X>27). [2 marks]

(b) Find the central 80% interval. [2 marks]

6. A normal model has known mean 100. Its 90th percentile is 112. [4 marks]

(a) Find its standard deviation. [2 marks]

(b) State its 10th percentile. [2 marks]

7. Independent $X \sim N(10, 4)$ and $Y \sim N(5, 9)$. [4 marks]

(a) Find the distribution of 2X-Y. [2 marks]

(b) Find P(2X-Y<10). [2 marks]

8. A normal population has mean 60 and SD 10. An independent random sample of 25 values is selected. [4 marks]

(a) Find the SE and P(sample mean>64). [2 marks]

(b) Would P(an individual value>64) be the same? Calculate it. [2 marks]

9. A non-normal population has mean 18 and finite SD 6. [4 marks]

(a) For n=100 independent random observations, give an approximate distribution of the sample mean. [2 marks]

(b) Identify one feature that could make convergence to normality slower. [2 marks]

10. A sensor rounds continuous measurements to the nearest whole number. The underlying X has density 2x on [0,1]. [4 marks]

(a) Find P(the displayed value is 1). [2 marks]

(b) Explain why the displayed value can have positive probability although P(X=1)=0. [2 marks]