

1. A random variable X is distributed normally with mean 450 and standard deviation 20.

(a) Find $P(X \leq 475)$. $P(-\infty < X < 475) = \text{normalcdf}(-9999, 475, 450, 20)$
 $= .894$ (2)

- (b) Given that $P(X > a) = 0.27$, find a .

$$P(X < a) = 1 - .27 = .73$$

$$\text{invNorm}(.73, 450, 20) = 462$$

(4)

(Total 6 marks)

2. The heights of boys at a particular school follow a normal distribution with a standard deviation of 5 cm. The probability of a boy being shorter than 153 cm is 0.705. $\rightarrow P(X < 153) = .705$

(a) Calculate the mean height of the boys. $\text{invNorm}(.705, 0, 1) = .539$ $.539 = \frac{153 - \mu}{5}$

- (b) Find the probability of a boy being taller than 156 cm.

$$P(156 < X < \infty) = \text{normalcdf}(156, 9999, 150, 5)$$

$$= .115$$

(Total 6 marks)

3. The heights of a group of students are normally distributed with a mean of 160 cm and a standard deviation of 20 cm.

(a) A student is chosen at random. Find the probability that the student's height is greater than 180 cm. $P(180 < X < \infty) = \text{normalcdf}(180, 9999, 160, 20) = .159$

- (b) In this group of students, 11.9% have heights less than d cm. Find the value of d .

$$P(X < d) = .119$$

(Total 6 marks)

$$\text{invNorm}(.119, 160, 20) = 136$$

$$d = 136$$

4. A fair coin is tossed five times. Calculate the probability of obtaining

- (a) exactly three heads;

$$n = 5 \quad p = \frac{1}{2}$$

- (b) at least one head.

$$\rightarrow P(X = 3) = \text{binompdf}(5, \frac{1}{2}, 3) = .313$$

(Total 6 marks)

$$\downarrow$$

$$P(X \geq 1) = 1 - P(X \leq 0)$$

$$= 1 - \text{binomcdf}(5, .5, 0)$$

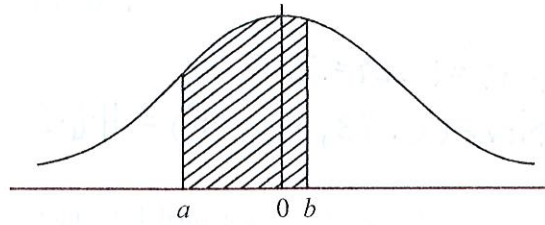
$$= .969$$

5. Reaction times of human beings are normally distributed with a mean of 0.76 seconds and a standard deviation of 0.06 seconds.

- (a) The graph below is that of the standard normal curve. The shaded area represents the probability that the reaction time of a person chosen at random is between 0.70 and 0.79 seconds.

$$a = \frac{.70 - .76}{.06}$$

$$a = -1$$

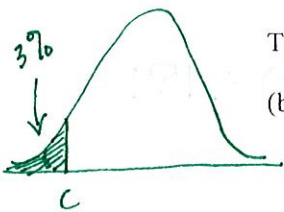


$$b = \frac{.79 - .76}{.06}$$

$$b = .5$$

- (i) Write down the value of a and of b .
- (ii) Calculate the probability that the reaction time of a person chosen at random is
- (a) greater than 0.70 seconds; $P(.7 < X < \infty) = .841$
- (b) between 0.70 and 0.79 seconds. $P(.7 < X < .79) = .532$

(6)



.03

Three percent (3%) of the population have a reaction time less than c seconds.

- (b) (i) Represent this information on a diagram similar to the one above. Indicate clearly the area representing 3%.
- (ii) Find c . $\text{invNorm}(.03, .76, .06) = .647$
- $$P(X < c) = .03$$
- $$c = .647$$

(4)

(Total 10 marks)

6. A multiple choice test consists of ten questions. Each question has five answers. Only one of the answers is correct. For each question, Jose randomly chooses one of the five answers.

$$p = \frac{1}{5}$$

- (a) Find the expected number of questions Jose answers correctly.

$$E(X) = 10\left(\frac{1}{5}\right) = 2$$

(1)

- (b) Find the probability that Jose answers exactly three questions correctly.

$$P(X = 3) = \text{binompdf}\left(10, \frac{1}{5}, 3\right) = .201$$

(2)

- (c) Find the probability that Jose answers more than three questions correctly.

$$P(X \geq 4) = 1 - P(X \leq 3)$$

$$= 1 - \text{binomcdf}\left(10, \frac{1}{5}, 3\right)$$

$$= .121$$

(3)

(Total 6 marks)