1.	The heights of females from a country are normally distributed with			
	a mean of 166.5 cma standard deviation of 6.1 cm			
	Given that 1% of females from this country are shorter than $k \text{ cm}$,			
	(a) find the value of <i>k</i>	(2)		
	(b) Find the proportion of females from this country with heights between 150 cm and 175 cm	(1)		
	A female, from this country, is chosen at random from those with heights between 150 cm and 175 cm			
	(c) Find the probability that her height is more than 160 cm	(4)		
	The heights of females from a different country are normally distributed with a standard deviation of 7.4 cm			
	Mia believes that the mean height of females from this country is less than 166.5 cm			
	Mia takes a random sample of 50 females from this country and finds the mean of her sample is 164.6 cm			
	(d) Carry out a suitable test to assess Mia's belief. You should			
	 state your hypotheses clearly use a 5% level of significance 	(4)		

2.	George throws a ball at a target 15 times. Each time George throws the ball, the probability of the ball hitting the target is 0.48				
	The random variable <i>X</i> represents the number of times George hits the target in 15 throws.				
	(a) Find				
	(i) $P(X = 3)$				
	(ii) $P(X \ge 5)$	(3)			
	George now throws the ball at the target 250 times.				
	(b) Use a normal approximation to calculate the probability that he will hit the target more than 110 times.				
		(3)			

3.	A study was made of adult men from region A of a country. It was found that their heights were normally distributed with a mean of 175.4 cm and standard deviation 6.8 cm.	
	(a) Find the proportion of these men that are taller than 180 cm.	(1)
	A student claimed that the mean height of adult men from region B of this country was different from the mean height of adult men from region A .	
	A random sample of 52 adult men from region B had a mean height of 177.2 cm	
	The student assumed that the standard deviation of heights of adult men was $6.8 \mathrm{cm}$ both for region A and region B .	
	(b) Use a suitable test to assess the student's claim. You should	
	state your hypotheses clearly	
	• use a 5% level of significance	(4)
	(c) Find the <i>p</i> -value for the test in part (b)	(1)

4. A medical researcher is studying the number of hours, *T*, a patient stays in hospital following a particular operation.

The histogram on the page opposite summarises the results for a random sample of 90 patients.

(a) Use the histogram to estimate P(10 < T < 30)

(2)

For these 90 patients the time spent in hospital following the operation had

- a mean of 14.9 hours
- a standard deviation of 9.3 hours

Tomas suggests that T can be modelled by $N(14.9, 9.3^2)$

(b) With reference to the histogram, state, giving a reason, whether or not Tomas' model could be suitable.

(1)

Xiang suggests that the frequency polygon based on this histogram could be modelled by a curve with equation

$$y = kxe^{-x}$$
 $0 \le x \le 4$

where

- x is measured in tens of hours
- k is a constant
- (c) Use algebraic integration to show that

$$\int_0^n x e^{-x} dx = 1 - (n+1)e^{-n}$$
(4)

(d) Show that, for Xiang's model, k = 99 to the nearest integer.

(3)

- (e) Estimate P(10 < T < 30) using
 - (i) Tomas' model of $T \sim N(14.9, 9.3^2)$

(1)

(ii) Xiang's curve with equation $y = 99xe^{-x}$ and the answer to part (c)

(2)

The researcher decides to use Xiang's curve to model P(a < T < b)

(f) State one limitation of Xiang's model.

(1)

Question 4 continued

