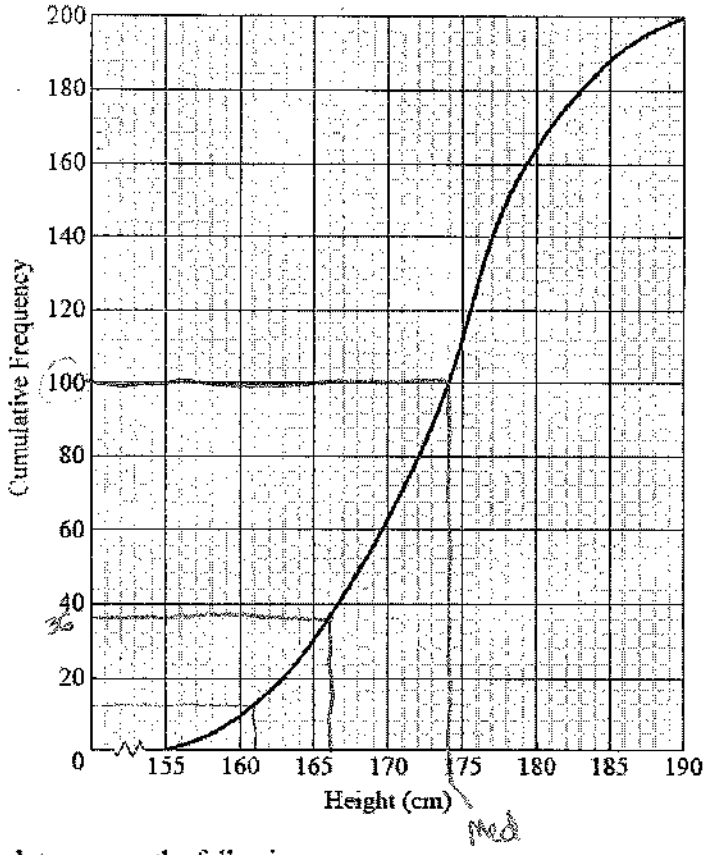
1. 2. *[Maximum mark: 6]*

The cumulative frequency curve below represents the heights of 200 sixteen-year-old boys.



Use the graph to answer the following.

(a) Write down the median value. 174 *[1 mark]*

(b) A boy is chosen at random. Find the probability that he is shorter than 161 cm. *[2 marks]*

$\frac{12}{200} = 6\%$

(c) Given that 82 % of the boys are taller than h cm, find h. *[3 marks]*

200(.82) = 164 taller than h

200 − 164 = 36 shorter than h

166 cm

2. 4. The eye colour of 97 students is recorded in the chart below.

	Brown	Blue	Green	
Male	21	16	9	46
Female	19	19	13	51
				97

One student is selected at random.

(a) Write down the probability that the student is a male. $46/97 \approx 0.474$

(b) Write down the probability that the student has green eyes, given that the student is a female. Green and F / F $\frac{13}{51} \approx 0.255$

(c) Find the probability that the student has green eyes or is male. $9+13+21+16 = \frac{59}{97} \approx 0.608$

3. 7. *[Maximum mark: 7]*

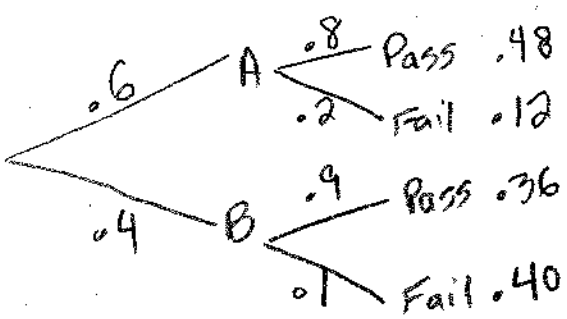
A company uses two machines, A and B, to make boxes. Machine A makes 60 % of the boxes.

80 % of the boxes made by machine A pass inspection.
90 % of the boxes made by machine B pass inspection.

A box is selected at random.

(a) Find the probability that it passes inspection. $.48+.36 = 0.84$ *[3 marks]*

(b) If the box does not pass inspection, find the probability that it was made by Machine A. *[3 marks]*



Fail and A / Fail $\frac{.12}{.52} = 0.231$

4. *[Maximum mark: 8]*

The random variable X has the following probability distribution, with $P(X > 1) = 0.5$.

x	0	1	2	3
$P(X = x)$	p	q	r	0.2

0.5

(a) Find the value of r. 0.3 *[2 marks]*

(b) Given that $E(X) = 1.4$, find the value of p and of q. *[6 marks]*

$p + q + 0.5 = 1$ $0p + 1q + 2(0.3) + 3(0.2) = 1.4$

$p + 0.2 + 0.5 = 1$ ← $q = 0.2$

$p = 0.3$

5. *[Maximum mark: 7]*

A box holds 240 eggs. The probability that an egg is brown is 0.05.

(a) Find the expected number of brown eggs in the box. $240(0.05) = 12$ *[2 marks]*

(b) Find the probability that there are 15 brown eggs in the box. *[2 marks]*

binompdf(240, 0.05, 15) ≈ 0.0733

(c) Find the probability that there are at least 10 brown eggs in the box. *[3 marks]*

1 − binomcdf(240, 0.05, 9) ≈

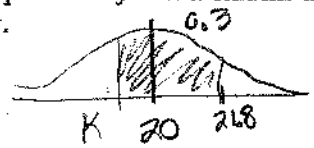
0.764

6. *[Maximum mark: 7]*

The time taken for a student to complete a task is normally distributed with a mean of 20 minutes and a standard deviation of 1.25 minutes.

(a) A student is selected at random. Find the probability that the student completes the task in less than 21.8 minutes. normalcdf(−100, 21.8, 20, 1.25) ≈ 0.925 *[2]*

(b) The probability that a student takes between k and 21.8 minutes is 0.3. Find the value of k. *[5]*



0.925 (from part a)

$P(<K) = 0.625$

InvNorm(0.625, 20, 1.25) ≈ 20.4

7. 1. *[Maximum mark: 6]*

The following diagram shows ΔPQR, where RQ = 9 cm, $P\hat{R}Q = 70°$ and $P\hat{Q}R = 45°$.

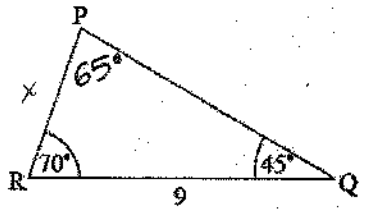


diagram not to scale

(a) Find $R\hat{P}Q$. 65° *[1 mark]*

(b) Find PR. $\frac{9}{\sin 65} = \frac{PR}{\sin 45}$ PR ≈ 7.02 cm *[3 marks]*

(c) Find the area of ΔPQR. *[2 marks]*

$A = \frac{1}{2}(9)(7.02)\sin 70$

$\approx 29.7\ cm^2$