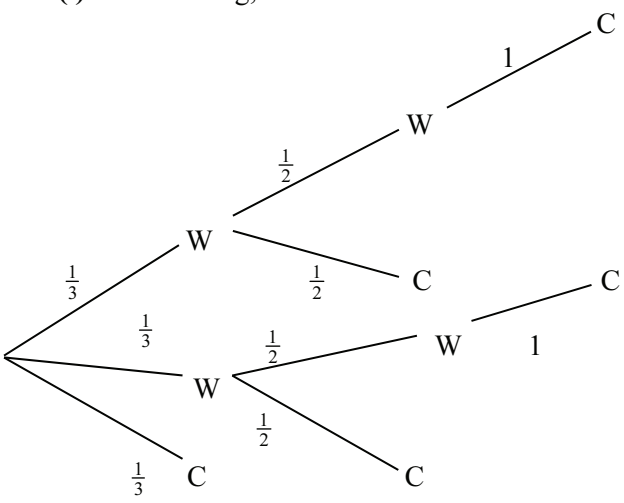
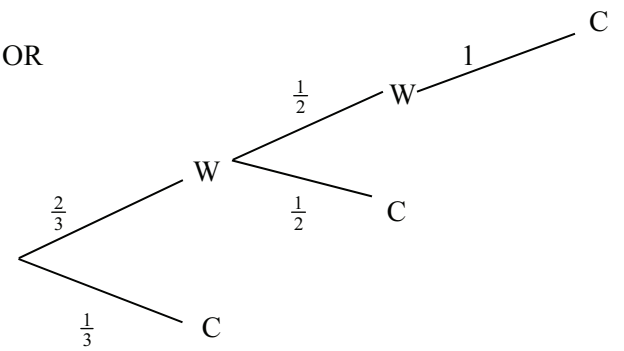
1 $^{48}C_{43}$ = 1712304 (1710000)	B1 B1 B1 **3**	48 seen in a single term combination oe 43 or 5 seen in a single term combination oe Both can be mult by integer $k \geqslant 1$ Correct final answer
2 **(i)** 6! ×5! = 86400 **(ii)** 6! × 7 × 6 × 5 × 4 = 604800	B1 B1 B1 **3** B1 B1 B1 **3**	6! oe seen multiplied by integer $k \geqslant 1$ 5! oe seen multiplied by integer $k \geqslant 1$ Correct final answer 6! seen mult by integer $k \geqslant 1$ Mult by $^7P_4$ oe Correct final answer
3 **(i)** 1 1 1 2 or 1 1 2 1 or 1 2 1 1 or 2 1 1 1 Prob = $\frac{1}{6}\times\frac{1}{6}\times\frac{1}{6}\times\frac{1}{6}\times 4$ = $\frac{1}{324}$ (0.00309) **(ii)** P(1,2) = $^7C_1 \times (1/324)\,(323/324)^6 + {}^7C_2(1/324)^2(323/324)^5$ = 0.0214	M1 M1 A1 **3** M1 M1 M1 A1 **4**	One of 1 1 1 2 seen Mult a prob by 4 or $(\frac{1}{6})^4 \times$ integer $k \geqslant 1$ seen Correct answer Bin term $^7C_x p^x (q)^{7-x}$, $0.99 \leqslant p + q \leqslant 1$ Using their p from **(i)** in a bin term Correct unsimplified answer Correct answer
4 **(i)** W = wrong, C = correct  OR  	M1 M1 B1 A1 **4** M1 M1 B1 A1	3 branches first qn and 2 by 2 for second qn only One branch twice for third qn or two branches twice with 0 and 1 seen on branches Any two of $\frac{1}{3}$, $\frac{1}{2}$ and 1 seen as probs Probs all correct and sensible labels NB SR for 4 outcomes instead of 3, M1 B1 only 2 branches first qn and 1 by 2 for second qn only One branch once for third qn or two branches with 0 and 1 seen on branches Any two of $\frac{1}{3}$ or $\frac{2}{3}$, $\frac{1}{2}$ and 1 seen as probs Probs all correct and sensible labels

© Cambridge International Examinations 2014

(ii)

x	1	2	3
Prob	$\frac{1}{3}$	$\frac{1}{3}$	$\frac{1}{3}$

P(1) = P(C) say $= \frac{1}{3}$

P(2) = P(WC) = $\frac{1}{6}$ P(WC) = $\frac{1}{6}$ total P (2) = $\frac{1}{3}$

P(3) = P(WWC) = $\frac{1}{6}$ P(WWC) = $\frac{1}{6}$ total P(3) = $\frac{1}{3}$

$E(X) = 1 \times \frac{1}{3} + 2 \times \frac{1}{3} + 3 \times \frac{1}{3} = 2$

B1 1, 2, 3 seen only oe

B1 2 correct probs

B1 3 correct probs

B1√ **4** Correct answer ft their probs provided $0.999 \leqslant \Sigma p \leqslant 1$

5 **(a)** **(i)** $P(x < 8) = P\left(z < \frac{8 - 7.15}{0.88}\right)$

$= \Phi(0.9659)$

$= 0.833$

M1 Standardising ± , no cc no sq rt no sq

A1 **2** Correct answer

(ii) $z = 0.674$

B1 Accept ± 0.674 or 0.675 only

$\frac{q - 7.15}{0.88} = 0.674$

M1 Standardised eqn = ± their z-value, allow sq or sq rt if already penalised in **(i)**

$q = 7.74$

A1 **3** Correct answer

(b) $P(Y > 4\mu) = P\left(z > \frac{4\mu - \mu}{(3\mu/2)}\right) = P(z > 2)$

M1 Standardising no sq rt, no cc, no sq, one variable

$= 1 - 0.9772$

$= 0.0228$

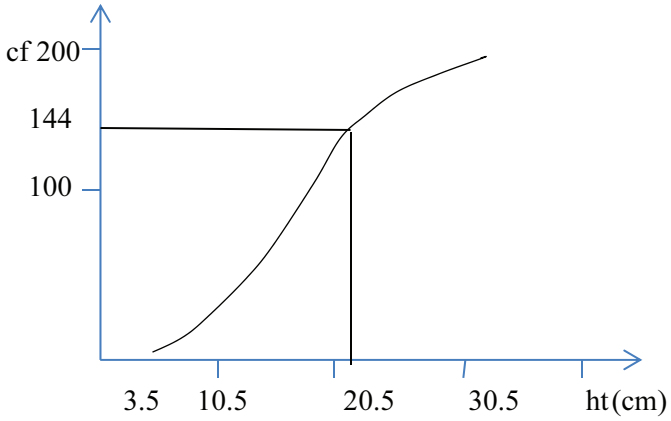
A1 $z = \pm 2$ seen

A1 **3** correct ans SR B1 if made-up values used and 0.0228 obtained

© Cambridge International Examinations 2014

6 (i)

ht	<10.5	<15.5	<20.5	<25.5	<30.5
CF	22	54	132	172	200



B1 At least 4 CFs correct seen on graph

B1 Labels correct, i.e. all of ht, cm, cf

M1 Attempt at upper end points either 10 or 10.5 or 11 at least 4 upper end points

A1 **4** All correct, i.e. points joined up from (3.5, 0) to (10.5, 22)….to (30.5, 200) Straight lines or curve

(ii) 72% less, i.e. 144 less than ht h.
$h = 22.5$ cm

M1 144 **used** can be implied
A1 **2** single value in range 21 to 23 inclusive

(iii) var = $(7^2 \times 22 + 13^2 \times 32 + 18^2 \times 78 + 23^2 \times 40 + 28^2 \times 28)/200 - 18.39^2$
$= 74870/200 - 18.39^2$
$= 374.35 - 18.39^2$
$= 36.1579$

M1 Using mid points attempt 7 ± 0.5in correct var formula incl $-$ mean^2

B1 At least 4 correct midpoints

sd = 6.01

A1 **3** Correct ans

7 (i) P (4, 5, 6) = $(0.75)^4 (0.25)^4 \times {}^8C_4 + (0.75)^5 (0.25)^3 \times {}^8C_5 + (0.75)^6 (0.25)^2 \times {}^8C_6$

M1 Bin term $p^r(1-p)^{8-r} \times {}^8C_r$ seen any p

M1 Correct unsimplified answer

$= 0.606$

A1 **3** Correct ans

(ii) $np = 160 \times 0.75 = 120$ $\quad npq = 30$

B1 Unsimplified mean and var correct

$$P(>114) = P\left(z > \left(\frac{114.5 - 120}{\sqrt{30}}\right)\right)$$

M1 Standardising, need sq rt
M1 Cont correction either 114.5 or 113.5

$= P(z > -1.004)$

M1 Correct area consistent with their working

$= \Phi(1.004) = 0.842$

A1 **5** Correct ans

(iii) np and nq both > 5

B1 **1** Need both

© Cambridge International Examinations 2014