1)

(a) (i) $s = 1$ ***A1*** ***N1***

(ii) evidence of appropriate approach ***(M1)***
e.g. $21 - 16$, $12 + 8 - q = 15$

$q = 5$ ***A1*** ***N2***

(iii) $p = 7$, $r = 3$ ***A1A1*** ***N2***

[5 marks]

(b) (i) $\mathrm{P}(\text{art} \mid \text{music}) = \frac{5}{8}$ ***A2*** ***N2***

(ii) **METHOD 1**

$\mathrm{P}(\text{art}) = \frac{12}{16} \quad \left(= \frac{3}{4}\right)$ ***A1***

evidence of correct reasoning ***R1***
e.g. $\frac{3}{4} \neq \frac{5}{8}$

the events are not independent ***AG*** ***N0***

METHOD 2

$\mathrm{P}(\text{art}) \times \mathrm{P}(\text{music}) = \frac{96}{256} \quad \left(= \frac{3}{8}\right)$ ***A1***

evidence of correct reasoning ***R1***
e.g. $\frac{12}{16} \times \frac{8}{16} \neq \frac{5}{16}$

the events are not independent ***AG*** ***N0***

[4 marks]

(c) $\mathrm{P}(\text{first takes only music}) = \frac{3}{16}$ (seen anywhere) ***A1***

$\mathrm{P}(\text{second takes only art}) = \frac{7}{15}$ (seen anywhere) ***A1***

evidence of valid approach ***(M1)***
e.g. $\frac{3}{16} \times \frac{7}{15}$

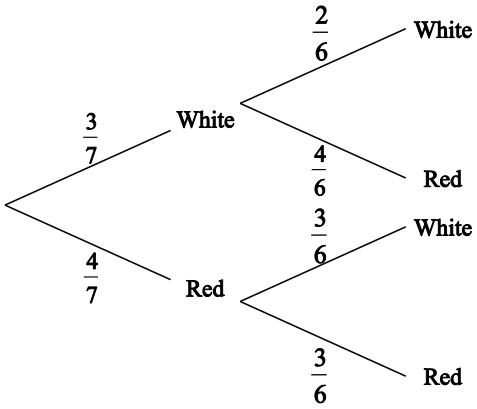
$\mathrm{P}(\text{music and art}) = \frac{21}{240} \quad \left(= \frac{7}{80}\right)$ ***A1*** ***N2***

[4 marks]

Total [13 marks]

2)

(a) (i)



$\frac{4}{6}, \frac{3}{6}$ and $\frac{3}{6}$ $\left(\frac{2}{3}, \frac{1}{2}\right.$ and $\left.\frac{1}{2}\right)$ ***A1A1A1*** ***N3***

(ii) multiplying along the correct branches (may be seen on diagram) ***(A1)***

e.g. $\frac{3}{7} \times \frac{2}{6}$

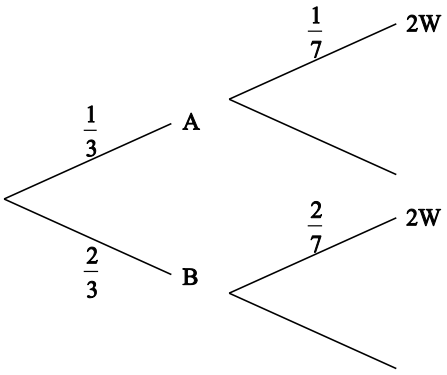
$\frac{6}{42}$ $\left(= \frac{1}{7}\right)$ ***A1*** ***N2***

[5 marks]

(b) $\mathrm{P}(\text{bag A}) = \frac{2}{6}$ $\left(= \frac{1}{3}\right)$, $\mathrm{P}(\text{bag B}) = \frac{4}{6}$ $\left(= \frac{2}{3}\right)$ (seen anywhere) ***(A1)(A1)***

appropriate approach ***(M1)***

e.g. $\mathrm{P}(WW \cap A) + \mathrm{P}(WW \cap B)$



correct calculation ***A1***

e.g. $\frac{1}{3} \times \frac{1}{7} + \frac{2}{3} \times \frac{2}{7}, \frac{2}{42} + \frac{8}{42}$

$\mathrm{P}(2W) = \frac{60}{252}$ $\left(= \frac{5}{21}\right)$ ***A1*** ***N3***

[5 marks]

continued ...

(c) recognizing conditional probability ***(M1)***

e.g. $\frac{\mathrm{P}(A \cap B)}{\mathrm{P}(B)}$, $\mathrm{P}(A \mid WW) = \frac{\mathrm{P}(WW \cap A)}{\mathrm{P}(WW)}$

correct numerator ***(A1)***

e.g. $\mathrm{P}(A \cap WW) = \frac{6}{42} \times \frac{2}{6}$, $\frac{1}{21}$

correct denominator ***(A1)***

e.g. $\frac{60}{252}$, $\frac{5}{21}$

probability $\frac{84}{420} \left(= \frac{1}{5} \right)$ ***A1*** ***N3***

[4 marks]

3)

(a) min value of r is -1, max value of r is 1 ***A1A1*** ***N2***

[2 marks]

(b) C ***A1*** ***N1***

[1 mark]

(c) linear, strong negative ***A1A1*** ***N2***

[2 marks]

Total [5 marks]

4)

(a) (i) $p = 17,\ q = 11$ ***A1A1*** ***N2***

(ii) $75 \le T < 85$ ***A1*** ***N1***

[3 marks]

(b) evidence of valid approach ***(M1)***
e.g. adding frequencies
$\frac{76}{93} = 0.8172043\ldots$
$\mathrm{P}(T < 95) = \frac{76}{93} = 0.817$ ***A1*** ***N2***

[2 marks]

(c) (i) 10 ***A1*** ***N1***

(ii) 50 ***A1*** ***N1***

[2 marks]

(d) (i) evidence of approach using mid-interval values (may be seen in part (ii)) ***(M1)***
79.1397849
$\overline{x} = 79.1$ ***A2*** ***N3***

(ii) 16.4386061
$\sigma = 16.4$ ***A1*** ***N1***

[4 marks]

5) (a) $y = 10.7x + 121$ ***A1A1*** ***N2***
[2 marks]

(b) (i) additional cost per box (unit cost) ***A1*** ***N1***

(ii) fixed costs ***A1*** ***N1***
[2 marks]

(c) attempt to substitute into regression equation ***M1***
e.g. $y = 10.7 \times 60 + 121$, $y = 760.12\ldots$

cost $= \$760$ (accept \$763 from 3 s.f. values) ***A1*** ***N2***
[2 marks]

(d) setting up inequality (accept equation) ***M1***
e.g. $19.99x > 10.7x + 121$

$x > 12.94\ldots$ ***A1***

13 boxes (accept 14 from $x > 13.02$, using 3 s.f. values) ***A1*** ***N2***

Note: Exception to the ***FT*** rule: if working shown, award the final ***A1*** for a correct integer solution for **their** value of x.

[3 marks]