Statistics 10 Solutions

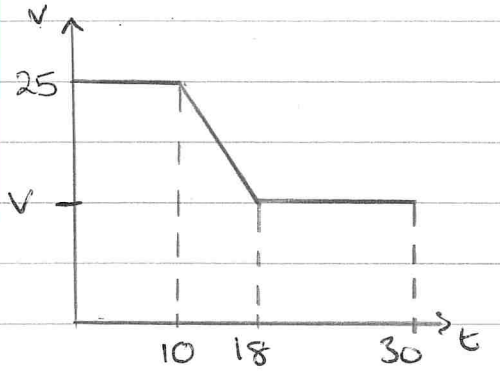
Section 1

1)a) $u=21 \quad v=0 \quad a=-9.8 \quad s=? \quad v^2=u^2+2as \Rightarrow s=22.5\text{ m}$

b) $u=21 \quad v=? \quad a=-9.8 \quad s=-1.5 \quad v^2=u^2+2as \Rightarrow v=\sqrt{470.4}\approx 22\text{ms}^{-1}$

c) $v=-\sqrt{470.4} \quad u=21 \quad a=-9.8 \quad t=? \quad v=u+at \Rightarrow t\approx 4.4\text{s}$

2)a)



b) $(25\times 10)+\frac{1}{2}(25+v)\times 8+12\times v=526$

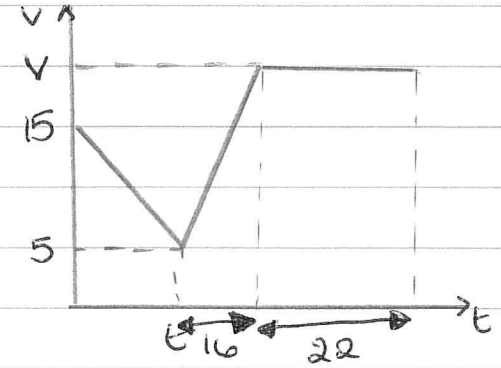
$v=11$

c) $u=25 \quad v=11 \quad t=8$

$v=u+at \Rightarrow a=-1.75\text{ms}^{-2}$

deceleration $=1.75\text{ms}^{-2}$

3)a)



b) $\frac{1}{2}(15+5)t=120$

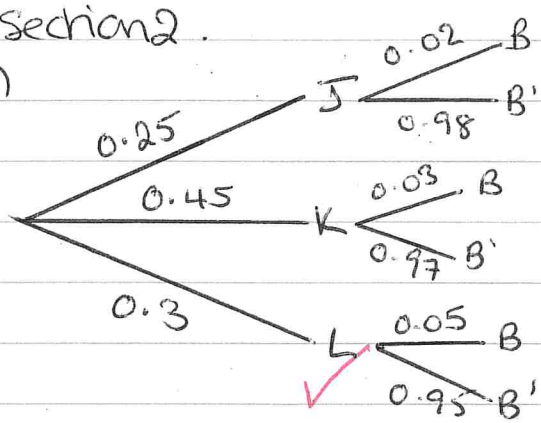
$\Rightarrow t=50\text{s}$

c) $120+\frac{1}{2}(5+v)16+22v=1000$

$\Rightarrow v=28$

Section 2

1)a)



$P(J\cap B)=\frac{1}{200}\quad(0.005)$

$P(J\cap B')=\frac{49}{200}\quad(0.245)$

$P(K\cap B)=\frac{27}{2000}\quad(0.0135)$

$P(K\cap B')=\frac{873}{2000}\quad(0.4365)$

$P(L\cap B)=\frac{3}{200}\quad(0.015)$

$P(L\cap B')=\frac{57}{200}\quad(0.285)$

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b) $P(J\cap B')=0.25\times 0.98=\frac{49}{200}$

c) $P(J\cap B)+P(K\cap B)+P(L\cap B)=0.25\times 0.02+0.45\times 0.03+0.3\times 0.05$

$=\frac{67}{2000}\quad(\text{or } 0.0335)$

d) $P(J\cap B \text{ or } L\cap B \,/\, B)=\frac{0.25\times 0.02+0.3\times 0.05}{0.0335}=0.597$

(Follow through from (b))

2) a) $P(C/\text{reads at least one magazine}) = \frac{6+3}{20} = \frac{9}{20}$ ✓

b) $P(B) = \frac{10}{30}$ $P(C) = \frac{9}{30}$ $P(B \cap C) = \frac{3}{30}$ ✓

$P(B) \times P(C) = \frac{10}{30} \times \frac{9}{30} = \frac{1}{10} = P(B \cap C)$ ✓

Yes they are independent ✓

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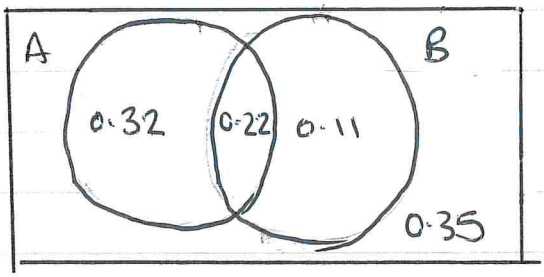
3) a)



Venn diagram ✓
0.32, 0.11, A, B ✓
0.22, 0.35, box ✓

b) $P(A) = 0.32 + 0.22 = 0.54$ ✓
$P(B) = 0.22 + 0.11 = 0.33$ ✓

c) $P(A/B') = \frac{P(A \cap B')}{P(B')} = \frac{0.32}{0.32+0.35} = \frac{32}{67}$ ✓

d) $P(A) = 0.54$ $P(B) = 0.33$ $P(A \cap B) = 0.22$
for independence $P(A) \times P(B) = P(A \cap B)$ ✓
$0.54 \times 0.33 \neq 0.22$ ✓
∴ not independent ✓

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4) a) E = take regular exercise B = always eat breakfast.
$P(E) = 2/5$ $P(B) = 4/3$ $P(E/B) = 9/25$.
$P(E/B) = \frac{P(E \cap B)}{P(B)} \Rightarrow P(E \cap B) = P(E/B) \times P(B)$ ✓
$= 9/25 \times 2/3 = 18/75$ ✓

b) $P(E' \cap B') = 1 - P(E \cup B)$ ✓ (or draw Venn diagram)
$= 1 - (P(E) + P(B) - P(E \cap B))$ ✓
$= 1 - (2/3 + 2/5 - 18/75) = 13/75$ ✓

c) $P(E) \times P(B) = 2/5 \times 2/3 \neq 18/75 = P(E \cap B)$ ✓
So E and B are <u>not</u> statistically independent ✓

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5)

	Glasses	No Glasses	Totals
Science	18	12	30
Humanities	44	24	68
Arts	27	23	50
Totals	89	59	148

(maybe seen in (b)) (maybe seen in (a))

a) $P(\text{Arts}) = \frac{50}{148}$ ✓

b) $P(\text{No glasses} \mid \text{Arts}) = \frac{23/148}{50/148} = \frac{23}{50}$ ✓ ✓

c) $P(\text{right handed}) = 0.8 \times \frac{30}{148} + 0.75 \times \frac{68}{148} + 0.7 \times \frac{50}{148}$ ✓ ✓ (f.t.)

$= \frac{55}{74}$ ✓

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d) $P(\text{Science} \mid \text{right handed}) = \frac{P(\text{Science and right handed})}{P(\text{right handed})}$ ✓

$= \frac{0.8 \times 30/148}{55/74}$ ✓ (f.t.)

$= \frac{12}{55}$ ✓

6)a) $P(B \cap R') = 0$ ✓

b) $P(B) = 0.27 + 0.33 = 0.6$ $\quad P(B \cap D) = 0.27$ ✓

$P(D) = 0.27 + 0.15 + t$

$0.6 \times (0.42 + t) = 0.27$ ✓

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$\Rightarrow t = \frac{0.27}{0.6} - 0.42 = 0.03$ ✓ ✓

c) $u = 1 - (0.33 + 0.27 + 0.15 + \text{"}t\text{"}) = 0.22$ ✓ ✓

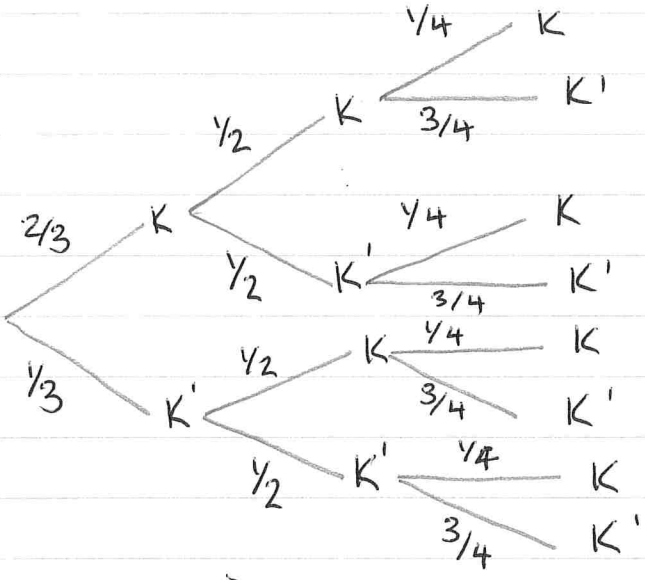
d)(i) $P(D \mid R \cap B) = \frac{P(D \cap R \cap B)}{P(R \cap B)} = \frac{0.27}{0.27 + 0.33} = 0.45$ ✓ ✓

(ii) $P(D \mid R \cap B') = \frac{P(D \cap R \cap B')}{P(R \cap B')} = \frac{0.15}{0.15 + \text{"}u\text{"}} = \frac{15}{37}$ ✓ ✓

e) $40 \times \text{"}0.45\text{"} + 37 \times \text{"}15/37\text{"} = 33$ ✓ ✓

("0.45": answer to d(i); "15/37": answer to d(ii))

7) a)



✓ for tree with correct number branches
✓ for 2/3, 1/3
✓ for 1/2, 1/2 ....
✓ for 1/4, 3/4 ....

b) P(All 3 keys) $= \frac{2}{3} \times \frac{1}{2} \times \frac{1}{4} = \frac{1}{12}$ ✓ ✓

c) P(Exactly 1 key) $= \frac{2}{3} \times \frac{1}{2} \times \frac{3}{4} + \frac{2}{3} \times \frac{1}{2} \times \frac{3}{4} + \frac{1}{3} \times \frac{1}{2} \times \frac{1}{4}$ ✓ ✓ ✓

$= \frac{5}{12}$ ✓

✓ for 3 triples added.

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d) P(KK'K' or K'K'K or K'K'K')

$= \frac{2}{3} \times \frac{1}{2} \times \frac{3}{4} + \frac{1}{3} \times \frac{1}{2} \times \frac{1}{4} + \frac{1}{3} \times \frac{1}{2} \times \frac{3}{4}$ ✓ ✓ ✓

$= \frac{5}{12}$ ✓

✓ for 3 triples added.

TOTAL = 74 MARKS.