| **Question** | **Scheme** | | | | | | | **Marks** |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **1(a)** | *(R* and *S* are mutually) exclusive. | | | | | | | B1 |
|  |  | | | | | | | **(1)** |
| **1(b)** | = + P – P use of Addition Rule | | | | | | | M1 |
| P –  P use of independence | | | | | | | M1 A1 |
| P | | | | | | |  |
| P = | | | | | | | A1 |
|  |  | | | | | | | **(4)** |
| **1(c)** | P(*A*’∩*B*) = = | | | | | | | M1A1ft |
|  |  | | | | | | | **(2)** |
| **1(d)** | P() = or P() or | | | | | | | M1 |
|  | | | | | | | A1 |
|  |  | | | | | | | **(2)** |
|  |  | | | | | | | **(9 marks)** |
| **2(a)** |  | | | | | | | B1  M1  A1  A1  B1 |
|  |  | | | | | | | **(5)** |
| **2(b)** | or 0.1625 | | | | | | | B1ft |
|  |  | | | | | | | **(1)** |
| **2(c)** | or  or  or 0.5875 | | | | | | | M1 A1 |
|  |  | | | | | | | **(2)** |
| **2(d)** | (condone awrt 0.809) | | | | | | | M1 A1cao |
|  |  | | | | | | | **(2)** |
| **2(e)** | this approach requires the product to be seen  So, they are independent. | | | | | | | M1  M1  A1 |
|  |  | | | | | | | **(3)** |
|  |  | | | | | | | **(13 marks)** |
| **3(a)** | *p* = P() =  = **0.15** | | | | | | | M1 |
| *q* = [P(*C*) – *p* ] = **0.10** | | | | | | | A1 |
|  |  | | | | | | | **(2)** |
| **3(b)** | *r* =  (o.e.)  or 1 – 0.08 – (0.6+0.25 – *p*) | | | | | | | M1 |
| = **0.22** | | | | | | | A1cao |
|  |  | | | | | | | **(2)** |
| **3(c)** | *s*  = [P(*A*) – *r* ] = **0.28** | | | | | | | B1ft |
| *t* = [ P(*B*) – *p* – *s* or use  ] = **0.17** | | | | | | | B1ft |
|  |  | | | | | | | **(2)** |
| **3(d)** | which is not equal to *s* (= 0.28) | | | | | | | M1 |
| So *A* and *B* are not independent | | | | | | | A1 |
|  |  | | | | | | | **(2)** |
| **3(e)** | ,= | | | | | | | M1 A1ft |
| = | | | | | | | A1 |
|  |  | | | | | | | **(3)** |
|  |  | | | | | | | **(11 marks)** |
| **4(a)** |  | | | | | | | M1 A1 |
|  |  | | | | | | | **(2)** |
| **4(b)** |  | | | | | | | M1 A1 |
|  |  | | | | | | | **(2)** |
| **4(c)** |  | | | | | | | M1 A1 |
|  | *F*  *H*  *C*  *B*  1  33  16  9  77  64 | | | | | | | **(2)** |
| **4(d)** |  | | | | | | | M1  B1 for 9, 1  B1 for 77,33 B1 for 64,16 |
| Allow diagrams with intersections between *F, C* and *H* provided these are marked with 0.  If their diagram indicates extra empty regions do not treat a blank as 0. | | | | | | |  |
|  |  | | | | | | | **(4)** |
| **4(e)** |  | | | | | | | M1 A1 |
|  |  | | | | | | | **(2)** |
|  |  | | | | | | | **(12 marks)** |
| **5(a)** | P(*AB*) = P(*A*|*B*) × P(*B*) | | | | | | |  |
| P(*AB*) = | | | | | | | M1 A1 |
|  |  | | | | | | | **(2)** |
| **5(b)** |  | | | | 2 intersecting circles and ‘P(*AB*)’ | | | B1ft |
| and | | | B1 |
| Box and | | | B1 |
|  |  | | | | | | | **(3)** |
| **5(c)** | = or 0.35 | | | | | | | B1ft |
|  |  | | | | | | | **(1)** |
| **5(d)** |  | | | | | | | M1 |
| = | | | | | | | A1 cao |
|  |  | | | | | | | **(2)** |
| **5(e)** | 0.3 | | | | | | | B1ft |
|  |  | | | | | | | **(1)** |
|  |  | | | | | | | **(9 marks)** |
| **6(a)** | Tree_NEW.jpg | | | | | | | M1  A1 |
|  |  | | | | | | | **(2)** |
| **6(b)** | = **0.245** (or exact equiv. e.g. ) | | | | | | | M1A1 |
|  |  | | | | | | | **(2)** |
| **6(c)** | = **0.0335** (or exact equiv. e.g. ) | | | | | | | M1A1 |
|  |  | | | | | | | **(2)** |
| **6(d)** | [] =  or | | | | | | | M1A1ft |
| awrt **0.597** (or  or exact equiv.) | | | | | | | A1 |
|  |  | | | | | | | **(3)** |
|  |  | | | | | | | **(9 marks)** |
| **7(a)** | *B, W*  or *T*, *W* [ accept ]  [Condone P(*B*), P(*W*) etc] | | | | | | | B1 |
| Since there is no overlap between the events or cannot happen together (o.e.) | | | | | | | B1 |
| (Accept comment in context e.g. “no one walks and takes the train”) | | | | | | |  |
|  |  | | | | | | | **(2)** |
| **7(b)** | e.g. | | | | | | | M1 |
| o.e.] | | | | | | | M1 |
| So *B* and *T* are not independent | | | | | | | A1cso |
|  |  | | | | | | | **(3)** |
| **7(c)** | [P(*W*) =]  or 0.28 | | | | | | | B1 |
|  |  | | | | | | | **(1)** |
| **7(d)** | [P() =]  or 0.2 | | | | | | | B1 |
|  |  | | | | | | | **(1)** |
| **7(e)** | [P(*T* | *B*) = ] | | | | | | | M1 |
| = | | | | | | | A1 |
|  |  | | | | | | | **(2)** |
|  |  | | | | | | | **(9 marks)** |
| **8(a)** | [P(*B*) = 0.4, P(*A*) = *p* + 0.1 so]  or 0.4 P(*A*) = 0.1 | | | | | | | M1 |
| ***p =* 0.15** | | | | | | | M1A1 |
|  |  | | | | | | | **(3)** |
| **8(b)** |  | | | | | | | M1 |
|  | | | | | | | dM1 |
| ***q =* 0.24** | | | | | | | A1 |
| *r* = 0.6 – (*p* + *q*) i.e. ***r =* 0.21** | | | | | | | A1ft |
|  |  | | | | | | | **(4)** |
| **8(c)** |  | | | | | | | M1 |
| = **0.75** | | | | | | | A1 |
|  |  | | | | | | | **(2)** |
|  |  | | | | | | | **(9 marks)** |
| **9(a)** | 0.3 | | | | | | | B1 |
|  |  | | | | | | | **(1)** |
| **9(b)** | P(*K*) = 0.05 + 0.15 or “0.3” – 0.25 + 0.15 or “0.3” = 0.25 +P(*K*) – 0.15 | | | | | | | M1 |
| May be seen on Venn diagram | | | | | | |  |
| = 0.2 | | | | | | | A1 |
|  |  | | | | | | | **(2)** |
| **9(c)** |  | | | | | | | M1 |
| = | | | | | | | A1 |
| =  or 0.6 | | | | | | | A1 |
|  |  | | | | | | | **(3)** |
| **9(d)** | or  or may see P(*J|K*) = 0.75 and P(*J*) = 0.25 | | | | | | | M1 |
| not equal therefore not independent | | | | | | | A1ft |
|  |  | | | | | | | **(2)** |
| **9(e)** | Not independent so confirms the teacher’s suspicion or they are linked | | | | | | | B1ft |
| (This requires a statement about independence in (d) or in (e)) | | | | | | |  |
|  |  | | | | | | | **(1)** |
|  |  | | | | | | | **(9 marks)** |
| **10(a)** | S  15  15  3  7  R  25  10  20  5  C | | | 3 closed curves and 25 in correct place | | | | M1 |
| 15,10,5 | | | | A1 |
| 15,3,20 | | | | A1 |
| Labels *R, S ,C* and box | | | | B1 |
| All values/100 or equivalent fractions award accuracy marks. | | | | | | |  |
|  |  | | | | | | | **(4)** |
| **10(b)** | 7/100 or 0.07 M1 for (‘their 7’in diagram or here)/100 | | | | | | | M1 A1 |
|  |  | | | | | | | **(2)** |
| **10(c)** | (3+5)/100 = 2/25 or 0.08 | | | | | | | M1A1 |
|  |  | | | | | | | **(2)** |
| **10(d)** | (25+15+10+5)/100 = 11/20 or 0.55 | | | | | | | M1 A1 |
|  |  | | | | | | | **(2)** |
| **10(e)** | P  Require denominator to be ‘their 65’ or ‘their ’ | | | | | | | M1 |
| =  require ‘their 15’ and correct denominator of 65 | | | | | | | A1 |
| =  or exact equivalents. | | | | | | | A1 |
|  |  | | | | | | | **(3)** |
|  |  | | | | | | | **(13 marks)** |
| **11(a)** | 0.7 Split (0.021)    Poor Stitching  0.03  (0.3) No split (0.009)      (0.97) Split (0.0194)  0.02  No Poor Stitching    (0.98) No split(0.9506) | | | | | | |  |
| Shape | | | | | | | B1 |
| Labels & 0.03 | | | | | | | B1 |
| Labels & 0.7,0.02 | | | | | | | B1 |
|  |  | | | | | | | **(3)** |
| **11(b)** | P(Exactly one defect) =  or | | | | | | | M1A1ft |
| = [0.009 + 0.0194 = ] **0.0284** | | | | | | | A1 cao |
|  |  | | | | | | | **(3)** |
| **11(c)** | P(No defects) =  (or better) | | | | | | | M1 |
| = 0.90307 **awrt 0.903** | | | | | | | A1 cao |
|  |  | | | | | | | **(2)** |
| **11(d)** | P(Exactly one defect) = (b) + | | | | | | | M1 M1 |
| = “0.0284” | | | | | | | A1ft |
| = [0.02698 + 0.04753] = 0.07451 **awrt 0.0745** | | | | | | | A1 cao |
|  |  | | | | | | | **(4)** |
|  |  | | | | | | | **(12 marks)** |
| **12(a)** | both | | | | | | | B1 |
|  | | | | | | | B1 |
| both | | | | | | | B1 |
| all three of | | | | | | | B1 |
|  |  | | | | | | | **(4)** |
| **12(b)** |  | | | | B1 for (oe) seen at least once | | | B1 M1 A1 |
|  |  | | | | | | | **(3)** |
| **12(c)** | P(*B*) = P(*RRR*) + P(*RYR*) + P(*YRR*) + P(*YYR*) | | | | M1 for at least 1 case of 3 balls identified. (Implied by 2nd M1) | | | M1 |
| **(\*)** | | | | | | | M1 A1cso |
|  |  | | | | | | | **(3)** |
| **12(d)** |  | | M1 for identifying both cases and + probs.  may be implied by correct expressions | | | | | M1 |
| **(\*)** | | | | | | | A1cso |
|  |  | | | | | | | **(2)** |
| **12(e)** | Must have some attempt to use | | | | | | | M1 |
|  | | | | | | | A1cao |
|  |  | | | | | | | **(2)** |
| **12(f)** |  | | | | | | Probabilities must come from the product of 3 probs. from their tree diagram. | M1  A1ft  A1 cao |
|  |  | | | | | | | **(3)** |
|  |  | | | | | | | **(17 marks)** |
| **13(a)** | bike owner  0.30  car owner  0.78  not bike owner  (0.70)  bike owner  not car owner  (0.22)  0.85  not bike owner  (0.15) | | | | | | | B1  B1  B1 |
|  |  | | | | | | | **(3)** |
| **13(b)** | P(car or bike but not both)= | | | | | | | M1 A1 |
|  |  | | | | | | | **(2)** |
| **13(c)** | [P(car|bike)] =  **awrt** 0.556 | | | | | | | M1A1  A1 |
|  |  | | | | | | | **(3)** |
| **13(d)** | , P(not bike) = 1 – 0.421    = 0.487518 **awrt** 0.488 | | | | | | | M1  dM1  A1 |
|  |  | | | | | | | **(3)** |
|  |  | | | | | | | **(11 marks)** |
| **14(a)** | [ ] = **0.6** (or exact equivalent) | | | | | | | B1 |
|  |  | | | | | | | **(1)** |
| **14(b)** | = **0.82** (or exact equivalent) | | | | | | | B1ft |
|  |  | | | | | | | **(1)** |
| **14(c)** |  | Use | | | | **Establish** independence before or after 1st M1and score marks for (d) (RH ver) | | M1 |
|  |  | | | | **Find** P(*B*) | |  |
|  | Use | | | | Use | | dM1 |
|  |  | | | |  | |  |
| *x* = **0.33**  (or exact equivalent) | | | | | | | A1cso |
|  |  | | | | | | | **(3)** |
| **14(d)** |  | | | | | | |  |
|  | | | | **or** stating P(*A*) = P(*A*|*B*) [= 0.6] | | | M1 |
| = 0.33 | | | |  | | |  |
| therefore (statistically) independent | | | | **or** P(*A*) = P(*A*|*B*)  therefore (statistically) independent | | | A1cso |
|  |  | | | | | | | **(2)** |
|  |  | | | | | | | **(7 marks)** |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | **Source paper** | **Question number** | **New spec references** | **Question description** | **New AOs** |
| 1 | S1 Jan 2012 | 2 | A 3.1, 3.2 | Probability | 1.1b, 1.2, 3.1a |
| 2 | S1 2015 | 3 | A 3.1, 3.2 | Probability | 1.1b, 2.1, 2.4, 3.1b, 3.4 |
| 3 | S1 2017 | 3 | A 3.1, 3.2 | Probability | 1.1b, 1.2, 2.4, 3.1a |
| 4 | S1 2013 | 3 | A 3.1, 3.2 | Probability | 1.1b, 3.1a, 3.1b, 3.4 |
| 5 | S1 2014R | 4 | A 3.1, 3.2 | Probability | 1.1b, 3.1a, 3.4 |
| 6 | S1 2014 | 4 | A 3.1, 3.2 | Probability | 1.1a, 1.1b, 3.4 |
| 7 | S1 2012 | 4 | A 3.1, 3.2 | Probability | 1.1b, 1.2, 2.4, 3.4 |
| 8 | S1 2013R | 6 | A 3.1, 3.2 | Probability and Venn diagram | 1.1b, 1.2, 3.1a, 3.4 |
| 9 | S1 2011 | 6 | A 3.1, 3.2, 3.3 | Probability | 1.1b, 1.2, 2.1, 2.4, 3.1b |
| 10 | S1 Jan 2012 | 6 | A 3.1, 3.2 | Probability | 1.1b , 3.1b, 3.4 |
| 11 | S1 2012 | 7 | A 3.1, 3.2 | Probability | 1.1b, 3.1b, 3.3, 3.4 |
| 12 | S1 Jan 2011 | 7 | A 3.1, 3.2 | Probability | 1.1b, 2.1, 3.1a, 3.1b |
| 13 | S1 2014R | 7 | A 3.1, 3.2 | Probability, Tree diagram | 1.1b, 3.1b, 3.4 |
| 14 | S1 2014 | 8 | A 3.1, 3.2 | Probability | 1.1b, 1.2, 2.1, 2.4 |