**Topic 5, Part 2 Review Sheet Answers to Part 1:**

**1.** (a) For using  (0.4 + *p* + 0.2 + 0.07 + 0.02 = 1) (M1)

 *p* = 0.31 A1 N2

(b) For using E(*X*) =  (M1)

 E(*X*) = 1(0.4) + 2(0.31) + 3(0.2) + 4(0.07) + 5(0.02) A1

 = 2 A2 N2

[6]

**2.** (a)

|  |  |  |  |
| --- | --- | --- | --- |
|  | Boy | Girl | Total |
| TV | **13** | **25** | **38** |
| Sport | 33 | 29 | **62** |
| Total | 46 | **54** | 100 |

 P(TV) =  (A1) (C2)

(b) P(TV  Boy) =  (= 0.283 to 3 sf) (A2) (C2)

**Notes:** Award (A1) for numerator and (A1) for denominator. Accept equivalent answers.

[4]

**3.** (a) Independent (I) (C2)

(b) Mutually exclusive (M) (C2)

(c) Neither (N) (C2)

**Note:** Award part marks if the candidate shows understanding of I and/or M
eg I P(A  B) = P(A)P(B) (M1)
 M P(A  B) = P(A) + P(B) (M1)

[6]

**4.** (a)  A1 N1

(b) P(*A*  *B*) = P(*A*) + P(*B*)  P(*A*  *B*) (M1)

P(*A*  *B*) = P(*A*) + P(*B*)  P(*A*  *B*)

 =  A1

 =  (0.275) A1 N2

(c) P(*A*  *B)* =  A1

 =  A1 N1

[6]

**5.** (a)  (A1)(A1) (C2)

(b)  (A2) (C2)

(c)   (A1)(A1) (C2)

[6]

**6.** (a) For summing to 1 (M1)

*eg* 0.1 + *a* + 0.3 + *b* = 1

 *a* + *b* = 0.6 A1 N2

 (b) evidence of correctly using  (M1)

*eg* 0  0.1 + 1  *a* + 2  0.3 + 3  *b*, 0.1 + *a* + 0.6 + 3*b* = 1.5

Correct equation 0 + *a* + 0.6 + 3*b* = 1.5 (*a* + 3*b* = 0.9) (A1)

Solving simultaneously gives

*a* = 0.45 *b* = 0.15 A1A1 N3

[6]

**7.** (a)  A1 N1

(b) 35  (8 + 5 + 7)(= 15) (M1)

Probability =  A1 N2

**Answers to Part II:**

**1.** P(different colours) = 1 – [P(GG) + P(RR) + P(WW)] (M1)= 1 – (A1)
= 1 –  (A1)
= (= 0.677, to 3 sf) (A1) (C4)

 **OR**

 P(different colours) = P(GR) + P(RG) + P(GW) + P(WG) + P(RW) + P(WR) (A1)
=  (A1)(A1)
= (= 0.677, to 3 sf) (A1) (C4)

[4]

**2.** For using P(*A*  *B*) = P(*A*) + P(*B*)  P(*A*  *B*) (M1)

Let P(*A*) = *x* then P(*B*) = 3*x*

P(*A*  *B*) = P(*A*)  3P(*A*) (= 3*x*2) (A1)

0.68 = *x* + 3*x*  3*x*2 (A1)

3*x*2  4*x* + 0.68 = 0

*x* = 0.2 ( *x* = 1.133, not possible) (A2)

P(*B*) = 3*x* = 0.6 (A1) (C6)

[6]

**3.** *p*(Red) =  *p*(Black) = 

(a) (i) *p*(one black) =  (M1)(A1)
 = 0.393 to 3 sf (A1) 3

(ii) *p*(at least one black) = 1 – *p*(none) (M1)
 = 1 –  (A1)
 = 1 – 0.344
 = 0.656 (A1) 3

(b) 400 draws: expected number of blacks =  (M1)
 = 50 (A1) 2

[8]

**4.** X ~ N (80, 82)

(a) P(*X* < 72) = P(*Z* < –1) (M1)
 = 1 – 0.8413
 = 0.159 (A1)
**OR**P(*X* < 72) = 0.159 (G2) 2

(b) (i) P(72 < *X* < 90) = P( –1 < Z < 1.25) (M1)
 = 0.3413 + 0.3944 (A1)
 = 0.736 (A1)
**OR**P(72 < *X* < 90) = 0.736 (G3)

(ii)



 (A1)(A1) 5

**Note:** Award (A1) for a normal curve and (A1) for the shaded area, which should not be symmetrical.

(c) 4% fail in less than *x* months
 *x* = 80 – 8 *×* –1(0.96) (M1)
 = 80 – 8 × 1.751 (A1)
 = 66.0 months (A1)
**OR***x* = 66.0 months (G3) 3

[10]

**5.** (a) Let *X* be the random variable for the IQ.
*X* ~ N(100, 225)
P(90 < *X* < 125) = P(–0.67 < *Z* < 1.67) (M1)
= 0.701
70.1 percent of the population (accept 70 percent). (A1)

 **OR**

 P(90 < *X* < 125) = 70.1% (G2) 2

(b) P( *X* ≥ 125) = 0.0475 (or 0.0478) (M1)
P(both persons having IQ ≥ 125) = (0.0475)2 (or (0.0478)2) (M1)
 = 0.00226 (or 0.00228) (A1) 3

(c) Null hypothesis (H0): mean IQ of people with disorder is 100 (M1)
Alternative hypothesis (H1): mean IQ of people with disorder
is less than 100 (M1)
P( < 95.2) = P = P(*Z* < –1.6) = 1 – 0.9452
 = 0.0548 (A1)
The probability that the sample mean is 95.2 and the null hypothesis
true is 0.0548 > 0.05. Hence the evidence is not sufficient. (R1) 4

[9]

**6.** (a) *p* (4 heads) =  (M1)
= 
=   0.273 (3 sf) (A1) 2

(b) *p* (3 heads) = 
=   0.219 (3 sf) (A1) 1

(c) *p* (5 heads) = *p* (3 heads) (by symmetry) (M1)
*p* (3 or 4 or 5 heads) = *p* (4) + 2*p* (3) (M1)
= 
 0.711 (3 sf) (A1) 3

[6]

**7.** (a)



 *n* (*E*  *H*) = *a* *+* *b* *+* *c* *=* 88 – 39 = 49 (M1)
*n* (*E*  *H*) = 32 + 28 – *b* *=* 49
 60 – 49 = *b* = 11 (A1)
*a* *=* 32 – 11 = 21 (A1)
*c* = 28 – 11 = 17 (A1) 4

**Note:** Award (A3) for correct answers with no working.

(b) (i) P(*E*  *H*) =  (A1)

(ii) P(*H**E*) =  (M1)
 =  (= 0.656) (A1)
**OR**Required probability =  (A1)(A1) 3

(c) (i) P(none in economics) =  (M1)(A1)
 = 0.253 (A1)

**Notes:** Award (M0)(A0)(A1)(ft) for = 0.258.
Award no marks for .

(ii) P(at least one) = 1 – 0.253 (M1)
 = 0.747 (A1)
**OR**3  (M1)
 = 0.747 (A1) 5

[12]

**8.** (a)
 (A1)(A1)(A1)(A1) 4

**Note:** Award (A1) for the given probabilities  in the correct positions, and (A1) for each **bold** value.

(b) Probability that Dumisani will be late is  (A1)(A1)
=  (0.294) (A1) (N2)3

(c) P(*W**L*) = 
P(*W*  *L*) =  (A1)
P(*L*) =  (A1)
P(*W**L*) =  (M1)
= (= 0.745) (A1) (N3)4

[11]

**9.** (a)



 (A1)(A1)(A1)

(b) (i) P(*R  S*) =  (A1) (N1)

(ii) P(*S*) =  (A1)(A1)

 =  (A1) (N3)

(iii) P(*R* *S*) =  (A1)(A1)

 =  (A1) (N3)

[10]

**10.** (a) P(*F*  *S*) = 1  0.14 (= 0.86) (A1)

**Choosing** an appropriate formula (M1)

*eg* P(*A*  *B*) = P(*A*) + P(*B*)  P(*A*  *B*)

Correct substitution

*eg* P(*F*  *S*) = 0.93  0.86 A1

P(*F*  *S*) = 0.07 AG N0

**Notes:** There are several valid approaches. Award
 (A1)(M1)A1 for relevant working using any
 appropriate strategy eg formula, Venn
 Diagram, or table.

 *Award no marks for the incorrect solution*

 P(*F*  *S*) = 1  P(*F*) + P(*S*) = 1  0.93 = 0.07

(b) Using conditional probability (M1)

*eg* P(*F*  *S*) 

P(*F*  *S*) =  (A1)

 = 0.113 A1 N3

(c) *F* and *S* are **not** independent A1 N1

**EITHER**

If independent P(*F*  *S*) = P(*F*), 0.113  0.31 R1R1 N2

**OR**

If independent P(*F*  *S*) = P(*F*) P(*S*), 0.07  0.31  0.62 (= 0.1922) R1R1 N2

(d) Let P(*F*) = *x*

P(*S*) = 2P(*F*) (= 2*x*) (A1)

For independence P(*F*  *S*) = P(*F*)P(*S*) (= 2*x*2) (R1)

Attempt to set up a quadratic equation (M1)

*eg* P(*F*  *S*) = P(*F*)P(*S*)  P(*F*)P(*S*), 0.86 = *x* + 2*x*  2*x*2

2*x*2  3*x* + 0.86 = 0 A2

*x* = 0.386, *x* = 1.11 (A1)

P(*F*) = 0.386 (A1) N5

[16]

(c) Number studying = 76 (A1)

Number not studying = 120  number studying = 44 (M1)

Probability =  A1 N3

[6]