

## Mark schemes

### Q1.

#### Alternative method 1

$$(B, B) \frac{8}{11} \text{ and } \frac{7}{10}$$

$$\text{or (R, R)} \frac{3}{11} \text{ and } \frac{2}{10}$$

oe

*may be seen on tree diagram*

M1

$$(B, B) \frac{8}{11} \times \frac{7}{10} \text{ or } \frac{56}{110}$$

$$\text{or (R, R)} \frac{3}{11} \times \frac{2}{10} \text{ or } \frac{6}{110}$$

oe

*may be seen on tree diagram*

M1dep

$$\frac{8}{11} \times \frac{7}{10} + \frac{3}{11} \times \frac{2}{10}$$
$$\frac{56}{110} + \frac{6}{110}$$

M1dep

$$\frac{62}{110} \text{ or } \frac{31}{55}$$

oe fraction

*accept 0.56(...) or 56.(...)%*

A1

#### Alternative method 2

$$(B, R) \frac{8}{11} \text{ and } \frac{3}{10}$$

$$\text{or (R, B)} \frac{3}{11} \text{ and } \frac{8}{10}$$

oe

*may be seen on tree diagram*

M1

$$(B, R) \frac{8}{11} \times \frac{3}{10}$$

$$\text{or (R, B)} \frac{3}{11} \times \frac{8}{10} \text{ or } \frac{24}{110}$$

oe

*may be seen on tree diagram*

M1dep

$$1 - \frac{8}{11} \times \frac{3}{10} - \frac{3}{11} \times \frac{8}{10}$$

$$1 - \frac{24}{110} - \frac{24}{110}$$

M1dep

$$\frac{62}{110} \text{ or } \frac{31}{55}$$

oe fraction

accept 0.56(...) or 56.(...)%

A1

### Additional Guidance

Ignore incorrect simplification or conversion after a correct fraction

M3A1

$$\frac{6820}{12100}$$

M3A1

[4]

### Q2.

$$\frac{7}{11} (\times) \frac{6}{10} \left( = \frac{42}{110} \right)$$

or

$$\frac{4}{11} (\times) \frac{3}{10} \left( = \frac{12}{110} \right)$$

oe

Can be on tree diagram

M1

$$\frac{7}{11} \times \frac{6}{10} \left( = \frac{42}{110} \right)$$

and

$$\frac{4}{11} \times \frac{3}{10} \left( = \frac{12}{110} \right)$$

M1

Their  $\frac{42}{110}$  + their  $\frac{12}{110}$

Dep on M2

M1Dep

$$\frac{54}{110}$$

oe  $\frac{27}{55}$

$$SC2 \frac{54}{121} \text{ or } \frac{65}{110} \left( = \frac{13}{22} \right)$$

$$SC1 \frac{65}{121}$$

A1

**Alternative**

$$\frac{7}{11} (\times) \frac{4}{10} \left( = \frac{28}{110} \right)$$

or

$$\frac{4}{11} (\times) \frac{7}{10} \left( = \frac{28}{110} \right)$$

oe

Can be on tree diagram

M1

$$\frac{7}{11} \times \frac{4}{10} \left( = \frac{28}{110} \right)$$

and

$$\frac{4}{11} \times \frac{7}{10} \left( = \frac{28}{110} \right)$$

$$\frac{28}{110} \times 2 \left( = \frac{56}{110} \right)$$

M1

$$1 - \left( \text{their } \frac{28}{110} + \text{their } \frac{28}{110} \right)$$

Dep on M2

M1Dep

$$\frac{54}{110}$$

$$\text{oe } \frac{27}{55}$$

$$\text{SC2 } \frac{54}{121} \text{ or } \frac{65}{110} \left( = \frac{13}{22} \right)$$

$$\text{SC1 } \frac{65}{121}$$

A1

[4]

**Q3.**

$$\frac{4}{10} \text{ and } \frac{3}{9}$$

M1

$$\frac{4}{10} \times \frac{3}{9}$$

M1

$$\frac{12}{90}$$

$$\text{oe } \frac{2}{15}$$

$$\text{SC1 } \frac{12}{100} \text{ or } \frac{16}{90} \text{ oe}$$

**Q4.**

(a)  $\frac{39}{295}$

B1

(b)  $\frac{14}{43}$

B1

(c)  $x$  in History only(and  $3x$  in English only)

or

expressions inside circles such that the number who take English is twice the number who take History

M1

$x + \text{their } x + \text{their } 3x + 125 = 295$

*oe equation**Must have three expressions inside circles*

M1

34

A1

**Additional Guidance** $2x$  in History only and  $5x$  in English only

M1

**Q5.**

(a) 0.54

*oe*

B1

(b) 0.9 and  $1 - 0.2$  or 0.8

or

$1 - 0.9$  or 0.1 and 0.7

*Pairs must be linked**eg on a tree diagram*

M1

$0.9 \times (1 - 0.2)$  or 0.72

or

$(1 - 0.9) \times 0.7$  or 0.07

*May be seen on a tree diagram*

M1

$0.9 \times (1 - 0.2)$  or 0.72

and

$(1 - 0.9) \times 0.7$  or  $0.07$

May be seen on a tree diagram

M1

0.79

oe

A1

[5]

**Q6.**

Indication that they need to swap 20p and 10p

B1

$\frac{1}{5}$  or  $\frac{2}{4}$

oe

M1

$\frac{1}{5} \times \frac{2}{4}$

oe Condone  $\frac{1}{5} \times \frac{2}{3}$

M1 dep

$\frac{2}{20}$

oe eg  $\frac{1}{10}$

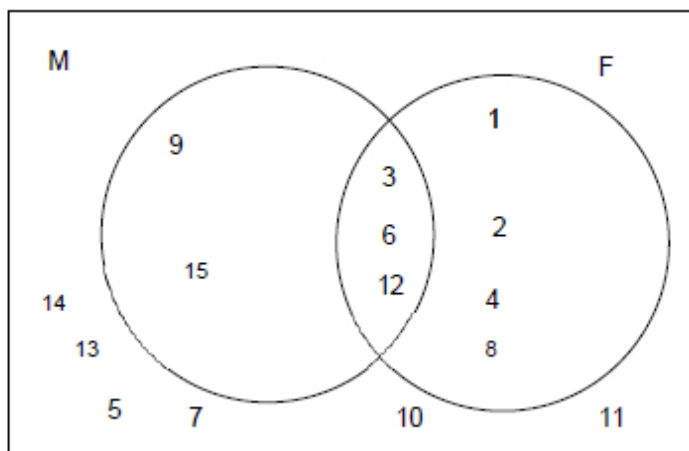
SC3  $\frac{2}{15}$  oe

A1

[4]

**Q7.**

ξ



B1 for two correct regions

Condone omission of numbers in  $(M \cup F)'$

B2

$$P(\text{Multiple 3 / Factor 24}) = \frac{3}{7}$$

M1

$$P(\text{Factor 24 / Multiple 3}) = \frac{3}{5}$$

M1

$$\frac{3}{7} > \frac{3}{5} \text{ <or> } 0.6 > 0.4(28\dots)$$

or

$$P(\text{multiple of 3...}) > P(\text{multiple of 7...})$$

oe

A1

### Additional Guidance

If Venn diagram not used, working must be clear

[5]

Q8.

(a)  $\frac{1}{10} \times \frac{9}{10}$  or  $\frac{9}{10} \times \frac{1}{10}$  or  $\frac{1}{10} \times \frac{1}{10}$

oe

M1

$$\frac{1}{10} \times \frac{9}{10} + \frac{9}{10} \times \frac{1}{10} + \frac{1}{10} \times \frac{1}{10}$$

oe

M1 dep

$$\frac{9}{100} + \frac{9}{100} + \frac{1}{100} \text{ or } \frac{18}{100} + \frac{9}{100}$$

oe

A1

### Alternative method 1

$$\frac{9}{10} \times \frac{9}{10}$$

oe

M1

$$1 - \frac{9}{10} \times \frac{9}{10}$$

oe

M1 dep

$$1 - \frac{81}{100}$$

oe

A1

**Alternative method 2**

Use of sample space diagram

M1

Indication of correct pairs

M1 dep

$$\frac{19}{100} \text{ or } 19 \text{ out of } 100$$

A1

(b)  $\frac{1}{10} \left( \times \frac{9}{9} \right)$  or  $\frac{9}{10} \times \frac{1}{9}$   
oe

M1

$$\frac{1}{10} \left( \times \frac{9}{9} \right) + \frac{9}{10} \times \frac{1}{9}$$

oe

M1 dep

$$\frac{18}{90}$$

oe

A1

**Alternative method 1**

$$\frac{9}{10} \times \frac{8}{9}$$

oe

M1

$$1 - \frac{9}{10} \times \frac{8}{9}$$

oe

M1 dep

$$\frac{18}{90}$$

oe

A1

**Alternative method 2**

Use of sample space diagram

M1

Indication of correct pairs

M1 dep

$$\frac{18}{90} \text{ or } \frac{9}{45}$$

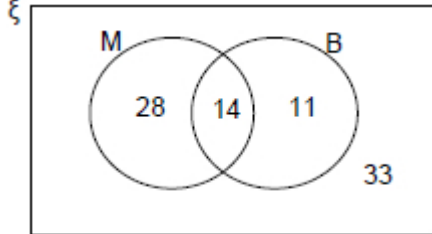
oe

A1

[6]

**Q9.**

(a) Fully correct diagram



B2 Two or three correct numbers in correct positions

B1 One correct number in correct position

B3

**Additional Guidance**

Three correct numbers in correct positions and one missing

B2

Two correct numbers in correct positions and two missing

B2

(b)  $\frac{14}{25}$  or 0.56 or 56%

Correct or ft their diagram  
oe fraction

B1ft

**Additional Guidance**

$\frac{14}{25}$  or 0.56 or 56% always scores B1

ft answer correct with subsequent incorrect simplification

B1ft

Ratio e.g. 14 : 25

B0

Expressed only in words e.g. 14 out of 25

B0

$\frac{14}{25}$  and 14 out of 25

B1

$\frac{14}{25}$  seen with change to incorrect decimal or incorrect percentage

e.g.  $\frac{14}{25}$  and answer 0.8

B1



Ignore chance words if  $\frac{14}{25}$  seen  
e.g.  $\frac{14}{25}$  and answer likely

**B1**

For a ft answer that is only seen as a decimal or %, accept truncation or rounding to at least 2sf

**[4]**

**Q10.**

**Alternative method 1**

$$\frac{4}{10} \text{ (black)}$$

oe

*May be on diagram*

**M1**

$$\frac{4}{10} \times \frac{3}{9}$$

oe

*0.4 × 0.33...*

*May be on diagram*

**M1dep**

$$\frac{12}{90} = \frac{1}{9}$$

oe

*0.13... or 13.(...)%*

**A1**

**Alternative method 2**

4 × 3 or 12  
or 10 × 9 or 90

**M1**

4 × 3 or 12  
and 10 × 9 or 90

**M1dep**

$$\frac{12}{90} = \frac{1}{9}$$

oe

*0.13... or 13.(...)%*

**A1**

**Additional Guidance**

$$\frac{12}{90} = \frac{1}{9}, \text{ ignore fw}$$

**M1M1A1**

Q11.

**Alternative method 1** red

42 seen or used

$$\text{or probability (red and red)} = \frac{42}{90}$$

$$\text{or } \frac{r}{10} \times \frac{r-1}{9}$$

$$\text{or } 1 - \left( \frac{r}{10} \times \frac{r-1}{9} \right)$$

oe

$$\frac{7}{15} \text{ or } 0.46 \text{ or } 0.466\dots \text{ or } 0.47$$

$$\text{or } 46\% \text{ or } 46.6\dots \text{ or } 47\%$$

B1

$$\frac{7}{10} \times \frac{6}{9} \text{ or } 42 = 7 \times 6$$

$$\text{or } \left( \frac{r}{10} \times \frac{r-1}{9} \right) = \frac{42}{90}$$

$$\text{or } 1 - \left( \frac{r}{10} \times \frac{r-1}{9} \right) = \frac{48}{90}$$

$$\text{or } r(r-1) = 42$$

$$\text{or } r^2 - r = 42$$

oe

M1

7 red

A1

**Alternative method 2** blue

$$\frac{b}{10} \times \frac{b-1}{9} + 2 \times \frac{b}{10} \times \frac{10-b}{9}$$

oe

B1

$$\frac{b}{10} \times \frac{b-1}{9} + 2 \times \frac{b}{10} \times \frac{10-b}{9} = \frac{48}{90}$$

$$\text{or } b^2 - 19b = -48$$

$$\text{or } b^2 - 19b + 48 = 0$$

$$\text{or } b = 3$$

oe

M1

7 red

**Additional Guidance**

7 with no working scores full marks

**[3]**