Cognitate

Question 1:

A. Total amount of sweets = 57 (1 mark)

Amount of black sweets is equal to 57 x $^{10}/_{19}$= 30 (1 mark)

John has 70% of the 30 black sweets. 30 x 0.7 = 21 (1 mark)

26-21 = 5 red sweets. (1 mark)

Total amount of red sweets is 57- 30 = 27 (1 mark)

John has 5 out of the 27 sweets, so $^{5}/_{27}$ x 100 = **18.5%** (1 mark)

B. John has 5 red sweets and 21 black sweets (from previous question) 57-21-5 = 31 sweets left. (1 mark)

After Susan eats all her sweets, there are now 17 sweets left. 31- 14 = 17 sweets for Stephan, James and Josh. (1 mark)

Using the given ratio, $^{7}/_{17}$ are red. Therefore they have **7 red sweets all together**. (1 mark)

Question 2:

A. 1- $^{8}/_{23}$= $^{15}/_{23}$ = chance of the weather being cold or freezing on a Monday. (1 mark)

$^{15}/_{23}$ x $^{5}/_{7}$ = $^{75}/_{161}$ = The probability that it will be cold or freezing on Monday, and cold on Tuesday. (1 mark)

$^{15}/_{23}$ x $^{1}/_{7}$ = $^{15}/_{161}$ = The probability that it will be cold or freezing on a Monday and freezing on a Tuesday. (1 mark)

$^{75}/_{161}$+ $^{15}/_{161}$ = $^{90}/_{161}$ = **0.56** (1 mark)

Award 4 marks for any alternative method, including $^{6}/_{7}$ x $^{15}/_{23}$

B. $^{15}/_{23}$ x $^{1}/_{7}$ = $^{15}/_{161}$ = The probability that it will be cold or freezing on a Monday, and hot on a Tuesday. (1 mark)

Let the probability that it will be cold on a Wednesday when there is a storm be X, therefore the probability that it is hot is ½ x. The total probability of it being either hot or cold when there is a storm is $^{2}/_{7}$, so 1.5x = $^{2}/_{7}$, solve for X, X = 0.190. ½ X = 0.095. (2 marks)

$^{15}/_{161}$ x $^{17}/_{26}$ x 0.095 = **5.8×10^{-3}** (2 marks)

Award 2 marks for alternative method to find the probability of it being hot on Wednesday with a storm. Allow 1 mark for answer given in incorrect form.

Question 3:

A. 0.85 x 0.75 x 0.8 = 0.51 (2 marks)

B. 0.15 x 0.25 x 0.2 = $\mathbf{{}^{3}/_{400}}$ (2 marks)

C. 1-0.51 = **0.49** (the probability that at least 1 fails can be any combination other than all three passing (0.51)) (2 marks)

D. (0.15 x 0.75 x 0.8) + (0.85 x 0.75 x 0.2) + (0.85 x 0.25 x 0.8) = **0.3875** (2 marks)

Each scenario has only 1 person failing. The total probability that only 1 fails is the sum of these 3 scenarios.

Question 4:

A. There are 4 total combinations of which pens are moved in and out of both boxes:

Scenario 1: Red pen removed from A to B, red pen removed from B to A.

Scenario 2: Red pen removed from A to B, green pen removed from B to A.

Scenario 3: Green pen removed from A to B, red pen removed from B to A.

Scenario 4: Green pen removed from A to B, green pen removed from B to A.

Probability of scenario 1 occurring: ${}^{4}/_{7}$ x ${}^{3}/_{8}$ = ${}^{3}/_{14}$. Results in the same number of red pens in box A,${}^{4}/_{7}$ (1 mark)

Probability of scenario 2 occurring: ${}^{4}/_{7}$ x ${}^{5}/_{8}$ = ${}^{5}/_{14}$. Results in 1 less red pen in box A, ${}^{3}/_{8}$. (1 mark)

Probability of scenario 3 occurring: ${}^{3}/_{7}$ x ${}^{2}/_{8}$ = ${}^{3}/_{28}$. Results in 1 more pen in box A, ${}^{5}/_{6}$. (1 mark)

Probability of scenario 4 occurring: ${}^{3}/_{7}$ x ${}^{6}/_{8}$ = ${}^{9}/_{28}$. Results in the same number of red pens in box A, ${}^{4}/_{7}$. (1 mark)

In scenario 1, 3 and 4, there are more red pens in box A than green pens. Therefore ${}^{4}/_{7}$ + ${}^{5}/_{6}$ + ${}^{4}/_{7}$ =$\mathbf{{}^{9}/_{14}}$ (2 marks)

Question 5:

A. The probability of picking a strawberry is $^3/_{12}$, the probability of picking 2 strawberry ice creams is $^3/_{12}$ x $^2/_{11}$ (because there are only 11 ice creams left after the first pick and 1 strawberry is missing, so there are only 2 strawberry ice creams left out of a total 11 ice creams) = $^1/_{22}$. (1 mark)

Probability of picking a chocolate is $^1/_3$, the probability of picking 2 chocolate ice creams is $^4/_{12}$ x $^3/_{11}$= $^1/_{11}$ (1 mark)

Probability of picking a vanilla is $^5/_{12}$, the probability of picking 2 vanilla ice creams is $^5/_{12}$ x $^4/_{11}$ = $^5/_{33}$ (1 mark)

$^1/_{22}$ + $^1/_{11}$ + $^5/_{33}$ = $\mathbf{^{19}/_{66}}$ (1 mark)

To get at least 1 strawberry ice cream, you must consider every scenario that involves a strawberry ice cream.

Scenario 1: 2 strawberries = $^3/_{12}$ x $^2/_{11}$= $^1/_{22}$ (1 mark)

Scenario 2: Strawberry then Chocolate = $^3/_{12}$ x $^4/_{11}$ = $^1/_{11}$ (1 mark)

Scenario 3: Strawberry then Vanilla = $^3/_{12}$ x $^5/_{11}$ = $^5/_{44}$ (1 mark)

Scenario 4: Chocolate then Strawberry = $^4/_{12}$ x $^3/_{11}$ = $^1/_{11}$ (1 mark)

Scenario 5: Vanilla then Strawberry = $^5/_{12}$ x $^3/_{11}$ = $^5/_{44}$ (1 mark)

Sum of all scenarios = $\mathbf{^5/_{11}}$ **(1 mark)**