Probability IB Questions

Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**1.** The table below shows the relative frequencies of the ages of the students at *Ingham High School.*

|  |  |
| --- | --- |
| Age (in years) | Relative frequency |
| 13 | 0.11 |
| 14 | 0.30 |
| 15 | 0.23 |
| 16 | 0.21 |
| 17 | 0.15 |
| Total | 1 |

(a) If a student is randomly selected from this school, find the probability that

(i) the student is 15 years old;

(ii) the student is 16 years of age or older.

There are 1200 students at *Ingham High School.*

(b) Calculate the number of 15 year old students.

|  |  |
| --- | --- |
| *Working:* |  |
|  | *Answers*:  (a) (i) ……………………………………...  (ii) ……………………………………..  (b) ………………………………………….. |

(Total 4 marks)

**2.** It is known that 5% of all AA batteries made by Power Manufacturers are defective. AA batteries are sold in packs of 4.

Find the probability that a pack of 4 has

(a) exactly two defective batteries;

(3)

(b) at least one defective battery.

(2)

(Total 5 marks)

**3.** Nene and Deka both play netball. The probability that Nene will score a goal on her first attempt is 0.75. The probability that Deka will score a goal on her first attempt is 0.82.

Calculate the probability that

(a) Nene and Deka will both score a goal on their first attempts;

(b) neither Nene nor Deka will score a goal on their first attempts.

|  |  |
| --- | --- |
| *Working:* |  |
|  | *Answers*:  (a) …………………………………………..  (b) ………………………………………….. |

(Total 4 marks)

**4.** A bag contains 2 red, 3 yellow and 5 green sweets.

Without looking, Mary takes one sweet out of the bag and eats it. She then takes out a second sweet.

(a) If the first sweet is green, what is the probability that the second sweet is also green?

(b) If the first sweet is not red, what is the probability that the second sweet is red?

|  |  |
| --- | --- |
| *Working:* |  |
|  | *Answers*:  (a) …………………………………………..  (b) ………………………………………….. |

(Total 4 marks)

**5.** Of a group of five students, two will be selected to visit the United Nations. The five students are John, Maria, Raul, Henri and Susan.

(a) With the aid of a tree diagram or a table of outcomes, find the number of **different** possible combinations of students that could go to the United Nations.

(b) Find the probability that both Maria and Susan will go on the trip.

|  |  |
| --- | --- |
| *Working:* |  |
|  | *Answers*:  (a) …………………………………………..  (b) ………………………………………….. |

(Total 4 marks)

**6.** In a group of fifteen students, three names begin with the letter B and four begin with a G. The remaining eight names begin with A, C, D, E, F, H, I and J respectively.

The 15 names are placed in a box. The box is shaken and two names are drawn out.

Find the probability that

(a) both names begin with any letter except G or B;

(b) both names begin with the same letter;

(c) both names begin with the letter H.



(Total 6 marks)

**7.** Jim drives to work each day through two sets of traffic lights.

The probability of the first set of traffic lights being red is 0.65.

If the first set is red then the probability that the next set of traffic lights is red is 0.46.

If the first set is not red, the probability that the next set is red is 0.72.



(a) Complete the tree diagram above.

(b) Calculate the probability that the second set of traffic lights is red.



(Total 8 marks)

**8.** Children in a class of 30 students are asked whether they can swim (S) or ride a bicycle (B).

There are 12 girls in the class. 8 girls can swim, 6 girls can ride a bicycle and 4 girls can do both.

16 boys can swim, 13 boys can ride a bicycle and 12 boys can do both. This information is represented in a Venn diagram.



(a) Find the values of *a* and *b*.

(2)

(b) Calculate the number of students who can do neither.

(2)

(c) Write down the probability that a student chosen at random can swim.

(2)

(d) Given that the student can ride a bicycle, write down the probability that the student is a girl.

(2)

(Total 8 marks)

**9.** Today Philip intends to go walking. The probability of good weather (G) is . If the weather is good, the probability he will go walking (W) is . If the weather forecast is not good (NG) the probability he will go walking is .

(a) Complete the probability tree diagram to illustrate this information.



(b) What is the probability that Philip will go walking?

|  |  |
| --- | --- |
| *Working:* |  |
|  | *Answer*:  (b) .................................................................. |

(Total 8 marks)

**10.** Two jars contain a number of coloured balls as indicated in the diagrams below.



**Jar One Jar Two**

Two experiments are carried out.

*First Experiment*: A jar is first chosen at random and then a ball is drawn from that jar.

1. Draw, **and label fully**, a tree diagram to show **all** possible outcomes of this experiment.

(2)

1. What is the probability that a white ball is drawn?

(3)

*Second Experiment*: The ball drawn in the first experiment is not replaced. A second ball is then drawn from the same jar.

1. What is the probability that both balls are white?

(2)

(Total 7 marks)

**11.** Heinrik rolls two 6-sided dice at the same time. One die has three red sides and three black sides. The other die has the sides numbered from 1 to 6. By means of a tree diagram, table of outcomes or otherwise, answer each of the following questions.

(a) How many different possible combinations can he roll?

(b) What is the probability that he will roll a red and an even number?

(c) What is the probability that he will roll a red or black and a 5?

(d) What is the probability that he will roll a number less than 3?

|  |  |
| --- | --- |
| *Working:* |  |
|  | *Answers*:  (a) ..................................................................  (b) ..................................................................  (c) ..................................................................  (d) .................................................................. |

(Total 8 marks)

Probability IB Questions - Answers

**1.** (a) (i) 0.23 (A1) (C1)

(ii) 0.21 + 0.15 = 0.36 (A1) (C1)

**Note:** Accept equivalent answers

(b) 1200×0.23 (M1)  
= 276 (A1) (C2)

**Note:** Follow through from candidate’s answer in part (a)(i)

[4]

**2.** (a) *p*(two defective) = 6×0.052×0.952 (M2)

**Note:** Award (M1) for 0.052×0.952, (M1) for (×6)

= 0.0135375  
= 0.0135 (3 s.f.) (A1)

(b) *p*(at least one defective) = 1 – 0.954 (M1)  
= 0.18549375...  
= 0.0185 (3 s.f.) (A1)

[5]

**3.** (a) 0.75 × 0.82 (M1)  
= 0.615  (A1)

(b) 0.25 × 0.18 (M1)  
= 0.045  (A1)

[4]

**4.** (a)  (A2)

(b)  (A2)

[4]

**5.** (a)

 (M1)

**Note:** Award (M1) for any reasonable counting method.

10 combinations (A1)

(b)  *(allow follow though from part (a))* (A2)

[4]

**6.** (a)  (M1)

=  (A1) (C2)

**Note:** (M1) is for a product including at least one correct fraction.

(b)  (M1)(M1)

**Note:** (M1) is for adding two products, the other (M1) is if both products attempt to deal with non-replacement and the numbers are not ridiculous.

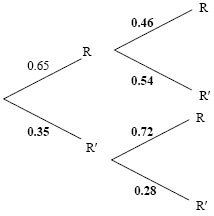
=  (A1) (C3)

**Note:** If one correct product is doubled this receives (M1)(M0)(A0)

(c) The probability is 0. (Allow answer “impossible” or equivalent.) (A1) (C1)

[6]

**7.** (a) (A4) (C4)



**Note:** Award (A4) for all 5 correct, (A3) for 4 correct, (A2) for 3 correct, (A1) for 2 correct.

(b) 0.65  0.46 + 0.35  0.72 (M1)(M1)

**Note:** Award (M1) for 0.65  0.46 (M1) for 0.35  0.72, (M1) for adding (M1) for answer.

= 0.299 + 0.252 (A1)

= 0.551 (A1) (C4)

[8]

**8.** (a) *a* = 4, *b* = 1 (A1)(A1) 2

(b) 30 – (4 + 12 + 1 + 2 + 4 + 4) = 3 (M1)(A1) (or (A2)) 2

(c)  (A1)(A1) 2

**Note:** Award(A1)for numerator,(A1)for denominator.

(d)  (A1)(A1)2

**Note:** Award(A1)for numerator,(A1)for denominator.

[8]

**9.**

(a)

 (A4) (C4)

(b) P (*G*  *W*) =  (A1)  
P(*NG*  *W*) =  (A1)  
P(*W*) =  (M1)  
=  (0.6875, 68.75% or 0.688 to 3 s.f.) (A1) (C4)

[8]

**10.** (a)

|  |  |  |
| --- | --- | --- |
|  | (A1)  (A1) | 2 |

(b) P(*J*1  *W*) = , P(*J*2  *W*) =  (M1)

**Note:** Award (M1) for either correct.

P(*W*) =  (M1)  
=  ***or*** 0.467 (3 s.f.) ***or*** 46.7% (3 s.f.) (A1) 3

(c) P(*J*1  *W*  *W*) = , P(*J*2  *W*  *W*) = 0 (M1)  
P(*W*  *W*) =   
=  ***or*** 0.15 ***or*** 15% (A1) 2

[7]

**11.** (a) 12 (A2) (C2)

(b)  or 25% (A2) (C2)

(c)  or 16.7% (3 s.f.) (A2) (C2)

(d)  or 33.3% (3 s.f.) (A2) (C2)

[8]