Unit G: Probability

Senior 4 Pre-Calculus Mathematics (40S)

Sample Questions by Outcome

Outcome:

G-1:   Construct a sample space for two or three events

Mental Math:

1.   A ball is drawn at random from a box containing 6 red balls, 4 white balls, and 3
        blue balls. What is the probability that it is red?

Answer: $\dfrac{6}{13}$

(January 1999 Provincial Examination for Pilot Schools)

Multiple Choice:

Long Answer:

1.   Rupert has either milk or cocoa to drink for breakfast with either oatmeal or
        pancakes. If he drinks milk, then the probability that he is having pancakes with
        the milk is $\frac{2}{3}$. The probability that he drinks cocoa is $\frac{1}{5}$. If he drinks cocoa, the
        probability of him having pancakes is $\frac{6}{7}$.

a)   Show the sample space of probabilities using a tree diagram or any other method
        of your choice.
b)   Find the probability that Rupert will have oatmeal with cocoa tomorrow morning.

(4 marks – 3 for a) and 1 for b))

Answers:
a)
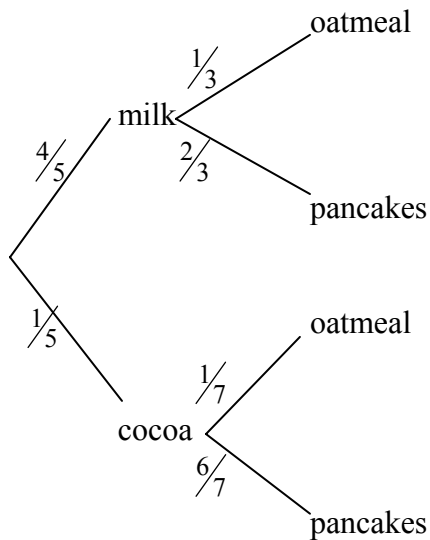
b) $\frac{1}{35}$

(January 1999 Provincial Examination for Pilot Schools)

Outcome:

G-2:   Solve problems involving the probabilities of independent or dependent events.

Mental Math:

1.   A card is selected from a deck of 52 cards. What is the probability of getting a
        queen or a club?

Answer: $\dfrac{16}{52}$ or $\dfrac{4}{13}$

(January 1998 Provincial Examination for Pilot Schools)

2.   A jar contains 4 red, 4 yellow, and 4 green jelly beans. If Joan and Jim take one
        jelly bean each, what is the probability that they both take a red jelly bean?

Answer: $\dfrac{1}{11}$

(January 1998 Provincial Examination for Pilot Schools)

3.   What is the probability of rolling a 2 or a 3 on a single roll of a six-sided die?

Answer: $\dfrac{2}{6}$ or $\dfrac{1}{3}$

(June 1998 Provincial Examination for Pilot Schools)

4.   A card is drawn from an ordinary deck of 52 cards. What is the probability the
        card will be a red ace?

Answer: $\dfrac{2}{52}$ or $\dfrac{1}{26}$

(June 1998 Provincial Examination for Pilot Schools)

5.   What is the probability of rolling a 2 or a 3 on a single roll on an eight-sided die
        which is numbered from 1 to 8?

Answer: $\dfrac{2}{8}$

(January 1999 Provincial Examination for Pilot Schools)

6.   What is the probability of rolling a five with a single roll of a six-sided die and getting a head with a single toss of a coin?

Answer: $\dfrac{1}{12}$

(January 1999 Provincial Examination for Pilot Schools)

7.   The numbers 1 through 13 are written on 13 different pieces of paper. One piece of paper is chosen at random. What is the probability that the number is even?

Answer: $\dfrac{6}{13}$

(June 1999 Provincial Examination for Pilot Schools)

8.   If three coins are tosses, what is the probability that each will show a head?

Answer: $\dfrac{1}{8}$ or $\left(\dfrac{1}{2}\right)^3$ or $(0.5)^3$ or 0.125

(January 2000 Provincial Examination for Pilot Schools)

9.   On each attempt the probability of hitting a target is 0.9. If an individual takes three shots, what is the probability the target will be missed on all three shots?

Answer: $(0.1)^3$ or 0.001

(January 2000 Provincial Examination for Pilot Schools)

10.   If a standard six-sided die is rolled, what is the probability that the number showing is divisible by 3?

Answer: $\dfrac{2}{6}$ or $\dfrac{1}{3}$

(June 2000 Provincial Examination for Pilot Schools)

11.   If the probability of rain on any given day is $\dfrac{2}{9}$, what is the probability that it will rain two days in a row?

Answer: $\dfrac{4}{81}$

(June 2000 Provincial Examination for Pilot Schools)

Multiple Choice:

1. A computer is used to generate random telephone numbers. Of the numbers generated and in service, 56 are unlisted and 144 are listed in the telephone directory. If one of these telephone numbers is randomly selected, what is the probability that it is unlisted?

a) $\dfrac{7}{18}$

b) $\dfrac{18}{7}$

c) $\dfrac{7}{25}$

d) $\dfrac{18}{25}$

Answer: c)
(January 1998 Provincial Examination for Pilot Schools)

2. A fair six-sided die is tossed twice. Find the probability of getting a 2, 4, or 6 on the first toss and a 2, 3 or 5 on the second toss.

a) $\dfrac{1}{4}$

b) $\dfrac{2}{3}$

c) $\dfrac{1}{2}$

d) $\dfrac{1}{6}$

Answer: a)
(June 1998 Provincial Examination for Pilot Schools)

3.   If a box contains 4 red, 2 white, and 5 blue balls, what is the probability that a ball drawn will be either blue or white?

a) $\dfrac{6}{11}$

b) $\dfrac{7}{11}$

c) $\dfrac{10}{11}$

d) $\dfrac{5}{11}$

Answer: b)
(June 1998 Provincial Examination for Pilot Schools)

4.   A jar contains 5 red and 7 blue marbles. What is the probability of pulling out 2 blue marbles in a row, without replacement?
a)   0.090
b)   0.340
c)   0.318
d)   0.292

Answer: c)
(January 1999 Provincial Examination for Pilot Schools)

5.   The probability of hitting a target when throwing a dart is $\dfrac{5}{7}$. If 6 darts are thrown, what is the probability of exactly 4 hits?

a) $\left(\dfrac{5}{7}\right)^4\left(\dfrac{2}{7}\right)^2$

b) $\left(\dfrac{5}{7}\right)^4$

c) $15\left(\dfrac{5}{7}\right)^4\left(\dfrac{2}{7}\right)^2$

d) $15\left(\dfrac{5}{7}\right)^4$

Answer: c)
(June 1999 Provincial Examination for Pilot Schools)

6.   A bag contains 4 red and 5 blue marbles. If 2 marbles are chosen without replacement, what is the probability that both are red?

a) $\dfrac{4}{27}$

b) $\dfrac{1}{6}$

c) $\dfrac{16}{81}$

d) $\dfrac{2}{9}$

Answer: b)
(January 2000 Provincial Examination for Pilot Schools)

7.   The probability of Bill hitting a target is $\dfrac{3}{4}$ and the probability of Jane hitting the target is $\dfrac{4}{5}$. Assuming these are independent events, what is the probability that both will miss the target?

a) $\left(\dfrac{3}{4}\right)\left(\dfrac{4}{5}\right)$

b) $\dfrac{1}{4}+\dfrac{1}{5}$

c) $\left(\dfrac{1}{4}\right)\left(\dfrac{1}{5}\right)$

d) $\left(\dfrac{3}{4}\right)\left(\dfrac{1}{5}\right)+\left(\dfrac{1}{4}\right)\left(\dfrac{4}{5}\right)$

Answer: c)
(June 2000 Provincial Examination for Pilot Schools)

Long Answer:

1.   If two six-sided dice are rolled together, what is the probability that the sum shown is greater than 9?

(2 marks)

Answer: $\dfrac{1}{6}$

(January 1998 Provincial Examination for Pilot Schools)

2.   The serial number of a $10 bill contains 8 digits. If your $10 bill contains the digit 7 at least once, you win a prize. What is the probability that your $10 bill will win?

(2 marks)

Answer: 5.7% chance

(January 1998 Provincial Examination for Pilot Schools)

3.   A box contains 4 green marbles and 2 red marbles. A marble is drawn and then replaced. This is continued for a total of 5 draws. What is the probability of drawing 4 green marbles and 1 red marble?

(3 marks)

Answer: 33%

(January 1998 Provincial Examination for Pilot Schools)

4.   Susan sees her friend, Tim, at his locker with a worried look on his face. She
        asks, "What's wrong?" Tim has to open his locker and change clothes within the
        next five minutes. However, he has forgotten the combination to his new lock.
        He knows that the lock requires three different numbers. He also remembers that
        all of the numbers are odd, and all of the numbers are divisible by seven. It takes
        10 seconds to dial a locker combination and 1.5 minutes to change clothes.
        Is Tim likely to be ready for gym class on time? Support your answer
        mathematically and show your work in the space below.

(4 marks)

Answer: Tim is likely to be ready for class since he has a probability of $\dfrac{7}{8}$ to hit the

               right combination in the time available.
(June 1998 Provincial Examination for Pilot Schools)

5.   The letters in the word SEQUOIA are each written on an index card. Two cards
        are drawn at random without replacement. What is the probability that two
        vowels are drawn?

(2 marks)

Answer: $\dfrac{10}{21}$

(June 1999 Provincial Examination for Pilot Schools)

6.   All the letters of the word MANITOBA are arranged at random in a row. What is
        the probability that this random arrangement will have the two A's next to each
        other?

(3 marks)

Answer: 0.25
(January 2000 Provincial Examination for Pilot Schools)

7.   If a fair coin is tossed 4 times, what is the probability of obtaining exactly 2
      heads?

(2 marks)

Answer: $\dfrac{6}{16}$ or $\dfrac{3}{8}$

(June 2000 Provincial Examination for Pilot Schools)

Outcome:

G-3:   Solve problems using the probabilities of mutually exclusive and complementary events

Mental Math:

1.   If the probability of winning is $\dfrac{2}{7}$, then the probability of not winning is?

Answer: $\dfrac{5}{7}$

(January 1999 Provincial Examination for Pilot Schools)

2.   If a single card is chosen from a deck of 52 cards, what is the probability that it is a king or red?

Answer: $\dfrac{28}{52}$ or $\dfrac{7}{13}$

(June 1999 Provincial Examination for Pilot Schools)

3.   The probability that Hayley does her homework is $\dfrac{2}{3}$. The probability that her teacher checks the homework is $\dfrac{3}{4}$. What is the probability that Hayley does not do her homework and gets caught?

Answer: $\dfrac{1}{4}$

(June 1999 Provincial Examination for Pilot Schools)

4.   A marble is chosen from a bag containing 3 red marbles, 2 blue marbles and 1 black marble. Find the probability that it is **not** black.

Answer: $\dfrac{5}{6}$

(June 2000 Provincial Examination for Pilot Schools)

Multiple Choice:

1.   The probability that Robin Hood will hit the target is 0.6. The probability that
      Little John will hit the target is 0.2. What is the probability that they both hit the
      target?

a)   0.80
b)   0.60
c)   0.30
d)   0.12

Answer: d)
(January 1998 Provincial Examination for Pilot Schools)

Long Answer:

1.   Dharma and Greg visit a Kindergarten class. The probability that Greg will catch
        the mumps is P(G) = 0.13 and the probability that Dharma will catch the mumps
        is P(Dh)=0.07. Find the probbaility that both **do not** catch the mumps.

(2 marks)

Answer: 0.8091 or 81%
(June 1998 Provincial Examination for Pilot Schools)

2.   In the blue room, there are 12 boys and 8 girls. In the green room, there are 7
        boys and 9 girls. If you select a room at random from one of the rooms, what is
        the probability that the student is a girl?

(2 marks)

Answer: $\dfrac{77}{160}$
(January 1999 Provincial Examination for Pilot Schools)

Outcome:

G-4:   Determine the conditional probability of two events

Mental Math:

1.   Four buses leave Winnipeg for Toronto at the same time. If Mary is on bus #803, what is the probability that Tom is on the same bus?

Answer: $\dfrac{1}{4}$

(June 1999 Provincial Examination for Pilot Schools)

Multiple Choice:

1.   A pair of standard six-sided dice is rolled. The dice show a sum of 8. The probability that one die shows a 5 is:

a) $\dfrac{1}{5}$

b) $\dfrac{2}{5}$

c) $\dfrac{5}{36}$

d) $\dfrac{11}{36}$

Answer: b)
(June 2000 Provincial Examination for Pilot Schools)

Long Answer:

1.   A skier has just reached the top of the hill. There are three paths leading away
        from the top. If the skier selects path A, then the probability of skiing to the
        bottom is $\dfrac{1}{4}$. If path B is selected, the probability of success is $\dfrac{1}{5}$. If path C is
        selected, the probability of success is $\dfrac{1}{3}$. If the skier succeeds in reaching the
        bottom, what is the probability that path B was used?

(3 marks)

Answer: $\dfrac{12}{37}$

(January 1999 Provincial Examination for Pilot Schools)

2.   Tom, Joanne, and Elsie are running for president of a company. The probability
        that they are elected is 30%, 20%, and 50%, respectively. If Tom is elected, the
        probability that stocks of the company will increase in value is 10%. If Joanne is
        elected, the probability that the stocks will increase in value is 15% and 20% if
        Elsie is elected. If the stocks have increased in value, what is the probability that
        Joanne was elected president?

(4 marks)

Answer: $\dfrac{3}{16}$

(June 1999 Provincial Examination for Pilot Schools)

3.   Three identical boxes each contain two drawers. In one box, each drawer
      contains a gold coin. In another box, each drawer contains a silver coin. The
      remaining box has a silver coin in one drawer and a gold coin in the other. One
      drawer is opened and a gold coin is found. What is the probability that the other
      drawer in that box also contains a gold coin?

      Michael claims that the probability is $\dfrac{1}{3}$. Jessica claims it is $\dfrac{1}{2}$. Raymond says

      the probability is $\dfrac{2}{3}$.

      Explain how each person may have arrived at their answer.

      Who is correct? Justify your answer.

(6 marks)

Answer: Raymond is correct. (Justification needed for full marks)
(June 1999 Provincial Examination for Pilot Schools)

6.   John takes the bus to school on two days, and on the other three days he walks. If
      he takes the bus he is late 10% of the time, but if he walks he is late 30% of the
      time.
a)   What is the probability that John arrives on time?
b)   If John was late, what is the probability that he took the bus?

(5 marks)

Answer: a)   0.78
               b)   0.182
(January 2000 Provincial Examination for Pilot Schools)

Outcome:

G-5:   Solve probability problems involving:
- permutations, combinations
- conditional probability

Mental Math:

Multiple Choice:

Long Answer:

1.   If seven girls and two boys are placed in a circle, what is the probability that the
        boys are together?

(3 marks)

Answer: 0.25
(January 1998 Provincial Examination for Pilot Schools)

2.   Three boxes contain coloured marbles with the contents of each box indicated in
        the diagram. Biff randomly selects a box, and then randomly selects a marble
        from the box. What is the probability that the marble selected is red?

| I | **3 red** | **II** | **2 red** | **III** | **4 red** |
| | **5 blue** | | **4 blue** | | **2 blue** |
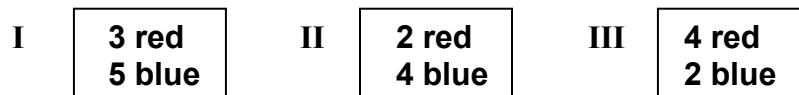
(4 marks)

Answer: $\dfrac{11}{24}$

(January 1998 Provincial Examination for Pilot Schools)

3.   A 6 letter permutation is selected at random from the letters SIMPLE. What is the
        probability that the third letter is P and the last letter is M?

(2 marks)

Answer:
(June 1998 Provincial Examination for Pilot Schools)

4.   From a group of 8 men and 7 women, a committee of 6 is chosen. What is the
        probability that 3 men and 3 women will be chosen?

(3 marks)

Answer: $\dfrac{1960}{5005}$ or 0.3916 or 39.2%

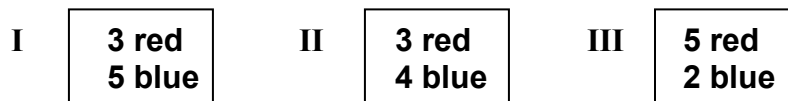(June 1998 Provincial Examination for Pilot Schools)

5.   The probability that Biff can score a goal with a slapshot from the blue line is 0.3.
        If he takes 6 shots, what is the probability that he scores 4 goals?

(3 marks)

Answer: 0.0595 or 59.5%
(June 1998 Provincial Examination for Pilot Schools)

6.   Three boxes contain coloured marbles with the contents of each box indicated in
        the diagram. Kelly randomly selects a box, and then randomly selects a marble
        from that box.

a)   What is the probability that the marble selected is blue?
b)   If a blue marble is chosen, what is the probability that it came from the second
        box?

I | 3 red | II | 3 red | III | 5 red |
    | 5 blue | | 4 blue | | 2 blue |

(4 marks)

Answers: a) $\dfrac{83}{168}$ or 0.494 or 49.4%

              b) $\dfrac{2016}{5229}$ or 0.386 or 38.6%
(June 1998 Provincial Examination for Pilot Schools)

7.   From a group of 6 boys and 8 girls, a committee of 5 is chosen. What is the
        probability that 2 boys and 3 girls will be chosen? (Give answer to four decimal
        places.)

(3 marks)

Answer: 0.4196
(January 1999 Provincial Examination for Pilot Schools)

8.   You are assigned a password consisting of 3 letters followed by 3 digits. What is
        the probability that your password will have no repetition of either letters or
        digits? For example, the password could be ZAP029. (Round your answer to 3
        decimal places.)

(2 marks)

Answer: 0.639
(January 2000 Provincial Examination for Pilot Schools)

9.   Forty tickets are numbered consecutively from 1 to 40. Three tickets are chosen
        at random without replacement. What is the probability that exactly two of the
        tickets are even?

(3 marks)

Answer: 0.3846
(January 2000 Provincial Examination for Pilot Schools)

10.   Four boys and girls are seated in a row of seven desks. Find the probability that
        the boys and girls alternate.

(3 marks)

Answer: $\dfrac{144}{5040}$ or $\dfrac{1}{35}$

(June 2000 Provincial Examination for Pilot Schools)

11.   Eight students of different heights are seated randomly around a circular table.
        Find the probability that the two tallest students are sitting next to each other.

(3 marks)

Answer: $\dfrac{1440}{5040}$ or $\dfrac{2}{7}$

(June 2000 Provincial Examination for Pilot Schools)

12.   Frankie takes 1 language course, 1 math course and 1 science course. The probability of Frankie passing a language course is 0.9, a math course is 0.7, and a science course is 0.6. Frankie's father picks one course at random and asks Frankie: "Did you pass?"

a)   What is the probability that the correct answer is "Yes"?

b)   If the correct answer is "Yes", what is the probability that the course was Math?

(5 marks – 3 for a) and 2 for b))

Answers:

a) $\dfrac{11}{15}$

b) $\dfrac{7}{22}$

(June 2000 Provincial Examination for Pilot Schools)