Grade 9 Mathematics Worksheet

Probability

Questions:

1. Out of a series of eight letters, you draw two letters directly after one another. What is the probability that you draw both the L's in the two events?

   coldplay

   A) $\frac{1}{4}$

   B) $\frac{1}{56}$

   C) $\frac{1}{28}$

   D) $\frac{1}{32}$

2. Eva draws coloured blocks from a brown paper bag. She records the colour, and puts the block back into the bag before drawing another one. There are four colours in the bag: red, green, blue and white. Here are the results of her first twenty draws:

Colour of the block	Frequency
Red	8
Green	3
Blue	5
White	4

   If Eva plans to complete 80 more draws, how many blue balls can she expect to have drawn over the next 80 draws?

   A) 5
   B) 25
   C) 20
   D) 15

3. You want to buy lunch from the sandwich shop. They sell open sandwiches and you can make up your own from the following menu.

What is the probability that a person will choose a salami and mustard rye sandwich?

Bread	Filling	Sauce
Rye	Cheese	Tomato
White	Ham	Mustard
Brown	Salami	1000 Islands
Soy	Salmon	Smoked Union
Bun	Spread	

A)   0,01
B)   0,9
C)   0,1
D)   0,07

4.   The deli around the corner from your house, sells delicious sandwich combinations. The menu offers you to build your own sandwich from the following ingredients:

SANDWICH MENU		
BREAD	CHEESE	MEAT
Wheat	Blue Cheese	Salami
Rye	Gorgonzola	Salmon
	Parmesan	

a)   Draw a tree diagram that clearly shows all the combinations of open sandwiches that can be built from only using one choice out of each ingredient.

b)   How may sandwiches could have Blue cheese and Salami on them?

5. Inside a box of chocolate you have various ingredients. The table below shows the contents of one such a box:

Caramel	Coconut	Ginger	Toffee	Creamy
6	3	4	2	5

a) Jenny does not like coconut and toffee centres in chocolates. What is the chance that she will pick a chocolate that she likes?

b) If she takes two chocolates from the box, what is the chance of her taking a ginger and a creamy centre?

6. You have a spinner that has five colours on it. These are red, blue, green, yellow and orange. The following information is given about the spinner:
   - blue is half the size of yellow, which makes up for a quarter of the spinner.
   - the ratio of red to green is 1 to 3, and green plus red is twice the size of the blue.
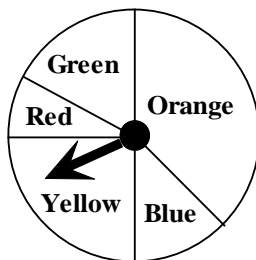
a) Is this a fair spinner? Explain fully.

b) List the probabilities of landing on the different colours.

c) What is the chance that you will not land on red if you spin the spinner?

7.   A bag contains 5 blue, 3 green and 2 white balls. You draw a ball at random from this bag.

   a)   Draw a probability tree diagram that shows all the probabilities for two consecutive draws, if you replaced the ball into the bag after every draw.

   b)   Draw a probability tree diagram that shows all the probabilities for two consecutive draws, if you did not replace the ball into the bag after every draw.

   c)   Calculate the probability of not drawing a white ball at all, whether you replace the balls after every draw, or not.

Solution:

1. At first there are two L's in the word consisting of eight letters. Once the first L has been drawn then there are seven letters remaining. There is a two in eight chance to draw the first L, since there are two of them. Then the second draw will have 7 letters left, and the second L now has a one in seven chance to be drawn. These two fractions multiplied give $\frac{2}{8} \times \frac{1}{7} = \frac{2}{56} = \frac{1}{28}$. So the answer is (C).

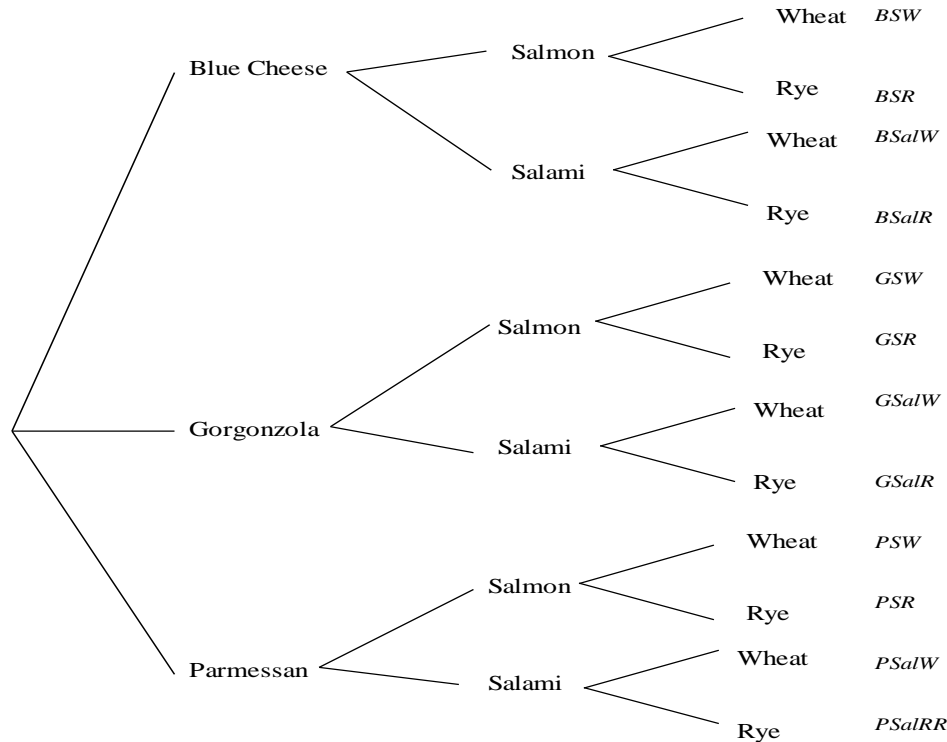2. For the experiment, the relative frequencies are:

Colour of the block	Frequency	Relative frequency
Red	8	$\frac{4}{10}$
Green	3	$\frac{3}{20}$
Blue	5	$\frac{1}{4}$
White	4	$\frac{1}{5}$

So for the next 80 draws she is likely to draw blue balls $\frac{1}{4} \times 80 = 20$ times. Solution is (C).

3. This choice is one out of a total of 100 choices of sandwiches. This is calculated by looking at the number of total possible outcomes: 5 breads / 5 fillings / 4 sauces. So outcomes that are possible = $5 \times 5 \times 4 = 100$. The choice indicated is thus one of a hundred which gives us a probability of $\frac{1}{100} = 0,01$. Thus the solution lies at (A).

4. a)

Blue Cheese

Salmon — Wheat — *BSW*

Salmon — Rye — *BSR*

Salami — Wheat — *BSalW*

Salami — Rye — *BSalR*

Gorgonzola

Salmon — Wheat — *GSW*

Salmon — Rye — *GSR*

Salami — Wheat — *GSalW*

Salami — Rye — *GSalR*

Parmessan

Salmon — Wheat — *PSW*

Salmon — Rye — *PSR*

Salami — Wheat — *PSalW*

Salami — Rye — *PSalRR*

b) There are four sandwiches with blue cheese on them. Of the four, only two can have salami on them. So only two sandwiches can have a combination of blue cheese and salami.

5. a) Total of 6+3+4+2+5=20 chocolates in the box
The ones that Jenny does not like are : 3 coconut + 2 toffee = 5 chocolates

$$P(likes) = 1 - \frac{5}{20} = 1 - \frac{1}{4} = 0,75 \ .$$

The chance that she picks a chocolate that she likes is 75%.

b) P(ginger then creamy) = $\frac{4}{20} \times \frac{5}{19} = \frac{20}{380} = \frac{1}{19} = 0,05$.

6. a) No it is not fair. A fair spinner would have equally likely outcomes – that is it would have been divided into equal parts so that each colour has an equal chance of being chosen. This spinner advantages orange, and disadvantages red the most.

b) Yellow = $\frac{1}{4}$ of the spinner (given) – P(Yellow) = $\frac{1}{4}$

Thus Blue = Half of yellow = $\frac{1}{2} \times \frac{1}{4} = \frac{1}{8}$ of the spinner – P(B) = $\frac{1}{8}$.

Green + Red = 2 times Blue = $2 \times \frac{1}{8} = \frac{1}{4}$. But R:G = 1:3. That means that of this quarter, one quarter is Red and three quarters are Green. So P(R) = $\frac{1}{4} \times \frac{1}{4} = \frac{1}{16}$
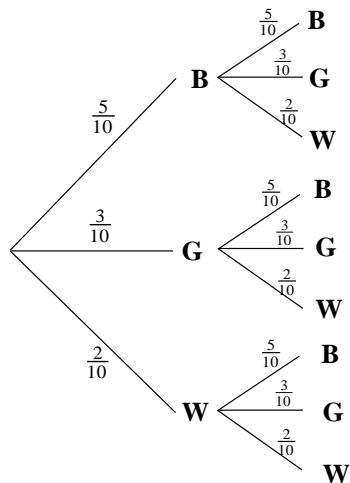
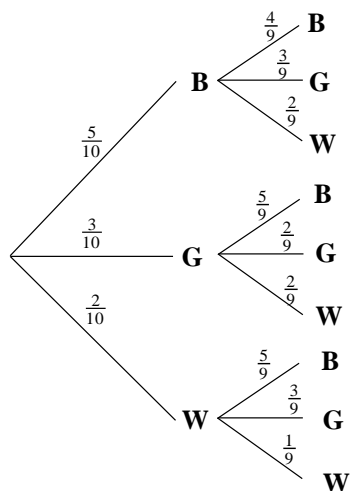and then P(G) = $\frac{3}{4} \times \frac{1}{4} = \frac{3}{16}$. That leaves us with Orange, which makes up the rest.

So then P(O) = $1 - \frac{1}{4} - \frac{1}{4} - \frac{1}{8} = 1 - \frac{1}{2} - \frac{1}{8} = \frac{8-4-1}{8} = \frac{3}{8}$.

c)   P(not R) = 1 − P(R) = $1 - \frac{1}{16} = \frac{15}{16} \approx 0,94$

7.   a)

b)

c)   P(not White) = 1 − P(white) = $1 - \frac{2}{10} \times \frac{2}{10} = 1 - \frac{1}{25} = \frac{24}{25}$ or $1 - \frac{2}{10} \times \frac{1}{9} = 1 - \frac{1}{45} = \frac{44}{45}$.

Working with what the relative frequency calculates, is an important idea. Learners need to understand that the more outcomes we record the closer the relative frequency will be to the actual theoretical probability. (The law of large numbers)

The total number of outcomes can be found without drawing a tree diagram or a table.

Constructing the tree diagram for an experiment / event can become very messy. Encourage learners to plan before they put pen to paper. The tree must be neatly constructed and when probabilities are recorded on the tree, they need to be visible. It is not always necessary to include the elements in the same space in the tree diagram.