



Mathematics Essentials 2016

Unit 3/4 Test 4

Task Weighting: 6%

Student Name:

Marking Key

Time Allowed: **55 Minutes**

Total Marks: **48**

Calculators and files are allowed in this test.

Answer all of the following questions. Show all working where appropriate to maximise marks.

Question 1

(2 Marks)

Express the probability of the following situation using the appropriate method shown.

Choosing a blue jellybean from a jar containing 7 red, 5 green and 4 blue jellybeans

I. Word Unlikely. $\frac{1}{2}$

II. Fraction $\frac{4}{16}$ or $\frac{1}{4}$ $\frac{1}{2}$

III. Decimal 0.25 $\frac{1}{2}$

IV. Percentage 25% $\frac{1}{2}$

Question 2

(2 Marks)

Provide a real life example/situation where probability is used to make a decision or decisions.

Any reasonable answer

eg. Probability of rain and how that affects making plans.

Question 3

(2 Marks)

The probability of Les being late for school on any morning is $\frac{3}{8}$. Les has 56 school days left until he finishes school. On approximately how many days will Les be late for school?

$$(3 \div 8) \times 56 = 21 \text{ Days.}$$

Question 4

(6 Marks: 3, 3)

A dice game is played between 2 players. Each player rolls a dice and the winner is decided as follows; Player A wins if 1, 2, 3 or 4 is the highest number rolled. Player B wins if 5 or 6 is the highest number rolled

- a) Complete the following sample space to display all possible outcomes for the game.

		PLAYER A					
PLAYER B		1	2	3	4	5	6
	1	1,1 A	1,2 A	1,3 A	1,4 A	1,5 B	1,6 B
	2	2,1 A	2,2 A	2,3 A	2,4 A	2,5 B	2,6 B
	3	3,1 A	3,2 A	3,3 A	3,4 A	3,5 B	3,6 B
	4	4,1 A	4,2 A	4,3 A	4,4 A	4,5 B	4,6 B
	5	5,1 B	5,2 B	5,3 B	5,4 B	5,5 B	5,6 B
	6	6,1 B	6,2 B	6,3 B	6,4 B	6,5 B	6,6 B

Full marks for showing all NUMBERS rolled
1 mark only for showing which PLAYER won

- b) Which Player has the higher probability of winning? Justify with calculations

$$\text{Player A} = \frac{16}{36} \checkmark$$

$$\approx 44\%$$

$$\text{Player B} = \frac{20}{36} \checkmark$$

$$\approx 56\%$$

∴ Player B has the higher probability of winning ✓

Question 5**(2 Marks)**

Tomorrow's weather forecast includes the statements: The probability of strong winds is 70%. The chance of rain is $\frac{4}{5}$. Which event, strong winds or rain is more likely to occur? Justify with calculations.

$$\frac{4}{5} = 0.8 \text{ or } 80\%$$

\therefore Rain is more likely to occur

Question 6**(5 Marks: 2, 1, 2)**

- a) If a 6-sided die was rolled 10 times how many times would you expect the number 4 to be rolled?

$$\frac{1}{6} \times 10 = 1.67 \quad \checkmark \quad \therefore \text{Expect 4 to be rolled 2 times}$$

$\therefore 2 \quad \checkmark$

- b) After 10 rolls the number 4 came up 5 times. Display as a percentage

$$\frac{5}{10} = 0.5$$

$$0.5 \times 100 = 50\%$$

- c) If the dice was rolled a further 90 times would you expect this percentage to increase or decrease? Explain your answer

~~increase~~
Whoops
Decrease \checkmark

- Law of Large numbers \checkmark

Question 7**(8 Marks: 2, 1, 1, 4)**

In basketball a player can shoot one of 3 shots; a 2 pointer (worth 2 points), a 3 pointer (worth 3 points) or a Free Throw (worth 1 point). A player's shooting percentage is the probability of making that shot.

If a basketballer has a 2-Point field goal percentage of 46%, a 3-Point field goal percentage of 30% and a Free Throw percentage of 80%. Calculate:

- a) How many Free Throws would you expect to be successful from 56 shots?

$$0.8 \times 56 = 44.8 \checkmark$$

$$\therefore \frac{45}{45} \text{ shots } \checkmark$$

- b) How many 2-Pointers would you expect to be successful from 21 shots?

$$0.46 \times 21 = 9.66 \checkmark$$

$$\therefore 10 \text{ shots } \checkmark$$

- c) How many 3-Pointers would you expect to be successful if 15 were shot?

$$0.3 \times 15 = 4.5 \checkmark$$

$$\therefore 4 \text{ or } 5 \text{ shots}$$

- d) If the basketballer had 10 of the same shot to get the most points possible, based on the shooting percentages, which is the better option, Free Throws, 2-Pointers or 3-Pointers?

F.T

$$0.8 \times 10 = 8$$

$$8 \times 1 = 8 \text{ points } \checkmark$$

2 pt

$$0.46 \times 10 = 4.6$$
$$\therefore 5$$

$$2 \times 5 = 10 \text{ points } \checkmark$$

3 pt

$$0.3 \times 10 = 3$$
$$\therefore 3$$

$$3 \times 3 = 9 \text{ points } \checkmark$$

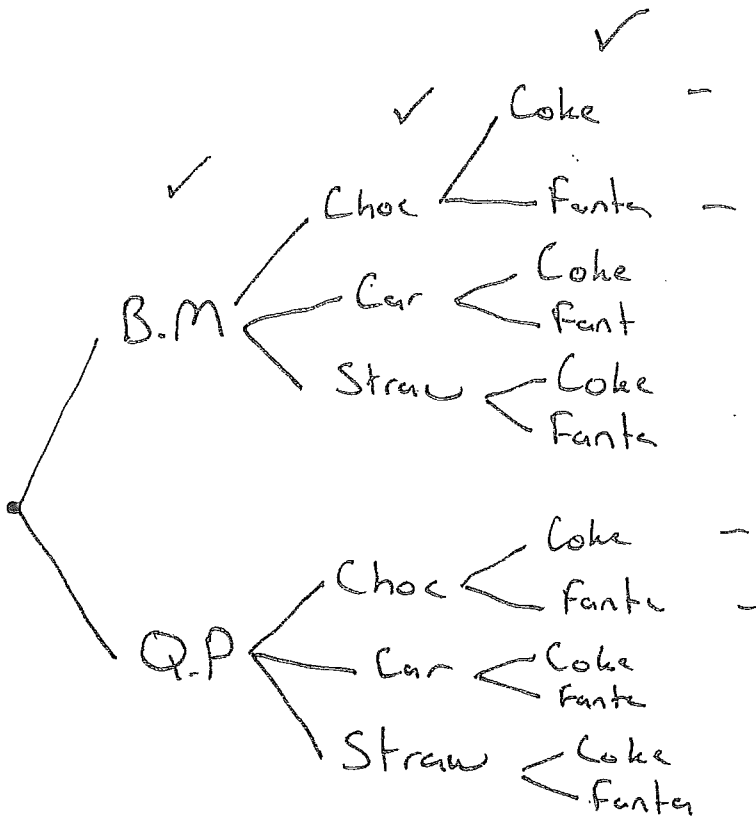
Best option is 2 pointers as you make 10 points where as F.T. you only make 8 points and 3ptrs you only make 9 points.

Question 8

(5 Marks)

Harrison **ALWAYS** orders from the following items when he eats at McDonalds; a Big Mac or a Quarter Pounder to start, then either a Chocolate, Caramel or Strawberry Mega Choc Waffle Cone and finally either a Coke or Fanta to wash it down.

If Harrison goes to McDonalds twice a week for 3 weeks how many Chocolate Mega Choc Waffle Cones would you expect Harrison to eat? Justify by creating a tree diagram to demonstrate the sample space.



$2 \times 3 = 6$ trips to McDonalds

$$\text{Choc} = \frac{4}{12} = \frac{1}{3}$$

$\frac{1}{3} \times 6 = 2$ \therefore You would expect Harrison to have 2 Choc Mega Choc waffle cones.

Question 9

(7 Marks: 2, 2, 2, 1)

This game is based on tennis but uses a coin and a six-sided die. There are two players, A and B. A serves by tossing a coin. If the outcome is heads (H) the service is good; if tails (T) there is a fault and that player is allowed to serve again. Only two services are allowed. H or TH gives a good service; TT gives a double fault, and B wins the point.

If the service is good, B rolls the die.

If the outcome is 1, 2, 3, or 4 then it is a good stroke; if 5 or 6 then the point is lost.

If the stroke is good then A rolls the die. This continues until the point is lost.

Pete is playing Mark in a game of Rainy Day Tennis.

- a) Pete is serving. He tosses the coin and gets a head. He then tosses the coin again and gets another head. Mark says that Pete is playing the game incorrectly. Explain why.

Pete's first serve was good so he doesn't need to flip the coin again ✓

- b) The following results of tossing the coin and rolling the die were recorded for a game:

P	P	M	P	M	P	M
T	H	3	1	4	2	6

Explain who won, given that Pete served. Explain your answer

Pete won. Mark rolled the 6 ✓

- c) If neither player had a coin, but they had the die, explain a method that could be used to play the game so that it is basically the same as in the rules.

Any reasonable answer using the dice

eg. 1, 2, 3 Good serve ✓
4, 5, 6 Fault ✓

- d) State one factor that may cause this simulation to no longer model the real world event.

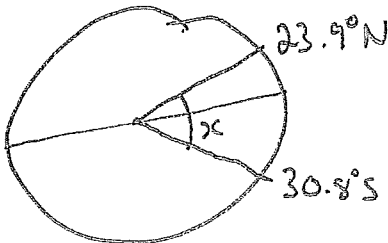
Weather, Court surface, player rankings etc. ✓

Question 10

(9 Marks: 3, 3, 3)

Kalgoorlie has a Latitude and Longitude of 30.8° S and 121.5° E. Find the distance between Kalgoorlie and the following places (Use the Earth's radius as 6370 km):

- a) Hualien County, Taiwan (23.9° N, 121.5° E)

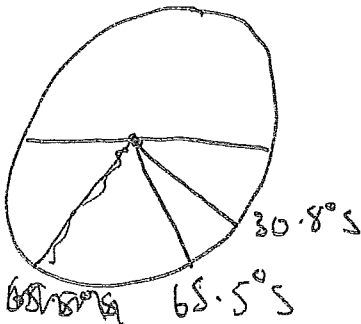


$$x = 23.9 + 30.8 \\ = 54.7$$

$$r = 6370$$

$$\text{Dist} = (x \div 360) \times 2\pi r \\ = (54.7 \div 360) \times 2 \times \pi \times 6370 \\ = 6081.41 \text{ km}$$

- b) Coast of Antarctica (65.5° S, 121.5° E)



$$x = 65.5 - 30.8 \\ = 34.7$$

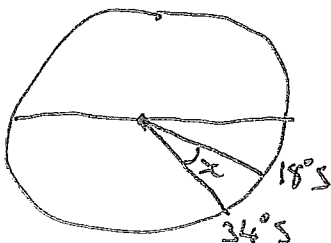
$$r = 6370$$

$$\text{Dist} = (x \div 360) \times 2\pi r \\ = (34.7 \div 360) \times 2 \times \pi \times 6370 \\ = 3857.86 \text{ km}$$

- c) Use the map provided to estimate the distance between Esperance and Lagrange in the northwest of the state. Show all working to allow your answer to be checked. (Use the Earth's radius as 6370 km)

$$\text{Esperance: } 18^\circ \text{S} \pm 0.2$$

$$\text{Lagrange: } 34^\circ \text{S}$$



$$x = 34 - 18 \\ = 16$$

$$\text{Dist} = (x \div 360) \times 2\pi r \\ = (16 \div 360) \times 2 \times \pi \times 6370 \\ = 1778.84 \text{ km}$$

END OF TEST

