Name:	School:	Target Grade:

PARADIGM

SECONDARY 4 E Math WA1

MOCK EXAM PAPER (Probability & Statistics)

READ THESE INSTRUCTIONS FIRST

INSTRUCTIONS TO CANDIDATES

1. Find a nice comfortable spot without distraction.

2. Be fully focused for the whole duration of the test.

3. Speed is KING. Finish the paper as soon as possible then return-back to Check Your Answers.

4. As you are checking your answers, always find ways to VALIDATE your answer.

5. Avoid looking through line by line as usually you will not be able to see your Blind Spot.

6. If there is no alternative method, cover your answer and REDO the question.

7. Give non-exact answers to 3 significant figures, or 1 decimal place for angles in degree, or 2 decimal place for $$$, unless a different level of accuracy is specified in the question.

Wish you guys all the best in this test.

You can do it.

I believe in you.

Team Paradigm

If you are struggling in this paper, it's an indication to work harder!
If you need support and personalised guidance, you can find us here
www.mathtutor.com.sg

PARADIGM [Turn Over]

Name: _____ Class: _____ Date: _____

Secondary 4 E Mathematics
WA1 Mock Paper

Topic: Probability & Statistics

Duration: 1 hour 10 minutes

45

Probability

1 A bag contains 30 pieces of tokens, of which x are gold tokens and the remaining are silver tokens.

Two tokens are drawn from the bag one after the other without replacement.

(a) Show that the probability that the second token drawn is a gold token is $\frac{x}{30}$. [2]

(b) The probability of drawing one gold and one silver token is $\frac{25}{87}$. [2]

Find the values of x.

2 (a) The table shows the number of students queuing at Stall F during recess on a particular day. Each student queues only once. [2]

	Sec 3	Sec 4	Sec 5
Boy	18	7	6
Girl	10	16	8

(i) One student in the queue is selected at random.
Find, as a fraction in its lowest term, the probability that the student is from Sec 4. [2]

(ii) Two students in the queue are selected at random. [2]
Find the probability that
(a) one of them is a boy and the other is a girl,
(b) both students are girls and one of them is from Sec 3.

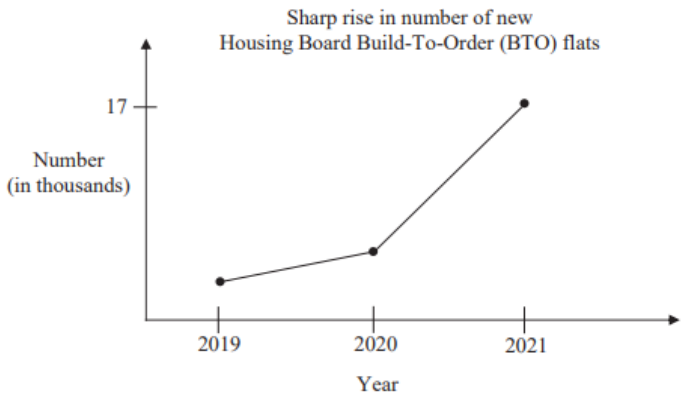
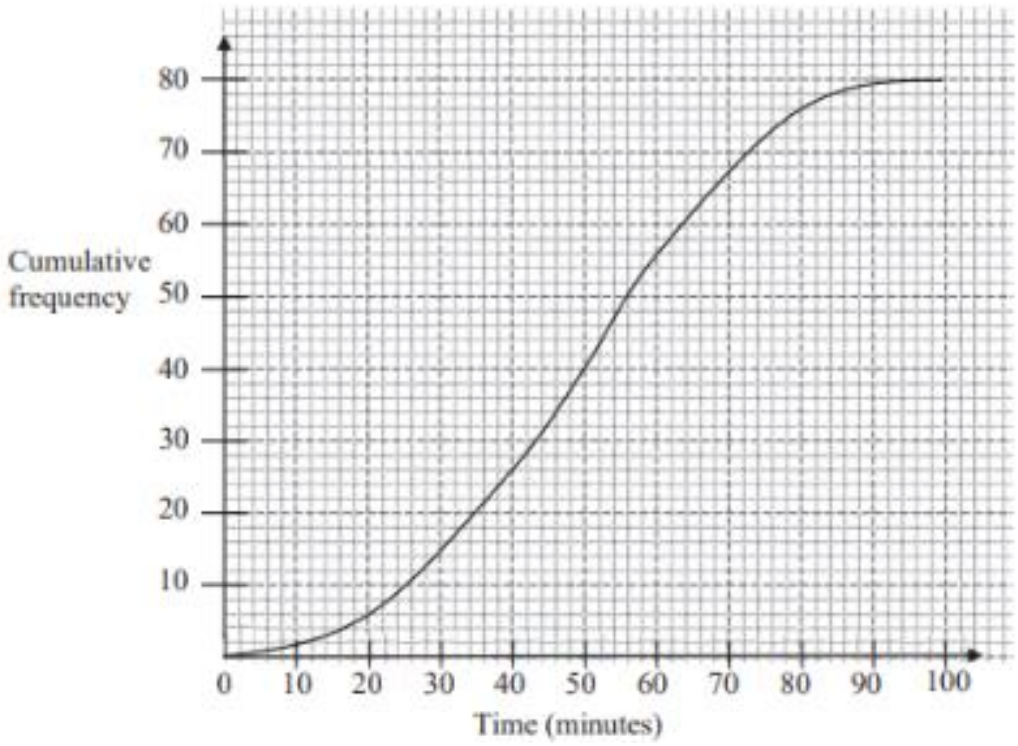
3 A bag contains five counters, numbered **1, 2, 3, 4** and **5.**
Two counters are taken from the bag at random, one after the other, **without replacement.**

(i) Draw a possibility diagram to represent the outcomes. [2]

(ii) Find, in the simplest form, the probability that
(a) both counters have a number less than 3, [1]
(b) neither counter has an even number, [1]
(c) the sum of the numbers is 10, [1]
(d) the product of the numbers is less than 6. [1]

4	(a) Box *A* contains 6 red cards, 4 blue cards and 2 green cards. Box *B* contains 3 red cards and 5 blue cards. A card is drawn at random from Box *A* and put into Box *B*. Next, a card is drawn at random from Box *B*. (i) Draw a tree diagram to show the probabilities of the possible outcomes. (ii) Find, as a fraction in its simplest form, the probability that (a) two green cards are drawn, (b) neither of the cards is green, (c)the two cards are of different colours.	[2] [1] [1] [1]

Statistics

1	 Explain how the line graph above may be misleading.	[1]
2	The mean and median of four numbers are 54 and 56 respectively. Find the mean of the largest and the smallest numbers.	[3]
3	The amount of time 80 secondary school students spent on social media in a day are recorded. The cumulative frequency curve below shows the distribution of their times. 	

(a) Use the curve to estimate

(i) the median, [1]

(ii) The interquartile range of the times. [2]

(b) Estimate the percentage of secondary students who spent more than 70 min on social media per day. [2]

(c) Complete the grouped frequency table for the spent on social media. [1]

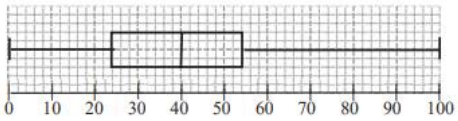
Time (min)	$0 \le x \le 20$	$20 \le x \le 40$	$40 \le x \le 60$	$60 \le x \le 80$	$80 \le x \le 100$
Frequency	6	20			

(d) Calculate an estimate of the mean time spent on social media. [1]

(e) Calculate an estimate of the standard deviation. [1]

(f) Explain why the mean standard deviation are estimates. [1]

(g) The amount of time 80 primary school students spent on social media in a day are also recorded. The box-whisker plot shows the distribution of the times (in minutes). [2]



Make two comments comparing the amount of time primary school students and secondary school students spent on social media.

4 The stem-and-leaf diagram shows the masses, in kilograms, of 14 infants.

5	0 1 1 2
6	2 4 4 8 9
7	0 3 7
8	2 5

Key : 6 | 4 represents 6.4 kg

For these masses, find

(a) The range, [1]

(b) The interquartile range [2]

5 The following stem-and-leaf diagram shows the marks obtained by 20 pupils in a class test that has a total mark of 50.

1	0 2
2	3 3 4 7 7
3	2 5 5 5 6 7 9
4	1 6 7 8 8
5	0

(i) State the median score. [1]

(ii) Find the standard deviation. [3]

(iii) If distinction is awarded to pupils who scored at least 80%, find the percentage of pupils in the class who scored distinction. [2]

Answer Key

Probability

1

(a) P(Second token is gold)$= \left(\frac{x}{30}\right)\left(\frac{x-1}{29}\right) + \left(\frac{30-x}{30}\right)\left(\frac{x}{29}\right)$

$$= \frac{x(x-1) + x(30-x)}{30(29)}$$

$$= \frac{29x}{30(29)}$$

$$= \frac{x}{30}$$

(b) $\left(\frac{x}{30}\right)\left(\frac{30-x}{30}\right) + \left(\frac{30-x}{30}\right)\left(\frac{x}{29}\right) = \frac{25}{87}$

$60x - 2x^2 = 250$

$2x^2 - 60x + 250 = 0$

$x^2 = 30x + 125 = 0$

$(x-5)(x-25) = 0$

$x = 5$ or $x = 25$

Ans: (a) $\frac{x}{30}$ (b) $x = 5$ or $x = 25$

2

(ii) (a) $\frac{31}{65} \times \frac{34}{64} \times 2 = \frac{527}{1040}$

(iii) $\frac{24}{65} \times \frac{10}{64} \times 2 = \frac{3}{26}$

Ans: (i) $\frac{23}{65}$ (ii) $\frac{527}{1040}$ (iii) $\frac{3}{26}$

3

Ans: (i)

	1	**2**	**3**	**4**	**5**
1	X	$(2,1)$	$(3,1)$	$(4,1)$	$(5,1)$
2	$(1,2)$	X	$(3,2)$	$(4,2)$	$(5,2)$
3	$(1,3)$	$(2,3)$	X	$(4,3)$	$(5,3)$
4	$(1,4)$	$(2,4)$	$(3,4)$	X	$(5,4)$
5	$(1,5)$	$(2,5)$	$(3,5)$	$(4,5)$	X

(ii)(a) $\frac{1}{10}$ (b) $\frac{3}{10}$ (c) 0 (d) $\frac{2}{5}$

4

(ii)(a) $\mathrm{P(GG)} = \frac{2}{12} \times \frac{1}{9}$ or $\frac{1}{6} \times \frac{1}{9}$

$$= \frac{1}{54}$$

(b) $\mathrm{P(neither\ is\ G)} = \frac{6}{12} + \frac{4}{12} = \frac{5}{6}$

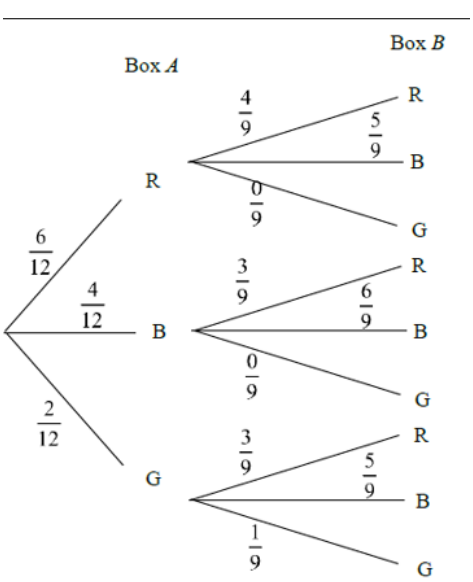
(c) $\mathrm{P(different\ colour)} = \mathrm{P(RR')} + \mathrm{P(BB')} + \mathrm{P(GG')}$

$= \frac{6}{12} \times \frac{5}{9} + \frac{4}{12} \times \frac{3}{9} + \frac{2}{12} \times \frac{8}{9}$

$= \frac{58}{108}$

$= \frac{29}{54}$

Ans: (i)



(ii)(a) $\frac{1}{54}$ (b) $\frac{5}{6}$ (c) $\frac{29}{54}$

Statistics

1 Ans: The title of the line graph is biased as it does not allow reader to make a judgment. **OR** The vertical axis does not start from 0, which exaggerates the differences. (can accept without the reasoning)

2 $a \quad b \quad c \quad d$

Mean $= 54$

Total $= 216$

Median $= 56$

$\frac{b+c}{2} = 56$

$b + c = 112$

$a + d = 216 - 112$

$= 104$

Mean of $a + d = \frac{104}{2}$

$= 52$

Ans: 52

3 (a)(ii) IQR $= 63 - 35$

IQR $= 28$

(b) Number of students who spent more than 70 min$= 80 - 68$

Percentage $= 15\%$

(c)

Time(min)	$0 \le x \le 20$	$20 \le x \le 40$	$40 \le x \le 60$	$60 \le x \le 80$	$80 \le x \le 100$
Frequency	6	20	**30**	**20**	**4**

(d) Mean$= \frac{10\times6+30\times20+50\times30+70\times20+90\times4}{80}$

Mean $= 49$

Ans: (a-i) 50 min (ii) IQR = 28 (b) 15% (c) 30, 20,4 (d) Mean = 49 (e) SD = 20.0 (f) We do not know the exact time each student spent on social media or Mid values are used in the calculation. (g) * The median time for primary school student is 10 min lower than secondary school students => On average, secondary school students spend more than on social media. * The interquartile range of the primary school students is higher than secondary school students => higher spread among the primary school students.

4	(a) $8.5 - 5.0 = 3.5$ (b) $Q1 = 5.2$ and $Q3 = 7.3$ $IQR = 7.3 - 5.2 = 2.1$ Ans: (a) 3.5kg, (b) 2.1kg	
5	(a)(ii) $\sum fx^2 = 25335$ $\sum fx = 675$ Standard deviation$= \sqrt{\frac{25335}{20} - \left(\frac{675}{20}\right)^2}$ $= \sqrt{1266.75 - 33.75^2} \approx 11.3$ (iii) 80% is 40 marks. Percentage who scored distinction $= \frac{6}{20} \times 100\% = 30\%$ Ans: (a)(i) 3.5, (a)(ii) ≈ 11.3, (a)(iii) 30%	