5 MUST KNOW QUESTIONS TO _CONQUER_

PROBABILITY & STATISTICS

1	A box contains 22 pens, n of which are red, $(n-1)$ are blue and the rest are green. A pen is chosen at random from the box. (a) Write down, in terms of n, the probability that the pen is green. (b) If the probability of choosing a green pen is $\frac{1}{2}$, find the number of blue pens.	[2] [2]
2	There are 8 blue balls and x black balls in a bag. If the probability of selecting a black ball is $\frac{3}{5}$. Find (a) the total number of balls in the bag, (b) the number of additional black balls needed so that the probability of selecting a black ball becomes $\frac{5}{6}$.	
3	The stem-and-leaf diagram shows the test results of a class of students. $\begin{array}{c|cccccc} 0 & 2 \\ 1 & 8 \\ 2 & 3 & 5 & 7 & 8 \\ 3 & 1 & 2 & 4 & 4 & 4 & 8 \\ 4 & 0 & 5 & 5 \end{array}$ Key: 1|8 means 18 marks Find (a) (i) the modal mark, (ii) the median mark. (b) Is the mean or median, a better representation of the subject ability of the class? Explain your answer. (c) A new student joined the class and took the same test. The new mean mark for the class is 30. Find the mark of the new student who joined the class. (d)	
4	The table shows the weights in kilograms (kg) of the students in Class 2A. <table><tr><td>Weight (in kg)</td><td>$38 \le w < 42$</td><td>$42 \le w < 46$</td><td>$46 \le w < 50$</td><td>$50 \le w < 54$</td><td>$54 \le w < 58$</td></tr><tr><td>Frequency</td><td>$2x+1$</td><td>$2x+2$</td><td>$3x+3$</td><td>$2x-1$</td><td>$2x-3$</td></tr></table> (a) Without calculating the value of x, state the modal weight of this distribution. (b) If there are 35 students in Class 2A, find the value of x. (c) Hence, calculate the estimate mean weight of the students in the class.	

5	The table below shows the pocket money of 20 students, rounded off to the nearest whole number.	
	23 24 23 25 20 21 20 24 22 21 23 25 25 20 23 23 20 21 22 25	
	(a) Draw a dot diagram to represent the information in the table.	
	(b) Find the modal amount of pocket money.	
	(c) Explain two limitations of using a dot diagram.	
	(d) Is a line graph a suitable way to represent the data? Explain your answer.	
6	A student shot a basketball into a ring. He noticed that he made 48 successful shots out of the 112 attempts.	
	(a) Find the probability that he made a successful shot. Leave your answer as a fraction in its simplest form.	[1]
	(b) After a week of training and practices, the student managed to make 38 successful shots out of 85 attempts. By calculating the <u>new</u> probability of successful shots and making a comparison with your answer in (a), state whether he made an improvement in his shooting skill after one week of training.	[2]
7	In a class of 40 students, 20 students joined Uniformed Groups, $\frac{1}{5}$ joined Clubs/Societies and remaining students joined Performing Arts. One student is selected at random.	
	(a) Find the probability that the student selected is from Performing Arts.	[2]
	(b) A few new students joined the class and they chose Uniformed Groups as their CCA. The probability of students in Uniformed Groups from the class is now $\frac{6}{11}$. Find the number of new students who joined the class.	[3]

Answer Key

1	Ans:

(a) Number of green pens $= 22 - n - n - 1)$

$$= 22 - n - n + 1$$
$$= 23 - 2n$$
$$= \frac{23 - 2n}{22}$$

(b) $\frac{23 - 2n}{22} = \frac{1}{2}$

$\frac{23 - 2n}{22} \times \frac{22}{1} = \frac{1}{2} \times \frac{22}{1}$

$23 - 2n = 11$

$2n = 12$

$n = 6$

Number of blue pens $= 5$

$P(green) = \frac{1}{2} = \frac{11}{22}$

No of green pens $= 11$

No of blue & red pens $= n + (n - 1)$

$$= 2n - 1$$

$2n - 1 = 11$

$n = 6$

2	Solutions:

(a) **Method 1**

P(select black ball) $= \frac{3}{5}$

$$\frac{x}{8 + x} = \frac{3}{5}$$
$$5x = 24 + 3x$$
$$2x = 24$$
$$x = 12$$

Total no. of balls in bag $= 8 + 12$
$$= 20$$

Method 2

P(blue ball) $= \frac{2}{5}$

$$\frac{8}{8 + x} = \frac{2}{5}$$
$$= \frac{8}{20}$$

Þ $x + 8 = 20$

∴ Total number of balls $= 20$

Method 3

Black: Total $= 3 : 5$

Blue: Total $= 2 : 5$

$2u$ — 8 balls

$5u$ — 20 balls

(b) Let y be the additional number of black balls.

$$\frac{12 + y}{20 + y} = \frac{5}{6}$$
$$72 + 6y = 100 + 5y$$
$$y = 28$$

Ans: (a) 20 (b) 28

3	Solutions:	
	(a)(ii) Position $= (15 + 1) \div 2 = 8$th Median $= 32$ (c) $(16 \times 30) - 456 = 24$ Ans: (a)(i) 34 (ii) 32 (b) The <u>median</u> would be a better representation on the spelling ability of the class because <u>the mean will be affected by 1 extreme value (2 marks) in the data</u>. (c) 24	

4	Solutions:
	
	(b) $2x + 1 + 2x + 2 + 3x + 3 + (2x - 1) + (3x - 3) = 35$
	    $11x + 2 = 35$
	        $11x = 33$
	            $x = 3$
	(c) $\dfrac{(40 \times 7) + (44 \times 8) + (48 \times 21) + (52 \times 5) + (56 \times 3)}{35}$
	$= \dfrac{1636}{35}$
	$= 46.7k$g
	
	Ans: (a) $46 \le w < 50$ (b) 3 (c) $46.7k$g	

5	Ans: (a) (b) Mode $= \$20$ (c)<u>It is difficult to represent decimals in a dot diagram. The presence of extreme values might make the dot diagram difficult to read. We cannot represent a large sample size on a dot diagram. Need to round off answers.</u> (d) <u>No, a line graph is suitable for time-based data.</u>	

6	Solutions:
	
	(a) P(successful shot) $= \dfrac{48}{112} = \dfrac{3}{7}$ hours
	
	(b) P(**new** successful shot)$= \dfrac{38}{85} \approx 0.447$ hours
	
	    P(successful shot)$= \dfrac{48}{112} = \dfrac{3}{7} \approx 0.429$ hours
	   The probability of making successful shot is <u>higher</u> after the one-week training, hence his shooting skill **did** improve.
	   The <u>new</u> probability of making successful shot is $\dfrac{38}{85}$.
	   The student (**did**) / ~~did not~~ improve on his shooting skills.
	
	Ans: (a) $\dfrac{3}{7}$ hours	

7	Solutions:
	
	(a) No. of students from club (b) Let no. of students who joined be x.
	$= \dfrac{1}{5} \times 40$ $\dfrac{20 + x}{40 + x} = \dfrac{6}{11}$
	$= 8$ $220 + 11x = 240 + 6x$
	P(P.A)$= \dfrac{12}{40} = \dfrac{3}{10}$ $11x - 6x = 240 - 220$
	                                  $5x = 20$
	                                    $x = 4$
	
	Ans: (a) $\dfrac{3}{10}$ (b) 4	