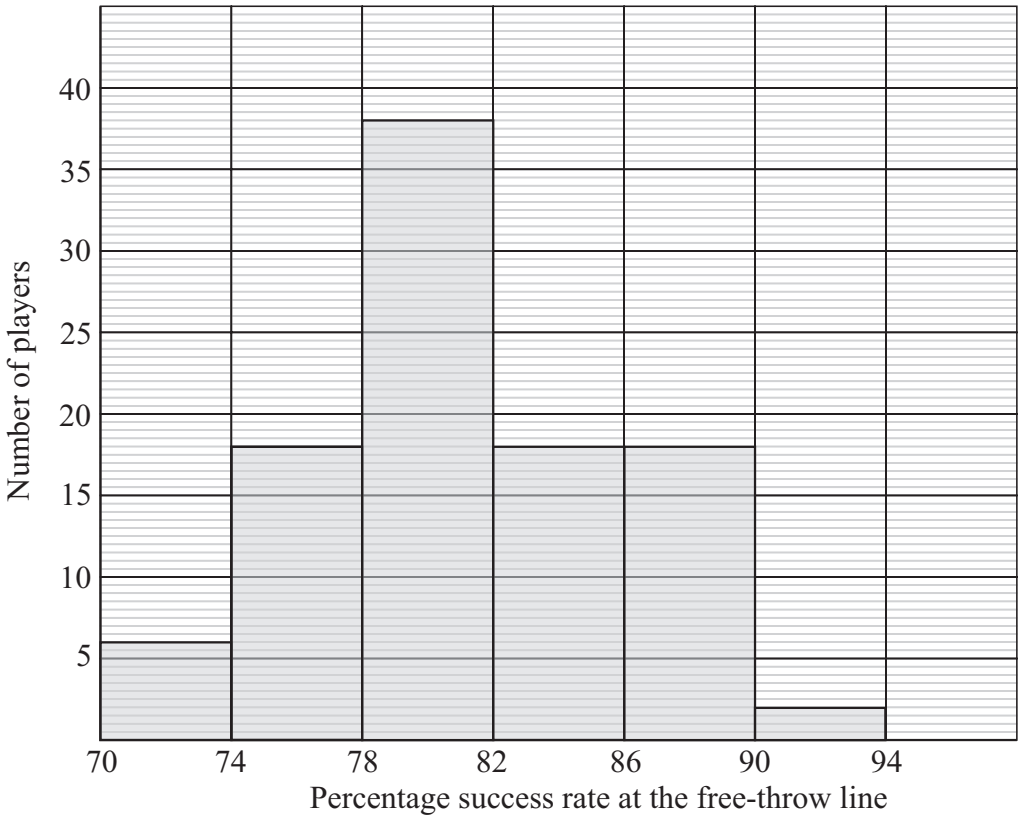
Sample Paper 6: Paper 2

Question 7 (50 marks)

Question 7 (a)



Percentage success	Frequency f	Mid-interval Value x	fx
70–74	6	72	432
74–78	18	76	1368
78–82	38	80	3040
82–86	18	84	1512
86–90	18	88	1584
90–94	2	92	184
	100		8120

$$\mu = \frac{\sum fx}{\sum f} = \frac{8120}{100} = 81.2 \Rightarrow \text{Mean percentage success rate} = 81.2\%$$

Question 7 (b)

Percentage success	Cumulative frequency	
<74	6	
<78	24	
<82	62	Median
<86	80	
<90	98	
<94	100	

$6\times1+18\times1+38x=38(1-x)+18\times1+18\times1+2\times1$

$24+38x=38-38x+38$

$76x=52$

$x=\dfrac{52}{76}=\dfrac{13}{19}$

$\therefore \text{Median}=77.5+\frac{13}{19}\times4=80.2$

Question 7 (c)

(i) Mean $\mu=81.2$

Median $=80.2$

$\%\text{ difference}=\dfrac{81.2-80.2}{81.2}\times100\%=1.23\%$

(ii) It is approximately normal because the mean is approximately equal to the median.

(iii) $\sigma=4.75$

Question 7 (d)

(i) $\mu=81.2,\ \sigma=4.75$

$P(z\le Z)=0.9\Rightarrow z=1.28$

$z=\dfrac{x-\mu}{\sigma}\Rightarrow1.28=\dfrac{x-81.2}{4.75}$

$\therefore x=87.3\%$

(ii) $\mu=81.2,\ \sigma=4.75$

$P(x<85)=?$

$x=85: z=\dfrac{x-\mu}{\sigma}=\dfrac{85-81.2}{4.75}=0.8$

$P(z<0.8)=0.7881=78.8\%$

Question 7 (e)

Conditions for a Bernoulli Trial:
Condition: There are only two possible outcomes (success or failure) in each trial.
Condition: There is a fixed number of trials *n*.
Condition: The probability of success *p* is fixed from trial to trial.
Condition: The trials are independent.
Condition: The binomial random variable is the number of successes in *n* trials.

Question 7 (f)

(i) $P(\text{Success})=0.927$

$P(\text{Failure})=0.073$

$P(\text{Scores all five})={}^5C_5(0.927)^5(0.073)^0=0.685=68.5\%$

(ii) $P(\text{Scores three out of five})={}^5C_3(0.927)^3(0.073)^2=0.042=4.2\%$

(iii) He has two successes and two failures on the first four throws and he scores on the last.

$P(\text{Scores two out of first four and scores last})={}^4C_2(0.927)^2(0.073)^2(0.927)=0.025=2.5\%$