

Application of Z score

$$Z_{\text{score}} = \frac{x - \mu}{\sigma}$$

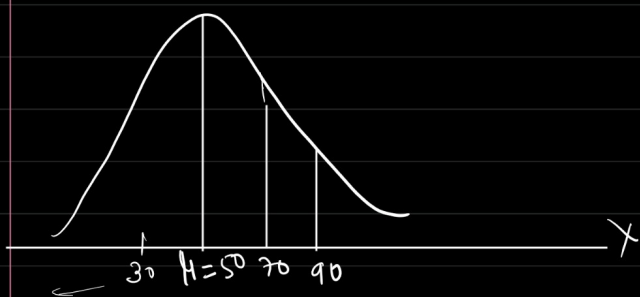
Q $N(\mu = 50\text{cm}, \sigma = 20, D = \underline{110})$

How many standard deviation D is away from mean?

$$Z_{\text{score}} = \frac{x_i - \mu}{\sigma} = \frac{110 - 50}{20} = \frac{60}{20} = \underline{3}$$

$D = 110$ is 3σ away from mean.

$Z = 3 \rightarrow D = 110$ is 3σ away from mean.
 $\sigma = 20 \rightarrow$ the dp on an avg is 20 units away from mean.



1 sd away from mean $\Rightarrow \mu + 1\sigma$

$$= 50 + 1 \times 20 = 70$$

2 " " " " $= \mu + 2\sigma = 50 + 2 \times 20 \Rightarrow 90$

3 sd " " " " $= \mu + 3\sigma = 50 + 3 \times 20 \Rightarrow \underline{110}$

$$\begin{aligned} &= \mu - 1\sigma \\ &= \mu - 2\sigma \\ &= \mu - 3\sigma \end{aligned}$$

$$\begin{aligned} \mu - 3\sigma &= 4 - 3 \times 1 = 1 \\ \mu - 2\sigma &= 4 - 2 \times 1 = 2 \\ \mu - 1\sigma &= 4 - 1 = 3 \end{aligned}$$

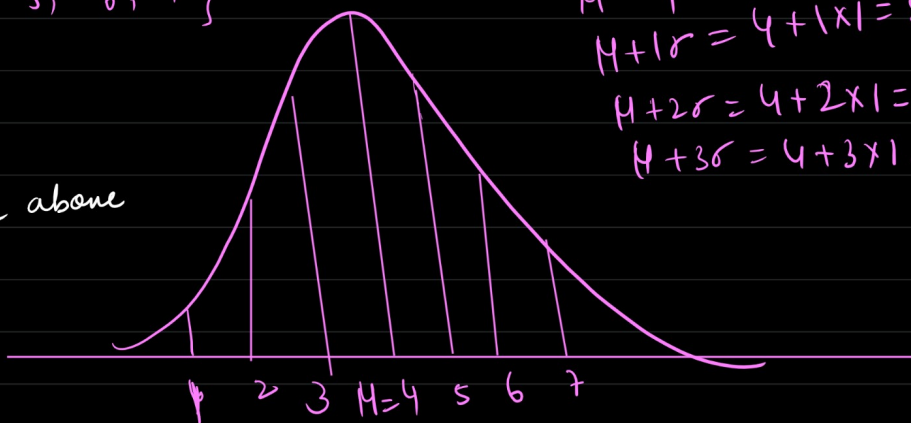
Q $X = \{1, 2, 3, 4, 5, 6, 7\}$

$$\mu = 4$$

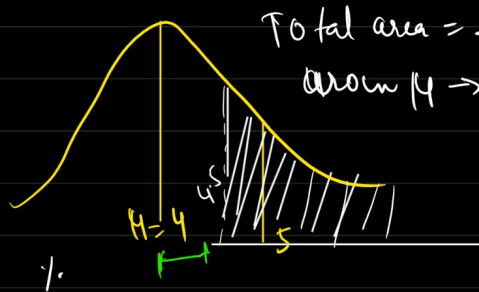
$$\sigma = 1$$

What % of score will fall above 4.5?

\rightarrow What is probability that score is more than 4.5?



$$\begin{aligned} \mu &= 4 \\ \mu + 1\sigma &= 4 + 1 \times 1 = 5 \\ \mu + 2\sigma &= 4 + 2 \times 1 = 6 \\ \mu + 3\sigma &= 4 + 3 \times 1 = 7 \end{aligned}$$



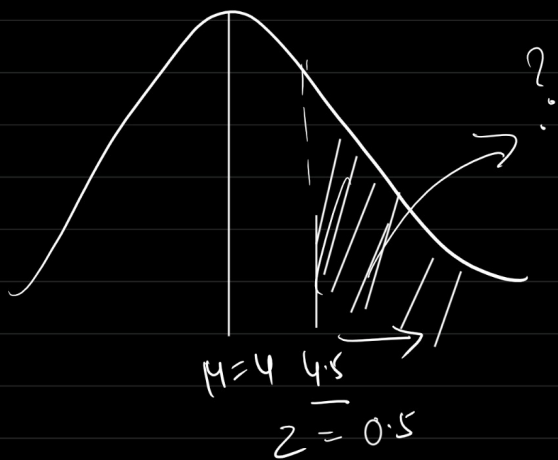
Total area = 1

around $\mu \rightarrow$ Area
is 50% on
left 50% on right

$$Z_{\text{score}} = \frac{x - \mu}{\sigma} = \frac{4.5 - 4}{1} = 0.5$$

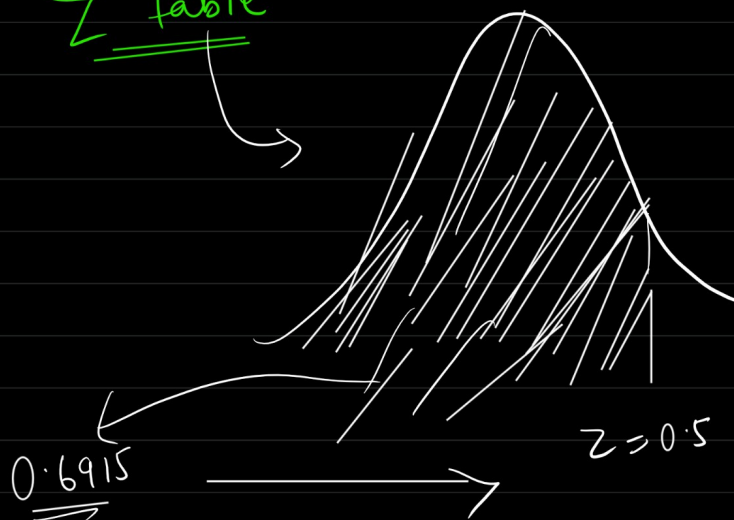
4.5 is 0.5 σ

away from
mean



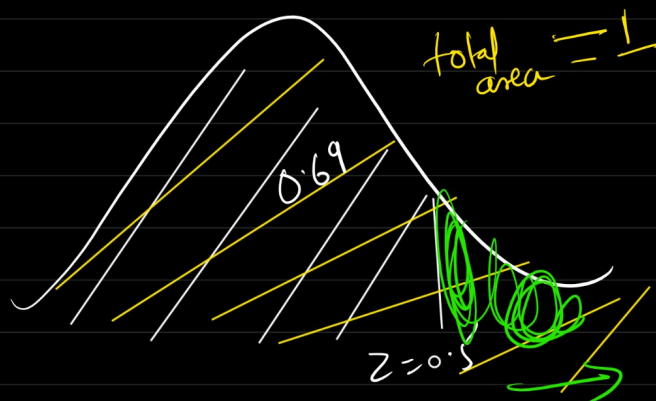
$\mu = 4$ 4.5
 $Z = 0.5$

Z table



0.6915

$Z = 0.5$



total
area = 1

0.69

$Z = 0.5$

$$= 1 - 0.69$$

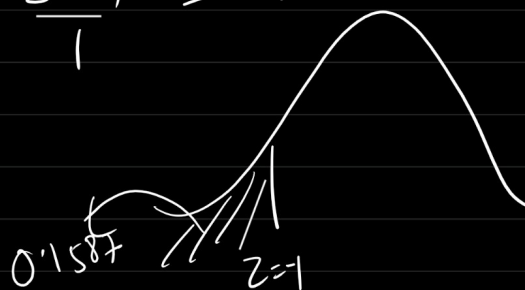
$$= 0.31$$

Q What is Percentage of marks below 3?

$$Z = \frac{x - \mu}{\sigma} = \frac{3 - 4}{1} = -1$$

$Z = -1$

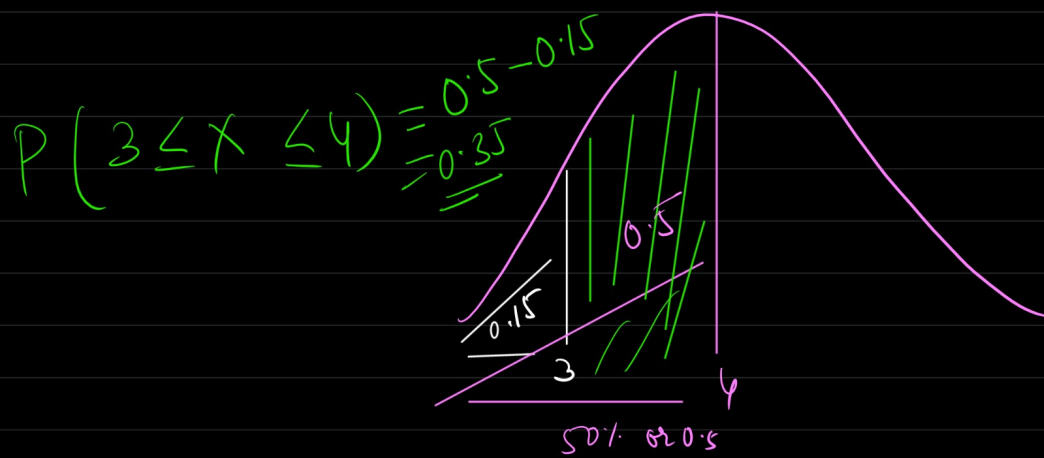
0.2420



0.2420

$Z = -1$

Q What is %age of marks between 4 & 3



Q The score follows a SND $\mu = 75$, and $\sigma = 10$
find prob that a randomly selected student will score below 80.

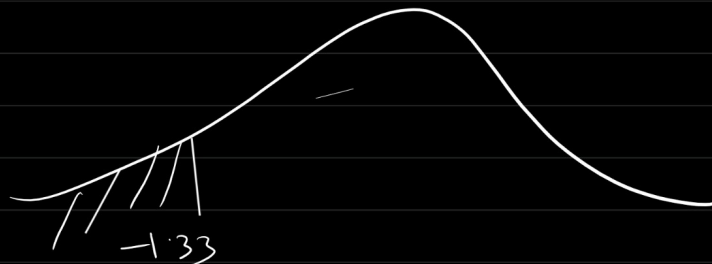
$$Z = \frac{x - \mu}{\sigma} = \frac{80 - 75}{10} = \frac{1}{2} \Rightarrow 0.5$$

for $z = 0.5$, Area/cumulative prob = 0.6915

Q The avg IQ is 100 with $\sigma = 15$
%age of people lower than IQ 80

→

$$Z_{score} = \frac{80 - 100}{15} = \frac{-20}{15} = -1.33$$



→ 0.9082