A 13 9.85% are under 40
89.97% are under 60
$\mu = ?$ & $\sigma = ?$

$P(x < 40) = 0.0985$
$P(x < 60) = 0.8997$

$P(x < 40) = P(z < z_1) = 0.0987$ { where $z_1 = \frac{40 - \mu}{\sigma}$ }

$0.5 - P(z_1 < z < 0) = 0.0987$
$0.5 - 0.0987 = P(z_1 < z < 0)$
$0.4013 = P(z_1 < z < 0)$
$z_1 = \pm 1.29 \quad z_1 = -1.29$
$\frac{40 - \mu}{\sigma} = -1.29 \quad -(1)$

$P(x < 60) = 0.8997 \quad \{z_2 = \frac{60-\mu}{\sigma}\}$

$P(z < z_2) = 0.8997$

$0.5 - P(z_2 < z < 0) = 0.8997$

$0.5 - 0.8997 = P(z_2 < z < 0)$

$-0.3997 = P(z_2 < z < 0)$

$-1.28 = P(z_2 < z < 0) \Rightarrow z_2 = 1.28$

So $\frac{60-\mu}{\sigma} = -1.28 - (2)$

$\frac{40-\mu}{\sigma} = -1.29 - (1)$

$40 = \mu - 1.29\sigma$

$60 = \mu + 1.28\sigma$

$\pm 20 = \pm 2.57\sigma \qquad \sigma = 7.782$

$\frac{40-\mu}{7.782} = -1.29$

$-\mu = -1.29 \times 7.782 - 40$

$\pm\mu = \pm 50.038 \qquad \mu = 50.04$

$\sigma = 7.782$

Q4 $n = 500$, $\mu = 40\%$ & $\sigma = 10\%$

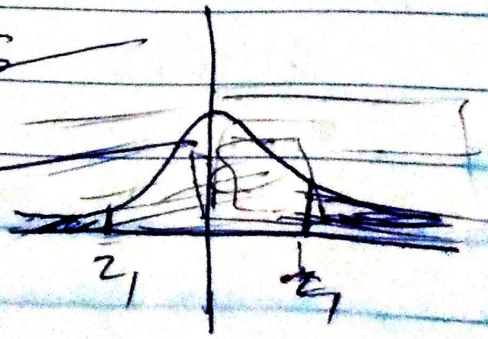
$\Rightarrow \mu = 0.4$ & $\sigma = 0.1$

P) $P(x \geq x_1) = 50\% = 0.5$

$P(z \geq z_1) = 0.5$

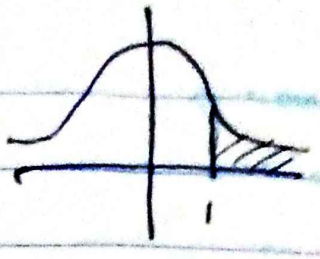
$0.5 + P(z_1 < z < 0) = 0.5$

$0.5 - 0.5 = P(z_1$



(i) $P(X \geq 50) = ?$ X : no of student will pass

$P\left(z \geq \frac{50-40}{10}\right) = P(z \geq 1)$



$P(z \geq 1) = 0.5 - P(0 < z < 1)$

$= 0.5 - 0.3413$

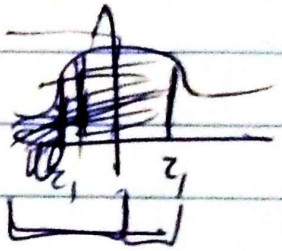
$= 0.1587$

for 500 students 0.1587×500

$= 79.35 \sim 79$

(ii) $P(X \geq x_1) =$ ~~350~~ ?

for passing 350 students



for 1 student, $\frac{350}{500} = 0.7$

$P(X \geq x_1) = P\left(z \geq \frac{x_1 - \mu}{\sigma}\right) = P(z \geq z_1)$

$P(z \geq z_1) = 0.7$

$0.5 + P(z_1 < z < 0) = 0.7$

$0.5 - 0.7 = -P(z_1 < z < 0)$

$-0.2 = P(z_1 < z < 0)$

$-0.2 = P(z_1 < z < z_1) \Rightarrow$

$z_1 = -0.06$

$\frac{x_1 - 40}{10} = -0.53$

$x_1 = -0.53 \times 10 + 40 = 34.7$

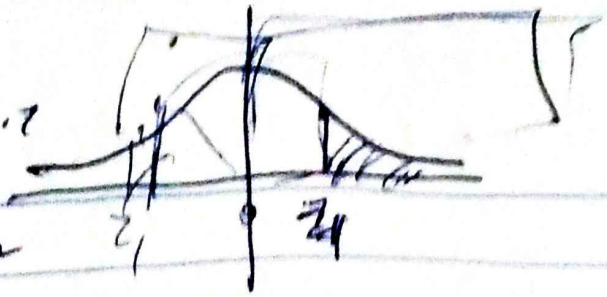
~ 35

$P(z > z_1) = 0.7$

$0.5 - P(0 < z < z_1) = 0.7$

$0.5 - P(0 < z < z_1) = 0.2$

$z_1 = -0.53$



$z_1 = \frac{x_1 - \mu}{\sigma} \Rightarrow \frac{x_1 - 40}{10} = -0.53$

$x_1 = -0.53 \times 10 + 40$

$= 34.7$

$\sim 35\%$

iii) $P(x > 60) = P\left(Z > \frac{60 - 40}{10}\right)$

$= P(z > 2)$

$0.5 - P(0 < z < 2)$

$= 0.5 - 0.4772$

$= 0.0228$

for 500, $0.0228 \times 500 = 11.4$

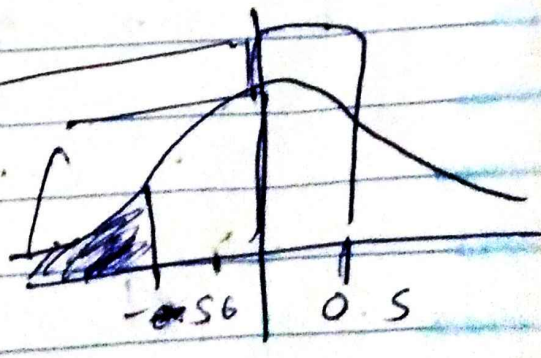
~ 11

$P(z \leq -0.56) =$

$0.5 - P(-0.56 < z < 0)$

$0.5 + P(0 < z < 0.56)$

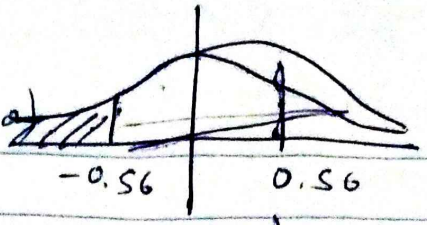
$0.5 + 0.2123$



$0.56 -$

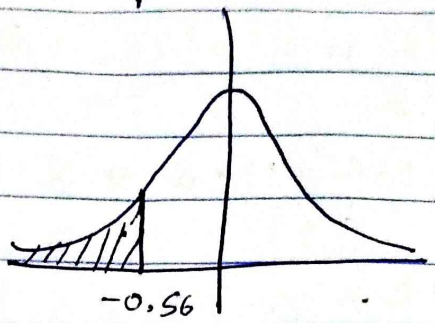
$P(z \leq -0.56)$

$0.5 - P(-0.56 < z < 0)$



$0.5 - 0.2123$

0.2877



Q3 $p = 60\% = 0.6$

$q = 40\% = 0.4$

$n = 200$

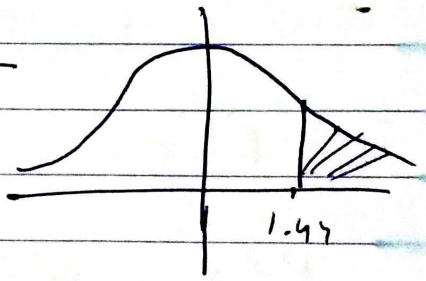
$\therefore$ mean $= \mu = np = 200 \times 0.6$

$= 120$

std $= \sqrt{\text{variance}} = \sqrt{npq}$

$= \sqrt{48}$

$= 6.93$



~~If~~ $x\%$ votes are in favor

(9) $P(X \geq 130)$

$= P\left(z \geq \frac{130 - 120}{6.93}\right) = P(z \geq 1.44)$

$= 0.5 - P(0 < z < 1.44)$

$= 0.5 - 0.4251$

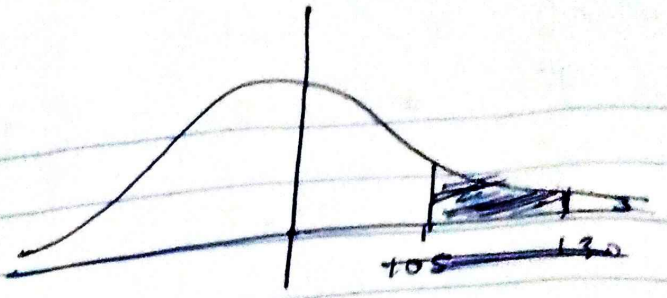
$= 0.075$

$= 7.5\%$

ii) $P(105 \leq X \leq 130)$

~~$P(X \leq 130) =$~~

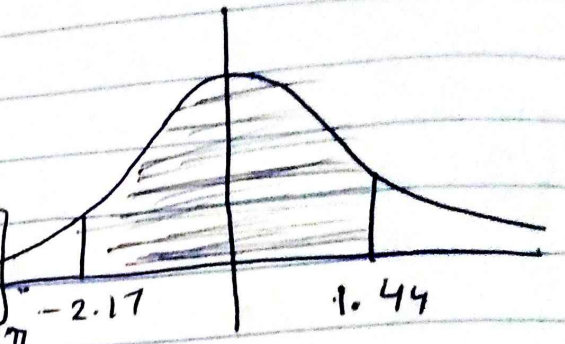
~~$= P(0$~~



$P\left(\frac{105 - \mu}{\sigma} \leq z \leq \frac{130 - \mu}{\sigma}\right)$

$P\left(\frac{105 - 120}{6.93} \leq z \leq 1.44\right)$

$P(-2.17 \leq z \leq 1.44)$



$= -[0.5 + P(0 \leq z < 1.44)]$

$+ [0.5 + P(0 < z < 2.17)]$

$= -[0.5 + 0.4251] + [0.5 + 0.4850]$

$= -0.9251 + 0.985 \quad = 0.06$

iii) $P(X = 120)$ z

$P(X \geq X_1) = 0.0648$

0.4352

$P(z \geq 1.52)$

$X_1 = 1.52 \times \sqrt{48} + 120$

$X_1 = 130.5$

$P(x = 120) = 0.0575$

0.4425

$z_1 = 1.58$

$X_1 = 1.58 \times \sqrt{48} + 120$

$= 131$