## A football team scores a late touchdown, now down by 8. Should they attempt the 2 pt conversion? $\alpha$ : Probability of XP success 2P +2 $(1 + \beta)/2$ $\beta$ : Probability of 2P success В -6 TD 0 $(1 + \alpha)/2$ $(1 + \alpha)/2$ ΧP $(1 + \alpha)/2$ Choose 2P attempt when +1 $\beta(1-\beta) > \alpha(\alpha-2\beta)$ 2P $\beta$ (1 + ( $\alpha - \beta/2$ ) $\beta > (2\alpha + 1 + \sqrt{4\alpha + 1})/2$ W for $\alpha$ = 1 then $\beta$ > 0.382 2P $-\beta$ -7 TD OT 0 $-\beta$ -8 $\alpha/2$ $\alpha/2$ 1/2 1/2 ΧP $\alpha$ $\alpha/2$ Assume $\beta < \alpha/2$ ΧP $(\alpha^2 + \beta(1-\alpha))/2$ -1 0 2P $\beta/2$ -8 -2 TD Conclusion: To maximize $\beta/2$ $\beta/2$ chances of winning, go for $1 - \alpha$ two if 2 pt attempts succeed ΧP -2 more than 38.2% of the time. 0 0