

$$2) T(n) = T\left(\frac{n}{5}\right) + T\left(\frac{7n}{10} + 6\right) + c'n$$

Guess:  $T(n) = O(n)$

Induction Hypothesis: Assume  $T(n) \leq c \cdot n$  for some constant  $c$

Proof:  $T(n) = T\left(\frac{n}{5}\right) + T\left(\frac{7n}{10} + 6\right) + c'n$

$$\leq c \cdot \frac{n}{5} + c \cdot \frac{7n}{10} + 6 + c'n$$

$$(c \cdot \frac{n}{5} + c \cdot \frac{7n}{10} + 6 + c'n) \leq c \text{ when } c=1, c'=\frac{1}{10}, n=1$$

$$\leq c \cdot n$$

$$\therefore T(n) = O(n) \text{ when } c \geq 1$$

□

3) Step 1: Divide into groups and find medians

$$\Theta(n)$$

Step 2: Find median-of-medians (○)

$$T(\lceil n/9 \rceil)$$

Step 3: Use median-of-medians to partition array

$$\Theta(n)$$

Step 4: Compare and recurse

$$T\left(\frac{5n}{6} + 6\right)$$

$$T(n) = T\left(\lceil n/9 \rceil\right) + T\left(\frac{5n}{6} + 6\right) + c'n$$