**Question 1**
A, B, C, D are filled equally in that array.
So P(probability) will be 1/4.

**A)** The expected number (average number) of trials for a success = 1/P
So it's 4/1 = 4
Reference: Slide number 13.

**B)** The expected number (average number) of trials for k successes = k/P
k = 10, P = 1/4
So the answer is 40.
Reference: Slide number 15.

**C)** Worst case is scan whole array, best case is all k elements are found at first k scan. Average time complexity will be average number of array locations to inspect before find k D. So it is $\frac{k}{p} = 4k$

**Question 2**
1 + (1/2 + 1/2) + (1/4 + 1/4 +1/4 +1/4) + … = log(n+1) =

$$S = 1 + \left(\frac{1}{2+0} + \frac{1}{2+0}\right) + \left(\frac{1}{4+0} + \frac{1}{4+0} + \frac{1}{4+0} + \frac{1}{4+0}\right)$$

S = 1 + (1/2 + 1/3) + (1/4 + 1/5 + 1/6 + 1/7) + … + 1/n =

$$S = 1 + \left(\frac{1}{2+0} + \frac{1}{2+1}\right) + \left(\frac{1}{4+0} + \frac{1}{4+1} + \frac{1}{4+2} + \frac{1}{4+3}\right)$$

So, it is clear that S<= log(n+1). This S is O(log(n+1))

**Question 3**
S = 1/2 + 2/4 + 3/8 + 4/16 + 5/32 + …
S/2 = 1/4 + 2/8 + 3/16 + 4/32 + …
S – S/2 = 1/2 + 1/4 + 1/8 + 1/16 + 1/32 + …
S/2 = 1/2 + 1/4 + 1/8 + 1/16 + 1/32 + …
S=1+1/2+1/2 + 1/4 + 1/8 + 1/16 + 1/32 + … =>

$S=a+ar+ar^2+ar^3+\ldots ar^{n-1}$ where a=1, r=1/2

Let us apply geometer series formula:

$S = \frac{a(1-r^n)}{1-r} = \frac{1(1-{1/2}^n)}{1-1/2} = 2(1 - {1/2}^n)$ where n is infinite => **S=2(1-0)=2**