- By the division algorithm, $p=3a$, $p=3a+1$ or $p=3a+2$

If $p=3a$ $\therefore 3|p$ and $3|p(p+1)(p+2)$

If $p=3a+1$ $\therefore p+2=(3a+1)+2=3(a+1)$ $\therefore 3|(p+2)$ and $3|p(p+1)(p+2)$

If $p=3a+2$ $\therefore p+1=(3a+2)+1=3(a+1)$ $\therefore 3|(p+1)$ and $3|p(p+1)(p+2)$

Either way, $3|p(p+1)(p+2)$

$\because$ 2, 3 are co-prime to each other, $\boxed{\therefore 2*3=6|p(p+1)(p+2)}$

$\boxed{\text{Prob 3:}}$ Prove the product of any four consecutive integers is divisible by 24.

- Suppose, we have four consecutive integers $p, p+1, p+2, p+3$.

$\boxed{\text{Let } n=p(p+1)(p+2)(p+3)}$. By division algorithm, we have $p=4a, 4a+1, 4a+2, 4a+3$.

If $p=4a$, then $4|p$ and $\therefore 4|n$

If $p=4a+1$, then $p+3=4a+1+3=4(a+1)$ $\therefore 4|(p+3)$ and $\therefore 4|n$

If $p=4a+2$, then $p+2=4a+2+2=4(a+1)$ $\therefore 4|(p+2)$ and $\therefore 4|n$

If $p=4a+3$, then $p+1=4a+3+1=4(a+1)$ $\therefore 4|(p+1)$ and $\therefore 4|n$

$\boxed{\therefore p(p+1)(p+2)(p+3) \text{ is divisible by } 4.}$

Suppose $p=4a$. $\therefore p+2=4a+2=2(2a+1)$ $\therefore 2|(p+2)$ when $p=4a$

Suppose $p=4a+1$ $\therefore p+1=4a+2=2(2a+1)$ $\therefore 2|(p+1)$ when $p=4a+1$

Suppose $p=4a+2=2(2a+1)$ $\therefore 2|p$ when $p=4a+2$

Suppose $p=4a+3$ $\therefore p+3=4a+6=2(2a+3)$ $\therefore 2|(p+3)$ when $p=4a+3$

In each case, we have 2 different no.s divisible by 2, out of which 1 is divisible by 4. $\therefore$ In the prime factorization of $p(p+1)(p+2)(p+3)$