In [ ]:

```
def dropout_forward(x, dropout_param):
    """
    Performs the forward pass for (inverted) dropout.

    Inputs:
    - x: Input data, of any shape
    - dropout_param: A dictionary with the following keys:
      - p: Dropout parameter. We keep each neuron output with probability p.
      - mode: 'test' or 'train'. If the mode is train, then perform dropout;
        if the mode is test, then just return the input.
      - seed: Seed for the random number generator. Passing seed makes this
        function deterministic, which is needed for gradient checking but not in
        real networks.

    Outputs:
    - out: Array of the same shape as x.
    - cache: A tuple (dropout_param, mask). In training mode, mask is the dropout
      mask that was used to multiply the input; in test mode, mask is None.
    """
    p, mode = dropout_param['p'], dropout_param['mode']
    assert (0<p<=1), "Dropout probability is not in (0,1]"
    if 'seed' in dropout_param:
        np.random.seed(dropout_param['seed'])

    mask = None
    out = None

    if mode == 'train':
        # ============================================================ #
        # YOUR CODE HERE:
        #   Implement the inverted dropout forward pass during training time.
        #   Store the masked and scaled activations in out, and store the
        #   dropout mask as the variable mask.
        # ============================================================ #


        mask = (np.random.rand(*x.shape) < p) / p #sample random mask AND normalization by p
        out = x * mask #dropout on the layer

        # ============================================================ #
        # END YOUR CODE HERE
        # ============================================================ #

    elif mode == 'test':

        # ============================================================ #
        # YOUR CODE HERE:
        #   Implement the inverted dropout forward pass during test time.
        # ============================================================ #


        out = x
        # ============================================================ #
        # END YOUR CODE HERE
        # ============================================================ #

    cache = (dropout_param, mask)
    out = out.astype(x.dtype, copy=False)

    return out, cache

def dropout_backward(dout, cache):
    """
    Perform the backward pass for (inverted) dropout.

    Inputs:
    - dout: Upstream derivatives, of any shape
    - cache: (dropout_param, mask) from dropout_forward.
    """
    dropout_param, mask = cache
    mode = dropout_param['mode']

    dx = None
    if mode == 'train':
        # ============================================================ #
        # YOUR CODE HERE:
        #   Implement the inverted dropout backward pass during training time.
        # ============================================================ #


        dx = dout * mask
        # ============================================================ #
        # END YOUR CODE HERE
        # ============================================================ #
    elif mode == 'test':
        # ============================================================ #
        # YOUR CODE HERE:
        #   Implement the inverted dropout backward pass during test time.
        # ============================================================ #
```

```
        dx = dout
        # ============================================================ #
        # END YOUR CODE HERE
        # ============================================================ #
    return dx
```