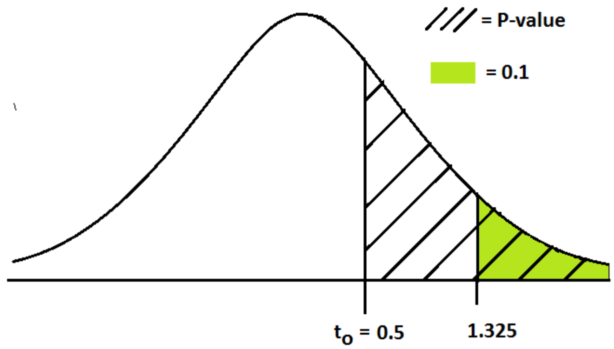
Obtaining P-values from the t-table

In the following examples assume that you determined the type of test (upper, lower, 2-tail), have found the value of the test statistic, and the the degrees of freedom, based on this information, what is the P-value:

1. $t_0 = 0.5$, $df = 20$

   (a) uppertail: $P - value = P(t > t_0) = P(t > 0.5)$
   From the table the only reference point is $t_{0.1} = 1.325$ (look it up). Sketching this shows:

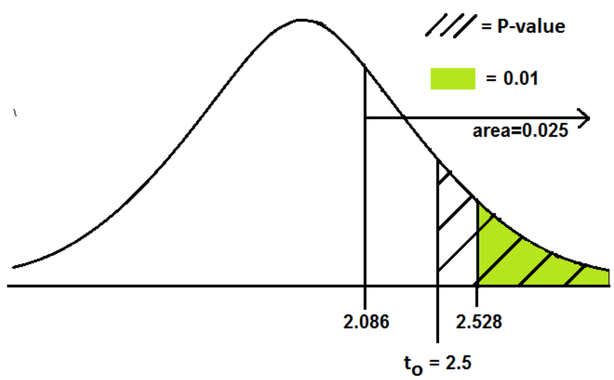
   As you can see from the diagram, the $P - value > 0.1$

   (b) lowertail: $P - value = P(t < t_0) = P(t < 0.5)$. Therefore the P-value is the area to the left of $t_0 = 0.5$, which is more than half of the area under the curve and it is $P - value > 0.5$.

   (c) 2-tail: $P - value = 2(P > |t_0|) = 2P(t > 0.5)$. This is two times the P-value found for the uppertail test. Multiply what you have found for the uppertail test by 2, and get $P - value > 0.2$

2. $t_0 = 2.5$, $df = 20$

   (a) uppertail: $P - value = P(t > t_0) = P(t > 2.5)$
   From the table we can now use two reference points $t_{0.025} = 2.086$ and $t_{0.01} = 2.528$ (look it up) (2.5 falls between those two numbers). Sketching this shows:

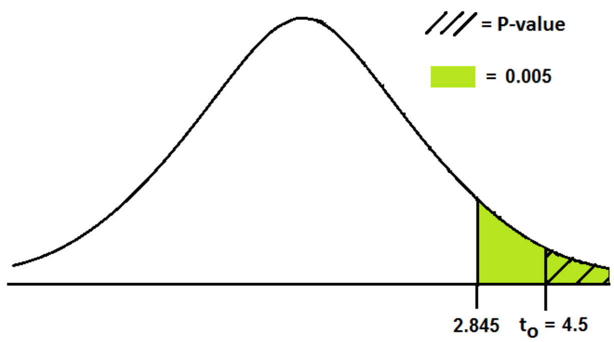
   As you can see from the diagram, the $0.01 < P - value < 0.025$

(b) lowertail: $P - value = P(t < t_0) = P(t < 2.5)$. Therefore the P-value is the area to the left of $t_0 = 2.5$, which is more than half of the area under the curve and it is $P - value > 0.5$

(c) 2-tail: $P - value = 2(P > |t_0|) = 2P(t > 2.5)$. This is two times the P-value found for the uppertail test. Multiply what you have found for the uppertail test by 2, and get $0.02 < P - value < 0.05$.

3. $t_0 = 4.5$, $df = 20$

(a) uppertail: $P - value = P(t > t_0) = P(t > 4.5)$
From the table we can use one reference point $t_{0.005} = 2.845$ (look it up). Sketching this shows:



As you can see from the diagram, the $P - value < 0.005$

(b) lowertail: $P - value = P(t < t_0) = P(t < 4.5)$. Therefore the P-value is the area to the left of $t_0 = 4.5$, which is more than half of the area under the curve and it is $P - value > 0.5$

(c) 2-tail: $P - value = 2(P > |t_0|) = 2P(t > 4.5)$. This is two times the P-value found for the uppertail test. Multiply what you have found for the uppertail test by 2, and get $P - value < 0.01$.

4. $t_0 = -0.5$, $df = 20$

(a) uppertail: $P - value = P(t > t_0) = P(t > -0.5)$. Negative values are not listed in the table, so we use symmetry, $P(t > -0.5) = P(t < 0.5)$, which we argued in 1.(b) is greater than 0.5. $P - value > 0.5$.

(b) lowertail: $P - value = P(t < t_0) = P(t < -0.5) = P(t > 0.5)$, which results in $P - value > 0.1$ (see 1.(a)).

(c) 2-tail: $P - value = 2(P > |t_0|) = 2P(t > 0.5)$. This is two times the P-value found for the lowertail test. Multiply what you have found for the lowertail test by 2, and get $P - value > 0.2$.

5. $t_0 = -2.5$, $df = 20$

(a) uppertail: $P - value = P(t > t_0) = P(t > -2.5) = P(t < 2.5)$(symmetry), which we argued in 2.(b) is greater than 0.5. $P - value > 0.5$.

(b) lowertail: $P - value = P(t < t_0) = P(t < -2.5) = P(t > 2.5)$ (symmetry), which results in $0.01 < P - value < 0.025$ (see 2.(a)).

(c) 2-tail: $P - value = 2(P > |t_0|) = 2P(t > 2.5)$. This is two times the P-value found for the lowertail test. Multiply what you have found for the lowertail test by 2, and get $0.02 < P - value < 0.05$.

6. $t_0 = -4.5$, $df = 20$

   (a) uppertail: $P - value = P(t > t_0) = P(t > -4.5) = P(t < 4.5)$ (symmetry), which we argued in 3.(b) is greater than 0.5, $P - value > 0.5$.

   (b) lowertail: $P - value = P(t < t_0) = P(t < -4.5) = P(t > 4.5)$ (symmetry). According to 3.(a), we get $P - value < 0.005$.

   (c) 2-tail: $P - value = 2(P > |t_0|) = 2P(t > 4.5)$. This is two times the P-value found for the lowertail test. Multiply what you have found for the lowertail test by 2, and get $P - value < 0.01$.