

**Exercise 6**  
**Noise from Sky Background**

You are trying to measure the flux from a star. How do the noise contributions from the star and the sky background contribute to the total uncertainty on your measurement?

Let's consider two different cases:

**1. Bright star, faint sky:  $c_* > c_b$**

Given:

Count rate from star  $c_* = 10 \text{ counts sec}^{-1}$

Count rate from sky background  $c_b = 2 \text{ counts sec}^{-1}$

If  $S_{tot} = S_* + S_b$  is the total signal counted in the measurement aperture, determine the signal-to-noise ratio  $S/N$  that you will get for exposure times of 1, 10, and 100 seconds. Write the necessary formula in the space below the table.

$t$ (sec)	$S_{tot}$ (counts)	$S_b$ (counts)	$S_*$ (counts)	$N_{tot}$ (counts)	$N_b$ (counts)	$N_*$ (counts)	$S/N_*$
1							
10							
100							

**2. Faint star, bright sky:  $c_* < c_b$**

Given:

Count rate from star  $c_* = 10 \text{ counts sec}^{-1}$

Count rate from sky background  $c_b = 15 \text{ counts sec}^{-1}$

Again, determine the signal-to-noise ratio  $S/N$  that you will get for exposure times of 1, 10, and 100 seconds. Write the necessary formula in the space below the table.

$t$ (sec)	$S_{tot}$ (counts)	$S_b$ (counts)	$S_*$ (counts)	$N_{tot}$ (counts)	$N_b$ (counts)	$N_*$ (counts)	$S/N_*$
1							
10							
100							