## The Twin Paradox

## Let's analyze the twin paradox

You and Yan are separated by a distance of 20 light-years, as measured from your reference frame. Yan is at rest with respect to you. The positive direction is from you toward Yan. Isabelle is passing you with a velocity, according to you, of $\vec{v}_{I Y}=+0.8 c$, while Jack is passing Yan with a velocity, according to Yan of $\vec{v}_{J Y}=-0.8 c$.

You and Isabelle both set your clocks to zero when Isabelle passes you.
Yan and Jack both set their clocks to zero when Jack passes Yan.
Your clock matches Yan's clock, according to you and Yan. You send a light pulse toward Yan when Isabelle passes you.

Fill in the tables to show the various clock readings, according to the appropriate observer, corresponding to the various events.

Table 1: Clock readings according to You.

| Event | Your clock | Yan's clock | Isabelle's clock | Jack's clock |
| :--- | :--- | :--- | :--- | :--- |
| Isabelle passes you | 0 | 0 | 0 | 0 |
| Jack passes Yan | 0 | 0 | 0 | 0 |
| Light arrives at Yan | 20 | 20 | 12 | 12 |
| Isabelle passes Yan | 25 | 25 | 15 | 15 |
| Jack passes Isabelle | 12.5 | 12.5 | 7.5 | 7.5 |

Table 2: Clock readings according to Isabelle.

| Event | Your clock | Yan's clock | Isabelle's clock | Jack's clock |
| :--- | :--- | :--- | :--- | :--- |
| Isabelle passes you | 0 | 16 | 0 | 5.85 |
| Jack passes Yan | -16 | 0 | -26.67 | 0 |
| Light arrives at Yan | 4 | 20 | 6.67 | 7.31 |
| Isabelle passes Yan | 9 | 25 | 15 | 9.14 |
| Jack passes Isabelle | 4.5 | 20.5 | 7.5 | 7.5 |

Table 3: Clock readings according to Jack.

| Event | Your clock | Yan's clock | Isabelle's clock | Jack's clock |
| :--- | :--- | :--- | :--- | :--- |
| Isabelle passes you | 0 | -16 | 0 | -26.67 |
| Jack passes Yan | 16 | 0 | 5.85 | 0 |
| Light arrives at Yan | 36 | 20 | 13.17 | 33.33 |
| Isabelle passes Yan | 41 | 25 | 15 | 41.67 |
| Jack passes Isabelle | 20.5 | 4.5 | 7.5 | 7.5 |

