Observation Round: Procedure

You have 30 minutes to read the questions and plan your observations. Do not talk to other participants. When you are shown the sign to 'GO NOW' by the supervisor, follow the directions to the telescope location taking with you the questions, clipboard and pen/pencil (a red light will be provided at the telescope). Keep your distance from other participants and do not talk to them. Show your badge and code to the assistant at your telescope.

You will have a total of 30 minutes to complete the observing tasks, starting when all participants are ready. At the end of 30 minutes take your papers and clipboard (leave the light) and wait until called to leave the observing location.

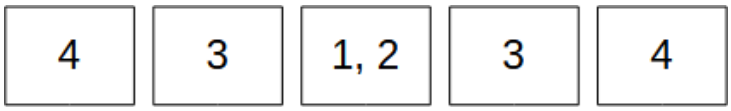
Follow the directions back to the preparation hall. Keep your distance from other participants and do not talk to them.

You will have another 30 minutes to process your observations and complete the answer sheet (there will be a calculator, geometrical instruments etc.). If you had any technical problems you can write a report for your team leader on the form in the answer sheets. At the end of 30 minutes place your answer sheets and the report in the envelope and wait at your desk until directed to leave the hall.

Observation Round: General Instructions

Scientists have discovered a crashed alien flying saucer. High up inside the hold, they found several screens transmitting views of the sky and telescopes have been set up to let you see them clearly from the level of the deck. Use your telescope to observe the (simulated) targets on the screens and record your results.

There are 5 screens on the opposite side: the central one will display video for tasks 1 and 2, the other four will display static images for tasks 3 and 4. The two screens closer to the centre will display the (same) image for task 3, and the two outer screens will display the (same) image for task 4. Point your telescope at the screens furthest away from you.



You will have a total of 30 minutes to complete the observing tasks, however tasks 1 and 2 will only be displayed once: just as with real observations you will only have one opportunity to collect the data. There will be two clocks visible showing the time remaining in the round.

At the start of the round a clock on the central screen will show the simulated time at the observer's location. The clock will have the correct orientation when seen through the telescope. The time will be shown for 3 minutes after which it will disappear; use this to set a start time for your observations.

Caution: the scale of the field of view is different between the video and still images.

Observation 1: 'Asteroid occultation'

Calculations based on the orbital elements predict that an asteroid will occult the star HD 163390 for 21 s, with the maximum occultation (mid-time) occurring at 23:03:32 UT. However, the ephemeris is not perfect and the prediction may be wrong by up to 20 s for the time and by 10s for the duration.

Based on your observations, find the true mid-time and duration of the occultation. To identify the star use Map 1 and the following coordinates:

HD 163390 RA: $17^{h}\ 58^{m}\ 05^{s}$ DEC: -18° 50′ 46.14″

The map and the sky are in the same epoch.

(15 points)

Answer Sheet

Mid-time of occultation	± error	Duration of occultation	± error

Solution

Beginning of occultation: 23:03:31
End of occultation: 23:03:48

Mid-time of occultation	± error	Duration of occultation	± error
23:03:39.5	0.4 s	17 s	0.2 s

Marking

1. Mid-time t of occultation:
   - 23:03:39.3 $\leq t <$ 23:03:39.7 $\implies$ 4 points
   - 23:03:39.0 $\leq t <$ 23:03:39.3 or 23:03:39.7 $< t \leq$ 23:03:40.0 $\implies$ 3 points
   - 23:03:38.0 $\leq t <$ 23:03:39.0 or 23:03:40.0 $< t \leq$ 23:03:41.0 $\implies$ 1 points
   - outside this range $\implies$ 0 points
2. Error in mid-time Δt:
   - $0.1 < \Delta x \leq 0.5 \implies$ 3 points
   - $0.5 < \Delta x \leq 0.7 \implies$ 2 points
   - $0.7 < \Delta x \leq 1.0 \implies$ 1 point
   - outside this range or missing $\implies$ 0 points
3. Duration x of occultation (should be to 1 s.f.):
   - 16.8 s $\leq x \leq$ 17.2 s $\implies$ 4 points
   - 16 s $\leq x <$ 16.8 s or 17.2 s $< x \leq$ 18 s $\implies$ 3 points
   - 15 s $\leq x <$ 16 s or 18 s $< x \leq$ 19 s $\implies$ 1 points
   - outside this range $\implies$ 0 points
4. Error in duration Δx:
   - $0.05 < \Delta x \leq 0.2 \implies$ 3 points
   - $0.2 < \Delta x \leq 0.4 \implies$ 2 points
   - $0.4 < \Delta x \leq 1.0 \implies$ 1 point
   - outside this range or missing $\implies$ 0 points
5. Error of duration lower than and different from error in mid time ($\Delta x < \Delta t$) $\implies$ 1 point