Question 1

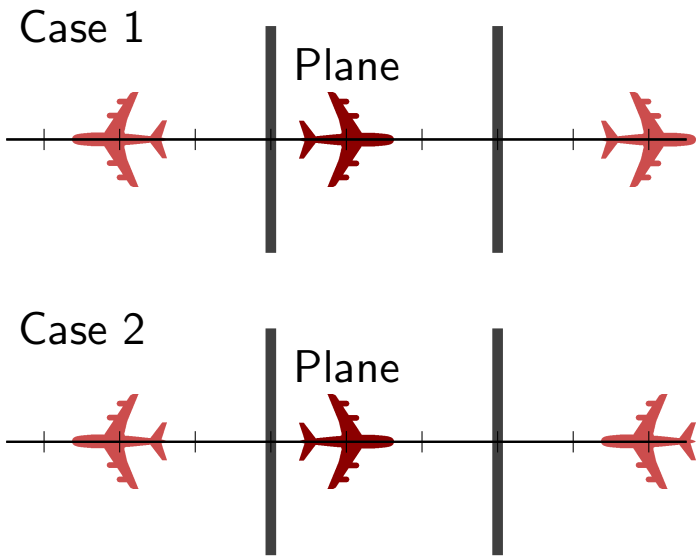
A diffraction grating is illuminated with yellow light (at normal incidence). The pattern seen on a screen behind the grating consists of three yellow spots, one at 0° (straight through) and one each at $\pm 45^\circ$.

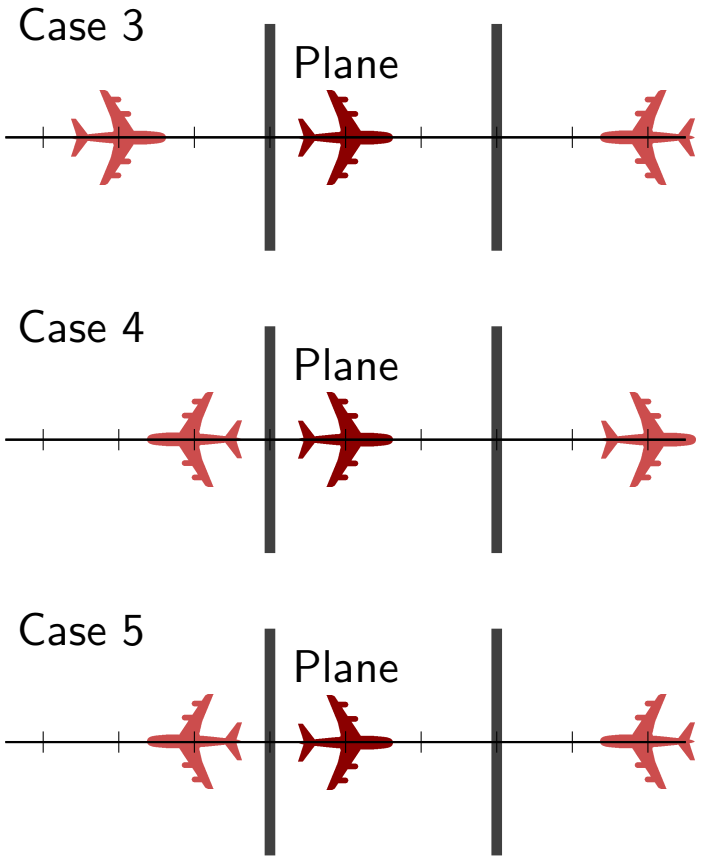
You now add red light of equal intensity, coming in the same direction as the yellow light. The new pattern consists of:

1. red spots at 0° and 45°.
2. yellow spots at 0° and 45°.
3. orange spots at 0° and 45°.
4. an orange spot at 0°, yellow spots at 45°, and red spots slightly farther out.
5. an orange spot at 0°, yellow spots at 45°, and red spots slightly closer in.

Question 2

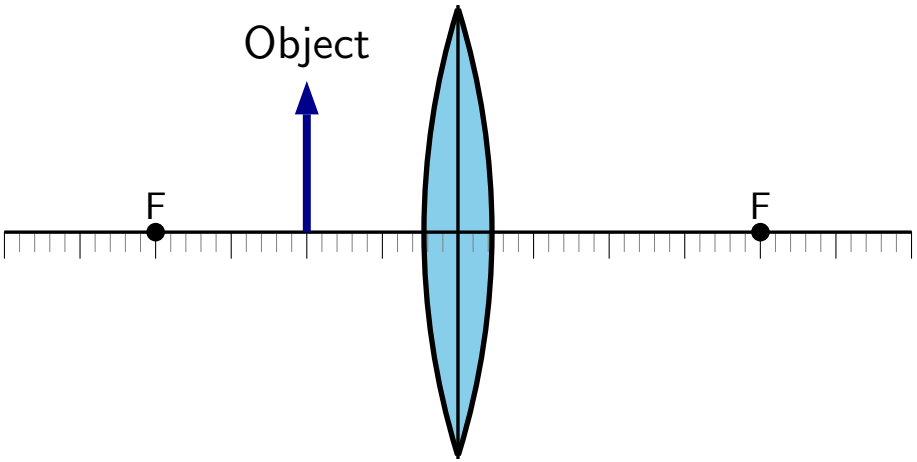
Two mirrors are parallel to each other as illustrated. A toy plane is placed between the mirrors. Various possibilities for some of the reflected images are illustrated. Which of these is correct?





Question 3

An object is placed to the left of a convex lens with focal point as illustrated.



As the object is shifted closer toward the left focal point, which of the following is true?

1. The location and height of the image remain fixed.
2. The image gets closer to the lens and its height decreases.
3. The image gets closer to the lens and its height increases.
4. The image gets further from the lens and its height increases.
5. The image gets further from the lens and its height decreases.

Question 4

Two people, Alex and Xela, have different near points; Alex's near point is twice as far from his eye as Xela's ($25\,\text{cm}$). Their far points are both at infinity. They both use identical magnifying glass to observe identical ants, each of which is $10\,\text{cm}$ from their eyes. They situate the magnifying glass so that the ant is at the focal point of the magnifying glass.

Which of the following is true?

1. Only Alex can see a clear image of the ant.
2. Only Xela can see a clear image of the ant.
3. Both Alex and Xela can see a clear image of the ant.
4. Neither can see a clear image of the ant.