

# AP Physics - Unit 2 - Dynamics

## WKST - FBD #1

Name: \_\_\_\_\_

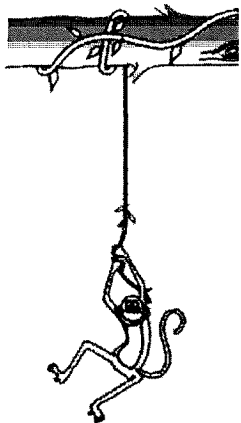
Date: \_\_\_\_\_

### Exercise: Free-Body Diagrams and Force-Resolution Diagrams

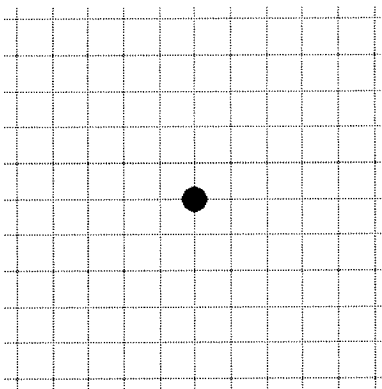
On this exercise remember that a Free-Body Diagram shows only the pertinent forces acting on an object. For our purposes, all the forces will be drawn as if they act on the center of mass of the object. The left column contains the physical representation of a situation. In the middle column, draw the free body diagram assuming the forces act on the black dot provided. Use the grid to draw arrows that are longer or shorter to show the relative strengths of forces, and the balancing (or lack of balancing) of force components. *Do not resolve any of the forces into components on the FBD's. The components are not a part of the FBD as prescribed on AP Physics Exams.*

When solving physics problems, it is often necessary or beneficial to resolve the vectors drawn on an FBD into components, usually parallel to acceleration and perpendicular to acceleration. In the column to the right, draw a Force-Resolution Diagram, (showing the force vectors) and the dotted-line components resolving these vectors into components parallel and perpendicular to acceleration.

1. No motion



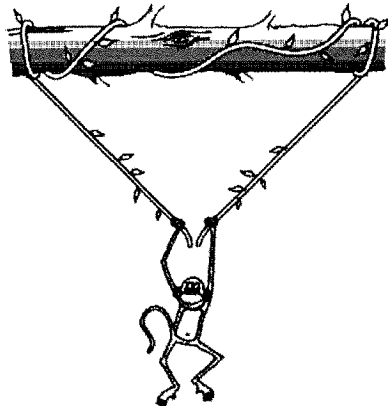
Free-Body Diagram



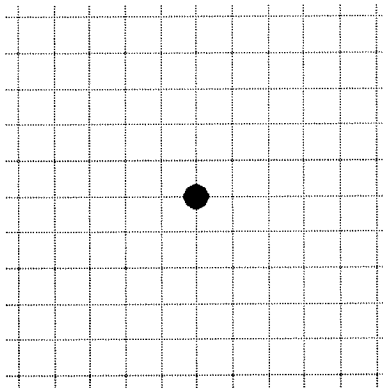
Force-Resolution Diagram



2. No motion



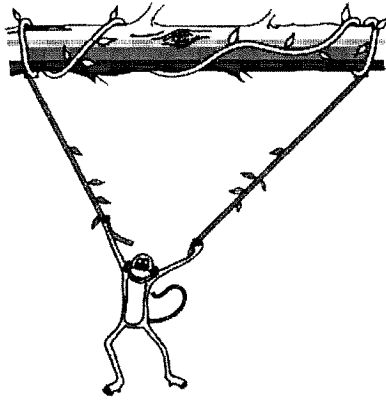
Free-Body Diagram



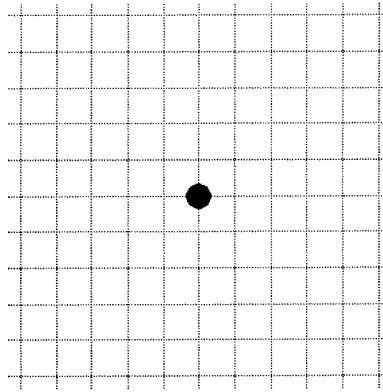
Force-Resolution Diagram



3. No motion



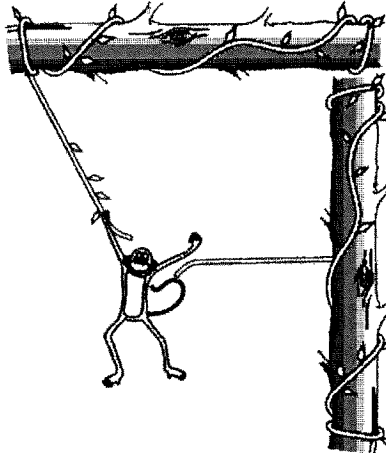
Free-Body Diagram



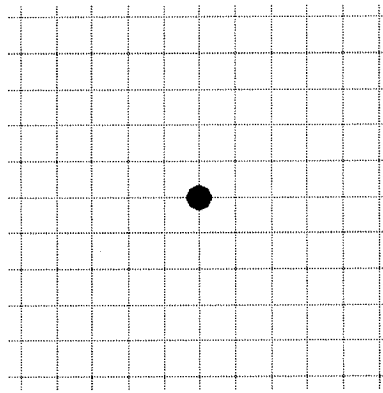
Force-Resolution Diagram



4. No motion



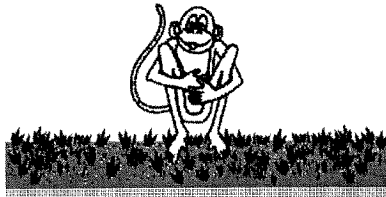
Free-Body Diagram



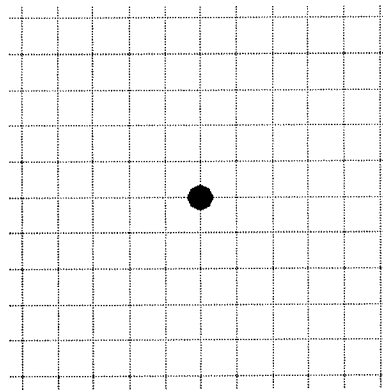
Force-Resolution Diagram



5. No motion



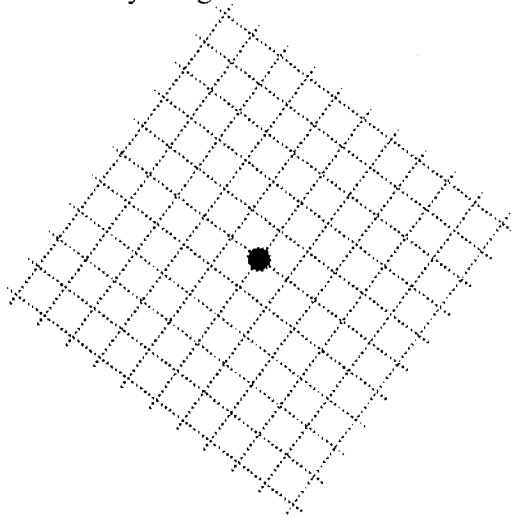
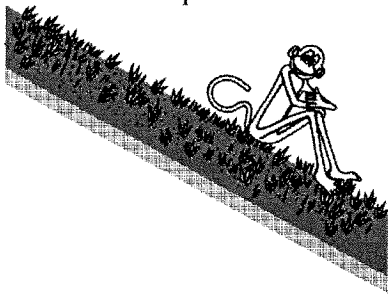
Free-Body Diagram



Force-Resolution Diagram



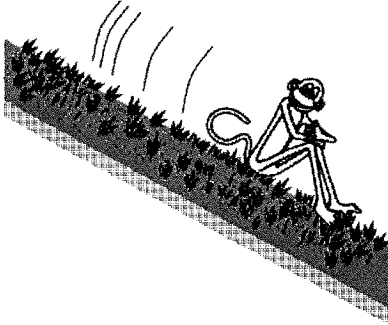
6. Friction prevents motion Free-Body Diagram



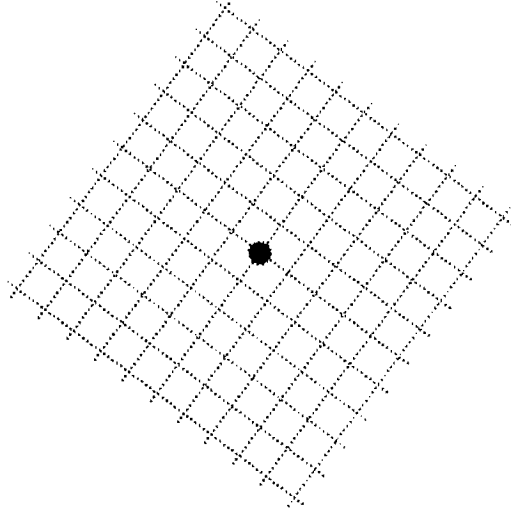
Force-Resolution Diagram



7. No friction



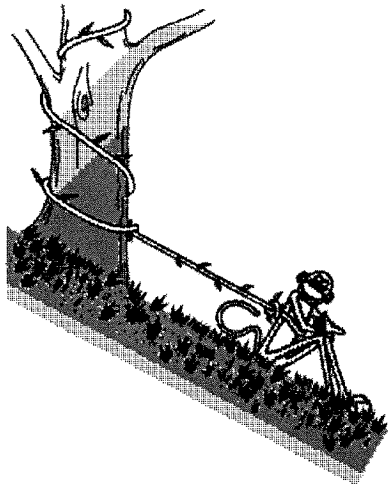
Free-Body Diagram



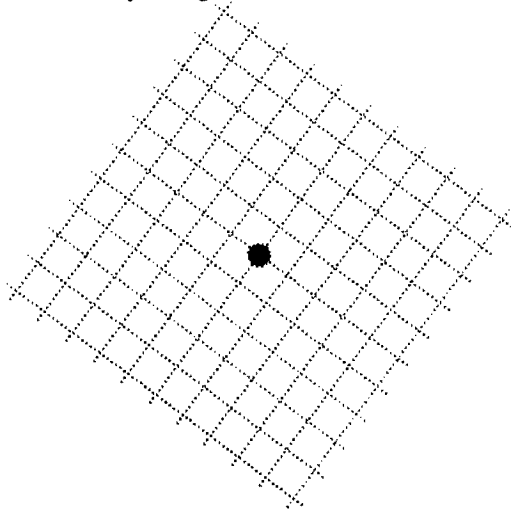
Force-Resolution Diagram



8. No motion



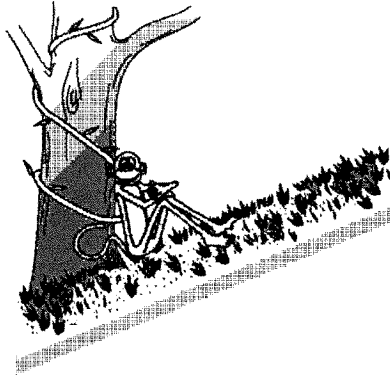
Free-Body Diagram



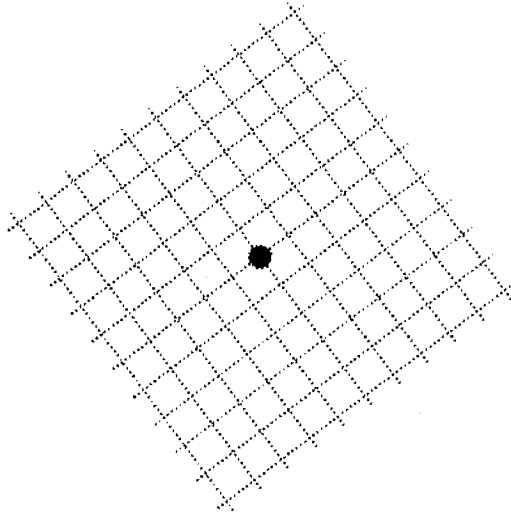
Force-Resolution Diagram



9. No motion



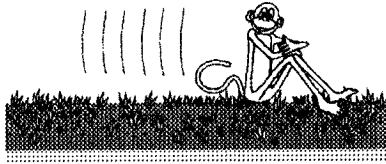
Free-Body Diagram



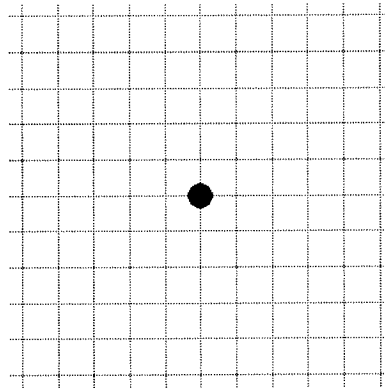
Force-Resolution Diagram



10. Constant speed, no friction



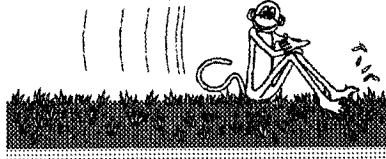
Free-Body Diagram



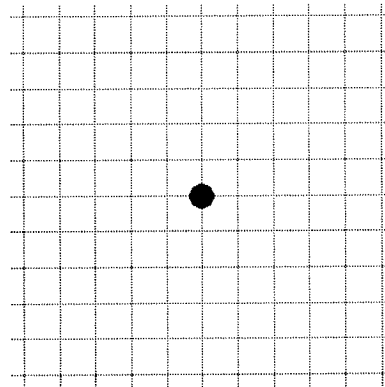
Force-Resolution Diagram



11. Slowing due to friction.



Free-Body Diagram



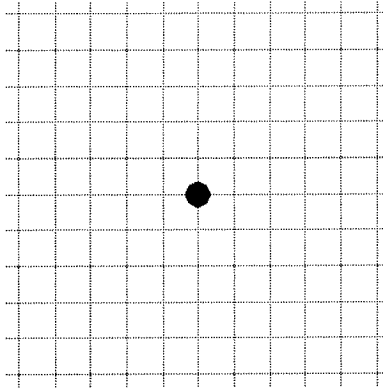
Force-Resolution Diagram



12. Freely-falling, no air resistance.



Free-Body Diagram



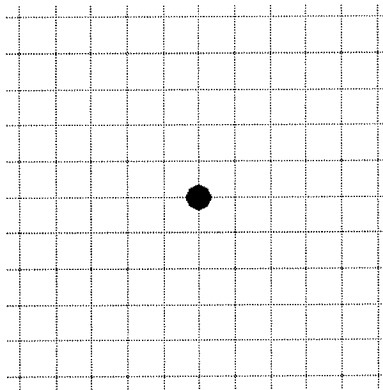
Force-Resolution Diagram



13. Constant (terminal) velocity.



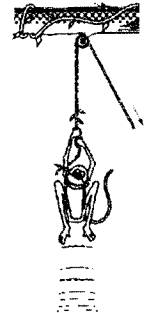
Free-Body Diagram



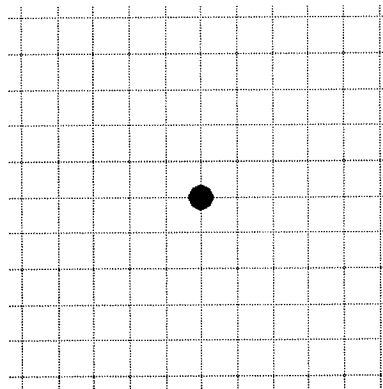
Force-Resolution Diagram



14. Tied to a vine and pulled straight upward, accelerating upward at  $9.8 \text{ m/s}^2$ .



Free-Body Diagram



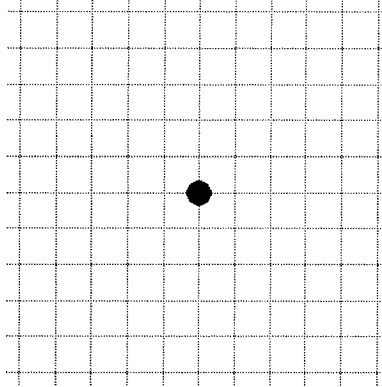
Force-Resolution Diagram



15. Tied to a vine and pulled straight downward, accelerating downward at  $19.6 \text{ m/s}^2$ .



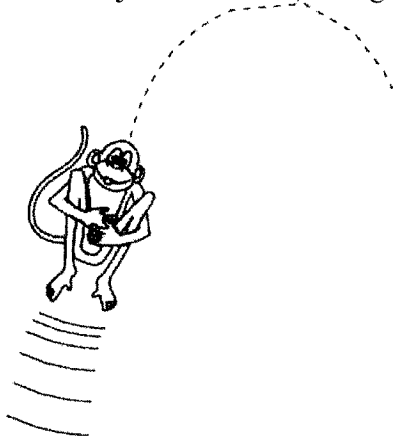
Free-Body Diagram



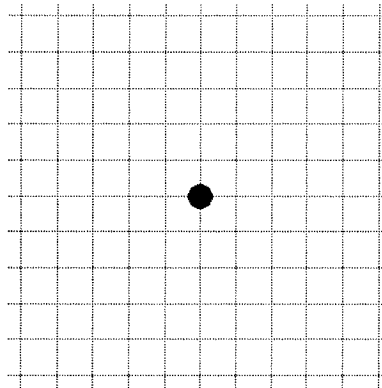
Force-Resolution Diagram



16. Projectile motion, rising.



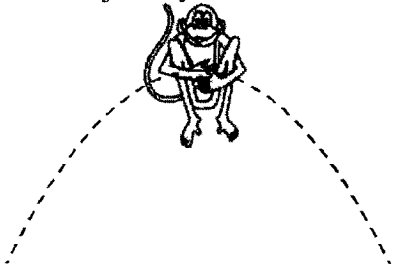
Free-Body Diagram



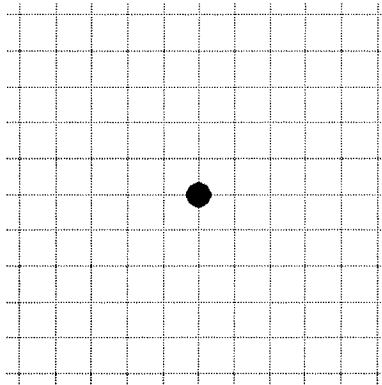
Force-Resolution Diagram



17. Projectile motion, highest point in trajectory.



Free-Body Diagram



Force-Resolution Diagram

