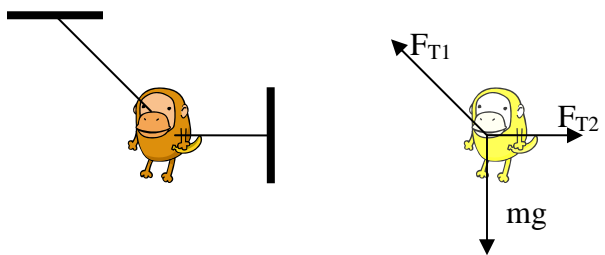


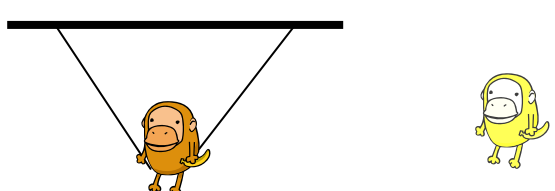
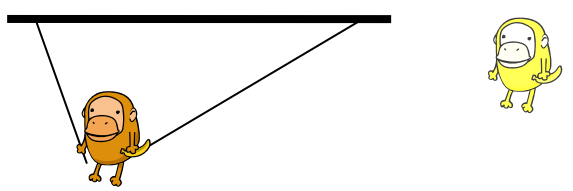

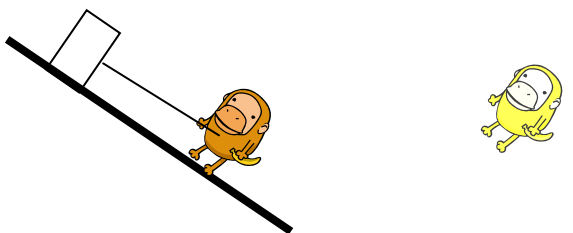

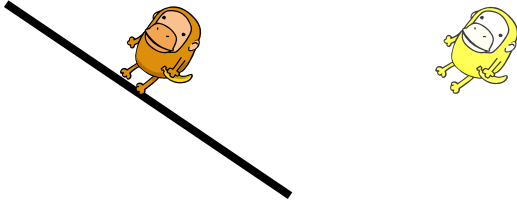


Free-Body Diagrams

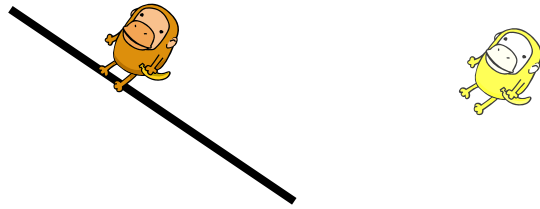
In each case an object is acted on by one or more forces. All drawings are in a vertical plane, and friction is negligible except where noted. Draw accurate free-body diagrams showing all forces acting on the object. Use pencil so you can correct mistakes. The first one is done as an example.

| | |
|---|---|
| <p>1. Static</p>  | <p>2. Static</p>  |
| <p>3. Object falling, no air friction.</p> <p>Eep!</p>  | <p>4. Static</p>  |
| <p>5. Static</p>  | <p>6. Static</p>  |
| <p>7. Static</p>  | <p>8. Static</p>  |

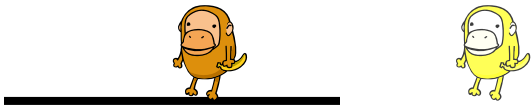
9. Sliding without friction.



10. Static friction prevents sliding.



11. Sliding at constant speed without friction.



12. Falling at constant (terminal) velocity.



13. Decelerating because of kinetic friction.



14. Rising in a parabolic trajectory.



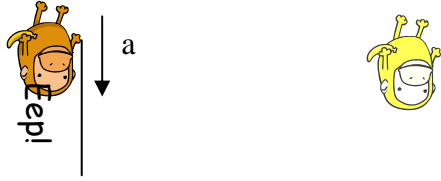
15. At the top of a parabolic trajectory.



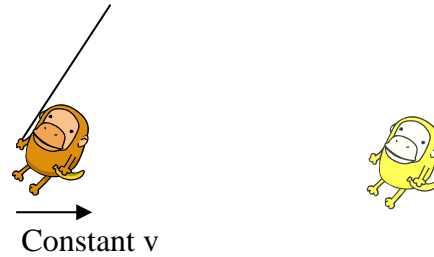
16. Tied to a rope and pulled straight upward. Accelerating upward at 9.8 m/s^2 . No friction.



17. Tied to a rope and pulled straight downward. Accelerating downward at 19.6 m/s^2 . No friction.



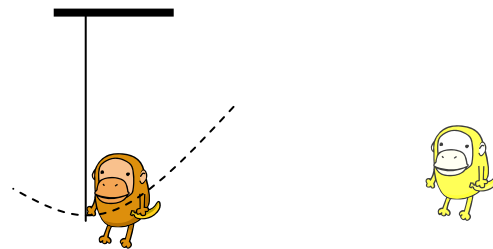
18. Tied to a rope and pulled so that it moves horizontally at a constant velocity. Note there must be friction in this case



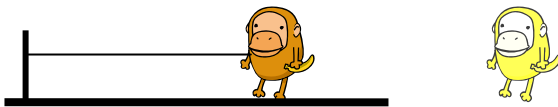
19. Tied to a rope and pulled so that it accelerates horizontally at $2g$. No air friction



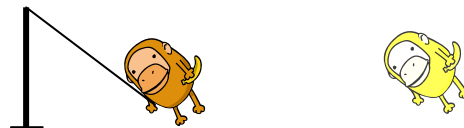
20. Swinging on a rope, at lowest position. No friction.



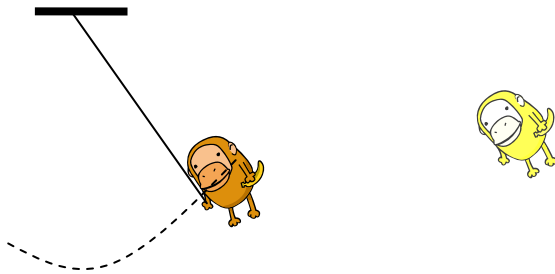
21. Tied to a post and moving in a circle at a constant speed on a frictionless horizontal surface. Coming straight out of the paper.



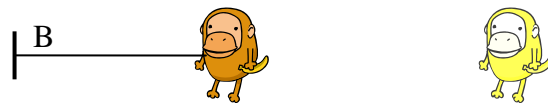
22. Tied to point A by a string. Moving in a horizontal circle at a constant speed. Not resting on a solid surface. No friction. Coming straight out of the paper.



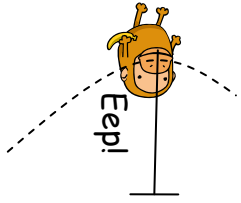
23. Swinging on a rope no friction.



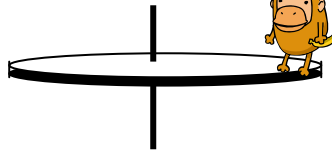
24. Tied to point B. Moving downward in a vertical circle with string horizontal. No Friction



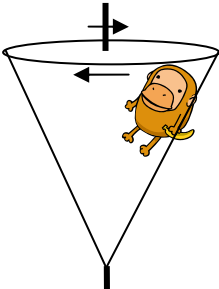
25. Swinging on a rope, at the top of a vertical circle.



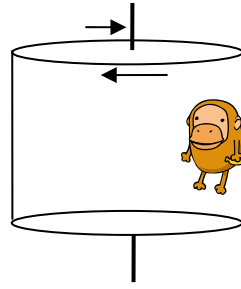
26. Riding on a horizontal disk that is rotating at constant speed about its vertical axis. Friction prevents object from sliding. Object is moving straight out of the paper.



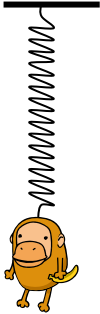
27. Resting against the frictionless inside wall of a cone rotating about its vertical axis at constant speed. Not accelerating vertically. Moving straight out of the paper.



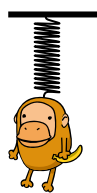
28. Stuck by friction against the inside wall of a drum rotating about its vertical axis at a constant speed. Object is moving straight out of the paper.



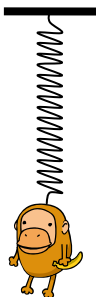
29. Suspended from a spring. Pulled downward slightly and released. No friction.



30. Suspended from a spring. Instantaneously at rest at the top of its travel.



31. Suspended from a spring. Moving downward through the equilibrium position. No friction.



32. Suspended from a spring. Moving upward through the equilibrium position. No friction.

