

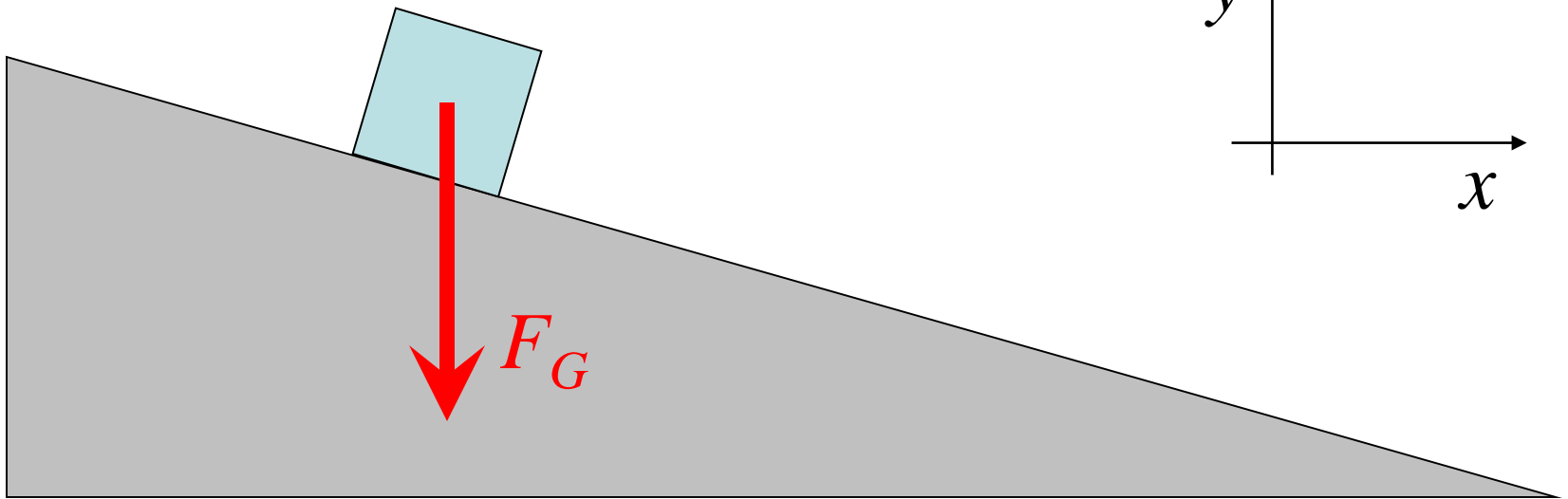
# Dynamics

- I. Newton's 3 Laws of Motion
  - inertia, force, mass, weight
  - interaction & nature of force
- II. Normal Force
- III. Compression, Tension, Sections
- IV. Pulleys and Systems
- V. Friction (between solids)
- VI. Air Resistance
- VII. Inclines, ramps, etc.**

	The student will be able to:	HW:
1	State Newton's 1 <sup>st</sup> and 2 <sup>nd</sup> Laws of Motion and apply these laws to physical situations in order to determine what forces act on an object and to explain the object's resulting behavior. Define and apply the concept of inertia and inertial frame of reference.	1 – 7 ✓
2	Recognize and state the proper SI unit of force and give its equivalence in fundamental units and use the relation $\mathbf{F}_{\text{net}} = m\mathbf{a}$ to solve problems.	✓ 8 – 10
3	Recognize the difference between weight and mass and convert from one to the other.	✓ 11 – 14
4	State and utilize Newton's 3 <sup>rd</sup> Law to solve related problems.	✓ 15 – 18
5	Understand and utilize the concept of the normal force to solve related problems.	✓ 19, 20
6	Define and apply the concepts of compression and tension and use the method of sections to solve for these.	✓ 21 – 26
7	Solve force problems involving pulleys, including those involving multiple objects and systems of equations (such as Atwood's machine).	✓ 27 – 31
8	Understand and utilize the relation between friction force, normal force, and coefficient of friction for both cases: static and kinetic.	✓ 32 – 37
9	Solve problems involving air resistance in which friction is assumed directly proportional to velocity; define and apply the concept of terminal velocity.	✓ 38 – 39
10	Apply force components to objects on an incline and solve related problems.	40 – 44

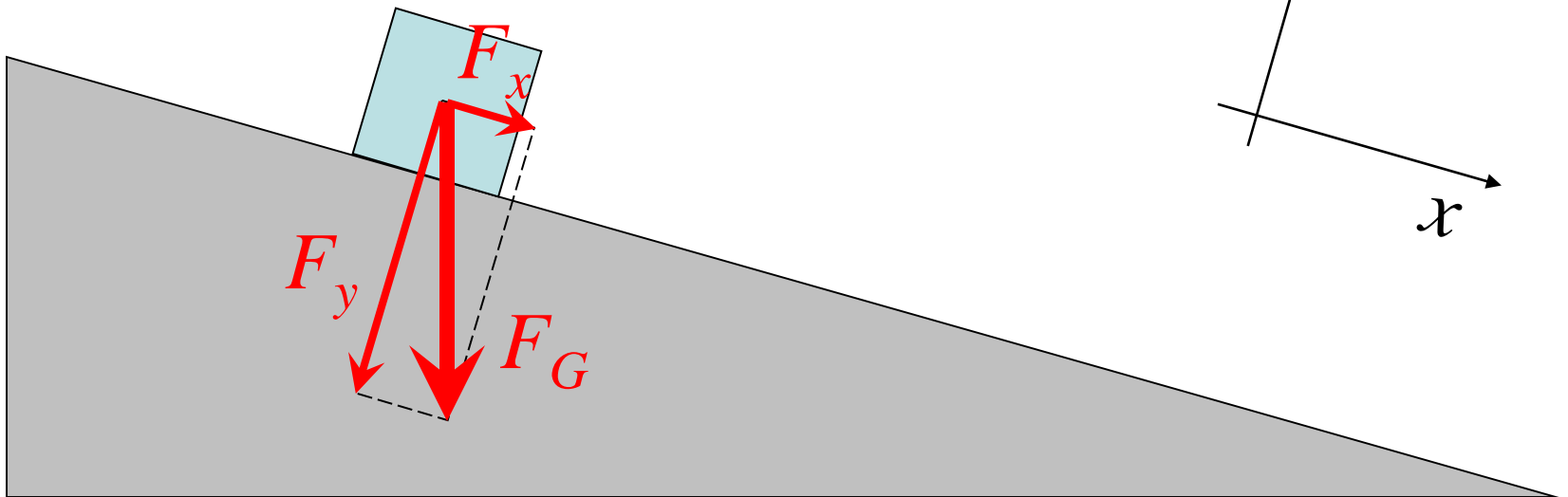
What force causes an object to go downhill?

Is it the force of gravity?

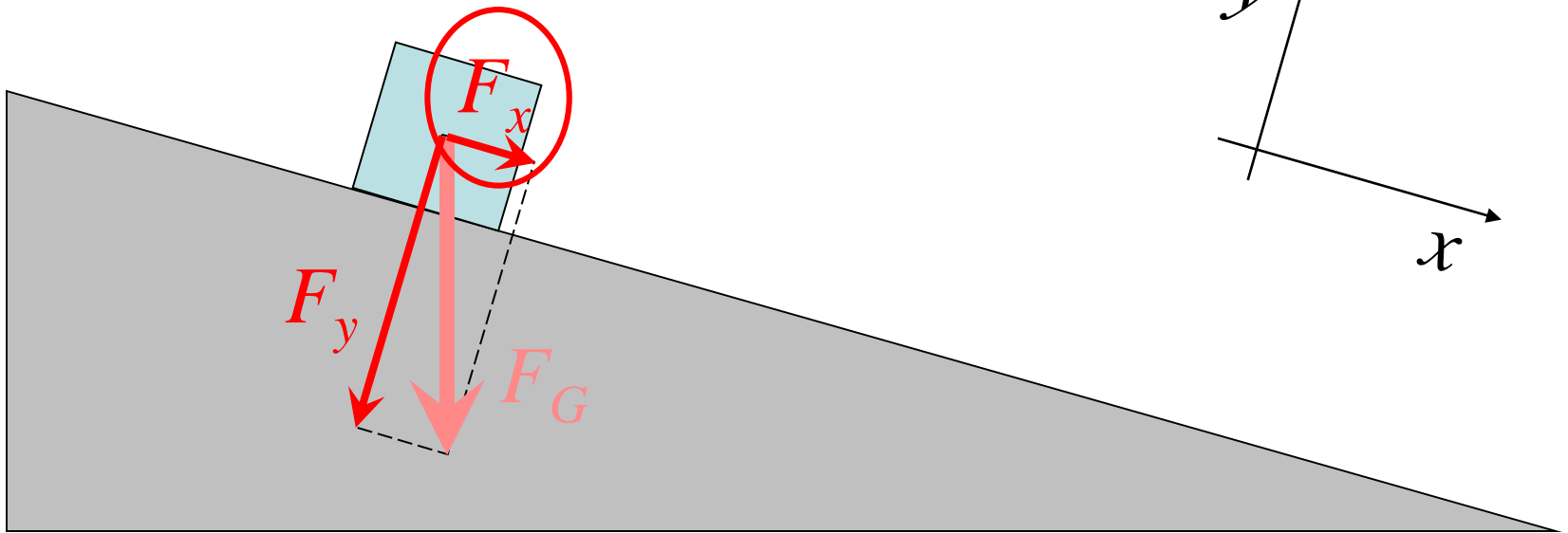


What force causes an object to go downhill?

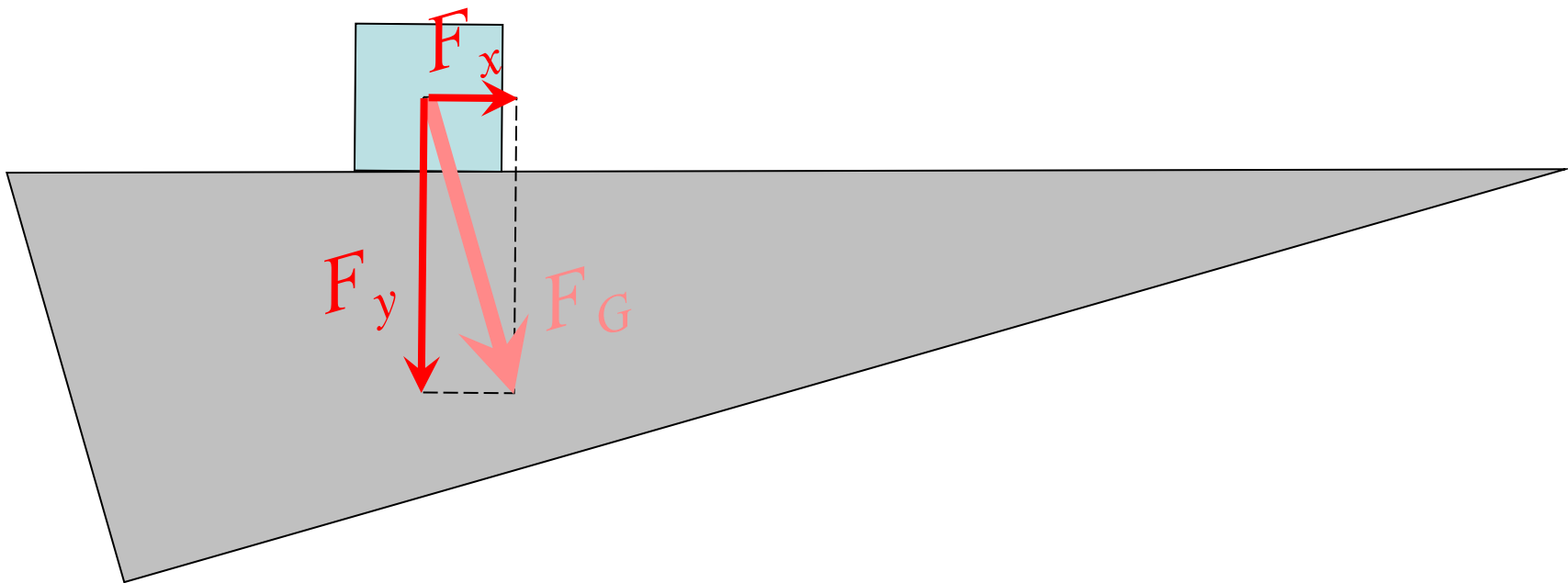
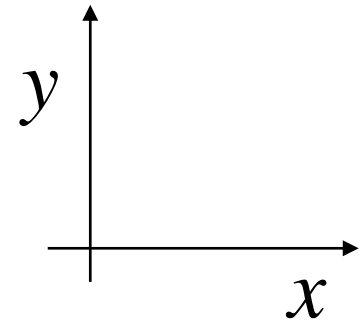
The answer is best understood by using a *tilted* coordinate system:



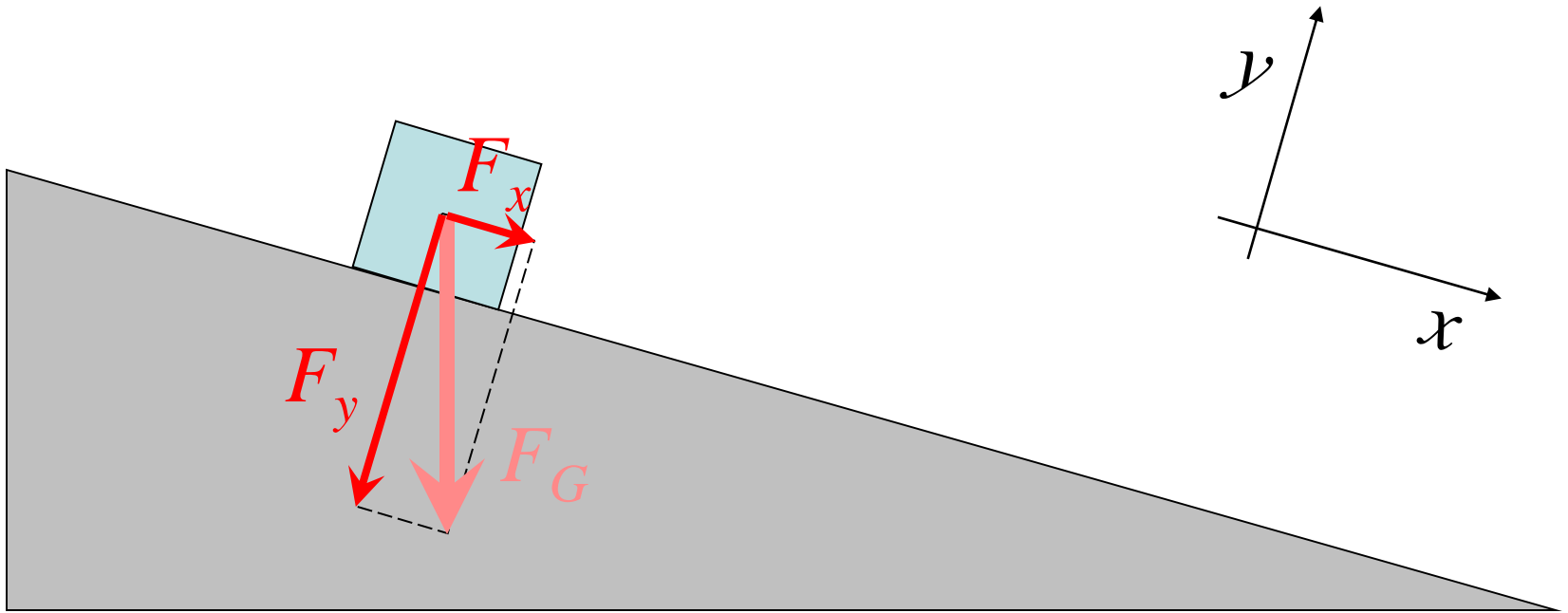
It is only a *component* of gravity that forces the object downhill.



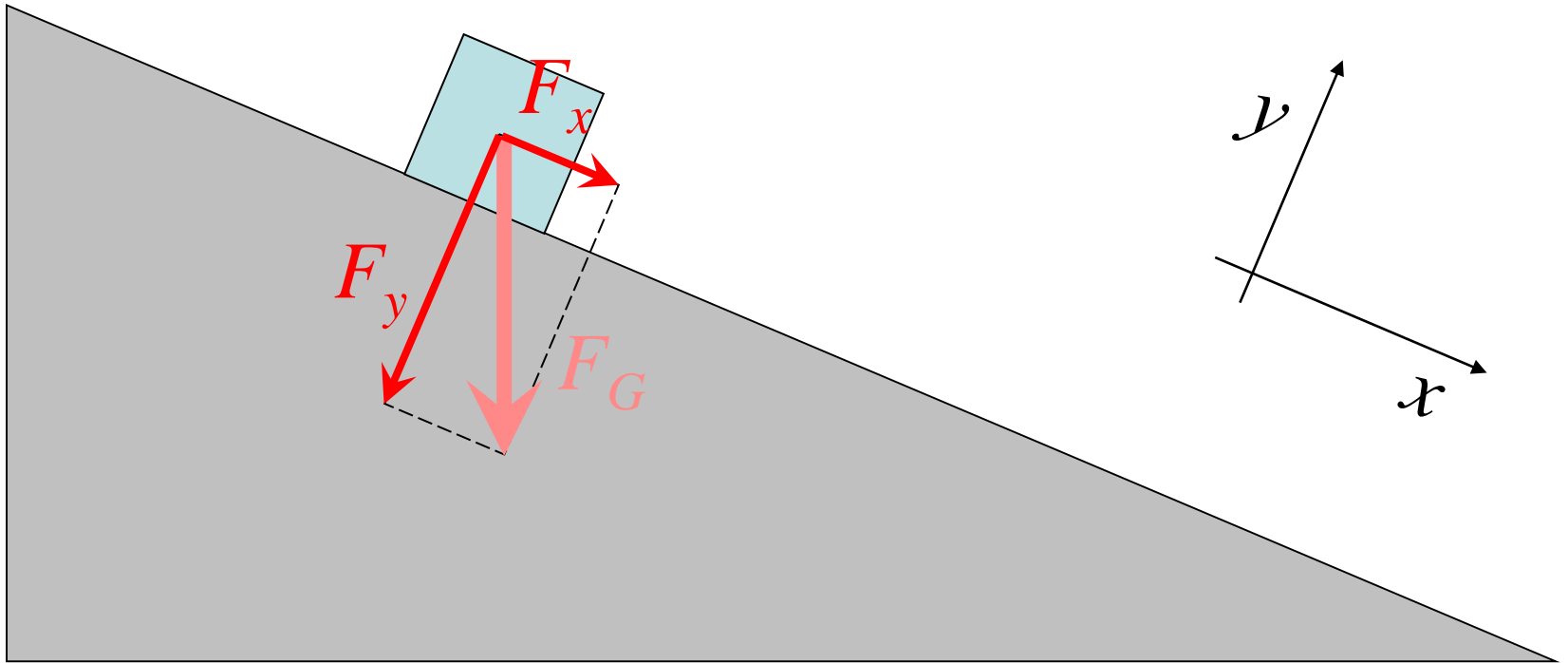
*It is only a component of gravity that forces the object downhill.*



The greater the slope...

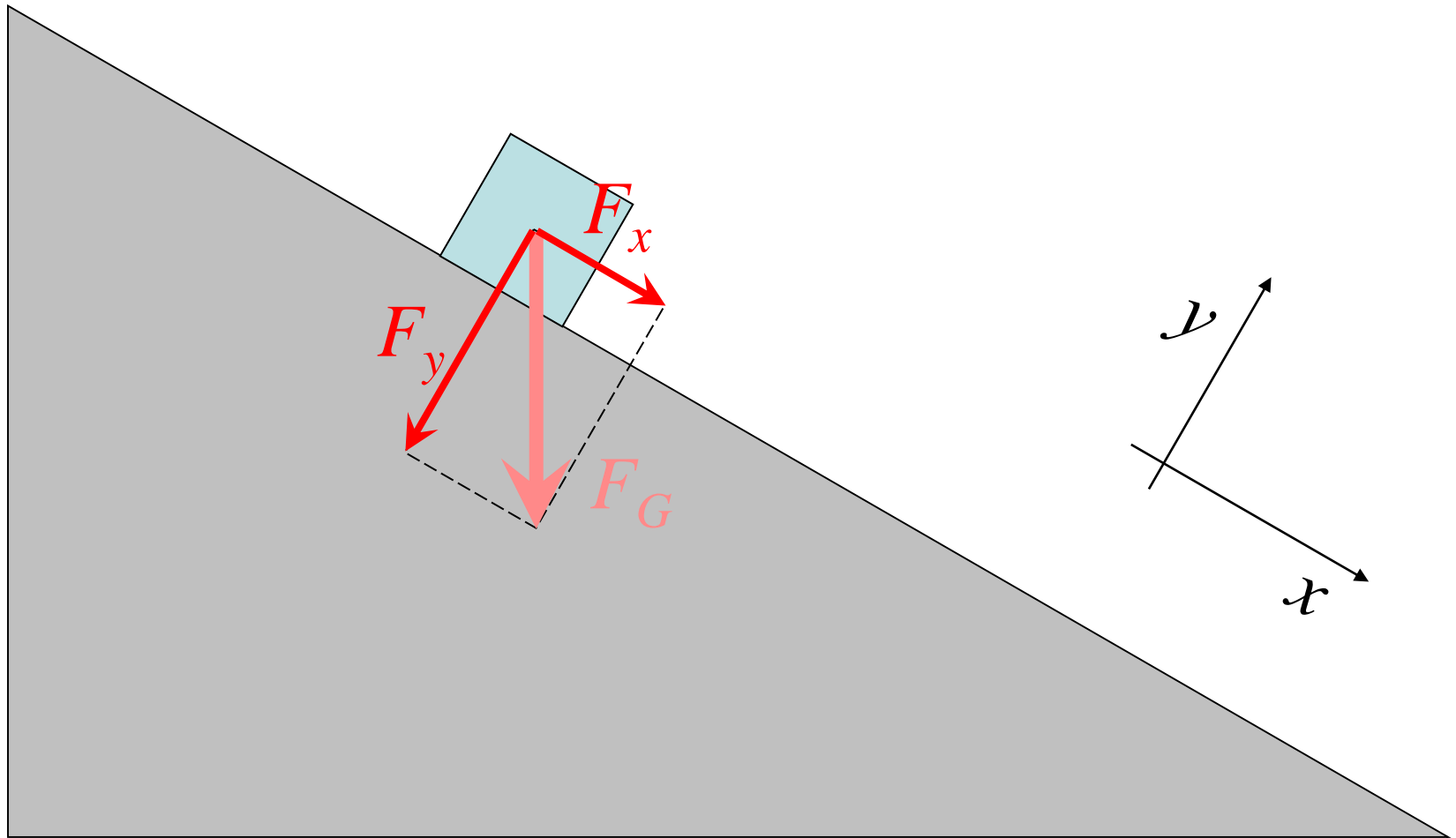


The greater the slope...

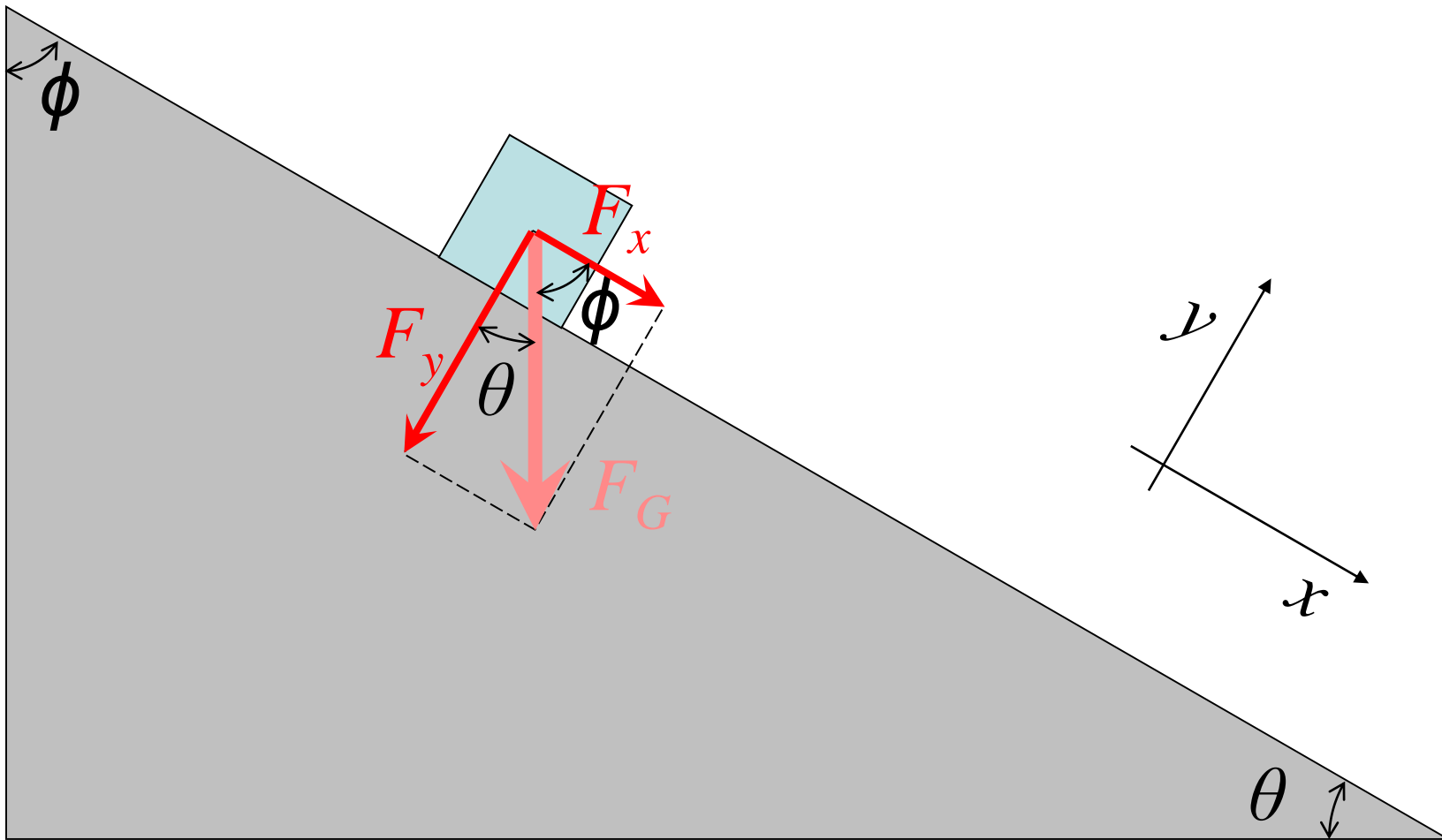


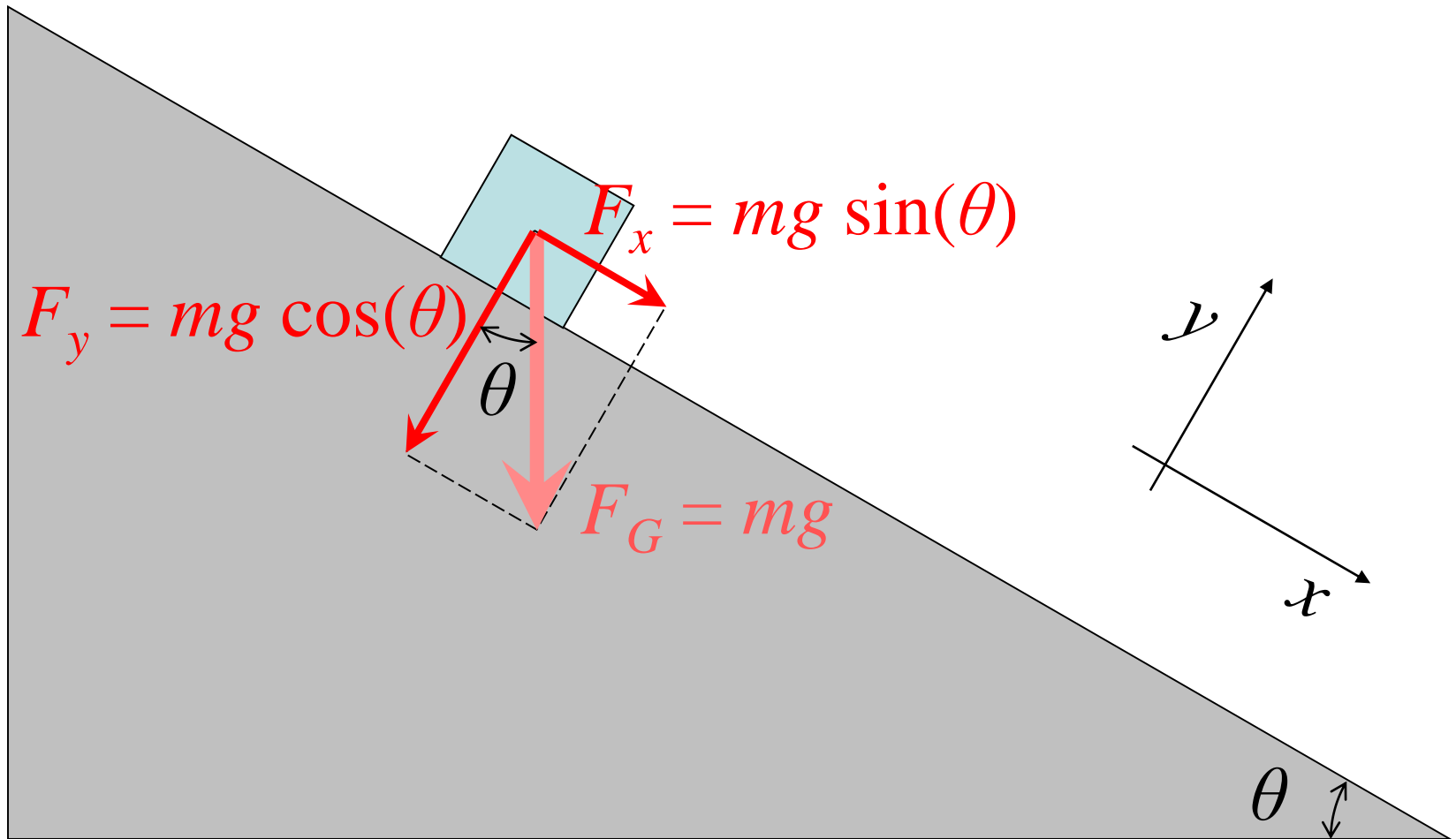


The greater the slope...



...there is greater force parallel to the surface ( $F_x$ ) and lesser force perpendicular to the surface ( $F_y$ ).





It is often necessary to find the components of gravity in terms of the angle of incline,  $\theta$ .