HOW TOOLS WORK

LEVERS
rule of thumb:

the length of the short arm (AC) times the distance the long end travels (DE) equals the length of the long arm (CD) times distance the short end travels (AB)
(AC) X (DE) = (CD) X (AB)

the length of the short arm (AC) times the speed at the long end (SL) equals the length of long arm (CD) times the speed at short end (SS).
(AC) X (SL) = (CD) X (SS)

the force at the end of the short arm (FS) times the length of the short arm (AC) equals the force at the end of the long arm (FL) times the length of the long arm (CD).
(FS) X (AC) = (FL) X (CD)

the force at short end (FS) times the distance short end travels (AB) equals the force on long end (FL) times the distance long end travels times (DE)
(FS) X (AB) = (FL) X (DE)

what this means:
The long end will move further, move faster and have less force than the short end. So if you move the pivot point to make the long arm longer and the short end shorter the long end will have to move further, move faster, and require less force to provide the same results at the short end.

HAMMERS:
rule of thumb:
The amount of force applied to a struck object is proportional the product of the speed times the weight of the striking object.

what it means:
The longer the handle or the heaver the head on a striking object the harder the long end will hit for the same amount of force and speed applied to the short end.

BELT DRIVES:
rule of thumb
For belt pulleys the RPM of the driving pulley times the diameter of the driving pulley equals the RPM of the driven pulley times the diameter of the driven pulley

The power at the driving pulley times the diameter of the driven pulley equals the power at the driven pulley times the diameter of the driving pulley.

what this means:
> If we change the belt on a drill press to use a larger pulley at the motor and/or a smaller pulley at the quill the bit will turn faster but will stall easier.

INCLINE PLANE:
rule of thumb:
> The amount of work you do is the productof how far you move something times the force you apply.

what this means:
> you do the same amount of work lifting a piano straight into a truck up as you do pushing it up a ramp. You just exert less force over a longer distance using a ramp.

HOW WE CAN USE IT
> screw driver (use the widest tip we can)
> pliers and wire cutters (have the longest handle we can)
> pliers and wire cutters (grip the object as close to the pivot point as we can)
> wrench (use the longest one we can or put an extension on it)
> hammer (grip as far from the head as possible)
> hammer (a heaver hammer hits harder)
> hammer (it takes more force to move a heavier hammer)
> drill press (changing to a bigger quill pulley and/or a smaller motor pulley will give a faster bit speed but with less turning force at the bit)
> sharpen chisels at a flatter angle (easier to push)
> use a ramp instead of dead lift
> use a pry bar instead of dead lift
> pianos (changing where the jack makes contact a small amount can make such a big difference in performance)

FORCE VECTORS
> the force is transmitted in a straight line from your hand to the resistance regardless of the shape of the handle.

> Try to keep where you grip as much on the plane of the resistance as possible to prevent side ways twist of the wrench off the bolt. (Flagpoleing)

> If something is between your hand and what you are turning it doesn't affect if you bend the tool to go around the obstruction.

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