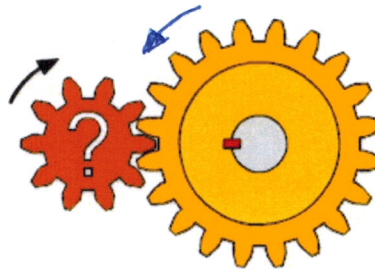1. In the following mechanism, the cogwheel on the left is the input (motor) wheel.
Calculate the number of teeth of that gear, with the following data:

Z_m = ?
N_m = 10 000 rpm
Z_s = 20 dientes
N_s = 7 000 rpm

$$N_m \cdot Z_m = N_s \cdot Z_s$$
$$10000 \cdot Z_m = 7000 \cdot 20$$
$$Z_m = \frac{7000 \cdot 20}{10000} = 14$$

2.

What force must the hydraulic cylinder of this recovery truck exert in order to lift a weight of 1000 kg? The force arm measures 1.5 m and the resistance arm 5 m. What type of lever is this recovery truck? (Remember that in order to change mass (kg) to force (N) you need to use the formula F = m x a)

It is a class 3 lever

5 m

1.5m

Resistance

Fulcrum

Hydraulic Cylinder

Force

1000 Kg
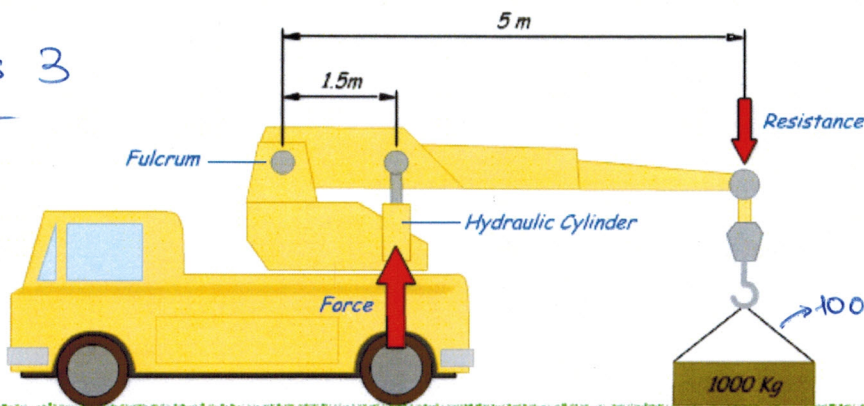
$$F \cdot d = R \cdot r$$
$$F \cdot 1.5 = 10000 \cdot 5$$
$$F = \frac{10000 \cdot 5}{1.5} = 33333'3 N$$
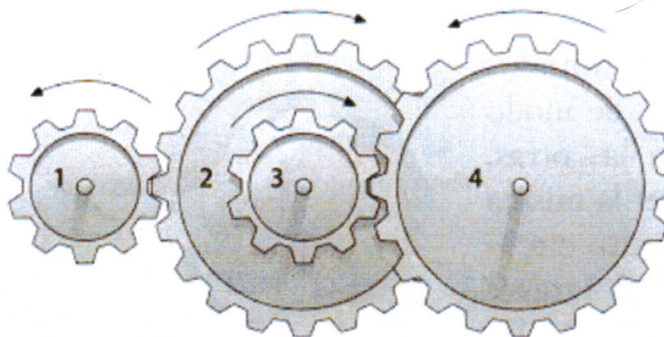
$1000 \cdot 10 = 10000 N = R$

3. In the following mechanism, calculate the velocity of the output wheel (4), given these data:

Z_1=20 Z_3=20 N_1=600 rpm
Z_2=40 Z_4=60

$$N_1 \cdot Z_1 = N_2 \cdot Z_2$$
$$600 \cdot 20 = N_2 \cdot 40$$
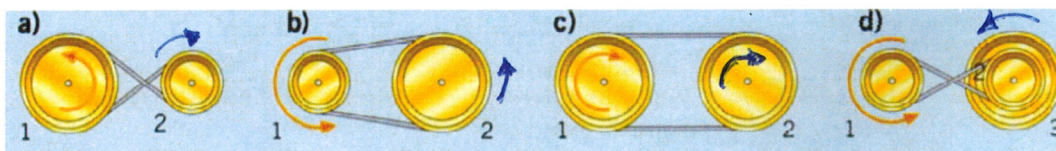$$N_2 = \frac{600 \cdot 20}{40} = 300 \text{ rpm}$$
$$N_3 = N_2 = 300 \text{ rpm}$$
$$N_3 \cdot Z_3 = N_4 \cdot Z_4$$
$$300 \cdot 20 = N_4 \cdot 60$$
$$N_4 = \frac{300 \cdot 20}{60} = 100 \text{ rpm}$$

4. In each one of the following mechanisms, indicate which way the output wheel rotates (clockwise or counterclockwise) and which wheel rotates faster.

a)   1   2   b)   1   2   c)   1   2   d)   1   2   3

Clockwise   Counterclockw.   clockwise   both
- 2 is faster   - 1 is faster   - both   Counterclockwise
                                          same speed   - all same speed

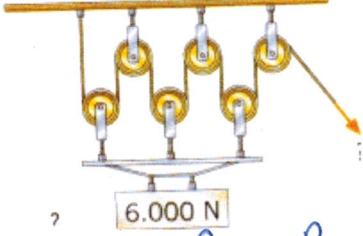5. Calculate, in each case, the Force (F) necessary to lift the Load (R):
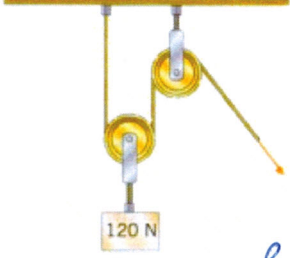
a)

100 N ?

$$F = R$$
$$F = 100 \text{ N}$$

b)

6.000 N

$$F = \frac{R}{2n} = \frac{R}{2 \cdot 3} = \frac{6000}{6} =$$
$$= 1000 \text{ N}$$

c)

120 N

$$F = \frac{R}{2} = \frac{120}{2} = 60 \text{ N}$$

6. In the following mechanisms, the motor rotates at 300 rpm. Calculate the rotation velocity of the output wheel.

D = 8 cm

Motor

D = 320 mm
32 cm

$$n_1 \cdot D_1 = n_2 \cdot D_2$$
$$300 \cdot 8 = n_2 \cdot 32$$
$$n_2 = \frac{300 \cdot 8}{32} = 75 \text{ rpm}$$

7.

A top-level weightlifter can generate 3000 N of force. What is the maximum weight that he would be able to lift with a force arm of 2 m and a resistance arm of 50 cm? (Remember that in order to change mass (kg) to force (N) you need to use the formula F = m x a)
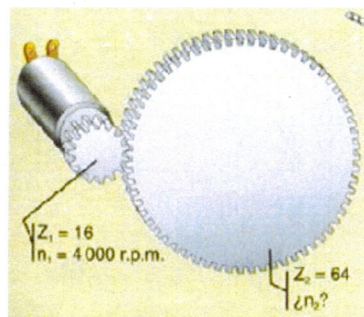
→ 0.5 m
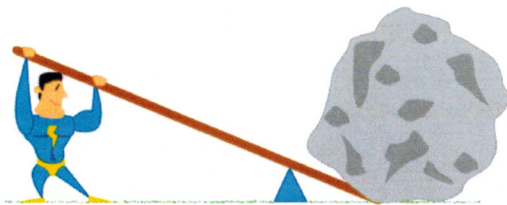
$$F \cdot d = R \cdot r$$
$$3000 \cdot 2 = R \cdot 0.5$$
$$R = \frac{3000 \cdot 2}{0.5} = 12000 \text{ N}$$

8. What is the velocity of the output wheel in the following mechanism. Is it a mechanism to reduce or to increase velocity?
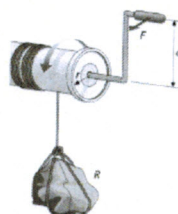
$Z_1 = 16$
$n_1 = 4\,000$ r.p.m.

$Z_2 = 64$
$¿n_2?$

$$n_1 \cdot Z_1 = n_2 \cdot Z_2$$
$$4000 \cdot 16 = n_2 \cdot 64$$
$$n_2 = \frac{4000 \cdot 16}{64} = 1000 \text{ rpm}$$

Mechanism to reduce velocity.

9. If a winch has a radius of 10 cm, and a crank of 50 cm. What is the maximum weight we can lift using a force of 5 N.

$$F \cdot d = R \cdot r$$
$$5 \cdot 50 = R \cdot 10$$
$$R = \frac{5 \cdot 50}{10} = 25 \text{ N}$$