A rotating star shrinks by a factor of 10^4 due to gravitational collapse. We can say that its angular velocity:

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B) Increases by a factor of 10^4
C) Increases by a factor of 10^2
D) Stays the same
E) Decreases

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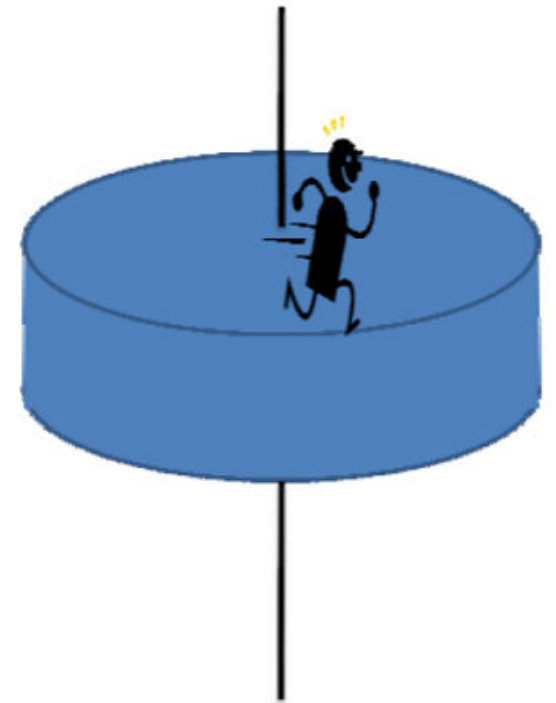When the star shrinks by a factor of 10^4, it's moment of inertia decreases by 10^8 since I is proportional to R^2. Angular momentum $L = I \omega$ is conserved, so ω must increase by a factor of 10^8.

https://www.youtube.com/watch?v=MncUDWhPB_E

A big solid disk sits on a frictionless axle. A man stands at the edge of the disk. If the man tries to run,

A) the man will stay in the same place and the disk will rotate under him.
B) the man will move counterclockwise around the axle, while the disk will rotate clockwise around the axle (viewed from the top).
C) the man and the disk will both start moving clockwise around the axis.
D) the man and the disk will both end up moving counterclockwise around the axis.

Ignore any effects associated with air resistance.

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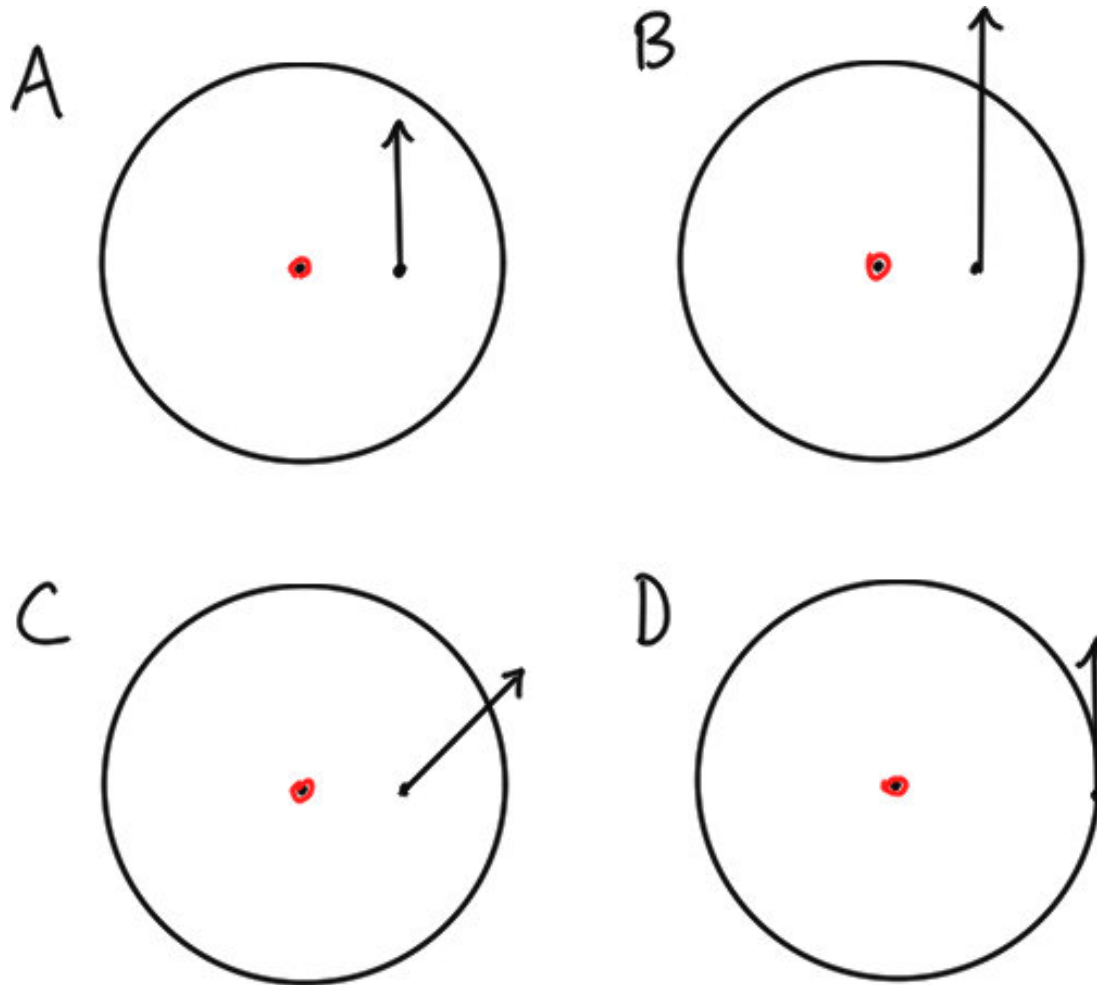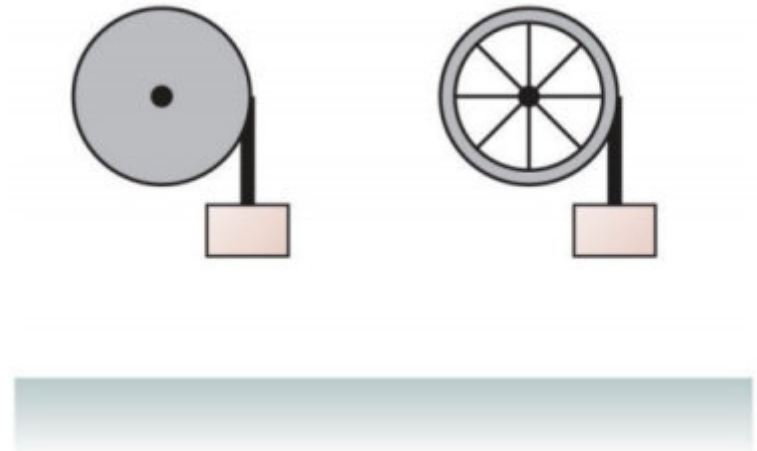
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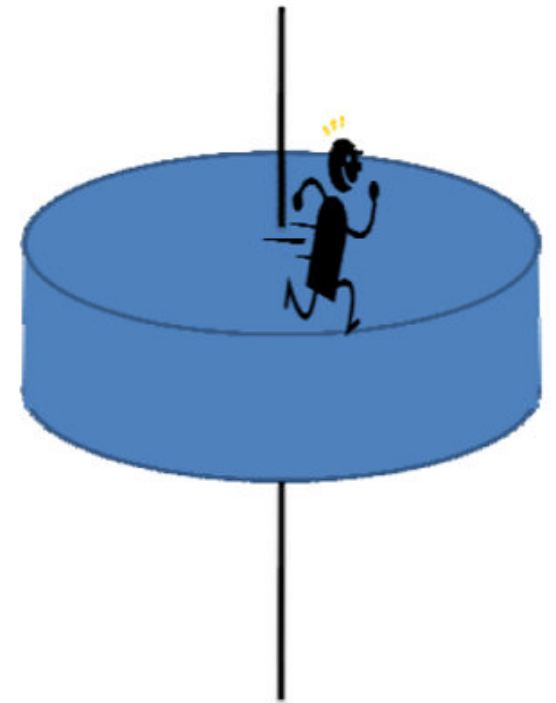
Rank from smallest to largest the magnitude of the torque produced by the forces below.

The solid disk and the hoop have the same mass, radius, and height above the ground and turn on frictionless horizontal axles. Ropes are wrapped around each and tied to blocks of the same mass. Which block hits the ground first?

A) The one on the left
B) The one on the right
C) Same
D) Can't be determined

Extra: after the block starts falling, how does the angular velocity of the wheel relate to the velocity of the block?

Which configuration has the largest angular acceleration?

(a)

2 kg 1 N
  2 m
2 kg
1 N

(b)

2 N
2 kg 2 m
2 kg
2 N

(c)

4 kg 1 N
  2 m
1 N 4 kg

(d)

2 kg 4 m 1 N
1 N 2 kg

(e)

2 kg 4 m 2 N
30° 30°
2 N 2 kg