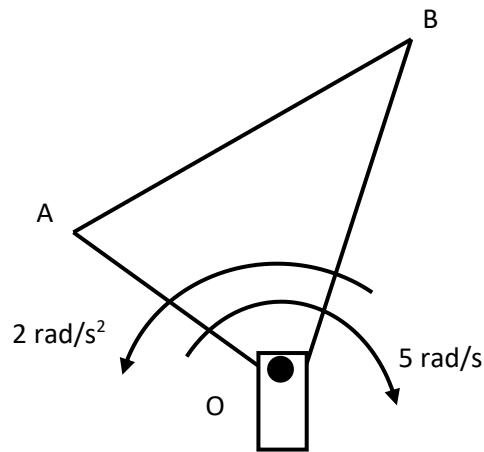**MACHINE DYNAMICS**

### SHEET 2: PLANAR KINEMATICS OF RIGID BODIES: BASIC VELOCITY AND ACCELERATION CALCULATIONS

1. The triangle below is rotating about O. Find the magnitude of the velocity and acceleration at A and B at the instant shown, and show a sketch with the velocity and acceleration vectors directions. OA=1.5 m, OB=2.2 m.

[v_A=7.5 m/s ; v_B=11 m/s ; a_A=37.62 m/s^2 ; a_B =55.18 m/s^2]


2. The rectangular plate shown below is rotating with clockwise angular speed of 8 rad/s at the moment it is pictured. If the velocity of corner A is 2 m/s, find the magnitude and the direction of the velocity at corner B.

[v_B=1.415 m/s]
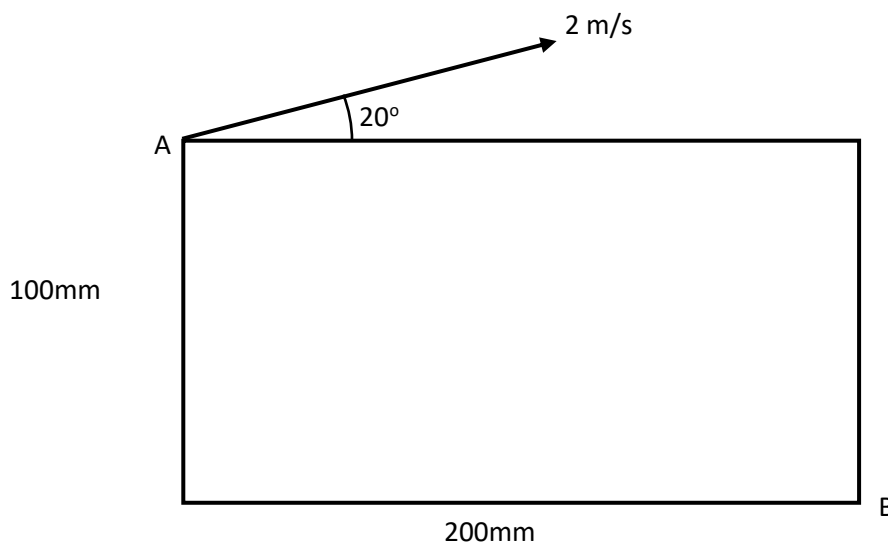
3. Find the velocity and acceleration experienced by a pilot as the plane below "rotates" at take off speed. Assume the pilot sits 9 m above and 36 m in front of the rear landing gear. There is 0.5144 m/s in a knot.

[76.43 m/s; 6.32 m/s²]

5 deg/s

10 deg/s²

150 knots

3m/s²
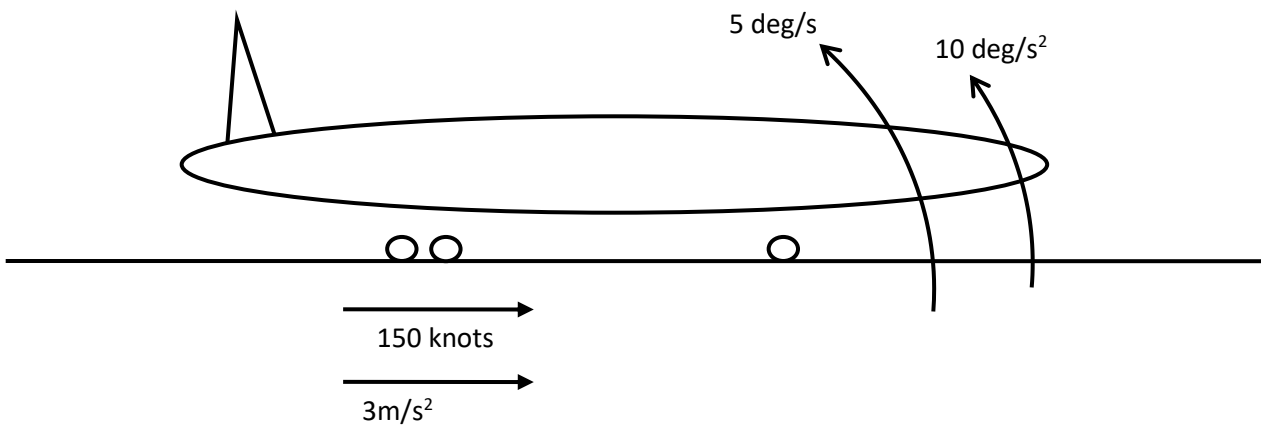
4. Determine the angular velocity of the spool shown below. The cable wraps around the inner core, and the spool does not slip on the platform P. Radius of the spool is 2 m, radius of the inner core is 1 m. Velocity of the platform is 1 m/s, velocity of the cable is 3 m/s.
[4/3 rad/s]

2 m

3 m/s

B

O

1 m

1 m/s

A

P
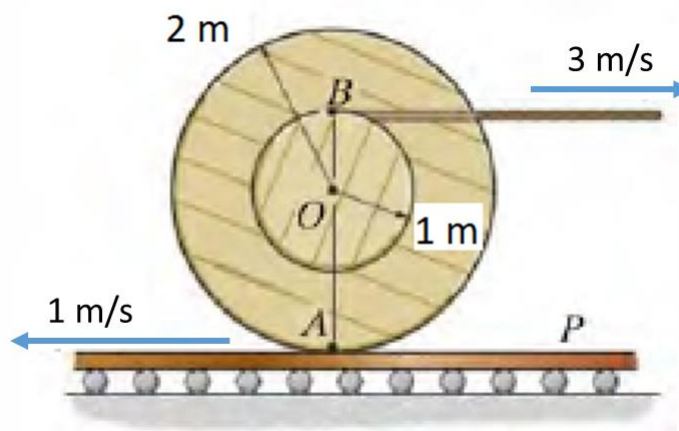
5. The bicycle has a velocity v=5 m/s, and at the same instant the rear wheel has a clockwise angular velocity ω = 3 rad/s, which causes it to slip at its contact point A. Radius of the rear wheel is 0.6 m. Determine the velocity of point A.
[3.2 m/s]

5 m/s

ω = 3 rad/s

C

0.6 m

A