Name: **Practice Final Exam Problems** _____
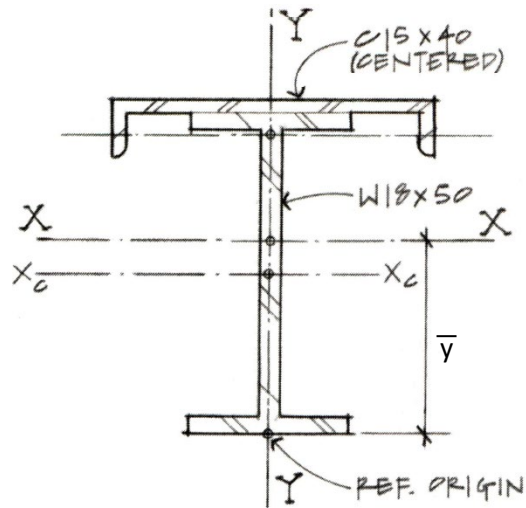
1. Determine the moment of inertia about the centroidal x- and the centroidal y-axes for the shape shown.
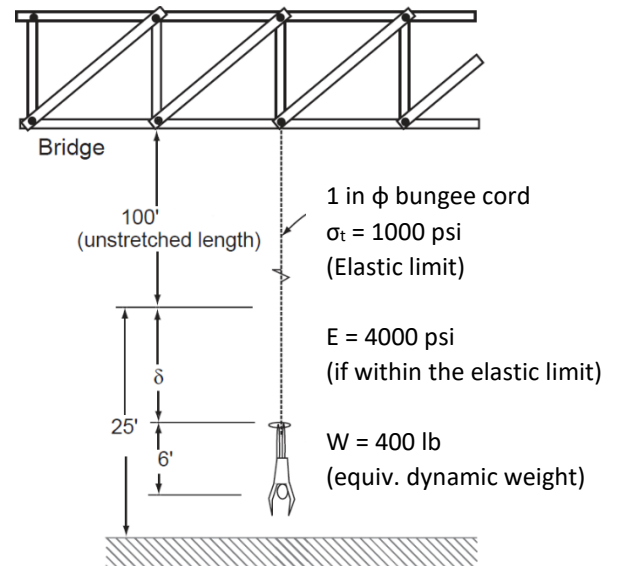

C15 X 40
(CENTERED)

W18x50

X

X_c

$\overline{y}$

Y — REF. ORIGIN

X-X Axis

Part	A (in²)	y (in)	Ay (in³)	$\overline{y} - y$ (in)	$A(\overline{y} - y)^2$ (in⁴)	I (in⁴)

Y-Y Axis

| Part	A (in²)	x (in)	Ax (in³)	$\overline{x} - x$ (in)	$A(\overline{x} - x)^2$ (in⁴)	I (in⁴)

2. A bungee jumper is using a 1" ϕ cord that has a lot of 'give'. If the jumper has an estimated equivalent 'dynamic' weight of 400 lb, determine the following:

A) the maximum elongation that would occur

B) is the stress developed in the cord within the elastic limit?

C) does the jumper 'bonk' his head or does he survive?

Bridge

100'
(unstretched length)

1 in ϕ bungee cord
σ_t = 1000 psi
(Elastic limit)

E = 4000 psi
(if within the elastic limit)

δ

25'

6'

W = 400 lb
(equiv. dynamic weight)

3. A 24 ft long girder supports three equal concentrated loads at quarter points. Determine the flexural stress if the girder is a W12x35 section. Use A36 Steel. Is the section adequate?

8 kips   8 kips   8 kips

A   6'   6'   6'   6'   B
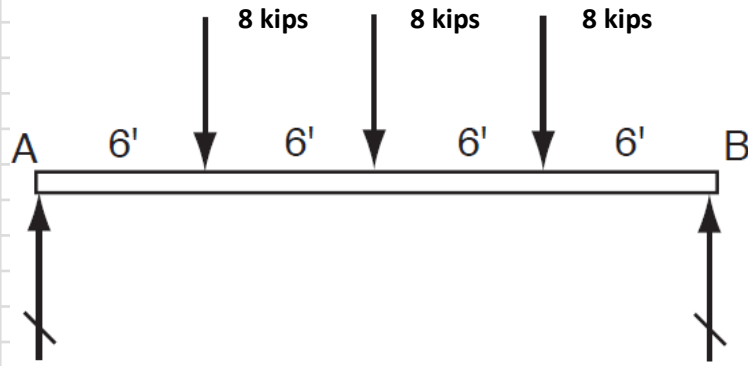
4. An outdoor deck in a mountainous region is supported by Western Red Cedar No. 2 grade joists. The joists are cantilevered 3 ft at one end. If the snow load on each joist is 120 lb/ft (including the joist weight), determine the required size for the joist based on bending and shear. σ_{Allow} = 900 psi and τ_{Allow} = 75 psi

$$\omega = 120 \text{ lb/ft}$$

A

B

3'

10'

Ay = 1014 lb

By = 546 lb
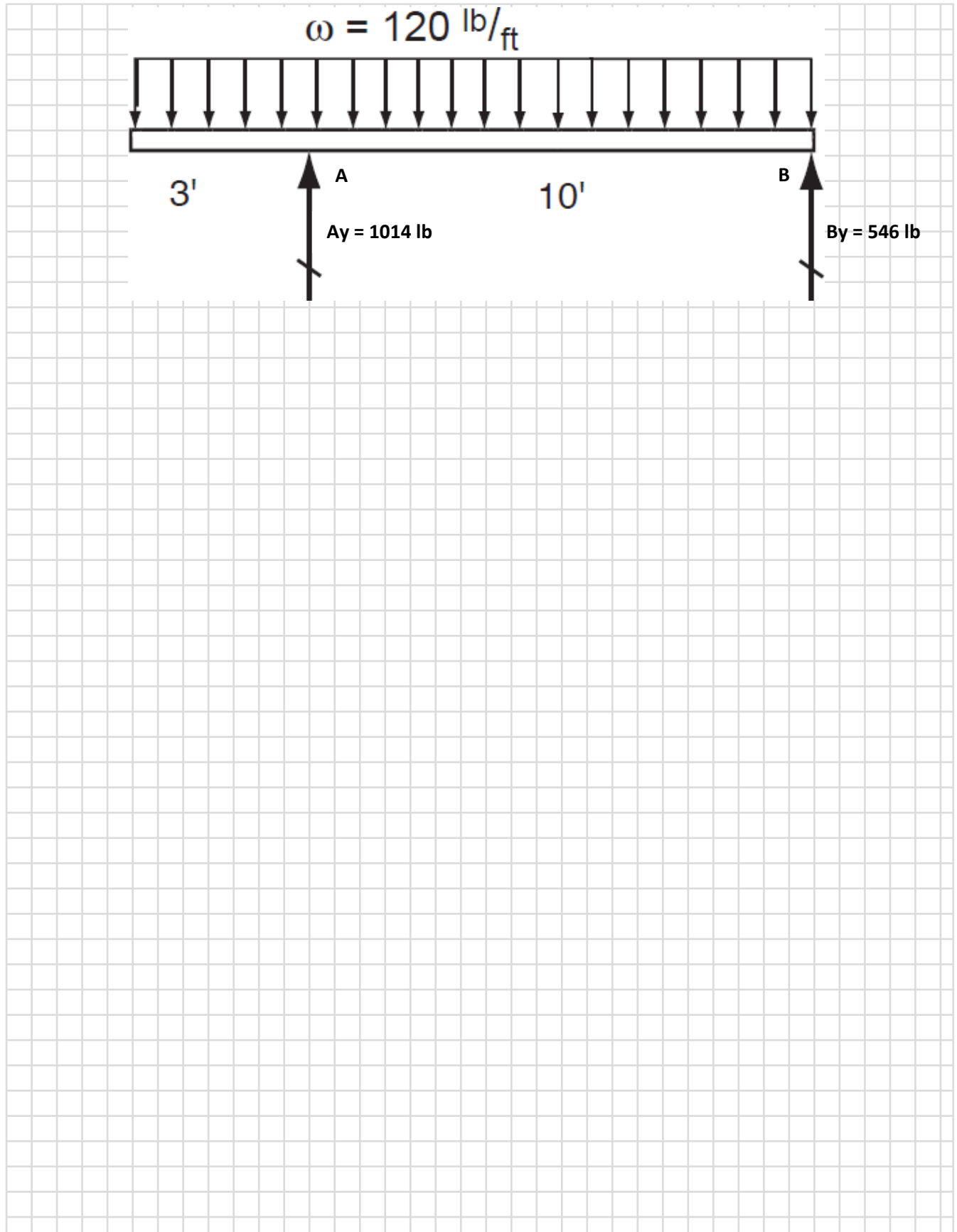
5. A 15-passenger elevator in a 15-story building is raised by using a 1 in. steel rope. Assuming that the city code requires a factor of safety of 11 against the ultimate strength of the rope, check the adequacy of the rope and its elongation.

1 in diameter rope

Net resisting area	= 0.523 in.^{2}
Ultimate Strength	= 27 tons = 54 Kips
Rope wt.	= 2.0 lb/ft
Rope Length	= 14 stories of rope plus 10 ft to pulley

Loads on Rope:

15 passengers @150 lb ea.	= 2,250 lb
15-passenger elevator cab	= 1,250 lb
Rope length = 14 ft x 10 ft/story + 10 ft (to pulley) = 150 ft x 2lb/ft	= <u>300 lb</u>
P =	3,800 lb

ELEVATOR
CABLE –
1"∅ STEEL
ROPE

15 STORY BUILDING