



## **HOMEWORK ANSWERS**

dcm 9/2/2025

### **Answers to Homework Problems**

*These partial answers will help determine whether you are on track. Some have been rounded.*

#### Homework 1

(1) The rounded result of  $9812/1000$  is 10 and has 1 significant figure, (3c)  $10 \text{ m}^3$ , (4) 7.0 psi, (5c) 2.9 psi, (6b)  $A = 54 \text{ in}^2$

#### Homework 2

~~(1) 15 mm~~, (31)  $6 \times 10^{-5} \text{ ft}^2/\text{s}$ , (42b) 320 N, (53)  $\mu = 368 \text{ Ns/m}^2$ , (64a)  $P_{\max} = 846 \text{ lb/ft}^2$ , (86b) 13.7 psi

#### Homework 3

(2)  $F = 6.1 \times 10^5 \text{ N}$ , (3a) 920 lb, (4) 590 kN, (5) 430 N

#### Homework 4

(1a) 42 kg, (2a) 25,000 lb, (3) 170 tons\*, (4d) 2300 lb, (5)  $4032 \text{ m}^3$ , (6)  $15 \text{ ft}^3$

#### Homework 5

(4a)  $Re = 400$ , (5a) 40-44 cfs, (5b) 2.7 ft/s

#### Homework 6

(1c) 60 minutes, (2a) The mass flow rate at duct 1 is  $0.144 \text{ kg/s}$ , (3)  $1.1 \text{ kg/min}$ , (4d)  $0.13 \text{ m/s}$ , (6b) Total head = 28 m

#### Homework 7

(1) 1.1 psi, (2)  $0.69 \text{ m/s}$ , (3)  $V_A = 14 \text{ m/s}$ , (4) EGL drops and HGL rises at junction, (5) velocity head increases and pressure head decreases, (6) results will vary.

#### Homework 8

(1) 320 hp, (2a)  $1.7 \times 10^5 \text{ W}$ , (3a) 40 hp, (4b) 19%, (6)  $13 \text{ m/s}$ , (7)  $V > 14 \text{ m/s}$

#### Homework 9

(2d) 430 lb, (3) 0.43 lb, (4)  $F = 52 \text{ lb}$ , (5) 31 mph

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\* Could be 180 tons depending on scaling vertical projection from diagram. Answer in two significant figures.

#### Homework 10

3 At point D, the HGL is – 3 ft.

4 At point F, the HGL is 8 ft.

#### Homework 11

(1) 390 ft

#### Homework 12

(1) short response, (2) short response, (3d) 86%, (4) 87 ft/s, (5c)  $D = 0.16$  mm

#### Homework 13

(1a) 8 m/s, (2)  $Q = 0.0063$  cfs, (3) 1.05 m, (4c)  $D = 1.0$  mm, (5) There are 3  $\Pi$  groups

#### Homework 14

(3b)  $V = 2.3$  m/s, (4a)  $R_h = 0.75$  ft, (5b) Option 1, \$680K/year; Option 2, \$2.4M/year; Option 3, \$470K/year