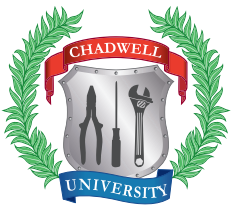


# CERTIFIED POOL OPERATOR (CPO) COURSE



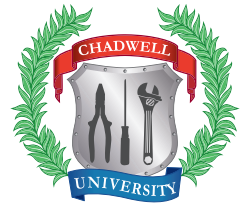
# CERTIFIED POOL OPERATOR (CPO)

## COURSE AGENDA - DAY 1

TIME	CHAPTER	TOPIC
8:30 - 9:00	-	Introduction & Housekeeping
9:00 - 9:15	1	Pool & Spa Management
9:15 - 10:15	3	Calculations
10:15 - 10:30	-	Break
10:30 - 10:45	4	Water Contamination
10:45 - 11:30	6	Water Balance
11:30 - 12:00	5	Water Problems & Dosage (pt. 1)
12:00 - 12:30	-	Lunch
12:30 - 1:00	5	Water Problems & Dosage (pt. 2)
1:00 - 2:00	8	Disinfection
2:00 - 2:30	12	Chemical Testing
2:30 - 2:45	-	Break
2:45 - 3:00	7	Chemical Feed & Control
3:00 - 4:15	9-10	Water Circulation & Filtration
4:15 - 4:30	-	Review and Q & A

# CERTIFIED POOL OPERATOR (CPO)

## COURSE AGENDA - DAY 2

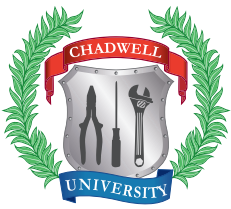


TIME	CHAPTER	TOPIC
8:30 - 9:00	3,8,9,10	Review Calculations
9:00 - 10:15	15	Spas & Therapy Pools
10:15 - 10:30	-	Break
10:30 - 11:00	14	Facility Safety
11:00 - 11:30	2	Regulations (Codes) Guidelines
11:30 - 12:00	13	Record Keeping
12:00 - 12:30	-	Lunch
12:20 - 1:00	16	Maintenance & Troubleshooting
1:00 - 1:15	11	Heating & Air Circulation
1:15 - 1:30	18	Facility Renovations & Design
1:30 - 2:15	-	Review and Q & A
2:15 - 2:30	-	Break
2:30 - 4:30	-	Exam (75% Minimum)

### **Instructor Contact Information:**

Vann Flippen C.P.O.I., M.R.S., NAA Faculty  
Chadwell Supply  
Vann.flippen@chadwellsupply.com  
Cell: 321-436-5677





# CERTIFIED POOL OPERATOR (CPO)

## HELPFUL SWIMMING POOL CALCULATIONS

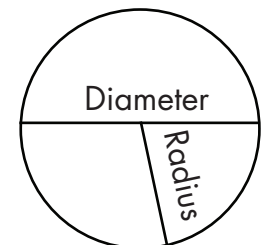
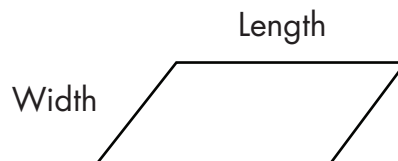
### Pool/Spa Equivalent Measures

1 Cubic Foot (cu. ft.) of Water contains 7.5 gallons	or	# cu. ft. x 7.48 = # gallons
1 Cubic Foot (cu. ft.) of Water weighs 62.4 pounds	or	#cu. ft. x 62.4 = # pounds of water
1 Gallon of Water Weighs 8.33 pounds	or	# gallons x 8.33 = # pounds of water
1 Gallon of Water Contains 128 fl. Oz	or	# fl. Oz. ÷ 128 = # gallons
1 Pound Contains 16 dry ounces	or	# ounces ÷ 16 = # pounds
1 Yard contains three (3) feet	or	# yards x 3 = # feet
1 Meter contains 3.28 feet	or	# meters x 3.28 = # feet
1 ppm is One Part Million	or	one divided by one million (1 ÷ 1,000,000)

Pump resistance is measured in Feet of Head; 1 pound/sq. in. is the pressure created by a column of water 2.31 High and is equal to 2.31 Feet of head.

### Determining Pool Surface Area

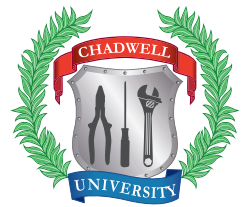
Rectangular Pool: Area = Length x Width



Circular Pool: Area =  $\pi \times r^2$

$\pi = 3.14$ ;  $r^2 =$  radius times itself;  $d =$  diameter;  $r =$  radius (half diameter)

# CERTIFIED POOL OPERATOR (CPO)



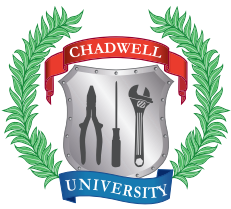
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APPENDIX J

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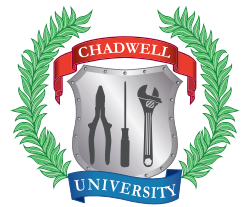
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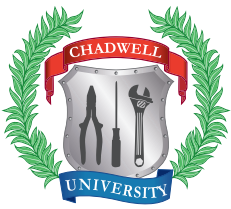
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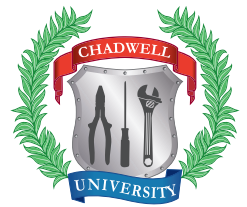
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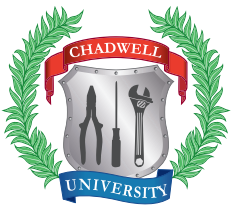
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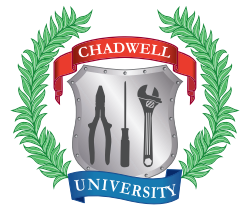
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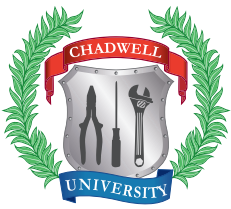
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# CERTIFIED POOL OPERATOR (CPO)

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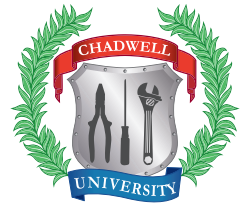
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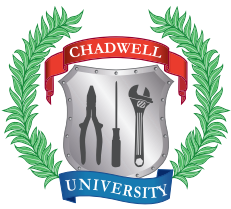
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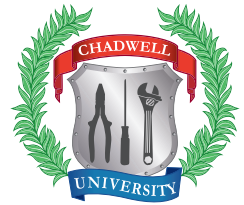
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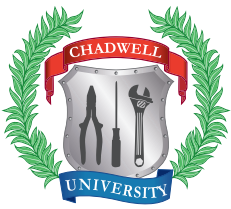
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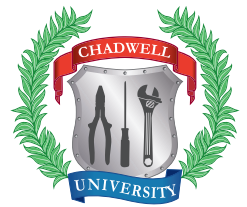
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# CERTIFIED POOL OPERATOR (CPO)



## BREAKPOINT CHLORINATION



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**Step 2:** Combined Chlorine X 10 = Breakpoint Amount

**Step 3:** Breakpoint Amount - Free Chlorine = Chemical Change

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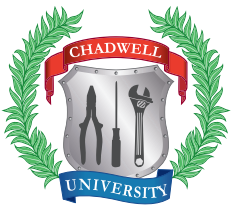
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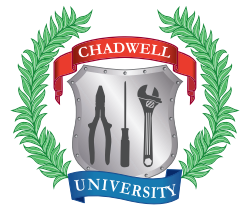
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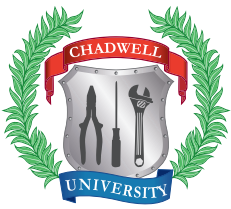
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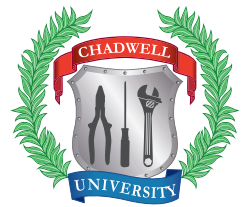
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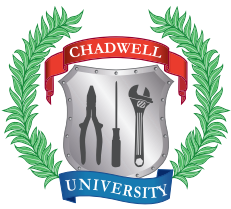
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# CERTIFIED POOL OPERATOR (CPO)

## WATER BALANCE RANGES

### **TOTAL ALKALINITY**

MEASURE OF RESISTANCE TO CHANGE OF pH

RANGE: 60 PPM - 150 PPM

IDEAL: 80 PPM - 120 PPM

### **pH**

MEASURE OF ACID VS. BASE

RANGE: 7.2 - 7.8

IDEAL: 7.4 - 7.6

### **CALCIUM HARDNESS**

MEASURE OF CALCIUM IONS IN WATER

RANGE: 150 PPM - 1000 PPM

IDEAL: 200 PPM - 400 PPM

### **TEMPERATURE**

POOLS: COMPETITION 78 ° - 80 °

RECREATION 82 ° - 84 °

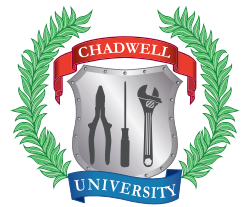
SPECIAL POPULATION 86 ° - 88 °

SPAS: NOT TO EXCEED 104 °

### **TOTAL DISSOLVED SOLIDS**

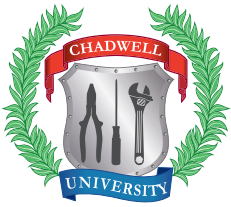
MEASURE OF ALL MINERALS DISSOLVED IN THE WATER

# CERTIFIED POOL OPERATOR (CPO)



## CALCULATIONS HOMEWORK

1. What is the *surface area* of a circular spa with a 12 foot diameter?
2. What is the *volume* of a circular spa with a 12 foot diameter and a constant depth of 3 feet?
3. What is the *surface area* of a rectangular pool with a length of 10 meters and a width of 25 feet?
4. What is the *volume* of a rectangular pool with a length of 32 feet, a width of 25 feet and a depth ranging from 3 feet in the shallow end to 6 feet in the deep end?
5. What is the *surface area* of a rectangular pool with a length of 10 yards and a width of 30 feet?
6. What is the *volume* of a rectangular pool with a length of 60 feet, a width of 30 feet, and a depth ranging from 3 feet in the shallow end to 7 feet in the deep end?
7. Calculate the *Saturation Index* for water that has a total alkalinity of 120 ppm, a pH of 7.6, a calcium hardness of 400 ppm, a temperature of 104°F, and a total dissolved solids of 880 ppm. If it is not balanced, fix it.
8. Calculate the *Saturation Index* for water that has a total alkalinity of 50 ppm, a pH of 7.0, a calcium hardness of 120 ppm, a temperature of 82°F, and a total dissolved solids of 400 ppm. If it is not balanced, fix it.
9. Calculate the *Saturation Index* for water that has a total alkalinity of 30 ppm, a pH of 7.0, a calcium hardness of 100 ppm, a temperature of 104°F, and a total dissolved solids of 600 ppm. If it is not balanced, fix it.
10. Adjust the ALKALINITY from 40 ppm to 100 ppm in a 2,500 gallon spa.
11. Neutralize the FREE CHLORINE from 7 ppm to 3 ppm in a 20,000 gallon pool. Use Sodium Thiosulfate.
12. Adjust the CALCIUM HARDNESS from 120 ppm to 200 ppm in a 60,000 gallon pool. Use Calcium Chloride 77%.



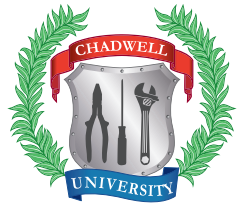
# CERTIFIED POOL OPERATOR (CPO)

## CALCULATIONS HOMEWORK

13. How much CALCIUM HYPOCHLORITE is needed to breakpoint chlorinate a 40,000 gallon pool if the free chlorine is 0.6 ppm and the total chlorine is 1.5?
14. How much SODIUM HYPOCHLORITE is needed to breakpoint chlorinate a 75,000 gallon pool if the free chlorine is 0.8 ppm and the total chlorine is 1.5?
15. How much LITHIUM HYPOCHLORITE is needed to breakpoint chlorinate a 50,000 gallon pool if the free chlorine is 1.2 ppm and the total chlorine is 1.5?
16. What is the *turnover rate* of a 150,000 gallon pool with a flow rate of 300 gpm?
17. What is the *flow rate* of a 50,000 gallon pool based on an 8 hour turnover rate?
18. What is the *filter surface area* needed for a *high-rate sand* filter if the flow rate is 313 gpm?
19. What is the *turnover rate* of a 40,000 gallon pool with a flow rate of 120 gpm?
20. What is the *flow rate* of a 115,000 gallon pool based on a 6 hour turnover rate?
21. What is the *filter surface area* needed for a *diatomaceous earth* (DE) filter if the flow rate is 64 gpm?
22. You are a CPO® for a pool that is 115 feet long and 24 meters wide. The pool is divided into two areas: a swimming area and a diving well. The swimming area is 25 yards long with a depth ranging from 4 feet to 9 feet with a constant slope. The diving well begins at 9 feet deep and slopes down to 4 yards deep for the next 3 meters. The remaining 30.16 feet of the diving well has a constant depth of 4 yards. What is the water *volume* of this facility?

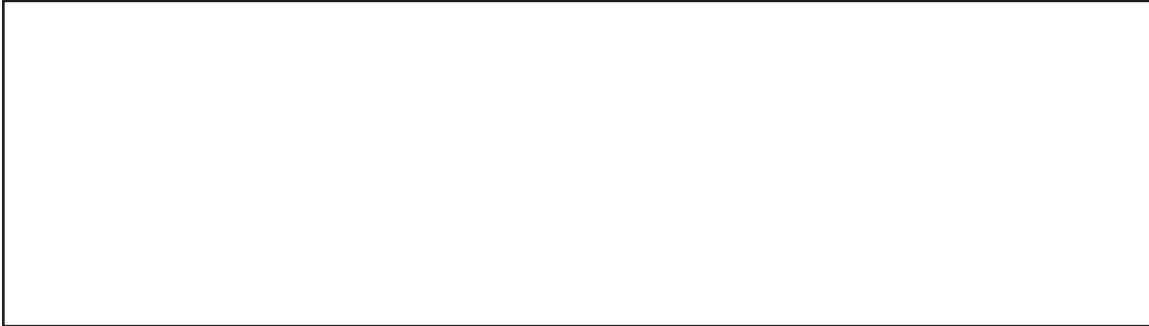


# CERTIFIED POOL OPERATOR (CPO)

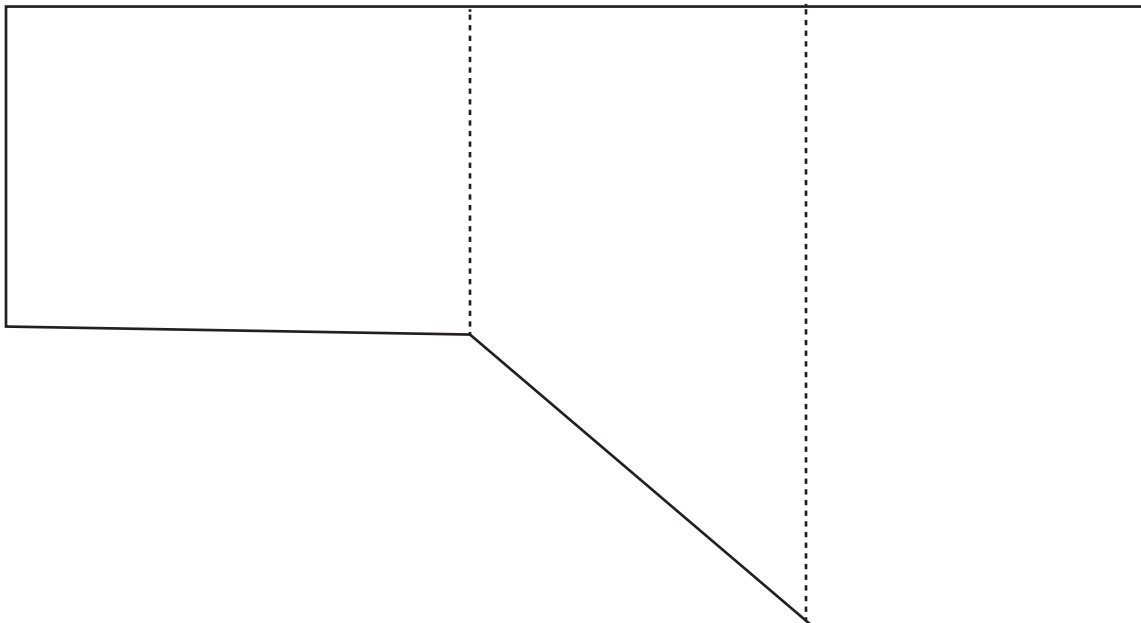


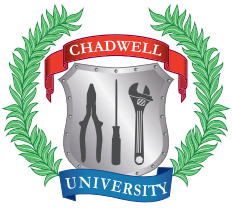
## WORKSHEET

Top View:



Side View:

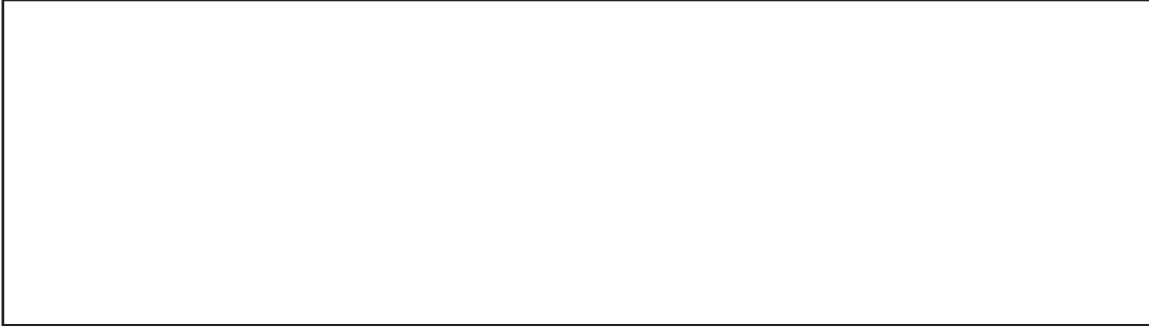




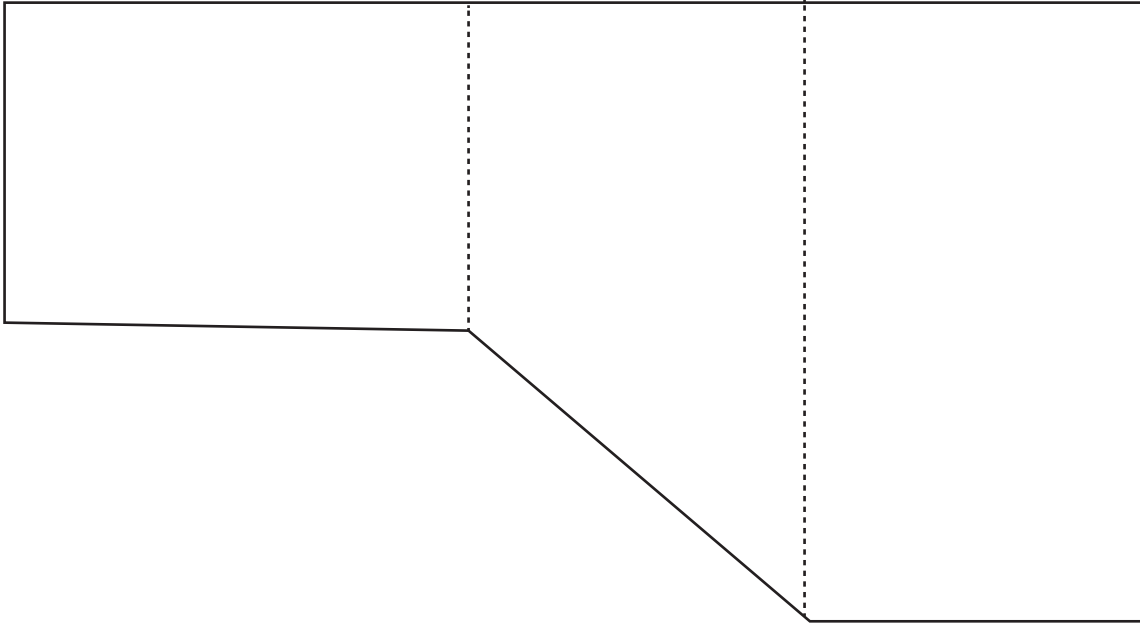
# CERTIFIED POOL OPERATOR (CPO)

## WORKSHEET

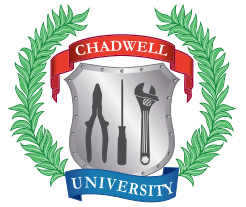
Top View:



Side View:

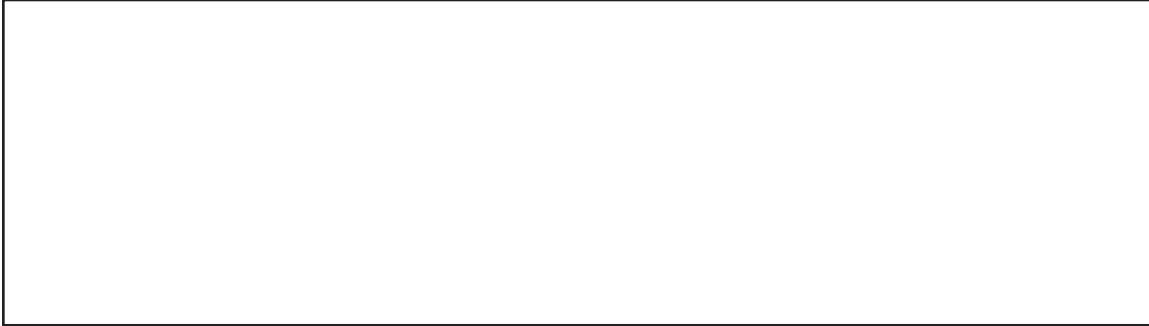


# CERTIFIED POOL OPERATOR (CPO)

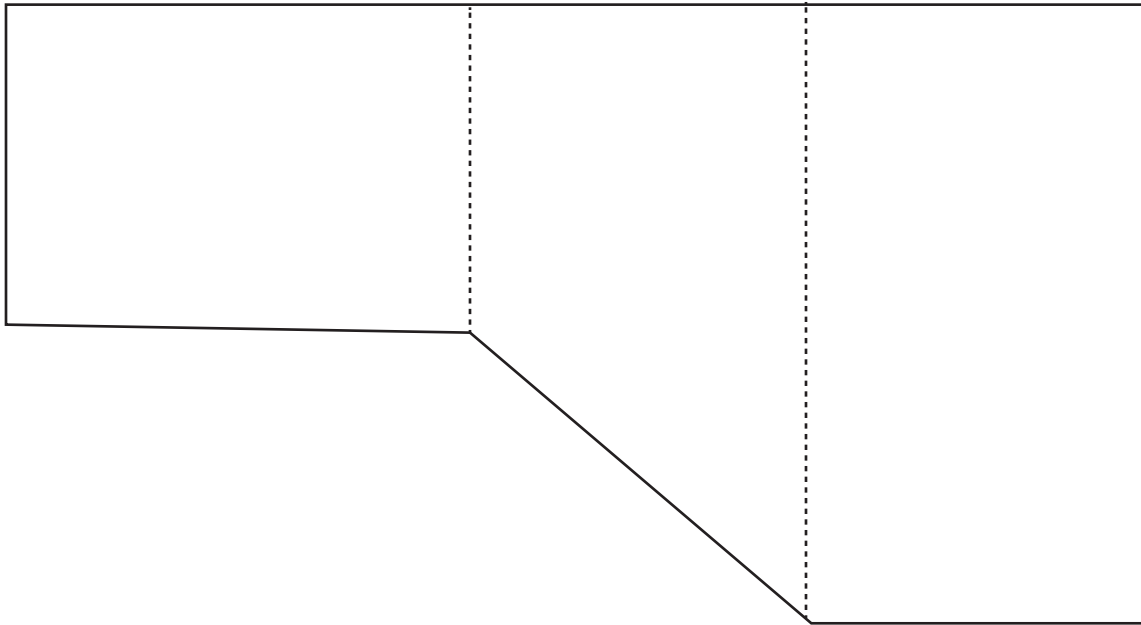


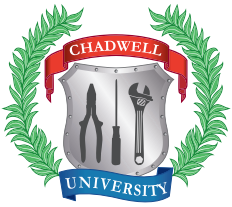
## WORKSHEET

Top View:



Side View:

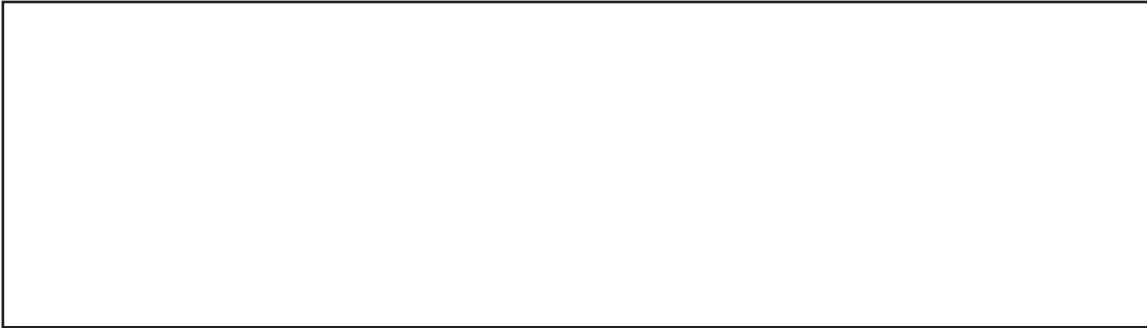




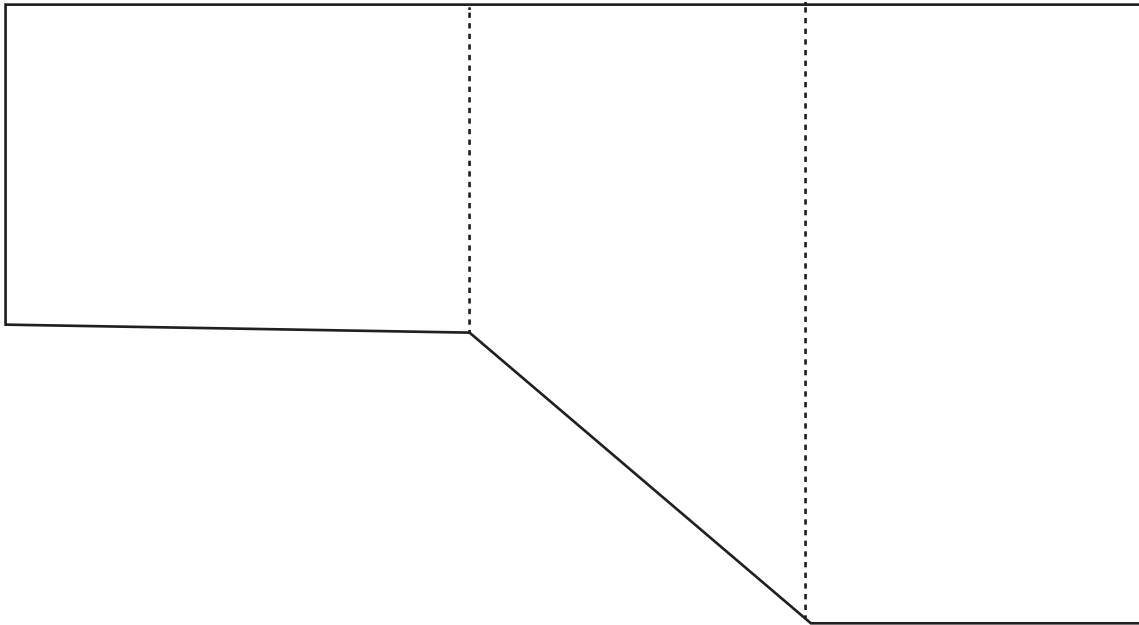
# CERTIFIED POOL OPERATOR (CPO)

## WORKSHEET

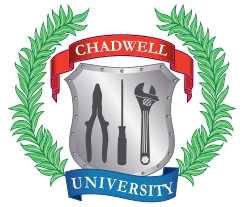
Top View:



Side View:

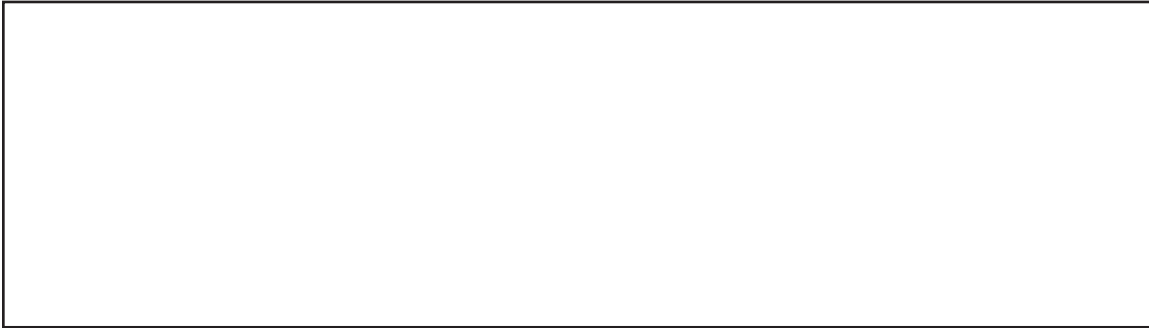


# CERTIFIED POOL OPERATOR (CPO)

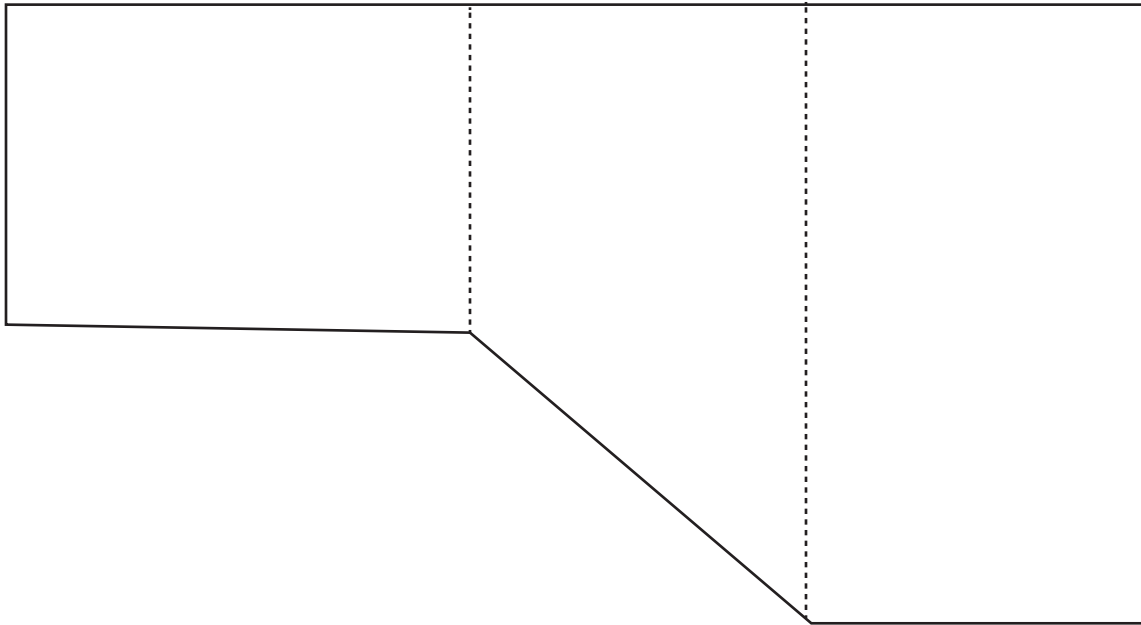


## WORKSHEET

Top View:



Side View:



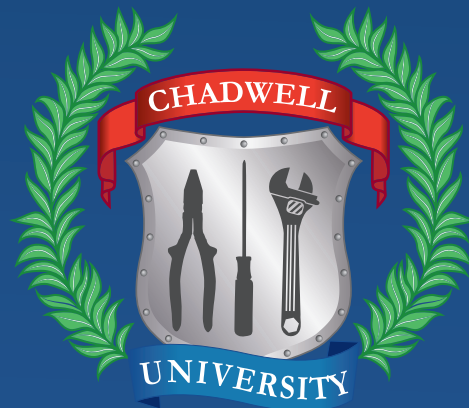






## Classes Offered by Chadwell University:

- ✓ Certified Pool Operator (CPO) Certification
- ✓ EPA608 Certification
- ✓ HVAC Industry Changes
- ✓ HVAC Introduction (A-Z)
- ✓ HVAC Low-Voltage Hands On Training
- ✓ R410A Certification
- ✓ Maintenance for Managers
- ✓ Safety Awareness



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