Summary of Variations of WDC Math Problems			
Type of Problem	**Example**	**Equation**	**Variations**
Calculate chlorine demand	Four mg/L of chlorine is used to disinfect a well that pumps at 25 gallons a minute. The chlorine residual is 0.3 mg/L after a 30-minute contact time. What is the chlorine demand of this well?	? Chlorine Demand = Dose - Residual ? Chlorine Demand = 4.0 - 0.3 = 3.7 mg/L	NONE
Determining length of time to fill storage tank	A well has the capacity to pump 300 gallons per minute. An operator has a daily water demand of 25,000 gallons a day. How many minutes is it necessary to operate the well pump to store a 1-day supply?	? mins = Daily Water Demand / Pump capacity ? mins = 25,0000 / 300 = 83.3 mins	NONE
Determining # of Days of Supply based on Customer Demand (gal/hr)	An operator loses power because of an ice storm. There are 9,000 gallons of water in the storage tank. The customer demand is 175 gallons per hour. Approximately how many days of supply are available?	? days = Storage Tank Volume / 24 hrs X Pump Capacity (gal/hr) ? days = 9000 / 24 hrs X 175 = 9000 / 4200 ? days = 2.14 days	NONE

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Using "active ingredient" weight to dilute solution for day tank	How many gallons of 15% sodium hypochlorite solution does it take to mix a 6% chlorine solution in a 100-gallon tank? There are 1.63 lbs of chlorine per gallon of 15% sodium hypochlorite solution. (e.g., "active ingredient" weight)	**Step 1:** Determine lbs of diluted solution ? lbs = 8.34 X day tank volume X diluted% (as a decimal) = 8.34 X 100 X 0.06 = 50.04 lbs **Step 2:** Convert "lbs" to "gal" using active ingredient wt ?gal = lbs needed for diluted solution (calculated in Step 1) / active ingredient weight ? gal = 50.04 = 30.7 gals 1.63	NONE
Feed Rate: Using "active ingredient" weight to determine "gals/day" from "lbs/day" feed rate. **(Davidson Pie Equation #1)**	A water plant uses sodium hypochlorite (12%) to disinfect the water which provides 1.2 lbs/gal of available chlorine ("active ingredient" weight). The required dosage is 2.5 mg/L. They treat 35,000 gallons per day. How many **gallons** of sodium hypochlorite will need to be fed?	**Step 1:** Solve for "lbs/day" for pure chlorine ?lbs/day = Flow (MGD) x Dose x 8.34 ?lbs/day = 0.035 X 2.5 X 8.34 = 0.73 lbs/day **Step 2:** Convert "lbs" to "gal" using active ingredient wt ?gal = lbs of pure chlorine (calculated in Step 1) / active ingredient weight ?gal / day = 0.73 / 1.2 = 0.6 gal / day	**Flow given in GPD:** Convert flow into MGD before using in feed rate equation: MGD = GPD ÷ 1,000,000 35,000 ÷ 1,000,000 = 0.035 MGD

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Refilling a day tank based on daily feed pump rate	A water plant operator mixes 4 gallons of 12.5% hypochlorite solution in a 30-gallon day tank. If the feed pump uses 10 gallons of the solution in a 24-hour period, how many gallons of 12.5% solution must be added with water to refill the day tank to its 30-gallon capacity?	Original Mixing Volume / Day Tank Volume = X(Unknown volume) / Feed Pump Usage in a day 4/30 = X/10 To get the "X" alone: multiply 4 X 10 = 40 (in the numerator) then divide 40/30 = 1.33 gal	NONE