Free 10-Question Water Math Check

Original practice for drinking water treatment and distribution exam math. November 2026.

> Educational study aid only. Never use these results to dose chemicals or operate a live water treatment or distribution facility. Follow your facility's SOPs, your ORC, and your state primacy agency.

These 10 original problems cover the core calculations that show up on entry-level water treatment and distribution exams. Work each item before reading the solution. Use the companion formula sheet. Unless a problem states otherwise, use the standard exam-convention factors 0.785, 7.48, 8.34, 2.31, 0.433, 1,440, and 3,960.

F01 — Unit Conversions (easy)

A small groundwater plant produces a steady 2.16 million gallons per day. What is this production rate in gallons per minute?

A. 2,160 gpm

B. 1,500 gpm

C. 90,000 gpm

D. 3,110 gpm

Correct answer: B — 1,500 gpm

Formula used: gpm = MGD × 1,000,000 ÷ 1,440 (or MGD × 694.4)

Worked solution

1. Convert million gallons per day to gallons per minute using 1 day = 1,440 minutes.
2. 2.16 MGD × 1,000,000 gal/MG = 2,160,000 gal/day.
3. 2,160,000 gal/day ÷ 1,440 min/day = 1,500 gpm.
4. The same result comes from 1 MGD = 694.4 gpm (1,000,000 ÷ 1,440).
5. The closest listed choice is B.

Tank/Pipe Area & Volume

Official Sources · Verified as of November 2026. Public pages only, cited for reference; confirm current details at the official source.

Source: Water Professionals International (WPI), *Standardized Water Treatment Operator Exams — Need-to-Know Criteria and Formula/Conversion Table* (as of November 2026). https://gowpi.org/services/abc-testing/standardized-exams/standardized-water-treatment-operator-exams/

Source: Water Professionals International (WPI), *Formula/Conversion Table — Water Treatment, Distribution & Water Laboratory Exams* (2024 edition, as of November 2026). https://gowpi.org/services/abc-testing/formula-conversion-tables/

Source: Water Professionals International (WPI), *Historical Need-to-Know Criteria (2019 standardized water treatment and distribution exams)* (as of November 2026). https://gowpi.org/services/abc-testing/need-to-know-criteria/

Source: Colorado CCWP Office, *CCWP – Need to know criteria and study resources* (as of November 2026). https://cdphe.colorado.gov/ccwp-need-to-know-criteria-and-study-resources

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F02 — Tank/Pipe Area & Volume (medium)

A circular finished-water tank is 40 feet in diameter and holds water to a depth of 20 feet. Using 0.785 for the circular-area factor, what is the volume of water in the tank, in gallons?

A. 25,120 gal

B. 46,974 gal

C. 187,898 gal

D. 751,424 gal

Correct answer: C — 187,898 gal

Formula used: gal = 0.785 × D² × depth × 7.48

Worked solution

1. Circular tank area (exam convention) = 0.785 × D².
2. Area = 0.785 × 40.0² = 0.785 × 1,600 = 1,256.000 ft².
3. Volume = 1,256.000 ft² × 20.0 ft = 25,120.00 ft³.
4. 25,120.00 ft³ × 7.48 gal/ft³ = 187,898 gal.
5. The closest listed choice is C.

Flow & Velocity

F03 — Flow & Velocity (medium)

An 8-inch-diameter distribution main is carrying 400 gallons per minute. What is the flow velocity in the main, in feet per second? Use 0.785 for the area factor.

A. 2.55 ft/s

B. 0.64 ft/s

C. 1.77 ft/s

D. 5.11 ft/s

Correct answer: A — 2.55 ft/s

Formula used: V = Q/A; V = (gpm ÷ 448.8) ÷ (0.785 × (D_in/12)²)

Worked solution

1. Velocity V = Q / A. Convert gpm to cubic feet per second, then divide by area.
2. Q = 400.0 gpm ÷ 448.8 = 0.8913 cfs.
3. Diameter = 8.0 in ÷ 12 = 0.6667 ft.
4. Area = 0.785 × (0.6667)² = 0.34889 ft².
5. V = 0.8913 cfs ÷ 0.34889 ft² = 2.55 ft/s.
6. The closest listed choice is A.

Detention Time

F04 — Detention Time (medium)

A rectangular sedimentation basin is 60 feet long, 20 feet wide, and 12 feet deep. If the basin treats 1.5 MGD, what is the theoretical detention time in hours?

A. 0.072 h

B. 1.92 h

C. 103 h

D. 1.72 h

Correct answer: D — 1.72 h

Formula used: t(h) = (L × W × D × 7.48) ÷ (MGD × 1,000,000) × 24

Worked solution

1. Detention time = tank volume ÷ flow. Convert the volume to gallons and the flow to gal/day.
2. Volume = 60.0 × 20.0 × 12.0 = 14,400 ft³.
3. 14,400 ft³ × 7.48 = 107,712 gal.
4. Flow = 1.50 MGD = 1,500,000 gal/day.
5. t = 107,712 ÷ 1,500,000 = 0.0718 day × 24 h/day = 1.72 h.
6. The closest listed choice is D.

Chlorine Dosage & Pounds Formula

F05 — Chlorine Dosage & Pounds Formula (easy)

A treatment plant produces 2.0 MGD and applies a 2.5 mg/L chlorine dose using 100% available chlorine. How many pounds of chlorine are used each day?

A. 5.0 lb/day

B. 41.7 lb/day

C. 37.4 lb/day

D. 83.4 lb/day

Correct answer: B — 41.7 lb/day

Formula used: lb/day = MGD × dose (mg/L) × 8.34 ÷ purity (decimal)

Worked solution

1. Use the pounds formula: lb/day = Flow (MGD) × Dose (mg/L) × 8.34 lb/gal.
2. 2.00 MGD × 2.50 mg/L × 8.34 = 41.700 lb/day of available chemical.
3. The closest listed choice is B.

Chemical Feed & Solution Purity

F06 — Chemical Feed & Solution Purity (medium)

Operators need to apply a 1.8 mg/L chlorine dose to 0.75 MGD using 65% calcium hypochlorite. How many pounds of calcium hypochlorite are required per day?

A. 11.3 lb/day

B. 7.32 lb/day

C. 17.3 lb/day

D. 0.17 lb/day

Correct answer: C — 17.3 lb/day

Formula used: lb/day = MGD × dose (mg/L) × 8.34 ÷ purity (decimal)

Worked solution

1. Use the pounds formula: lb/day = Flow (MGD) × Dose (mg/L) × 8.34 lb/gal.
2. 0.75 MGD × 1.80 mg/L × 8.34 = 11.259 lb/day of available chemical.
3. The product is 65.0% available, so divide by 0.65: 11.259 ÷ 0.65 = 17.3 lb/day of product.
4. The closest listed choice is C.

Filtration & Backwash

F07 — Filtration & Backwash (easy)

A rectangular filter measures 20 feet by 25 feet and is operated at a surface loading rate of 4.0 gpm/ft². What is the filter flow rate in gallons per minute?

A. 2,000 gpm

B. 200 gpm

C. 500 gpm

D. 4,000 gpm

Correct answer: A — 2,000 gpm

Formula used: flow (gpm) = L × W × rate (gpm/ft²)

Worked solution

1. Filter flow = area × surface loading (or backwash) rate.
2. Area = 20.0 × 25.0 = 500 ft².
3. Flow = 500 ft² × 4.0 gpm/ft² = 2,000 gpm.
4. The closest listed choice is A.

Pressure/Head & Pumps/Horsepower

F08 — Pressure/Head & Pumps/Horsepower (easy)

A pressure gauge on a service tap reads 65 psi. What is the equivalent pressure head, in feet of water?

A. 28.1 ft

B. 65 ft

C. 326 ft

D. 150.2 ft

Correct answer: D — 150.2 ft

Formula used: head (ft) = psi × 2.31

Worked solution

1. Convert pressure to feet of water head: head (ft) = pressure (psi) × 2.31.
2. 65.0 psi × 2.31 ft/psi = 150.2 ft.
3. Using the reciprocal 0.433 psi/ft gives essentially the same result (psi ÷ 0.433).
4. The closest listed choice is D.

Distribution Disinfection & Flushing

F09 — Distribution Disinfection & Flushing (medium)

A crew is preparing to disinfect 1,500 feet of newly installed 12-inch water main at a dose of 25 mg/L. How many pounds of 100% chlorine are required to dose the full volume of the main? Use 0.785 for the area factor.

A. 0.22 lb

B. 1.84 lb

C. 13.7 lb

D. 1.19 lb

Correct answer: B — 1.84 lb

Formula used: lb = [0.785 × (D_in/12)² × L × 7.48 × dose × 8.34 ÷ 1,000,000] ÷ purity

Worked solution

1. Find the main volume in gallons, then apply the pounds formula to that volume.
2. Diameter = 12.0 in ÷ 12 = 1.0000 ft.
3. Area = 0.785 × (1.0000)² = 0.78500 ft².
4. Volume = 0.78500 × 1,500 ft × 7.48 = 8,807.7 gal.
5. lb of chlorine = (8,807.7 gal × 25.0 mg/L × 8.34) ÷ 1,000,000 = 1.836 lb.
6. The closest listed choice is B.

Mixed Exam Scenarios

F10 — Mixed Exam Scenarios (easy)

A clearwell holds 80,000 gallons. If the plant is producing 0.80 MGD, what is the theoretical detention time in the clearwell, in minutes?

A. 100 min

B. 2.4 min

C. 144 min

D. 1,440 min

Correct answer: C — 144 min

Formula used: t(min) = volume (gal) ÷ (MGD × 1,000,000 ÷ 1,440)

Worked solution

1. Convert MGD to gpm, then divide the tank volume by that flow.
2. 0.80 MGD × 1,000,000 ÷ 1,440 = 555.56 gpm.
3. t = 80,000 gal ÷ 555.56 gpm = 144 min.
4. Equivalently: (80,000 ÷ 800,000) × 1,440 = 144 min.
5. The closest listed choice is C.

Answer key (for quick review)

ID	Topic	Answer
F01	Unit Conversions	B. 1,500 gpm
F02	Tank/Pipe Area & Volume	C. 187,898 gal
F03	Flow & Velocity	A. 2.55 ft/s
F04	Detention Time	D. 1.72 h
F05	Chlorine Dosage & Pounds Formula	B. 41.7 lb/day
F06	Chemical Feed & Solution Purity	C. 17.3 lb/day
F07	Filtration & Backwash	A. 2,000 gpm
F08	Pressure/Head & Pumps/Horsepower	D. 150.2 ft
F09	Distribution Disinfection & Flushing	B. 1.84 lb
F10	Mixed Exam Scenarios	C. 144 min

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Written for the exam edition Colorado is administering as of November 2026. Colorado uses standardized WPI (formerly ABC) Water Treatment and Water Distribution examinations for certificate classes, except custom Class S and Class T exams (administered through Colorado CWP/CCWP and the WWFOCB Board). In Aqua Talk (May 6, 2026), the Water and Wastewater Facility Operators Certification Board advised operators not to use WPI's 2025 Need-to-Know Criteria yet, because those criteria are not aligned with the exams Colorado currently administers. Confirm the edition in effect on your exam date with CCWP / the Board.

Developed in conjunction with a Colorado-certified Class A Water Treatment Operator & ORC — Altitude Water LLC.

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