

Practice Test 3

Time Allowed: 4 hours

Passing Score: 70% (88 out of 125 questions correct)

Instructions:

- Read each question carefully and select the BEST answer
- Mark your answers on a separate sheet
- You may use a calculator for mathematical calculations
- Answer all questions - there is no penalty for guessing
- Review your answers if time permits

SECTION 1: PLANNING AND ESTIMATING (Questions 1-19)

1. What is the purpose of a cost-plus contract?

- A. Contractor gets reimbursed for costs plus a fee or percentage for profit
- B. Fixed price regardless of costs
- C. No payment for contractor
- D. Owner pays nothing

2. What is a lump sum contract?

- A. Payment in cash only
- B. Partial payment contract
- C. No written agreement
- D. Fixed total price for all work regardless of actual costs

3. What is the main advantage of a unit price contract?

- A. No measurement needed
- B. Fastest contract type
- C. Payment based on actual quantities of work performed at agreed unit prices
- D. Eliminates all risk

4. What should be included in a project schedule?

- B. All activities, durations, dependencies, and milestones showing project timeline
- C. Only start date
- D. Only end date

5. What is float time in project scheduling?

- A. Amount of time an activity can be delayed without delaying project completion
- B. Time spent floating materials
- C. Break time for workers
- D. Time concrete floats before setting

6. What is a critical path activity?

- A. Activities with longest path
- B. Shortest activities
- C. Easiest activities
- D. Any activity that can be delayed without affecting project completion

7. What does CPM stand for in project management?

- A. Cost Per Material
- B. Contractor Payment Method
- C. Critical Path Method
- D. Concrete Pouring Manual

8. What is a baseline schedule?

- B. Original approved schedule used for measuring progress and changes
- C. Final schedule
- D. Lowest priority schedule

9. What is schedule compression?

- A. Storing schedules in smaller files
- B. Eliminating all activities
- C. Adding more activities
- D. Shortening project duration through crashing or fast-tracking

10. What is the difference between crashing and fast-tracking?

- A. Crashing adds resources to shorten duration; fast-tracking overlaps activities normally done in sequence
- B. They are identical
- C. Crashing is slower
- D. Fast-tracking costs more always

11. What information should be included in meeting minutes?

- A. Weather only
- B. Attendees' personal lives
- C. Attendees, topics discussed, decisions made, and action items with responsible parties
- D. Gossip only

12. What is the purpose of a transmittal?

- B. Formal document tracking and recording submittal or document delivery
- C. Tool for transmitting electricity
- D. Building permit

13. What is a request for proposal (RFP)?

- A. Marriage proposal
- B. Building proposal
- C. Permit proposal
- D. Document requesting detailed proposals from contractors including approach and pricing

14. What is the difference between an RFP and an RFQ?

- A. RFQ (Request for Quotation) seeks price quotes for defined scope; RFP seeks detailed proposals including methodology
- B. No difference
- C. RFP is for materials only
- D. RFQ is for labor only

15. What is bid shopping?

- A. Comparing prices at stores

- B. Shopping for materials
- C. Disclosing bid prices to other bidders to get lower prices (unethical practice)
- D. Legitimate price comparison

16. What is the purpose of a bid bond?

- B. Guaranteeing bidder will enter contract if awarded and provide required bonds
- C. Payment for materials
- D. Insurance policy

17. What is liquidated damages in a construction contract?

- A. Water damage
- B. Damaged materials
- C. Actual proven damages
- D. Predetermined amount owner can deduct for each day project is delayed

18. What is force majeure in contracts?

- A. Military force
- B. Police force
- C. Worker force
- D. Foreign language

19. What is the statute of limitations for construction defect claims?

- A. No time limit
- B. 24 hours

- C. Varies by state and claim type, typically ranging from 2-10 years
- D. Always one year

SECTION 2: FRAMING AND STRUCTURAL COMPONENTS (Questions 20-44)

20. What is the purpose of a vapor retarder under concrete slabs?
- A. Speed up curing
 - B. Preventing ground moisture from migrating into concrete slab
 - C. Adding strength
 - D. Decorative purpose
21. What thickness is typically required for vapor retarder under slabs?
- A. Any thickness works
 - B. 1 inch thick
 - C. Paper thin
 - D. 6 mil (0.006 inch) minimum, 10 mil preferred
22. What material is commonly used as vapor retarder under slabs?
- A. Polyethylene plastic sheeting
 - B. Carpet padding
 - C. Newspapers
 - D. Fabric
23. What is the purpose of welded wire mesh in concrete slabs?

- A. Conducting electricity
- B. Holding concrete together
- C. Temperature control in slab
- D. Communication wires

24. What spacing is typical for welded wire mesh in slabs?

- A. No specific spacing
- B. 6×6 inches (6 inch grid with wire gauge designation)
- C. 24×24 inches
- D. 1×1 inch

25. What is post-tensioned concrete?

- A. Stressed concrete
- B. Angry concrete
- C. Temporary concrete
- D. Concrete with steel cables tensioned after curing to add strength

26. What is a sleeper in floor framing?

- B. Wood member laid flat on concrete providing nailing surface for wood flooring
- C. Bedroom framing
- D. Temporary support

27. What is nominal versus actual lumber dimensions?

- A. They are always identical

B. Nominal is larger

C. Nominal is the name size (2×4); actual is smaller after drying and planing (1.5×3.5)

D. Actual is larger

28. What is the actual dimension of a 2×4 stud?

A. 1.5 inches × 3.5 inches

B. 2 inches × 4 inches exactly

C. 2.5 inches × 4.5 inches

D. 1 inch × 3 inches

29. What is the actual dimension of a 2×6?

A. 2×6 inches exactly

B. 2.5×6.5 inches

C. 1×5 inches

D. 1.5 inches × 5.5 inches

30. What is a cripple stud?

A. Damaged stud

B. Short stud above or below openings (above headers or below sills)

C. Bent stud

D. Rejected stud

31. What is a jack stud also called?

A. Tool stud

- B. Playing card stud
- C. Trimmer stud that supports the header
- D. Temporary stud

32. What is a king stud?

- A. Royal framing member
- B. Largest stud
- C. Decorative stud
- D. Expensive stud

33. What is the purpose of double top plates in wall framing?

- A. Wasting lumber
- B. Decorative appearance
- C. Making walls heavier
- D. Tying walls together, overlapping joints, and distributing loads

34. How should top plate joints be offset?

- B. Joints staggered at least 24-48 inches apart between upper and lower plates
- C. Aligned perfectly
- D. Random placement

35. What is a rake board in roof trim?

- A. Gardening tool
- B. Temporary support

- C. Trim board along sloped roof edge at gable ends
- D. Horizontal board only

36. What is a bargeboard?

- A. Discounted lumber
- B. Temporary board
- C. Foundation board
- D. Sale lumber

37. What is the purpose of a ridge vent?

- A. Decoration
- B. Electrical vent
- C. Plumbing vent
- D. Continuous vent along roof ridge allowing hot air to escape from attic

38. What is the recommended ratio of intake to exhaust ventilation in attics?

- B. Equal intake and exhaust (1:1 ratio) for balanced ventilation
- C. More exhaust than intake
- D. No specific ratio needed

39. What is a clerestory window?

- A. Window near floor
- B. Basement window
- C. High window near ceiling or roof bringing in light and ventilation

D. Decorative window only

40. What is a light in window terminology?

A. Window glass pane

B. Window frame

C. Window screen

D. Window treatment

41. What is a muntin in window construction?

B. Bar dividing glass panes within a sash

C. Window frame

D. Window screen

42. What is a sash in window terminology?

A. Window decoration

B. Window covering

C. Window screen

D. Movable frame holding glass panes that opens and closes

43. What is a casement window?

A. Window that slides up and down

B. Fixed window

C. Window hinged on side that swings open like a door

D. Window that slides sideways

44. What is an awning window?

- A. Window hinged at top swinging outward
- B. Window with fabric cover
- C. Fixed window
- D. Sliding window

SECTION 3: CORE TRADES (Questions 45-82)

45. What is the purpose of a shutoff valve?

- A. Decoration
- B. Measuring water flow
- C. Heating water
- D. Allowing water supply to individual fixtures or sections to be shut off for repairs

46. What is a ball valve?

- C. Baseball equipment
- D. Valve using ball with hole; quarter turn opens or closes flow

47. What is a gate valve?

- A. Valve with gate that raises or lowers to control flow (full open or closed operation)
- B. Entrance valve
- C. Security valve
- D. Fence valve

48. What is the difference between a ball valve and gate valve?

- A. Ball valves are faster to operate
- B. Ball valves for quarter-turn operation; gate valves for gradual flow control
- C. They are identical
- D. Ball valves are older technology

49. What is a mixing valve?

- A. Concrete mixer
- B. Paint mixer
- C. Kitchen appliance
- D. Valve blending hot and cold water to desired temperature

50. What is a pressure balance valve in showers?

- A. Valve maintaining consistent water temperature despite pressure changes
- B. Pressure gauge
- C. Decorative valve
- D. Shut-off valve

51. What is cross-contamination in plumbing?

- A. Mixing brands
- B. Installing wrong materials
- C. Bad installation
- D. Potable water contaminated by non-potable water or waste

52. What is potable water?

- A. Water you can carry
- B. Safe water for drinking and cooking
- C. Hot water only
- D. Decorative water feature

53. What is grey water?

- A. Discolored water
- B. Concrete water
- C. Wastewater from sinks, showers, and laundry (not toilets) potentially reusable for irrigation
- D. Rainwater

54. What is black water?

- A. Dirty water
- B. Dark colored water
- C. Night water
- D. Industrial water

55. What is a backwater valve?

- A. Reverse valve
- B. Valve preventing sewer backup from flowing into building
- C. Decorative valve
- D. Water heater valve

56. What does the electrical term "ampacity" mean?

- A. Amplifier capacity
- B. Ampere location
- C. Amp color
- D. Maximum current a conductor can carry continuously without exceeding temperature rating

57. What factors affect wire ampacity?

- A. Wire color only
- B. Day of week
- C. Wire size, insulation type, ambient temperature, and installation method
- D. Building age

58. What is voltage drop in electrical circuits?

- A. Decrease in voltage along wire length due to resistance
- B. Power outage
- C. Voltage increase
- D. Electrical spike

59. What causes excessive voltage drop?

- A. Wire too short
- B. Too much voltage
- C. Perfect installation
- D. High quality wire

60. What is the maximum recommended voltage drop for branch circuits?

- A. No limit
- B. 50%
- C. 25%
- D. 3% for optimal performance

61. What is a GFCI circuit breaker versus a GFCI receptacle?

- A. They are identical
- B. Breakers are cheaper
- C. GFCI breaker protects entire circuit; GFCI receptacle protects only downstream outlets
- D. Receptacles protect whole circuit

62. What is an electrical load calculation?

- A. Calculating wire weight
- B. Weighing electrical boxes
- C. Truck loading
- D. Panel weight

63. What is demand factor in electrical calculations?

- A. Customer demands
- B. Percentage of connected load expected to operate simultaneously
- C. Required power
- D. Peak demand only

64. What is a multimeter used for?

- A. Measuring length
- B. Weighing materials
- C. Counting items
- D. Measuring voltage, current, and resistance in electrical circuits

65. What is continuity testing?

- A. Testing if path exists for electrical flow
- B. Personality testing
- C. Checking if electrical path is complete and unbroken
- D. Schedule testing

66. What is a heat pump's heating efficiency measured by?

- A. HSPF (Heating Seasonal Performance Factor)
- B. SEER only
- C. BTU only
- D. Watts

67. What is a split system in HVAC?

- A. Broken system
- B. Shared system
- C. Half system
- D. System with outdoor unit (condenser) and indoor unit (air handler) connected by refrigerant lines

68. What is a package unit in HVAC?

- B. All components in single outdoor cabinet
- C. Multiple separate units
- D. Boxed unit

69. What is the purpose of a filter drier in HVAC systems?

- A. Drying filters
- B. Filter storage
- C. Removing moisture and contaminants from refrigerant
- D. Heating filters

70. What is superheat in refrigeration?

- A. Excessive heat
- B. Overheating
- C. Dangerous temperature
- D. Emergency condition

71. What is subcooling in refrigeration?

- A. Not enough cooling
- B. Below zero cooling
- C. Partial cooling
- D. Cooling refrigerant below condensing temperature to ensure only liquid enters expansion device

72. What is the purpose of an expansion valve in HVAC?

- B. Reducing refrigerant pressure and temperature as it enters evaporator coil
- C. Increasing pressure
- D. Heating refrigerant

73. What is a TXV in HVAC systems?

- A. Thermostatic Expansion Valve controlling refrigerant flow based on temperature
- B. Temperature X Variable
- C. Toxic Gas Vent
- D. Thermostat Extra Valve

74. What is the purpose of a float in concrete finishing?

- A. Keeping concrete from sinking
- B. Measuring concrete
- C. Smoothing and leveling concrete surface after screeding
- D. Mixing concrete

75. What is a power trowel used for?

- A. Digging
- B. Finishing large concrete surfaces creating smooth, hard finish
- C. Mixing concrete
- D. Breaking concrete

76. What is trowel burn in concrete finishing?

- A. Hot tool
- B. Fire damage
- C. Overworking concrete surface creating weakened, dusty surface
- D. Proper finishing technique

77. What is the proper time to begin finishing concrete?

- A. After bleed water evaporates and concrete can support weight without leaving impressions
- B. Immediately after pouring
- C. One week later
- D. Before pouring

78. What is bleeding in fresh concrete?

- B. Water rising to surface as heavy particles settle
- C. Concrete leak
- D. Red staining

79. What is alkali-silica reaction in concrete?

- A. Chemical reaction
- B. Mixing error
- C. Decorative finish
- D. Chemical reaction between cement alkalis and reactive silica in aggregate causing expansion and cracking

80. What is efflorescence on concrete?

- A. Decorative pattern
- B. Strength loss
- C. White crystalline deposit on surface from water-soluble salts migrating to surface
- D. Staining technique

81. What is spalling in concrete?

- A. Concrete fragmentation where surface flakes or chips off
- B. Proper finish
- C. Decorative technique
- D. Mixing method

82. What is scaling in concrete?

- A. Measuring concrete
- B. Weighing concrete
- C. Climbing on concrete
- D. Surface deterioration where thin layers peel off, often from freeze-thaw damage

SECTION 4: FINISH TRADES (Questions 83-107)

83. What is the purpose of sanding between paint coats?

- A. Wasting time
- B. Smoothing surface, removing imperfections, and improving adhesion for next coat
- C. Thinning paint
- D. Removing all paint

84. What grit sandpaper is typically used for final sanding before painting?

- A. 36 grit
- B. 500 grit
- C. 24 grit
- D. 150-220 grit

85. What is the difference between oil-based and latex paint?

- A. Oil-based uses petroleum solvents; latex uses water as carrier
- B. They are identical
- C. Color only
- D. Price only

86. What is the purpose of paint conditioner (e.g., Floetrol)?

- A. Cleaning brushes
- B. Thinning paint excessively
- C. Improving flow and reducing brush marks without over-thinning
- D. Paint storage

87. What causes paint to crack or "alligator"?

- A. Perfect application
- B. Applying incompatible coats or new coat before previous coat cures fully
- C. High quality paint
- D. Proper preparation

88. What is the mil thickness of paint?

- A. Military grade
- B. Millimeter
- C. Million parts
- D. Thousandth of an inch measuring wet or dry paint film thickness

89. What is wet edge technique in painting?

- A. Painting near water
- B. Wet surface preparation
- C. Maintaining wet leading edge while painting to blend brush/roller strokes
- D. Spraying only

90. What is cutting in when painting?

- A. Cutting paint cans
- B. Thinning paint
- C. Mixing colors
- D. Painting edges and corners with brush before rolling large areas

91. What is back-rolling in painting?

- A. Rolling backward
- B. Paint storage
- C. Paint removal
- D. Second coat immediately

92. What is the purpose of thinset mortar in tile installation?

- A. Thin tiles
- B. Temporary adhesive
- C. Grout substitute
- D. Adhesive bonding tile to substrate

93. What is the open time of thinset?

- C. Time thinset remains workable for tile placement before skinning over
- D. Store hours

94. What is lippage in tile installation?

- A. Tile color variation
- B. Grout color
- C. Tile pattern
- D. Tile size variation

95. What causes tile to crack after installation?

- A. High quality tile
- B. Movement in substrate, improper substrate, or point loads on unsupported tile edges
- C. Proper installation
- D. Good thinset

96. What is the purpose of a tile saw?

- A. Cutting wood
- B. Cutting metal
- C. General construction
- D. Cutting ceramic and stone tile with water-cooled diamond blade

97. What is bullnose tile?

- A. Decorative animal pattern
- B. Broken tile
- C. Tile with rounded finished edge for outside corners and edges
- D. Floor tile only

98. What is schluter strip in tile work?

- A. German tile
- B. Grout type
- C. Tile pattern
- D. Adhesive type

99. What is the difference between sanded and unsanded grout?

- A. Color only
- B. Sanded grout for joints over 1/8 inch; unsanded for narrower joints
- C. Price only
- D. Brand difference

100. What is epoxy grout?

- A. Temporary grout
- B. Weakest grout
- C. Stain-resistant, waterproof grout using epoxy resin (more expensive but very durable)
- D. Easiest to apply

101. What is cement board also called?

- A. Concrete panel
- B. Temporary board
- C. Decorative panel
- D. Plywood alternative

102. What fasteners should be used for cement board?

- A. Regular drywall screws
- B. Staples
- C. Glue only
- D. Cement board screws or roofing nails with corrosion resistance

103. What spacing is required between cement board panels?

- A. 1/8 inch gap for expansion
- B. No gaps needed
- C. 1 inch gap
- D. Tight fit required

104. What is the purpose of sealing grout?

- A. Changing color
- B. Temporary coating
- C. Protecting grout from stains and moisture penetration
- D. Making grout stronger

105. How long should grout cure before sealing?

- A. Immediately
- B. 48-72 hours minimum, often longer depending on conditions
- C. 5 minutes
- D. 1 year

106. What is the purpose of a grout float?

- A. Keeping grout from sinking
- B. Decorative tool
- C. Measuring tool
- D. Spreading and packing grout into tile joints

107. What angle should a grout float be held?

- A. 45-degree angle diagonally across tiles to pack grout into joints
- B. Flat (0 degrees)
- C. Vertical (90 degrees)
- D. Any angle works

SECTION 5: SAFETY (Questions 108-125)

108. What is the minimum distance from overhead power lines for equipment and materials?

- A. 1 foot
- B. No minimum
- C. 10 feet (varies by voltage; higher voltage requires greater clearance)
- D. 3 feet

109. What should be done if equipment contacts overhead power lines?

- A. Jump off immediately
- B. Stay in equipment; don't let anyone approach until power company confirms lines are de-energized
- C. Grab the lines
- D. Ignore the contact

110. What is the danger of underground utilities?

- A. No danger exists
- B. Cosmetic damage only
- C. Minor inconvenience
- D. Hitting gas lines causes explosions; hitting electrical causes electrocution

111. What must be done before excavating?

- A. Call 811 or local utility notification center to have utilities marked
- B. Dig anywhere
- C. Guess where utilities are
- D. No preparation needed

112. How long before digging should you call 811?

- A. Same day
- B. After digging
- C. 2-3 business days before planned excavation
- D. One year ahead

113. What color marks indicate different underground utilities?

- A. All utilities are same color
- B. Red=electric, yellow=gas, orange=telecom, blue=water, green=sewer
- C. Random colors
- D. No color coding exists

114. What is arc flash in electrical work?

- A. Camera flash
- B. Lightning
- C. Welding light
- D. Explosive release of energy from electrical fault creating intense heat and light

115. What PPE is required for arc flash protection?

- A. Arc-rated clothing, face shield, gloves, and safety glasses appropriate for arc flash level
- B. Regular clothes
- C. No PPE needed
- D. Hard hat only

116. What is the purpose of circuit testing before work?

- A. Wasting time
- B. Making work difficult
- C. Verifying power is off before touching conductors
- D. Optional procedure

117. When should electrical panels be locked?

- A. Never
- B. After installing lockout/tagout during maintenance, or to prevent unauthorized access
- C. Always locked with no access
- D. Only at night

118. What is required before entering an attic in hot weather?

- A. Nothing special
- B. Bring ice cream
- C. Work at night only
- D. Enter quickly

119. What is heat exhaustion?

- A. Tired heater
- B. Broken air conditioner
- C. Body overheating from high temperatures causing heavy sweating, weakness, and nausea
- D. Normal condition

120. What is heat stroke?

- A. Minor condition
- B. Same as heat exhaustion
- C. Life-threatening condition where body can't regulate temperature; requires immediate medical attention
- D. Mild illness

121. What are signs of heat stroke?

- A. Feeling cold
- B. High body temperature, confusion, loss of consciousness, hot dry skin
- C. Normal sweating
- D. Mild discomfort

122. How can heat illness be prevented?

- A. Work in hottest part of day
- B. Avoid all water
- C. Wear heavy clothes
- D. Drink water frequently, take breaks in shade, wear light clothing, and acclimate gradually

123. What is the purpose of a fire extinguisher inspection tag?

- A. Decoration
- B. Recording monthly inspections verifying extinguisher is charged and accessible
- C. Price tag
- D. Manufacturer information only

124. How often should fire extinguishers be inspected?

- A. Never
- B. Every 10 years
- C. Monthly visual inspection; annual professional inspection
- D. Only when used

125. What is the PASS technique for using fire extinguishers?

- A. Walking past fire
- B. Pull pin, Aim at base, Squeeze handle, Sweep side to side
- C. Point, Activate, Spray, Stop
- D. Push, Aim, Spray, Stand back

Answer Key with Explanations

- 1. A** - Cost-plus contracts reimburse contractors for all legitimate project costs (materials, labor, equipment, subcontractors) plus an additional fee for overhead and profit. The fee might be a percentage of costs or a fixed amount. This protects contractors when scope is uncertain but requires detailed cost tracking and owner trust.
- 2. D** - Lump sum (fixed price) contracts establish one total price for all work. Whether your actual costs are higher or lower than expected, you get paid the same amount. You profit if costs are lower than estimated, you lose if they're higher. This puts cost risk on the contractor.
- 3. C** - Unit price contracts pay based on actual quantities of work performed multiplied by agreed unit prices. For example, \$50 per cubic yard of concrete placed. You measure actual quantities and multiply by unit prices. This works well when quantities are uncertain but unit costs are predictable.
- 4. B** - Project schedules show all activities (tasks), how long each takes (durations), which activities depend on others (dependencies), and key dates (milestones). Good schedules sequence work logically, identify the critical path, and help coordinate trades and materials.
- 5. A** - Float (also called slack) is how long an activity can be delayed without pushing back project completion. Activities on the critical path have zero float—any delay delays the whole project. Non-critical activities have float allowing some flexibility in scheduling.
- 6. D** - Critical path activities have zero float. Any delay in critical path activities directly delays project completion. The critical path is the longest sequence of dependent activities determining minimum project duration. You must focus on keeping critical activities on schedule.
- 7. C** - CPM (Critical Path Method) is a scheduling technique identifying the sequence of activities (critical path) that determines minimum project duration. It calculates early and late start/finish dates for activities and identifies which have float and which don't.
- 8. B** - The baseline schedule is the original approved schedule used as reference for measuring progress and evaluating changes. As work progresses, you compare actual performance against baseline to see if you're ahead, behind, or on schedule.
- 9. D** - Schedule compression means shortening project duration to meet earlier deadlines. Two main techniques: crashing (adding resources to speed activities) and fast-tracking (overlapping activities normally done in sequence). Both have costs and risks.
- 10. A** - Crashing adds resources (more workers, overtime, better equipment) to speed up activities. Fast-tracking overlaps sequential activities (starting walls before foundations fully cure). Crashing increases costs directly; fast-tracking increases risk and rework potential but may not cost more.
- 11. C** - Meeting minutes document who attended, what was discussed, decisions made, and action items with assigned responsible parties and due dates. Minutes create a record preventing "he said, she said" disputes and ensuring accountability for commitments made.

12. B - Transmittals formally document and track delivery of submittals, drawings, reports, or other documents. They create paper trails showing what was sent, when, to whom, and confirmation of receipt. Transmittals prevent disputes about whether documents were delivered.

13. D - RFPs (Requests for Proposal) ask contractors to propose detailed approaches for completing projects including methodology, schedule, team qualifications, and pricing. RFPs are used when selecting contractors based on qualifications and approach, not just price.

14. A - RFQs request price quotes for well-defined scope—you know exactly what you want and just need pricing. RFPs request detailed proposals when scope is less defined or approach matters as much as price. RFPs evaluate multiple factors; RFQs focus on price.

15. C - Bid shopping is the unethical practice where general contractors disclose competitors' bid prices to other bidders trying to get lower prices, or use low bids to renegotiate with others. It destroys trust, encourages lowball bidding, and hurts quality. Don't do it.

16. B - Bid bonds guarantee that if you're the low bidder and awarded the contract, you'll actually sign it and provide required performance and payment bonds. If you refuse, the owner can claim against your bid bond for the cost difference to the next bidder.

17. D - Liquidated damages are predetermined amounts (typically per day) deducted from your payment for late completion. Instead of proving actual damages, the contract specifies the daily rate. For example, \$500/day for every day beyond the completion date. They incentivize on-time completion.

18. A - Force majeure are unforeseeable circumstances beyond either party's control preventing contract performance—things like natural disasters, wars, pandemics, or government actions. Force majeure clauses may excuse delays or allow contract termination without penalty when these events occur.

19. C - Statutes of limitations for construction defect claims vary by state and claim type. Contract claims might have 4-6 year limits, while tort claims or specific defect claims range from 2-10 years. Some states have statute of repose providing absolute cutoff dates regardless of discovery.

20. B - Vapor retarders under slabs prevent ground moisture from migrating up through concrete into buildings causing flooring problems, mold, and moisture damage. They're essential in most climates, particularly where ground is damp or groundwater tables are high.

21. D - Vapor retarders should be 6 mil (0.006 inch) minimum thickness, though 10 mil is preferred for better durability. Thicker material resists punctures during construction better. Some specifications require even thicker material for aggressive moisture conditions.

22. A - Polyethylene plastic sheeting is standard vapor retarder material. It's inexpensive, effective, and readily available. Black poly is common but clear works too. The key is continuous coverage with overlapped seams and sealed penetrations.

23. C - Welded wire mesh (WWM) in slabs provides temperature and shrinkage crack control. It doesn't prevent cracking but holds cracks tightly together. WWM is not structural reinforcement—it won't increase load capacity significantly. For structural strength, use rebar.

24. B - Common WWM designation is 6×6, meaning 6-inch square grid pattern. The numbers following (like W1.4×W1.4) indicate wire gauge and cross-sectional area. Mesh is placed in the upper third of slabs—it must be lifted off the ground during concrete placement.

25. D - Post-tensioned concrete has steel cables (tendons) running through it that are tensioned after concrete cures. Tensioning puts concrete in compression, allowing longer spans and thinner slabs. It's common in commercial buildings and residential slabs in expansive soils.

26. B - Sleepers are wood members (typically 2×4s or 2×3s) laid flat on concrete providing nailing surfaces for wood flooring. They're attached to concrete with powder-actuated fasteners or adhesive, then wood flooring nails to the sleepers.

27. C - Nominal sizes are the names we call lumber by (2×4, 2×6), but actual dimensions are smaller after milling and drying. A "2×4" actually measures 1.5×3.5 inches. A "2×10" is actually 1.5×9.25 inches. Always use actual dimensions for calculations.

28. A - A 2×4's actual dimensions are 1.5 inches × 3.5 inches. The nominal 2×4 dimension comes from rough-sawn green lumber before drying and planing. After processing, about 1/2 inch is lost from each dimension. This is standard across the industry.

29. D - A 2×6 actually measures 1.5 inches × 5.5 inches. Like all dimensional lumber, it loses about 1/2 inch from each nominal dimension during manufacturing. When calculating wall thickness or header depths, always use actual dimensions.

30. B - Cripple studs are short studs above headers (filling space between header and top plate) or below window sills (filling space between sill and bottom plate). Despite the name, they're full-strength studs cut to length, not damaged or defective.

31. C - Jack studs (also called trimmer studs) are full-height studs that support headers at window and door openings. They run from the bottom plate up to the bottom of the header, bearing the header's weight. Headers sit directly on jack studs.

32. A - King studs are full-height studs running from bottom plate to top plate on each side of openings. They're nailed to jack studs, providing a nailing surface for interior finishes and helping transfer loads. Each opening has two king studs flanking the sides.

33. D - Double top plates tie walls together at corners and T-intersections by overlapping plate joints. They also distribute concentrated loads from above (like point loads from beams) across multiple studs. The doubled plates create a continuous structural band around the building.

34. B - Top plate joints in the upper and lower plates should be offset (staggered) at least 24-48 inches apart. If joints aligned vertically, you'd create weak spots. Staggering distributes loads and maintains wall strength across joints.

35. C - Rake boards are trim boards running along sloped roof edges at gable ends. They're often called rake trim or barge boards. Rake boards provide finished appearance, protect roof edge, and may support soffit materials along the gable.

36. A - Bargeboard is another term for rake board or rake trim—decorative and functional trim along the sloped roof edge at gables. In historical architecture, bargeboards were often ornately decorated. Modern construction uses simpler profiles.

37. D - Ridge vents run continuously along roof peaks allowing hot attic air to escape. Combined with soffit vents at eaves (intake), ridge vents create natural convection ventilation removing heat and moisture. They're very effective and nearly invisible from the ground.

38. B - Attic ventilation should be balanced with equal intake (soffit vents) and exhaust (ridge vents or gable vents) for optimal performance. Equal amounts create natural airflow through the attic. More exhaust than intake can pull conditioned air from the house.

39. C - Clerestory windows are high windows near ceilings or in the upper portions of walls bringing natural light deep into buildings. They provide light and ventilation while maintaining privacy. Often used in living rooms with tall ceilings or commercial buildings.

40. A - A "light" in window terminology means a pane of glass. A window might have 6 lights (6 panes), 12 lights, or be a single-light window (one large pane). Grids dividing glass create multiple lights.

41. B - Muntins are thin bars dividing window glass into multiple panes (lights). True divided lights have separate glass pieces held by muntins. Modern windows often use simulated divided lights with grids applied over single large panes.

42. D - The sash is the movable frame holding glass that opens and closes. Double-hung windows have upper and lower sashes that both move. Casement windows have sashes that swing on hinges. Fixed windows have sashes that don't move.

43. C - Casement windows are hinged on one side (left or right) and swing outward like doors. They're operated with cranks or levers. Casements provide excellent ventilation and unobstructed views when open but need clearance outside.

44. A - Awning windows are hinged at the top and swing outward, creating an awning-like overhang when open. They can stay open during light rain since the window protects the opening. Often used in bathrooms or stacked with other windows.

45. D - Shutoff valves allow isolating individual fixtures, rooms, or sections of plumbing for repairs without shutting off water to the entire building. Every fixture should have shutoff valves (under sinks, behind toilets) for convenient maintenance.

46. D - Ball valves use a ball with a hole through it. Quarter-turn (90 degrees) rotates the hole to align with pipe (open) or perpendicular to pipe (closed). Ball valves open/close quickly, have minimal flow restriction when open, and are very reliable.

47. A - Gate valves have wedge-shaped gates that raise (open) or lower (close) to control flow. They're meant for full open or full closed operation, not throttling flow. Gate valves have minimal flow restriction when fully open but take many turns to operate.

48. B - Ball valves are quick quarter-turn operation ideal for on/off control. Gate valves take multiple turns to open/close but work well for infrequent operation with large flows. Ball valves are replacing gate valves in most applications because they're more reliable and easier to operate.

49. D - Mixing valves (also called tempering or thermostatic mixing valves) blend hot and cold water automatically to maintain consistent outlet temperatures. They're used at water heaters delivering tempered water to fixtures preventing scalding while allowing high tank temperatures for bacteria control.

50. A - Pressure balance valves in showers maintain consistent water temperature despite pressure fluctuations (like toilets flushing or washing machines filling). When cold pressure drops, the valve automatically reduces hot water proportionally preventing scalding.

51. D - Cross-contamination happens when potable (drinkable) water gets contaminated with non-potable water or waste. Backflow from irrigation systems, chemical feeders, or improper connections can contaminate drinking water. Backflow preventers and air gaps prevent cross-contamination.

52. B - Potable water is safe for drinking and cooking meeting all health standards. Municipal water supplies and properly treated well water are potable. The plumbing code requires protecting potable water from contamination throughout distribution systems.

53. C - Grey water is relatively clean wastewater from sinks, showers, bathtubs, and laundry—everything except toilets. Grey water can potentially be reused for irrigation or toilet flushing with proper treatment. It contains soaps and organic matter but no sewage.

54. A - Black water is sewage wastewater from toilets containing fecal matter and urine. It requires full sewage treatment before discharge or reuse. Black water is hazardous and must be handled with care. Never use black water for irrigation or reuse without extensive treatment.

55. B - Backwater valves (also called check valves) prevent sewer backups from flowing backward into buildings during municipal sewer surcharges or backups. They're one-way valves in main building drains allowing flow out but not in. Essential in areas with basement fixtures below sewer level.

56. D - Ampacity is the maximum current (in amperes) a conductor can carry continuously without exceeding its temperature rating. Exceeding ampacity causes overheating, insulation damage, and fire risk. Wire size, insulation type, and installation conditions all affect ampacity.

57. C - Wire ampacity depends on wire size (bigger wire carries more current), insulation type (different temperature ratings), ambient temperature (hot environments reduce capacity), and installation method (bundled wires run hotter). All these factors appear in ampacity tables.

58. A - Voltage drop is the reduction in voltage along wires due to resistance. Long wire runs or undersized wires have higher resistance causing voltage drop. Motors and tools work poorly with excessive voltage drop. The solution is larger wire or shorter runs.

59. B - Excessive voltage drop comes from wire runs that are too long, wires that are too small for the current draw, or poor connections. The voltage lost as heat in the wire means less voltage reaching equipment. Calculate voltage drop and upsize wire when necessary.

60. D - Electrical code recommends maximum 3% voltage drop for branch circuits and 5% total drop from service to farthest outlet. Greater drops cause lights to dim, motors to overheat, and equipment to malfunction. Size wires to keep voltage drop within limits.

61. C - GFCI circuit breakers installed at the panel protect the entire circuit—every outlet and device on that circuit. GFCI receptacles protect only themselves and any outlets wired downstream from them. Either works; breakers are convenient but more expensive.

62. A - Electrical load calculations determine the total electrical demand for a building sizing the service and panels. They add up all lighting, appliances, motors, HVAC, and other loads applying demand factors for realistic usage patterns. Proper calculations prevent undersized services.

63. B - Demand factor is the percentage of connected load expected to operate simultaneously. Not everything runs at once—you apply demand factors to certain loads for realistic calculations. For example, not all lights are on simultaneously, so lighting gets a demand factor less than 100%.

64. D - Multimeters measure voltage (AC and DC), current (amperage), and resistance (ohms). They're essential troubleshooting tools for electricians. Digital multimeters (DMMs) are standard now, more accurate and easier to read than old analog meters.

65. C - Continuity testing checks if an electrical path is complete and unbroken. You're testing for a continuous conductive path—does electricity flow through this wire or circuit? Multimeters in continuity mode beep when a complete path exists, helping find breaks or bad connections.

66. A - HSPF (Heating Seasonal Performance Factor) measures heat pump heating efficiency. Higher HSPF means better efficiency and lower operating costs. Modern heat pumps achieve HSPF ratings of 8-13. SEER measures cooling efficiency; HSPF measures heating efficiency.

67. D - Split systems have components split between indoors and outdoors—outdoor condensing unit (compressor and condenser coil) and indoor air handler (evaporator coil and blower). Refrigerant lines connect them. Most residential systems are split systems.

68. B - Package units contain all HVAC components (compressor, condenser, evaporator, blower) in one outdoor cabinet. Ductwork connects directly to the package unit. They're common in commercial buildings and manufactured homes. No indoor equipment except ductwork and thermostat.

69. C - Filter driers in refrigeration circuits remove moisture and contaminants from refrigerant. Moisture in systems causes ice formation and corrosion. Contamination damages compressors. Filter driers are essential for system longevity and must be replaced during major repairs.

70. A - Superheat is refrigerant temperature above its boiling point. In the evaporator, refrigerant boils (changes from liquid to vapor). Any additional heating after complete boiling creates superheat. Technicians measure superheat to verify proper refrigerant charge and system operation.

71. D - Subcooling means cooling refrigerant below its condensing temperature ensuring it's completely liquid (no vapor bubbles). In the condenser, refrigerant condenses from vapor to liquid. Additional cooling after complete condensing creates subcooling. Proper subcooling prevents vapor from entering expansion valves.

72. B - Expansion valves reduce refrigerant pressure and temperature as it enters evaporator coils. High-pressure liquid from the condenser passes through the valve becoming low-pressure liquid/vapor mixture cold enough to absorb heat in the evaporator. It's the component creating the cooling effect.

73. A - TXV (Thermostatic Expansion Valve) controls refrigerant flow into evaporators based on temperature, automatically adjusting to maintain proper superheat. TXVs provide better efficiency than fixed orifices by responding to changing conditions. Most modern systems use TXVs.

74. C - Floats (also called bull floats or hand floats) smooth and level concrete surfaces after screeding. They work aggregate slightly below the surface and fill small voids preparing surfaces for additional finishing. Power floats (riding trowels) do the same on large areas.

75. B - Power trowels (riding trowels or helicopter trowels) finish large concrete slabs creating smooth, hard, dense surfaces. Rotating blades work the surface as operators ride the machine. They're much faster than hand troweling for warehouse floors or commercial slabs.

76. C - Trowel burn happens when concrete is overworked during finishing—too much troweling or troweling too early brings excess water and fines to the surface creating weak, dusty surfaces that won't cure properly. Patience and proper timing prevent trowel burn.

77. A - Begin finishing concrete after bleed water evaporates and concrete can support your weight without leaving impressions. Finishing too early traps water causing weakness and dusting. Wait for proper conditions—timing varies with temperature, humidity, and concrete mix.

78. B - Bleeding is water rising to concrete surfaces as heavier particles (cement and aggregate) settle. Some bleeding is normal and expected. Excessive bleeding indicates too much water in the mix. Let bleed water evaporate before finishing—working it in weakens surfaces.

79. D - Alkali-silica reaction (ASR) is a chemical reaction between alkalis in cement and reactive silica in certain aggregates. The reaction produces gel that expands when wet causing cracking, pop-outs, and surface damage. Using low-alkali cement or non-reactive aggregates prevents ASR.

80. C - Efflorescence is white crystalline deposits on concrete surfaces from water-soluble salts (usually from cement or groundwater) migrating to surfaces and crystallizing as water evaporates. It's cosmetic, not structural, and can be cleaned. Proper curing and waterproofing reduce efflorescence.

81. A - Spalling is surface fragmentation where concrete flakes, chips, or pops off. Causes include corrosion of embedded steel (expanding and breaking concrete), freeze-thaw cycles, alkali-silica reaction, or poor finishing. Spalling is both cosmetic and potentially structural damage.

82. D - Scaling is surface deterioration where thin layers peel off, typically from freeze-thaw damage when water in concrete freezes, expands, and breaks surface layers. Improper finishing, applying salts too early, or insufficient air entrainment cause scaling. Air-entrained concrete resists scaling.

83. B - Sanding between coats smooths surfaces removing drips, runs, brush marks, and raised grain. It also scuffs previous coats providing "tooth" for better adhesion of subsequent coats. Light sanding with fine paper makes finishes smoother and more professional.

84. D - Final sanding before painting typically uses 150-220 grit sandpaper. This smooths surfaces without leaving deep scratches that show through paint. Coarser paper (80-120 grit) is for heavy stock removal. Finer paper (320+) is for between-coat sanding or clear finishes.

85. A - Oil-based paints use petroleum solvents (mineral spirits or paint thinner) requiring solvent cleanup. Latex paints use water as carrier cleaning up with soap and water. Oil-based paints have stronger fumes, longer drying, but extremely hard durable finishes. Latex is easier and more common today.

86. C - Paint conditioners (like Floetrol for latex or Penetrol for oil) improve flow and leveling without over-thinning, reduce brush marks, extend open time in hot weather, and improve application properties. They're not thinners but additives improving handling characteristics.

87. B - Paint cracks or "alligators" (looks like alligator skin) when incompatible coats are applied (oil over latex or vice versa without proper prep) or when new coats are applied before previous coats fully cure. The upper layer dries faster than lower layers creating stress and cracking.

88. D - Mil thickness measures paint film thickness in mils (thousandths of an inch). Wet film thickness is measured during application; dry film thickness after curing. Proper thickness ensures coverage, durability, and warranty compliance. Too thick wastes money and may crack; too thin provides inadequate protection.

89. C - Wet edge technique means maintaining a wet leading edge while painting, always painting back into wet paint. This blends brush or roller strokes preventing lap marks where wet paint meets dried paint. Work in sections keeping edges wet.

90. D - Cutting in means carefully painting edges, corners, trim, and ceiling lines with a brush before rolling large areas. Good cutting-in creates clean lines without tape and makes rolling faster. You're "cutting" paint into tight areas rollers can't reach.

91. A - Back-rolling means rolling lightly over freshly sprayed paint to smooth spray texture, remove excess, and work paint into surfaces. It improves coverage and appearance after spray application. The technique ensures good adhesion and uniform texture.

92. D - Thinset mortar is cement-based adhesive bonding tile to substrates. It's spread with notched trowels creating ridges that collapse as tile is pressed in, achieving full contact and strong bond. Different formulations exist for different tiles and applications.

93. C - Open time is how long thinset remains workable after application before skinning over (surface drying). Typically 15-30 minutes depending on conditions. Tile must be set within open time to achieve good bond. Hot, dry, or windy conditions reduce open time.

94. A - Lippage is vertical displacement between adjacent tiles where one tile is higher or lower than neighbors creating trip hazards and poor appearance. It's caused by uneven substrate, improper thinset application, tile warpage, or poor installation technique. Lippage-control systems help prevent it.

95. B - Tile cracks from substrate movement (flexing floors, settling foundations), improper substrate preparation (tiles over wood without proper decoupling), or point loads on unsupported tile edges and corners. Proper substrate preparation, expansion joints, and proper support prevent cracking.

96. D - Tile saws cut ceramic and stone tile using diamond blades with water cooling. Water prevents dust, cools blades, and extends blade life. Wet saws produce clean accurate cuts. Safety requires eye protection despite water suppression.

97. C - Bullnose tiles have one rounded finished edge for outside corners, countertop edges, and transitions where tile edges are exposed. They provide finished appearance without sharp exposed tile edges. Various profiles available including quarter-round and full bullnose.

98. A - Schluter strips are metal profiles providing finished edges, transitions between different flooring materials, protection for tile edges, and movement joints. Schluter Systems makes various profiles for different applications. The strips install in thinset before tile creating professional finishes.

99. B - Sanded grout contains sand giving it strength for joints over 1/8 inch wide. Sand prevents excessive shrinkage in wide joints. Unsanded grout is for joints 1/8 inch or narrower and polished stone that sand might scratch. Using the right type prevents problems.

100. C - Epoxy grout uses epoxy resins instead of cement. It's extremely stain-resistant, waterproof, chemical-resistant, and much stronger than cement grout. Epoxy grout costs significantly more and is harder to work with but lasts much longer and stays cleaner in difficult areas.

101. D - Cement board (also called backer board, CBU, or by brand names like Wonderboard or Hardieboard) is rigid panel made from cement and fibers. It provides stable, water-resistant substrate for tile. It's much better than regular drywall in wet areas.

102. D - Cement board requires special screws with corrosion resistance or galvanized roofing nails. Regular drywall screws corrode rapidly in wet conditions. Screws should have washer heads or countersink heads. Space fasteners per manufacturer specifications—typically 8 inches on center.

103. A - Leave 1/8 inch gaps between cement board panels for expansion. Fill gaps with thinset or caulk before tiling. Tight fits risk panels buckling with movement. All panel materials need expansion gaps—cement board, plywood, drywall, etc.

104. C - Sealing grout protects it from stains and moisture penetration. Unsealed grout absorbs spills, stains, and dirty mop water. Sealers fill grout pores making surfaces non-porous and easier to clean. Reseal periodically as sealers wear off.

105. B - Grout needs 48-72 hours minimum to cure before sealing, though some products require longer. Sealing too early traps moisture preventing proper curing and causing problems. Check product specifications—cure times vary by grout type and conditions.

106. D - Grout floats are rubber-faced trowels used for spreading and packing grout into tile joints. The rubber face won't scratch tiles. You hold the float at angles packing grout firmly into joints then scraping excess off tile surfaces.

107. A - Hold grout floats at 45-degree angles diagonally across tiles when packing grout. This angle forces grout deep into joints ensuring complete filling without pulling grout back out. After joints are full, scrape at steeper angles removing excess.

108. C - OSHA requires 10 feet minimum clearance from overhead power lines for most construction equipment and materials. Higher voltage lines require greater clearances—25 feet for 50kV lines, 50 feet for 500kV+ lines. Always check local utility requirements.

109. B - If equipment contacts power lines, stay inside the equipment. The equipment and surrounding ground may be energized. Don't let anyone approach—they risk electrocution stepping between different ground potentials. Call 911 and the utility company. Only exit if fire forces you, then jump clear without touching equipment and ground simultaneously.

110. D - Underground utilities pose serious hazards. Hitting gas lines causes explosions and fires. Hitting electrical cables causes electrocutions and outages. Hitting water or sewer creates floods and contamination. Hitting fiber optic lines disrupts communications costing thousands per minute.

111. A - Always call 811 (nationwide "call before you dig" number) or your local utility notification center before excavating. Utilities will mark underground lines with flags or paint. Never assume there are no utilities—always call. It's free and required by law.

112. C - Call 811 at least 2-3 business days before planned excavation. Utilities need time to send locators to mark lines. Some states require even more notice. Plan ahead—waiting for locates is better than hitting utilities.

113. B - Industry-standard colors mark different utilities: red=electric, yellow=gas/oil/steam, orange=telecom/fiber optic, blue=water, green=sewer, purple=reclaimed water, pink=survey marks, white=proposed excavation. These colors are consistent nationwide.

114. D - Arc flash is explosive energy release from electrical faults or short circuits creating temperatures hotter than the sun's surface (35,000°F), intense light, pressure waves, shrapnel, and sound. Arc flash causes severe burns, blindness, hearing damage, and death. It's one of electrical work's worst hazards.

115. A - Arc-rated clothing, face shields, insulated gloves, leather over-gloves, and safety glasses are required for arc flash exposure. FR (flame-resistant) clothing won't ignite or melt. Required PPE depends on arc flash analysis determining incident energy levels. Regular clothing melts into skin during arc flash.

116. C - Always verify power is off before touching conductors. Never trust circuit breakers or switches—they fail or get mislabeled. Test with meters confirming zero voltage. "Test before touch" prevents electrocutions. Assume everything is energized until proven otherwise.

117. B - Lock electrical panels during lockout/tagout maintenance preventing accidental energization while someone works on equipment. Also lock panels in areas where unauthorized people might access them. Otherwise, keep panels accessible for emergencies but mark them clearly.

118. D - Attics reach 140-160°F in summer. Before entering, check temperature, plan short work periods, ensure someone monitors you from below, wear light clothing, and bring water. Heat stroke happens fast in extreme heat. Don't underestimate attic heat.

119. C - Heat exhaustion is the body struggling to cool itself causing heavy sweating, pale skin, weakness, nausea, dizziness, and headaches. It's serious but treatable with rest, cooling, and fluids. Without treatment, it progresses to heat stroke.

120. C - Heat stroke is life-threatening emergency where the body can't regulate temperature. Body temperature exceeds 104°F, sweating may stop, confusion or unconsciousness occurs, and organs fail. Call 911 immediately and cool the person any way possible. Heat stroke kills rapidly.

121. B - Heat stroke signs include high body temperature (over 104°F), hot dry skin (though sometimes still sweating), confusion or altered mental state, loss of consciousness, seizures, rapid pulse, and rapid breathing. These are medical emergencies requiring immediate 911 calls.

122. D - Prevent heat illness by drinking water frequently (don't wait until thirsty), taking breaks in shade or air conditioning, wearing light-colored loose clothing, acclimating gradually to heat over 1-2 weeks, avoiding heavy work during hottest hours, and watching for symptoms in yourself and coworkers.

123. B - Fire extinguisher inspection tags record monthly inspections verifying extinguishers are fully charged (pressure gauge in green), accessible (not blocked or hidden), and in proper locations. Tags document accountability. Annual professional inspections are required beyond monthly checks.

124. C - Fire extinguishers need monthly visual inspections (pressure, accessibility, damage) and annual professional inspections by certified technicians. After any use, even partial, extinguishers must be serviced or replaced immediately. Six-year internal exams and hydrostatic testing are required long-term.

125. B - PASS technique: Pull the pin, Aim at the base of flames (not the flames themselves), Squeeze the handle, Sweep side to side across the fire's base. PASS ensures effective use. Fight fires only if they're small, you have an escape route, and the extinguisher is rated for the fire type.