Practice Test 4

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 addenda in bidding documents?

A. Advertising the project

B. Final project completion

C. Written modifications or clarifications to bidding documents issued before bid opening

D. Post-construction changes

2. When must contractors acknowledge receipt of addenda?

A. Never required

B. With their bid submission to confirm they've incorporated all changes

C. After project completion

D. One year later

3. What is the difference between an addendum and a change order?

A. No difference

B. Both occur after construction starts

C. Addenda are more expensive

D. Addendum issued during bidding; change order issued after contract execution

4. What is a pre-qualification process for contractors?

A. Evaluation of contractor qualifications before allowing them to bid

B. Final project approval

C. Building permit application

D. Insurance purchase

5. What information is typically required for contractor pre-qualification?

A. Personal hobbies

B. Favorite color

C. Financial capacity, experience, bonding ability, and references

D. Shoe size

6. What is the purpose of alternates in bid documents?

B. Alternative contractors

C. Replacement materials

D. Design alternatives

7. What is a base bid?

A. Lowest possible bid

B. Foundation cost only

C. First bid received

D. Price for basic scope before alternates or options

8. How should contractors handle ambiguities in plans and specifications?

A. Make assumptions and proceed

B. Ignore them

C. Guess the intent

D. Lowest bid always wins

9. What is the purpose of a bid depository?

A. Bank for construction loans

B. Material storage

C. Collecting bids from subcontractors for distribution to general contractors

D. Tool storage

10. What is a stipulated sum contract?

A. Estimated price

B. Lump sum or fixed price for defined scope of work

C. Cost-plus contract

D. Time and materials

11. What is a guaranteed maximum price (GMP) contract?

A. Minimum price guarantee

B. Average price

C. Exact fixed price

D. Cost-plus with upper limit; savings may be shared

12. What is the purpose of a payment schedule in contracts?

A. Scheduling work activities

B. Employee pay dates

C. Material delivery schedule

D. Holiday calendar

13. What is front-loading in construction billing?

A. Loading materials at front of site

B. Starting work early

C. Billing higher percentages early in project for work not yet performed

D. Foundation work

14. What is the stored materials clause in payment applications?

B. Allows payment for materials delivered to site but not yet installed

C. Material storage fees

D. Warehouse rental

15. What is a notice to proceed?

A. Traffic sign

B. Permit approval

C. Final inspection

D. Formal authorization from owner for contractor to begin work

16. When does the contract time typically start?

A. Date specified in notice to proceed or contract

B. When permits are issued

C. When contractor feels ready

D. After final payment

17. What is time of the essence in contracts?

A. Time doesn't matter

B. Flexible deadlines

C. Contractual provision making timely performance critical with legal consequences for delays

D. Work hour restrictions

18. What is concurrent delay?

A. Two projects at same time

B. Multiple contractors delaying each other

C. Delays caused by both owner and contractor simultaneously

D. Delayed payments

19. What is the difference between delay damages and liquidated damages?

A. They are identical

B. Delay damages are actual proven costs

C. Liquidated damages are smaller

D. Delay damages are actual proven costs from delays; liquidated damages are predetermined amounts

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

20. What is a bearing wall versus a shear wall?

A. Bearing walls support vertical loads; shear walls resist lateral loads from wind or earthquakes

B. They are identical

C. Shear walls are weaker

D. Bearing walls are temporary

21. What is oriented strand board (OSB)?

A. Solid wood planks

B. Particle board

C. Engineered panel made from wood strands oriented in layers and bonded with adhesive

D. Plywood alternative using veneers

22. What is the difference between OSB and plywood?

B. OSB uses wood strands; plywood uses thin wood veneers; both are structural panels

C. They are identical

D. OSB is always weaker

23. What is Exposure 1 rated sheathing?

A. Exterior permanent exposure

B. Interior use only

C. Temporary exposure only

D. Sheathing suitable for temporary exposure to weather during construction delays

24. What is tongue and groove sheathing?

A. Shaped edges that interlock between panels providing edge support

B. Decorative paneling

C. Interior wall covering

D. Temporary panels

25. What is APA rated sheathing?

A. Any plywood

B. European standard

C. Panels rated by APA (formerly American Plywood Association) for structural performance

D. Decorative panels

26. What is the span rating on plywood/OSB panels?

A. Maximum age of panel

B. Distance from factory

C. Price category

D. Panel weight

27. What is structural 1 sheathing?

A. Any structural panel

B. Thickest panel

C. Cheapest panel

D. Panels made with stronger adhesives and wood species for high-stress applications

28. What is the difference between wall sheathing and roof sheathing?

A. Color only

B. Wall sheathing may use lower span ratings; roof sheathing needs ratings for rafter/truss spacing

C. No difference

D. Wall sheathing is thicker

29. What is H-clip used for in roof sheathing?

A. Holding shingles

B. Electrical clips

C. Metal clips supporting panel edges between rafters preventing sagging

D. Decorative trim

30. What is the proper nail penetration for wood framing?

A. Just through first member

B. Flush with surface

C. Any depth works

D. Bent over ends

31. What is toenailing in framing?

A. Nailing toes

B. Decorative nailing

C. Temporary nailing

D. Driving nails at angles through one member into another

32. What spacing is required for framing nails in sheathing?

A. Random spacing

B. 6 inches on edges, 12 inches in field (interior) for most applications

C. 24 inches everywhere

D. No specific spacing needed

33. What is the purpose of stagger-nailing in framing?

A. Wasting nails

B. Creating patterns

C. Offsetting nails to prevent splitting and improve holding power

D. Decorative appearance

34. What is end distance for nails and screws?

A. Final nail in a board

B. Distance from end of board to prevent splitting

C. Nail length

D. Space between nails

35. What is pneumatic framing?

B. Using air-powered nail guns for faster framing

C. Pressurized buildings

D. Air conditioning installation

36. What is the advantage of screws over nails in framing?

A. Faster installation

B. Cheaper cost

C. Easier removal

D. Better withdrawal resistance and no loosening from wood shrinkage

37. What is a structural ridge beam?

A. Any ridge board

B. Decorative ridge

C. Ridge member engineered to support roof loads allowing rafters without ceiling joists

D. Temporary support

38. When are ceiling joists not required with rafters?

A. Always required

B. Never required

C. When structural ridge beam supports rafters

D. Small buildings only

39. What is the purpose of ceiling joists with rafters?

A. Holding ceiling materials only

B. Resisting outward thrust from rafters preventing wall spreading

C. Decoration

D. Electrical routing

40. What is rafter rise?

A. Rafter angle

B. Rafter length

C. Rafter width

D. Vertical height from top plate to ridge

41. What is rafter run?

A. Rafter speed

B. Distance rafter travels

C. Horizontal distance from outside wall to center of ridge

D. Rafter slope

42. What is a common rafter?

A. Most frequently used size

B. Cheapest rafter

C. Standard quality

D. Inferior material

43. What is a hip roof versus a gable roof?

A. Height difference

B. Hip roofs slope on all four sides; gable roofs slope on two sides with triangular ends

C. Material difference

D. Cost difference

44. What is a Dutch gable roof?

A. European roof

B. Temporary roof

C. Flat roof

D. Hip roof with small gable at the top

SECTION 3: CORE TRADES (Questions 45-82)

45. What is a trap primer in plumbing?

A. Painting traps

B. Trap installation tool

C. Device adding water to floor drains periodically to prevent trap seal evaporation

D. Trap cleaner

46. What is a relief vent in plumbing?

A. Emergency pressure release

B. Roof vent

C. Decorative vent

D. Additional vent preventing pressure problems in long drain runs

47. What is the minimum vent size ratio to drain size?

A. Vent must be at least half the drain size

B. Vents must be larger than drains

C. No relationship required

D. Vents must be same size as drains

48. What is a wet vent?

A. Vent in wet location

B. Vent serving as both drain and vent for multiple fixtures

C. Leaking vent

D. Exterior vent

49. What is a loop vent?

A. Decorative vent

B. Circular vent

C. Vent looping up from fixture drain before connecting to stack

D. Temporary vent

50. What is a battery of fixtures in plumbing?

A. Electric fixtures

B. Water heater power

C. Decorative arrangement

D. Lighting fixtures

51. What is a common vent in plumbing?

A. Any vent

B. Vent serving two fixture traps on opposite sides of a wall

C. Frequently used vent

D. Standard vent

52. What is the water hammer effect related to?

A. Plumbing tools

B. Installation technique

C. Normal operation

D. Sudden water velocity changes creating pressure surges

53. What is a vacuum breaker?

A. Cleaning tool

B. Air conditioner component

C. Vent type

D. Atmospheric vent

54. What is the purpose of an air admittance valve?

A. Air conditioning

B. Ventilation fan

C. One-way valve allowing air into drains without requiring roof vents

D. Pressure regulator

55. What is a residential electrical service entrance?

A. Front door wiring

B. Point where utility power enters building including meter and main disconnect

C. Interior panel

D. Light switches

56. What is the service drop?

A. Dropped ceiling

B. Voltage reduction

C. Failed service

D. Power outage

57. What is a weatherhead in electrical service?

A. Weather forecasting device

B. Outdoor light fixture

C. Roof vent

D. Rain protection component

58. What is the minimum height for overhead service drops?

A. No minimum

B. 6 feet

C. 10 feet over driveways; 12 feet over residential property; 18 feet over public streets

D. 25 feet everywhere

59. What is a meter base?

A. Foundation for meter

B. Enclosure holding electric meter connecting utility to building service

C. Measuring tool

D. Meter storage

60. What is the difference between single-phase and three-phase power?

A. No difference

B. Phases refer to project stages

C. Single-phase is weaker

D. Single-phase has two hot conductors; three-phase has three hot conductors for higher power

61. What size wire is typically used for 20-amp circuits?

A. 12 AWG

B. 18 AWG

C. 8 AWG

D. 20 AWG

62. What is the maximum number of outlets on a 20-amp circuit?

A. Exactly 20

B. 5 outlets

C. No specific limit; calculate based on load

D. Unlimited outlets

63. What is a tandem circuit breaker?

A. Bicycle breaker

B. Double breaker

C. Temporary breaker

D. Two single-pole breakers in one space allowing more circuits in panel

64. What is breaker rejection feature?

B. Panel design preventing installation of incompatible breaker brands

C. Quality control

D. Breaker testing

65. What is bus bar in electrical panels?

A. Transportation power

B. Busbar location

C. Metal bar carrying electricity

D. Copper or aluminum bars distributing power to circuit breakers

66. What is refrigerant in HVAC systems?

A. Cooled air

B. Ice

C. Substance absorbing and releasing heat through phase changes in cooling systems

D. Water

67. What is R-410A refrigerant?

B. Modern refrigerant replacing R-22; higher pressure and more efficient

C. Old refrigerant

D. Emergency refrigerant

68. Why can't R-410A and R-22 be mixed?

A. Different colors

B. Cost difference

C. Compatibility issues

D. Incompatible pressures, oils, and system components; mixing damages equipment

69. What is the function of a compressor in HVAC?

A. Compressing ducts

B. Reducing airflow

C. Decorative component

D. Heating air

70. What is the function of a condenser in air conditioning?

A. Distributing air

B. Releasing heat absorbed from indoor air to outside air

C. Filtering air

D. Generating cold

71. What is the function of an evaporator coil?

A. Evaporating water

B. Heating air

C. Absorbing heat from indoor air causing cooling

D. Filtering air

72. What is a metering device in HVAC?

A. Measuring airflow

B. Billing device

C. Thermometer

D. Component controlling refrigerant flow (expansion valve or orifice)

73. What is the purpose of refrigerant lines?

A. Transporting refrigerant between indoor and outdoor units

B. Decorative pipes

C. Water lines

D. Gas lines

74. What is the difference between supply and return ducts?

A. No difference

B. Supply ducts deliver conditioned air to rooms; return ducts bring air back to unit

C. Color only

D. Size only

75. What is duct sealing and why is it important?

A. Decorative finish

B. Duct painting

C. Sealing joints and seams preventing air leakage improving efficiency

D. Duct cleaning

76. What is air balancing in HVAC?

A. Level installation

B. Weight distribution

C. Equal duct sizes

D. Adjusting airflow to ensure proper heating/cooling in all rooms

77. What is concrete admixture?

A. Concrete mix

B. Material added to concrete mix to modify properties (accelerate, retard, increase workability)

C. Aggregate

D. Water

78. What is a plasticizer admixture?

A. Plastic coating

B. Strengthening additive

C. Admixture improving concrete workability without adding excess water

D. Color additive

79. What is air-entrained concrete?

A. Lightweight concrete

B. Weak concrete

C. Decorative concrete

D. Foreign concrete

80. Why is air entrainment important in concrete?

A. Makes concrete lighter

B. Reduces strength

C. Decorative appearance

D. Microscopic air bubbles resist freeze-thaw damage by providing expansion space

81. What is a concrete test cylinder?

A. Decorative column

B. Concrete tool

C. Sample of concrete cured and tested for strength verification

D. Form shape

82. When are concrete test cylinders broken (tested)?

A. Immediately

B. 7 and 28 days (sometimes 14 days) to verify strength development

C. Never tested

D. One year later

SECTION 4: FINISH TRADES (Questions 83-107)

83. What is the difference between interior and exterior paint?

A. Interior paint resists weather, UV, mildew; exterior paint is less durable

B. Color only

C. Price only

D. Brand difference

84. What is mildewcide in paint?

A. Bug killer

B. Paint thinner

C. Additive preventing mildew growth in humid conditions

D. Color additive

85. What is the purpose of a bonding primer?

A. Creating texture

B. Improving adhesion to difficult surfaces like glossy paint or tile

C. Final coat

D. Paint remover

86. What sheen level hides imperfections best?

A. Gloss

B. Semi-gloss

C. Satin

D. Flat (matte)

87. What is brushing versus rolling paint?

A. Brushing for trim and detail; rolling for large flat surfaces

B. No difference

C. Brushing is faster

D. Rolling is more expensive

88. What causes paint to blister in hot weather?

B. Moisture or solvents trapped under paint expanding from heat

C. Cold weather

D. Proper application

89. What is the difference between stain and paint?

A. No difference

B. Color only

C. Price only

D. Stain penetrates wood showing grain; paint forms opaque surface film

90. What is the proper surface moisture content for painting wood?

A. Any moisture acceptable

B. Completely dry (0%)

C. Wood moisture content should be below 15% (often 12% or less)

D. Very wet wood

91. What causes paint flashing?

A. Bright colors

B. Glossy paint

C. Perfect application

D. Proper preparation

92. What is the difference between ceramic and porcelain tile?

A. No difference

B. Porcelain is denser, less porous, and more durable than standard ceramic

C. Color only

D. Shape only

93. What is rectified tile?

A. Damaged tile

B. Recycled tile

C. Temporary tile

D. Tile with precisely cut edges allowing very narrow grout joints

94. What is tile caliber?

A. Tile quality grade

B. Tile color

C. Size variation category; tiles sorted by actual size despite same nominal size

D. Tile pattern

95. What is the purpose of tile spacers?

A. Maintaining consistent grout joint width during installation

B. Temporary support

C. Decorative elements

D. Cost reduction

96. What is vitrification in tile manufacturing?

B. Firing process making tile dense and non-porous

C. Color application

D. Shape forming

97. What does PEI rating indicate for tile?

A. Price

B. Color

C. Size

D. Wear resistance and suitability for different traffic levels

98. What is COF rating for tile?

A. Cost factor

B. Color factor

C. Coefficient of friction measuring slip resistance

D. Coverage factor

99. What is the difference between wall tile and floor tile?

A. Floor tile is harder, thicker, and more slip-resistant than wall tile

B. No difference

C. Color only

D. Wall tile is stronger

100. What is the proper substrate for tile over wood floors?

A. Hardwood directly

B. Two layers 5/8-inch plywood or one layer plywood plus cement board

C. Carpet padding

D. Single layer 1/2-inch plywood

101. What is a mortar bed for tile?

A. Sleeping area

B. Temporary base

C. Thick layer of cement mortar creating level substrate for tile

D. Grout type

102. What is thin-set versus thick-set tile installation?

A. Thin-set uses thinset adhesive; thick-set uses mortar bed

B. Tile thickness

C. No difference

D. Cost difference

103. What is tile lippage tolerance?

A. No lippage allowed

B. Maximum 1/16 to 1/8 inch vertical displacement between tiles depending on tile size

C. Any amount acceptable

D. 1 inch maximum

104. What causes hollow-sounding tile?

A. Perfect installation

B. Tile quality

C. Color

D. Pattern

105. What is efflorescence on tile?

A. Decorative pattern

B. Tile damage

C. White salt deposits from moisture leaching minerals to surface

D. Grout color

106. What type of grout is best for showers?

A. Epoxy or urethane grout resisting water and mildew better than cement grout

B. Unsanded grout only

C. Any grout works

D. No grout needed

107. What is grout haze?

A. Foggy appearance

B. Residue on tile surface after grouting requiring removal with haze remover

C. Grout color

D. Intentional finish

SECTION 5: SAFETY (Questions 108-125)

108. What is the proper use of extension cords on construction sites?

A. Permanent wiring

B. Any use acceptable

C. No restrictions

D. Temporary use only; not for permanent wiring; must be properly rated

109. What is the maximum length recommended for extension cords?

A. Any length

B. 100 feet

C. 200 feet

D. 1000 feet

110. What gauge extension cord is needed for power tools?

A. 18 gauge for light duty

B. 22 gauge

C. 12 or 14 gauge for most power tools depending on amperage and length

D. Any gauge works

111. What is the danger of undersized extension cords?

A. No danger

B. Overheating, voltage drop, fire risk, and tool damage

C. Cords work better

D. Cost savings

112. What is double insulation on power tools?

A. Extra insulation layer

B. Two power cords

C. Two separate layers

D. Two-prong plug design with non-conductive housing providing shock protection without ground

113. What must be done with damaged power tool cords?

A. Repair immediately by qualified person or remove tool from service

B. Tape them up

C. Ignore damage

D. Use anyway

114. What is the purpose of cord grips on power tools?

A. Decoration

B. Hand grip

C. Preventing strain on electrical connections where cord enters tool

D. Cord storage

115. What is kickback on power saws?

A. Tool payment

B. Sudden backward motion when blade binds causing injury

C. Normal operation

D. Tool warranty

116. What causes power saw kickback?

A. Perfect cutting

B. Sharp blade

C. Proper technique

D. New tools

117. When should saw guards be removed?

A. Never; guards must remain in place and functional

B. Always

C. When convenient

D. For faster cutting

118. What is the proper stance when using circular saws?

A. Stand directly behind saw

B. Any position

C. Stand to side of cut line never directly behind blade

D. Sit down

119. What is the purpose of blade guards on saws?

A. Decoration

B. Making cutting difficult

C. Protecting operator from blade contact and flying debris

D. Slowing work

120. What is the danger of removing blade guards?

A. No danger

B. Faster cutting

C. Better visibility

D. Severe cuts, amputations, and flying debris injuries

121. When should hearing protection be worn?

A. Never

B. In noisy environments above 85 decibels or when using loud tools

C. Only when convenient

D. Only indoors

122. What type of respirator is needed for silica dust?

A. Cloth mask

B. Surgical mask

C. N95 or better respirator (half-face or full-face for extended exposure)

D. No protection needed

123. What is the proper care for safety glasses?

A. Leave dirty

B. Clean regularly, inspect for scratches, replace when damaged

C. Never clean

D. Share with everyone

124. What is the purpose of safety toe boots?

A. Fashion

B. Comfort only

C. Keeping feet warm

D. Protecting toes from crushing injuries and punctures

125. What injuries do safety boots prevent?

A. Crushing injuries from dropped materials, punctures from nails, and cuts from sharp objects

B. Sunburn

C. Hearing loss

D. Respiratory problems

Answer Key with Explanations

1. C - Addenda are written modifications or clarifications to bidding documents issued before bids are due. They might clarify confusing details, correct errors, or change requirements based on pre-bid questions. All bidders receive the same addenda ensuring everyone bids on identical scope.

2. B - Contractors must acknowledge receipt of all addenda with their bid submission. This proves they've received and incorporated all changes into their pricing. A bid without addendum acknowledgment might be rejected as non-responsive since you may not have included required changes.

3. D - Addenda are issued during the bidding phase before contracts are signed, modifying bid documents for all bidders. Change orders happen after contract execution, modifying the contract between owner and contractor. Timing is the key difference.

4. A - Pre-qualification evaluates contractors before allowing them to bid on projects. Owners review financial capacity, experience, safety records, and past performance. Only contractors meeting minimum standards get invited to bid. This saves everyone time and ensures qualified bidders.

5. C - Pre-qualification typically requires financial statements proving capacity to handle project size, experience with similar projects, bonding capacity, safety records, references from past clients, and current workload information. Owners verify you're qualified before investing time reviewing your bid.

6. B - Alternates (also called bid alternates) give owners options to add or delete items from base bid scope. For example, "Alternate 1: Add irrigation system for $15,000." Alternates let owners adjust scope to fit budgets after seeing base bid pricing.

7. D - Base bid is the price for the basic defined scope before any alternates, allowances, or options. It's the foundation price. Alternates get added to or subtracted from the base bid creating final contract amount based on owner selections.

8. A - When plans or specifications are ambiguous or contradictory, never assume or guess. Issue a Request for Information (RFI) asking for clarification. Document everything. Making wrong assumptions costs you money. Get written clarification protecting yourself and ensuring correct work.

9. C - Bid depositories collect subcontractor bids and distribute them to general contractors, preventing bid shopping and providing fair competition. Subs submit bids to the depository by deadline, then generals receive bid results. This protects subcontractors from manipulation.

10. B - Stipulated sum contracts (also called lump sum or fixed price) establish one total price for all work defined in the contract. Whether your costs are higher or lower, you receive the agreed price. You profit if costs are low, lose if they're high.

11. D - Guaranteed Maximum Price contracts set a ceiling on costs. The contractor gets reimbursed for costs plus fee, but total can't exceed the GMP. If costs run higher, contractor absorbs overruns. If costs are lower, savings may be shared per the agreement.

12. A - Payment schedules establish when and how much contractors get paid throughout projects—monthly progress payments based on work completed, milestone payments at specific completion points, or percentage-based payments. Schedules ensure steady cash flow and proper payment timing.

13. C - Front-loading means billing disproportionately high percentages early in projects for work not yet performed. For example, charging 40% for mobilization that only costs 10%. If projects terminate early, you've been overpaid. Most contracts prohibit front-loading.

14. B - Stored materials clauses allow payment for materials delivered to sites but not yet installed. You might get paid for windows stored on-site even though they're not installed yet. This helps cash flow but requires proper safeguards against theft or damage.

15. D - Notice to Proceed is formal written authorization from owners for contractors to begin work. It triggers contract time and establishes the official start date. Don't start work before receiving NTP—you might not get paid for early work or could face liability issues.

16. A - Contract time starts on the date specified in the Notice to Proceed or in the contract documents. This is your official start date for calculating completion deadlines. The completion date is calculated from this start date plus contract duration.

17. C - "Time is of the essence" is contractual language making timely performance critical with serious legal consequences for delays. It means deadlines are firm and delays may result in liquidated damages, contract termination, or other penalties. Time becomes a material term.

18. B - Concurrent delay occurs when both owner and contractor cause delays simultaneously. For example, the owner delays providing information while contractor is also behind schedule. Concurrent delays complicate claims since both parties contributed. Time extensions may be granted without additional compensation.

19. D - Delay damages are actual proven costs from delays—extended overhead, escalated materials costs, idle equipment. You must prove actual damages. Liquidated damages are predetermined daily amounts specified in contracts for late completion without proving actual damages.

20. A - Bearing walls support vertical loads from above (roof, floors, upper walls) carrying weight down to foundations. Shear walls resist lateral loads from wind or earthquakes preventing buildings from racking sideways. Some walls are both bearing and shear walls.

21. C - OSB (Oriented Strand Board) is engineered panel made from wood strands (flakes) oriented in layers perpendicular to each other and bonded with adhesive under heat and pressure. It's strong, consistent, and uses wood efficiently. Common for sheathing and subflooring.

22. B - OSB uses wood strands in layers; plywood uses thin wood veneers (sheets) in layers. Both are structural panels with similar strength and uses. OSB is usually cheaper; plywood handles moisture better. Either works for most applications when properly rated.

23. D - Exposure 1 rated sheathing can handle temporary weather exposure during construction delays but isn't rated for permanent exterior exposure. It's suitable for sheathing that gets covered with siding or roofing. Most residential sheathing is Exposure 1.

24. A - Tongue and groove panels have shaped edges—one edge has a protruding tongue, the other has a receiving groove. The tongue of one panel fits into the groove of the next, creating edge support and interlocking panels. Common for roof sheathing and subflooring.

25. C - APA (formerly American Plywood Association, now APA-The Engineered Wood Association) rates and stamps structural panels certifying they meet performance standards. APA stamps guarantee structural properties, span ratings, and exposure ratings. Look for APA stamps when buying sheathing.

26. A - Span ratings on panels (like 32/16 or 24/16) indicate maximum recommended spacing for supports. The first number is for roof applications (rafter spacing), second is for floor applications (joist spacing). A 32/16 panel can span 32 inches on roofs, 16 inches on floors.

27. D - Structural 1 sheathing uses stronger wood species and adhesives for higher stress applications like shear walls or diaphragms. It's stronger than standard sheathing but looks identical. Use Structural 1 when engineers specify it for lateral load resistance.

28. B - Wall sheathing often uses lower span ratings since studs space at 16 or 24 inches. Roof sheathing needs ratings matching rafter/truss spacing (often 24 inches). Both must be rated for their specific application—don't use wall sheathing on roofs or vice versa.

29. C - H-clips are small metal clips installed between roof sheathing panels at unsupported edges providing edge support preventing sagging between rafters. They're H-shaped fitting over panel edges. Use them when panel edges don't land on rafters or when required by span ratings.

30. A - Nails should penetrate at least 1-1/2 inches into the member being nailed to (or through it entirely if it's thin). For example, when nailing sheathing to studs, nails should penetrate studs at least 1-1/2 inches providing adequate holding power.

31. D - Toenailing means driving nails at angles (typically 30-45 degrees) through one member into another. It's used when you can't nail straight through—like attaching studs to plates. Toenail from both sides for best holding power.

32. B - Sheathing nails typically space 6 inches on center along panel edges (where strength is critical) and 12 inches on center in the field (middle areas). Edge nailing is closer because edges carry most shear loads. Some applications require closer spacing.

33. C - Stagger-nailing means offsetting nails in rows rather than aligning them in straight lines. This prevents splitting (concentrated stress) and distributes holding power better. When nailing plates together, stagger nails preventing them from hitting the same grain line.

34. B - End distance is the minimum distance from board ends to fasteners. Nails or screws too close to ends cause splitting. Typical minimum is 3/4 inch from ends, though this varies by fastener size and wood species. Greater distance provides better holding.

35. B - Pneumatic framing uses compressed-air-powered nail guns (framing nailers) shooting nails rapidly. It's much faster than hand-nailing—you can shoot 2-4 nails per second. Most modern framing uses pneumatics. Cordless battery nailers are also popular now.

36. D - Screws have better withdrawal resistance than nails—they don't back out as wood shrinks and swells. Screws also provide better holding in engineered lumber. However, screws are slower to install and more expensive. Use screws where withdrawal resistance matters most.

37. C - Structural ridge beams are engineered beams carrying roof loads allowing rafters to bear on the beam without ceiling joists to resist thrust. The beam supports rafters like floor joists bear on girders. This creates open vaulted ceilings without ceiling joists.

38. A - Ceiling joists are usually required with rafters to resist outward thrust. Rafters push walls outward at the plates; ceiling joists tie walls together resisting this thrust. Exceptions: when structural ridge beams carry loads or when engineers design alternative restraint systems.

39. B - Ceiling joists resist outward thrust from rafters preventing walls from spreading apart. Rafters act like the sides of a triangle trying to push walls outward; ceiling joists are the bottom of the triangle holding walls together. This is critical structural function.

40. D - Rafter rise is the vertical height from the top of the wall plate to the top of the ridge. If your ridge is 8 feet above the plate, your rise is 8 feet. Rise and run together determine roof pitch and rafter length.

41. C - Rafter run is the horizontal distance from the outside of the wall to the center of the ridge (half the building width for simple gable roofs). For a 24-foot-wide building, the run is 12 feet. Run is measured horizontally, not along the rafter slope.

42. A - Common rafters run perpendicular from ridge to wall plate at regular spacing (typically 16 or 24 inches on center). They're the "common" or standard rafters. Hip and valley rafters are special rafters at angles; common rafters are the simple straight ones.

43. B - Hip roofs slope on all four sides meeting at hips (external angles). Gable roofs slope on two sides with vertical triangular gable ends on the other two sides. Hip roofs are more wind resistant; gable roofs are simpler and cheaper to frame.

44. D - Dutch gable roofs (also called Dutch hip or gablet) combine hip and gable designs. They're mostly hipped roofs with small gables at the top of each hip slope. This provides some gable benefits (light, ventilation) while maintaining hip roof advantages.

45. C - Trap primers automatically add small amounts of water periodically to floor drains or other infrequently used fixtures preventing trap seals from evaporating. Without primers, traps dry out allowing sewer gases into buildings. They're essential for floor drains that rarely receive water.

46. A - Relief vents are additional vents in long drain runs preventing pressure and vacuum problems. They connect horizontal drains to vent systems relieving pressure differentials that could siphon traps or slow drainage. They're required when drains exceed certain lengths without venting.

47. A - Vents must be at least half the diameter of the drain they serve. A 3-inch drain needs a 1-1/2-inch minimum vent. Larger vents are better. Undersized vents don't provide adequate air supply causing slow drainage and trap siphoning problems.

48. B - Wet vents serve as both drain and vent for multiple fixtures. The drain from an upstream fixture (like a lavatory) continues to vent downstream fixtures. The pipe carries both waste and air. Wet venting is common for bathroom groups saving pipe and maintaining proper venting.

49. C - Loop vents rise from fixture drains, loop upward above the flood rim, then drop back down connecting to the main vent stack. They protect individual fixtures from pressure fluctuations. Loop vents are common for island sinks where conventional venting is difficult.

50. A - A battery of fixtures is a group of similar fixtures (like multiple sinks or toilets) served by a common drain and vent. Public restrooms often have batteries of fixtures. Special venting and drainage rules apply to fixture batteries ensuring adequate drainage and venting.

51. B - Common vents serve two fixture traps on opposite sides of a wall (like back-to-back sinks). One vent pipe serves both fixtures. The vent connects between fixtures and extends upward. Common vents save pipe and space when fixtures align on opposite wall sides.

52. D - Water hammer results from sudden water velocity changes—water flows rapidly then stops suddenly when valves close. The kinetic energy converts to pressure surges banging through pipes. Fast-closing valves, high pressure, and unsecured pipes make it worse. Water hammer arrestors absorb shock preventing damage.

53. A - Vacuum breakers are atmospheric vents preventing backsiphonage. They allow air into pipes when vacuum conditions occur preventing contamination from being sucked backward into potable water. Common on hose bibs, irrigation systems, and chemical feeders.

54. C - Air admittance valves (AAVs or Studor vents) are one-way valves allowing air into drain systems when negative pressure occurs but sealing when pressure equalizes. They replace roof vents in some applications like island sinks or renovations where roof venting is difficult.

55. B - The electrical service entrance is where utility power enters buildings including the meter socket, service conductors, service disconnect (main breaker), and grounding. It's the transition point from utility ownership to building ownership. Everything after the meter is your responsibility.

56. D - The service drop is overhead electrical conductors running from utility poles to buildings. It's called a "drop" because wires drop down from poles to building service entrance. Underground service is called "service lateral" not service drop.

57. A - Weatherheads (also called service heads or raintight service entrances) are the top fittings on service masts where utility wires connect. They're designed to prevent water from running down wires into service equipment. The curved shape sheds water away from openings.

58. C - Service drops must be 10 feet minimum above driveways, 12 feet above residential property and sidewalks, and 18 feet above public streets and alleys. These clearances prevent contact with vehicles and people. Higher voltages require greater clearances.

59. B - The meter base (meter socket or meter can) is the enclosure holding electric meters. It connects utility service to building service providing the metering point. The utility owns and installs the meter; you provide and install the meter base.

60. D - Single-phase power has two hot conductors (legs) providing 120/240 volts—standard residential service. Three-phase has three hot conductors providing higher power capacity for motors and large loads. Most homes use single-phase; commercial and industrial often use three-phase.

61. A - 12 AWG wire is standard for 20-amp circuits. It has adequate ampacity for 20 amps. You could use larger wire (10 AWG) but it's unnecessary and more expensive. Never use smaller wire (14 AWG) on 20-amp circuits—that's a code violation and fire hazard.

62. C - There's no specific outlet limit on 20-amp circuits—you calculate based on actual load. General rule is limiting outlets to 10-13 on 20-amp circuits ensuring continuous loads don't exceed 16 amps (80% of capacity). Actual load matters more than outlet count.

63. D - Tandem breakers (also called twin, cheater, or double-stuff breakers) fit two single-pole breakers into one full-size panel space. They have two switches and protect two separate circuits. Tandems let you add circuits to full panels but must be compatible with your panel.

64. B - Breaker rejection features are panel designs (keyed shapes, tab configurations) preventing installation of incompatible breaker brands. Panels are designed for specific breaker types. Rejection features prevent dangerous mixing of incompatible equipment. Always use breakers listed for your specific panel.

65. D - Bus bars are thick copper or aluminum bars running through panels distributing power to circuit breakers. Hot bus bars carry incoming power from utility; breakers connect to buses. Neutral and ground bus bars provide connection points for neutral and ground wires.

66. C - Refrigerants are substances that absorb and release heat through phase changes (liquid to vapor and back). As refrigerant evaporates, it absorbs heat (cooling). As it condenses, it releases heat. This phase-change cycle moves heat from inside to outside creating cooling.

67. B - R-410A (sold as Puron or other names) is modern refrigerant replacing R-22 (Freon) phased out for environmental reasons. R-410A operates at higher pressures, is more efficient, doesn't deplete ozone, and requires systems specifically designed for it.

68. D - R-410A and R-22 use incompatible oils, operate at vastly different pressures, and require different system components. Mixing them damages compressors, reduces efficiency, and voids warranties. Systems designed for one won't work properly with the other. Never mix refrigerants.

69. A - Compressors compress refrigerant vapor increasing pressure and temperature. This is the heart of the cooling system and usually the most expensive component. Compressors require significant electrical power and must be precisely sized for system capacity.

70. B - Condensers (outdoor coils) release heat absorbed from indoor air to outside air. High-pressure hot refrigerant vapor from compressors flows through condenser coils. Outdoor air blows across coils cooling refrigerant until it condenses to liquid, releasing heat to outdoors.

71. C - Evaporator coils (indoor coils) absorb heat from indoor air causing cooling. Low-pressure liquid refrigerant flows through evaporators. As indoor air blows across cold coils, refrigerant absorbs heat and evaporates to vapor. This heat absorption cools and dehumidifies indoor air.

72. D - Metering devices (expansion valves or fixed orifices) control refrigerant flow from high-pressure side to low-pressure side. They create the pressure drop allowing refrigerant to evaporate in the evaporator coil. Proper metering ensures optimal system performance.

73. A - Refrigerant lines (linesets) transport refrigerant between outdoor condensing units and indoor evaporator coils. The larger insulated line (suction line) carries low-pressure vapor to compressors. The smaller line (liquid line) carries high-pressure liquid to metering devices.

74. B - Supply ducts deliver conditioned (heated or cooled) air from HVAC units to rooms through registers or diffusers. Return ducts bring air from rooms back to HVAC units for reconditioning through return grilles. Both are necessary for continuous air circulation.

75. C - Duct sealing uses mastic, tape, or other sealants on all joints and seams preventing air leakage. Leaky ducts waste 20-30% of conditioned air losing energy and reducing comfort. Sealing dramatically improves efficiency and comfort.

76. D - Air balancing adjusts dampers, registers, and fan speeds ensuring proper airflow to all rooms. Without balancing, some rooms get too much air (noisy, uncomfortable) while others get too little (hot or cold spots). Professional balancing optimizes comfort and efficiency.

77. B - Concrete admixtures are materials added to concrete mixes modifying properties. Accelerators speed setting, retarders slow setting, water reducers improve workability, air entrainers add air bubbles, and other admixtures provide various benefits. They're added during mixing.

78. C - Plasticizers (also called water reducers or superplasticizers) improve concrete workability making it flow easier without adding excess water. This maintains strength while improving placeability. They allow lower water-cement ratios producing stronger concrete that's still workable.

79. A - Air-entrained concrete contains microscopic air bubbles (typically 4-8% air by volume) intentionally added with air-entraining admixtures. These tiny bubbles aren't visible but dramatically improve freeze-thaw resistance. Air entrainment is essential in cold climates.

80. D - Air entrainment creates microscopic air bubbles throughout concrete providing expansion space when water freezes. When moisture in concrete freezes, it expands. Air bubbles accommodate this expansion preventing cracking and surface scaling. Air-entrained concrete is much more durable in freeze-thaw cycles.

81. C - Concrete test cylinders are samples of fresh concrete poured into cylinder molds (typically 6 inches diameter by 12 inches tall), cured under controlled conditions, then crushed to measure compressive strength. They verify concrete meets specified strength requirements.

82. B - Test cylinders are typically crushed (compression tested) at 7 days and 28 days after casting. The 28-day test is the standard acceptance test since concrete reaches about 90% of full strength by 28 days. Seven-day tests provide early strength data. Some specs also require 14 or 56-day tests.

83. A - Interior paints are designed for interior environments—less durable, easier cleanup, lower VOCs, various sheens. Exterior paints resist weather, UV degradation, mildew, and temperature extremes with tougher, more flexible films. Never use interior paint outside—it won't last.

84. C - Mildewcides (mildew inhibitors) are additives preventing mildew and mold growth on paint films. Essential in humid conditions like bathrooms, kitchens, or humid climates. They keep paint from developing black spots and maintain appearance. Most quality paints include mildewcides.

85. B - Bonding primers improve adhesion to difficult surfaces—glossy paint, tile, metal, or other slick surfaces where regular paint won't stick. They have special formulations gripping these surfaces and providing good "tooth" for topcoats. Use bonding primers when painting over questionable surfaces.

86. D - Flat (matte) paint has no sheen reflecting very little light. This hides surface imperfections, uneven textures, and wall flaws better than glossy paint. However, flat paint is harder to clean. Glossy paint shows every imperfection but wipes clean easily.

87. A - Brushes excel at trim, edges, detail work, and cutting in where precision matters. Rollers cover large flat areas (walls, ceilings) much faster. Sprayers are fastest but require more preparation. Most painting combines brushing (trim) and rolling (large areas) for efficiency and quality.

88. B - Paint blisters in hot weather when moisture or solvents trapped under paint films expand from heat creating bubbles. Painting in direct sunlight, over damp surfaces, or when too hot causes this. Paint cooler surfaces in shade and ensure surfaces are dry.

89. D - Stains penetrate wood pores coloring wood while showing grain and texture. They're transparent or semi-transparent. Paint forms opaque surface films hiding wood grain completely. Stains enhance wood beauty; paint covers it. You can't stain over paint but can paint over stain.

90. C - Wood should be below 15% moisture content for painting (often 12% or less for best results). Moisture meters verify this. Wet wood causes paint to peel and blister as moisture escapes. Let wood dry thoroughly—several days of dry weather after rain before exterior painting.

91. A - Flashing (also called picture framing or poor hide) shows as uneven appearance where touch-ups or repairs show differently than surrounding paint. It's caused by differences in sheen, texture, or coverage. Proper prep, good quality paint, and repainting entire surfaces prevent flashing.

92. B - Porcelain tile is fired at higher temperatures than standard ceramic making it denser, harder, less porous, and more durable. Porcelain absorbs less than 0.5% water; ceramic absorbs more. Porcelain works anywhere; ceramic is better for walls than high-traffic floors. Porcelain costs more but lasts longer.

93. D - Rectified tile has edges precisely cut after firing creating perfectly square tiles with sharp edges. This allows very narrow grout joints (1/16 inch) for modern seamless looks. Non-rectified tiles have slightly irregular edges requiring wider grout joints. Rectification is a finishing process.

94. C - Caliber refers to actual tile size compared to nominal size. Tiles with the same nominal size (like 12×12) often vary slightly in actual size. Tiles are sorted into calibers (size groups) during manufacturing. Buy enough tiles from the same caliber to avoid size mismatches within installations.

95. A - Tile spacers maintain uniform grout joint widths during installation. They temporarily hold tiles at correct spacing until thinset sets. Consistent joint widths create professional appearance. Spacers come in various sizes (1/16 to 1/2 inch) matching desired joint widths. Remove them before grouting.

96. B - Vitrification is the firing process making tile dense and glass-like. High firing temperatures fuse clay particles making tile hard, strong, and non-porous. Highly vitrified porcelain absorbs minimal water. Lower vitrification produces more porous ceramic tile. Vitrification level affects durability and water absorption.

97. D - PEI (Porcelain Enamel Institute) ratings measure tile wear resistance and classify suitable traffic levels. PEI 1-2 is for walls only, PEI 3 for light residential traffic, PEI 4 for heavy residential, PEI 5 for commercial. Choose PEI ratings matching your traffic conditions.

98. C - COF (Coefficient of Friction) measures slip resistance. Higher COF means better traction. COF above 0.5 is generally considered slip-resistant. Wet COF (DCOF) is most important. Check COF ratings for floors, especially bathrooms, kitchens, and outdoor areas where slipping risks exist.

99. A - Floor tiles are harder, thicker, denser, and more slip-resistant than wall tiles. Wall tiles are lighter, thinner, sometimes more decorative but less durable. Never use wall tile on floors—it won't withstand traffic and may be dangerously slippery. Floor tile works on walls though.

100. B - Tile over wood floors requires stable rigid substrate preventing flexing that cracks tile. Install two layers of 5/8-inch plywood (total 1-1/4 inches) with staggered joints, or one layer plywood plus cement board. Single thin plywood layers flex too much. Follow manufacturer requirements.

101. C - Mortar beds (also called mud beds or thick-set) are thick layers (3/4 to 2 inches) of cement mortar providing level stable substrate and proper drainage slopes in showers. Traditional thick-set method uses mortar beds; modern thin-set uses thinset adhesive over cement board.

102. A - Thin-set installation uses thinset adhesive (1/8 to 3/8 inch thick) bonding tile to substrates. Thick-set uses thick mortar beds (3/4+ inches). Thin-set is faster, cheaper, and common today. Thick-set is traditional, better for slopes and uneven surfaces, but slow and expensive.

103. B - Acceptable lippage is typically 1/16 inch maximum for tiles under 15 inches, and up to 1/8 inch for larger tiles. Excessive lippage creates trip hazards and poor appearance. Proper substrate preparation, tile selection, and lippage control systems minimize lippage.

104. D - Hollow-sounding tile indicates inadequate thinset coverage creating voids between tile and substrate. This weakens bond and allows tile to crack under loads. Proper trowel notch size, technique, and back-buttering large tiles ensure full coverage preventing hollow spots.

105. C - Efflorescence is white powdery salt deposits appearing on tile and grout surfaces. Salts from mortar, grout, or substrate dissolve in water and migrate to surfaces where water evaporates leaving crystalline deposits. It's cosmetic, not structural. Prevention involves waterproofing and quality materials.

106. A - Epoxy or urethane grouts work best in showers because they're waterproof, stain-resistant, and don't support mildew growth. Cement grout absorbs water eventually supporting mildew despite sealers. Epoxy costs more and is harder to install but performs much better in wet areas.

107. B - Grout haze is dried grout residue left on tile surfaces after grouting. It appears as cloudy film making tiles look dull. Remove it with grout haze remover or diluted vinegar shortly after grouting while still fresh. Once cured for weeks, haze is much harder to remove.

108. D - Extension cords are for temporary power only, not permanent wiring. They must be proper gauge for loads, free of damage, kept out of water, not run through walls or ceilings, and not strung together. Hard-wired connections are required for permanent installations.

109. A - Keep extension cords as short as practical. Long runs create voltage drop and heat. While no absolute maximum exists, avoid runs over 100 feet. If you need power farther away, use temporary power distribution boxes or larger wire gauges compensating for voltage drop.

110. C - Most power tools need 12 or 14 AWG extension cords depending on amperage draw and cord length. Larger tools or longer runs need 12 AWG. Light-duty hand tools might work with 14 AWG on short runs. Never use light-duty 16 or 18 AWG cords for power tools.

111. B - Undersized extension cords overheat from excessive current, cause voltage drop reducing tool performance, create fire risks, and can damage tools. The cord gets hot, insulation melts, and fires start. Always use properly sized cords. Bigger wire is always safer than smaller.

112. D - Double-insulated tools have two layers of insulation isolating electrical parts from metal housings. This provides shock protection without requiring ground connections. Double-insulated tools

use two-prong plugs. The double-square symbol indicates double insulation. They're safe without grounding but still need GFCIs in wet conditions.

113. A - Damaged cords must be repaired immediately by qualified electricians or the tool removed from service. Never use tools with damaged cords—exposed wires cause shock and fire. Tape repairs are temporary at best and often dangerous. Repair properly or replace the tool.

114. C - Cord grips (strain reliefs) are molded fittings where cords enter tools preventing pulling, bending, and twisting from stressing electrical connections inside tools. Without them, repeated movement damages internal connections causing failures and shocks. Never use tools with damaged cord grips.

115. B - Kickback is sudden backward motion when saw blades bind in cuts, violently throwing saws toward operators. It causes severe injuries—lacerations, amputations, or operators losing control. Kickback happens in milliseconds with tremendous force. Proper technique and sharp blades reduce kickback risk.

116. D - Kickback causes include dull blades, binding in cuts, cutting materials that pinch blades closed, improper support allowing material to sag and pinch, and incorrect technique. Blade guards help but don't prevent kickback. Sharp blades, proper support, and good technique are essential.

117. A - Saw guards must remain in place and functional always. Removing guards exposes operators to blade contact, flying debris, and prevents guards from protecting during kickback. Disabled guards are OSHA violations and massively increase injury severity. Never remove or defeat guards.

118. C - Stand to the side of cut lines, never directly behind blades. Kickback throws saws backward along cut lines. Standing behind puts you directly in the kickback path. Side positioning keeps you out of danger zones while maintaining control and visibility.

119. C - Blade guards protect operators from accidental blade contact, contain flying debris and chips, and provide crucial protection during kickback events. Guards cover blades when not cutting and retract during cuts. They're required safety equipment, not optional conveniences.

120. D - Removing blade guards dramatically increases injury severity. Exposed blades cause deep lacerations, amputations, and severe cuts when contact occurs. Guards also don't contain flying debris. Kickback without guards is even more dangerous. Injuries to unguarded tools are typically much worse than guarded ones.

121. B - Wear hearing protection in environments above 85 decibels or when using loud tools like circular saws, grinders, or impact tools. Prolonged exposure above 85 dB causes permanent hearing loss. Earplugs or earmuffs rated for sufficient noise reduction protect hearing. Damage accumulates over time and is irreversible.

122. C - Silica dust requires N95 respirators minimum for short exposures. Extended exposure or high dust levels need half-face or full-face respirators with P100 filters. Cloth masks, surgical masks, and dust masks don't protect against fine silica particles that cause silicosis. Always use properly rated respiratory protection.

123. B - Clean safety glasses regularly removing dirt and debris, inspect for scratches that impair vision, replace when damaged or scratched, store properly preventing damage, and never share glasses for hygiene reasons. Damaged or dirty glasses reduce visibility creating other hazards.

124. D - Safety toe boots (steel toe, composite toe, or alloy toe) protect toes from crushing injuries when heavy objects drop and from punctures when stepping on nails or sharp objects. They're required in most construction areas. Injuries to unprotected feet are severe—crushed toes, amputations, and puncture wounds.

125. A - Safety boots prevent crushing injuries from dropped materials, punctures from nails or sharp metal, cuts from sharp edges, and provide ankle support preventing sprains. The protective toe caps can withstand thousands of pounds of compression. They've prevented countless severe injuries and are essential construction PPE.