# Practice Test 6

**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 construction schedule of values?

A. Property valuation

B. Employee salary schedule

C. Material pricing list

D. Breakdown of contract price into categories for progress billing

2. What is the typical retention percentage held from progress payments?

A. 10% (though 5-10% is common depending on jurisdiction and contract)

B. 50%

C. 25%

D. 1%

3. What is a conditional lien waiver?

A. Permanent waiver

B. Automatic waiver

C. Waiver effective only upon receipt of payment

D. No conditions attached

4. What is front-end loading in schedule of values?

A. Loading materials at project start

B. Assigning higher values to early work items to improve cash flow

C. Starting work early

D. Hiring workers first

5. What is the difference between substantial completion and final completion?

A. No difference

B. Same milestone

C. Timing only

D. Substantial is when work is usable with minor items remaining; final is 100% complete

6. What is a punch list walk?

A. Fighting inspection

B. Boxing inspection

C. Dance inspection

D. Boxing materials

7. What is the purpose of as-built documentation?

A. Original plans

B. Future plans

C. Recording actual construction conditions including changes and field modifications

D. Preliminary sketches

8. What is a request for substitution?

A. Replacement worker request

B. Request to use alternative materials or methods different from specifications

C. Subcontractor change

D. Schedule modification

9. What is an equal or approved equal in specifications?

A. Exact match only

B. Any product works

C. Cheapest option

D. Specified product or equivalent meeting same performance standards

10. What is the purpose of shop drawing review?

A. Checking retail prices

B. Store inspections

C. Shopping comparisons

D. Material delivery

11. What is a product data submittal?

A. Employee data

B. Financial data

C. Manufacturer information and specifications for materials requiring approval

D. Sales data

12. What is the typical review time for submittals?

B. Varies but often 10-14 days for architect review

C. 24 hours

D. 6 months

13. What is a re-submittal?

A. First submittal

B. Final submittal

C. Optional submittal

D. Corrected submittal after initial rejection or requesting revisions

14. What is lead time for materials?

A. Time to deliver leads

B. First delivery time

C. Loading time

D. Metal delivery

15. What is expediting in construction?

A. Slowing down work

B. Canceling orders

C. Accelerating material deliveries or work to meet schedule demands

D. Normal pace

16. What is the difference between procurement and purchasing?

A. Same thing

B. Procurement includes entire process from planning to delivery; purchasing is buying transaction

C. Procurement is cheaper

D. Purchasing includes everything

17. What is just-in-time delivery?

A. Late delivery

B. Early delivery

C. Random delivery

D. Materials arriving exactly when needed minimizing storage

18. When should long-lead items be identified?

A. As early as possible in planning to avoid delays

B. After construction starts

C. At project end

D. Never identify them

19. What is value engineering?

A. Engineering values

B. Valuating engineers

C. Analyzing alternatives to achieve required function at lower cost

D. Expensive engineering

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

20. What is a shear panel in wood framing?

A. Cutting panel

B. Wall or floor panel designed to resist lateral forces

C. Decorative panel

D. Temporary panel

21. What is hold-down hardware in seismic construction?

A. Temporary clamps

B. Storage brackets

C. Safety equipment

D. Anchors preventing wall uplift at shear wall ends

22. What is the purpose of boundary members in shear walls?

A. Property line markers

B. Decorative elements

C. Temporary supports

D. Wall layout

23. What is Simpson Strong-Tie in construction?

A. Necktie brand

B. Rope product

C. Brand of structural connectors and fasteners for wood framing

D. Concrete product

24. What is a structural screw versus common nail?

A. No difference

B. Screws specifically engineered and tested for structural connections

C. Screws are weaker

D. Nails are always better

25. What is bearing capacity of soil?

A. How much soil weighs

B. Soil color

C. Soil moisture

D. Maximum load per unit area soil can support safely

26. What is allowable versus ultimate bearing capacity?

A. Allowable includes safety factor; ultimate is maximum before failure

B. Same capacity

C. Allowable is higher

D. No relationship

27. What is soil consolidation?

A. Mixing soils

B. Removing soil

C. Settlement and densification of soil under load over time

D. Decorative landscaping

28. What is differential settlement?

A. Equal settlement

B. Uneven settlement causing structural damage when different parts settle different amounts

C. No settlement

D. Positive settlement

29. What is an underpinning?

A. Clothing

B. Decorative element

C. Temporary support

D. Strengthening or supporting existing foundations from below

30. What is a caisson foundation?

A. Shallow foundation

B. Temporary foundation

C. Decorative foundation

D. Monument

31. What is a grade beam?

A. Wooden beam at grade

B. Reinforced concrete beam at or below grade connecting foundation elements

C. Decorative beam

D. Temporary beam

32. What is reinforced concrete versus prestressed concrete?

A. Same thing

B. No difference

C. Reinforced has no steel

D. Reinforced uses rebar for strength; prestressed has tensioned cables

33. What is the purpose of stirrups in concrete beams?

A. Horse equipment

B. Decorative elements

C. Vertical reinforcement resisting shear forces

D. Temporary supports

34. What is clear cover on reinforcing steel?

A. Plastic coating on rebar

B. Distance from concrete surface to nearest reinforcement

C. Transparent concrete

D. Cover material

35. What is the minimum clear cover for outdoor exposed concrete?

A. 1/2 inch

B. 2 inches typically (varies by application)

C. 6 inches

D. 1/4 inch

36. What is a continuous footing?

A. Walking constantly

B. Temporary footing

C. Spot footing

D. Long strip footing supporting entire wall length

37. When are isolated footings used?

A. For continuous walls

B. Everywhere

C. Never used

D. For individual columns transferring point loads

38. What is the purpose of rebar development length?

A. Bar manufacturing

B. Storage length

C. Minimum embedment length required for proper bond and force transfer

D. Cutting length

39. What is a splice in rebar?

A. Breaking rebar

B. Decorative element

C. Temporary connection

D. Metal connector

40. What is lapping in reinforcing steel?

A. Folding rebar

B. Bending rebar

C. Cutting rebar

D. Overlapping bars to transfer forces between sections

41. What is epoxy-coated rebar?

A. Painted rebar

B. Decorative rebar

C. Temporary coating

D. Rusty rebar

42. What is fiber-reinforced concrete?

A. Dietary fiber concrete

B. Fabric concrete

C. Concrete containing fibers improving crack control and impact resistance

D. Weak concrete

43. What is the 28-day strength test for concrete?

A. Testing after one month

B. Standard compressive strength test at 28 days

C. Four-week curing

D. Daily testing

44. What is concrete maturity testing?

A. Concrete age

B. Final strength

C. Color testing

D. Estimating strength based on temperature history and time

## SECTION 3: CORE TRADES (Questions 45-82)

45. What is a water softener?

A. Adding chemicals to water

B. Heating water

C. Cooling water

D. Filtering water

46. What is hard water?

A. Frozen water

B. Pressurized water

C. Water with high mineral content (calcium and magnesium)

D. Salt water

47. What is a PRV in plumbing?

A. Private valve

B. Pressure Reducing Valve controlling water pressure

C. Public valve

D. Decorative valve

48. What is water hammer arrestor sizing?

A. Random size

B. Any size works

C. Largest possible

D. Based on fixture units and pipe size per manufacturer specs

49. What is a circulating pump in hot water systems?

A. Pump circulating hot water maintaining instant hot water at fixtures

B. Drainage pump

C. Well pump

D. Decorative pump

50. What is a manifold plumbing system?

A. Traditional branching system

B. Old system

C. Central distribution point with individual lines to each fixture

D. Decorative system

51. What is PEX plumbing?

A. Metal pipe

B. Clay pipe

C. Cross-linked polyethylene flexible plastic pipe for water supply

D. Drain pipe

52. What are the advantages of PEX over copper?

A. No advantages

B. More expensive always

C. Harder to install

D. Heavier material

53. What is an access panel in plumbing?

A. Entrance door

B. Decorative panel

C. Temporary cover

D. Removable panel providing access to valves or components

54. What is a cleanout plug?

A. Drain plug

B. Removable cap on cleanout fitting for accessing and clearing blockages

C. Decorative plug

D. Temporary plug

55. What is hydrostatic testing?

A. Water level testing

B. Humidity testing

C. Testing system with water pressure to verify leak-free installation

D. Drainage testing

56. What is rough-in dimension for plumbing?

A. Approximate measurement

B. Final measurement

C. Random measurement

D. Decorative measurement

57. What is a fixture rough-in?

A. Damaged fixture

B. Installing supply and drain lines before wall closure

C. Final fixture installation

D. Temporary fixture

58. What is a diverter valve?

A. Entertainment valve

B. Decorative valve

C. One-way valve

D. Valve directing water flow between outlets like tub spout and showerhead

59. What is a Roman tub filler?

A. Ancient plumbing

B. Italian product

C. Temporary filler

D. European style

60. What is electrical bonding?

A. Gluing wires

B. Wire insulation

C. Connecting metal parts to same electrical potential preventing shock

D. Decorative wiring

61. What is a grounding electrode system?

A. Electrical test equipment

B. Connection to earth providing ground reference and fault protection

C. Battery system

D. Generator

62. What is a ground rod?

A. Fishing equipment

B. Survey marker

C. Decorative rod

D. Metal rod driven into earth for grounding

63. What is the minimum depth for ground rods?

A. 2 feet

B. 4 feet

C. 8 feet or driven to refusal in rocky soil

D. 1 foot

64. What is an equipment grounding conductor?

A. Wire connecting equipment metal parts to ground preventing shock

B. Hot wire

C. Neutral wire

D. Any wire

65. What is a bonding jumper?

A. Athletic wear

B. Temporary connection

C. Decorative wire

D. Conductor ensuring electrical continuity between metal parts

66. What is a TVSS device?

A. Television

B. Temporary device

C. Decorative device

D. Vacuum system

67. What is a whole-house surge protector?

A. Circuit breaker

B. Fuse

C. Device at panel protecting entire home from voltage spikes

D. Light switch

68. What is arc fault detection?

B. Technology detecting dangerous arcing conditions and shutting off power

C. Welding detection

D. Lightning detection

69. What is a load center?

A. Weight distribution point

B. Storage area

C. Equipment location

D. Heavy machinery

70. What is the service grounding point?

A. Where service connects to grounding electrode system

B. Entrance point

C. Meter location

D. Panel location

71. What is a ductless mini-split system?

A. Broken duct system

B. Individual room air conditioning units with outdoor compressor and indoor air handlers

C. Central system

D. Temporary cooling

72. What is a heat pump's coefficient of performance (COP)?

A. Cost rating

B. Size measurement

C. Color code

D. Efficiency ratio of heat output to energy input

73. What is auxiliary heat in heat pumps?

A. Main heating

B. Backup heat

C. Decorative heating

D. Supplemental or emergency heat when heat pump can't meet demand

74. What is an economizer in HVAC?

A. Cost reduction device

B. Cheaper system

C. System using outside air for free cooling when conditions permit

D. Budget control

75. What is a VAV system?

A. Vehicle system

B. Variable Air Volume system adjusting airflow based on demand

C. Ventilation fan

D. Fixed system

76. What is a building automation system (BAS)?

A. Robot construction

B. Computerized control system managing HVAC, lighting, and building systems

C. Automatic doors

D. Security system

77. What is HVAC zoning?

A. Climate zones

B. Building zones

C. Time zones

D. Dividing building into areas with independent temperature control

78. What is setback temperature?

A. Reduced temperature setting during unoccupied periods saving energy

B. Increased temperature

C. Normal temperature

D. Emergency temperature

79. What is concrete spalling caused by?

A. Proper installation

B. Good concrete

C. Reinforcement corrosion, freeze-thaw, or chemical attack

D. Color additives

80. What is concrete scaling?

A. Measuring concrete

B. Surface peeling from freeze-thaw, deicers, or improper finishing

C. Weighing concrete

D. Proper finish

81. What is surface dusting on concrete?

A. Decorative finish

B. Proper finish

C. Cleaning method

D. Powdery weak surface from premature finishing or excess water

82. What is crazing in concrete?

A. Breaking concrete

B. Strong concrete

C. Fine random surface cracks creating spider-web pattern

D. Proper finish

## SECTION 4: FINISH TRADES (Questions 83-107)

83. What is primer surfacer in automotive painting?

A. High-build primer filling imperfections and providing smooth surface

B. Final coat

C. Decorative primer

D. Temporary coating

84. What is VOC in paint?

A. Voice command

B. Ventilation code

C. Volume control

D. Volatile Organic Compounds (chemicals that evaporate contributing to air pollution)

85. What is low-VOC or zero-VOC paint?

A. High-chemical paint

B. Paint with reduced harmful emissions for better air quality

C. Expensive paint only

D. Decorative paint

86. What is paint chalking?

A. Decorative technique

B. Proper finish

C. Powdery surface deterioration from UV and weather exposure

D. Intentional texture

87. What is mil thickness gauge?

A. Military standard

B. Million parts

C. Millimeter gauge

D. Tool measuring paint film thickness in thousandths of inch

88. What is a paint shield?

A. Protective barrier preventing paint on adjacent surfaces while cutting in

B. Decorative element

C. Temporary cover

D. Paint storage

89. What is back-brushing after spraying?

A. Cleaning brushes

B. Lightly brushing sprayed paint to improve penetration and finish

C. Removing paint

D. Wasting time

90. What is pin-striping in painting?

A. Removing stripes

B. Pattern painting

C. Decorative narrow lines in contrasting colors

D. Paint defect

91. What is mosaic tile?

A. Large tile only

B. One color only

C. Temporary tile

D. Small tiles (typically under 2×2 inches) creating patterns

92. What is a tile medallion?

A. Award for tile installers

B. Decorative tile pattern or design creating focal point

C. Tile tool

D. Tile size

93. What is subway tile?

A. Underground tile

B. Transportation tile

C. Rectangular tile (typically 3×6 inches) originally used in subway stations

D. Temporary tile

94. What is a tile niche?

A. Market segment

B. Recessed shelf in tile wall for storage in showers

C. Tile pattern

D. Tile color

95. What is waterproofing membrane under tile?

A. Temporary barrier

B. Decorative layer

C. Optional material

D. Barrier preventing water penetration to substrate

96. What is a mud pan in tile installation?

A. Dirt container

B. Baking pan

C. Shallow pan holding mortar or thinset during application

D. Water container

97. What is a grout bag?

A. Decoration

B. Tool

C. Storage bag

D. Tile bag

98. What is a grout saw?

A. Cutting tile

B. Tool removing old grout from joints

C. Cutting grout bags

D. Power saw

99. What is tile movement joints?

A. Decorative joints

B. Temporary joints

C. Installation joints

D. Joints accommodating expansion and contraction preventing cracking

100. What is a tile trim?

A. Cutting tile

B. Tile waste

C. Decorative or finishing edge pieces for transitions and exposed edges

D. Temporary trim

101. What is schluter profile in tile?

A. German tile type

B. Tile pattern

C. Tile color

D. Grout color

102. What is a threshold in tile work?

A. Entry point

B. Transition strip between different flooring materials or rooms

C. Doorway tile

D. Decorative tile

103. What is natural stone sealing?

A. Decorative finish

B. Temporary coating

C. Applying sealer protecting porous stone from stains and moisture

D. Stone cutting

104. What is honed stone versus polished stone?

A. Same finish

B. Honed has matte smooth finish; polished has glossy reflective finish

C. Honed is rough

D. No difference

105. What is tumbled stone?

A. Broken stone

B. Dropped stone

C. Damaged stone

D. Stone with worn aged appearance from tumbling process

106. What is gauged stone?

A. Measuring stone

B. Pricing stone

C. Weighing stone

D. Stone cut to uniform thickness

107. What is full-bed mortar method for stone?

A. Sleeping on stone

B. Thin application

C. Traditional thick mortar bed installation method

D. Decorative method

## SECTION 5: SAFETY (Questions 108-125)

108. What is the purpose of a daily toolbox talk?

A. Tool inspection

B. Brief safety meeting discussing specific hazards and safe work practices

C. Tool distribution

D. Tool cleaning

109. What topics should toolbox talks cover?

A. Gossip

B. Politics

C. Sports

D. Daily hazards and safe practices

110. What is a job hazard analysis (JHA)?

A. Cost analysis

B. Schedule analysis

C. Employee analysis

D. Tool analysis

111. What is the hierarchy of hazard controls?

A. Random controls

B. Cheapest controls

C. Elimination, substitution, engineering, administrative, PPE (most to least effective)

D. Any controls

112. What is the most effective hazard control?

A. PPE

B. Eliminating the hazard completely

C. Signs

D. Training

113. What is the least effective hazard control?

A. Elimination

B. Engineering controls

C. Substitution

D. PPE (personal protective equipment)

114. What is administrative control in safety?

A. Office safety

B. Paperwork

C. Management policies

D. Procedures, policies, and work practices reducing exposure

115. What is engineering control in safety?

A. Hiring engineers

B. Engineering paperwork

C. Physical changes to workplace or equipment eliminating hazards

D. Design reviews

116. What is behavior-based safety?

A. Employee discipline

B. Focusing on employee behavior and promoting safe practices through observation

C. Punishment system

D. Reward system only

117. What is a near-miss incident?

A. Target practice

B. Successful completion

C. Perfect safety

D. Normal occurrence

118. Why should near-misses be reported?

A. They reveal hazards that could cause future injuries

B. Punishment

C. Creating paperwork

D. Wasting time

119. What is a root cause analysis?

A. Gardening term

B. Tree inspection

C. Investigating to identify underlying causes of incidents

D. Surface investigation

120. What is the purpose of incident investigation?

A. Assigning blame

B. Punishment

C. Identifying causes and preventing recurrence

D. Creating reports only

121. What is a safety incentive program?

A. Punishment system

B. Required by law

C. Expensive program

D. Rewarding safe behavior and injury-free performance

122. What is the proper way to lift heavy objects?

A. Lift with back, bend at waist, twist while lifting

B. Any method works

C. Use only arms

D. Jerk rapidly

123. What is the danger of repetitive motion injuries?

A. No danger exists

B. One-time injuries

C. Cumulative damage from repeated movements causing conditions like carpal tunnel

D. Immediate injury only

124. What is ergonomics in construction?

A. Economic study

B. Designing work to fit workers reducing injury and improving efficiency

C. Decoration

D. Equipment pricing

125. What should be done if injured on the job?

A. Hide the injury

B. Ignore the injury

C. Work through pain

D. Report immediately, seek medical attention, and document the incident

# Answer Key with Explanations

**1. D** - The schedule of values breaks down your total contract price into categories (foundation, framing, roofing, etc.) with dollar values for each. This becomes the basis for progress billing—you bill monthly based on percentages of each category completed. It's essentially your payment roadmap through the project.

**2. A** - Typical retention (also called retainage) is 10%, though 5-10% is common depending on location and contract terms. If you bill $100,000, the owner keeps $10,000 and pays $90,000. Retention accumulates throughout the project and releases after final completion providing the owner leverage ensuring you finish everything.

**3. C** - Conditional lien waivers become effective only when you actually receive payment. The waiver says "when the check clears, I waive my lien rights." If the check bounces, the waiver is void. Never sign unconditional waivers before receiving payment—you'd be waiving rights before getting paid.

**4. B** - Front-end loading assigns disproportionately high values to early work items in the schedule of values. You might put 30% of contract value in mobilization that only costs 10%. This improves early cash flow but leaves less to bill later. Most contracts prohibit excessive front-loading.

**5. D** - Substantial completion means work is complete enough for the owner's intended use with only minor punch list items remaining. Final completion is 100% done—every punch list item completed, all required documentation submitted, and everything perfect. Substantial completion triggers final payment timelines and warranty periods.

**6. A** - Punch list walks are joint inspections where owner, architect, and contractor walk through projects identifying remaining items needing correction or completion before final payment. Everyone makes lists of deficiencies, the contractor fixes them, then final inspection determines if everything's truly complete.

**7. C** - As-built documentation records actual construction conditions including all field changes, deviations from original plans, and final locations of concealed systems. They're essential for future maintenance, renovations, and troubleshooting. As-builts show what was actually built, not what was originally planned.

**8. B** - Requests for substitution ask permission to use alternative materials or methods different from specifications. Maybe the specified product is unavailable or you found something better or cheaper. The architect or engineer reviews substitutions approving them only if they're truly equal or better.

**9. D** - "Approved equal" or "or equal" in specifications means you can use the specified product or equivalent products meeting the same performance standards. You must prove the substitute is truly equal in quality, function, and appearance. The design team makes final equality determinations.

**10. A** - Shop drawing reviews verify contractors plan to fabricate and install products correctly matching design intent and coordinating with other systems. The architect or engineer reviews shop drawings approving, approving with comments, or rejecting them. This catches problems before fabrication and installation.

**11. C** - Product data submittals provide manufacturer information, specifications, test data, and technical details for products requiring approval. They prove materials meet specifications and allow the design team to verify proper product selection before ordering and installation.

**12. B** - Typical submittal review takes 10-14 days though this varies by contract and submittal complexity. Plan ahead—don't submit items needing immediate installation. Submittals go through multiple review levels (contractor, architect, engineer) taking time. Rush reviews risk inadequate review and mistakes.

**13. D** - Re-submittals are corrected submittals after initial rejection or requests for revisions. If your first submittal was rejected because it didn't meet specs, you re-submit with corrected information or different products. Re-submittals add time to schedules so get submittals right the first time.

**14. A** - Lead time is the period between ordering materials and delivery ready for installation. A window might have 8-week lead time—order today, receive in 8 weeks. You must order materials with adequate lead time or face delays. Long lead times require very early ordering.

**15. C** - Expediting means accelerating processes to meet schedule demands—rushing material deliveries, prioritizing fabrication, adding resources to speed work. You expedite when schedules are tight or you're behind. Expediting usually costs more but prevents bigger delays and liquidated damages.

**16. B** - Procurement encompasses the entire supply chain process—identifying needs, selecting suppliers, negotiating, purchasing, tracking, receiving, and paying. Purchasing is just the buying transaction itself. Procurement is strategic; purchasing is tactical. Good procurement ensures materials arrive when needed at best prices.

**17. D** - Just-in-time (JIT) delivery schedules materials arriving exactly when needed for installation minimizing storage, protecting materials from damage and theft, and reducing site congestion. It requires excellent coordination and reliable suppliers. When it works, JIT improves efficiency; when it fails, it stops projects cold.

**18. A** - Identify long-lead items as early as possible in planning—during design or early construction. Long-lead items (custom windows, special equipment, imported materials) take weeks or months to manufacture and deliver. Late identification causes delays and expensive expediting. Early identification lets you order soon enough.

**19. C** - Value engineering analyzes alternatives to achieve required functions at lower cost without sacrificing quality or performance. Can you use a different structural system costing less but working just as well? Value engineering finds smarter, more economical solutions not cheaper, lower-quality ones.

**20. B** - Shear panels are walls or floor sections specifically designed and constructed to resist lateral forces from wind or earthquakes. They use structural sheathing with specific nailing patterns and boundary framing creating stiffness that prevents building racking. Not all walls are shear panels—only those engineered for lateral loads.

**21. D** - Hold-down hardware (also called tie-downs) are heavy-duty connectors at shear wall ends anchoring walls to foundations or lower floors. They resist overturning forces when lateral loads try to tip

shear walls over. Hold-downs transfer huge tension forces preventing walls from lifting off foundations during earthquakes or storms.

**22. C** - Boundary members (also called boundary elements or chord studs) are vertical framing members at shear wall edges specifically designed to resist overturning moments and compression forces. They're typically built-up studs or posts stronger than regular studs handling concentrated forces at shear wall ends.

**23. C** - Simpson Strong-Tie is the dominant brand of structural connectors and fasteners for wood framing—hurricane ties, joist hangers, hold-downs, angle brackets, and countless other products. When engineers specify "Simpson HD10 hold-down," they're specifying that brand's specific product. Many contractors use "Simpson" generically for any structural hardware.

**24. B** - Structural screws are specifically engineered and tested for structural connections with published load ratings. They're not just deck screws—they're tested for shear and withdrawal loads and approved by code officials. When engineers specify structural screws, you must use rated structural screws, not random construction screws.

**25. D** - Soil bearing capacity is the maximum pressure (pounds per square foot) soil can support without excessive settlement or failure. Sandy gravel might support 3,000-4,000 PSF; soft clay might only handle 1,500-2,000 PSF. Foundations must distribute building loads within the soil's bearing capacity.

**26. A** - Allowable bearing capacity includes safety factors (typically 2-3) reducing ultimate bearing capacity to safe working loads. If ultimate capacity is 6,000 PSF, allowable might be 2,000 PSF. Design to allowable capacity; ultimate is the failure point. The safety factor accounts for soil variability and uncertainties.

**27. C** - Soil consolidation is gradual settlement and densification under sustained loads as air and water squeeze out of soil pores. Consolidation happens over time—weeks to years depending on soil. It's one reason buildings settle slightly after construction. Proper compaction before construction minimizes future consolidation.

**28. B** - Differential settlement occurs when different building parts settle different amounts causing structural damage—cracked walls, stuck doors and windows, foundation cracks. It's caused by soil variations, uneven loads, or poor soil prep. Uniform settlement settles everything equally causing no damage; differential settlement tears buildings apart.

**29. D** - Underpinning strengthens or supports existing foundations from below. You might underpin when adding floors increasing loads, when original foundations are inadequate, or when adjacent excavation threatens foundations. Underpinning involves excavating under existing foundations in sections and adding deeper or stronger support.

**30. A** - Caissons (also called drilled piers or drilled shafts) are deep cylindrical foundation elements drilled into the ground and filled with concrete. They're used when surface soils are weak requiring deep foundations to reach bedrock or stable soil. Large buildings often use caissons supporting massive loads.

**31. B** - Grade beams are reinforced concrete beams at or below grade connecting foundation elements (caissons, piers, or piles) tying them together and distributing loads. They work like foundation walls but don't bear directly on soil—they span between deep foundation elements.

**32. D** - Reinforced concrete uses rebar or mesh providing tensile strength where concrete is weak in tension. The steel isn't tensioned. Prestressed (or post-tensioned) concrete has steel cables tensioned after concrete cures putting concrete in permanent compression. Prestressing allows longer spans and thinner sections.

**33. C** - Stirrups are vertical or diagonal steel reinforcement in concrete beams resisting shear forces. They're typically bent rebar forming U or rectangular shapes around main longitudinal reinforcement. Stirrups prevent beams from failing in shear—they hold beams together when shear forces try to slide sections apart.

**34. A** - Clear cover is the distance from the nearest reinforcement to concrete surfaces. It's "clear" space between rebar and the outside. Adequate cover protects rebar from corrosion, provides fire resistance, and ensures proper concrete encasement. Insufficient cover leads to rebar corrosion and concrete spalling.

**35. B** - Outdoor exposed concrete typically requires 2 inches minimum clear cover though this varies by application. Harsher environments (marine, freeze-thaw) may require more. The cover protects rebar from moisture and chemicals. Slabs on grade might use less; aggressive environments use more.

**36. D** - Continuous footings (also called strip footings or wall footings) are long concrete strips running under entire wall lengths. They distribute wall loads along the footing length. Most foundation walls sit on continuous footings. They're "continuous" because they're uninterrupted under walls.

**37. D** - Isolated footings (also called spread footings or pad footings) are individual concrete pads under columns or posts. Each column gets its own footing spreading the concentrated column load over enough area for safe soil pressure. Buildings with columns use isolated footings; buildings with bearing walls use continuous footings.

**38. C** - Development length is the minimum embedment length required for rebar to develop its full strength through bond with concrete. If rebar isn't embedded long enough, it pulls out before reaching full capacity. Development length depends on bar size, concrete strength, and other factors. Tables and formulas determine required lengths.

**39. D** - Rebar splices join separate bars transferring forces between them. Splices are necessary when bars aren't long enough to run continuously. Common splice types include lap splices (overlapping bars), mechanical couplers (threaded connectors), and welded splices. Proper splicing maintains reinforcement continuity.

**40. D** - Lapping is overlapping bars to transfer forces from one bar to the next through bond with the surrounding concrete. Lap lengths depend on bar size and concrete strength—typically 12-20 inches or more. Proper lapping is critical—inadequate laps create weak points where reinforcement fails to develop full strength.

**41. A** - Epoxy-coated rebar has factory-applied epoxy coating protecting steel from corrosion. It's used in corrosive environments like bridge decks, parking structures, or marine applications. The green coating prevents moisture and chlorides from reaching steel. Damaged coating must be repaired—scratches compromise protection.

**42. C** - Fiber-reinforced concrete contains short fibers (steel, synthetic, or glass) distributed throughout improving crack control, impact resistance, and toughness. Fibers don't replace structural reinforcement but supplement it controlling shrinkage cracks and improving durability. Different fiber types serve different purposes.

**43. B** - The standard concrete strength acceptance test crushes cylinders at 28 days after casting. Specifications typically require minimum compressive strength at 28 days (like 3,000 or 4,000 PSI). Concrete continues gaining strength beyond 28 days but 28-day strength is the standard benchmark.

**44. D** - Concrete maturity testing estimates strength based on time and temperature history. Concrete cures faster at higher temperatures. Maturity meters measure accumulated temperature-time and correlate it to strength using pre-established relationships. This allows estimating strength without waiting 28 days—useful for form removal decisions.

**45. A** - Water softeners remove hardness minerals (calcium and magnesium) through ion exchange replacing them with sodium or potassium. Soft water prevents scale buildup in pipes and water heaters, improves soap effectiveness, and makes water feel "softer." They're common where well water or municipal water is very hard.

**46. C** - Hard water has high dissolved mineral content, primarily calcium and magnesium. It creates scale deposits, reduces soap effectiveness, spots dishes and fixtures, and feels different than soft water. Hardness varies by location depending on geology. Water softeners address hard water problems.

**47. B** - PRV stands for Pressure Reducing Valve (also called pressure regulator). It reduces high incoming water pressure from municipal systems down to safe levels for buildings (typically 50-60 PSI). High pressure wastes water, damages fixtures and appliances, and creates noise. PRVs protect plumbing systems.

**48. D** - Water hammer arrestors must be properly sized based on fixture units served and pipe sizes per manufacturer specifications. Undersized arrestors don't absorb shock adequately; oversized ones cost more than necessary. Manufacturers provide sizing tables matching arrestors to applications. Following these tables ensures proper water hammer protection.

**49. A** - Circulating pumps continuously circulate hot water through supply lines back to water heaters maintaining hot water at all fixtures. Without circulation, water cools in pipes and you waste water waiting for hot water. Recirculation provides instant hot water but uses energy maintaining hot pipes. Timer controls reduce energy waste.

**50. C** - Manifold (also called PEX manifold or home-run) systems have a central distribution manifold with dedicated lines running to each fixture. Each fixture gets its own supply line from the manifold.

Benefits include consistent pressure, easy fixture isolation, and reduced fittings. All lines are accessible at the central manifold.

**51. C** - PEX (cross-linked polyethylene) is flexible plastic tubing used for water supply. It's easy to install (fewer fittings, bendable), resists corrosion and scale, handles freezing better than copper, costs less than copper, and is quiet. PEX has become extremely popular for residential plumbing.

**52. A** - PEX advantages over copper include lower material cost, easier and faster installation (flexible requiring fewer fittings), better freeze resistance (expands without bursting), corrosion resistance, quieter operation, and no soldering required. Copper advantages are fire resistance and some prefer its proven track record. PEX has largely replaced copper in residential.

**53. D** - Access panels are removable panels in walls or ceilings providing access to valves, cleanouts, electrical junctions, or mechanical equipment. They allow maintenance and repairs without demolishing walls. Code requires access to certain components. Access panels should be conveniently located and properly sized.

**54. B** - Cleanout plugs are removable caps on cleanout fittings allowing access to drain lines for clearing blockages. When drains clog, you remove the plug and insert a snake or cable through the cleanout. Plugs should be removable without special tools for emergency access.

**55. C** - Hydrostatic testing pressurizes systems with water to test for leaks before covering or concealing. Supply systems test at higher-than-operating pressure. Drain systems fill with water checking for leaks. Successful hydrostatic tests verify leak-free installation. Failed tests require finding and fixing leaks.

**56. A** - Rough-in dimensions specify exact locations for supply and drain connections before covering walls. Fixtures have specific rough-in requirements—toilets typically rough in 12 inches from wall to drain center. Following correct rough-ins ensures fixtures install properly. Wrong rough-ins mean fixtures don't fit.

**57. B** - Fixture rough-in installs supply and drain lines before walls close. Pipes stub out at correct locations for future fixture connections. After inspection and wall closure, fixtures install connecting to rough-in stubouts. Rough-in must be exact—moving pipes after drywall is installed is expensive.

**58. D** - Diverter valves redirect water flow between outlets—most commonly between bathtub spout and showerhead. Pull the diverter knob and water switches from tub to shower. Three-way diverters direct flow to three outlets like tub spout, showerhead, and hand shower.

**59. A** - Roman tub fillers are deck-mounted faucets for freestanding or platform tubs inspired by Roman baths. They're typically large fixtures with hand showers mounted on tub decks or floors rather than walls. They create dramatic architectural statements and work with freestanding tubs.

**60. C** - Electrical bonding connects metal parts ensuring they're at the same electrical potential. This prevents voltage differences between metal objects that could shock someone touching both. Bonding connects water pipes, gas pipes, metal framing, and other conductive materials to the grounding system.

**61. B** - The grounding electrode system provides the connection to earth establishing ground reference and safe path for fault currents. It includes ground rods, concrete-encased electrodes (Ufer grounds), metal water pipes, and other electrodes. The grounding electrode system is the foundation of electrical safety.

**62. A** - Ground rods are metal rods (typically 5/8-inch diameter copper-clad steel) driven into earth providing electrical connection to ground. They're the most common grounding electrode. Current code requires two ground rods unless the first rod meets low resistance requirements. Ground rods must be driven to proper depth.

**63. C** - Ground rods must be driven at least 8 feet deep (most rods are 8 or 10 feet long). In rocky areas where driving 8 feet is impossible, rods can be driven at angles or installed in trenches. The goal is adequate contact with soil for low electrical resistance to earth.

**64. A** - Equipment grounding conductors (EGC) are green or bare wires connecting equipment metal parts to ground protecting against electric shock if equipment develops faults. If hot wires touch metal enclosures, EGCs carry fault current to ground tripping breakers. Proper grounding prevents electrocution.

**65. D** - Bonding jumpers are conductors ensuring electrical continuity between metal parts that might otherwise have poor connections. They bond around water meters, bond metal piping systems, and ensure continuous ground paths. Good bonding prevents voltage differences between metal objects.

**66. A** - TVSS (Transient Voltage Surge Suppressor) devices protect against voltage spikes and surges from lightning, power company switching, and large equipment. They divert surge energy to ground before it damages electronics and appliances. Whole-house TVSS installs at panels; individual TVSS protects specific equipment.

**67. C** - Whole-house surge protectors install at main panels protecting entire homes from surges before they enter branch circuits. They're more effective than plug-in suppressors and protect permanently wired equipment like HVAC, appliances, and the panel itself. They're increasingly required by code.

**68. B** - Arc fault detection technology monitors electrical waveforms identifying dangerous arcing conditions (loose connections, damaged wires) and shutting off power before fires start. AFCI breakers provide this protection and are required in bedrooms and most living areas in modern construction.

**69. D** - Load centers are electrical service panels (breaker panels) where incoming power distributes to branch circuits. The term "load center" describes residential-grade panels. They're called load centers because they center and distribute the electrical load. It's just another name for electrical panel.

**70. A** - The service grounding point is where the service connects to the grounding electrode system—typically where the main service conductor neutral bonds to ground and connects to ground rods or other electrodes. This is the critical connection linking building electrical systems to earth ground.

**71. B** - Ductless mini-split systems have outdoor condensing units connected to one or more indoor air handling units (wall-mounted or ceiling-mounted) via refrigerant lines. Each indoor unit provides heating and cooling to individual rooms or zones without ductwork. They're efficient, quiet, and allow room-by-room control.

**72. D** - COP (Coefficient of Performance) measures heat pump efficiency as the ratio of heat output to energy input. A COP of 3 means the pump produces 3 units of heat for every 1 unit of electricity consumed. Higher COPs mean better efficiency. Heat pumps typically achieve COPs of 2-4.

**73. D** - Auxiliary heat (also called supplemental or backup heat) provides additional heating when heat pumps can't meet demand alone—during extremely cold weather or defrost cycles. Auxiliary heat is typically electric resistance strips. They're expensive to operate but provide reliable heat when needed.

**74. C** - Economizers use outside air for "free cooling" when outdoor conditions are favorable. When it's cool outside and you need cooling, the economizer brings in outside air instead of running compressors. This saves significant energy in mild weather. Commercial buildings use economizers extensively.

**75. B** - VAV (Variable Air Volume) systems adjust airflow to zones based on demand rather than constant volume. Dampers modulate to different zones based on thermostats. VAV saves energy by reducing fan operation and conditioning only the air actually needed. It's common in commercial buildings.

**76. B** - Building Automation Systems (BAS) are computerized control systems managing HVAC, lighting, security, and other building systems from central interfaces. BAS optimize energy use, provide remote monitoring and control, log data, and integrate all building systems. Large buildings use sophisticated BAS.

**77. D** - HVAC zoning divides buildings into areas with independent temperature control—each zone has its own thermostat controlling dampers or equipment. Zoning provides comfort flexibility and efficiency gains—you only heat/cool occupied zones. Homes commonly use 2-4 zones.

**78. A** - Setback temperature is reduced heating or increased cooling setpoint during unoccupied periods saving energy without compromising occupied comfort. You might heat to 70°F when home but setback to 62°F overnight. Programmable thermostats automate setbacks. Setback strategies save 10-30% on heating and cooling.

**79. C** - Concrete spalling (surface breaking off) is typically caused by corrosion of embedded reinforcement (rust expands breaking concrete), freeze-thaw cycles (especially with deicers), chemical attack, or fire damage. Adequate concrete cover, proper air entrainment, and corrosion-resistant rebar prevent spalling.

**80. B** - Concrete scaling is surface deterioration where thin layers peel off. It's usually caused by freeze-thaw cycles (especially with deicing salts), premature finishing, inadequate air entrainment, or applying salts too early. Properly air-entrained concrete finished at the right time resists scaling.

**81. D** - Surface dusting is powdery, weak concrete surfaces that wear away and generate dust. It's caused by premature finishing (troweling while bleed water is present), excess water in mix, or carbonation. Dusting surfaces never develop proper strength and continue wearing. Proper timing and water control prevent dusting.

**82. C** - Crazing is fine random surface cracks creating spider-web or map-cracking patterns. It's usually cosmetic, not structural. Crazing is caused by rapid surface drying, plastic shrinkage, or carbonation. While unsightly, crazing typically doesn't affect structural performance. Proper curing reduces crazing.

**83. A** - Primer surfacer (also called high-build primer or primer filler) is thick primer filling minor surface imperfections and creating smooth surfaces for topcoats. It builds thickness quickly and sands easily. Body shops use primer surfacers extensively preparing cars for paint. It's sandable filler and primer combined.

**84. D** - VOCs (Volatile Organic Compounds) are chemicals that evaporate from paints, stains, and finishes contributing to air pollution and health problems. Traditional paints contained high VOCs—the "paint smell." VOCs include solvents and thinners that off-gas as coatings cure.

**85. B** - Low-VOC and zero-VOC paints have reduced harmful emissions providing better indoor air quality. They smell less, are healthier for occupants and painters, and meet increasingly stringent environmental regulations. Performance has improved dramatically—low-VOC paints now perform as well as high-VOC products.

**86. C** - Chalking is paint deterioration where surface becomes powdery from UV and weather exposure. Binders break down leaving loose pigment on the surface. You notice it when you rub a painted surface and get powder on your hand. Some chalking is normal aging; excessive chalking indicates paint failure.

**87. D** - Mil thickness gauges measure paint film thickness in mils (thousandths of an inch). Proper thickness ensures adequate coverage, protection, and warranty compliance. Painters use mil gauges verifying they're applying specified film thickness. Too thin provides inadequate protection; too thick wastes expensive coating.

**88. A** - Paint shields are handheld barriers (typically metal or plastic) protecting adjacent surfaces while painting. You hold the shield against surfaces you don't want painted (like ceiling when cutting in wall color) preventing paint splatter and overspray. They create clean lines faster than taping.

**89. B** - Back-brushing means lightly brushing freshly sprayed paint working it into surfaces and improving coverage. Spray application is fast but back-brushing ensures paint penetrates properly particularly on rough surfaces. The combination of spraying and back-brushing provides speed and quality.

**90. C** - Pin-striping is painting thin decorative lines in contrasting colors creating accents and visual interest. Classic cars often have pin-striping. Special brushes and steady hands create straight consistent lines. Pin-striping adds elegance to painted surfaces.

**91. D** - Mosaic tile consists of small tiles (typically under 2×2 inches, often 1×1 inch or smaller) mounted on mesh sheets. Multiple small tiles create patterns and allow curves and details impossible with larger tiles. Mosaics make beautiful accents in showers and backsplashes.

**92. A** - Tile medallions are decorative tile arrangements creating focal points—think of them as tile artwork. They might feature patterns, contrasting colors, or special tiles arranged artistically. Medallions often center in entryways or as shower accents. They're functional art.

**93. C** - Subway tile is rectangular tile (originally 3×6 inches but now various sizes) named for its use in New York subway stations in the early 1900s. The classic white beveled edge style remains popular. Subway tile installed in brick patterns creates timeless, versatile looks.

**94. B** - Tile niches are recessed shelves built into shower walls providing storage without protruding into the space. They're framed during construction, waterproofed properly, and tiled inside. Niches are both functional and attractive storing shampoo and soap without cluttering shower shelves.

**95. D** - Waterproofing membranes are barriers preventing water penetration to substrates protecting structural components from damage. They're critical in showers and wet areas. Membranes go under tile over cement board or other substrates. Without proper waterproofing, water eventually damages structures causing expensive repairs.

**96. C** - Mud pans (also called mortar pans or hawk) are shallow flat pans with handles holding mortar or thinset during application. Tile setters scoop thinset from mud pans onto trowels. They're essential tools keeping thinset accessible and preventing it from drying while working.

**97. A** - Grout bags (like pastry bags) allow forcing grout into joints without mess. You fill the bag with grout and squeeze it into joints—useful for uneven stone, vertical surfaces, or tight spaces where grout floats don't work well. Think of them as caulking guns for grout.

**98. B** - Grout saws are handheld tools with carbide grit blades that cut out old grout from joints. You score along joints removing deteriorated or discolored grout before regrouting. Grout saws make renovation work much easier than chiseling out old grout by hand.

**99. D** - Movement joints (also called expansion joints or soft joints) are flexible joints accommodating expansion and contraction in tile installations preventing cracking. Tile expands and contracts with temperature and moisture. Movement joints filled with caulk (not grout) allow this movement without damage.

**100. C** - Tile trim pieces provide finished edges and transitions. Examples include bullnose (rounded edges), quarter-round, Schluter profiles, and edge caps. Trim pieces create professional appearances at exposed edges, transitions between materials, and outside corners. They're essential for polished installations.

**101. D** - Schluter profiles (made by Schluter Systems) are metal or plastic trim profiles creating finished edges, transitions, movement joints, and waterproofing in tile installations. Popular profiles include Jolly (edge trim), Schiene (edge protection), and Ditra (uncoupling membrane). "Schluter" has become almost generic for tile edging.

**102. A** - Thresholds (also called transition strips or reducers) are trim pieces transitioning between different flooring materials or different floor heights—like tile to hardwood or tile to carpet. They cover edges, provide smooth transitions, and prevent tripping. Proper thresholds create professional finished appearances.

**103. C** - Natural stone is porous and must be sealed preventing stains and moisture absorption. Sealers penetrate stone filling pores creating protective barriers. Without sealing, stone absorbs oils, water, and stains permanently. Different stones need different sealers. Regular resealing maintains protection.

**104. B** - Honed stone has matte smooth finish created by grinding without polishing. It feels smooth but has no gloss. Polished stone has glossy reflective finish from additional polishing steps. Honed is less slippery, hides wear better, and has contemporary appearance. Polished is dramatic and formal.

**105. D** - Tumbled stone has worn aged appearance from mechanical tumbling wearing edges and surfaces. The process simulates natural aging creating rustic character. Tumbled finishes hide imperfections and provide non-slip texture. Popular for old-world or Mediterranean styles.

**106. D** - Gauged stone is cut to uniform thickness making installation easier and more predictable. Natural cleft stone has varying thickness requiring more skill to install level. Gauged stone costs more but installs faster with more consistent results particularly for floor applications.

**107. C** - Full-bed mortar method (also called thick-set or mud-set) installs stone over thick mortar beds. This traditional method accommodates irregular stone backs, allows slope creation, and provides solid support. It's more expensive and time-consuming than thin-set but works better for natural stone especially in showers.

**108. B** - Toolbox talks are brief daily safety meetings (5-15 minutes) discussing specific hazards workers face that day and safe work practices. They keep safety top-of-mind, address daily changing conditions, and give workers voice raising concerns. Daily talks dramatically improve safety awareness.

**109. D** - Toolbox talks cover that day's specific hazards and safe practices—trench safety before excavating, fall protection before roofing, electrical safety before panel work. The talks are short, focused, and immediately relevant to that day's work. Document topics and attendance.

**110. A** - Job Hazard Analysis (JHA) systematically identifies potential hazards in work tasks and establishes controls eliminating or reducing risks. JHAs break tasks into steps, identify hazards in each step, and define safe procedures. They're proactive hazard identification improving safety before incidents.

**111. C** - The hierarchy of controls ranks hazard control effectiveness: (1) Elimination—remove hazard entirely; (2) Substitution—replace with less hazardous option; (3) Engineering controls—physical changes isolating workers from hazards; (4) Administrative controls—procedures and training; (5) PPE—personal protective equipment. Always start at the top.

**112. B** - Eliminating hazards completely is the most effective control. If the hazard doesn't exist, it can't cause injury. Can you do the work differently eliminating the hazard? Elimination is always preferred over trying to protect workers from existing hazards.

**113. D** - PPE (personal protective equipment) is the least effective control because it depends on proper selection, consistent use, and maintenance. PPE fails if workers don't wear it, wear it incorrectly, or it's damaged. Use PPE as last defense after trying all higher-level controls.

**114. D** - Administrative controls are procedures, policies, training, and work practices reducing hazard exposure. Examples include job rotation (reducing repetitive motion exposure), work permits, training programs, and scheduling work during safer conditions. They depend on human behavior and are less reliable than engineering controls.

**115. C** - Engineering controls are physical changes to the workplace or equipment eliminating hazards or isolating workers from them. Examples include machine guards, ventilation systems, sound barriers, and automation. Engineering controls work without relying on human behavior making them very effective.

**116. B** - Behavior-based safety focuses on observing worker behaviors, identifying safe and at-risk behaviors, providing feedback, and promoting safe practices through positive reinforcement. It recognizes most incidents involve behavioral components. Good programs are non-punitive focusing on learning and improvement.

**117. D** - Near-miss incidents are close calls—incidents that could have caused injury but didn't through luck or last-second intervention. A tool drops from height but misses workers. A trench wall cracks but doesn't collapse. Near-misses reveal hazards requiring correction.

**118. A** - Report near-misses because they reveal hazards that could cause serious injuries next time. They're free warnings identifying problems before someone gets hurt. Investigating near-misses uncovers hazards requiring correction. Organizations with good near-miss reporting have fewer actual injuries.

**119. C** - Root cause analysis investigates incidents identifying underlying causes, not just immediate causes. A worker falls from a ladder—immediate cause is ladder moved. Root causes might be inadequate training, poor supervision, schedule pressure, or improper equipment. Addressing root causes prevents recurrence.

**120. C** - Incident investigations identify causes and implement corrective actions preventing recurrence. They're not about blame or punishment—they're about learning and improvement. Focus on systems, processes, and conditions, not individuals. Good investigations make workplaces safer for everyone.

**121. D** - Safety incentive programs reward safe behavior, injury-free performance, hazard identification, and safety participation. They might include bonuses, recognition, prizes, or other rewards. Good programs promote safety culture but avoid incentivizing under-reporting injuries.

**122. A** - Proper lifting technique: keep load close to body, bend knees not waist, lift with legs not back, avoid twisting while carrying, get help with heavy or awkward loads. Back injuries are common and often preventable with proper technique and mechanical assistance.

**123. C** - Repetitive motion injuries (like carpal tunnel syndrome, tendonitis, or back strain) develop gradually from repeated movements over time. Each repetition causes minor stress; accumulated stress eventually causes injury. Job rotation, ergonomic tools, and proper technique reduce repetitive motion injury risk.

**124. B** - Ergonomics designs work to fit workers reducing injury and improving efficiency. It considers human capabilities and limitations designing tools, workstations, and processes minimizing physical stress. Good ergonomics reduces injuries, improves productivity, and makes work more comfortable.

**125. D** - Report work injuries immediately to supervisors, seek appropriate medical attention, document what happened, and follow company incident reporting procedures. Prompt reporting ensures proper medical care, starts workers' compensation processes, and allows investigation before evidence is lost. Never hide injuries—they could worsen.