Instructions: **Fee $40**

1. Print these pages.
2. Circle the correct answers and transfer them to the answer sheet on last pages.
3. Page down to the last page for the verification forms and mailing instructions.
4. 90 questions are listed in a straight order mini sections format throughout the complete quiz.

2023 NEC Definitions Quiz

This course is valid for these credentials:

Credential Description	Cred Code	Credit Hours
Registered/Beginner Electrician	BE	3.0
Commercial Electrical Inspector	CEI	3.0
Industrial Journeyman Electrician	IJE	3.0
Journeyman Electrician	JE	3.0
Master Electrician	ME	3.0
Residential Journeyman Electrician	RJE	3.0
Residential Master Electrician	RME	3.0
UDC-Electrical Inspector	UEI	3.0

Accessible (as applied to equipment). Capable of being reached for operation, renewal, and inspection.
Attachment Fitting. A device that, by insertion into a locking support and mounting receptacle, establishes a connection between the conductors of the attached utilization equipment and the branch-circuit conductors connected to the locking support and mounting receptacle. Informational Note: An attachment fitting is different from an attachment plug because no cord is associated with the fitting. An attachment fitting in combination with a locking support and mounting receptacle secures the associated utilization equipment in place and supports its weight.
Bathroom. An area including a sink (basin) with one or more of the following: a toilet, a urinal, a tub, a shower, a bidet, or similar plumbing fixtures.
Bonding Jumper, Main. The connection between the grounded circuit conductor and the equipment grounding conductor, or the supply-side bonding jumper, or both, at the service.
Bonding Jumper, Supply-Side. A conductor installed on the supply side of a service or within a service equipment enclosure(s), or for a separately derived system, that ensures the required electrical conductivity between metal parts required to be electrically connected.
Cable, Coaxial. A cylindrical assembly composed of a conductor centered inside a metallic tube or shield, separated by a dielectric material, and usually covered by an insulating jacket.
Cable, Optical Fiber. A factory assembly or field assembly of one or more optical fibers having an overall covering.
Cable, Optical Fiber, Composite. A cable containing optical fibers and current-carrying electrical conductors.
Cable, Optical Fiber, Conductive. A factory assembly of one or more optical fibers having an overall covering and containing non–current carrying conductive member(s) such as metallic strength member(s), metallic vapor barrier(s), metallic armor, or metallic sheath.
Cable, Optical Fiber, Nonconductive. A factory assembly of one or more optical fibers having an overall covering and containing no electrically conductive materials.
Circuit Integrity (CI) Cable. Cable(s) used for remote-control, signaling, or power limited systems that supply critical circuits to ensure survivability for continued circuit operation for a specified time under fire conditions.

Class 1 Circuit. The portion of the wiring system between the load side of the overcurrent device or power-limited supply and the connected equipment. Informational Note: See 725.41 for voltage and power limitations of Class 1 circuits.
Class 2 Circuit. The portion of the wiring system between the load side of a Class 2 power source and the connected equipment. Due to its power limitations, a Class 2 circuit considers safety from a fire initiation standpoint and provides acceptable protection from electric shock.
Class 3 Circuit. The portion of the wiring system between the load side of a Class 3 power source and the connected equipment. Due to its power limitations, a Class 3 circuit considers safety from a fire initiation standpoint. Since higher levels of voltage and current than for Class 2 are permitted, additional safeguards are specified to provide protection from an electric shock hazard that could be encountered.
Coordination, Selective (Selective Coordination). Localization of an overcurrent condition to restrict outages to the circuit or equipment affected, accomplished by the selection and installation of overcurrent protective devices and their ratings or settings for the full range of available overcurrents, from overload to the available fault current, and for the full range of overcurrent protective device opening times associated with those overcurrents.
DC-to-DC Converter. A device that can provide an output dc voltage and current at a higher or lower value than the input dc voltage and current.

1. What best defines a factory assembly or field assembly of one or more optical fibers having an overall covering?
    A. Cable, optical fiber, conductive
    B. Cable, optical fiber, composite
    C. Cable, coaxial
    D. Cable, optical fiber
2. What best defines a conductor installed on the supply side of a service or within a service equipment enclosure(s)?
    A. Bonding jumper
    B. Bonding jumper, main
    C. Bonding jumper, supply-side
    D. Grounding electrode conductor
3. Why is an attachment fitting different from an attachment plug?
    A. Because no cord is associated with the fitting
    B. Because no cord grip is associated with the fitting
    C. Because no fitting is associated with a plug
    D. All listed answers
4. What is the localization of an overcurrent condition to restrict outages to the circuit or equipment affected, accomplished by the selection and installation of overcurrent protective devices and their ratings or settings for the full range of available overcurrents, from overload to the available fault current, and for the full range of overcurrent protective device opening times associated with those overcurrents?
    A. Pre-set GFCI Breaker
    B. Overloads adjustable
    C. An isolation disconnect
    D. Coordination, selective (Selective Coordination)
5. Where is a bonding jumper, main located?
    A. At the first sub panel
    B. At the service
    C. At the service laterals
    D. At the service transformer
6. Cable(s) used for remote-control, signaling, or power limited systems that supply critical circuits to ensure survivability for continued circuit operation for a specified time under fire conditions best defines what listed term?
    A. Cable, optical fiber
    B. Circuit integrity (CI) cable
    C. Cable, coaxial

D. Cable, optical fiber, composite

7. What is a device that can provide an output dc voltage and current at a higher or lower value than the input dc voltage and current?
   A. DC-to-DC rectifier
   B. AC-to-DC converter
   C. AC-to-AC rectifier
   D. DC-to-DC converter
8. What term best defines equipment capable of being reached for operation, renewal, and inspection?
   A. Accessible (as applied to equipment)
   B. Readily Accessible
   C. Non-guarded
   D. Controlled entry
9. What is a cylindrical assembly composed of a conductor centered inside a metallic tube or shield, separated by a dielectric material, and usually covered by an insulating jacket?
   A. Cable, optical fiber, conductive
   B. Cable, optical fiber, composite
   C. Cable, optical fiber
   D. Cable, coaxial
10. What is a cable containing optical fibers and current-carrying electrical conductors?
   A. Cable, coaxial
   B. Cable, optical fiber
   C. Cable, optical fiber, composite
   D. Cable, optical fiber, conductive
11. A Class 2 circuit considers safety from a _____ standpoint and provides acceptable protection from electric shock.
   A. Fire initiation
   B. Fire signaling device
   C. Short circuit
   D. Overloaded
12. What is a factory assembly of one or more optical fibers having an overall covering and containing no electrically conductive materials?
   A. Cable, optical fiber
   B. Cable, optical fiber, nonconductive
   C. Cable, coaxial
   D. Cable, optical fiber, composite
13. What section is referenced for voltage and power limitations of Class 1 circuits?
   A. 527.14
   B. 752.41
   C. 745.42
   D. 725.41
14. What class of circuit requires additional safeguards to provide protection from an electric shock hazard that could be encountered?
   A. Class 1
   B. Class 2
   C. Class 3
   D. No listed answer
15. What best defines a factory assembly of one or more optical fibers having an overall covering and containing non–current-carrying conductive member(s) such as metallic strength member(s), metallic vapor barrier(s), metallic armor, or metallic sheath?
   A. Cable, optical fiber
   B. Cable, optical fiber, conductive
   C. Cable, coaxial
   D. Cable, optical fiber, composite

16. What is an area including a sink (basin) with one or more of the following: a toilet, a urinal, a tub, a shower, a bidet, or similar plumbing fixtures?

A. Water closet
B. Bathroom group
C. Bathroom
D. A half bathroom

Dormitory Unit. A building or a space in a building in which group sleeping accommodations are provided for more than 16 persons who are not members of the same family in one room, or a series of closely associated rooms, under joint occupancy and single management, with or without meals, but without individual cooking facilities.

Electric Vehicle (EV). An automotive-type vehicle for on-road use, such as passenger automobiles, buses, trucks, vans, neighborhood electric vehicles, electric motorcycles, and the like, primarily powered by an electric motor that draws current from a rechargeable storage battery, fuel cell, photovoltaic array, or other source of electric current. Plug-in hybrid electric vehicles (PHEV) are electric vehicles having a second source of motive power. Off-road, self-propelled electric mobile equipment, such as industrial trucks, hoists, lifts, transports, golf carts, airline ground support equipment, tractors, boats, and the like, are not considered electric vehicles.

Electrical Datum Plane. A specified distance above a water level above which electrical equipment can be installed and electrical connections can be made.

Equipotential Plane. Accessible conductive parts bonded together to reduce voltage gradients in a designated area.

Fault Current. The current delivered at a point on the system during a short-circuit condition.

Fault Current, Available (Available Fault Current). The largest amount of current capable of being delivered at a point on the system during a short-circuit condition. Informational Note: A short-circuit can occur during abnormal conditions such as a fault between circuit conductors or a ground fault. See Informational Note Figure 100.1.

Free Air (as applied to conductors). Open or ventilated environment that allows for heat dissipation and air flow around an installed conductor.

Fuel Cell. An electrochemical system that consumes fuel to produce an electric current. In such cells, the main chemical reaction used for producing electric power is not combustion. However, there may be sources of combustion used within the overall cell system, such as reformers/fuel processors.

Fuel Cell System. The complete aggregate of equipment used to convert chemical fuel into usable electricity and typically consisting of a reformer, stack, power inverter, and auxiliary equipment.

Generating Capacity, Inverter. The sum of parallel-connected inverter maximum continuous output power at 40°C in watts or kilowatts.

Ground-Fault Circuit Interrupter (GFCI). A device intended for the protection of personnel that functions to de-energize a circuit or portion thereof within an established period of time when a ground-fault current exceeds the values established for a Class A device. Informational Note: Class A ground-fault circuit interrupters trip when the ground-fault current is 6 mA or higher and do not trip when the ground-fault current is less than 4 mA. For further information, see UL 943, *Standard for Ground-Fault Circuit Interrupters.*

Grounding Conductor, Equipment (EGC). A conductive path(s) that is part of an effective ground-fault current path and connects normally non–currentcarrying metal parts of equipment together and to the system grounded conductor or to the grounding electrode conductor, or both. Informational Note No. 1: It is recognized that the equipment grounding conductor also performs bonding.

Informational Note No. 2: See 250.118 for a list of acceptable equipment grounding conductors.

Habitable Room. A room in a building for living, sleeping, eating, or cooking, but excluding bathrooms, toilet rooms, closets, hallways, storage or utility spaces, and similar areas.

Information Technology Equipment Room. A room within the information technology equipment area that contains the information technology equipment.
Interactive Inverter. An inverter intended for use in parallel with power source(s) such as an electric utility to supply common loads and capable of delivering power to the utility.
Inverter. Equipment that changes dc to ac.

17. What is a room within the information technology equipment area called that contains the information technology equipment?
    A. Data equipment room
    B. Information technology equipment room
    C. Cat 5 data equipment room
    D. Technology equipment room
18. What does the code define as accessible conductive parts bonded together to reduce voltage gradients in a designated area?
    A. Equipotential plane
    B. Grounded
    C. Bonded, single point
    D. Bonding jumper
19. What best defines Plug-in hybrid electric vehicles (PHEV)?
    A. A gas-powered vehicle that has a second source of motive power
    B. An electric vehicle that has a single source of motive power
    C. An electric vehicle that has a second source of motive power
    D. A gas-powered vehicle that has a single source of motive power
20. What does the code consider a specified distance above the water level above which electrical equipment can be installed and electrical connections can be made?
    A. Equipotential plane
    B. Electrical datum plane
    C. Event horizon
    D. A service dock
21. What is an electrochemical system that consumes fuel to produce an electric current?
    A. Fuel cell
    B. Fuel cell system
    C. Generating capacity
    D. Inverter
22. What does the code consider a building or a space in a building in which group sleeping accommodations are provided for more than 16 persons who are not members of the same family in one room?
    A. Single family dwelling
    B. Habitable Room
    C. Multi family dwelling
    D. Dormitory unit
23. What is an inverter intended for use in parallel with power source(s) such as an electric utility to supply common loads and capable of delivering power to the utility?
    A. Dual mode interactive inverter
    B. Inverter, multimode
    C. Interactive inverter
    D. Single mode interactive inverter
24. What best defines the complete aggregate of equipment used to convert chemical fuel into usable electricity and typically consisting of a reformer, stack, power inverter, and auxiliary equipment?
    A. Fuel cell
    B. Fuel cell system
    C. Generating capacity
    D. Inverter

25. What is the current delivered at a point on the system during a short-circuit condition?
    A. Fault current, available (Available Fault Current)
    B. Stray current
    C. Fault current
    D. Instantaneous short circuit current
26. What is the open or ventilated environment that allows for heat dissipation and air flow around an installed conductor?
    A. Hysteresis
    B. Free air (as applied to conductors)
    C. Open air
    D. Air ventilated
27. What is the largest amount of current capable of being delivered at a point on the system during a short-circuit condition?
    A. Instantaneous short circuit current
    B. Stray current
    C. Fault current
    D. Fault current, available (Available Fault Current)
28. Where should you look in the 2023 code for a list of acceptable equipment grounding conductors?
    A. 250.118
    B. 250.66
    C. 250.52(C)
    D. 250.52(D)
29. What is the sum of parallel-connected inverter maximum continuous output power at 40°C in watts or kilowatts defined as?
    A. Storage capacity
    B. Generating capacity, inverter
    C. Battery storage
    D. Chemical storage
30. At what ground fault current does a Class A circuit trip?
    A. Less than 6 mA
    B. Less than 4 mA
    C. 16 mA or higher
    D. 6 mA or higher
31. What does the code define as equipment that changes dc to ac?
    A. An inverter
    B. Power production equipment
    C. Fuel cell system
    D. Fuel cell
32. What is a room in a building for living, sleeping, eating, or cooking, but excluding bathrooms, toilet rooms, closets, hallways, storage or utility spaces, and similar areas?
    A. Dormitory unit
    B. Habitable Room
    C. Multi family dwelling
    D. Single family dwelling

Inverter Input Circuit. Conductors connected to the dc input of an inverter.
Inverter Output Circuit. Conductors connected to the ac output of an inverter.
Inverter, Multimode. Equipment having the capabilities of both the interactive inverter and the stand-alone inverter.
Island Mode. The operational mode for stand-alone power production equipment or an isolated microgrid, or for a multimode inverter or an interconnected microgrid that is disconnected from an electric power

production and distribution network or other primary power source. Informational Note: Isolated microgrids are distinguished from interconnected microgrids, which are addressed in Article 705.
Laundry Area. An area containing or designed to contain a laundry tray, clothes washer, or clothes dryer.
Messenger or Messenger Wire. A wire that is run along with or integral with a cable or conductor to provide mechanical support for the cable or conductor.
Photovoltaic (PV) System. The total components, circuits, and equipment up to and including the PV system disconnecting means that, in combination, convert solar energy into electric energy.
Pier. A structure extending over the water and supported on a fixed foundation (fixed pier), or on flotation (floating pier), that provides access to the water.
Pier, Fixed. Pier constructed on a permanent, fixed foundation, such as on piles, that permanently establishes the elevation of the structure deck with respect to land.
Pier, Floating. Pier designed with inherent flotation capability that allows the structure to float on the water surface and rise and fall with water level changes.
Power Production Equipment. Electrical generating equipment supplied by any source other than a utility service, up to the source system disconnecting means. Informational Note: Examples of power production equipment include such items as generators, solar photovoltaic systems, and fuel cell systems.
Power-Limited Tray Cable (PLTC). A factory assembly of two or more insulated conductors rated at 300 volts, with or without associated bare or insulated equipment grounding conductors, under a nonmetallic jacket.
Prime Mover. The machine that supplies the mechanical horsepower to a generator.
Raceway, Communications. An enclosed channel of nonmetallic materials designed expressly for holding communications wires and cables; optical fiber cables; data cables associated with information technology and communications equipment; Class 2, Class 3, and Type PLTC cables; and power-limited fire alarm cables in plenum, riser, and general-purpose applications.

33. What is equipment having the capabilities of both the interactive inverter and the stand-alone inverter best defined as?
    A. Inverter output circuit
    B. Inverter input circuit
    C. Inverter, multimode
    D. Wheatstone bridge
34. What is a wire that is run along with or integral with a cable or conductor to provide mechanical support for the cable or conductor?
    A. Wire support system
    B. Guide wire
    C. Support cable
    D. Messenger or messenger wire
35. What are conductors connected to the ac output of an inverter defined as?
    A. Inverter output circuit
    B. Inverter input circuit
    C. Inverter, Multimode
    D. Wheatstone bridge
36. What article addresses isolated microgrids being distinguished from interconnected microgrids?
    A. 725
    B. 705
    C. 735
    D. 700
37. What are conductors connected to the dc input of an inverter defined as?
    A. Inverter output circuit
    B. Inverter input circuit
    C. Rectifier circuit
    D. Wheatstone bridge

38. What listed term best defines an area containing or designed to contain a laundry tray, clothes washer, or clothes dryer?

A. Dry cleaner
B. Laundry mat
C. Laundry area
D. Laundry room

39. What is a pier constructed on a permanent, fixed foundation, such as on piles, that permanently establishes the elevation of the structure deck with respect to land?

A. Pier, Floating
B. Pier
C. Pier, Fixed
D. Pier, permanent

40. What best defines the total components, circuits, and equipment up to and including the PV system disconnecting means that, in combination, convert solar energy into electric energy?

A. Stored energy system (SE) System
B. Solar (SV) System
C. Chemically stored (CS) System
D. Photovoltaic (PV) System

41. What is the machine that supplies the mechanical horsepower to a generator?

A. Prime mover
B. Shaft drive
C. Drive shaft
D. Gear linkage

42. What is electrical generating equipment supplied by any source other than a utility service, up to the source system disconnecting means?

A. Generating production equipment
B. Power production equipment
C. Storage production equipment
D. Power-limited production equipment

43. What is a structure extending over the water and supported on a fixed foundation (fixed pier), or on flotation (floating pier), that provides access to the water?

A. Pier, Floating
B. Pier, Fixed
C. Pier
D. Pier, permanent

44. What is an enclosed channel of nonmetallic materials designed expressly for holding communications wires and cables?

A. Den rail
B. Communications wireway
C. Panduit
D. Raceway, communications

45. What best defines a pier designed with inherent flotation capability that allows the structure to float on the water surface and rise and fall with water level changes?

A. Pier, Fixed
B. Pier
C. Pier, Floating
D. Pier, permanent

46. What best defines a factory assembly of two or more insulated conductors rated at 300 volts, with or without associated bare or insulated equipment grounding conductors, under a nonmetallic jacket?

A. Power-Limited Tray Cable (PLTC)
B. Tray Cable (TC)
C. Twisted shielded pair (TS)

D. Power Tray Cable (PTC)

Receptacle. A contact device installed at the outlet for the connection of an attachment plug, or for the direct connection of electrical utilization equipment designed to mate with the corresponding contact device. A single receptacle is a single contact device with no other contact device on the same yoke or strap. A multiple receptacle is two or more contact devices on the same yoke or strap. Informational Note: A duplex receptacle is an example of a multiple receptacle that has two receptacles on the same yoke or strap.
Reconditioned. Electromechanical systems, equipment, apparatus, or components that are restored to operating conditions. This process differs from normal servicing of equipment that remains within a facility, or replacement of listed equipment on a one-to-one basis. Informational Note: The term *reconditioned* is frequently referred to as *rebuilt, refurbished,* or *remanufactured*.
Service Equipment. The necessary equipment, consisting of a circuit breaker(s) or switch(es) and fuse(s) and their accessories, connected to the serving utility and intended to constitute the main control and disconnect of the serving utility.
Single-Pole Separable Connector. A device that is installed at the ends of portable, flexible, single-conductor cable that is used to establish connection or disconnection between two cables or one cable and a single-pole, panel-mounted separable connector.
Stand-Alone System. A system that is capable of supplying power independent of an electric power production and distribution network.
Switch, Bypass Isolation. A manual, nonautomatic, or automatic operated device used in conjunction with a transfer switch to provide a means of directly connecting load conductors to a power source and of disconnecting the transfer switch.
Thermally Protected (as applied to motors). A motor or motor-compressor that is provided with a thermal protector.
Part III. Hazardous (Classified) Locations
Aircraft Painting Hangar. An aircraft hangar constructed for the express purpose of spray/coating/dipping applications and provided with dedicated ventilation supply and exhaust.
(Revised) Associated Apparatus.
Apparatus in which the circuits are not necessarily intrinsically safe themselves but that affects the energy in the intrinsically safe circuits and is relied on to maintain intrinsic safety. Such apparatus is one of the following: (1) Electrical apparatus that has an alternative type of protection for use in the appropriate hazardous (classified) location (2) Electrical apparatus not so protected that shall not be used within a hazardous (classified) location Informational Note No. 1: Associated apparatus has identified intrinsically safe connections for intrinsically safe apparatus and also may have connections for nonintrinsically safe apparatus. Informational Note No. 2: An example of associated apparatus is an intrinsic safety barrier, which is a network designed to limit the energy (voltage and current) available to the protected circuit in the hazardous (classified) location, under specified fault conditions.
Associated Nonincendive Field Wiring Apparatus.
Apparatus in which the circuits are not necessarily nonincendive themselves but that affect the energy in nonincendive field wiring circuits and are relied upon to maintain nonincendive energy levels. Such apparatus are one of the following: (1) Electrical apparatus that has an alternative type of protection for use in the appropriate hazardous (classified) location (2) Electrical apparatus not so protected that shall not be used in a hazardous (classified) location Informational Note: Associated nonincendive field wiring apparatus has designated associated nonincendive field wiring apparatus connections for nonincendive field wiring apparatus and may also have connections for other electrical apparatus.
Combustible Dust. Dust particles that are 500 microns or smaller (i.e., material passing a U.S. No. 35 Standard Sieve as defined in ASTM E11-2015, Standard Specification for Woven Wire Test Sieve Cloth and Test Sieves), and present a fire or explosion hazard when dispersed and ignited in air. Informational Note: See ASTM E1226-

2012a, Standard Test Method for Explosibility of Dust Clouds, or ISO 6184-1, Explosion protection systems — Part 1: Determination of explosion indices of combustible dusts in air, for procedures for determining the explosibility of dusts.

Combustible Gas Detection System. A protection technique utilizing stationary gas detectors in industrial establishments.

Cord Connector. A fitting intended to terminate a cord to a box or similar device and reduce the strain at points of termination and may include an explosionproof, a dust-ignitionproof, or a flameproof seal.

Different Intrinsically Safe Circuits. Intrinsically safe circuits in which the possible interconnections have not been evaluated and identified as intrinsically safe.

Dust-Ignitionproof. Equipment enclosed in a manner that excludes dusts and does not permit arcs, sparks, or heat otherwise generated or liberated inside of the enclosure to cause ignition of exterior accumulations or atmospheric suspensions of a specified dust on or in the vicinity of the enclosure. Informational Note No. 1: For further information on dust-ignitionproof enclosures, see ANSI/UL 1203-2015, *Explosion-Proof and Dust-Ignition-Proof Electrical Equipment for Hazardous (Classified) Locations.* Informational Note No. 2: Dust-ignitionproof enclosures are sometimes additionally marked Type 9 per NEMA 250-2014, *Enclosures for Electrical Equipment.*

47. What is a manual, nonautomatic, or automatic operated device used in conjunction with a transfer switch to provide a means of directly connecting load conductors to a power source and of disconnecting the transfer switch?
    A. Switch, bypass isolation
    B. Isolation switch
    C. Electronic bypass switch
    D. Solder pot switch
48. What is the term reconditioned frequently referred to as?
    A. Remanufactured
    B. Rebuilt
    C. Refurbished
    D. All listed answers
49. How are dust-ignition proof enclosures sometimes additionally marked?
    A. Type 8
    B. Type 9
    C. Type 7
    D. Type 6
50. What listed term best defines the necessary equipment, consisting of a circuit breaker(s) or switch(es) and fuse(s) and their accessories, connected to the serving utility and intended to constitute the main control and disconnect of the serving utility?
    A. Service, main
    B. Stand-alone system
    C. Service equipment
    D. Motor control center
51. What listed term best defines intrinsically safe circuits in which the possible interconnections have not been evaluated and identified as intrinsically safe?
    A. Intrinsically safe circuits
    B. Different intrinsically safe circuits
    C. Safe circuits, intrinsically
    D. Different interconnected safe circuits
52. What is a system that is capable of supplying power independent of an electric power production and distribution network?
    A. Stand-alone system
    B. Service equipment
    C. Bypass system

D. Back up system

53. What is a protection technique utilizing stationary gas detectors in industrial establishments?
A. Combustible detection system
B. Gas detection system
C. Combustible vapor detection system
D. Combustible gas detection system

54. What size dust particle is considered combustible?
A. 400 microns or larger
B. 500 microns or larger
C. 500 microns or smaller
D. 200 microns

55. What is a motor or motor-compressor that is provided with a thermal protector?
A. Bi metal overload, multi tap
B. Thermal overload, squirl cage
C. Electronic thermal overload, single phase
D. Thermally protected (as applied to motors)

56. What listed term best defines an apparatus in which the circuits are not necessarily intrinsically safe themselves but that affects the energy in the intrinsically safe circuits and is relied on to maintain intrinsic safety?
A. Associated Nonincendive Field Wiring Apparatus
B. Associated Apparatus
C. Field wiring apparatus
D. Nonincendive Field Wiring Apparatus

57. What part of Article 100, definitions, can you find the definition of aircraft painting hangar?
A. I
B. II
C. III
D. IV

58. What listed term best describes an apparatus in which the circuits are not necessarily nonincendive themselves but that affect the energy in nonincendive field wiring circuits and are relied upon to maintain nonincendive energy levels?
A. Associated Nonincendive Field Wiring Apparatus
B. Associated Apparatus
C. Field wiring apparatus
D. Nonincendive Field Wiring Apparatus

59. What is a fitting intended to terminate a cord to a box or similar device and reduce the strain at points of termination and may include an explosionproof, a dust-ignition proof, or a flameproof seal?
A. Strain relief
B. Connector
C. CGB
D. Cord Connector

60. What is a device that is installed at the ends of portable, flexible, single-conductor cable that is used to establish connection or disconnection between two cables or one cable and a single-pole, panel-mounted separable connector?
A. Twist lock connector
B. Separable connector
C. Single-pole separable connector
D. All listed answers

61. What is a contact device installed at the outlet for the connection of an attachment plug, or for the direct connection of electrical utilization equipment designed to mate with the corresponding contact device?
A. Cord
B. Receptacle
C. Cord plug
D. Cord connector

Dusttight. Enclosures constructed so that dust will not enter under specified test conditions. Informational Note No. 1: For further information, see ANSI/UL 121201-2017, *Nonincendive Electrical Equipment for Use in Class I and II, Division 2 and Class III, Divisions 1 and 2 Hazardous (Classified) Locations.* Informational Note No. 2: Enclosure Types 3, 3X, 3S, 3SX, 4, 4X, 5, 6, 6P, 12, 12K, and 13, per NEMA 250-2014, *Enclosures for Electrical Equipment* and ANSI/UL 50E-2015, *Enclosures for Electrical Equipment, Environmental Considerations,* are considered dusttight.

Electrical Resistance Trace Heating "60079-30-1". Type of protection for the purpose of producing heat on the principle of electrical resistance and typically composed of one or more metallic conductors and/or an electrically conductive material, suitably electrically insulated and protected. Informational Note: See ANSI/UL 60079-30-1-2017, *Explosive Atmospheres — Part 30-1: Electrical Resistance Trace Heating — General and Testing Requirements.*

Encapsulation "m". Type of protection where electrical parts that could ignite an explosive atmosphere by either sparking or heating are enclosed in a compound in such a way that this explosive atmosphere cannot be ignited. Informational Note: See ANSI/UL 60079-18-2015, *Explosive atmospheres — Part 18: Equipment protection by encapsulation "m".*

Explosionproof Equipment. Equipment enclosed in a case that is capable of withstanding an explosion of a specified gas or vapor that may occur within it and of preventing the ignition of a specified gas or vapor surrounding the enclosure by sparks, flashes, or explosion of the gas or vapor within, and that operates at such an external temperature that a surrounding flammable atmosphere will not be ignited thereby. (CMP-14) Informational Note No. 1: For further information, see ANSI/UL 1203-2015, *Explosion-Proof and Dust-Ignition-Proof Electrical Equipment for Use in Hazardous (Classified) Locations.* Informational Note No. 2: Explosionproof enclosures are sometimes additionally marked Type 7 per NEMA 250-2014, *Enclosures for Electrical Equipment.*

Flameproof "d". Type of protection where the enclosure will withstand an internal explosion of a flammable mixture that has penetrated into the interior, without suffering damage and without causing ignition, through any joints or structural openings in the enclosure of an external explosive gas atmosphere consisting of one or more of the gases or vapors for which it is designed. Informational Note: See ANSI/UL 60079-1-2015, *Explosive Atmospheres — Part 1: Equipment Protection by Flameproof Enclosures "d".*

Hermetically Sealed. Equipment sealed against the entrance of an external atmosphere where the seal is made by fusion, for example, soldering, brazing, welding, or the fusion of glass to meta Informational Note: For further information, see ANSI/ISA-12.12.01-2013, *Nonincendive Electrical Equipment for Use in Class I and II, Division 2, and Class III, Divisions 1 and 2 Hazardous (Classified) Locations.*

Increased Safety "e". Type of protection applied to electrical equipment that does not produce arcs or sparks in normal service and under specified abnormal conditions, in which additional measures are applied so as to give increased security against the possibility of excessive temperatures and of the occurrence of arcs and sparks. Informational Note: See ANSI/UL 60079-7–2017, *Explosive Atmospheres — Part 7: Equipment Protection by Increased Safety "e"*

Inherently Safe Optical Radiation "op is". Type of protection to minimize the risk of ignition in explosive atmospheres from optical radiation where visible or infrared radiation is incapable of producing sufficient energy under normal or specified fault conditions to ignite a specific explosive atmosphere. Informational Note: See ANSI/UL 60079-28-2017, *Explosive Atmospheres — Part 28: Protection of Equipment and Transmission Systems Using Optical Radiation.*

Intrinsic Safety "i". Type of protection where any spark or thermal effect is incapable of causing ignition of a mixture of flammable or combustible material in air under prescribed test conditions. Informational Note: See UL 913-2015, *Intrinsically Safe Apparatus and Associated Apparatus for Use in Class I, II, and III, Division 1 Hazardous (Classified) Locations;* and ANSI/UL 60079-11-2013, *Explosive Atmospheres — Part 11: Equipment protection by intrinsic safety "i".*

Intrinsically Safe Apparatus. Apparatus in which all the circuits are intrinsically safe.

Intrinsically Safe Circuit. A circuit in which any spark or thermal effect is incapable of causing ignition of a mixture of flammable or combustible material in air under prescribed test conditions. Informational Note: Test conditions are described in ANSI/UL 913-2013, *Standard for Safety, Intrinsically Safe Apparatus and Associated Apparatus for Use in Class I, II, and III, Division 1, Hazardous (Classified) Locations.*
Intrinsically Safe System. An assembly of interconnected intrinsically safe apparatus, associated apparatus, and interconnecting cables, in that those parts of the system that may be used in hazardous (classified) locations are intrinsically safe circuits. Informational Note: An intrinsically safe system may include more than one intrinsically safe circuit.
Limited Finishing Workstation. An apparatus that is capable of confining the vapors, mists, residues, dusts, or deposits that are generated by a spray application process but does not meet the requirements of a spray booth or spray room, as herein defined. Informational Note: See Section 14.3 of NFPA 33, *Standard for Spray Application Using Flammable or Combustible Materials,* for limited finishing workstations.
Liquid Immersion "o". Type of protection where electrical equipment is immersed in a protective liquid in such a way that an explosive atmosphere that may be above the liquid or outside the enclosure cannot be ignited. Informational Note: See ANSI/UL 60079-6-2016, *Explosive Atmospheres — Part 6: Equipment protection by liquid immersion "o"*

62. What type of protection is used to minimize the risk of ignition in explosive atmospheres from optical radiation where visible or infrared radiation is incapable of producing sufficient energy under normal or specified fault conditions to ignite a specific explosive atmosphere?
    A. Intrinsic safety
    B. Inherently safe optical radiation
    C. Intrinsically safe circuit
    D. Intrinsically safe apparatus
63. What type of encapsulation is used to prevent electrical parts that could ignite an explosive atmosphere by either sparking or heating?
    A. e
    B. d
    C. m
    D. op
64. What part of ANSI/UL 60079-30-1-2017 would you find information regarding electrical resistance trace heating — general and testing requirements?
    A. Part 30
    B. Part 1
    C. Part 18
    D. Part 3
65. What are enclosures constructed so that dust will not enter under specified test conditions defined as?
    A. Ignition resistant
    B. vapor proof
    C. Ignition proof
    D. Dust tight
66. What best defines equipment sealed against the entrance of an external atmosphere where the seal is made by fusion, for example, soldering, brazing, welding, or the fusion of glass to metal?
    A. Encapsulated
    B. Intrinsically safe
    C. Hermetically sealed
    D. Intrinsically safe apparatus
67. How are explosionproof enclosures sometimes additionally marked?
    A. Type 7
    B. Type 8
    C. Type 9

D. Type 6

68. What is an assembly of interconnected intrinsically safe apparatus, associated apparatus, and interconnecting cables, in that those parts of the system that may be used in hazardous (classified) locations are intrinsically safe circuits best defined as?

A. Intrinsically safe seal off
B. Intrinsically safe apparatus
C. Intrinsically safe circuit
D. Intrinsically safe system

69. What letter designator is used to identify flameproof enclosures?

A. m
B. d
C. e
D. op

70. What part of ANSI/UL 60079-1-2015 is referenced in the 2023 code regarding equipment protection by flameproof enclosures?

A. Part 30
B. Part 1
C. Part 18
D. Part 3

71. What letter designator is used to identify equipment protection by increased safety?

A. e
B. m
C. i
D. op

72. What letter designator is used to identify equipment protection by intrinsic safety?

A. op
B. m
C. e
D. i

73. What is a circuit in which any spark or thermal effect is incapable of causing ignition of a mixture of flammable or combustible material in air under prescribed test conditions considered?

A. Intrinsically safe apparatus
B. Intrinsically safe circuit
C. Intrinsically safe system
D. Intrinsically safe seal off

74. What letter designator is used to identify equipment protection by liquid immersion?

A. op
B. m
C. e
D. o

75. What section of NFPA 33 are standards for spray applications using flammable or combustible materials for limited finishing workstations located?

A. 14.3
B. 16.3
C. 12.4
D. 15.5

76. What best defines an apparatus in which all the circuits are intrinsically safe?

A. Intrinsically safe system
B. Intrinsically safe circuit
C. Intrinsically safe apparatus
D. Intrinsically safe seal off

Major Repair Garage. A building or portions of a building where major repairs, such as engine overhauls, painting, body and fender work, and repairs that require draining of the motor vehicle fuel tank are performed on motor vehicles, including associated floor space used for offices, parking, or showrooms.
Membrane Enclosure. A temporary enclosure used for the spraying of workpieces that cannot be moved into a spray booth where open spraying is not practical due to the proximity to other operations, finish quality, or concerns such as the collection of overspray. Informational Note: See Chapter 18 of NFPA 33-2016, *Standard for Spray Application Using Flammable or Combustible Materials,* for information on the construction and use of membrane enclosures.
Minor Repair Garage. A building or portions of a building used for lubrication, inspection, and minor automotive maintenance work, such as engine tune-ups, replacement of parts, fluid changes (e.g., oil, antifreeze, transmission fluid, brake fluid, air-conditioning refrigerants), brake system repairs, tire rotation, and similar routine maintenance work, including associated floor space used for offices, parking, or showrooms.
Mobile Equipment. Equipment with electrical components suitable to be moved only with mechanical aids or is provided with wheels for movement by person(s) or powered devices.
Motor Fuel Dispensing Facility. That portion of a property where motor fuels are stored and dispensed from fixed equipment into the fuel tanks of motor vehicles or marine craft or into approved containers, including all equipment used in connection therewith. Informational Note: Refer to Articles 510 and 511 with respect to electrical wiring and equipment for other areas used as lubritoriums, service rooms, repair rooms, offices, salesrooms, compressor rooms, and similar locations.
Nonincendive Circuit. A circuit, other than field wiring, in which any arc or thermal effect produced under intended operating conditions of the equipment, is not capable, under specified test conditions, of igniting the flammable gas–air, vapor–air, or dust–air mixture. Informational Note: Conditions are described in ANSI/ISA-12.12.01-2013, *Nonincendive Electrical Equipment for Use in Class I and II, Division 2, and Class III, Divisions 1 and 2 Hazardous (Classified) Locations.*
Nonincendive Component. A component having contacts for making or breaking an incendive circuit and the contacting mechanism is constructed so that the component is incapable of igniting the specified flammable gas–air or vapor–air mixture. The housing of a nonincendive component is not intended to exclude the flammable atmosphere or contain an explosion. Informational Note: For further information, see ANSI/ISA-12.12.01-2013, *Nonincendive Electrical Equipment for Use in Class I and II, Division 2, and Class III, Divisions 1 and 2 Hazardous (Classified) Locations.*
Nonincendive Equipment. Equipment having electrical/electronic circuitry that is incapable, under normal operating conditions, of causing ignition of a specified flammable gas–air, vapor–air, or dust–air mixture due to arcing or thermal means. Informational Note: For further information, see ANSI/ISA-12.12.01-2013, *Nonincendive Electrical Equipment for Use in Class I and II, Division 2, and Class III, Divisions 1 and 2 Hazardous (Classified) Locations.*
Nonincendive Field Wiring. Wiring that enters or leaves an equipment enclosure and, under normal operating conditions of the equipment, is not capable, due to arcing or thermal effects, of igniting the flammable gas–air, vapor–air, or dust–air mixture. Normal operation includes opening, shorting, or grounding the field wiring.
Nonincendive Field Wiring Apparatus. Apparatus intended to be connected to nonincendive field wiring. Informational Note: For further information, see ANSI/ISA-12.12.01-2013, *Nonincendive Electrical Equipment for Use in Class I and II, Division 2, and Class III, Divisions 1 and 2 Hazardous (Classified) Locations.*
Oil Immersion. Electrical equipment immersed in a protective liquid in such a way that an explosive atmosphere that may be above the liquid or outside the enclosure cannot be ignited.
Optical Radiation. Electromagnetic radiation at wavelengths in vacuum between the region of transition to X-rays and the region of transition to radio waves, that is approximately between 1 nm and 1000 µm. Informational Note: For additional information on types of protection that can be applied to minimize the risk of ignition in explosive atmospheres from optical radiation in the wavelength range from 380 nm to 10 µm, see ANSI/UL 60079-28-2017, Explosive Atmospheres — Part 28: Protection of Equipment and Transmission

Systems Using Optical Radiation.

Optical System With Interlock "op sh". Type of protection to minimize the risk of ignition in explosive atmospheres from optical radiation where visible or infrared radiation is confined inside optical fiber or other transmission medium with interlock cut-off provided to reliably reduce the unconfined beam strength to safe levels within a specified time in case the confinement fails and the radiation becomes unconfined.

Informational Note: See ANSI/UL 60079-28-2017, *Explosive Atmospheres — Part 28: Protection of Equipment and Transmission Systems Using Optical Radiation.*

77. What chapter of NFPA 33-2016 contains information on the construction and use of membrane enclosures?

A. 12
B. 16
C. 15
D. 18

78. What listed term best defines a building or portions of a building where major repairs, such as engine overhauls, painting, body and fender work, and repairs that require draining of the motor vehicle fuel tank are performed on motor vehicles, including associated floor space used for offices, parking, or showrooms?

A. Commercial repair garage
B. Minor repair garage
C. Major repair garage
D. Privately owned repair garage

79. What is equipment with electrical components suitable to be moved only with mechanical aids or is provided with wheels for movement by person(s) or powered devices considered?

A. Mobile equipment
B. Stationary equipment
C. Movable equipment
D. Temporary Installation

80. What term best defines a building or portions of a building used for lubrication, inspection, and minor automotive maintenance work, such as engine tune-ups, replacement of parts, fluid changes (e.g., oil, antifreeze, transmission fluid, brake fluid, air conditioning refrigerants), brake system repairs, tire rotation, and similar routine maintenance work, including associated floor space used for offices, parking, or showrooms?

A. Privately owned repair garage
B. Major repair garage
C. Commercial repair garage
D. Minor repair garage

81. What does the 2023 code define as a circuit, other than field wiring, in which any arc or thermal effect produced under intended operating conditions of the equipment, is not capable, under specified test conditions, of igniting the flammable gas–air, vapor–air, or dust–air mixture?

A. Nonincendive equipment
B. Nonincendive component
C. Nonincendive circuit
D. Nonincendive field wiring

82. What 2023 code article(s) should be referenced with respect to electrical wiring and equipment for other areas used as lubritoriums, service rooms, repair rooms, offices, salesrooms, compressor rooms, and similar locations?

A. Articles 510 and 511
B. Articles 515 and 517
C. Article 505
D. Article 503

83. What part of ANSI/UL 60079-28-2017 is referenced in the 2023 code with regards to the protection of equipment and transmission systems using optical radiation?

A. Part 82
B. Part 2
C. Part 8

D. Part 28

84. What is equipment having electrical/electronic circuitry that is incapable, under normal operating conditions, of causing ignition of a specified flammable gas–air, vapor–air, or dust–air mixture due to arcing or thermal means?

A. Nonincendive component
B. Nonincendive circuit
C. Nonincendive equipment
D. Nonincendive field wiring

85. What does the 2023 code define as electromagnetic radiation at wavelengths in vacuum between the region of transition to X-rays and the region of transition to radio waves, that is approximately between 1 nm and 1000 µm?

A. Electromagnetic radiation
B. Optical radiation
C. X-rays
D. Radio waves

86. What is a component having contacts for making or breaking a nonincendive circuit and the contacting mechanism is constructed so that the component is incapable of igniting the specified flammable gas–air or vapor–air mixture considered?

A. Nonincendive field wiring
B. Nonincendive circuit
C. Nonincendive equipment
D. Nonincendive component

Outdoor Spray Area. A spray area that is outside the confines of a building or that has a canopy or roof that does not limit the dissipation of the heat of a fire or dispersion of flammable vapors and does not restrict fire-fighting access and control. For the purpose of this standard, an outdoor spray area can be treated as an unenclosed spray area.

Portable Equipment. Equipment with electrical components suitable to be moved by a single person without mechanical aids.

Powder Filling "q". Type of protection where electrical parts capable of igniting an explosive atmosphere are fixed in position and completely surrounded by filling material (glass or quartz powder) to prevent the ignition of an external explosive atmosphere. Informational Note: See ANSI/UL 60079-5-2016, *Explosive Atmospheres — Part 5: Equipment protection by powder filling "q"*.

Pressurized. The process of supplying an enclosure with a protective gas with or without continuous flow, at sufficient pressure to prevent the entrance of combustible dust or ignitible fibers/flyings.

Pressurized Enclosure "p". Type of protection for electrical equipment that uses the technique of guarding against the ingress of the external atmosphere, which may be explosive, into an enclosure by maintaining a protective gas therein at a pressure above that of the external atmosphere. Informational Note: See ANSI/UL-60079-2-2017, *Explosive Atmospheres — Part 2: Equipment protection by pressurized enclosures "p".*

Process Seal. A seal between electrical systems and flammable or combustible process fluids where a failure could allow the migration of process fluids into the premises' wiring system.

Protected Optical Fiber Cable. Optical fiber cable protected from releasing optical radiation into the atmosphere during normal operating conditions and foreseeable malfunctions by additional armoring, conduit, cable tray, or raceway. Informational Note: See ANSI/UL 60079-28-2017, *Explosive Atmospheres — Part 28: Protection of Equipment and Transmission Systems Using Optical Radiation.*

Protected Optical Radiation "op pr". Type of protection to minimize the risk of ignition in explosive atmospheres from optical radiation where visible or infrared radiation is confined inside optical fiber or other transmission medium under normal constructions or constructions with additional mechanical protection based on the assumption that there is no escape of radiation from the confinement. Informational Note: See ANSI/UL 60079-28-2017, *Explosive Atmospheres — Part 28: Protection of Equipment and Transmission Systems Using Optical Radiation.*

Protection by Enclosure "t". Type of protection for explosive dust atmospheres where electrical equipment is provided with an enclosure providing dust ingress protection and a means to limit surface temperatures. Informational Note: For additional information, see ANSI/UL 60079-31-2015, *Explosive Atmospheres — Part 31: Equipment Dust Ignition Protection by Enclosure "t".*

Purged and Pressurized. The process of (1) purging, supplying an enclosure with a protective gas at a sufficient flow and positive pressure to reduce the concentration of any flammable gas or vapor initially present to an acceptable level; and (2) pressurization, supplying an enclosure with a protective gas with or without continuous flow at sufficient pressure to prevent the entrance of a flammable gas or vapor, a combustible dust, or an ignitible fiber. Informational Note: For further information, see ANSI/NFPA 496-2013, *Purged and Pressurized Enclosures for Electrical Equipment.*

Simple Apparatus. An electrical component or combination of components of simple construction with well-defined electrical parameters that does not generate more than 1.5 volts, 100 mA, and 25 mW, or a passive component that does not dissipate more than 1.3 watts and is compatible with the intrinsic safety of the circuit in which it is used. Informational Note No. 1: The following apparatus are examples of simple apparatus: (1) Passive components; for example, switches, instrument connectors, plugs and sockets, junction boxes, resistance temperature devices, and simple semiconductor devices such as LEDs (2) Sources of stored energy consisting of single components in simple circuits with well-defined parameters; for example, capacitors or inductors, whose values are considered when determining the overall safety of the system (3) Sources of generated energy; for example, thermocouples and photocells, that do not generate more than 1.5 volts, 100 mA, and 25 mW Informational Note No. 2: For further information, refer to ANSI/UL 913-2013, *Intrinsically Safe Apparatus and Associated Apparatus for Use in Class I, II, III, Division 1, Hazardous (Classified) Locations;* and ANSI/UL 60079-11-2013, *Explosive Atmospheres — Part 11: Equipment Protection by Intrinsic Safety "i."*

Spray Area. Any fully enclosed, partly enclosed, or unenclosed area in which dangerous quantities of flammable or combustible vapors, mists, residues, dusts, or deposits are present due to the operation of spray processes, including (1) any area in the direct path of a spray application process; (2) the interior of a spray booth, spray room, or limited finishing workstation, as herein defined; (3) the interior of any exhaust plenum, eliminator section, or scrubber section; (4) the interior of any exhaust duct or exhaust stack leading from a spray application process; (5) the interior of any air recirculation path up to and including recirculation particulate filters; (6) any solvent concentrator (pollution abatement) unit or solvent recovery (distillation) unit; and (7) the inside of a membrane enclosure. The following are not part of the spray area: (1) fresh air make-up units; (2) air supply ducts and air supply plenums; (3) recirculation air supply ducts downstream of recirculation particulate filters; and (4) exhaust ducts from solvent concentrator (pollution abatement) units. Informational Note: Unenclosed spray areas are locations outside of buildings or are localized operations within a larger room or space. Such are normally provided with some local vapor extraction/ventilation system. In automated operations, the area limits are the maximum area in the direct path of spray operations. In manual operations, the area limits are the maximum area of spray when aimed at 90 degrees to the application surface.

87. What is optical fiber cable protected from releasing optical radiation into the atmosphere during normal operating conditions and foreseeable malfunctions by additional armoring, conduit, cable tray, or raceways?

A. Fiber cable
B. Protected optical radiation cable
C. Purged and pressurized cable
D. Protected optical fiber cable

88. What is equipment with electrical components suitable to be moved by a single person without mechanical aids best defined as?

A. Movable equipment
B. Stationary equipment
C. Portable equipment

D. Temporary Installation

89. What best defines the supplying of an enclosure with a protective gas at a sufficient flow and positive pressure to reduce the concentration of any flammable gas or vapor initially present to an acceptable level?

A. Purging
B. Pressurization
C. Vacuumed
D. Negative pressure sealed (NPS)

90. What is the process of supplying an enclosure with a protective gas with or without continuous flow, at sufficient pressure to prevent the entrance of combustible dust or ignitible fibers/flyings considered?

A. Process seal
B. Pressurized enclosure
C. Pressurized
D. Pressurized equipment

2023 NEC Definitions Quiz Answer Sheet

1	a b c d	31	a b c d	61	a b c d
2	a b c d	32	a b c d	62	a b c d
3	a b c d	33	a b c d	63	a b c d
4	a b c d	34	a b c d	64	a b c d
5	a b c d	35	a b c d	65	a b c d
6	a b c d	36	a b c d	66	a b c d
7	a b c d	37	a b c d	67	a b c d
8	a b c d	38	a b c d	68	a b c d
9	a b c d	39	a b c d	69	a b c d
10	a b c d	40	a b c d	70	a b c d
11	a b c d	41	a b c d	71	a b c d
12	a b c d	42	a b c d	72	a b c d
13	a b c d	43	a b c d	73	a b c d
14	a b c d	44	a b c d	74	a b c d
15	a b c d	45	a b c d	75	a b c d
16	a b c d	46	a b c d	76	a b c d
17	a b c d	47	a b c d	77	a b c d
18	a b c d	48	a b c d	78	a b c d
19	a b c d	49	a b c d	79	a b c d
20	a b c d	50	a b c d	80	a b c d
21	a b c d	51	a b c d	81	a b c d
22	a b c d	52	a b c d	82	a b c d
23	a b c d	53	a b c d	83	a b c d
24	a b c d	54	a b c d	84	a b c d
25	a b c d	55	a b c d	85	a b c d
26	a b c d	56	a b c d	86	a b c d
27	a b c d	57	a b c d	87	a b c d
28	a b c d	58	a b c d	88	a b c d
29	a b c d	59	a b c d	89	a b c d
30	a b c d	60	a b c d	90	a b c d

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