West Virginia CTE

HVAC I

Basic Safety

1 **Students will demonstrate knowledge of :** 1752.1

- the importance of safety, the causes of workplace incidents, and the process of hazard recognition and control
- the safe work requirements for elevated work, including fall protection guidelines
- how to avoid struck-by and caught-in-between hazards
- common energy-related hazards and explain how to avoid them
- the proper use of personal protective equipment (PPE)
- other specific job-site safety hazards

2 **Students will define incidents and the significant costs associated with them** 1752.2

3 **Students will identify the common causes of incidents and their related consequences** 1752.3

4 **Students will describe the processes related to hazard recognition and control, including the Hazard Communication (HAZCOM) Standard and the provisions of a Safety Data Sheet (SDS)** 1752.4

5 **Students will identify and describe various fall hazards** 1752.5

6 **Students will identify and describe equipment and methods used in fall prevention and fall arrest** 1752.6

7 **Students will identify and describe the safe use of ladders and stairs** 1752.7

8 **Students will identify and describe the safe use of ladders and stairs** 1752.8

9 **Students will identify and explain how to avoid struck-by and caught-in-between hazards** 1752.9

10 **Students will identify and explain how to avoid caught-in and caught-between hazards** 1752.10

11 **Students will describe basic job-site electrical safety guidelines** 1752.11

12 **Students will explain the importance of lockout/tagout and describe basic procedures** 1752.12

13 **Students will identify and describe the basic use of PPE used to protect workers from bodily injury** 1752.13

14 **Students will identify potential respiratory hazards and the basic respirators used to protect workers against those hazards** 1752.14

15 **Students will identify various exposure hazards commonly found on job sites** 1752.15

16 **Students will identify hazards associated with environmental extremes** 1752.16

17 **Students will identify hazards associated with hot work** 1752.17

18 **Students will identify fire hazards and describe basic firefighting procedures** 1752.18

19 **Students will identify confined spaces and describe the related safety considerations** 1752.19

Introduction to Construction Math

20 **Students will demonstrate knowledge of:** 1752.20

- whole numbers and how to work with them mathematically
- how to work with fractions
- the decimal system and how to work with decimals
- various tools used to measure length and how they are used
- converting units of length, weight, volume, and temperature between the imperial and metric systems of measurement
- basic angles and geometric shapes and how to calculate their area and volume

21 **Students will identify different whole numbers and their place values** 1752.21

22 **Students will demonstrate the ability to add and subtract whole numbers** 1752.22

23 **Students will demonstrate the ability to multiply and divide whole numbers** 1752.23

24 **Students will define equivalent fractions and show how to find lowest common denominators** 1752.24

25 **Students will describe improper fractions and demonstrate how to change an improper fraction to a mixed number** 1752.25

26 **Students will demonstrate the ability to add and subtract fractions** 1752.26

27 **Students will demonstrate the ability to multiply and divide fractions** 1752.27

28 **Students will describe decimals and their place values** 1752.28

29 **Students will demonstrate the ability to add, subtract, multiply, and divide decimals** 1752.29

30 **Students will demonstrate the ability to convert between decimals, fractions, and percentages** 1752.30

31 **Students will identify and demonstrate how to use rulers** 1752.31

32 **Students will identify and demonstrate how to use measuring tapes** 1752.32

33 **Students will identify and convert units of length measurement between the imperial and metric systems** 1752.33

34 **Students will identify and convert units of weight measurement between the imperial and metric systems** 1752.34

35 **Students will identify and convert units of volume measurement between the imperial and metric systems** 1752.35

36 **Students will identify and convert units of temperature measurement between the imperial and metric systems** 1752.36

37 **Students will identify various types of angles** 1752.37

38 **Students will identify basic geometric shapes and their characteristics** 1752.39

39 **Students will demonstrate the ability to calculate the area of two-dimensional shapes** 1752.39

40 **Students will demonstrate the ability to calculate the volume of three-dimensional shapes** 1752.40

Introduction to HVAC

41 **Students will demonstrate knowledge of** 1752.41

- the basic principles of heating, ventilation, air conditioning, and refrigeration
- the principles that guide HVAC/R installation and service techniques
- career paths available in the HVAC/R trade

42 **Students will explain the principles of heating** 1752.42

43 **Students will explain the principles of ventilation** 1752.43

44 **Students will explain the principles of air conditioning** 1752.44

45 **Students will explain the principles of refrigeration** 1752.45

46 **Students will identify common safety principles and organizations** 1752.46

47 **Students will describe the importance of LEED construction and energy management** 1752.47

48 **Students will describe trade licensing and certification requirements** 1752.48

49 **Students will identify important codes and permits** 1752.49

50 **Students will identify the responsibilities and characteristics needed to be a successful HVAC/R technician** 1752.50

51 **Students will identify residential, commercial, and industrial career opportunities** 1752.51

52 **Students will describe opportunities provided by equipment manufacturers** 1752.52

Trade Math

53 **Students will demonstrate knowledge of** 1752.53

converting units of measurement from the inch-pound system to the metric system, and vice-versa

solving basic algebraic equations

geometric figures

54 **Students will identify units of measure in the inch-pound and metric systems** 1752.54

55 **Students will convert, length, area, and volume values** 1752.55

56 **Students will convert weight values** 1752.56

57 **Students will convert pressure and temperature values** 1752.57

58 **Students will define algebraic terms** 1752.58

59 **Students will demonstrate an understanding of the sequence of operations** 1752.59

60 **Students will solve basic algebraic equations** 1752.60

61 **Students will describe the characteristics of a circle** 1752.61

62 **Students will identify and describe types of angles** 1752.62

63 **Students will identify and describe types of polygons** 1752.63

64 **Students will calculate various values associated with triangles** 1752.64

Basic Electricity

65 Students will demonstrate knowledge of 1752.65

- the fundamentals of electricity and basic electrical theory
- electrical measuring instruments used in HVAC/R work and their uses
- electrical components used in HVAC/R systems and their functions

66 Students will state how electrical power is created and distributed 1752.66

67 Students will state the safety practices associated with electricity 1752.67

68 Students will describe the difference between alternating current and direct current 1752.68

69 Students will define voltage, current, resistance, and power and describe how they are related 1752.69

70 Students will use Ohm's law to calculate the current, voltage and resistance in a circuit 1752.70

71 Students will use the power formula to calculate how much power is consumed by a circuit 1752.71

72 Students will describe the differences between series and parallel circuits and calculate circuit loads for each type 1752.72

73 Students will describe how voltage is measured 1752.73

74 Students will describe how current is measured 1752.74

75 Students will describe how resistance is measured 1752.75

76 Students will identify and describe various load devices and explain how they are represented on circuit diagrams 1752.76

77 Students will identify and describe various control devices and explain how they are represented on circuit diagrams 1752.77

78 Students will identify and describe the types of electrical diagrams used in HVAC/R work 1752.78

Introduction to Heating

79 Students will demonstrate knowledge of 1752.79

- the fundamental concepts of heating and combustion
- the role of forced-air gas furnaces in residential heating
- hydronic and electric heating systems

80 Students will describe the heat transfer process 1752.80

81 Students will identify gas fuels and their combustion characteristics 1752.81

82 **Students will describe the types of gas furnaces and how they operate** 1752.82

83 **Students will identify and describe the equipment and controls used in gas furnaces** 1752.83

84 **Students will describe the basic installation and maintenance requirements for gas furnaces** 1752.84

85 **Students will describe the operation of hydronic heating systems** 1752.85

86 **Students will describe the operation of electric heating equipment** 1752.86

Introduction to Cooling

87 **Students will demonstrate knowledge of** 1752.87

- the fundamental concepts of the refrigeration cycle
- common refrigerants and their basic characteristics
- the major components of cooling systems and how they function
- the common controls used in cooling systems and how they function

88 **Students will describe how heat affects the state of substances** 1752.88

89 **Students will explain how heat is transferred from one substance to another** 1752.89

90 **Students will describe pressure-temperature relationships** 1752.90

91 **Students will describe the basic pattern of refrigerant flow and the changes of state that occur in the refrigeration cycle** 1752.91

92 **Students will identify common instruments used to measure pressure and temperature** 1752.92

93 **Students will identify fluorocarbon refrigerants** 1752.93

94 **Students will describe the use of ammonia as a refrigerant** 1752.94

95 **Students will identify various refrigerant containers and their safe handling requirements** 1752.95

96 **Students will identify basic compressors and their function in the system** 1752.96

97 **Students will identify different condensers used to transfer heat** 1752.97

98 **Students will identify different evaporators used to transfer heat** 1752.98

99 **Students will describe the devices used to meter refrigerant flow.** 1752.99

100 **Students will discuss basic refrigerant piping concepts** 1752.100

101 **Students will identify various accessories used in refrigeration circuits** `1752.101`

102 **Students will identify common primary controls** `1752.102`

103 **Students will identify controls that are secondary to the process** `1752.103`