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

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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

Students will demonstrate the ability to multiply and divide fractions 1752.27

Students will describe decimals and their place values 1752.28

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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

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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

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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

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

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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

Students will identify various accessories used in refrigeration circuits 1752.101

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

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