*The homework questions in this packet are similar to the ones found on the actual written exam. The attached formula sheet with an alcohol correction chart is provided to help you learn the calculations but is **not** allowed to be used on the ACI exam. Answers to the problems are given on the last page of the packet so that you may check your work.*

1. Calculate the reported density of the concrete in lb/ft^3.

Known:	Volume of Measure	0.250	ft^3
	Mass of Empty Measure	7.45	lb
	Mass of the Measure + Concrete	45.58	lb

2. The total mass of all materials in a batch is 34,855 lb. If the density of the concrete is 146.6 lb/ft^3, determine the yield for the batch in yd^3.

3. For a yield of 9.8 yd^3 and a design yield of 10.0 yd^3, calculate the relative yield of the concrete.

4. If a batch of concrete used 6,000 lb of cement and produced a yield of 9.6 yd^3, what is the cement content of the mix in lb/yd^3?

5. A theoretical density for a concrete mixture is 150.7 lb/ft^3. If the density of the concrete being produced at the jobsite is 142.5 lb/ft^3, calculate the air content (%) of the concrete.

6. Calculate the reported density of the concrete.

Mass of empty measure	7.80	lb
Mass of full measure	45.64	lb
Net mass of concrete		lb
Reported volume of measure	0.251	ft^3
Reported density (unit weight)		lb/ft^3

7. Calculate the reported air content (pressure meter) of the concrete.

Measured air content	8.0	%
Aggregate correction factor	0.4	%
Reported air content		%

8. Calculate the reported air content (volumeter) of the concrete.

Initial meter reading	6.50
Final meter reading	6.75
Pints of alcohol used	2
Alcohol content correction	
Calibrated cups of water added	0
Reported air content	

9. Calculate the reported density of the concrete in lb/ft^3.

Known:			
	Volume of Measure	0.249	ft^3
	Mass of Empty Measure	7.60	lb
	Mass of the Measure + Concrete	44.85	lb

10. The total mass of all materials in a batch is 38,600 lb. If the density of the concrete is 148.5 lb/ft^3, determine the yield for the batch in yd^3.

11. For a yield of 9.3 yd^3 and a design yield of 9.0 yd^3, calculate the relative yield of the concrete.

12. If a batch of concrete used 5,500 lb of cement and produced a yield of 9.3 yd^3, what is the cement content of the mix in lb/yd^3?

13. A theoretical density for a concrete mixture is 151.2 lb/ft^3. If the density of the concrete being produced at the jobsite is 141.7 lb/ft^3, calculate the air content (%) of the concrete.

14. Calculate the reported density of the concrete.

Mass of empty measure	11.56	lb
Mass of full measure	49.22	lb
Net mass of concrete		lb
Reported volume of measure	0.248	ft^3
Reported density (unit weight)		lb/ft^3

15. Calculate the reported air content (pressure meter) of the concrete.

Measured air content	7.5	%
Aggregate correction factor	0.3	%
Reported air content	_____	%

16. Calculate the reported air content (volumeter) of the concrete.

Initial meter reading	7.25
Final meter reading	7.50
Pints of alcohol used	3
Alcohol content correction	_____
Calibrated cups of water added	0
Reported air content	_____

17. Calculate the reported air content (volumeter) of the concrete.

Initial meter reading	8.00
Final meter reading	8.25
Pints of alcohol used	4
Alcohol content correction	_____
Calibrated cups of water added	2
Reported air content	_____

Density (D)
$$D = (M_c - M_m) / V_m = W_c / V_m$$

D = density (unit weight) of concrete (lb/ft³)
M_c = mass of the measure filled with concrete (lb)
M_m = mass of the empty measure (lb)
V_m = volume of the measure (ft³)
W_c = weight of the concrete

Yield (Y)
$$Y_{(yd^3)} = M / (D \times 27)$$

Y = volume of concrete produced per batch (yd³)
M = total mass of all materials batched (lb)
D = density (unit weight) of concrete (lb/ft³)

Relative Yield (R$_y$)
$$R_y = Y / Y_d$$

R_y = relative yield
Y = yield (yd³)
Y_d = volume of concrete the batch was designed to produce (yd³)

Cement Content (C)
$$C = C_b / Y$$

C = actual cement content (lb/yd³)
C_b = mass of cement or cementatious materials in the batch (lb)
Y = yield (yd³)

Gravimetric Air Content (A)
$$A = [(T - D) / T] \times 100$$

A = air content (percentage of voids) in the concrete
T = theoretical density of the concrete (lb/ft³)
D = density (unit weight) of concrete (lb/ft³)

Correction for the Effect of Isopropyl Alcohol on C173 Air Meter Reading			
Pints	Ounces	Liters	Correction, %
≤ 2.0	≤ 32	≤ 1.0	0.0
3.0	48	1.5	0.25
4.0	64	2.0	0.50
5.0	80	2.5	0.75

Answers

1. 152.5 lb/ft^3

2. 8.8 yd^3

3. 0.98

4. 625 lb/yd^3

5. 5.4 %

6. 150.8 lb/ft^3

7. 7.6 %

8. 6.75 %

9. 149.6 lb/ft^3

10. 9.6 yd^3

11. 1.03

12. 591 lb/yd^3

13. 6.3 %

14. 151.9 lb/ft^3

15. 7.2 %

16. 7.25 %

17. 9.75 %