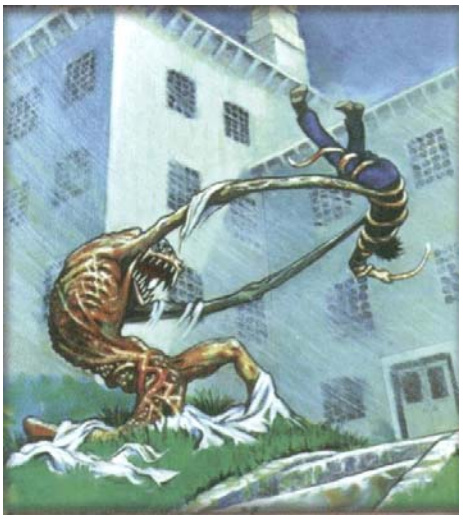
Review For Final Exam



Review For Final Exam

1. A random error of ±0.11 ft. is estimated for each of 12 length measurements that are added together to get the total length. What is the estimated total error?

$$E_{Total} = E\sqrt{n} = \pm 0.\overline{11}\text{ft.}\sqrt{12} = \pm 0.3811 = \pm 0.\overline{38}$$

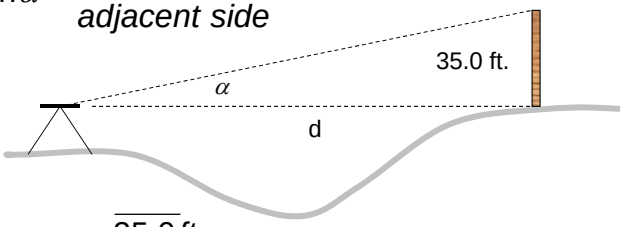
A. ±0.38 ft.
B. ±0.33 ft.
C. ±0.28 ft.
D. ±0.19 ft.
E. ±0.01 ft.

Review For Final Exam

2. What is the distance to the flag pole if the pole is 35.0 ft. in height and the measured angle a = 7° 45’ 30”.

A. 4.87 ft.
B. 35.0 ft.
C. 100 ft.
D. 257 ft.
E. 295 ft.

$$\tan\alpha = \frac{opposite\ side}{adjacent\ side}$$



$$adjacent\ side = \frac{\overline{35.0\,ft}}{\tan\left(7.7583^{\circ}\right)} = 257\,\text{ft.}$$

Review For Final Exam

3. Complete and check the above set of level notes and estimate the height of the instrument between points TP_2 and TP_3.

Station	BS	HI	FS	Elevation
BM_1	**1.23**	101.23		**100.00**
TP_1	**2.25**	98.96	**4.52**	96.71
TP_2	**6.25**	100.56	**4.65**	94.31
TP_3	**4.23**	101.58	**3.21**	97.35
TP_4	**1.47**	97.36	**5.69**	95.89
BM_2			**8.42**	88.94

A. 102.42 ft.
B. 101.58 ft.
C. 100.56 ft.
D. 97.36 ft.
E. 95.48 ft.

Review For Final Exam

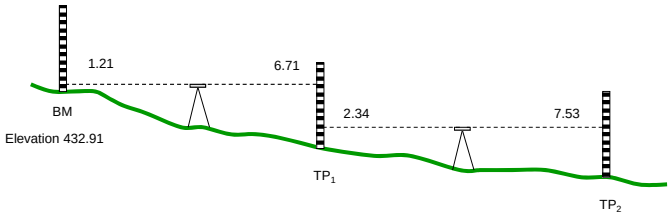
4. Complete and check the above set of level notes and estimate the elevation of point BM_2.

Station	BS	HI	FS	Elevation
BM_1	**1.23**	101.23		**100.00**
TP_1	**2.25**	98.96	**4.52**	96.71
TP_2	**6.25**	100.56	**4.65**	94.31
TP_3	**4.23**	101.58	**3.21**	97.35
TP_4	**1.47**	97.36	**5.69**	95.89
BM_2			**8.42**	88.94

A. 101.02 ft.
B. 100.02 ft.
C. 98.02 ft.
D. 97.35 ft.
E. 88.94 ft.

Review For Final Exam

5. Develop and check a set of level notes from the above figure. What is the FS at point TP_2?



Station	BS	HI	FS	Elevation
BM_1	**1.21**	434.12		**432.91**
TP_1	**2.34**	429.75	**6.71**	427.41
TP_2		422.22	**7.53**	422.22

Review For Final Exam

5. Develop and check a set of level notes from the above figure. What is the FS at point TP_2?

A. 1.34 ft.
B. 3.20 ft.
C. 4.41 ft.
D. 6.71 ft.
E. 7.53 ft.

Station	BS	HI	FS	Elevation
BM_1	**1.21**	434.12		**432.91**
TP_1	**2.34**	429.75	**6.71**	427.41
TP_2		422.22	**7.53**	422.22

Review For Final Exam

6. What is the change in elevation between points BM_1 and TP_2?

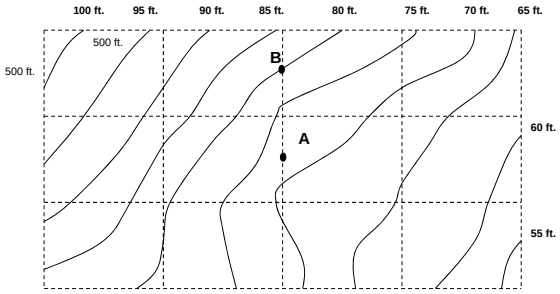
A. -16.40 ft.
B. -10.69 ft.
C. 4.54 ft.
D. 10.94 ft.
E. 432.91 ft.

$$TP_2 - BM_1 = 422.22\,\text{ft.} - 432.91\text{ft.} = -10.69\,\text{ft.}$$

Station	BS	HI	FS	Elevation
BM_1	**1.21**	434.12		**432.91**
TP_1	**2.34**	429.75	**6.71**	427.41
TP_2		422.22	**7.53**	422.22

Review For Final Exam

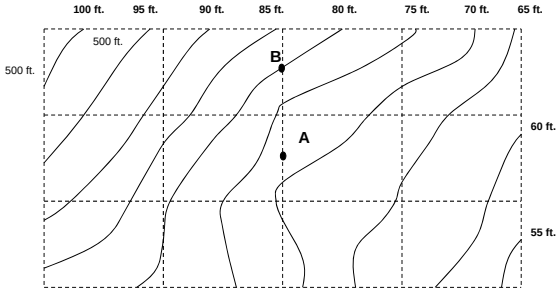
7. Estimate the elevation of Point A?



A. 65 ft.
B. 68 ft.
C. 70 ft.
D. 73 ft.
E. 75 ft.

Review For Final Exam

8. Which of the following values is most nearly slope between Point A and Point B?



A. 1%
B. 3%
C. 5%
D. 7%
E. 9%

$$Slope = \frac{\Delta h}{L} = \frac{80\,\text{ft.} - 73\,\text{ft.}}{500\,\text{ft.}} = 0.014$$

Review For Final Exam

9. For the following site data, what would be an appropriate square grid spacing to develop a contour map using one-foot intervals?

A. 5 foot
B. 10 foot
C. 15 foot
D. 20 foot
E. 25 foot

Side	Distance
AB	100.0
BC	150.0
CD	200.0
DA	100.0

Point	Elevation
A	100.0
B	105.0
C	108.0
D	105.0

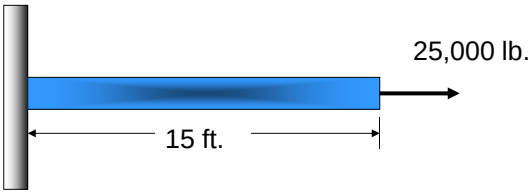
$$AB = \frac{100\text{ ft.}}{5\text{ ft.}} = 20.0 \qquad BC = \frac{150\text{ ft.}}{3\text{ ft.}} = 50.0$$

$$CD = \frac{200\text{ ft.}}{3\text{ ft.}} = 66.7 \qquad DA = \frac{100\text{ ft.}}{5\text{ ft.}} = 20.0$$

Review For Final Exam

10. If the bar fails at strains greater than 0.05, what is the largest allowable deformation of bar to prevent failure?

A. 11 in.
B. 9 in.
C. 7 in.
D. 5 in.
E. 2 in.

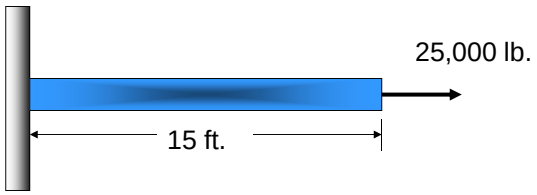


$$\varepsilon = \frac{\delta}{L} \quad \Rightarrow \quad \delta = \varepsilon L = 0.05(15\,\text{ft.})\left(\frac{12\,\text{in.}}{\text{ft.}}\right) = 9\,\text{in.}$$

Review For Final Exam

11. If the bar yields at a deformation of 0.25 in. under an axial load, estimate the yield stress in the material if the modulus of elasticity of 29,000 ksi?

A. 20 ksi
B. 40 ksi
C. 60 ksi
D. 80 ksi
E. 100 ksi

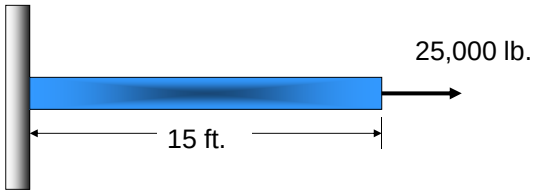


$$\sigma = E\varepsilon = 29{,}000\,ksi\left(\frac{0.\overline{25}\,\text{in.}}{15\,\text{ft.}\left(12\,\text{in.}/\text{ft.}\right)}\right) = 40\,\text{ksi}$$

Review For Final Exam

12. What is the deformation of the bar shown above if its cross-sectional area is 0.5 in.^{2} and the modulus of elasticity of the material is 29,000 ksi?

A. 0.03 in.
B. 0.31 in.
C. 0.62 in.
D. 1.25 in.
E. 2.50 in.

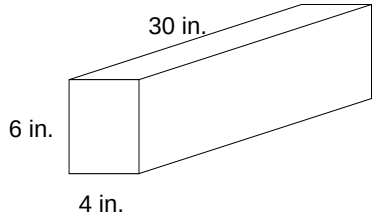


$$\sigma = E\varepsilon \Rightarrow \frac{P}{A} = E\frac{\delta}{L} \Rightarrow \delta = \frac{PL}{AE}$$

$$\delta = \frac{PL}{AE} = \frac{25\,kips(180\,\text{in.})}{0.5\,\text{in.}^2(29{,}000ksi)} = 0.31\,\text{in.}$$

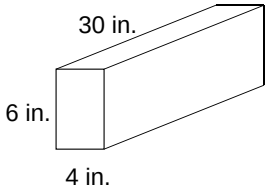
Review For Final Exam

Construct ***ten*** beams, each having the dimensions shown in the figure below. Include a "make-sure-you-have-enough" factor of 1.2 in your mix calculations. Assume a *w/c* ratio of 0.35 and a mix design of 1:2:3. All weights should be reported in quarter–pound. Assume concrete weights about 145 lb./ft.^{3} for all calculations.



Review For Final Exam

13. The total volume of concrete required for this application is estimated to be:



Number of beams

$$V = 10(4\,\text{in.})(6\,\text{in.})(30\,\text{in.})(1.2)$$

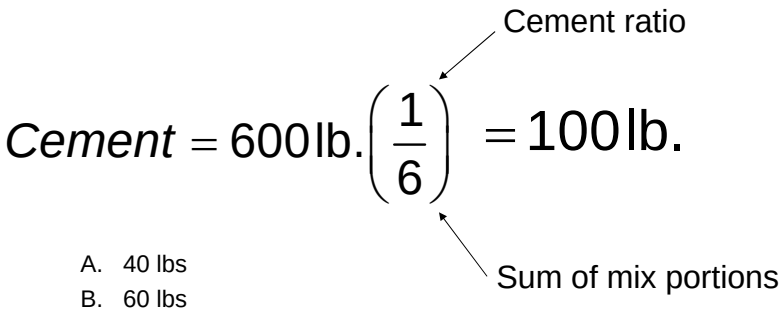
make-sure-you-have-enough" factor

$$= 8{,}640\,\text{in.}^3$$

A. 1,080 in^3
B. 2,700 in^3
C. 7,200 in^3
D. 8,640 in^3
E. 9,640 in^3

Review For Final Exam

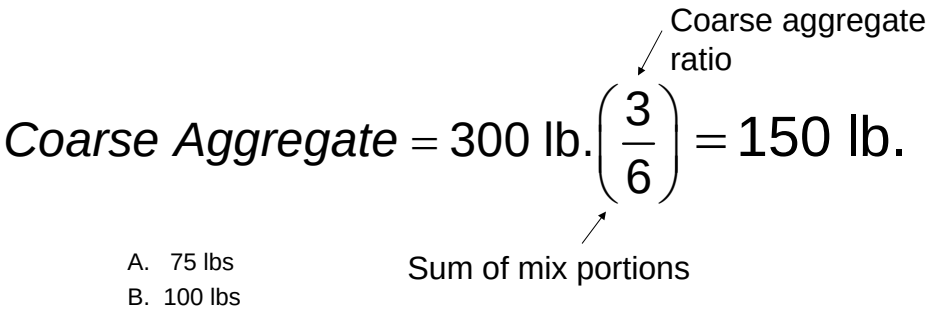
14. The weight of cement required to make 600 lb. of the concrete mix describe above is:



A. 40 lbs
B. 60 lbs
C. 80 lbs
D. 100 lbs
E. 120 lbs

Review For Final Exam

15. The weight of course aggregate required to make 300 lb. of the concrete mix describe above is:

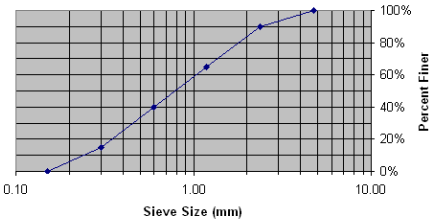


A. 75 lbs
B. 100 lbs
C. 125 lbs
D. 150 lbs
E. 175 lbs

Review For Final Exam

From the data given below, develop a particle-size distribution plot. Use the table and blank graph shown below:

Sieve Number	Diameter (mm)	Mass of Soil Retained on Each Sieve (g)	Percent Rretained (%)	Percent Finer (%)	D_{10}	D_{30}	D_{60}
4	4.750	0.0	0.0%	100.0%			
8	2.360	40.0	10.0%	90.0%			
16	1.180	100.0	25.0%	65.0%			
30	0.600	100.0	25.0%	40.0%			1.06
50	0.300	100.0	25.0%	15.0%		0.48	
100	0.150	60.0	15.0%	0.0%	0.25		
PAN		0.0	0.0%	0.0%			
	Sum =	400.0			0.25	0.48	1.06

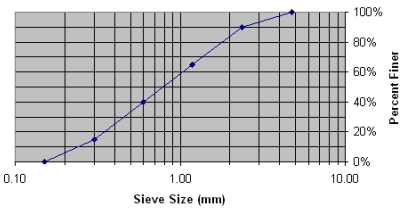


Effective Size (mm)	0.25
Uniformity Coefficient	4.26
Coefficient of Gradation	0.87

Review For Final Exam

16. The percent passing the #30 sieve may be most closely approximated as:

Sieve Number	Diameter (mm)	Mass of Soil Retained on Each Sieve (g)	Percent Rretained (%)	Percent Finer (%)	D_{10}	D_{30}	D_{60}
4	4.750	0.0	0.0%	100.0%			
8	2.360	40.0	10.0%	90.0%			
16	1.180	100.0	25.0%	65.0%			
30	0.600	100.0	25.0%	40.0%			1.06
50	0.300	100.0	25.0%	15.0%		0.48	
100	0.150	60.0	15.0%	0.0%	0.25		
PAN		0.0	0.0%	0.0%			
	Sum =	400.0			0.25	0.48	1.06



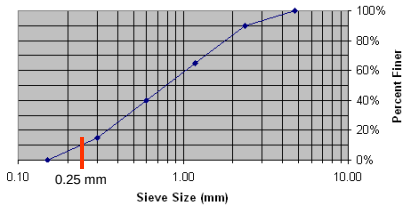
Effective Size (mm)	0.25
Uniformity Coefficient	4.26
Coefficient of Gradation	0.87

A. 100%
B. 80%
C. 40%
D. 20%
E. 10%

Review For Final Exam

17. The effective size of the soil may be most closely approximated as:

Sieve Number	Diameter (mm)	Mass of Soil Retained on Each Sieve (g)	Percent Rretained (%)	Percent Finer (%)	D_{10}	D_{30}	D_{60}
4	4.750	0.0	0.0%	100.0%			
8	2.360	40.0	10.0%	90.0%			
16	1.180	100.0	25.0%	65.0%			
30	0.600	100.0	25.0%	40.0%			1.06
50	0.300	100.0	25.0%	15.0%		0.48	
100	0.150	60.0	15.0%	0.0%	0.25		
PAN		0.0	0.0%	0.0%			
	Sum =	400.0			0.25	0.48	1.06

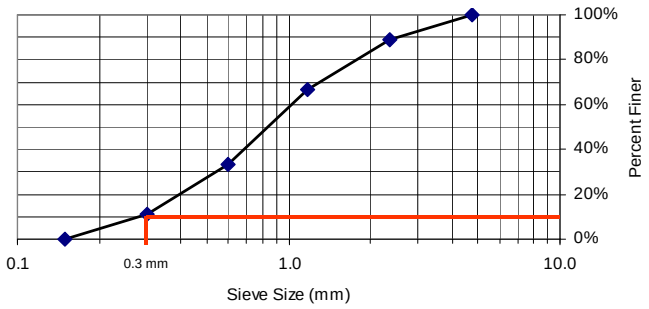


Effective Size (mm)	0.25
Uniformity Coefficient	4.26
Coefficient of Gradation	0.87

A. 0.01 mm
B. 0.10 mm
C. 0.20 mm
D. 0.25 mm
E. 0.40 mm

Review For Final Exam

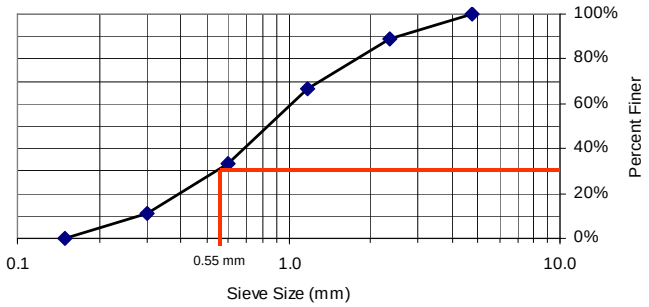
18. The effective size of the soil shown in the graph above is most closely approximated by:



A. 0.3 mm
B. 0.4 mm
C. 0.5 mm
D. 0.6 mm
E. 0.7 mm

Review For Final Exam

19. The particle-size D_{30} is most closely approximated as:



A. 0.55 mm
B. 0.65 mm
C. 0.75 mm
D. 0.85 mm
E. 1.05 mm

Review For Final Exam

20. Which of the following filtration mechanisms is ***not*** involved in removing suspended solids in a granular-media filter?

A. interception
B. straining
C. flocculation
D. hydration
E. sedimentation

Review For Final Exam

21. The hydraulic loading rate in the 3.5 in. diameter filters in lab, with a flowrate of 1,250 ml/min, is most nearly approximated as:

$$Loading\ Rate = \frac{Flowrate}{Area}$$

$$= \frac{1{,}250\,ml/min}{\frac{\pi(3.5\,in.)^2}{4}} \times \frac{1\,gallon}{3{,}785\,ml} \times \frac{144\,in.^2}{ft.^2} = \boxed{4.94\,gpm/ft.^2}$$

A. 1.0 gpm/ft.^{2}
B. 2.0 gpm/ft.^{2}
C. 3.0 gpm/ft.^{2}
D. 4.0 gpm/ft.^{2}
E. 5.0 gpm/ft.^{2}

Review For Final Exam

22. The backwash velocity required to expand a sand bed filter to a porosity of 0.70 for a sand with a settling velocity is 0.20 ft./s and the initial porosity of the sand is 0.35 is most nearly approximated as:

$$v = v_s \alpha_e^{4.5}$$

$$= \left(0.20\,ft/s\right)(0.70)^{4.5}$$

$$= \boxed{0.04\,ft./s}$$

A. 0.01 ft./s
B. 0.03 ft./s
C. 0.04 ft./s
D. 0.05 ft./s
E. 0.07 ft./s

Review For Final Exam

23. The results of a filter run, operated in a manner identical to that used in lab, are shown in the table above. Which of the following volumes most closely estimates the total volume treated after 60 minutes?

Initial Turbidity (NTU) 100

time (min)	Flowrate (ml/min)	Turbidity (NTU)	V (ml)	Average Turbidity
0	1,000	2.00	---	---
10	1,000	2.00	10,000	0.37
20	900	3.00	10,000	0.46
30	900	5.00	9,000	0.67
40	800	6.00	9,000	0.92
50	800	8.00	8,000	1.04
60	---	10.00	8,000	1.33
		Sum	54,000	4.79

%FTU Removed	95.2%

Filter Efficiency	51,415

A. 24,000 ml
B. 36,000 ml
C. 48,000 ml
D. 54,000 ml
E. 72,000 ml

Review For Final Exam

24. Which of the following values most closely estimates the average turbidity after 60 minutes?

Initial Turbidity (NTU) 100

time (min)	Flowrate (ml/min)	Turbidity (NTU)	V (ml)	Average Turbidity
0	1,000	2.00	---	---
10	1,000	2.00	10,000	0.37
20	900	3.00	10,000	0.46
30	900	5.00	9,000	0.67
40	800	6.00	9,000	0.92
50	800	8.00	8,000	1.04
60	---	10.00	8,000	1.33
		Sum	54,000	4.79

%FTU Removed	95.2%

Filter Efficiency	51,415

A. 0 NTU
B. 3 NTU
C. 5 NTU
D. 7 NTU
E. 9 NTU

Review For Final Exam

25. If the average turbidity is 10 NTU at the end of 60 minutes, which of the following values most closely estimates the %NTU removed?

$$\%Turbidity\,(NTU)\,Removed = \frac{100-10}{100}\times 100\% = 90\%$$

A. 100%
B. 95%
C. 90%
D. 85%
E. 75%

Review For Final Exam

End of Review