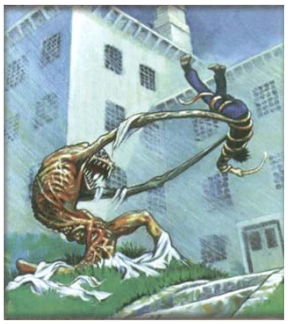
Review For Mid-Term Exam



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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?

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

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

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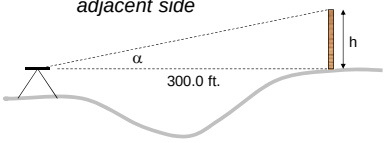
2. What is the height of the flag pole if the horizontal distance from the instrument to the base of the pole is measured as 300.0 ft. and the measured angle α = 7° 45' 30".

A. 40.87 ft.
B. 53.43 ft.
C. 84.29 ft.
D. 142.2 ft.
E. 292.2 ft.

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



$$opposite\ side = \overline{300.0}\text{ft.} \times \tan\left(7.7583^{\circ}\right) = 40.87\text{ft.}$$

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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.

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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.

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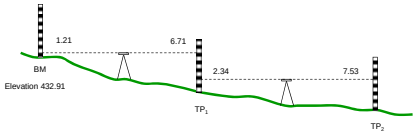
5. Develop and check a set of level notes from the above figure. What is the FS at point TP_2?



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

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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

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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.

$$TP_2 - BM_1 = 422.22ft - 432.91ft = -10.69ft$$

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

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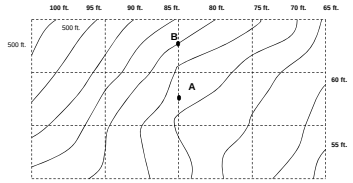
7. Estimate the elevation of Point A?

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



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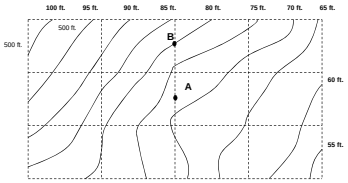
8. Which of the following values is most nearly slope between Point A and Point B?

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



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

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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

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

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

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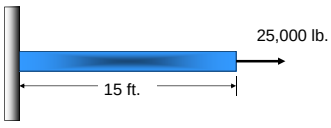
10. If the bar fails at strains greater than 0.05, what is the largest allowable deformation of bar to prevent failure?

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



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

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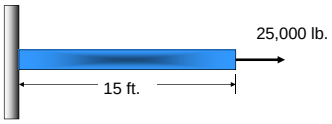
11. If the bar yields at a deformation of 0.25 in. under an axial load, estimate the yield stress in the material if the modulus of elasticity of 29,000 ksi?

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

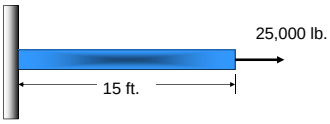


$$\sigma = E\varepsilon \quad = 29{,}000 ksi \left(\frac{0.25 in}{15 ft \left(12 \frac{in}{ft} \right)} \right) = 40 \text{ksi}$$

Review For Mid-Term 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.



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

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

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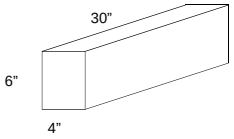
Construct ***ten*** beams, each having the dimensions shown in the figure below. Include a "make-sure-you-have-enough" factor of 1.2 in your mix calculations. Assume a *w/c* ratio of 0.35 and a mix design of 1:2:3. All weights should be reported in quarter-pound. Assume concrete weights about 145 lb./ft.^{3}.



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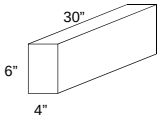
13. The total volume of concrete required for this application is estimated to be:



Number of beams

$$V = 10(4in.)(6in.)(30in.)(1.2)$$

make-sure-you-have-enough" factor

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

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}

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

Cement ratio

$$Cement = 600 lb. \left(\frac{1}{6} \right) = 100 lb.$$

Sum of mix portions

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

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

Coarse aggregate ratio

$$Coarse\ Aggregate = 300 lb. \left(\frac{3}{6} \right) = 150 lb.$$

Sum of mix portions

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

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End of Review