



DATA SHEET

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Sheet #:	D1j
Title:	GRADES AND ANGLES
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Originally Compiled by:	Lloyd E. Church
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USE OF GRADE AND ANGLE CHART

Any information regarding a grade may be obtained by use of the graph chart and the connecting conversion table, such as the height of risers at various points along the base for a given angle in per cent, ratio (1 in n) or degrees.

Most frequently it is desired to determine the intermediate riser heights when an overall grade is dictated by circumstance, such as a 3 inch rise in 80 running inches.

The base scale may be extended by multiplying all figures of the base scale and the altitude scale by the same factor without changing the values of the Conversion Table. Thus, multiplying by a factor of two (2), 80" on the base becomes 160" and 1" on the altitude is 2". Either way the grade equals 1.25%.

Example 1

Given a rise of 2.8" in a distance of 84", find the riser heights at 14", 34" and 60" along the base and determine the grade in percent.

Solution:

At the intersecting grid lines of 84 on the "B" scale and 2.8 on the "A" scale, place a dot. Draw a diagonal line from the lower left zero corner, through the dot to the right hand scale line. From 14 on the B scale read up to the diagonal line; then to the left along the horizontal to A scale and read 0.5".

Likewise 34 on B scale intersects the diagonal line at the horizontal line for a reading of 1.15" on the A scale. 60 on the B scale shows a riser height of 2".

The point where the diagonal line touches the right hand graph line will indicate the grade as 3.33%. The grade also has a ratio of 1 in 30 Approx., and an angle of 1.9" Approx.

Example 2

Given a grade of 2% or a ratio of 1 in 50 or an angle of 1.143° , find riser heights for 25", 50" and 75" distance along the horizontal base.

Solution:

Draw a diagonal line from lower left 0 corner to the 2 per cent line on the scale to the right. Where 25 on the B scale intersects the diagonal line, read 0.5" on the A scale. Where 50 on B intersects diagonal read A equals 1.0". At 75 on B read 1.5" rise.

Note:

A diagonal drawn on the graph does not represent the true grade. It will be much steeper than the actual grade.



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To find the value of any gradient in various designations:

A = Altitude }
B = Base } in like units

$A/B \times 100 = \text{Percent of Grade}$

$B/A = \text{Ratio of altitude or 1 in base number}$

$A/B = \text{Tangent of angle. From a trigonometric table of tangents the angle in degrees may be found.}$

CONVERSION TABLE

PERCENT	RATIO 1 in n	TAN ANGLE	DEGREE ANGLE
7.0	14.29	0.070	4.015
6.8	14.71	0.068	3.891
6.6	15.16	0.066	3.782
6.4	15.63	0.064	3.666
6.3	16.13	0.062	3.547
6.0	16.66	0.060	3.439
5.8	17.25	0.058	3.322
5.6	17.86	0.056	3.205
5.4	18.55	0.054	3.091
5.2	19.23	0.052	2.975
5.0	20.00	0.050	2.866
4.8	20.83	0.048	2.750
4.6	21.74	0.046	2.635
4.4	22.73	0.044	2.520
4.2	23.81	0.042	2.405
4.0	25.00	0.040	2.292
3.8	26.32	0.038	2.177
3.6	27.77	0.036	2.062
3.4	29.41	0.034	1.943
3.2	31.25	0.032	1.832
3.0	33.33	0.030	1.720
2.8	35.72	0.028	1.605
2.6	38.46	0.026	1.490
2.4	41.67	0.024	1.375
2.2	45.45	0.022	1.258
2.0	50.00	0.020	1.143
1.8	55.55	0.018	1.030
1.6	62.50	0.016	0.917
1.4	71.43	0.014	0.801
1.2	83.33	0.012	0.685
1.0	100.00	0.010	0.574
0.8	125.00	0.008	0.459
0.6	166.66	0.006	0.344
0.4	250.00	0.004	0.221
0.2	500.00	0.002	0.113



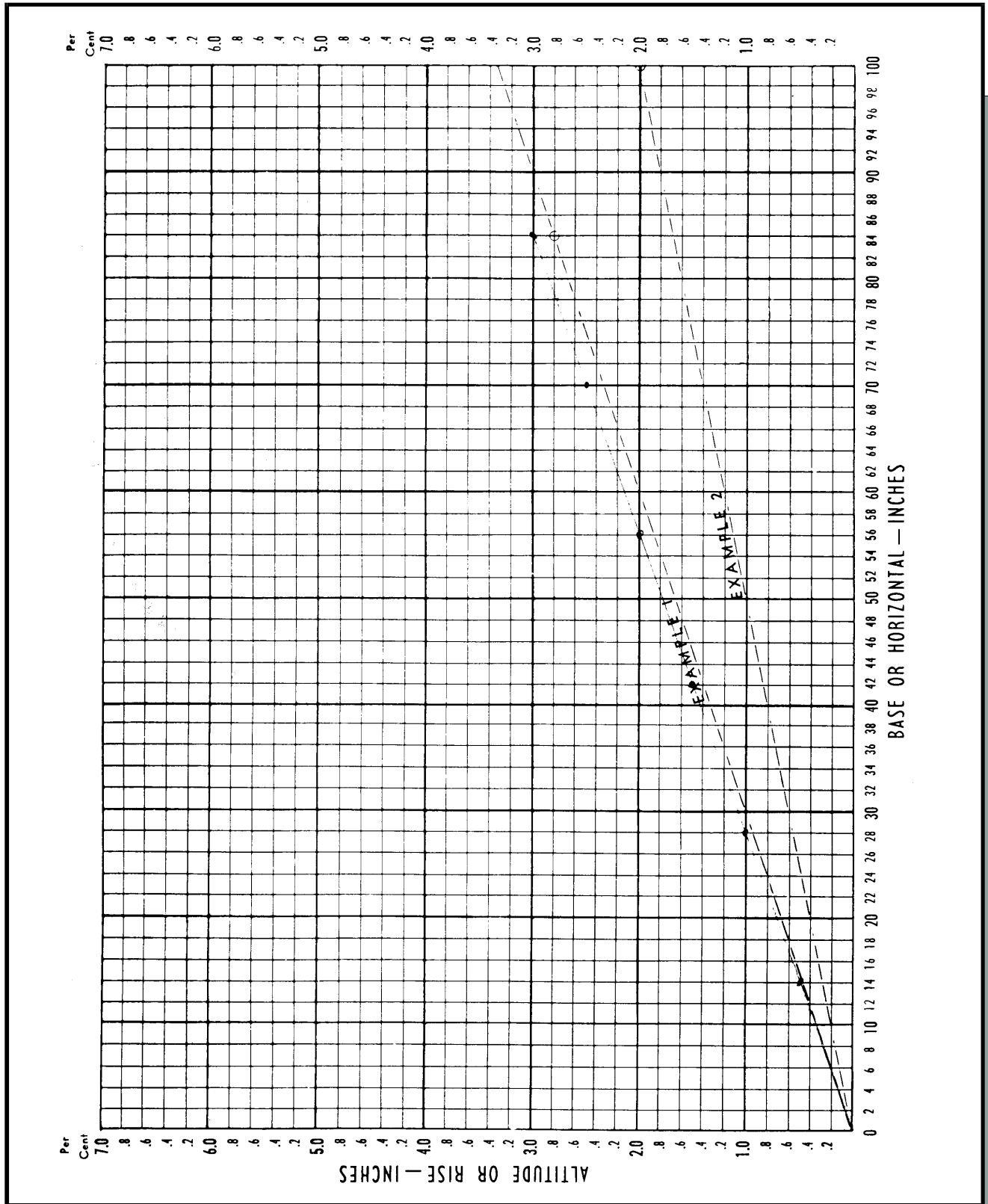
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GRAPH CHART

