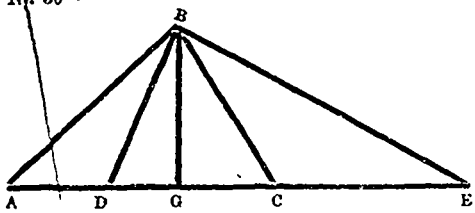
No. 30—



Solutions.

ABC and DBE are right-angled triangles; AB = 40, BE = 50 and DC = 30.

Find BD and BC.

Draw BG perpendicular to AE. Let AG = x, then $BG = \sqrt{40^2 - x^2}$,

and $AG : BG :: BG : CG \therefore GC = \frac{GB^2}{AG} = \frac{40^2 - x^2}{x}$,

then $DG = 30 - \frac{40^2 - x^2}{x}$, also $DG : BG :: BG : EG \therefore EG = \frac{40^2 - x^2}{30 - \frac{40^2 - x^2}{x}}$,

But $EG = \sqrt{50^2 - (40^2 - x^2)}$, $\therefore \frac{40^2 - x^2}{\frac{30x - (40^2 - x^2)}{x}} = \sqrt{900 + x^2}$, or $\frac{1600x - x^3}{30x - 1600 + x^2} = \sqrt{900 + x^2}$,

$$\frac{2560000x^2 - 3200x^4 + x^6}{-2300x^2 - 96000x + 60x^3 + x^4 + 2560000} = 900 + x^2,$$

$2560000x^2 - 3200x^4 + x^6 = 490000x^2 - 86400000x - 42000x^3 - 1400x^4 + 60x^5 + x^6 + 2304000000.$

$60x^5 + 1800x^4 - 42000x^3 - 2070000x^2 - 86400000x + 2304000000 = 0$

$x^5 + 30x^4 - 700x^3 - 34500x^2 - 1440000x + 38400000 = 0$

Now let $x = 5z$ and we reduce the equation to

$z^5 + 6z^4 - 28z^3 - 276z^2 - 2304z + 12288 = 0.$

Now find the value of z by Horner's method.

					) 6.4535567
6	—28	—276	—2304	—12288	
6	72	264	— 72	-14256	
12	44	—12	—2376	196800000	
6	108	912	5400	166915584	
18	152	900	30240000	29884416	
6	144	1776	11488896	27840420	
24	296	2676000	41728896	2043996	
6	180	196224	12297344	1723492	
30	47600	2872224	5402624,0	320504	
6	1456	202112	165460	287835	
360	49056	3074336	5568084	32669	
4	1472	208064	166800	28792	
364	50528	32824,00	573488,4	3877	
4	1488	268	1009	3455	
368	52016	33092	574497	422	
4	1504	268	1009		
372	,053,520	33360	57550,6		
4		268	17		
376		,03,36,28	57567		
4			17		
,0380			57,5,84		

$z = 6.4535567$

$\therefore x = 32.2677835 = AG.$

$DG = 30 - \frac{40^2 - x^2}{x} = 12.682723,$

$EG = 44.059163,$

$BG = \sqrt{40^2 - x^2} = 23.6387425,$

$GC = \frac{BG^2}{AG} = 17.317277,$

$BD = \sqrt{BG^2 + DG^2} = 26.8261372,$

$BC = \sqrt{BG^2 + CG^2} = 29.3032124.$

[The above is a very fine, and we might say difficult, problem, and as our solution involves considerable Geometry and Algebra, we would advise our readers to study it carefully.—ED.]