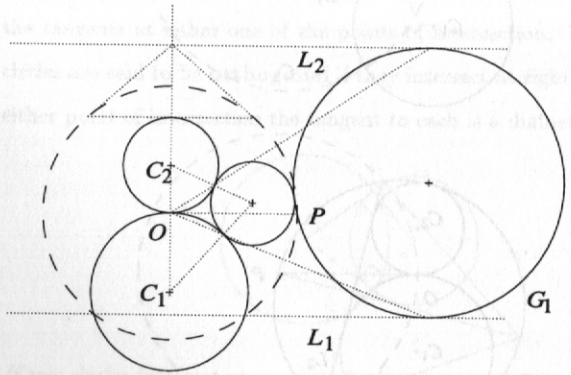
Some of the construction lines are shown, but not all—you will have to work out the rest for yourself. (How, for example, are L_1 and L_2 constructed? It's not just a matter of sliding the straight edge up against the two circles!)

Solution 2

Invert the diagram about the circle with centre O and radius OP. From Theorem 1 we deduce that C_1 and C_2 invert respectively to lines L_1 and L_2 parallel to OP. Any circle tangent to C_1 and C_2 is inverted to a circle tangent to L_1 and L_2 and such a circle must have its centre on the line parallel to OP with radius one half the distance between L_1 and L_2.

Since P inverts to itself, we seek the circles tangent to L_1 and L_2 passing through P, say G_1 and G_2. These two circles then invert to the required circles.

Since the end points of the diameters of G_1 and G_2 on L_1 and L_2 invert to the tangency points with C_1 and C_2, we construct them by drawing the line segments from these end points to O, and finding where they cut C_1 and C_2. The line segments from the centres of C_1 and C_2 through the corresponding tangency points intersect at the centres of the required circles, which can now be drawn.



The diagram shows just one of these circles, G_1 say, the inverse of which yields the smaller of the required tangent circles. Once again the reader is left to determine the details of this construction, and complete the construction of G_2 and its inverse.

RESULTS OF THE 1991 ASIAN PACIFIC MATHEMATICS OLYMPIAD

Table One: Australian Team scores

Candidate	Question					Total	Award
	1	2	3	4	5		
Anthony Henderson	7	7	7	7	1	29	*Gold*
Meng Tan	7	7	7	2	0	23	*Silver*
Luke Kameron	2	2	7	7	0	18	*Silver*
Joanna Masel	7	2	2	7	0	18	*Bronze*
Angelo Di Pasquale	7	7	0	2	0	16	*Bronze*
Justin Sawon	0	7	7	1	0	15	*Bronze*
Martin Roberts	7	0	7	1	0	15	*Bronze*
Tom Brennan	0	6	7	2	0	15	*Hon. Mention*
Stuart Sellner	7	0	0	7	0	14	*Hon. Mention*
Weiben Yuan	7	0	7	0	0	14	*Hon. Mention*
Mean	5.1	3.8	5.1	3.6	0.1	17.7	

Table Two: Total scores of candidates

Country	Candidate									
	1	2	3	4	5	6	7	8	9	10
Australia	29(G)	23(S)	18(S)	18(B)	16(B)	15(B)	15(B)	15(H)	14(H)	14(H)
Canada	34(G)	22(S)	20(S)	19(B)	18(B)	17(B)	16(B)	15(H)	14(H)	14
R of China	25(G)	24(S)	24(S)	21(B)	19(B)	18(B)	18(B)	18(H)	18(H)	17(H)
Colombia	18(S)	14(B)	11(H)	10(H)	9(H)	8	7(H)	5	4	3
Hong Kong	18(S)	17(S)	16(B)	16(B)	14(B)	14(B)	12(B)	12(H)	11(H)	11(H)
R of Korea	26(G)	25(S)	24(S)	22(B)	20(B)	19(B)	19(B)	18(H)	17(H)	17(H)
Malaysia	17(S)	14(B)	9(H)	8(H)	7	5	4	4		
Mexico	16(B)	12(B)	11(H)	9(H)	9(H)	9(H)	8(H)	8(H)	7(H)	
New Z'land	12(B)	11	11(H)	11	8	8	8	8(H)	7	5
Philippines	20(S)	20(S)	13(B)	9(H)	9	9(H)	7(H)	5	3	3
Singapore	29(G)	27(S)	21(S)	18(B)	17(B)	11(H)	10(H)	9(H)	8(H)	7
Thailand	16(B)	16(B)	13(B)	9(H)	7(H)	7(H)				

G = Gold S = Silver B = Bronze H = Honourable Mention

Table Three: Score frequency per question

Marks	Question				
	1	2	3	4	5
0	9	31	38	32	92
1	4	7	6	34	12
2	11	40	2	16	6
3	6	10	2	9	2
4	1	4	2	9	0
5	6	5	4	2	0
6	2	4	8	2	0
7	74	12	51	9	1
Mean	5.4	2.4	4.0	1.9	0.3
Discrim Index	0.68	0.68	0.82	0.39	0.04