HANDBOOK

7130.3

REPRINT: Includes
Changes 1 thru 7

HOLDING PATTERN CRITERIA

August 28, 1967

U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION

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RECORD OF CHANGES

DIRECTIVE NO. 7130.3

CHANGE TO BASIC	SUPPLEMENTS			OPTIONAL	CHANGE TO BASIC	SUPPLEMENTS			OPTIONAL
1				12/1/67					
2				10/22/68					
3				3/17/69					
4				8/19/69					
5				9/25/69					
6				5/24/72					
7				10/30/90					

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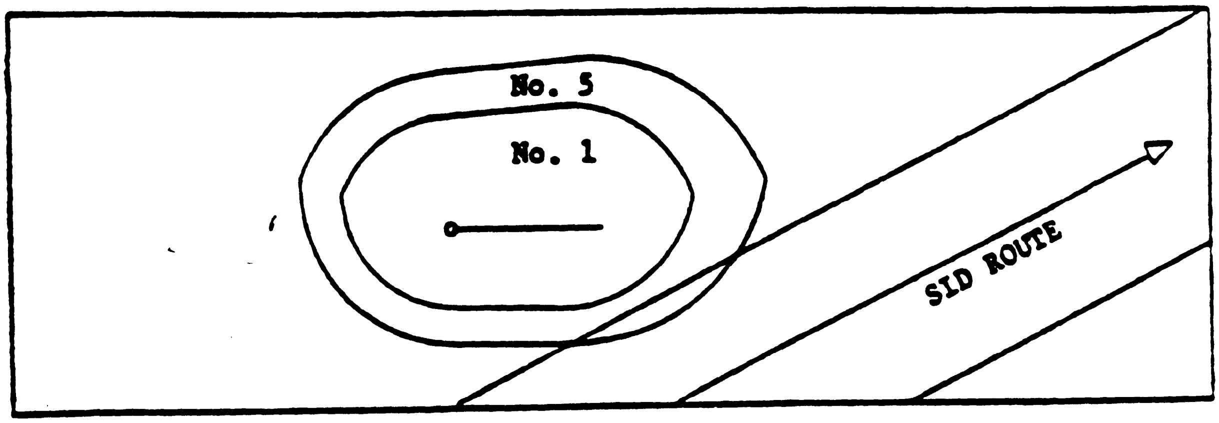
b. Example Problem: Assume that propeller-driven aircraft (175K) are to hold at a fix located 12 miles from the farthest navaid used to form the fix. Altitudes involved are 2,000 feet through 12,000 feet. Reference to Figure 3, page 5, indicates use of template No. 5 (12,000 feet). When it is applied to the fix, no conflict with other operations is indicated between 12,000 feet and 5,000 feet. However, a SID departure route 4,000 feet and below is affected. Reference to Figure 3 indicates use of template No. 1 (4,000 feet and below). Figure 4 depicts this problem and shows that only two patterns were necessary in determining the solution.

FIGURE 4. EXAMPLE PROBLEM DEPICTION



SECTION 4. DME APPLICATION

21. SLANT-RANGE EFFECT. An airborne DME odometer reading of 5 n.mi., at 30,000 feet, would indicate that an aircraft was directly over the navaid. If the aircraft maintained 5 n.mi. DME distance during descent, the flight path would form an arc beginning over the navaid to a point on the surface 5 n.mi. horizontal distance from the navaid. Therefore, near the surface a holding fix could be 5 n.mi. horizontally from the navaid, but at 13,000 feet it would be 4.5 n.mi. horizontally from the navaid. In this instance, 5 n.mi. is the fix-to-navaid

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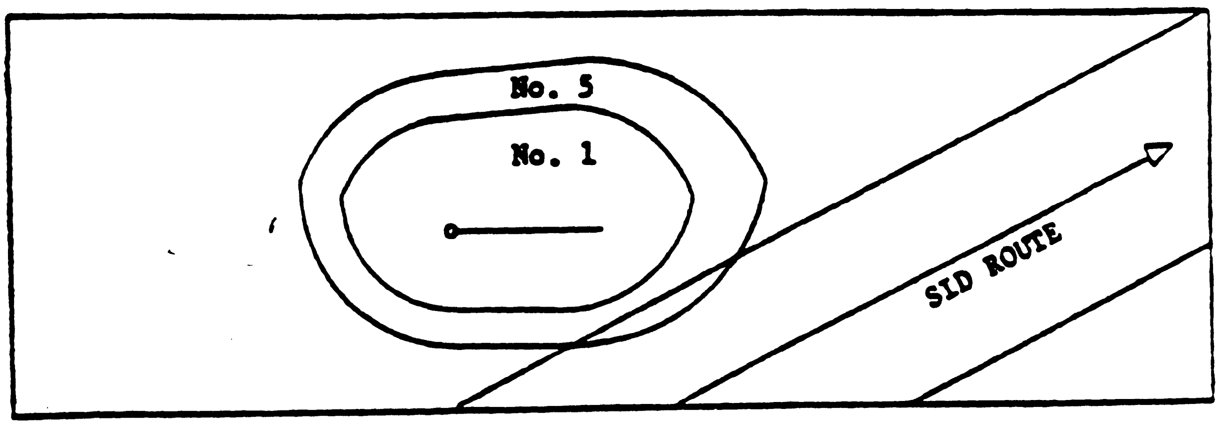

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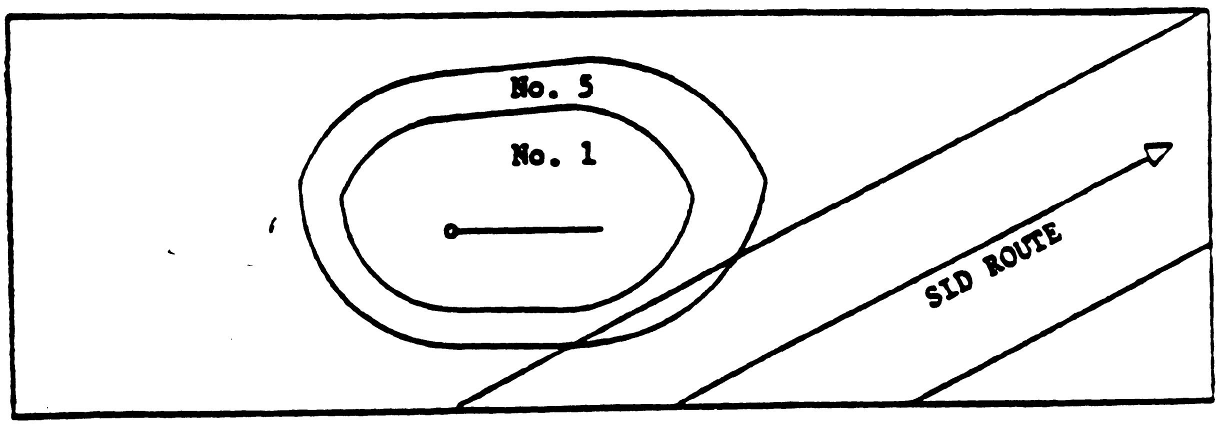

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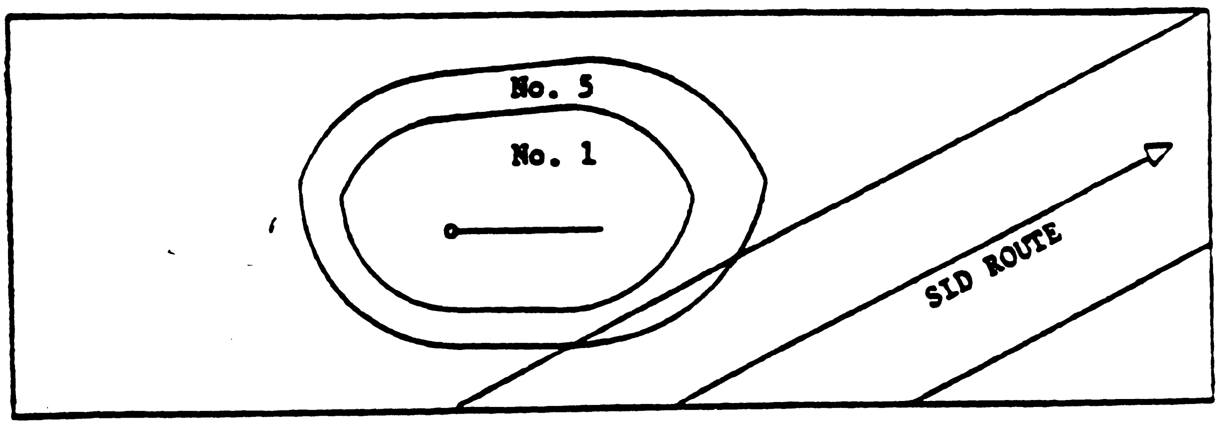

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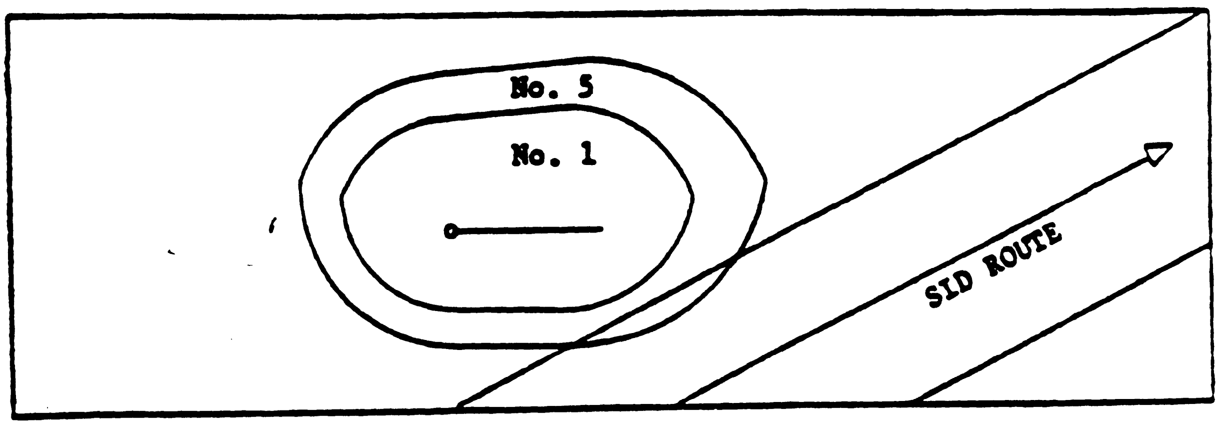

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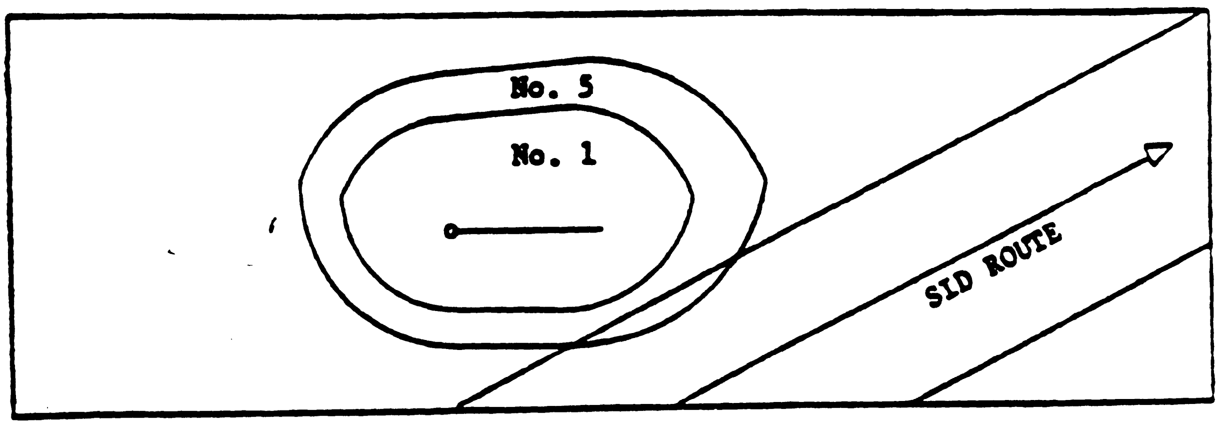

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Part 2: Find the correct pattern/template size and leg lengths for 23,000 fret, giving consideration to protected airspace for flight operations crossing the holding course between 54 • d 68 nautical miles.

Referion: o Figure 3, pagand5 determine the appropriate pattern . . . No. 18. Refer to Appendix 1, page 10, and find leg lengths . . . 7/2, 8/2, 9/3, 10/3, 11/4, • d 12/4. When template No. 18 is applied to the fix it shows that numbered areas 3 and 4 overlap the protected airspace for the flight operation which taker place between 54 and 68 nautical miles. This will make it necessary, in the final solution, to choose • leg length for which numbered areas 3 and 4 are not required.

Part 3: Find the correct pattern/template size for 13,000 feet.

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Final Solution to Problem 2: The range of leg lengths listed in Part 1 (FL 390) are: 13 n.mi. through 20 n.mi. Compare the findings of Part 1 with Part 2; i.e., the 13 n.mi. minimum leg length with the maximum leg length not requiring numbered areas 3 and 4 . . . 8 n.mi. Since the leg lengths are not compatible, a change will be required when aircraft descend below FL 240. Consequently, any leg length in the 13 n.mi. to 20 n.mi. range can be selected for aircraft holding between FL 390 and FL 240. Part 3 (14,000') findings indicate • maximum leg length of 8 n.mi. This is compatible with Part 2 findings. Therefore, an 8 n.mi. leg length is selected to serve MHA through 23,000 feet.

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41. OUTBOUND END REDUCTION AREAS. Construct reduction areas by using Figure 14, and the following directions:

a. For patterns 1 through 6 locate points f4, f3, at one mile intervals from point F along a line parallel to the holding course. Locate points e4, e3, at one mile intervals from E along line E-C.

b. For patterns 7 through 18 proceed as in subparagraph a., except locate "f" and "e" points at two mile intervals.

c. For pattern 19 and above locate points f4, f3, and f2 at two mile intervals from point F along a line parallel to the holding course. Locate points e4, e3, and e2, at two mile intervals from E along line E-C.

d. Use distance F-M for the radius of all arcs formed per the following:

(1) Place compass center at H and draw a short arc above M.

(2) Place compass center at f4 and draw an arc across the arc formed in step (1).

(3) Place compass center at intersection of arcs formed by steps (1) and (2), and connect f4-H.

(4) Place compass center at e4 and draw a short arc below M.

(5) Place compass center at f4 and draw an arc across the arc formed in step (4).

(6) Place compass center at intersection of arcs formed by steps (4) and (5), and connect f4-e4.

(7) Repeat steps (1) through (6), using appropriate "e" and "f" points, to form the other e-f and f-h arcs.

e. Arcs[1/] formed by following subparagraph d., instructions depict the outbound end numbered areas. These areas are numbered 2 through 4 for patterns 1 through 18, and 1 through 4 for patterns 19 and above,

1/ These are dashed lines on templates issued by the Washington office.

41. <u>OUTBOUND END REDUCTION AREAS</u>. Construct reduction areas by using Figure 14, and the following directions:

a. For patterns 1 through 6 locate points f4, f3, at one mile intervals from point F along a line parallel to the holding course. Locate points e4, e3, at one mile intervals from E along line E-C.

b. For patterns 7 through 18 proceed as in subparagraph a., except locate "f" and "e" points at two mile intervals.

c. For pattern 19 and above locate points f4, f3, and f2 at two mile intervals from point F along a line parallel to the holding course. Locate points e4, e3, and e2, at two mile intervals from E along line E-C.

d. Use distance F-M for the radius of all arcs formed per the following:

(1) Place compass center at H and draw a short arc above M.

(2) Place compass center at f4 and draw an arc across the arc formed in step (1).

(3) Place compass center at intersection of arcs formed by steps (1) and (2), and connect f4-H.

(4) Place compass center at e4 and draw a short arc below M.

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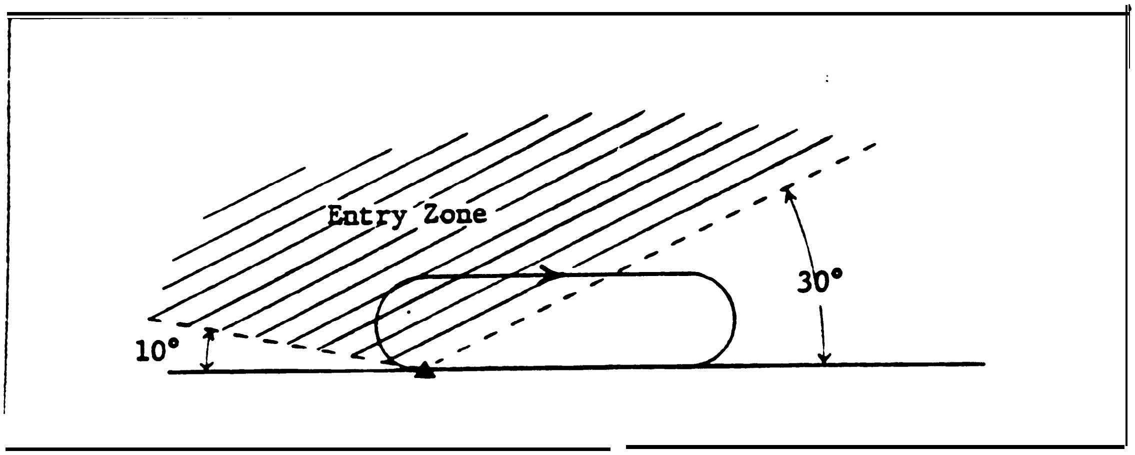
FIGURE 19. ZONE FOR ENTRY REROUTING



50. DME LEG LENGTH SELECTION. Whenever possible use a leg length longer than the minimum listed. This will enhance inbound course bracketing.

51. DME HOLDING DIRECTION. An inbound holding course toward the navaid has the following advantages over an inbound holding course away from the navaid:

a. It provides a greater choice of leg lengths.

b. When associated with an instrument approach, normally, the aircraft on the inbound holding course will be on-course toward the approach navaid.

52. ESTABLISHING MINIMUM ALTITUDES. MHA's are determined by Flight Standards Service.

53. MILITARY TURBOJET TRAINING BASES. Although holding airspace protection may be based on 230 Knot pattern sizes, establishment of 265 Knot pattern sizes also may be feasible. Adding the capability of accommodating most supersonic military aircraft, at military turbojet training bases, may be desirable and is encouraged.

54. HOLDING PATTERNS ON/ADJACENT TO ILS COURSES. Patterns established close to/overlying an ILS localizer course below 5,000 feet, between the outer marker and the localizer antenna, shall not permit the inbound holding course to coincide with the inbound ILS course. 1/ See Figure 20.

1/ Due to the possibility of creating reflected unwanted signals.

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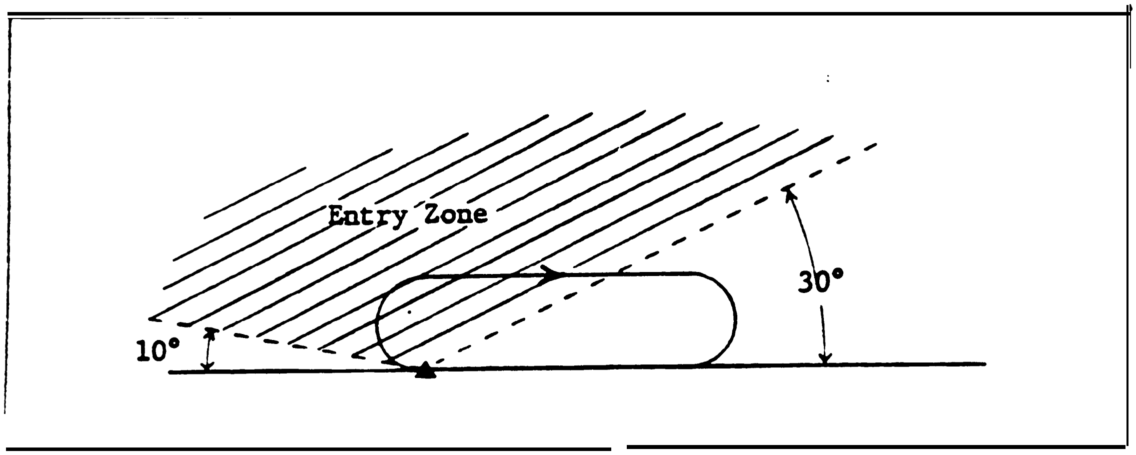

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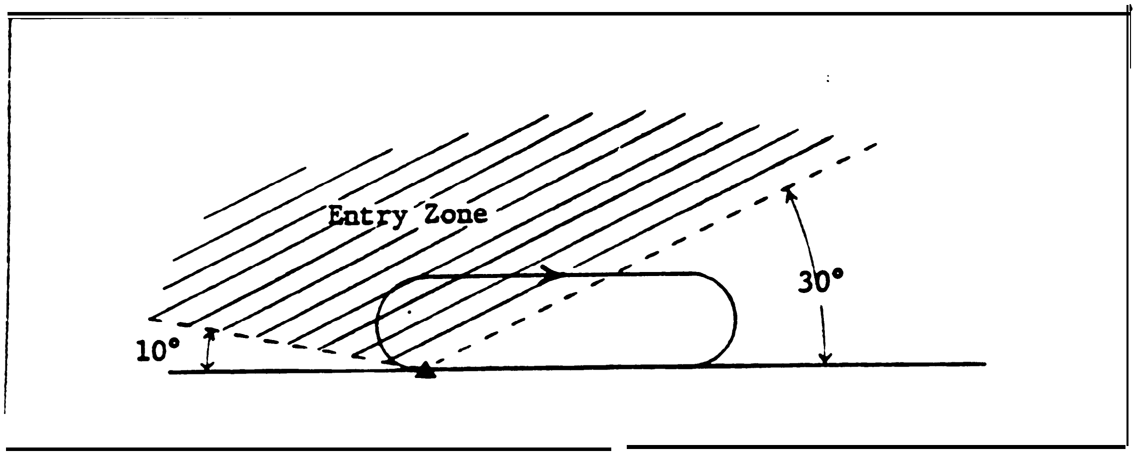

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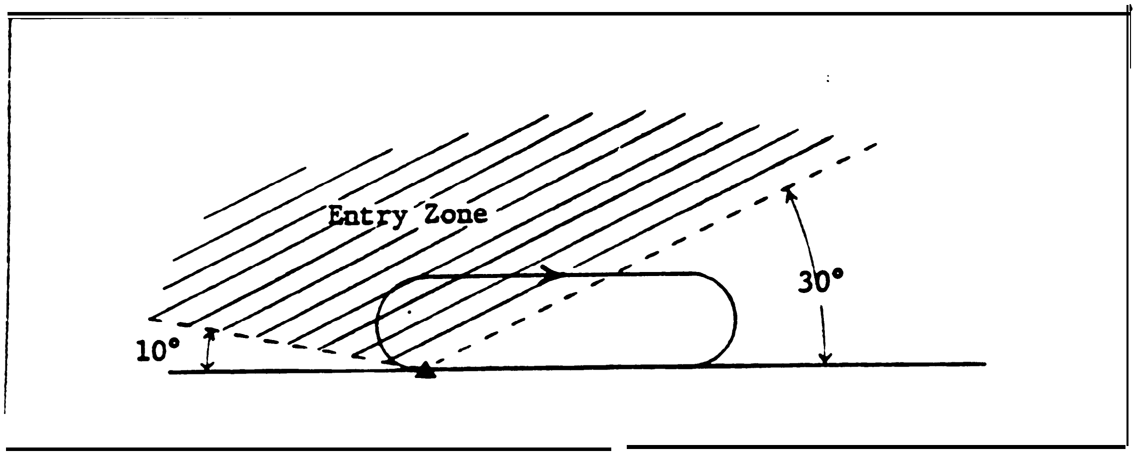

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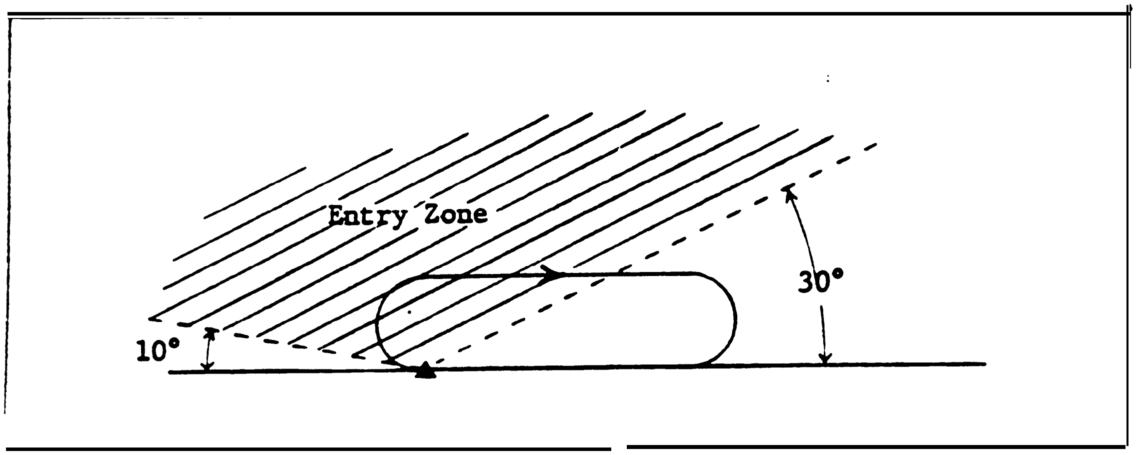

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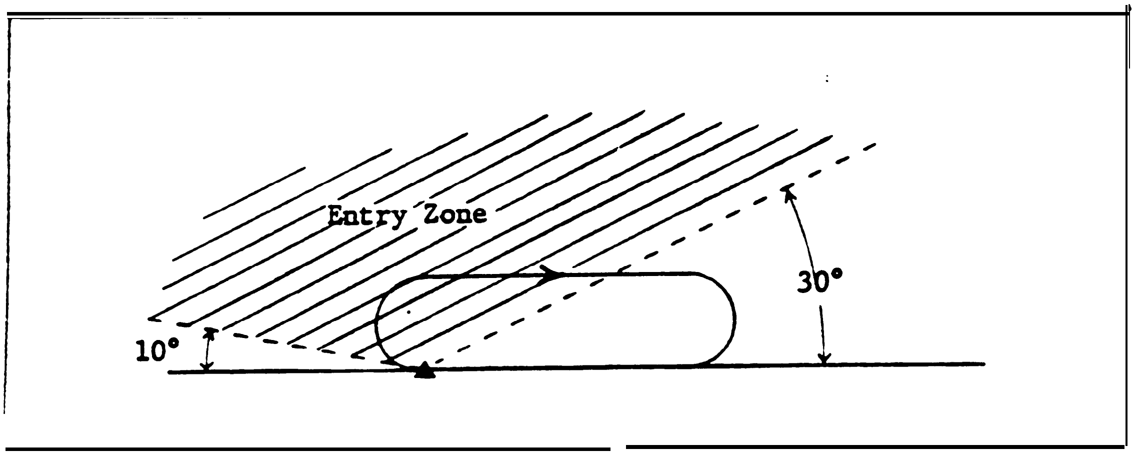

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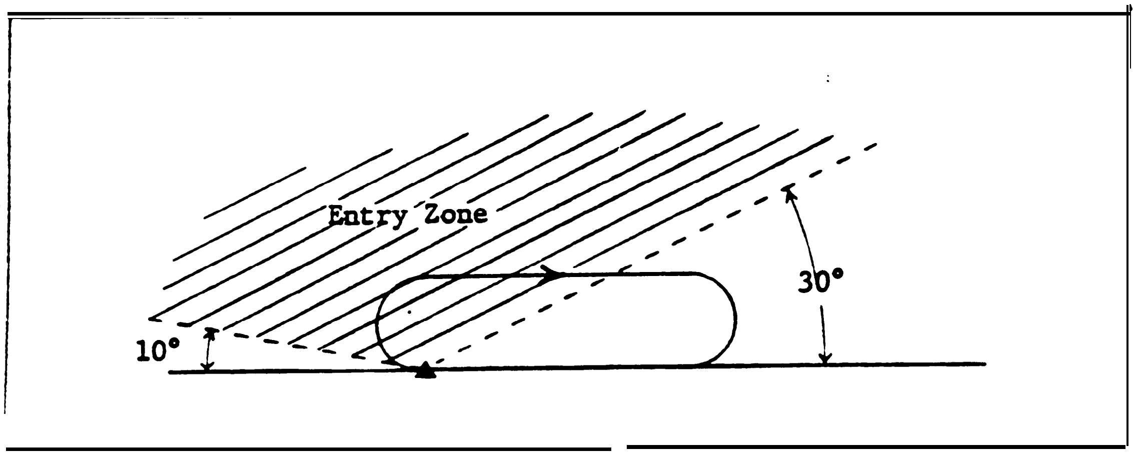

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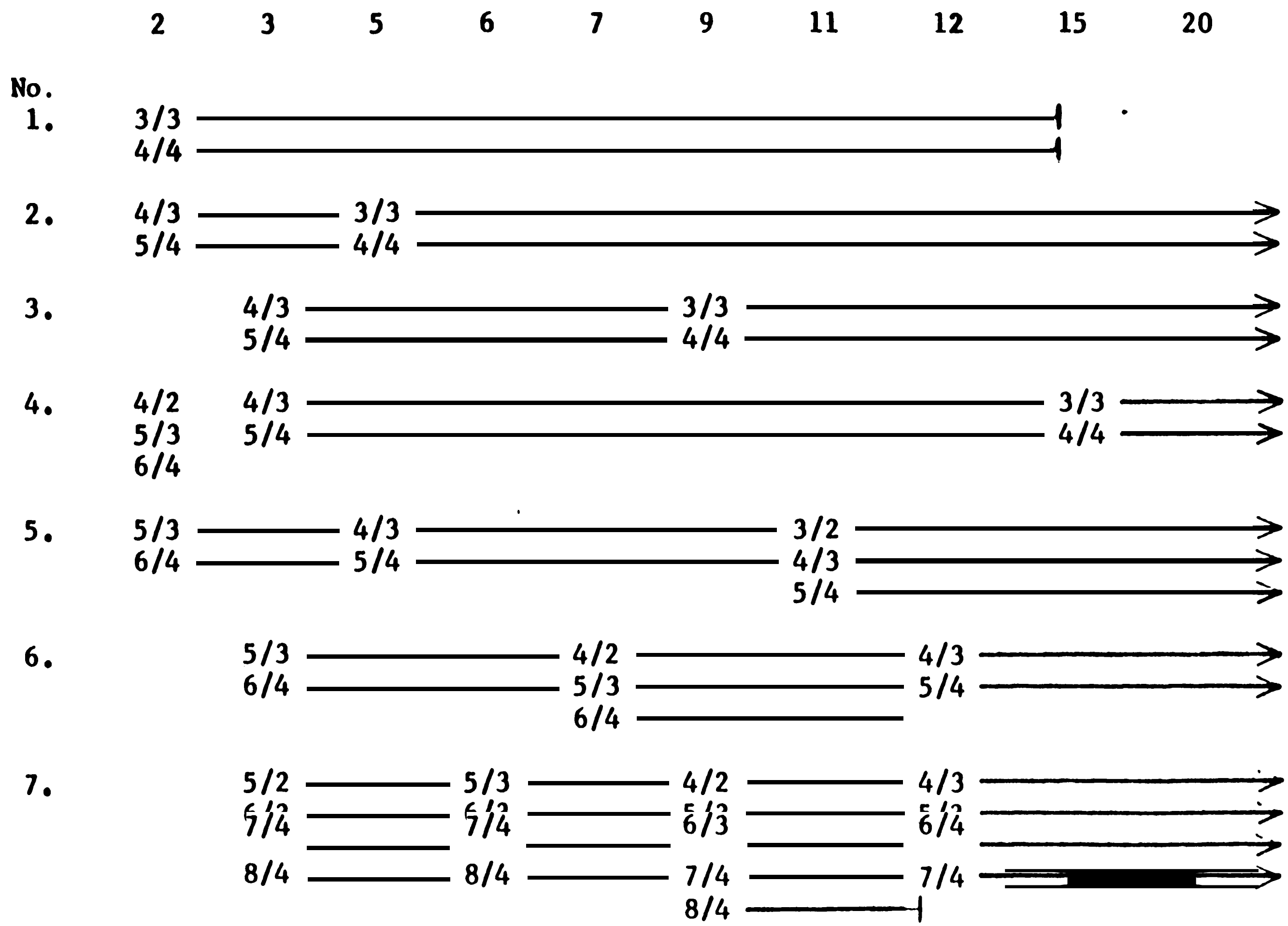
DME LEG LENGTH/OUTBOUND END REDUCTION AREA CODE

(Holding course toward the Navaid)

Fix-to-Navaid Distance (geographical) in Nautical Miles



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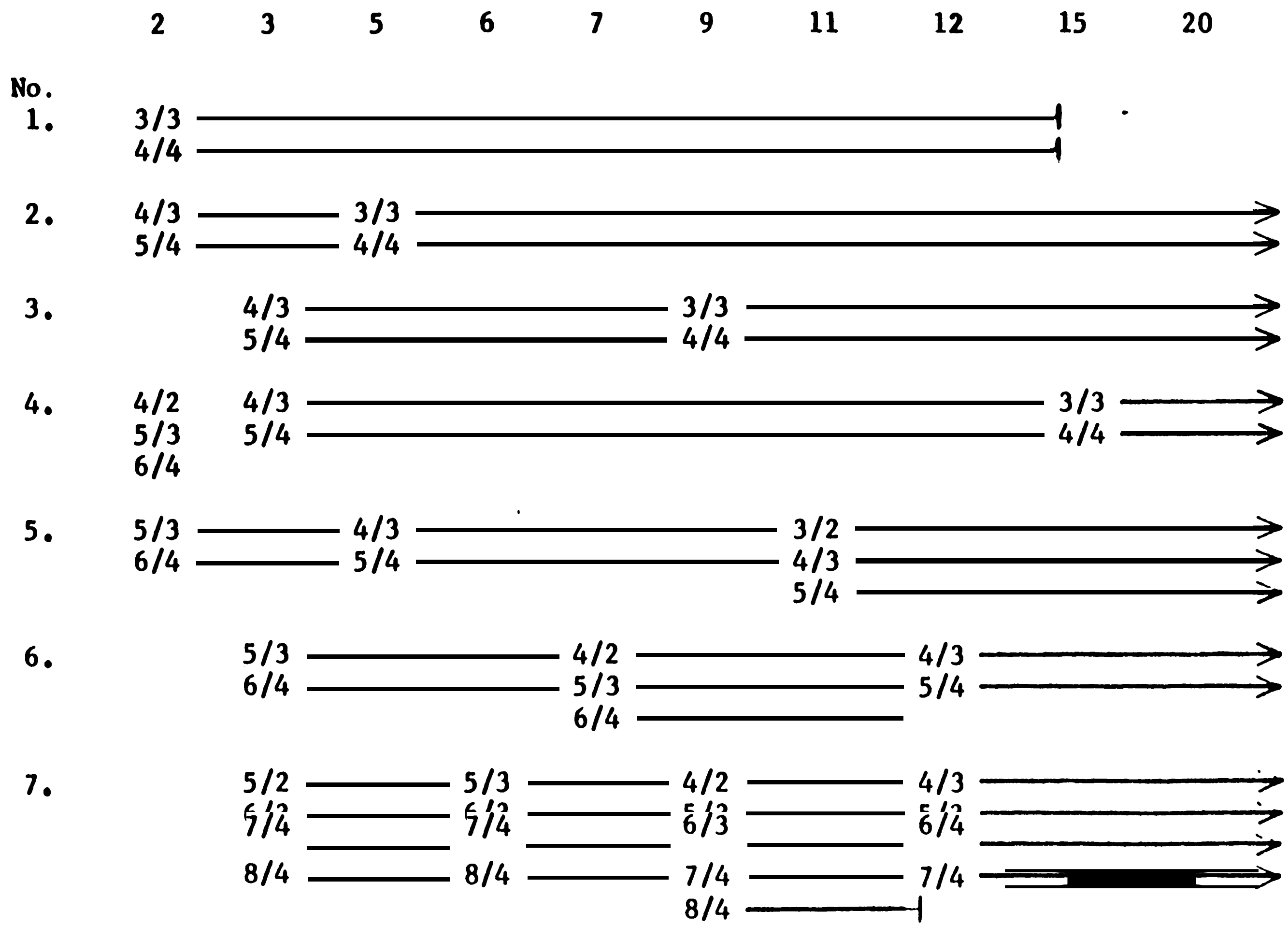

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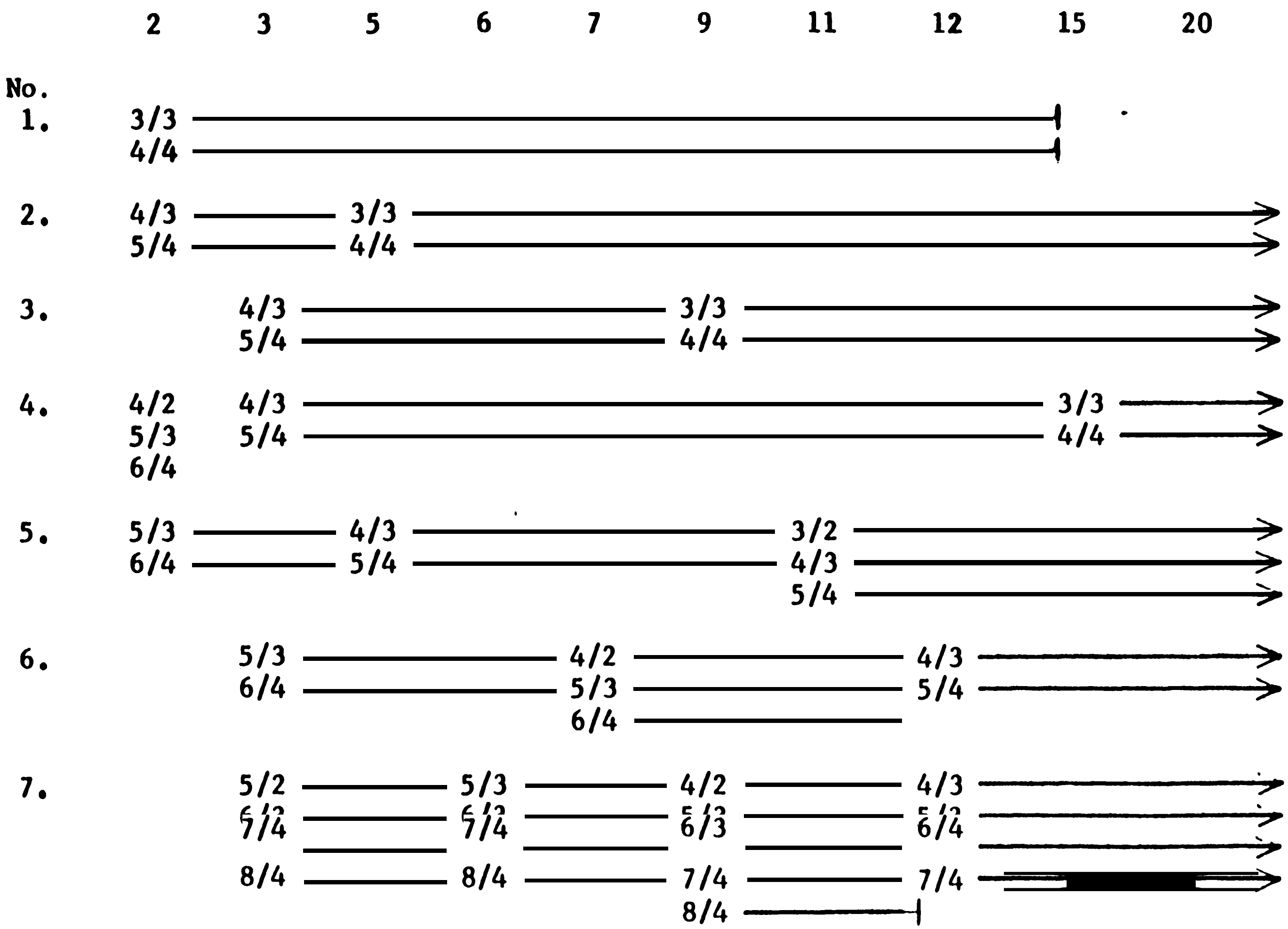

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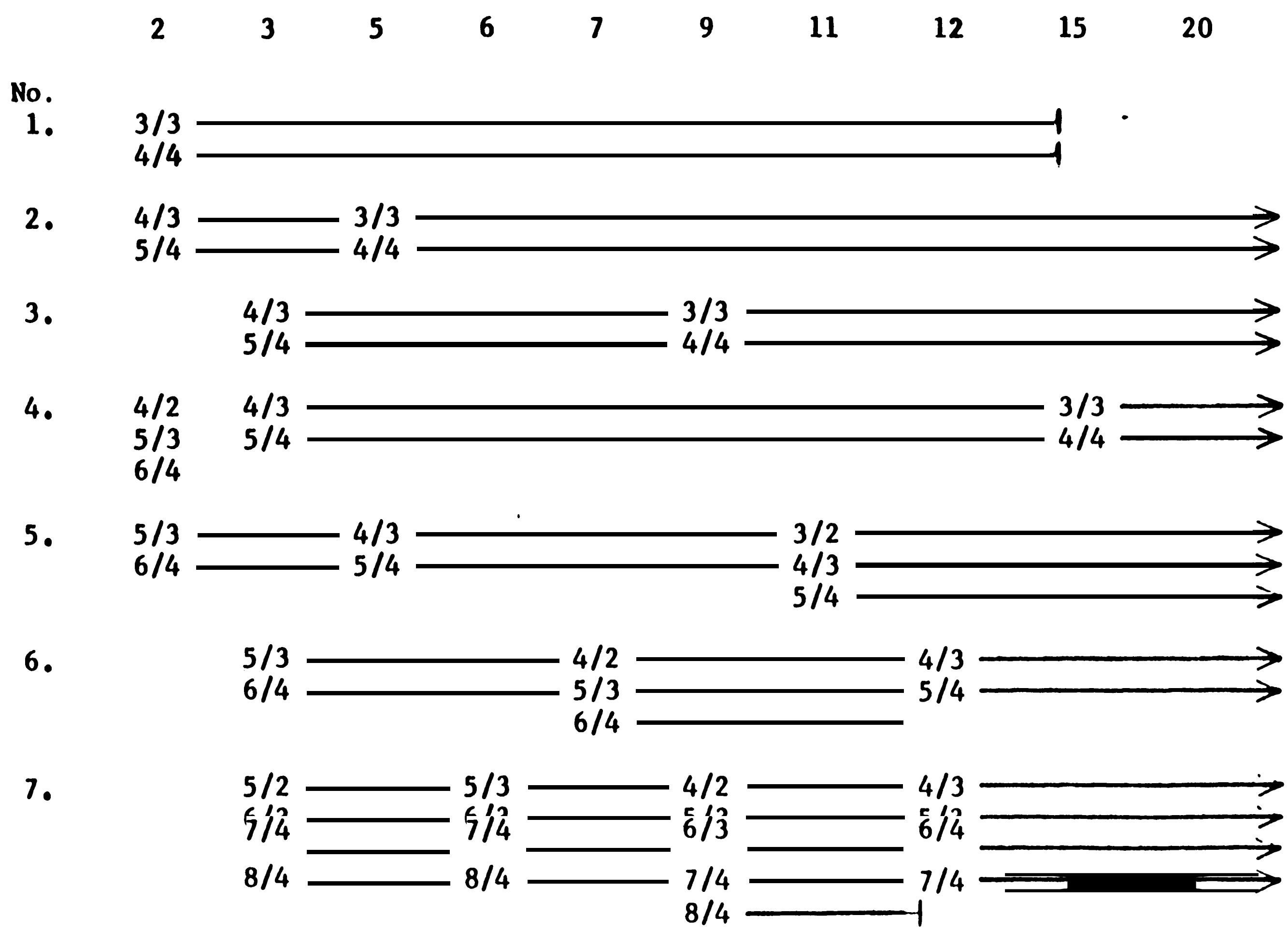


DME LEG LENGTH/OUTBOUND END REDUCTION AREA CODE

(Holding course toward the Navaid)

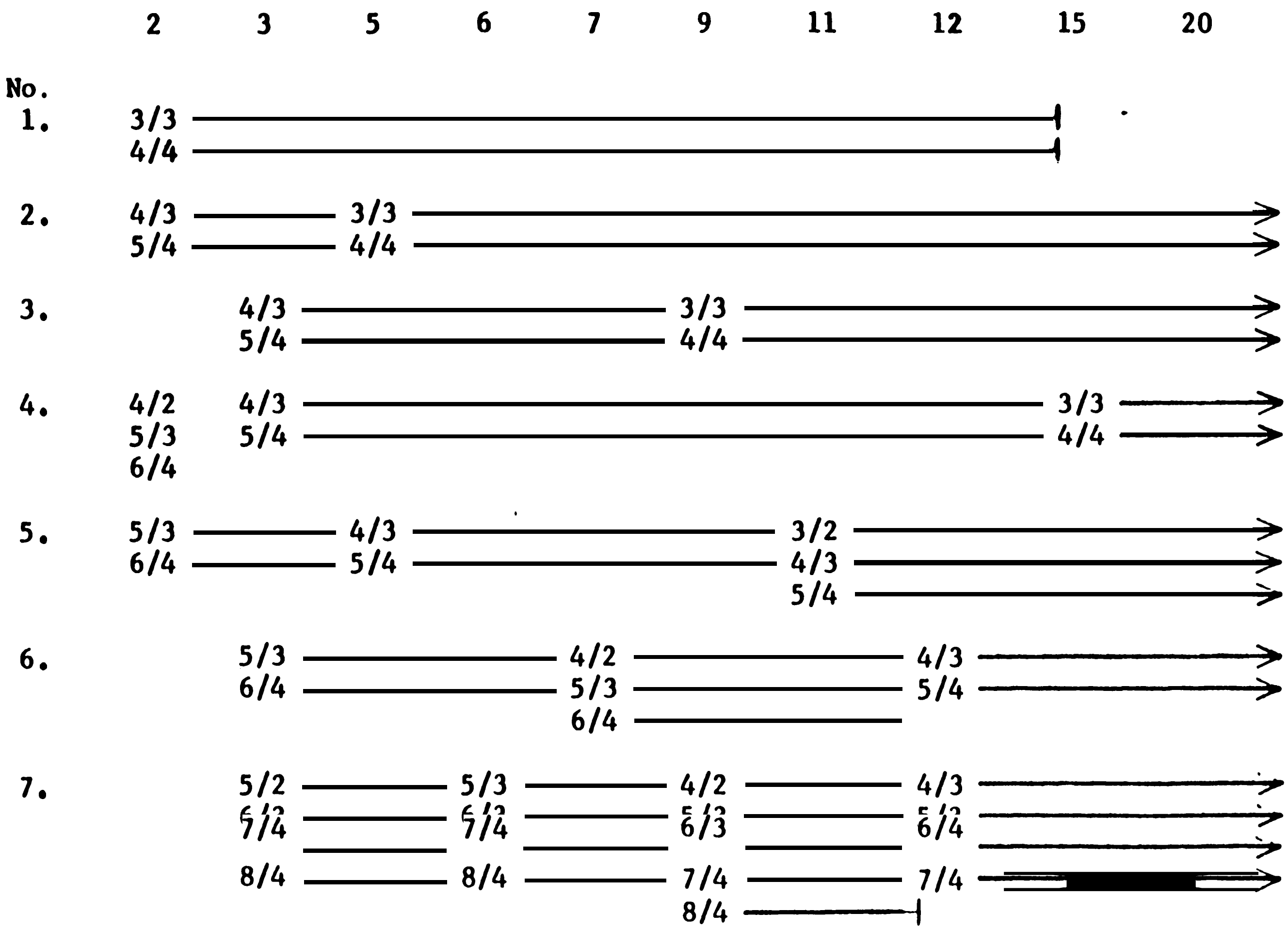
Fix-to-Navaid Distance (geographical) in Nautical Miles

No.	2	3	5	6	7	9	11	12	15	20
1.	3/3									
	4/4									
2.	4/3		3/3							
	5/4		4/4							
3.		4/3				3/3				
		5/4				4/4				
4.	4/2	4/3							3/3	
	5/3	5/4							4/4	
	6/4									
5.	5/3		4/3				3/2			
	6/4		5/4				4/3			
							5/4			
6.		5/3			4/2			4/3		
		6/4			5/3			5/4		
					6/4					
7.		5/2		5/3		4/2		4/3		
		6/3		6/3		5/3		5/3		
		7/4		7/4		6/3		6/4		
		8/4		8/4		7/4		7/4		
						8/4				

DME LEG LENGTH/OUTBOUND END REDUCTION AREA CODE

(Holding course <u>toward</u> the Navaid)

Fix-to-Navaid Distance (geographical) in Nautical Miles



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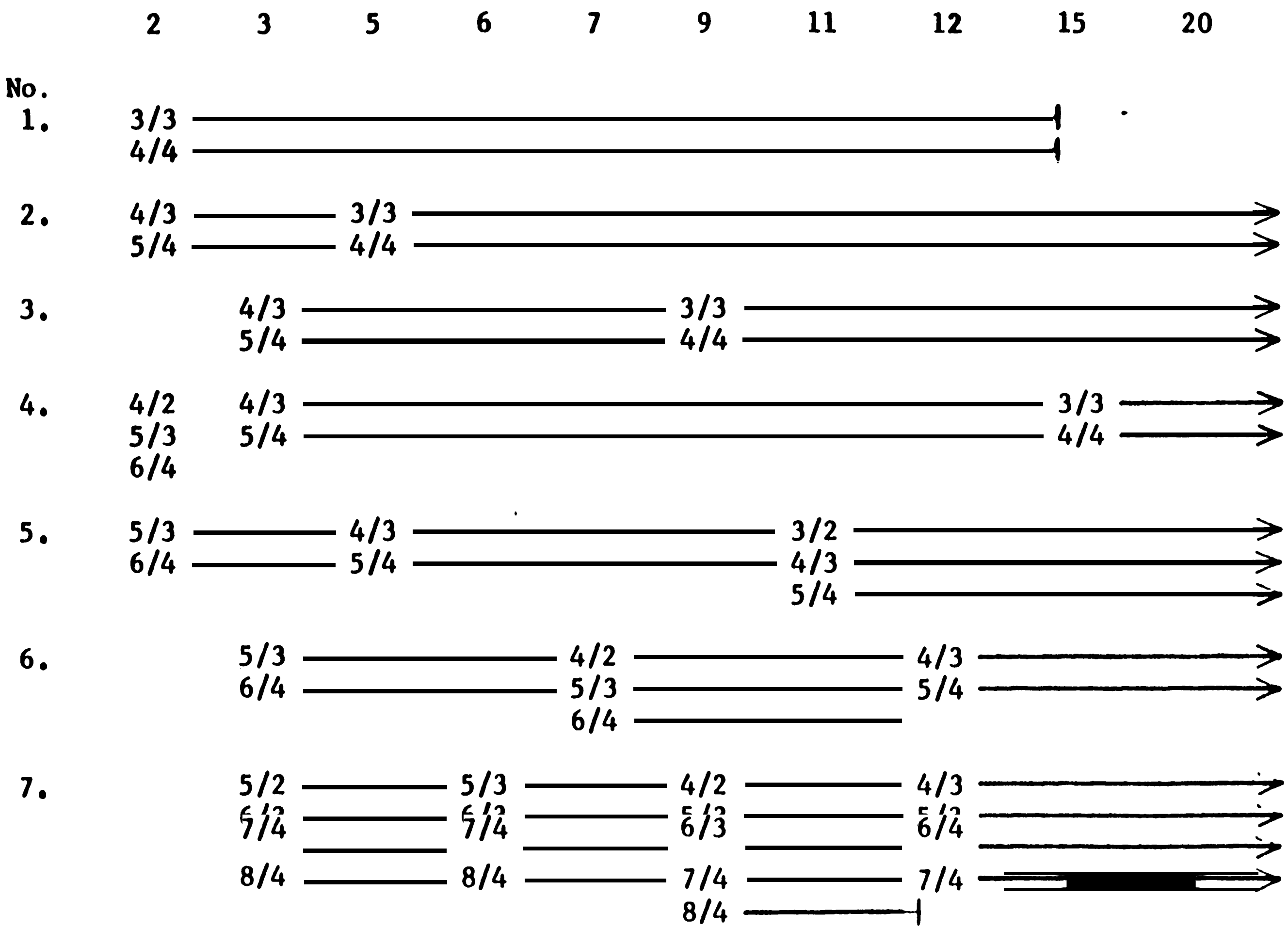

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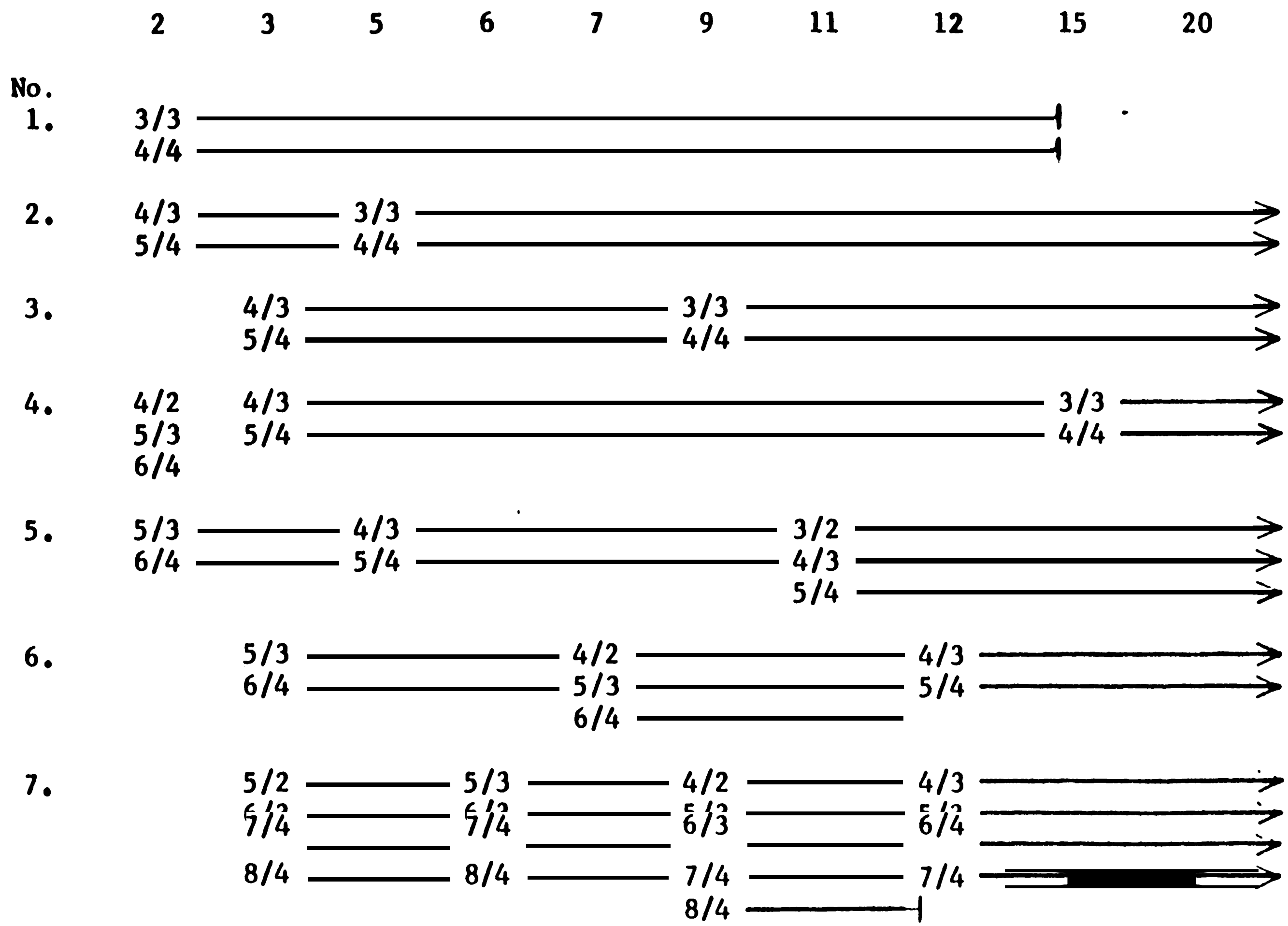

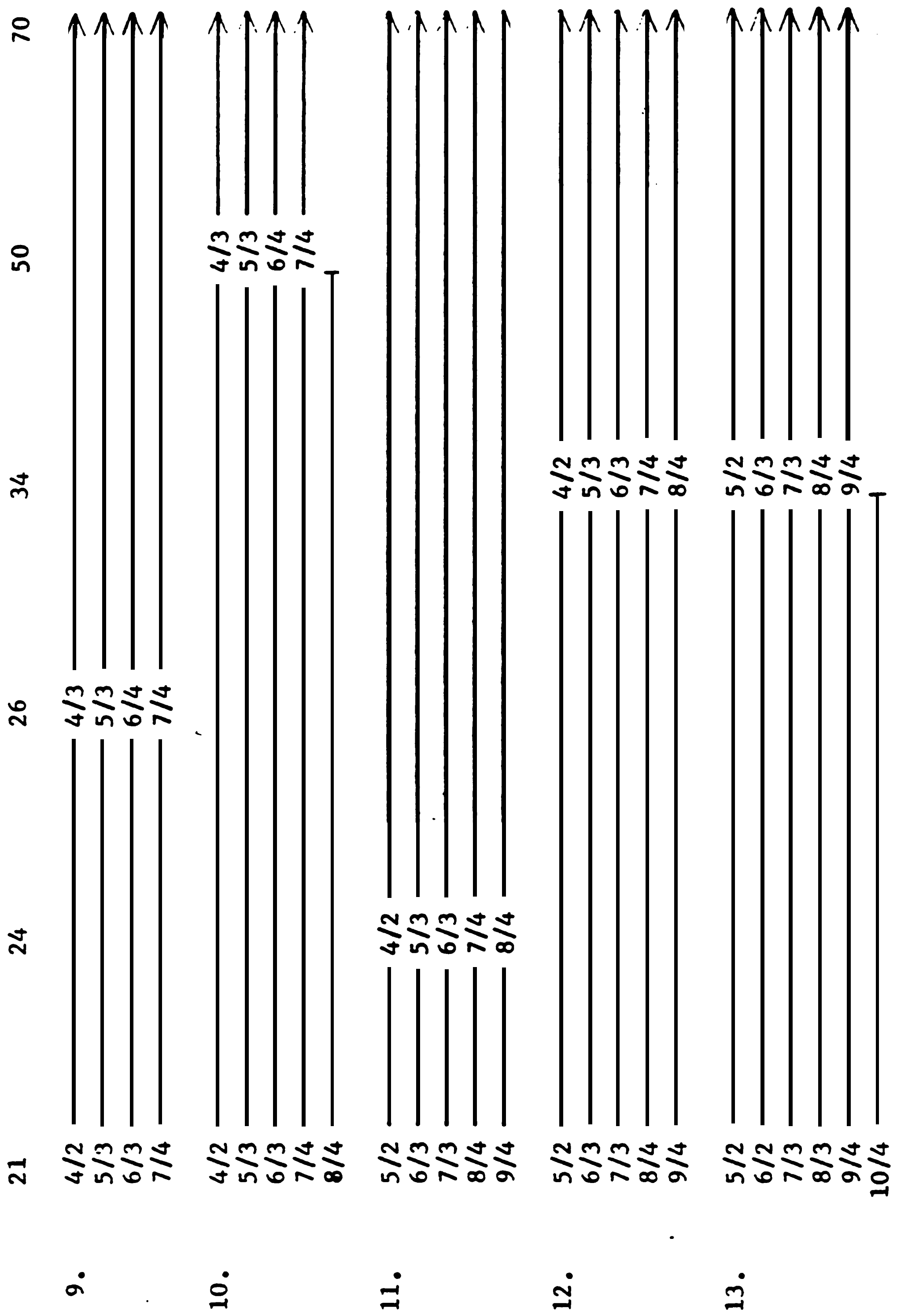
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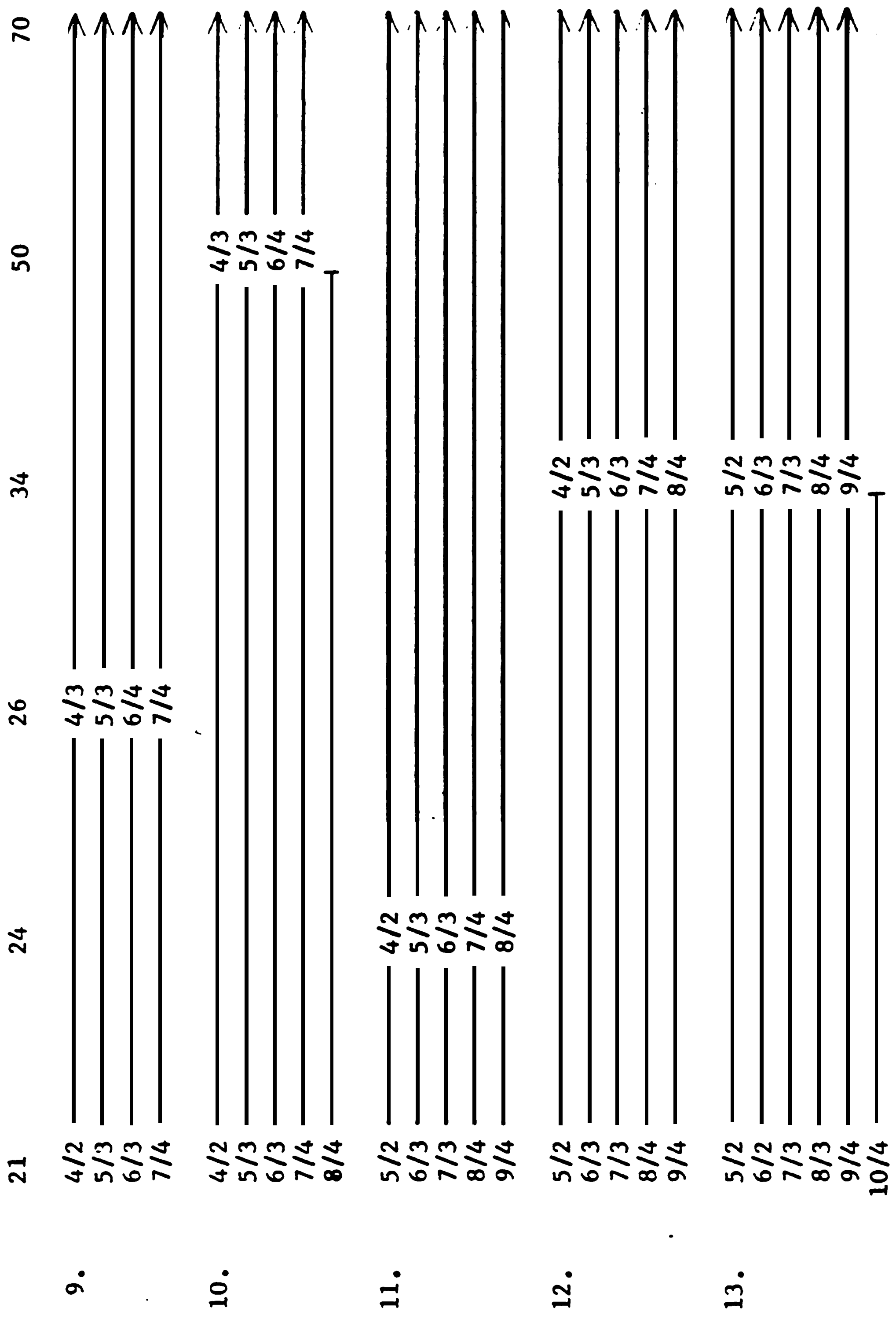
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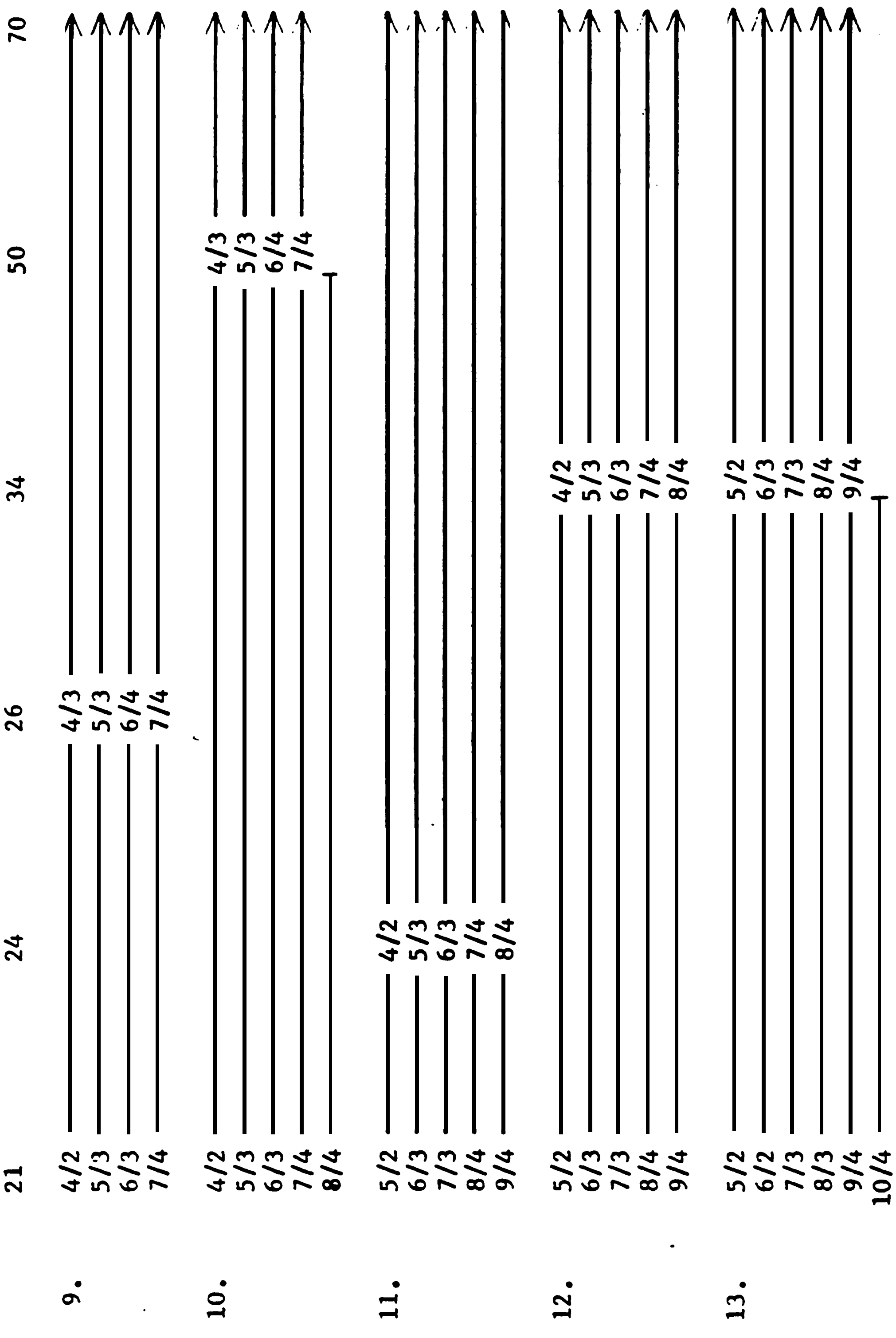
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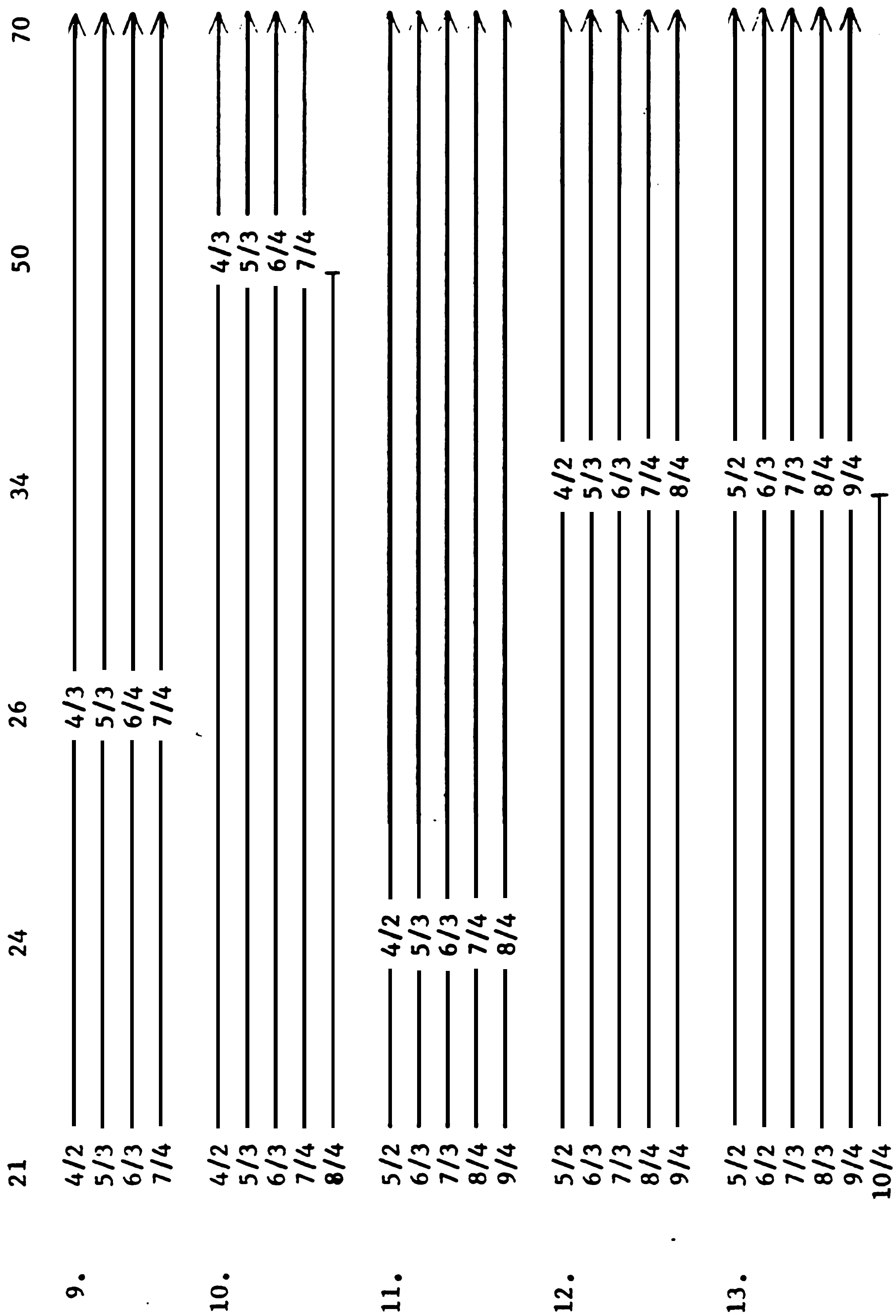
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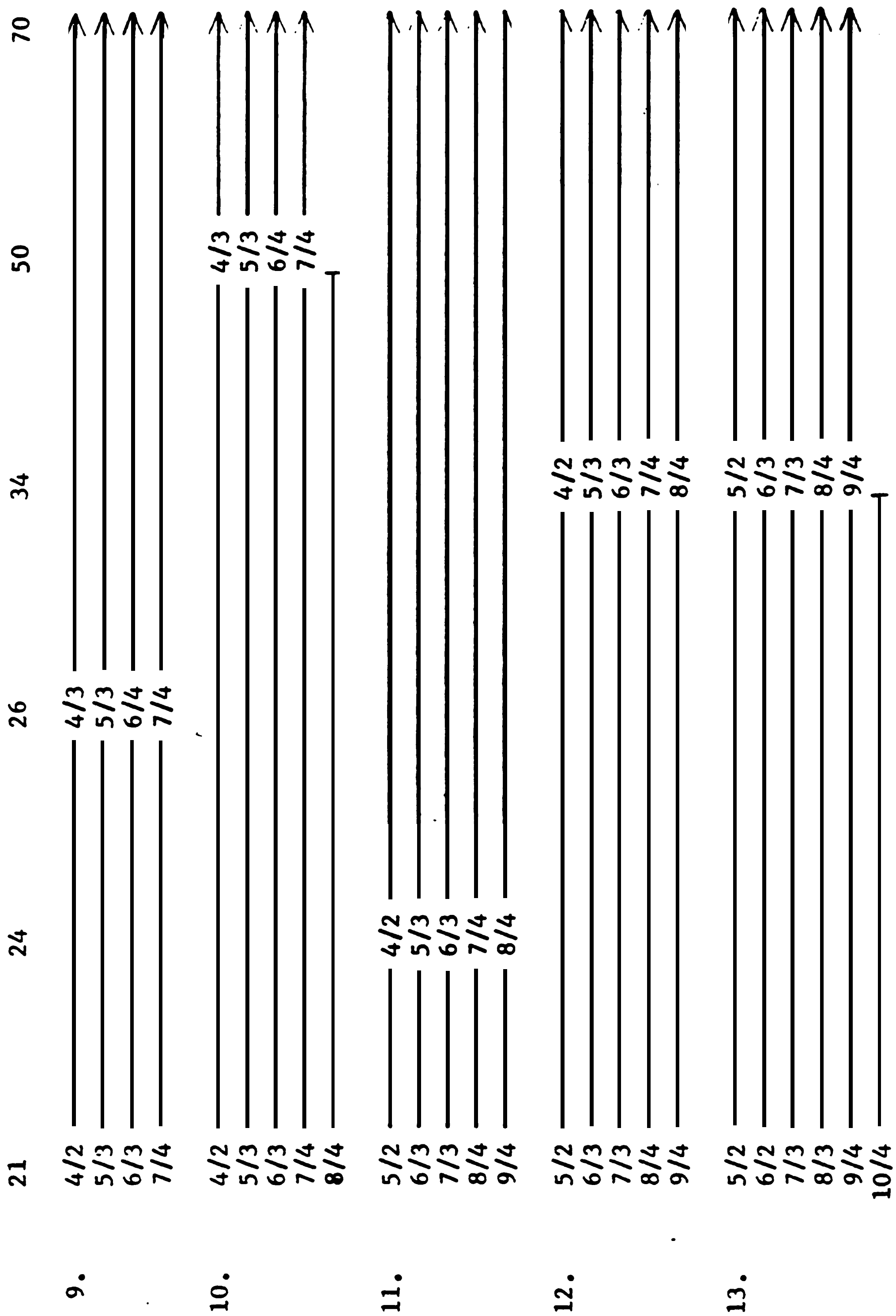
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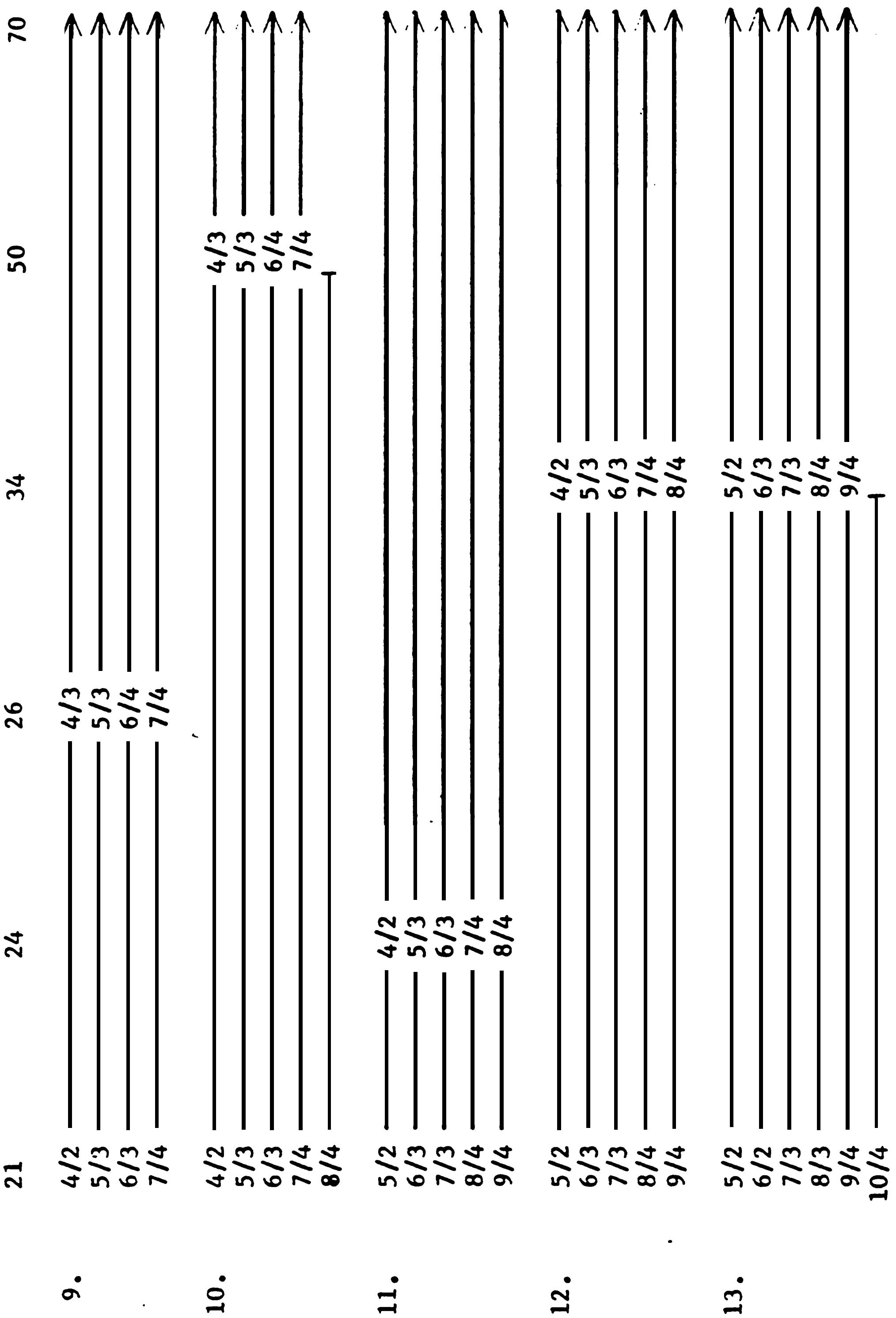
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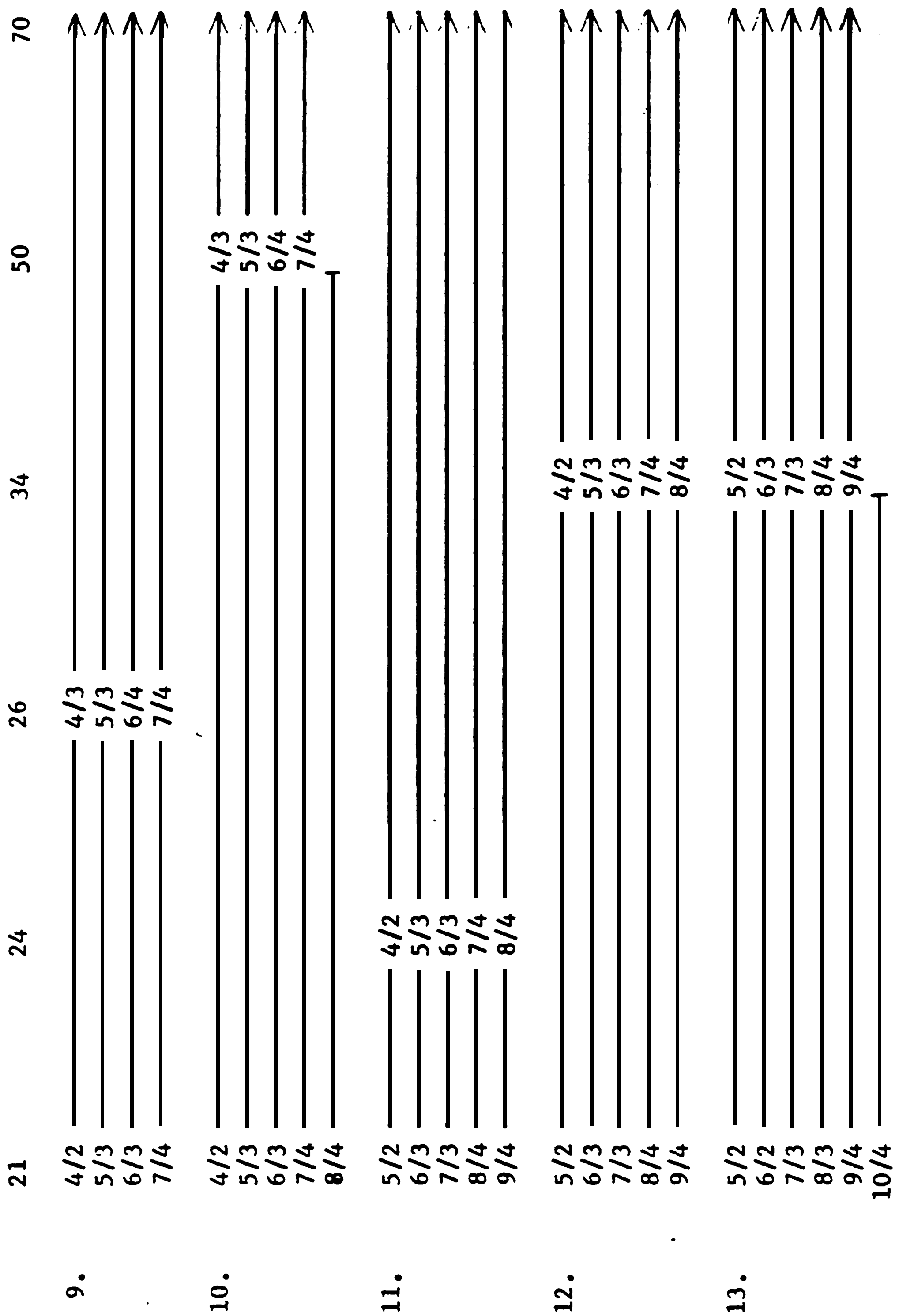
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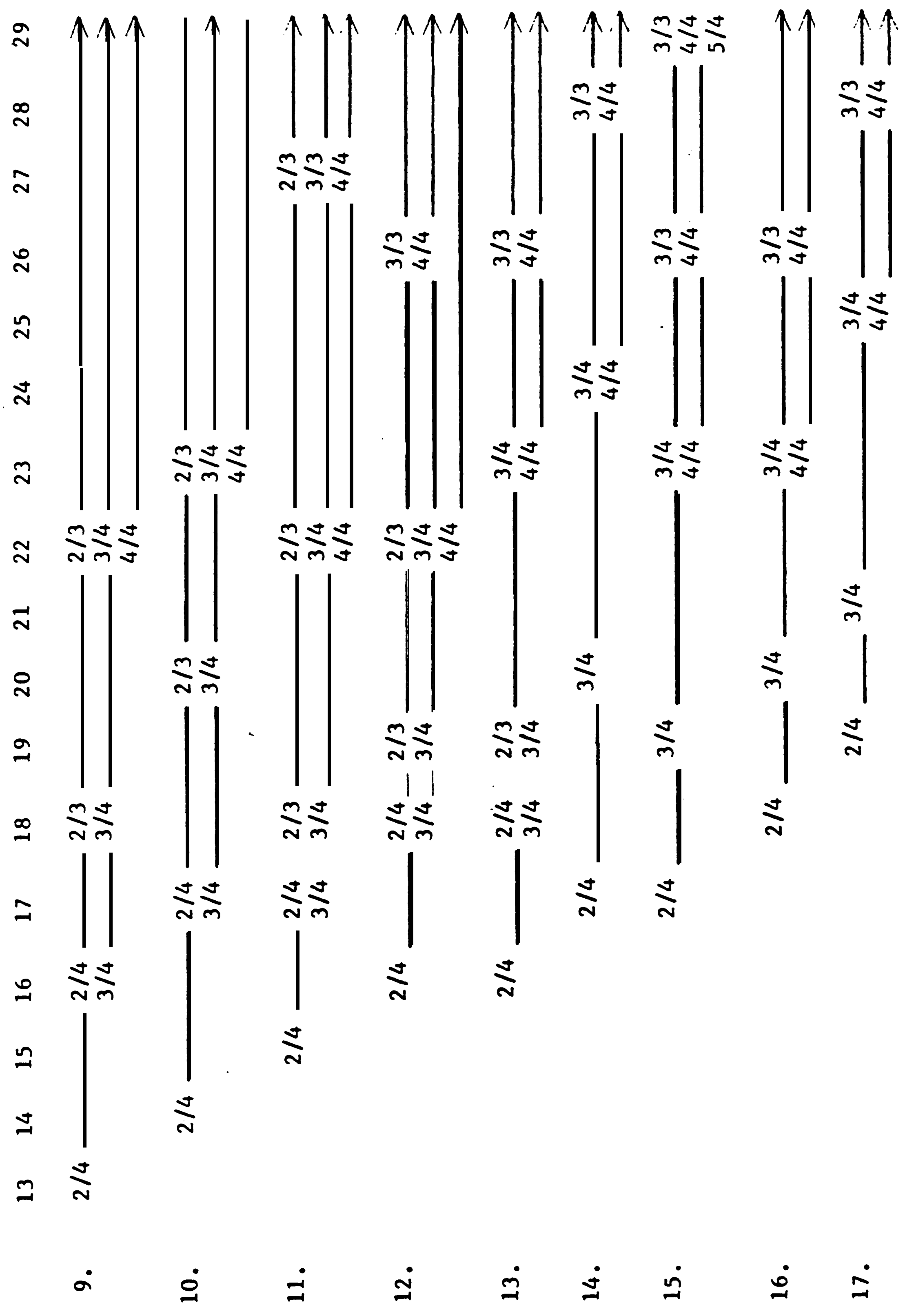
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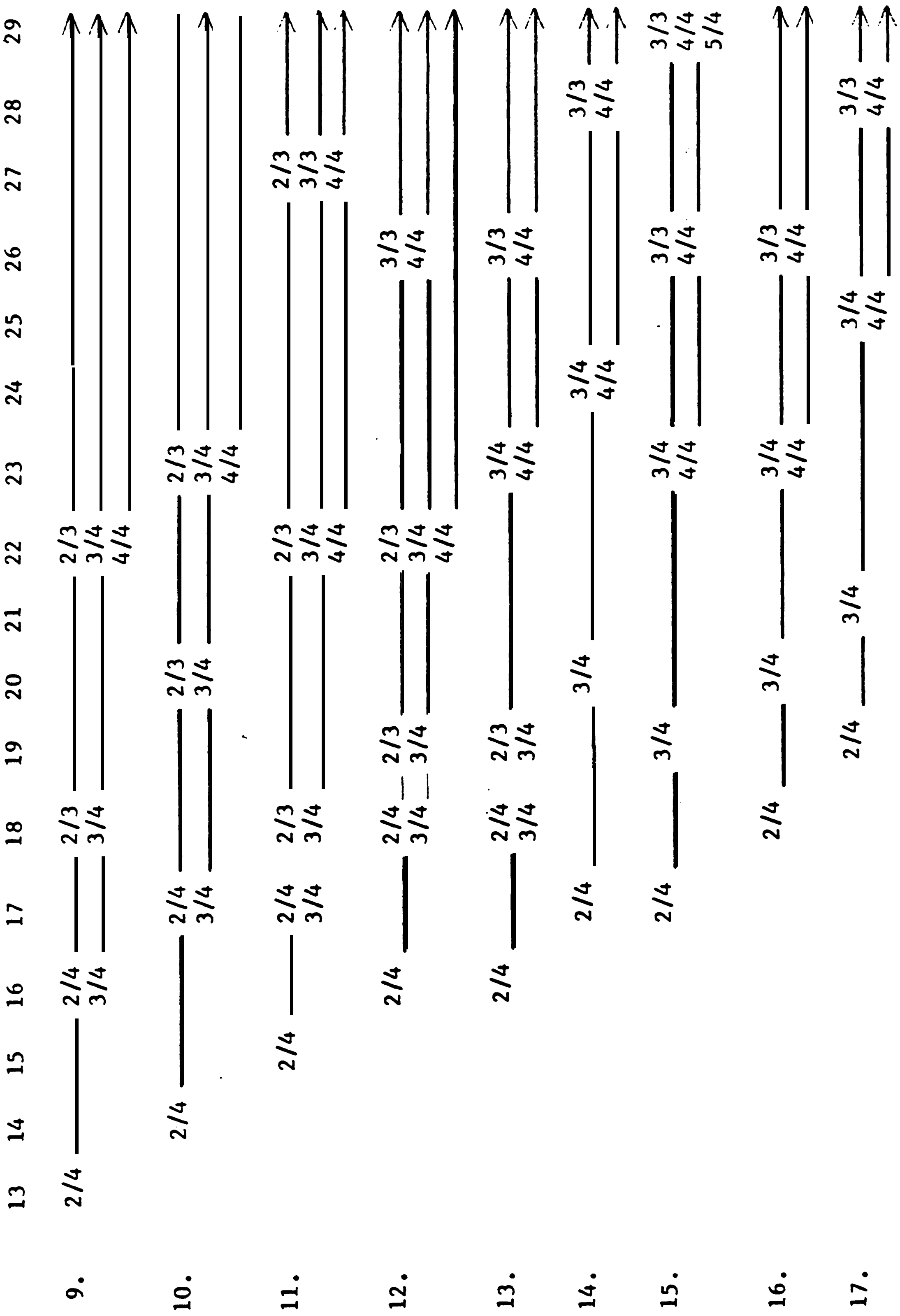
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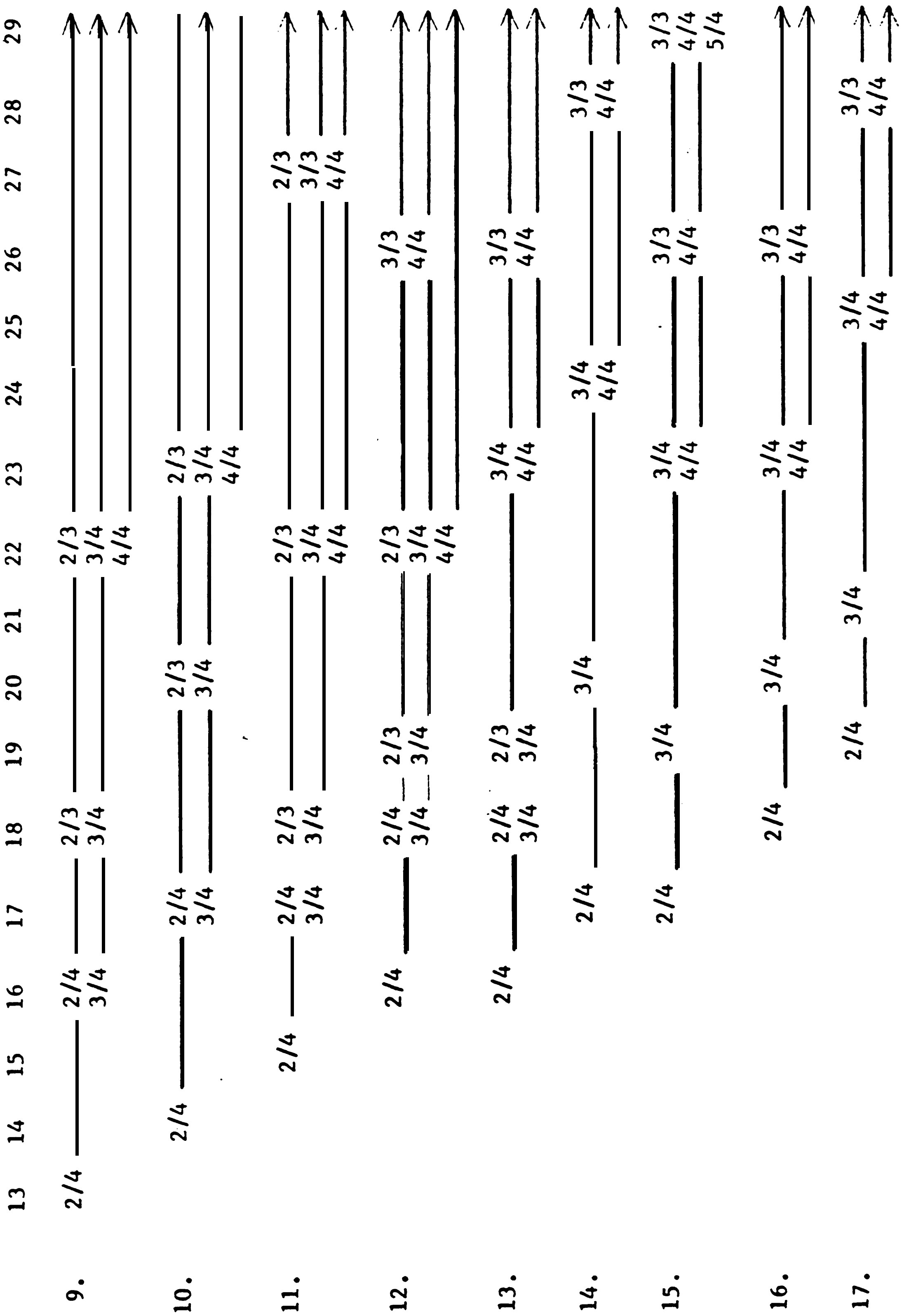
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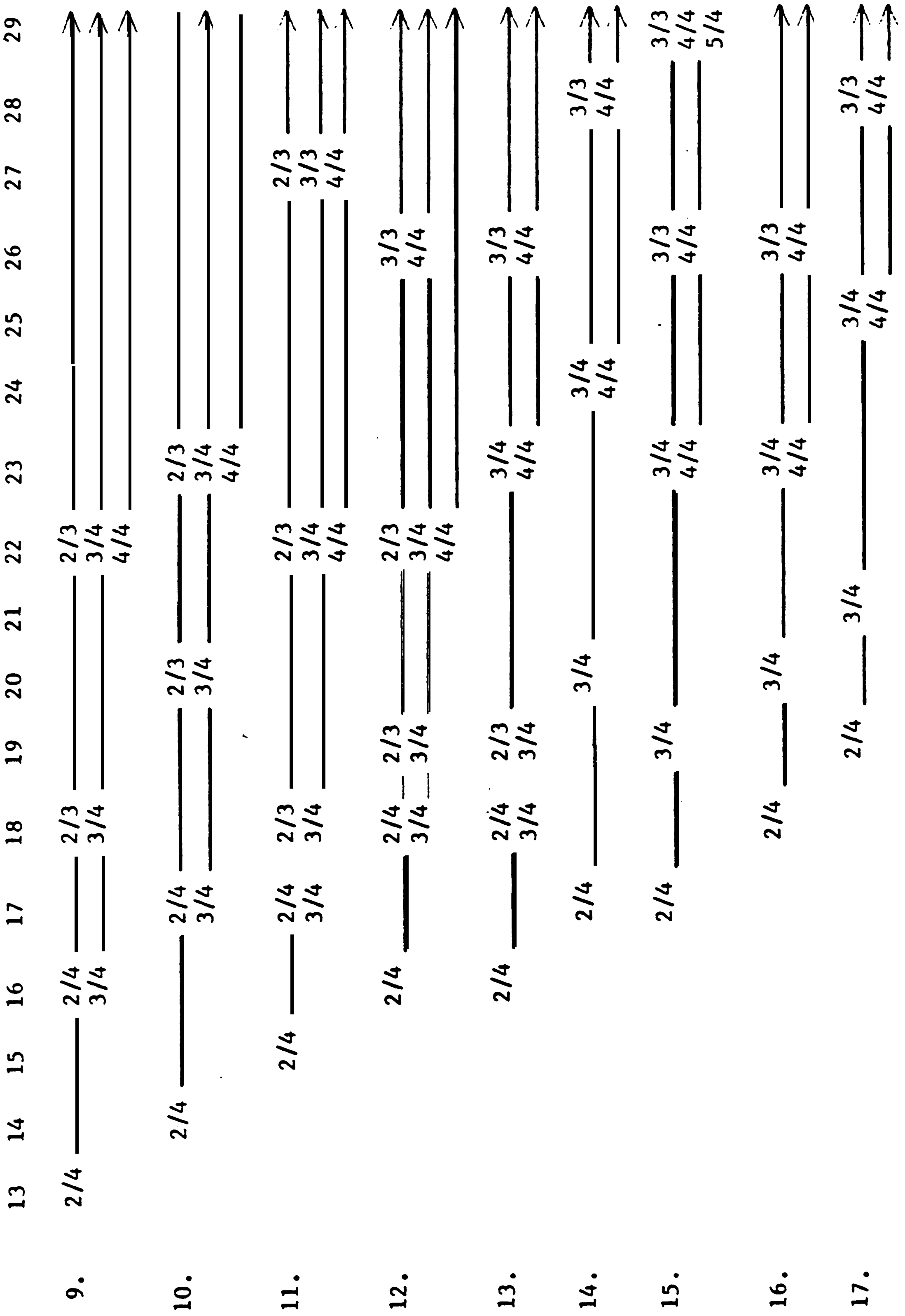
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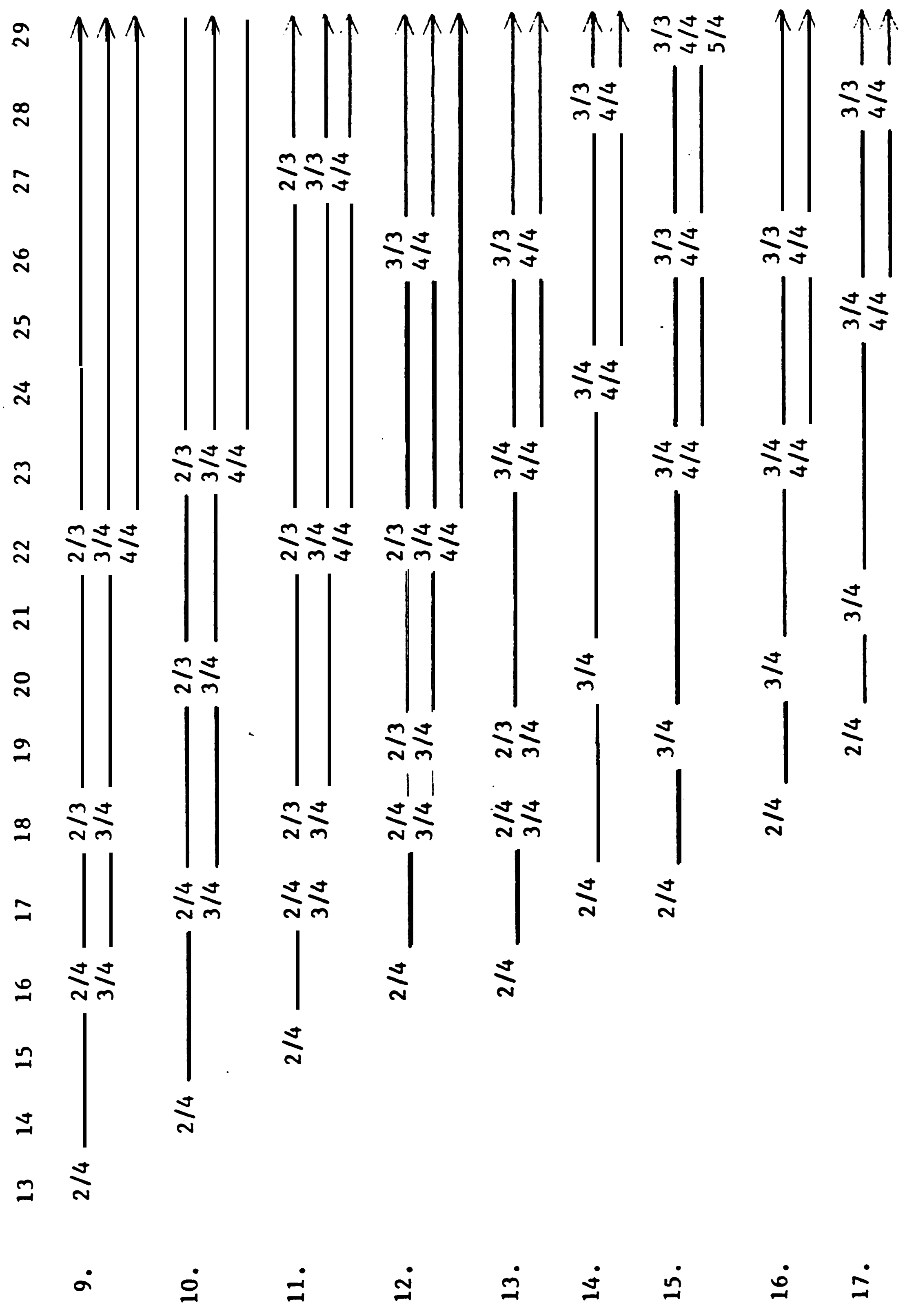
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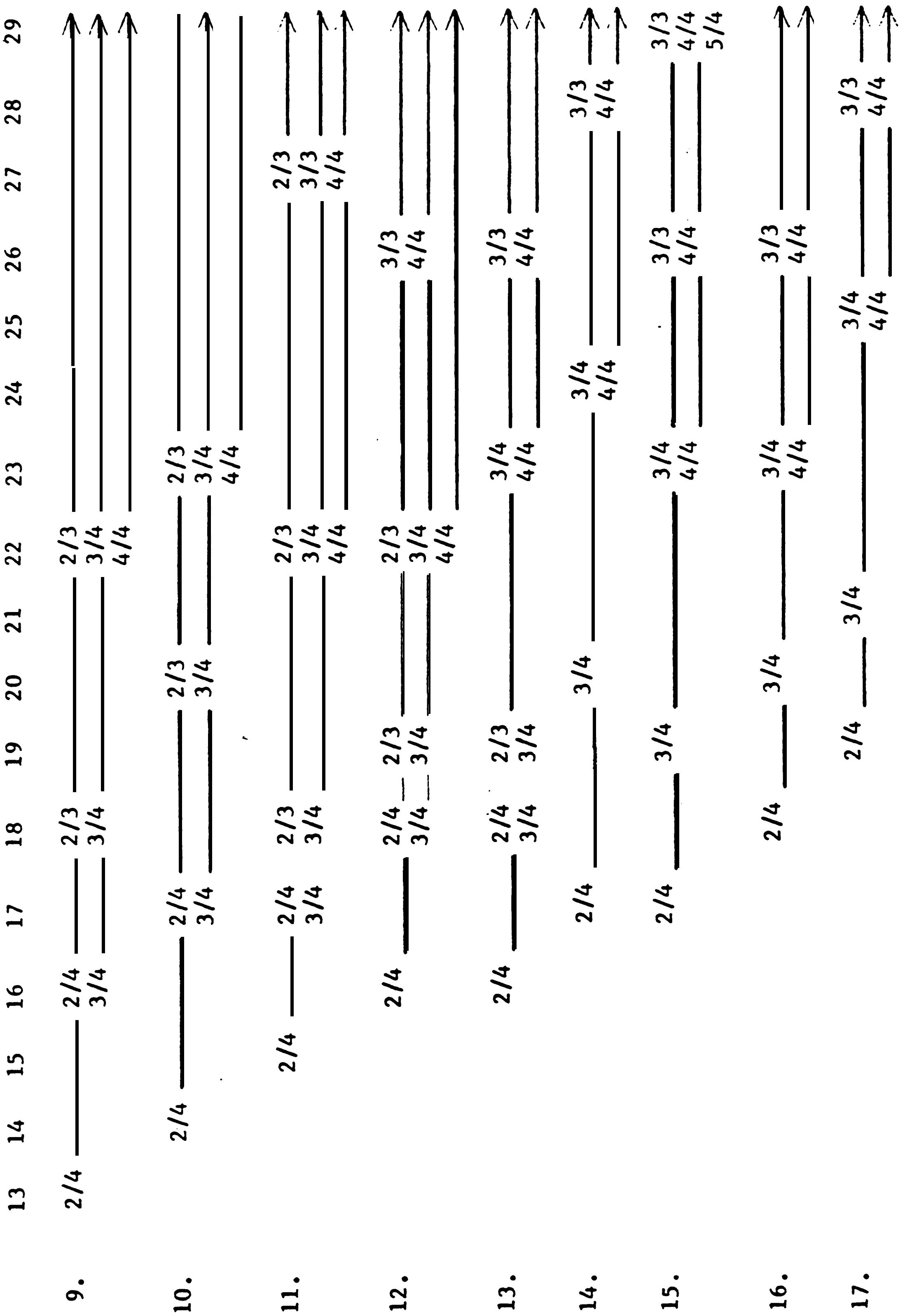
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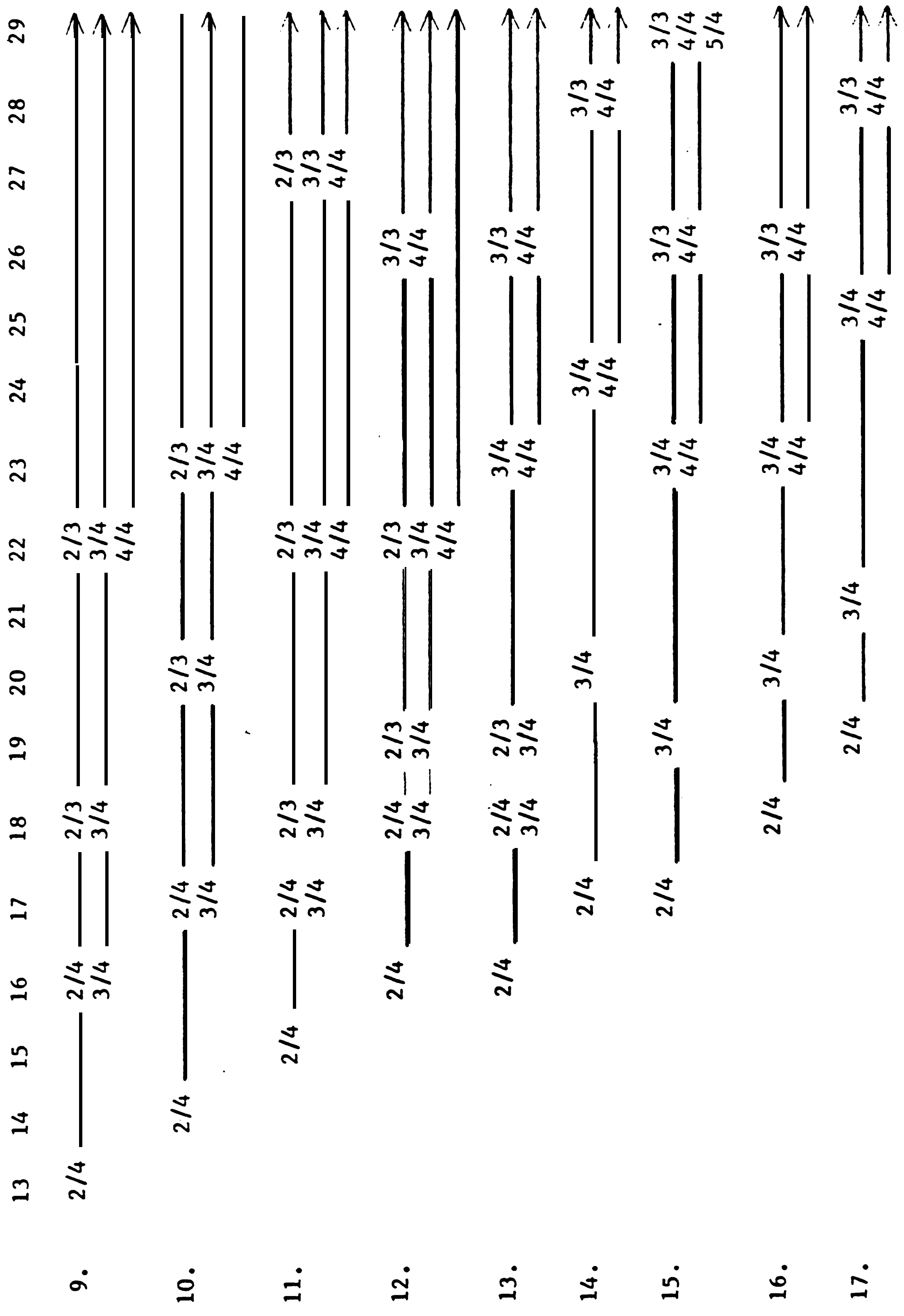
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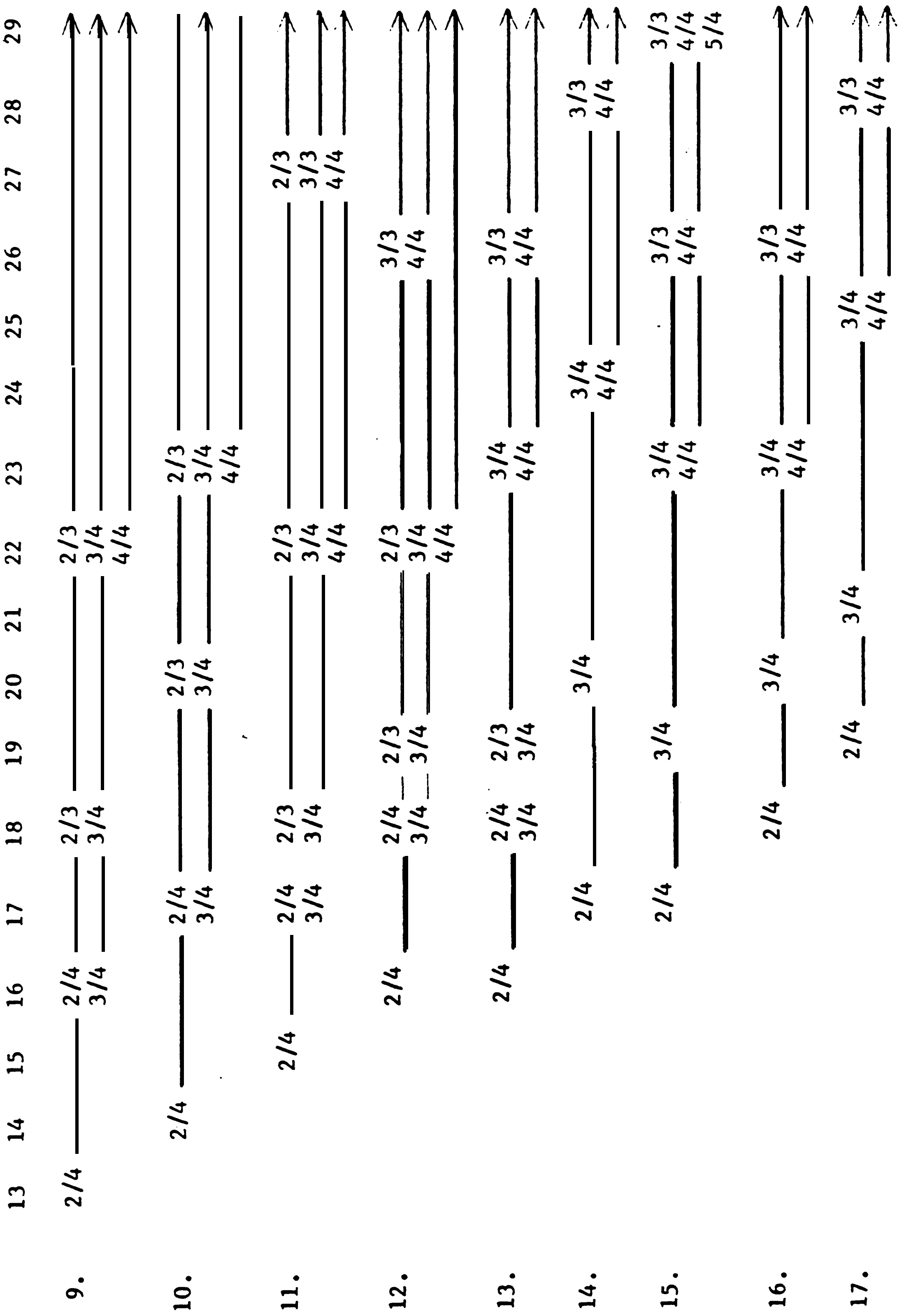
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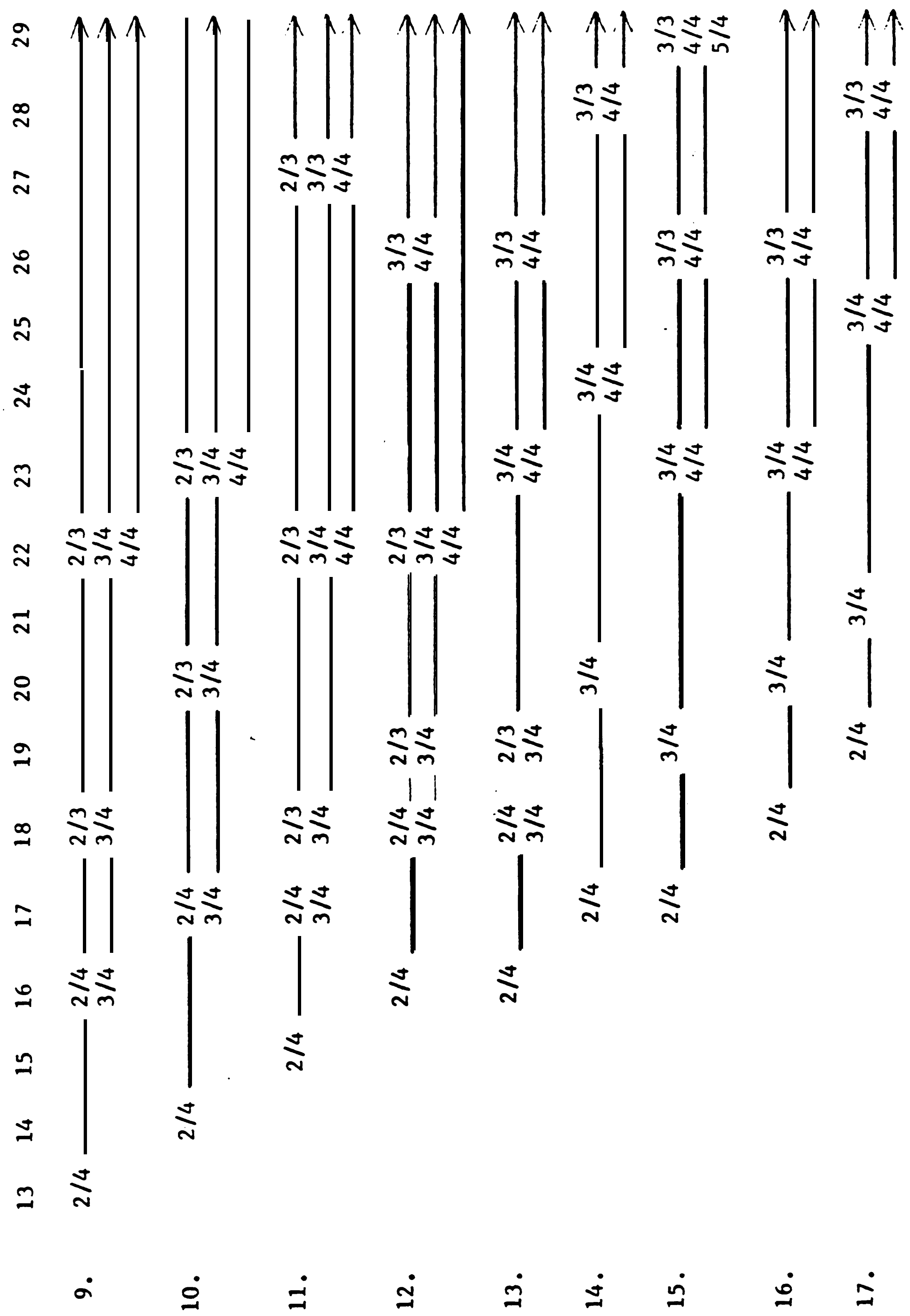
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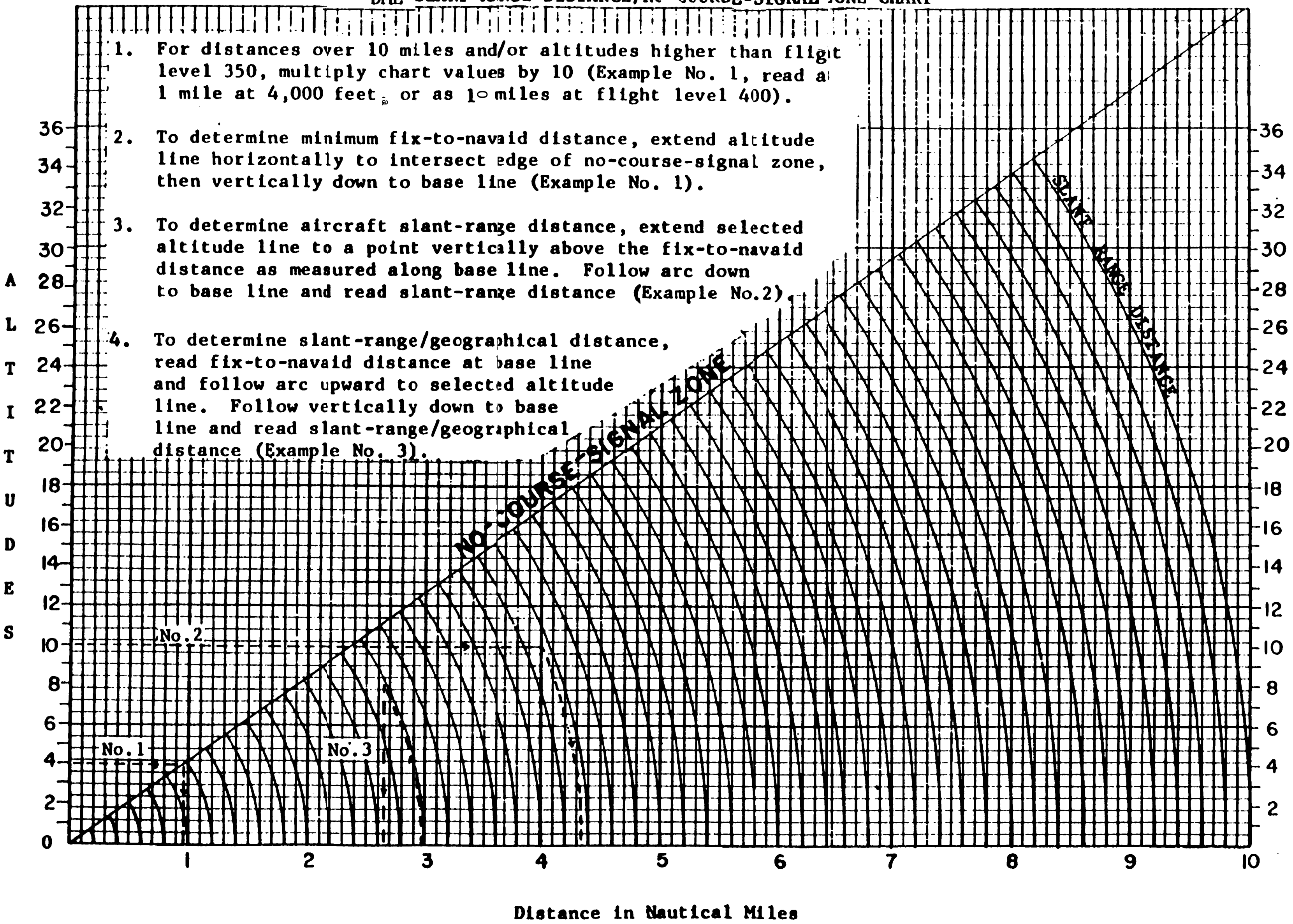
DME SLANT-RANGE DISTANCE/NO-COURSE-SIGNAL ZONE CHART



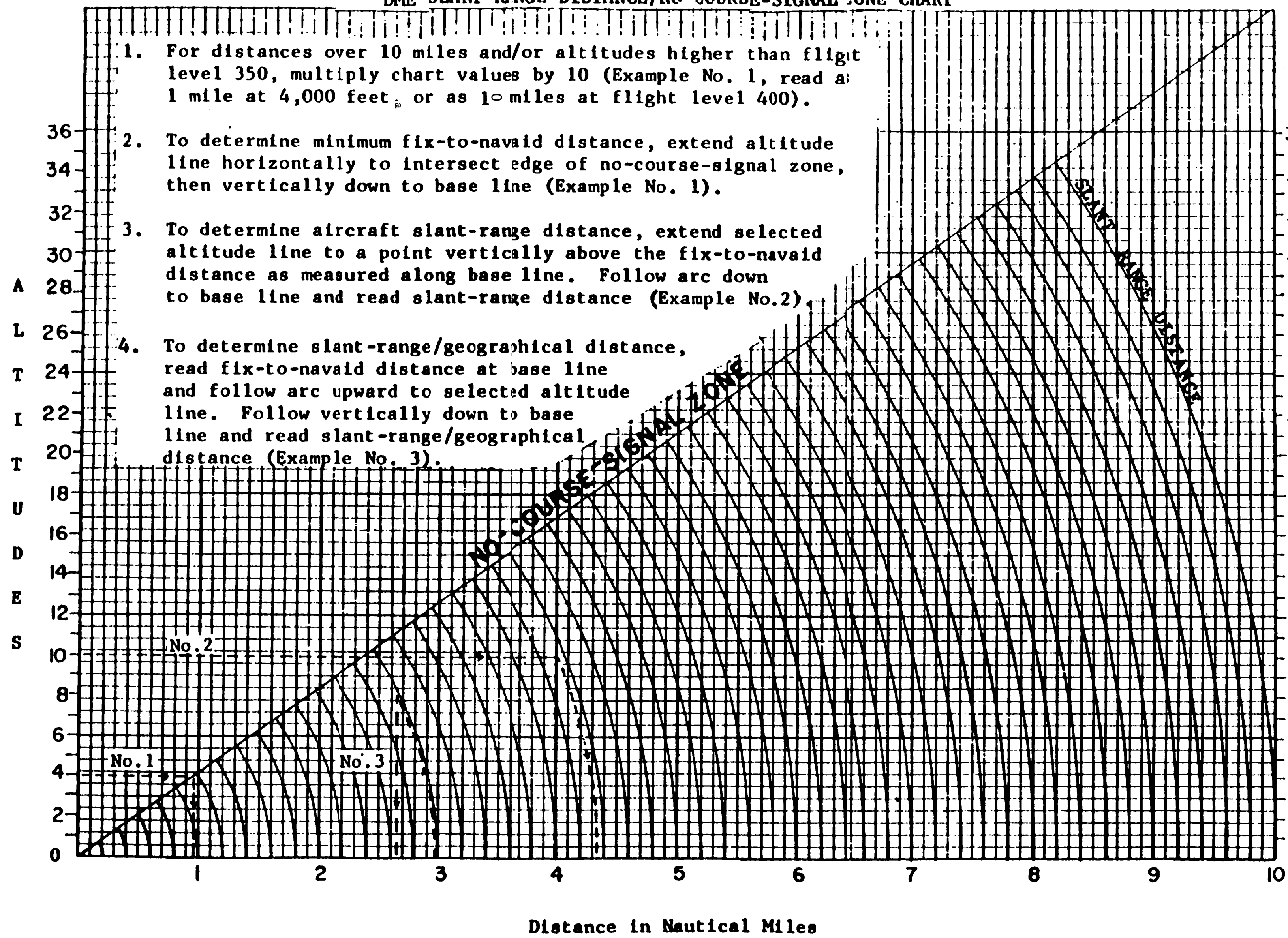
DME SLANT-RANGE DISTANCE/NO-COURSE-SIGNAL ZONE CHART

1. For distances over 10 miles and/or altitudes higher than flight level 350, multiply chart values by 10 (Example No. 1, read as 1 mile at 4,000 feet, or as 10 miles at flight level 400).

2. To determine minimum fix-to-navaid distance, extend altitude line horizontally to intersect edge of no-course-signal zone, then vertically down to base line (Example No. 1).

3. To determine aircraft slant-range distance, extend selected altitude line to a point vertically above the fix-to-navaid distance as measured along base line. Follow arc down to base line and read slant-range distance (Example No. 2).

4. To determine slant-range/geographical distance, read fix-to-navaid distance at base line and follow arc upward to selected altitude line. Follow vertically down to base line and read slant-range/geographical distance (Example No. 3).



DME SLANT-RANGE DISTANCE/NO-COURSE-SIGNAL ZONE CHART

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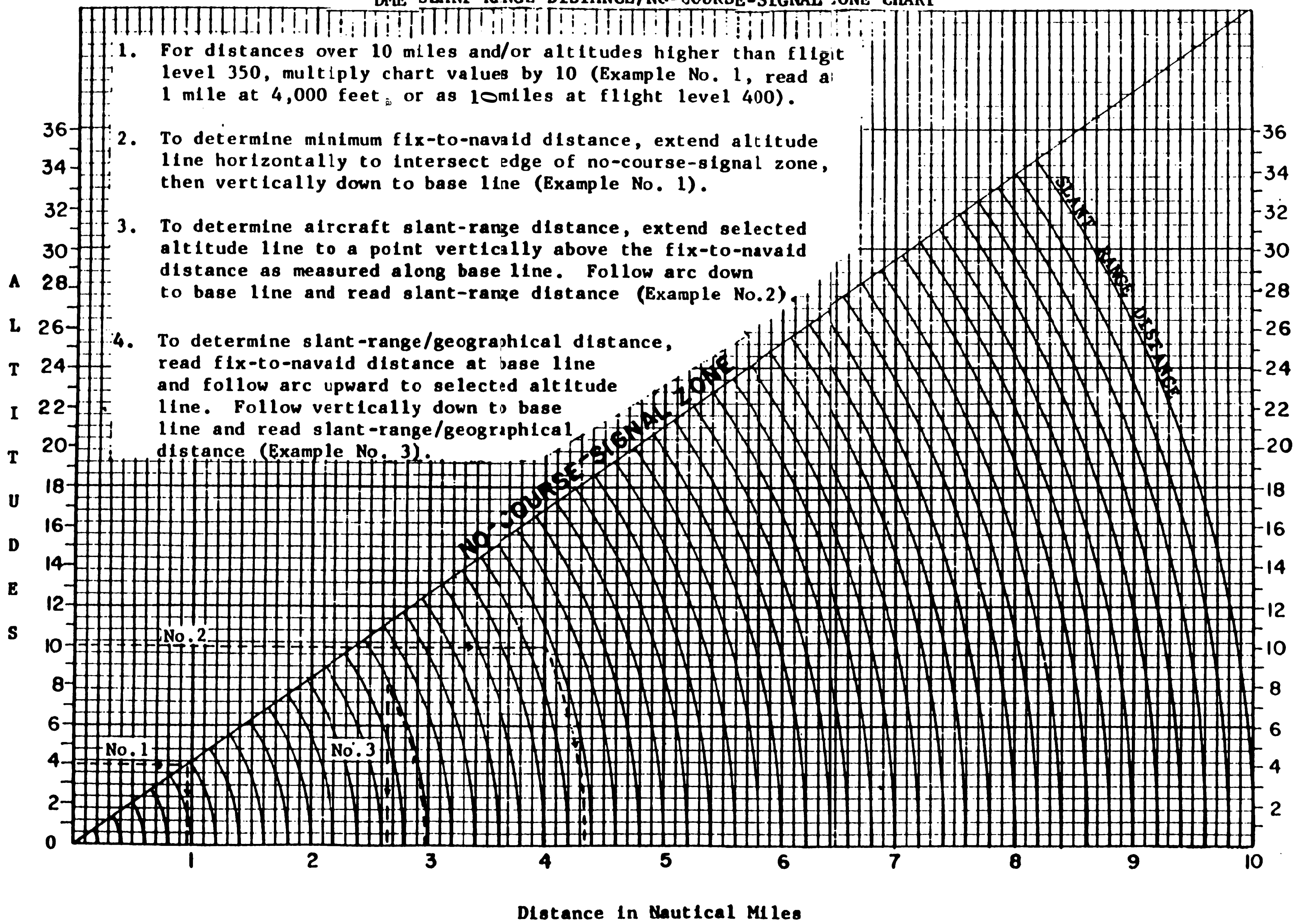

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