Microsoft Excel 16.64 Answer Report
Worksheet: [BUDT_732_0506_Team23.xlsx]Model
Report Created: 12/7/22 11:44:47 PM
Result: Solver found a solution. All constraints and optimality conditions are satisfied.
Solver Engine

Engine: Simplex LP

Solution Time: 810.859 Seconds.

Iterations: 5 Subproblems: 0

Solver Options

Max Time Unlimited, Iterations Unlimited, Precision 0.000001, Use Automatic Scaling

Max Subproblems Unlimited, Max Integer Sols Unlimited, Integer Tolerance 1%, Assume NonNegative

Objective Cell (Min)

Cell	Name	Original Value	Final Value
$J$29	Total =SUMIF($B$5:$B$18,H15,$D$5:$D$18)	62.7	40.8

Variable Cells

Cell	Name	Original Value	Final Value	Integer
$D$5	Route Taken?	1	0	Binary
$D$6	Route Taken?	0	1	Binary
$D$7	Route Taken?	0	0	Binary
$D$8	Route Taken?	1	0	Binary
$D$9	Route Taken?	0	0	Binary
$D$10	Route Taken?	0	0	Binary
$D$11	Route Taken?	0	0	Binary
$D$12	Route Taken?	0	0	Binary
$D$13	Route Taken?	0	0	Binary
$D$14	Route Taken?	0	0	Binary
$D$15	Route Taken?	0	0	Binary
$D$16	Route Taken?	0	0	Binary
$D$17	Route Taken?	0	0	Binary
$D$18	Route Taken?	0	1	Binary

Constraints

Cell	Name	Cell Value	Formula	Status	Slack
$H$18	Capacity Constraint	21	$H$18<=$J$18	Not Binding	19
$M$10	=SUMIF($A$5:$A$18,H10,$D$5:$D$18) Net Flow	0	$M$10<=$P$10	Not Binding	1
$M$11	=SUMIF($A$5:$A$18,H11,$D$5:$D$18) Net Flow	0	$M$11<=$P$11	Not Binding	1
$M$12	=SUMIF($A$5:$A$18,H12,$D$5:$D$18) Net Flow	0	$M$12<=$P$12	Not Binding	1
$M$13	=SUMIF($A$5:$A$18,H13,$D$5:$D$18) Net Flow	0	$M$13<=$P$13	Not Binding	1
$M$14	=SUMIF($A$5:$A$18,H14,$D$5:$D$18) Net Flow	0	$M$14<=$P$14	Not Binding	1
$M$15	=SUMIF($A$5:$A$18,H15,$D$5:$D$18) Net Flow	1	$M$15<=$P$15	Binding	0
$M$16	Net Flow	1	$M$16=1	Binding	0
$M$7	=SUMIF($A$5:$A$18,H7,$D$5:$D$18) Net Flow	-1	$M$7=$P$7	Binding	0
$M$8	=SUMIF($A$5:$A$18,H8,$D$5:$D$18) Net Flow	0	$M$8=$P$8	Binding	0
$M$9	=SUMIF($A$5:$A$18,H9,$D$5:$D$18) Net Flow	0	$M$9=$P$9	Binding	0
$D$5:$D$18=Binary					

Denver Public School Bus System

Decision Variables

From	To	Miles	Route Taken?	Number of Students	Rout Not Taken
0	1	12	0	12	1
0	2	10	1	11	0
1	3	15	0	19	1
1	4	32	0	20	1
1	5	19	0	18	1
1	6	12	0	15	1
1	7	10	0	16	1
1	8	15	0	10	1
2	3	13	0	19	1
2	4	22	0	20	1
2	5	21	0	18	1
2	6	20	0	15	1
2	7	16	0	16	1
2	8	11	1	10	0

Input

Bus Capacity 40

Bus Stops	Number of Students
1	12
2	11
3	19
4	20
5	18
6	15
7	16
8	10

Penalty for not picking up child 0.1

Constraints

Flow in - Flow out constraint

Nodes	Flow In	Formula Text	Flow out	Formula Text	Net Flow	FORMULA TEXT	Equality	Required
0	0	=SUMIF($B$5:$B$18,H7,$D$5:$D$18)	1	=SUMIF($A$5:$A$18,H7,$D$5:$D$18)	-1	=I7-K7	=	-1
1	0	=SUMIF($B$5:$B$18,H8,$D$5:$D$18)	0	=SUMIF($A$5:$A$18,H8,$D$5:$D$18)	0	=I8-K8	=	0
2	1	=SUMIF($B$5:$B$18,H9,$D$5:$D$18)	1	=SUMIF($A$5:$A$18,H9,$D$5:$D$18)	0	=I9-K9	=	0
3	0	=SUMIF($B$5:$B$18,H10,$D$5:$D$18)	0	=SUMIF($A$5:$A$18,H10,$D$5:$D$18)	0	=I10-K10	=	1
4	0	=SUMIF($B$5:$B$18,H11,$D$5:$D$18)	0	=SUMIF($A$5:$A$18,H11,$D$5:$D$18)	0	=I11-K11	=	1
5	0	=SUMIF($B$5:$B$18,H12,$D$5:$D$18)	0	=SUMIF($A$5:$A$18,H12,$D$5:$D$18)	0	=I12-K12	=	1
6	0	=SUMIF($B$5:$B$18,H13,$D$5:$D$18)	0	=SUMIF($A$5:$A$18,H13,$D$5:$D$18)	0	=I13-K13	=	1
7	0	=SUMIF($B$5:$B$18,H14,$D$5:$D$18)	0	=SUMIF($A$5:$A$18,H14,$D$5:$D$18)	0	=I14-K14	=	1
8	1	=SUMIF($B$5:$B$18,H15,$D$5:$D$18)	0	=SUMIF($A$5:$A$18,H15,$D$5:$D$18)	1	=I15-K15	=	1
					1	=SUM(M10:M15)	=	1

Capacity Constraint

21	<=	40

Objective

		FormulaText
Total reposition miles	21	=SUMPRODUCT(C5:C18,D5:D18)
Penalty for not picking up child	19.8	=SUMPRODUCT(E5:E18,F5:F18)*C33
Total	40.8	=J27+J28

Penalty	Total Reposition Miles
0.1	21
0.5	22
1.5	22
5	32
10	32
20	44
100	44
1000	44