Dominated and non-dominated variants – problems for practice

1. Choose which variants are non-dominated and dominated (and by which ones).

	k_1 (min)	k_2 (max)	k_3 (max)
Variant 1	50	54	24
Variant 2	28	72	39
Variant 3	21	77	51

(*Solution: Non-dominated variant is 3; var 1 is dominated by 2 and 3; var 2 is dominated by 3*)

2. Choose which variants are non-dominated and dominated (and by which ones). Determine ideal and basal variant and full solution.
*hint: you can try to use Excel add-in SANNA from prof. Jablonský from PSE

	k_1 (min)	k_2 (max)	k_3 (min)	k_4 (max)	k_5 (min)
Variant 1	48	64	84	64	18
Variant 2	24	82	6	105	15
Variant 3	26	88	146	101	7
Variant 4	33	67	22	56	20
Variant 5	47	60	126	70	18
Variant 6	28	88	166	75	19

(*Solution: Non-dominated variants are 2 and 3 (full solution); variants 1, 4, 5 are domin by 2, variant 6 is domin by 3; basal variant has values 48, 60, 166, 56, 20; ideal 24, 88, 6, 105, 7*)

Transformation of minimizing criteria to maximizing, normalizing – problems for practice

1. Transform the following criteria to maximizing.

	k_1 (min)	k_2 (max)	k_3 (min)	k_4 (max)	k_5 (min)
Variant 1	48	64	84	64	18
Variant 2	24	82	6	105	15
Variant 3	26	88	146	101	7
Variant 4	33	67	22	56	20
Variant 5	47	60	126	70	18
Variant 6	28	88	166	75	19

(*Solution: for transforming min criterion values to max values use y(max) = B(min) – y(min)*)

	T-k_1 (min)	k_2 (max)	T-k_3 (min)	k_4 (max)	T-k_5 (min)
Variant 1	0	64	82	64	2
Variant 2	24	82	160	105	5
Variant 3	22	88	20	101	13
Variant 4	15	67	144	56	0
Variant 5	1	60	40	70	2
Variant 6	20	88	0	75	1

2. Transform the following matrix of parameters to the normalized values.

	k_1 (min)	k_2 (min)	k_3 (max)
Variant 1	50	54	24
Variant 2	28	72	39
Variant 3	21	77	51

(*Solution: we transform max criterion values using (y-B)/(I-B), and min using (B-y)/(B-I)*)

	T-k_1 (min)	T-k_2 (min)	T-k_3 (max)
Variant 1	0	1	0
Variant 2	0.76	0.22	0.56
Variant 3	1	0	1

WSA – problems for practice

1. We have 5 evaluation criteria, that were assigned points based on their importance: k_1) 3, k_2) 6, k_3) 7, k_4) 1, k_5) 5. Calculate weights of these criteria (for possible further calculations).
(*Solution: individual weights are calculated as the ratio of k_n from $\Sigma(k_1 ... k_n)$, thus k_1) 0.136; k_2) 0.273; k_3) 0.318; k_4) 0.045; k_5) 0.227; what sums up as 1.000*)

2. An investor has decided to build a factory and chooses between 4 alternatives. Individual parameters and weights are in the table. Use WSA for evaluation of the variants.

	Investment costs	Running costs	Production of item 1	Production of item 2	Production of item 3
Variant 1	58	9.7	58	58	67
Variant 2	55	5.4	59	69	121
Variant 3	54	9.2	63	50	31
Variant 4	69	11.8	43	90	190
weights	8%	12%	15%	22%	43%

(*Solution: 1) 35.2%; 2) 66.3%; 3) 27.9%; 4) 65.0%*)

3. An investor has again decided to build a factory and chooses between 3 alternatives. Individual parameters and weights are in the table. Use WSA for evaluation of the variants.

	Investment costs	Running costs	Production of item 1	Production of item 2	Production of item 3	Negatíva voči okoliu
Variant 1	46	5.9	68	57	122	5
Variant 2	31	8.4	61	92	81	6
Variant 3	55	10.3	88	111	144	14
weights	5	4	8	11	14	12

(*Solution: 1) 53.8%; 2) 45.4%; 3) 61.1%*)

Lexicographic method – problem for practice

1. A family wants to buy a new car. They have preliminary chosen 5 models. Use lexicographic method, which models should be considered for further decision.

	Price	Trunk size	Power	Fuel cons.	Safety	Looks
A	488	430	105	6.9	10	6
B	416	401	102	5.1	8	8
C	694	555	108	7.2	10	10
D	449	439	93	6.2	6	7
E	580	445	108	5.6	10	5
Criterion preference	1.	3.	5.	4.	2.	6.
Limit	≤600	≥400	≥100	≤7,0	≥8	≥6

(*Solution: A family would consider models A, B for further decision making*)