

Bob, Ned, and Pam are trying to split a bag of Skittles, by placing bids on the group of each color.

	Bob	Ned	Pam
Red	\$3 *	\$2	\$2
Orange	\$2	\$2	\$3 *
Yellow	\$1	\$1	\$2 *
Green	\$3 *	\$1	\$1
Purple	\$1	\$2	\$3 *

- (1) Answer these questions about compensation notation.

(a) Find N .

$$N = 3$$

(b) Find b_{Ned} .

$$b_{Ned} = 2 + 2 + 1 + 1 + 2 = \$8$$

(c) Find m , the average bid for the Skittles.

$$m = \frac{10 + 8 + 11}{3} = \frac{29}{3} = \$9.67$$

- (2) **Random Compensation** It is decided that Bob should receive the Red and Green Skittles; Ned should get the Orange and Purple Skittles, and Pam receives the Yellow Skittles. Additionally, Bob and Ned must each pay Pam \$2 for acquiring more colors.

(a) Determine the values of x_{Bob} , x_{Ned} , and x_{Pam} .

$$x_{Bob} = 3 + 3 - 2 = \$4$$

$$x_{Ned} = 2 + 2 - 2 = \$2$$

$$x_{Pam} = 2 + 2 + 2 = \$6$$

(b) Is this compensation fair?

No, Ned doesn't get his fair share.

(c) Could this compensation be Pareto-Optimal?

No - Pam bid higher on Orange & Purple & didn't receive them
 $w = 12$
 $h = 14$
 $w \neq h$

(3) **Knaster's Procedure** Use Knaster's Procedure and answer the following questions.

	Bob	Ned	Pam	
Fair Share	3.33	2.67	3.67	
Value of Item Received	6	0	8	Surplus ↓
Money Received	-2.67	2.67	4.33	-4.33

(a) Who gets to keep which Skittles?

Bob - Red & Green
 Pam - Orange, Yellow & Purple
 no Skittles for Ned

(b) Using this method, what are x_{Bob} , x_{Ned} , and x_{Pam} ?

$$x_{Bob} = 3.33 + \frac{4.33}{3} = \$4.77$$

$$x_{Ned} = 2.67 + \frac{4.33}{3} = \$4.11$$

$$x_{Pam} = 3.67 + \frac{4.33}{3} = \$5.11$$

(c) What is the final settlement for this scenario?

Bob gets Red & Green and pays \$1.23
 Ned receives \$4.11

(d) Use your results from above Knaster's Procedure problem, to fill in the Perception chart.

View of Compensation	Bob	Ned	Pam
Bob views	4.77	4.11	1.11
Ned views	1.77	4.11	2.11
Pam views	1.77	4.11	5.11

(e) Is this an **envy-free** arrangement?

Yes

(f) **X/B Fractions** Find the $\frac{x}{b}$ fractions for Bob, Ned, and Pam.

$$x/b \text{ Bob} = 4.77/10 = .477$$

$$x/b \text{ Ned} = 4.11/3 = .514$$

$$x/b \text{ Pam} = 5.11/11 = .465$$

(g) Is this an **equitable** arrangement?

No

x/b fractions are not equal

(4) **Equitability Procedure** Use the Equitability Procedure and answer the following questions, based on the same Skittles bid.

(a) Who gets to keep which Skittles?

Bob - Red & Green
 Pam - Orange, Yellow, & Purple
 no Skittles for Ned

(b) Using this method, what are x_{Bob} , x_{Ned} , and x_{Pam} ?

$$x_{Bob} = 3.33 + \frac{10}{29}(4.33) = \$4.82$$

$$x_{Ned} = 2.67 + \frac{8}{29}(4.33) = \$3.86$$

$$x_{Pam} = 3.67 + \frac{11}{29}(4.33) = \$5.31$$

(c) What is the final settlement for this scenario?

Bob gets Red & Green and pays \$1.18

Ned gets \$3.86

Pam gets Orange, Yellow, & Purple and pays \$2.69

Bob -2.67
 +1.44
 Ned 2.67
 +1.44

Pam -4.33
 +1.44

Bob -2.67
 +1.49
 Ned 2.67
 +1.19

Pam -4.33 + 1.64

- (5) **Adjusted Winner** Ned goes home and later Bob and Pam find that they also have a bag of M&Ms to share. Out of money, they decide to assign point values and use the Adjusted Winner Method share the candies.

	Bob	Pam	Point Ratios
Red	10	30*	$\frac{30}{10} = 3$
Orange	30*	20	$\frac{30}{20} = 1.5$
Yellow	15*	5	$\frac{15}{5} = 3$
Green	20*	10	$\frac{20}{10} = 2$
Blue	5	30*	$\frac{30}{5} = 6$
Brown	20*	5	$\frac{20}{5} = 4$

- (a) Which color of candy gets shared between them?

Orange

- (b) Set up a transfer equation, and solve for x.

$$\begin{aligned}
 55 + x(30) &= 60 + (1-x)(20) \\
 55 + 30x &= 80 - 20x \\
 50x &= 25 \\
 x &= .5
 \end{aligned}$$

- (i) What percentage of the shared candy does Bob get?

50%

- (ii) What percentage of the shared candy does Pam get?

50%

- (c) Distribution of non-shared items.

- (i) What non-shared color(s) does Bob get?

Yellow, Green, Brown

- (ii) What non-shared color(s) does Pam get?

Red, Blue