

Finding an Expected Value Involving Multiple Events

EXAMPLE 3 Comparing Two Expected Values

A child asks his parents for some money. The parents make the following offers.

Father’s offer: The child flips a coin. If the coin lands heads up, the father will give the child \$20. If the coin lands tails up, the father will give the child nothing.

Mother’s offer: The child rolls a 6-sided die. The mother will give the child \$3 for each dot on the up side of the die.

Which offer has the greater expected value?

SOLUTION

Father’s offer:

$$\text{Expected value} = \left(\frac{1}{2}\right)(20) + \left(\frac{1}{2}\right)(0) = \$10$$



Mother’s offer: There are six possible outcomes.

DATA				
	A	B	C	D
1	Number	Payoff	Probability	Expected Value
2	1	\$3.00	16.67%	\$0.50
3	2	\$6.00	16.67%	\$1.00
4	3	\$9.00	16.67%	\$1.50
5	4	\$12.00	16.67%	\$2.00
6	5	\$15.00	16.67%	\$2.50
7	6	\$18.00	16.67%	\$3.00
8	Total			\$10.50
9				

Even though the mother’s offer has a slightly higher expected value, the best the child can do with the mother’s offer is \$18, whereas the child has a 50% chance of receiving \$20 with the father’s offer.

✓ Checkpoint

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The child’s uncle makes a different offer. The child rolls a 12-sided die. The uncle will give the child \$2 for each dot on the up side of the die. Use a spreadsheet to find the expected value of this offer. Which offer would you take? Explain.



	A	B	C	D
1	Number	Payoff	Probability	Expected Value
2	1	\$2.00	8.33%	\$0.17
3	2	\$4.00	8.33%	\$0.33
4	3	\$6.00	8.33%	\$0.50
5	4	\$8.00	8.33%	\$0.67