

# Roll The Dice

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TEACHING EXPECTED VALUE USING  
RANDOMLY-ASSIGNED GRADES



Please roll a die.

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Write down the number you get.

Please don't cheat.

We'll talk about why later.

# The Basics

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**Learning Objective:** Students will be able to use the expected value formula in the rule of rational choice to determine whether a course of action is rational.

- Community college micro class
- Usually toward the end of the semester
- Many students are underprepared mathematically
- This spirals back to the rule of rational choice and the opportunity cost concept to reinforce key material before the exam

# The Basics

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**Learning Objective:** Students will be able to use the expected value formula in the rule of rational choice to determine whether a course of action is rational.

**Recall** the rule of rational choice: A decision is rational if (and only if) its expected marginal benefit at least covers its expected marginal cost.

$$MB \geq MC$$

# The Basics, Cont'd

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The Expected Value Formula:

$$EV = \sum_{i=1}^n p_i v_i$$

where  $p_i$  is the probability of outcome  $i$  and  $v_i$  is the value of outcome  $i$ .

# The Lesson

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- Usually a late-semester lesson when at least students are worried about their grades
- The offer: “You can keep your current grade, or you can roll the die. Your grade will be determined by this chart:

If you roll...	Your course grade is...
1	A
2	A
3	B
4	C
5	D
6	F

# The Lesson

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- Ask, “How good a deal is this?”

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- Double the chance at an A! But, still a chance at an F.

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- Let’s quantify it:

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- Ask, “How good a deal is this?”
- Double the chance at an A! But, still a chance at an F.
- Let’s quantify it:

Probability of each number =  $\frac{1}{6}$

A = 4.0, B = 3.0, C = 2.0, D = 1.0, F = 0.0

If you roll...	Your course grade is...
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$$EV = \sum_{i=1}^n p_i v_i$$

$$= \frac{1}{6} \times 4 + \frac{1}{6} \times 4 + \frac{1}{6} \times 3 + \frac{1}{6} \times 2 + \frac{1}{6} \times 1 + \frac{1}{6} \times 0$$

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$$= \frac{4}{6} + \frac{4}{6} + \frac{3}{6} + \frac{2}{6} + \frac{1}{6} + \frac{0}{6}$$

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- Who thinks this is a good deal?

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- Who thinks this is a good deal? Students who expect to get a C+ or lower.

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- Is this result actually achievable? **No, only whole numbers are.**
- So, then, what does it tell us? **Information about the distribution of the class.**
- Who thinks this is a good deal? **Students who expect to get a C+ or lower.** *Now, use some econ vocabulary – what are the marginal benefit and marginal cost of The Roll?*

# How did our class do?

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Depending on size of class, we should get close to this average.

Discuss the equity of this with the class.

Usually finish with the Powerball EV exercise as group work.

# Thank you!

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