

Looking Ahead

In this example, the order of operations with real numbers is applied when calculating an expected value.

Example Preview

Find the expected value, $E(X)$, for the following data.

x	$P(X = x)$	$x \cdot P(X = x)$
-7	0.2	-1.4
-6	0.1	-0.6
-5	0.2	-1.0
-4	0.1	-0.4
-3	0.4	-1.2

Solution

The expected value of a random variable X is the mean of the random variable X . It is denoted by μ or $E(X)$ and is calculated as follows.

$$\begin{aligned}
 E(X) = \mu &= \sum [x_i \cdot P(X = x_i)] \\
 &= (-7)(0.2) + (-6)(0.1) + (-5)(0.2) + (-4)(0.1) + (-3)(0.4) && \text{Multiply} \\
 &= -1.4 + (-0.6) + (-1.0) + (-0.4) + (-1.2) && \text{Add} \\
 &= -4.6
 \end{aligned}$$

5.R.1 Exercises

Concept Check

True/False. Determine whether each statement is true or false. If a statement is false, explain how it can be changed so the statement will be true. (**Note:** There may be more than one acceptable change.)

- If there are no grouping symbols, multiplication should always be performed before addition.
- When following the rules for order of operations, powers indicated by exponents should be evaluated last.
- The square root symbol is a grouping symbol.
- A well-known mnemonic device for remembering the rules for order of operations is SADMEP.

Practice

Simplify.

5. a. $24 \div 4 \cdot 6$

b. $24 \cdot 4 \div 6$

7. $3^2 \div (-9) \cdot (4 - 2^2) + 5(-2)$

8. $14 \cdot 3 \div (-2) - 6(4)$

6. $15 \div (-3) \cdot 3 - 10$

9. $|16 - 20| + (-10)^2 + 5^2$

Applications

Solve.

10. **Discounts:** The Matthews family, a family of 4, is planning a trip to New York City. During their visit, they want to see the Broadway play *Matilda*. The tickets cost \$102 each. The Matthews purchase the tickets online and the website charges a service fee of \$7.50 per ticket. The website is running a sale where the Matthews can get 10% off of their entire purchase.

a. Write an expression to describe how much of a discount the Matthews will receive on their purchase.

b. What is the final purchase price of the tickets?

11. **Banking:** Dennis overdrew his checking account and ended up with a balance of $-\$42$. The bank charged a \$35 overdraft fee and an additional \$5 fee for every day the account was overdrawn. Dennis left his account overdrawn for 3 days.

a. Write an expression to show the balance of Dennis's checking account after 3 days.

b. Simplify the expression in part a. to find the balance of Dennis's checking account after 3 days.

12. *Expected Value:* Find the expected value, $E(X)$, for the following data.

x	$P(X = x)$	$x \cdot P(X = x)$
-10	0.1	-1.0
-7	0.2	-1.4
-5	0.5	-2.5
0	0.1	0
5	0.1	0.5

Writing & Thinking

13. Explain, in your own words, why the following expression cannot be evaluated.

$$(24 - 2^4) + 6(3 - 5) \div (3^2 - 9)$$

14. Consider any number between 0 and 1. If you square this number, will the result be larger or smaller than the original number? Is this always the case? Explain.