Probability: Algebraic Counters

Practice Worksheet (Nov 2020 Paper 2H Style)

I Do

A bag contains X counters. There are only red and blue counters. There are 4 more blue counters than red. Finty takes at random 2 counters without replacement. The probability of taking 2 blue counters is $\frac{3}{8}$. Work out the value of X.

We Do

A bag contains X counters. There are only red and blue counters. There are 5 more blue counters than red. Keeley randomly takes 2 counters without replacement. The probability of taking 2 blue counters is $\frac{3}{7}$. Work out the value of X.

You Do

A bag contains X counters. There are only red and blue counters. There are 3 more blue counters than red. Zoe randomly takes 2 counters without replacement. The probability of taking 2 blue counters is $\frac{5}{12}$. Work out the value of X.

Challenge

A bag contains X counters. There are only red and blue counters. There are 2 more red counters than blue. Catherine randomly takes 2 counters without replacement. The probability of taking 2 red counters is $\frac{2}{5}$. Work out the value of X.

Answers

- **I Do:** $r = 6, b = 10, X = 16$. Prob = $(10/16) \times (9/15) = 90/240 = 3/8$. **X=16**.
- We Do: r=5, b=10, X=15. Prob = $(10/15) \times (9/14) = 3/7$.
- **You Do:** $r = 3, b = 6, X = 9$. Prob = $(6/9) \times (5/8) = 30/72 = 5/12$. **X=9**.
- **Challenge:** $b = 2, r = 4, X = 6$. Prob = $(4/6) \times (3/5) = 12/30 = 2/5$. **X=6**.

We Do: worked algebra

Blue counters = (X + 5)/2; red counters = (X - 5)/2.

((X + 5)/(2X)) × ((X + 3)/(2(X - 1))) = 3/7

7(X + 5)(X + 3) = 12X(X - 1)

$5X^2$ - 68X - 105 = 0

(X - 15)(5X + 7) = 0

X = 15 or X = -7/5. Reject the negative value, so X = 15.

Check: 10 blue and 5 red; (10/15) × (9/14) = 3/7.