**3. Pick a card, any card.**

**a)**

| Win | \$0 | \$5 | \$10 | \$30 |
|---|---|---|---|---|
| $P$(amount won) | $\frac{26}{52}$ | $\frac{13}{52}$ | $\frac{12}{52}$ | $\frac{1}{52}$ |

**b)** $\mu = E(\text{amount won}) = \$0\left(\frac{26}{52}\right) + \$5\left(\frac{13}{52}\right) + \$10\left(\frac{12}{52}\right) + \$30\left(\frac{1}{52}\right) \approx \$4.13$

**c)** Answers may vary. In the long run, the expected payoff of this game is \$4.13 per play. Any amount less than \$4.13 would be a reasonable amount to pay in order to play. Your decision should depend on how long you intend to play. If you are only going to play a few times, you should risk less.

**4. You bet!**

**a)**

| Win | \$100 | \$50 | \$0 |
|---|---|---|---|
| $P$(amount won) | $\frac{1}{6}$ | $\left(\frac{1}{6}\right)\left(\frac{5}{6}\right) = \frac{5}{36}$ | $\left(\frac{5}{6}\right)\left(\frac{5}{6}\right) = \frac{25}{36}$ |

**b)** $\mu = E(\text{amount won}) = \$100\left(\frac{1}{6}\right) + \$50\left(\frac{5}{6}\right) + \$0\left(\frac{25}{26}\right) \approx \$23.61$

**c)** Answers may vary. In the long run, the expected payoff of this game is \$23.61 per play. Any amount less than \$23.61 would be a reasonable amount to pay in order to play. Your decision should depend on how long you intend to play. If you are only going to play a few times, you should risk less.

**5. Kids.**

**a)**

| Kids | 1 | 2 | 3 |
|---|---|---|---|
| $P$(Kids) | 0.5 | 0.25 | 0.25 |

**b)** $\mu = E(\text{Kids}) = 1(0.5) + 2(0.25) + 3(0.25) = 1.75$ kids

**c)**

| Boys | 0 | 1 | 2 | 3 |
|---|---|---|---|---|
| $P$(boys) | 0.5 | 0.25 | 0.125 | 0.125 |

$\mu = E(\text{Boys}) = 0(0.5) + 1(0.25) + 2(0.125) + 3(0.125) = 0.875$ boys

**6. Carnival.**

**a)**

| Net winnings | \$95 | \$90 | \$85 | \$80 | -\$20 |
|---|---|---|---|---|---|
| number of darts | 1 dart | 2 darts | 3 darts | 4 darts (win) | 4 darts (lose) |
| $P$(Amount won) | $\left(\frac{1}{10}\right) = 0.1$ | $\left(\frac{9}{10}\right)\left(\frac{1}{10}\right) = 0.09$ | $\left(\frac{9}{10}\right)^2\left(\frac{1}{10}\right) = 0.081$ | $\left(\frac{9}{10}\right)^3\left(\frac{1}{10}\right) = 0.0729$ | $\left(\frac{9}{10}\right)^4 = 0.6561$ |

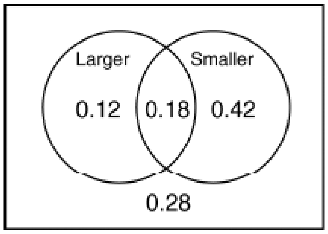
**b)** $\mu = E(\text{number of darts}) = 1(0.1) + 2(0.09) + 3(0.081) + 4(0.0729) + 4(0.6561) \approx 3.44$ darts

**c)** $\mu = E(\text{winnings}) = \$95(0.1) + \$90(0.09) + \$85(0.081) + \$80(0.0729) - \$20(0.6561) \approx \$17.20$

7. **Software.**

Since the contracts are awarded independently, the probability that the company will get both contracts is (0.3)(0.6) = 0.18. Organize the disjoint events in a Venn diagram.

| Profit | larger only $50,000 | smaller only $20,000 | both $70,000 | neither $0 |
|---|---|---|---|---|
| *P*(profit) | 0.12 | 0.42 | 0.18 | 0.28 |

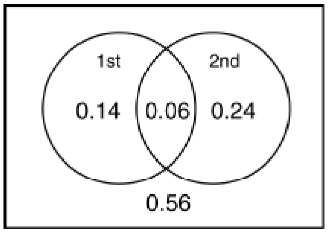



$\mu = E(\text{profit}) = \$50{,}000(0.12) + \$20{,}000(0.42) + \$70{,}000(0.18)$
$= \$27{,}000$

8. **Racehorse.**

Assuming that the two races are independent events, the probability that the horse wins both races is (0.2)(0.3) = 0.06. Organize the disjoint events in a Venn diagram.

| Profit | 1st only $30,000 | 2nd only $30,000 | both $80,000 | neither – $10,000 |
|---|---|---|---|---|
| *P*(profit) | 0.14 | 0.24 | 0.06 | 0.56 |




$\mu = E(\text{profit}) = \$30{,}000(0.14) + \$30{,}000(0.24)$
$+ \$80{,}000(0.06) - \$10{,}000(0.56)$
$= \$10{,}600$

**18. Insurance.**

**a)**

| Profit | \$100 | – \$9900 | – \$2900 |
|---|---|---|---|
| $P$(Profit) | 0.9975 | 0.0005 | 0.002 |

**b)** $\mu = E(\text{Profit}) = 100(0.9975) - 9900(0.0005) - 2900(0.002) = \$89$

**c)**

$$\sigma^2 = Var(\text{Profit}) = (100-89)^2(0.9975) + (-9900-89)^2(0.0005) + (-2900-89)^2(0.002) = 67{,}879$$

$$\sigma = SD(\text{Profit}) = \sqrt{Var(\text{Profit})} \approx \sqrt{67{,}879} \approx \$260.54$$

**21. Contest.**

**a)** The two games are not independent. The probability that you win the second depends on whether or not you win the first.

**b)**

$$P(\text{losing both games}) = P(\text{losing the first})\, P(\text{losing the second} \mid \text{first was lost}) = (0.6)(0.7) = 0.42$$

**c)**

$$P(\text{winning both games}) = P(\text{winning the first})\, P(\text{winning the second} \mid \text{first was won}) = (0.4)(0.2) = 0.08$$

**d)**

| $X$ | 0 | 1 | 2 |
|---|---|---|---|
| $P(X = x)$ | 0.42 | 0.50 | 0.08 |

**e)**

$\mu = E(X) = 0(0.42) + 1(0.50) + 2(0.08) = 0.66$ games

$\sigma^2 = Var(X) = (0-0.66)^2(0.42) + (1-0.66)^2(0.50) + (2-0.66)^2(0.08) = 0.3844$

$\sigma = SD(X) = \sqrt{Var(X)} = \sqrt{0.3844} = 0.62$ games