Solving Inequalities

Games at the carnival cost $3 each. The prizes awarded to winners cost the owner $145.65. How many games must be played for the owner of the game to make at least $50?

1. As a salesperson, Jonathan is paid $50 per week plus 3% of the total amount he sells. This week, he wants to earn at least $100. Write an inequality with integer coefficients for the total sales needed to earn at least $100, and describe what the solution represents.

2. Systolic blood pressure is the higher number in a blood pressure reading. It is measured as the heart muscle contracts. Heather was with her grandfather when he had his blood pressure checked. The nurse told him that the upper limit of his systolic blood pressure is equal to half his age increased by 110.
   a. a is the age in years, and p is the systolic blood pressure in mmHg (milliliters of Mercury). Write an inequality to represent this situation.
   b. Heather's grandfather is 76 years old. What is "normal" for his systolic blood pressure?

3. Traci collects donations for a dance marathon. One group of sponsors will donate a total of $6 for each hour she dances. Another group of sponsors will donate $75 no matter how long she dances. What number of hours, to the nearest minute, should Traci dance if she wants to raise at least $1,000?

4. Jack's age is three years more than twice his younger brother's, Jimmy's, age. If the sum of their ages is at most 18, find the greatest age that Jimmy could be.

5. Brenda has $500 in her bank account. Every week she withdraws $40 for miscellaneous expenses. How many weeks can she withdraw the money if she wants to maintain a balance of a least $200?

6. A scooter travels 10 miles per hour faster than an electric bicycle. The scooter traveled for 3 hours, and the bicycle traveled for $5\frac{1}{2}$ hours. All together, the scooter and bicycle traveled no more than 285 miles. Find the maximum speed of each.

Games at the carnival cost 3 each. The prizes awarded to winners cost 145.65. How many games must be played to make at least 50?

Let g represent the number of games played.

$$3g - 145.65 \geq 50$$
$$3g - 145.65 + 145.65 \geq 50 + 145.65$$
$$3g + 0 \geq 195.65$$
$$\left(\frac{1}{3}\right)(3g) \geq \left(\frac{1}{3}\right)(195.65)$$
$$g \geq 65.217$$

There must be at least 66 games played to make at least 50.

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1. As a salesperson, Jonathan is paid 50 per week plus 3% of the total amount he sells. This week, he wants to earn at least 100. Write an inequality with integer coefficients for the total sales needed to earn at least 100, and describe what the solution represents.

   Let the variable p represent the purchase amount.

$$50 + \frac{3}{100}p \geq 100$$
$$\frac{3}{100}p + 50 \geq 100$$
$$(100)\left(\frac{3}{100}p\right) + 100(50) \geq 100(100)$$
$$3p + 5000 \geq 10000$$
$$3p + 5000 - 5000 \geq 10000 - 5000$$
$$3p + 0 \geq 5000$$
$$\left(\frac{1}{3}\right)(3p) \geq \left(\frac{1}{3}\right)(5000)$$
$$p \geq 1666\frac{2}{3}$$

   Jonathan must sell $1,666.67$ in total purchases.

2. Systolic blood pressure is the higher number in a blood pressure reading. It is measured as the heart muscle contracts. Heather was with her grandfather when he had his blood pressure checked. The nurse told him that the upper limit of his systolic blood pressure is equal to half his age increased by 110.

   a. a is the age in years, and p is the systolic blood pressure in mmHg (milliliters of Mercury). Write an inequality to represent this situation.

$$p \leq \frac{1}{2}a + 110$$

b. Heather's grandfather is 76 years old. What is "normal" for his systolic blood pressure?

$p \leq \frac{1}{2}a + 110$, *where* $a = 76$.

$$p \leq \frac{1}{2}(76) + 110$$
$$p \leq 38 + 110$$
$$p \leq 148$$

A systolic blood pressure for his age is normal if it is at most 148.

3. Traci collects donations for a dance marathon. One group of sponsors will donate a total of $6 for each hour she dances. Another group of sponsors will donate $75 no matter how long she dances. What number of hours, to the nearest minute, should Traci dance if she wants to raise at least $1,000?

Let the variable h represent the number of hours Traci dances.

$$6h + 75 \geq 1000$$
$$6h + 75 - 75 \geq 1000 - 75$$
$$6h + 0 \geq 925$$
$$\left(\frac{1}{6}\right)(6h) \geq \left(\frac{1}{6}\right)(925)$$
$$h \geq 154\frac{1}{6}$$

$h \geq 154$ *hours and* 10 *minutes.*

4. Jack's age is three years more than twice his younger brother's, Jimmy's, age. If the sum of their ages is at most 18, find the greatest age that Jimmy could be.

Let the variable j represent Jimmy's age in years.

Then, the expression $3 + 2j$ *represents Jack's age in years.*

$$j + 3 + 2j \leq 18$$
$$3j + 3 \leq 18$$
$$3j + 3 - 3 \leq 18 - 3$$
$$3j \leq 15$$
$$\left(\frac{1}{3}\right)(3j) \leq \left(\frac{1}{3}\right)(15)$$
$$j \leq 5$$

Jimmy's age is 5 *years or less.*

5. Brenda has $500 in her bank account. Every week she withdraws $40 for miscellaneous expenses. How many weeks can she withdraw the money if she wants to maintain a balance of a least $200?

Let the variable w represent the number of weeks.

$$500 - 40w \geq 200$$
$$500 - 500 - 40w \geq 200 - 500$$
$$-40w \geq -300$$
$$\left(-\frac{1}{40}\right)(-40w) \leq \left(-\frac{1}{40}\right)(-300)$$
$$w \leq 7.5$$

$40 *can be withdrawn from the account for seven weeks if she wants to maintain a balance of at least* $200.

6. A scooter travels 10 miles per hour faster than an electric bicycle. The scooter traveled for 3 hours, and the bicycle traveled for $5\frac{1}{2}$ hours. All together, the scooter and bicycle traveled no more than 285 miles. Find the maximum speed of each.

	Speed	Time	Distance
Scooter	$x + 10$	3	$3(x + 10)$
Bicycle	x	$5\frac{1}{2}$	$5\frac{1}{2}x$

$$3(x + 10) + 5\frac{1}{2}x \le 285$$

$$3x + 30 + 5\frac{1}{2}x \le 285$$

$$8\frac{1}{2}x + 30 \le 285$$

$$8\frac{1}{2}x + 30 - 30 \le 285 - 30$$

$$8\frac{1}{2}x \le 255$$

$$\frac{17}{2}x \le 255$$

$$\left(\frac{2}{17}\right)\left(\frac{17}{2}x\right) \le (255)\left(\frac{2}{17}\right)$$

$$x \le 30$$

The maximum speed the bicycle traveled was 30 miles per hour, and the maximum speed the scooter traveled was 40 miles per hour.