2009 Q6

6. Steve's empty swimming pool will hold 24,000 gallons of water when full. It will be filled by 4 hoses, each of which supplies 2.5 gallons of water per minute. How many hours will it take to fill Steve's pool?

(A) 40 **(B)** 42 **(C)** 44 **(D)** 46 **(E)** 48

6. **Answer (A):** Together the hoses supply 10 gallons per minute to the pool. The pool holds 24,000 gallons, so it will take a total of $\frac{24{,}000 \text{ gallons}}{10 \text{ gallons/minute}} = 2400$ minutes. Because 2400 minutes equals 40 hours, it takes 40 hours to fill Steve's pool.

OR

The hoses supply (10 gallons/minute)(60 minutes/hour) = 600 gallons/hour. So it will take $\frac{24{,}000 \text{ gallons}}{600 \text{ gallons/hour}} = 40$ hours to fill Steve's pool.

2013 Q7

7. Trey and his mom stopped at a railroad crossing to let a train pass. As the train began to pass, Trey counted 6 cars in the first 10 seconds. It took the train 2 minutes and 45 seconds to clear the crossing at a constant speed. Which of the following was the most likely number of cars in the train?

(A) 60 **(B)** 80 **(C)** 100 **(D)** 120 **(E)** 140

7. **Answer (C):** Because Trey counted 6 cars in 10 seconds, close to $6 \cdot 6 = 36$ cars passed in $10 \cdot 6 = 60$ seconds or 1 minute. In 2 minutes 45 seconds, about $2 \cdot 36 + \frac{45}{60}(36) = 72 + \frac{3}{4}(36) = 72 + 27 = 99$ cars passed, so there were approximately 100 cars in the train.

OR

Two minutes and 45 seconds is $2(60) + 45 = 165$ seconds. Let N be the number of cars, and set up a proportion:

$$\frac{6}{10} = \frac{N}{165}$$

Solving gives $10N = 6(165) = 990$, so $N = 99$. Approximately 100 train cars passed.

1993 Q8

8. To control her blood pressure, Jill's grandmother takes one half of a pill every other day. If one supply of medicine contains 60 pills, then the supply of medicine will last approximately

(A) 1 month (B) 4 months (C) 6 months
(D) 8 months (E) 1 year

8. **(D)** Since she takes one half of a pill every other day, one pill will last 4 days. Hence 60 pills will last $60 \times 4 = 240$ days, or about 8 months.

1998 Q8

8. A child's wading pool contains 200 gallons of water. If water evaporates at the rate of 0.5 gallons per day and no other water is added or removed, how many gallons of water will be in the pool after 30 days?

(A) 140 (B) 170 (C) 185 (D) 198.5 (E) 199.85

8. **Answer (C):** $200\text{gallons} - 0.5(30)\text{gallons} = 200\text{gallons} - 15\text{gallons} = 185\text{gallons}$.

2010 Q8

8. As Emily is riding her bicycle on a long straight road, she spots Emerson skating in the same direction 1/2 mile in front of her. After she passes him, she can see him in her rear view mirror until he is 1/2 mile behind her. Emily rides at a constant rate of 12 miles per hour, and Emerson skates at a constant rate of 8 miles per hour. For how many minutes can Emily see Emerson?

(A) 6 **(B)** 8 **(C)** 12 **(D)** 15 **(E)** 16

8. **Answer (D):** Emily gains on Emerson at the rate of $12 - 8 = 4$ miles per hour. To get from $\frac{1}{2}$ mile behind Emerson to $\frac{1}{2}$ mile in front of him, she must gain 1 mile on him. This takes $\frac{1}{4}$ hour, which is 15 minutes.

OR

Make a chart that shows the position of Emily and Emerson every 5 minutes. Note that for every 5 minutes Emily rides $\frac{12}{60}$ miles per minute $\times$ 5 minutes $= 1$ mile, and Emerson skates $\frac{8}{12}$ mile. Eventually, Emily will be $\frac{1}{2}$ mile ahead of Emerson. Notice that happens after 15 minutes.

Time (minutes)	0	5	10	15
Emily's Distance (miles)	0	1	2	3
Emerson's Distance (miles)	$\frac{1}{2}$	$1\frac{1}{6}$	$1\frac{5}{6}$	$2\frac{1}{2}$

2005 Q8

8. Suppose m and n are positive odd integers. Which of the following must also be an odd integer?

(A) $m + 3n$ **(B)** $3m - n$ **(C)** $3m^2 + 3n^2$ **(D)** $(nm + 3)^2$ **(E)** $3mn$

8. **(E)**

To check the possible answers, choose the easiest odd numbers for m and n. If $m = n = 1$, then

$$m + 3n = 4, \quad 3m - n = 2, \quad 3m^2 + 3n^2 = 6, \quad (mn + 3)^2 = 16 \text{ and } 3mn = 3.$$

This shows that (A), (B), (C) and (D) can be even when m and n are odd. On the other hand, because the product of odd integers is always odd, $3mn$ is always odd if m and n are odd.

Questions: Which of the expressions are always even if m and n are odd? What are the possibilities if m and n are both even? If one is even and the other odd?

2011 Q8

8. Bag A contains three chips labeled 1, 3, and 5. Bag B contains three chips labeled 2, 4, and 6. If one chip is drawn from each bag, how many different values are possible for the sum of the two numbers on the chips?

(A) 4 **(B)** 5 **(C)** 6 **(D)** 7 **(E)** 9

8. **Answer (B):** Make a table of possibilities.

+	1	3	5
2	3	5	7
4	5	7	9
6	7	9	11

The possible sums are 3, 5, 7, 9, and 11, for a total of 5 possibilities.