MATHCOUNTS® Problem of the Week Archive

National Dog Day! – August 24, 2020

Problems & Solutions

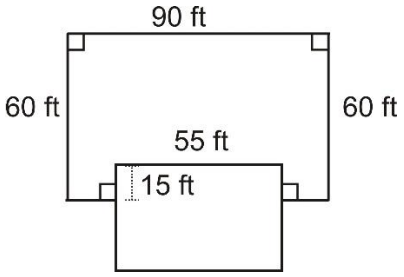
Olivia is planning to adopt a puppy on National Dog Day (August 26). The adoption fee at the local shelter is $150 plus a 4% tax. On her way to pick up the puppy, she stops at a store to buy a food dish, dog food, a water dish and a bed for her new pup that cost (before tax) $5, $10, $5 and $12, respectively. If these purchases have a 5% sales tax added to them at check out, how much does Olivia spend in total (after tax) on the adoption fees and supplies combined?

*The adoption fee at the shelter, including tax, would be $150(1.04) = $156. The supplies Olivia bought at the store, including tax, would be ($5 + $10 + $5 + $12)(1.05) = $33.60. Thus, in total, Olivia spends $156 + $33.60 = $**189.60**.*

Gavin's dog had a litter of puppies. All of the puppies in this litter were either yellow or black. If there was one less black puppy, the ratio of yellow puppies to black puppies would be 2/3. If there was one more black puppy, the ratio of yellow puppies to black puppies would be 1/2. How many puppies were in the litter?

*We can express "with one less black puppy, the ratio of yellow puppies to black puppies would be 2/3" as $y/(b-1) = 2/3 \rightarrow 3y = 2b - 2$. We can express "with one more black puppy, the ratio of yellow puppies to black puppies would be 1/2" as $y/(b+1) = 1/2 \rightarrow 2y = b + 1 \rightarrow b = 2y - 1$. Using substitution, we get that $3y = 2(2y - 1) - 2$. Now, we can solve for y: $3y = 4y - 2 - 2 \rightarrow -1y = -4 \rightarrow y = 4$. Now, we can plug in the value of y to find the value of b: $3(4) = 2b - 2 \rightarrow 12 = 2b - 2 \rightarrow 14 = 2b \rightarrow b = 7$. Thus, the total number of puppies in the litter was 4 + 7 = **11**.*

Jermaine's back yard measures 60 feet by 90 feet and is fenced in, as shown in the diagram, so that his dog can run around and play. His house is rectangular. How many square feet does Jermaine's dog have in which to play?



*If the fence were an enclosed rectangle, we could find its area by taking 90 × 60 to get 5400 square feet. However, we must take into account the portion of the house that overlaps with the yard, which has an area of 55 × 15 = 825 square feet. So, Jermaine's dog has 5400 – 825 = **4575** square feet in which to play.*

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