

Unit 5 Math Practice

1. A vegetable farmer wishes to switch to a combination of trees and vegetables (agroforestry) on several hectares of her land to reduce erosion and to diversify what she grows. She needs to assess whether her land can produce as much income by growing two crops instead of one. The farmer estimates that the new tree crop would cover 40 percent of her fields, with the vegetable crop covering the other 60 percent. Which equation should she use to calculate how much total income she would get from using the new two-crop plan?

(A) $\left(\frac{\$ \text{ income trees}}{ha} \times 0.4\right) + \left(\frac{\$ \text{ income veg}}{ha} \times 0.6\right) = \text{agroforestry income}$

(B) $\left(\frac{\$ \text{ income trees}}{ha} \times total\ ha \times 0.6\right) + \left(\frac{\$ \text{ income veg}}{ha} \times total\ ha \times 0.4\right) = \text{agroforestry income}$

(C) $(\$ \text{ income veg } \times 0.4) + (\$ \text{ income trees } \times 0.6) = \text{agroforestry income}$

(D) $\left(\frac{\$ \text{ income trees}}{ha} \times total\ ha \times 0.4\right) + \left(\frac{\$ \text{ income veg}}{ha} \times total\ ha \times 0.6\right) = \text{agroforestry income}$ ✓

(E) $Total\ income\ from\ old\ crop \times 0.4 = \text{agroforestry income}$

2. In a rural region of India, scientists collected data of different pesticide residue levels from closely located farming plots. Some of these plots used integrated pest management biopesticides, while others used chemical pesticides to control pests. The data below show levels of four pesticide residues found in tomato and cucumber crops in the two treatment plots.

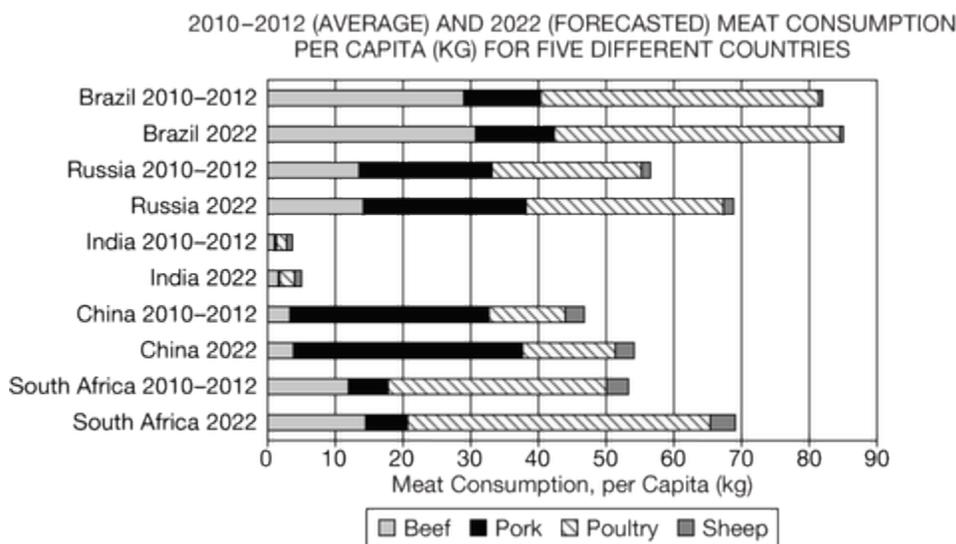
Crop	Treatment	Residue Level ($\frac{mg}{kg}$)			
		Monocrotophos	Chlorpyrifos	Endosulfan	Cypermethrin
Tomato	Integrated pest management	0.005	0.034	0.012	0.023
Tomato	Pesticides	0.005	0.041	0.101	0.028
Cucumber	Integrated pest management	0.004	0.011	0.011	0.009
Cucumber	Pesticides	0.005	0.026	0.026	0.012

Which of the following statements is best supported by the data in the table?

- (A) Crops grown using integrated pest management have higher levels of all pesticides in cucumbers but do not have higher levels in tomatoes.
- (B) Crops grown using integrated pest management had lower levels of monocrotophos measured in both tomatoes and cucumbers.
- (C) The greatest effect of integrated pest management was seen in lower levels of endosulfan in both tomatoes and cucumbers. ✓
- (D) Integrated pest management resulted in substantially higher levels of all four pesticides in tomatoes.

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3. The harvesting of livestock for meat consumption affects the planet in various ways. Approximately 25% of the land area on Earth is used for raising livestock. One-third of all water used in meat production goes toward producing beef, and the demand for beef is projected to increase by 95% by 2050. The graph below shows the average meat consumption per capita from 2010 to 2012 and the forecasted meat consumption for 2022 for five different countries.

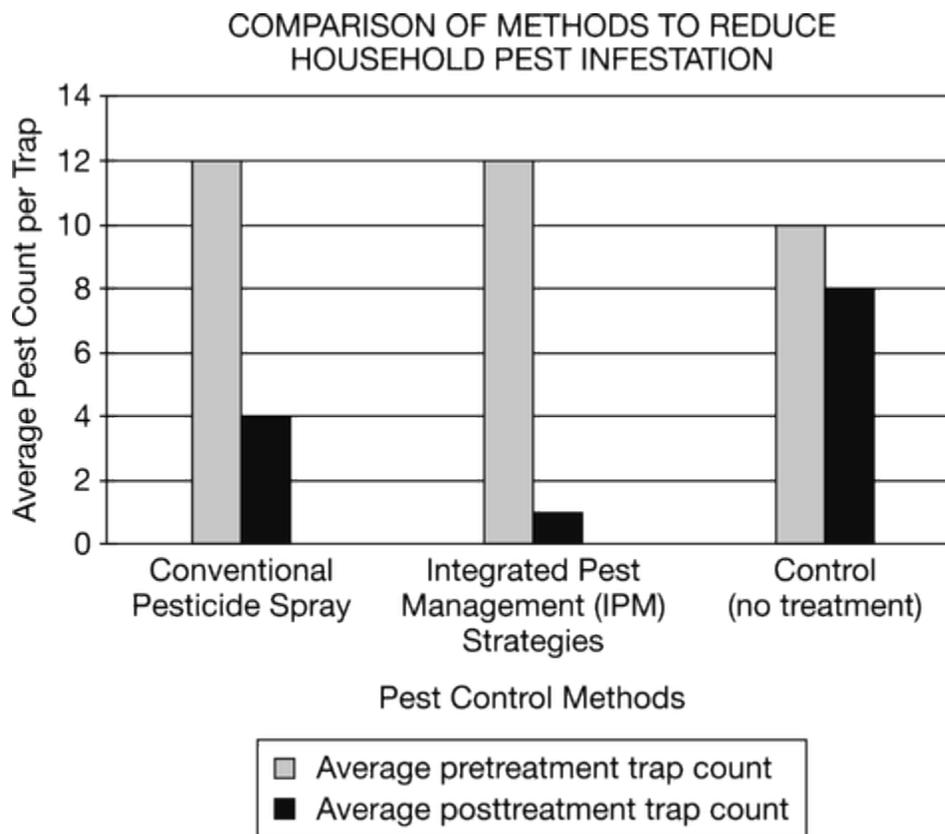


Which of the following claims is best supported by the data in the graph?

- (A) As the demand for chicken increases and the demand for beef decreases, changes in meat production will decrease the demand on global water supplies.
- (B) Meat consumption per capita will decrease in India between 2012 and 2022 because individuals in that country have a primarily vegetarian diet.
- (C) Global meat consumption per capita will increase in all five countries between 2012 and 2022 as the countries move through the demographic transition and become more developed. ✓
- (D) The use of growth hormones and antibiotics will allow for an increased yield in meat production in all five countries by 2022.

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4.



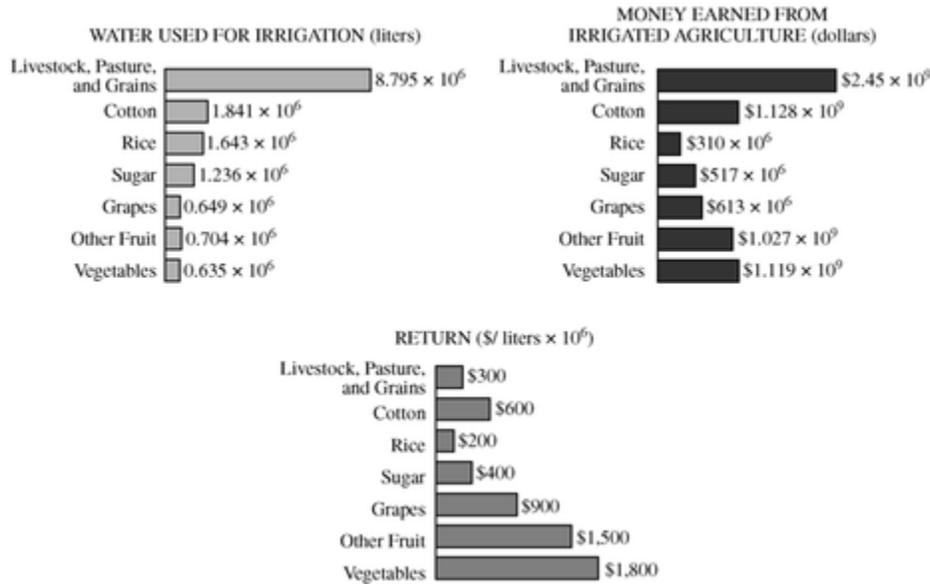
Scientists studied the effects of three different ways to control household pests. They treated one group of pests with a conventional pesticide spray. A second group was treated using Integrated Pest Management (IPM) techniques. A third group received no treatment method at all. The success of each treatment was measured based on the change in the number of pests in the traps over time. Fewer pests caught indicate fewer pests in the area after application of the technique. The results are shown in the graph above.

Which of the following claims would be the best solution to the pest problem, based on the data in the graph?

- (A) Use of conventional pesticides is the most successful method because the pesticides can be sprayed multiple times until the pest infestation is under control.
- (B) Use of Integrated Pest Management techniques is the most successful method because the sources for food, water, and shelter for pests are disrupted, leading to a reduced number of pests in the area. ✓
- (C) Use of the control treatment is the most successful method because insects have a short life span and will die off naturally.
- (D) Use of the three different treatments are equally effective in controlling pests because a variety of different methods can be successful at eliminating pests.

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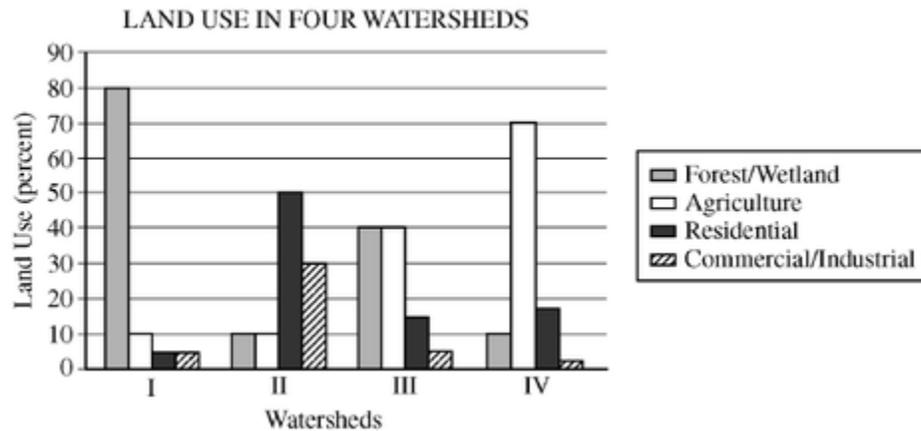
5.



Which of the following statements best explains the graphs above?

- (A) The price of cotton is high because cotton growing uses a lot of water.
- (B) Fruits and vegetables give the greatest monetary return per water usage. ✓
- (C) Raising cattle for consumption uses few resources.
- (D) The amount of livestock exceeds the amount of fruits and vegetables grown.
- (E) People consume more vegetables than they do rice.

6.

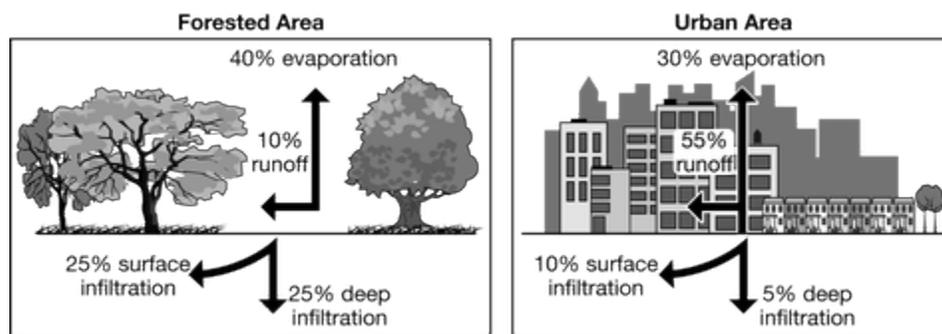


Based on the information shown in the graph, which of the following statements is most likely to be true?

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- (A) Streams in watershed I experience substantially more algal blooms than those in watershed IV.
- (B) When precipitation varies, streams in watershed II experience the greatest fluctuations in water volume. ✓
- (C) Watershed III has the highest percentage of impervious surfaces.
- (D) The water quality of streams in watershed IV is excellent because of the abundance of nutrients available to aquatic organisms.
- (E) Low dissolved oxygen is a severe problem in the streams in watershed I because of the inability of light to penetrate the forest canopy.
7. Corn can be grown at a rate of 1,000 kcal per hectare, and it takes 20 times more land to produce beef than it does to produce corn. Which of the following equations would correctly calculate the amount of land needed to produce 10,000 kcal of beef?
- (A) $10,000 \text{ kcal corn} \times \frac{20 \text{ ha}}{\text{kcal beef}} \times 100 \text{ ha}$
- (B) $\frac{1 \text{ ha}}{1,000 \text{ kcal corn}} \times \frac{20 \text{ kcal corn}}{1 \text{ kcal beef}} \times 10,000 \text{ kcal beef}$ ✓
- (C) $\frac{20 \text{ kcal beef}}{1 \text{ kcal corn}} \times \frac{10,000 \text{ kcal}}{10 \text{ ha}} \times \frac{20 \text{ beef}}{1 \text{ corn}}$
- (D) $\frac{20 \text{ ha}}{1,000 \text{ kcal beef}} \times \frac{1,000 \text{ kcal corn}}{1 \text{ ha}}$
- (E) $\frac{10 \text{ ha}}{10,000 \text{ kcal beef}} \times \frac{10,000 \text{ cal corn}}{1 \text{ ha}} \times \frac{1 \text{ ha corn}}{20 \text{ ha beef}}$
8. A family of five recently replaced its 5-gallon-per-minute showerheads with water-saving 2-gallon-per-minute showerheads. Each member of the family averages 8 minutes in the shower per day. In a 30-day period, how many fewer gallons of water will the family use with the new showerheads?
- (A) 60
- (B) 800
- (C) 2,400
- (D) 3,600 ✓
- (E) 7,200
9. The combustion of one gallon of automobile fuel produces about 5 pounds of carbon (in CO₂). Two autos are making a trip of 600 miles. The first auto gets 20 miles per gallon, and the second gets 30 miles per gallon. Approximately how much *less* carbon (in CO₂) will be produced by the second auto on this trip?
- (A) 300 lbs
- (B) 150 lbs
- (C) 100 lbs
- (D) 75 lbs
- (E) 50 lbs ✓

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10. Based on the diagrams above, what is the percent change in the amount of runoff in urban areas compared to forested areas?
- (A) 81% decrease
 (B) 60% decrease
 (C) 150% increase
 (D) 450% increase

11. The table below shows fish harvest data from United States commercial fisheries in 2011, 2012, and 2013.

	2011	2012	2013
Total Fish Landings	6.1 billion pounds	6.0 billion pounds	6.1 billion pounds
Bycatch	714.2 million pounds	601.7 million pounds	689.1 million pounds

Fish landings are defined as the total catch of marine fish that are brought into ports for sale. Bycatch refers to the unwanted fish and other marine organisms that are caught during commercial fishing operations, but are not harvested or sold. Which of the following methods would you use to calculate the percent of the total catch of all fish in 2012 that was bycatch?

- (A) $\frac{6.017 \times 10^8}{6 \times 10^9 + 6.017 \times 10^8}$
 (B) $\frac{6 \times 10^9}{6 \times 10^9 + 6.017 \times 10^8}$
 (C) $\frac{6.017 \times 10^8}{6 \times 10^9} \times 100$
 (D) $\frac{6.017 \times 10^8}{6 \times 10^9 + 6.017 \times 10^8} \times 100$