

6. The rate at which a river flows is one third the speed of a boat in still water. If that boat travels down that river for two hours and then back upriver for two hours, it will be 16 miles short of its starting point. What is the speed of the boat in still river?

(a) 4mph (b) 8mph (c) 12mph (d) 24mph (e) none of these

7. A cube is sliced up by planes parallel with its faces. How many planes do we use to slice if the total of the surface areas of the resulting pieces is twice the surface area of the original cube?

(a) 2 (b) 3 (c) 6 (d) 12 (e) none of these

8. The edges of a rectangular box are 2, 3, and 4. What is the length of the shortest path from one vertex to the opposite vertex on the surface of the box?

(a) $\sqrt{29}$ (b) $\sqrt{41}$ (c) $\sqrt{45}$ (d) $\sqrt{53}$ (e) none of these

9. A rectangular aquarium that is 6 feet long, 2 feet wide and 1 foot high is half-full of water. It is slowly tilted along one of the 6 foot edges until the water is just ready to spill out. How deep is the water at its deepest point when the water just starts to spill?

(a) $\frac{2}{\sqrt{5}}$ (b) $\sqrt{5}2$ (c) $\frac{1}{\sqrt{5}}$ (d) $\sqrt{5}$ (e) none of these

10. Peter, Quincy, Robert, Shawn, and Todd play the following game. Peter goes out of the room, and the other four decide on who will hide a ring. Two kids will tell three statements each to the entering Peter, of which two will be true, one will be a lie. Peter heard the following when he returned:

Quincy: "I don't have the ring."

"Robert has the ring."

"I have played this game many times."

Robert: "I don't have the ring."

"Quincy lied when he said that I have the ring."

"Shawn does not have the ring either."

Who is holding the ring?

(a) Quincy (b) Robert (c) Shawn (d) Todd (e) cannot be determined

11. Four friends; Alex, Bob, Carl, and Daniel would like to climb through a dark and narrow tunnel. They only have one lamp (necessary to be able to get through), and only two of the children can get in the tunnel together. Alex could get through in 1 minute, Bob in 2 minutes, Carl in 5 and Daniel in 6 minutes. At least how many minutes must the battery hold in their lamp for all of them to get through?

(a) 8 (b) 10 (c) 12 (d) 15 (e) none of these
12. Which of the following statements are true?

(i) The sum of two rational numbers must be rational.
(ii) The sum of two irrational numbers must be irrational.
(iii) The product of two rational numbers must be rational.
(iv) The product of two irrational numbers must be irrational.

(a) only (i) and (iii) (b) only (i) and (ii) (c) only (i), (ii) and (iii)
(d) all of them (e) none of them
13. What is the sum of the digits of the smallest positive integer that gives a remainder of 4 when divided by 5, a remainder of 5 when divided by 6, and a remainder of 6 when divided by 7?

(a) 3 (b) 7 (c) 11 (d) 15 (e) none of these
14. What is the probability that out of three friends, exactly two have the same birth month? (assume that the 12 birth months have equal probabilities).

(a) $\frac{11}{144}$ (b) $\frac{11}{24}$ (c) $\frac{11}{96}$ (d) $\frac{11}{48}$ (e) none of these
15. For any set S let $n(S)$ denote the number of elements in set S . If $n(A) = 80$, $n(B) = 60$, $n(C) = 90$, what is the maximum number of elements the set $(A \cup B) \cup (B \cap C)$ can have?

(a) 80 (b) 140 (c) 170 (d) 200 (e) 230