

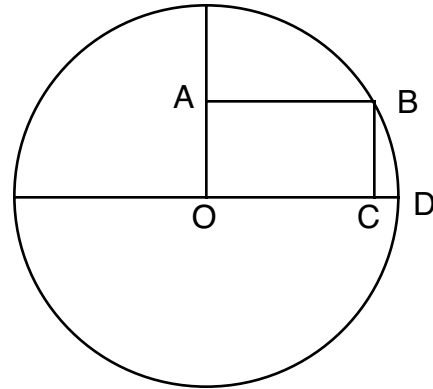
## PROBLEMS RELATING TO TOPICS IN MATHEMATICS

Each of these problems relates directly to some topic in general math, algebra, or geometry. Some of them relate to more than one area. Certain problems or questions relate to the calendar and to weights and measures, both of which I consider to be within the scope of several math courses.

1. A page of newspaper is about 0.003 inches thick. Suppose you placed a sheet of newspapers on the floor, then put a second sheet on top of the first, then two more sheets, then four, and so on, building up a pile of newspaper. Each time you add as many sheets as are already there. After the tenth time, you would have a pile about three inches high. After the fiftieth time, how high would the pile be?
2. Suppose you want to travel two miles at an average speed of sixty mph. If you average thirty mph for the first mile, how fast so tou have to go for the second mile?
3. As a class project, my geometry class was going to run a string around the Earth at the Equator. But one student observed that if the string was at ground level, very few people would notice it. So the class decided to stake the string at a height of 1 yard above the surface of the Earth. To do this, how much additional string would be needed? (Assume that the Earth is a sphere with diameter 8,000 miles.)
4. A single railroad track one mile long is laid over level ground. The ends are firmly secured so they cannot move. On a hot day the track expands a total of one inch over its entire length. But since the ends are secured, the track rises. Assuming that the rise of the track is linear with the highest point in the middle (forming two legs of an isosceles triangle with the ground being the base), how high above the ground will the middle of the track rise?
5. A farmer built a triangular pen for his chickens. The pen was made of wire mesh attached to posts imbedded in the ground. The posts were spaced at equal intervals. The wire mesh, of uniform width, was attached to the posts at equal heights above the ground. The farmer paid for the wire mesh using only ten dollar bills and received no change. He paid with a different number of ten dollar bills for the wire mesh along each side of the pen. The farmer made the following entry in a notebook:
  - Cost of mesh for side of pen facing barn - \$10.
  - Cost of mesh for side of pen facing pond - \$20.
  - Cost of mesh for side of pen facing house - \$30.Exactly one of the three costs in his entry was incorrect. Which one and what should it have been?

6. A man was born in 30 B.C. How old was he on his birthday in 30 A.D.?
7. Which is heavier: a pound of feathers or a pound of gold?
8. A man is walking on a railroad bridge which goes from point A to point B. He is three-eighths of the way across the bridge when he hears a train approaching from behind. The train is going sixty miles per hour. If he runs toward A, he will meet the train there. If he runs toward B, he will meet the train there. How fast can he run?

9. In the figure, O is the center of the circle and AB is parallel to OD. AO and BC are perpendicular to OD. OC is 5 units long and CD is 1 unit long. Find the length of AC.



10. One side of an isosceles triangle is 5 inches and another side is 12 inches. Find the third side.
11. You have a two pan balance scale for your business and you must be able to weigh all units from one to forty. A salesman is willing to sell you weights in any size you wish for only \$100 per weight. To keep costs down you want to buy as few weights as possible. What is the smallest number of weights you can buy and how many units is each weight?
12. A fly is in an oblong room that is thirty feet long, twelve feet wide and twelve feet high. He is perched on an end wall one foot from the ceiling and six feet from each side wall. He wishes to proceed to a point on the other end wall one foot from the floor and six feet from each side wall. Assuming the fly walks along the shortest path, how far must he walk to get to his destination?

The questions which appear below require special factual knowledge. Two of these can easily be looked up. The third question is one which you would only know about if you had seen it or were told about it.

13. When George Washington was born, what was the date?
14. How many days in February in the year 2000? in the year 2100?
15. Where would you find examples of a regular quadrilateral, pentagon, hexagon, and octagon? Where would you find a structure in the shape of a regular nonagon?

