

Mathematics and Statistics Awareness Month Problems

Middle School Problems

A1. Two different circles overlap. The area of the overlapping region is $\frac{1}{2}$ of the area of the smaller circle and is $\frac{1}{6}$ of the sum of the area of the larger circle plus the area of the smaller circle.

What is the ratio of the area of the smaller circle to the larger circle?

A2. James needs 51 cents to buy a chocolate bar, while Steven needs 45 cents to buy it. Together they can buy one chocolate bar with 2 cents remaining.

How much money does Steven have?

A3. Erik has a bag of 58 balls, some are red and the rest are white. He removes some of the balls from the bag and notices that he removed 6 times more white balls than red. He observes that of the balls remaining in the bag, there are 5 times more red balls than white.

How many balls did he remove from the bag and how many were red?

A4. A school has fewer than 200 students.

When they line up in rows of 4 there is 1 extra student.

When they line up in rows of 5 there are 2 extra students.

When they line up in rows of 6 there are 3 extra students.

How many students could there be in the school?

A5. (a) Adam has a five-digit number * * * * *

When he places a 1 at the end of this number it becomes a six-digit number three times as large as the number he obtains when he places a 1 at the start.

Find the five-digit number.

(b) If you added a 1 in the same way to a 3-digit number how many times as large would it have to be?

A6. Charles and Tom are on a camping holiday and, at their campsite, they make friends with Florence. They ask her when her birthday is but, being a bit of a joker, Florence tells them only that it is one of the following dates.

May 14, May 15, May 18, June 16, June 19,

July 12, July 15, August 12, August 14, August 16.

She then tells Charles the month of her birthday, but not the day in the month, while she tells Tom the day in the month, but not the month. Immediately, Charles declares “Well, Tom certainly cannot know for sure when Florence’s birthday is” to which Tom replies “Ah, but now I do.” “And now I know when it is as well,” comes back Charles.

When is Florence’s birthday? Explain your reasoning.

A7. The pages of George's book are numbered from 1. The page numbers have a total of 555 digits.

How many pages does the book have?

How many of the digits are a 5?

A8. Peter is walking through a train tunnel when he hears a train approaching. He knows that on this section of track trains travel at 60 mph. The tunnel has equally spaced marker posts, with post 0 at one end and post 12 at the other end. Peter is by post 7 when he hears the train. He quickly works out that whether he runs to the nearer end or the further end of the tunnel as fast as he can (at constant speed) he will just exit the tunnel before the train reaches him.

How fast can Peter run?

A9. There is a bag with marbles in it. Here are some statements about the bag.

(a) There is a blue marble in the bag.

(b) There is a red marble and a blue marble in the bag.

(c) There is a red marble and a blue marble and a green marble in the bag.

(d) There is a red marble in the bag.

Is it possible that exactly two of these statements are true?

A10. Note that $654/545 = 6/5$, so that one can "cancel" the 54 in the numerator and denominator of $654/545$ without changing the value of the fraction. Now consider the fraction $6545454 \cdots 54/545454 \cdots 545$, where there are n copies of 54 following the digit 6 of the numerator, and the same number n of copies of 54 preceding the final digit 5 of the denominator.

Prove that this fraction is equal to $6/5$ for every positive integer n .