Oklahoma School of Science and Mathematics
Sixth Annual Middle School Mathematics Contest
Round One, Spring, 2008

Explanation of Answers

1. By substituting 4 for x, we get $3(4) - 6 = 12 - 6 = 6$.

2. We must use the correct order of operations, doing the division first.

$$\frac{3}{4}+\left(\frac{18}{5}\div\frac{9}{25}\right)$$

$$\frac{3}{4}+\left(\frac{18}{5}\times\frac{25}{9}\right)$$

$$\frac{3}{4}+\left(\frac{2}{1}\times\frac{5}{1}\right)$$

$$\frac{3}{4}+\frac{10}{1}=\frac{3}{4}+\frac{40}{4}=\frac{43}{4}$$

3. The original area is $3 \times 5 = 15$ sq in. When both sides are doubled, the new area is $6 \times 10 = 60$ sq in. So we must multiply 15 by 4 to get 60.

4. $6.023 \times 10^{23} = 602{,}300{,}000{,}000{,}000{,}000{,}000{,}000$ which has 24 digits. There will be 23 digits to the right of where the decimal originally is plus the one digit that is to the left of the decimal originally.

5. Parking for 4 days would cost $4 \times 8 = \$32$. A 20% discount means he would pay 80% of the normal cost. $32 \times .80 = \$25.60$.

6. The 2 hour drive plus the 45 minute stop means the trip will take $2 \times 60 + 45$ minutes or $120 + 45 = 165$ minutes.

7. She has a total of $3 + 5 + 7 = 15$ marbles. The probability of drawing a green marble is 3 greens out of 15 total. $\frac{3}{15}=\frac{1}{5}$.

8. The average grade equals the total points divided by the number of tests.

$$87=\frac{95+98+72+80+x}{5}$$

$$87\times 5 = 345 + x$$

$435 - 345 = x$ $\quad 90 = x$ the score on the last test.

9. The ratio of flour to butter is $\frac{1\frac{1}{2}}{2}=\frac{\frac{3}{2}}{2}=\frac{3}{2}\cdot\frac{1}{2}=\frac{3}{4}$. Using a proportion,

$$\frac{3}{4}=\frac{f}{\frac{3}{7}}\Rightarrow\frac{3}{4}\cdot\frac{2}{7}=f\Rightarrow\frac{3}{14}=f$$

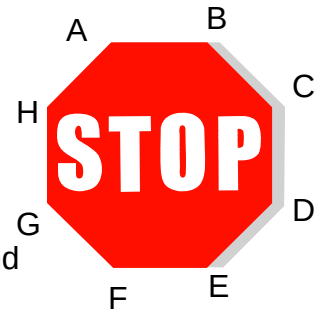
10. 2008 = 2^3 x 251. Since 2 is prime, the smallest prime factor is 2.

11. There are 9 1x1 squares, 4 2 x 2 squares, and 1 3 x 3 square. A total of 14 squares.

12. If we list the first 10 terms and add them together, $1+(-1)+(-3)+(-5)+(-7)+(-9)+(-11)+(-13)+(-15)+(-17)=-80$ we can find the answer. In general, we can say that the sum will be the first term plus the last term divided by two times the number of terms.

13. First, find the total amount of fat. 2(.01) + 3(.02) = .08 gal of fat. Then find what percent that is of the total volume. (.08) / 5 = .016 or 1.6%.

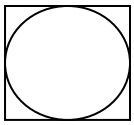
14. There is only one line of symmetry. ⇳



15. Starting at A, we can draw AC, AD, AE, AF, and AG. From B we can draw BD, BE, BF, BG, and BH. From C we draw CE, CF, CG, and CH. We can draw CA, but it is the same as AC. From D, we draw DF, DG, and DH. From E, we get EG and EH. From F we have FH. That gives a total of 20 diagonals.

16. The LCM of 12 and 18 is 36. The GCD is 6. 36 + 6 = 42.

17. If we consider the circle to have radius 1, the square will have side 2. The area of the circle is π and the area of the square is 4. The percent of the area of the square that the circle covers is $\frac{\pi}{4}\approx .785398$. So the part that is not covered is 1 - .7854 = .2146 or 21.5%.



18. Since the absolute value makes all values of the expression non-negative (zero or greater), the smallest possible value would be zero. The zeros are 0 and $12/7$. The only integer value that makes the expression 0 is 0. $(7x^2-12x)=(x)(7x-12)$

19. If all the letters were different, there would be 7! ways to write them. Since there are 2 O's, we need to divide 7! by 2! or 2. $\frac{7!}{2!}=\frac{7\cdot6\cdot5\cdot4\cdot3\cdot2\cdot1}{2\cdot1}=2520$.

20. The triangle formed has a base of 4 units and a height of 1.5 units. The area of the triangle is $\frac{1}{2}(4)(1.5)=3$.