## Mini Mathletes 2018 - Ciphering Solution Key

## 1 Solutions

- 1. **486** We have A = 243 + 123 and B = 243 123 so A + B = (243 + 123) + (243 123) = 243 + 243 = 486.
- 2. **195** Grace starts with 1030 dollars, spends 650 dollars, gains 25 dollars, and spends 210 dollars so the total amount of money she has left is 1030 650 + 25 210 = 195 dollars.
- 3.  $\begin{bmatrix} \frac{1}{6} \end{bmatrix}$  If you roll the one dice first, then there is a  $\frac{1}{6}$  chance that the second dice will be the same number as the first dice so the probability that the two dice show the same number is  $\frac{1}{6}$ .
- 4. **16** If it takes her 1 hour to type 5 pages, it takes her  $\frac{60}{5} = 12$  hours to type 60 pages. After she is done typing, she then prints the pages. If her printer takes 1 hour to print 20 pages, it takes her  $\frac{60}{20} = 3$  hours to print 60 pages. After that, she tapes the papers into pairs. There are  $\frac{60}{2} = 30$  pairs of papers and it takes her 2 minutes to tape each pair. Then it takes her  $30 \cdot 2 = 60$  minutes or 1 hour to tape all 30 pairs. Therefore, the total number of hours it will take her to type, print, and tape is 12 + 3 + 1 = 16.
- 5. **30** If 32 kids take Algebra, then 50 32 = 18 kids take only Geometry. Since 12 kids take Algebra and Geometry, the total number of kids who take at least Geometry is 18 + 12 = 30.
- 6. [1350] From 1 : 00 PM to 2 : 30 PM, 90 minutes pass by so at 2 : 30 PM, the red balloon has volume  $90 \times 25$  cubic inches and the blue balloon has volume  $90 \times 10$  cubic inches. Therefore, the difference in the volume of the two balloons is  $90 \times 25 90 \times 10 = 90 \times 15 = 1350$  cubic inches.
- 7. **3** The two middle values of the data set are 8 and 10 so the median of the data set is  $\frac{1}{2} \cdot (8+10) = 9$ . The mean of the data set is  $\frac{1}{4} \cdot (10+25+8+5) = 12$  so the difference between the mean and median is 12 9 = 3.
- 8. **5** From the first equation 3A = 36 so A = 12. From the second equation 12 + 2B = 32 so B = 10. And finally, from the third equation, 12 + 10 C = 17 so C = 5.
- 9. **16** Each of the four cookies can go in either the red jar or the blue jar so the number of ways to distribute all four cookies among the two jars is  $2 \times 2 \times 2 \times 2 = 16$ .
- 10.  $\boxed{40 + 4\pi}$  The area of a semi-circle is half the area of a square or  $\frac{1}{2} \cdot \pi r^2$  where r is the radius. The radius of the semi-circle in the window is  $\frac{1}{2} \times 8 = 4$  so the area of the entire window is the area of the square plus the area of the semi-circle or  $8 \times 8 + \frac{1}{2} \cdot 4^2\pi = 64 + 8\pi$ . The edge of the window consists of three sides of a square and the curved part of the semi-circle. The perimeter of the curved part of a semi-circle is half the perimeter of a circle or  $\frac{1}{2} \cdot 2\pi r = \pi r$  so the perimeter of the window is  $8 \times 3 + 4\pi = 24 + 4\pi$ . Therefore, the numeral difference of the window's area and perimeter is  $(64 + 8\pi) - (24 + 4\pi) = 40 + 4\pi$ .