SAMO Grade 8 First Round 2014 - Solutions

1. **A** Since the numerator is a multiple of 0, it is zero, and thus the whole fraction is zero.

2. **D** The bottom right cell must contain 2, so that the bottom row has sum 15. Then the diagonal shows $x + 5 + 2 = 15$, so $x = 8$

3. **E** $360 \times 20 - 24 \times 300 = 3 \times 12 \times 10 \times 2 \times 10 - 2 \times 12 \times 3 \times 100$
$= 2.3.12.100 - 2.3.12.100$, so the difference is zero

4. **E** To achieve the symmetry we have to shade four more squares, and so a total of 9 squares will be shaded, or 7 unshaded.

5. **C** The triangle is isosceles, so its vertical angle must be $180° - 2 \times 65° = 50°$.
x is what remains of a complete revolution once we subtract this 50° and also two right angles, and is thus $360° - 50° - 180° = 130°$

6. **C** The values are A: 2 + 0, B: 0 + 4, C: 0 + 1+ 4, D: 2 + 0 + 4, E: 2 + 0 + 4 so only C is odd

7. **A** $42 = 2 \times 3 \times 7$, and $2 + 3 + 7 = 12$

8. **A** The numbers at the right-hand ends of rows are the perfect squares. That means that 49 appears at the end of one row, and 64 at the end of the next. The 49 is above the last but one number in the next row, which is $64 - 1 = 63$

9. **C** The value is $5^2 - 6 = 25 - 6 = 19$

10. **E** The number of blocks in Pattern 1 is 5, in Pattern 2 is 7, and so on, with each pattern containing two more blocks than the previous one. This leads to a formula 2P + 3 for the number of blocks in Pattern P, and thus $2 \times 10 + 3 = 23$ blocks in Pattern 10.

11. **D** There are two triangles of equal area $\frac{1}{2}(4)(8)$. Their combined area is therefore 32 with a common overlap of $\frac{1}{2}(4)(4) = 8$. So the area of the shaded region is equal to $32 - 8 = 24$

12. **D** For his average over five weeks to be 60 km he needs to have run a total of $5 \times 60 = 300$ km. The graph shows that he ran $20 + 60 + 100 + 40 = 220$ km in the first four weeks, and so he must run $300 - 220 = 80$ km in the fifth week.

13. **D** With each die having six possible results, there are $6 \times 6 \times 6$ results for the three dice in combination. There are only 6 ways in which the dice can all show the same number, so the required probability is $\frac{6}{6 \times 6 \times 6} = \frac{1}{36}$

14. **B** The shaded triangle is half of a rectangle of length 10 – 2 = 8 cm, and since its area is 12 cm^2, its width must be w where $\frac{1}{2}w \times 8 = 12$ and so w = 3 cm. Now the whole rectangle has this width and length 10 cm, so its area is $3 \times 10 = 30$ cm^2.

15. **E** The new shape still has all the edges from the original cube, and another three formed at each of the corners. Originally the cube had 12 edges and 8 vertices, so it now has $12 + 8 \times 3 = 36$ edges.

16. **C** Because they have the same base, the heights of the rectangles with areas 12 and 21 must be in the ratio of their areas, which is 21/12 = 7/4. This is also the ratio of the heights of the other two rectangles, and because these also share a base, that must be the ratio of their areas. Thus the fourth rectangle has area $20 \times 7/4 = 35$

17. **E** $\sqrt{(9)^{\sqrt{4}} \times \left(\sqrt{9}\right)^4} = \sqrt{9^2 \times 3^4} = 9 \times 3^2 = 81$

18. **B** ΔADQ and ΔABP are each $\frac{1}{4}$ the area of ABCD, and ΔPCQ is $\frac{1}{8}$ of the area of ABCD.
So $\Delta APQ = 1 - \frac{1}{4} - \frac{1}{4} - \frac{1}{8} = \frac{3}{8}$ of the area of ABCD = $\frac{3}{8}$ of 72 cm^2 = 27 cm^2

19. **B** If the height of each rectangle is $4h$ and the width of each is h, then the perimeter of each is $2(4h + h) = 10h$. But this is given as 20, so h = 2. Then the square has side of length $4h$ = 8, and therefore a perimeter of $4 \times 8 = 32$ units.

20. **A** BC : CD = 9 : 5 = $9k$: $5k$ while AB : BC = 1 : 3 = $3k$: $9k$.
Then AB : BD = $3k$: $(9k + 5k)$ = 3 : 14