2006 Thunder Bay High School Mathematics Competition

Senior Individual Answers

For complete solutions to any of the problems or for discussions of any of the problems, email ryanholm72@hotmail.com.

Note to markers: For the full solution questions students are expected to provide much more detail than I have here to receive full marks; this is just a reference sheet.

Note to students: The solutions provided here are only *sketch solutions*. Steps have been omitted and the solutions are meant to guide any student who has made a valiant attempt at solving the problem.

Multiple Choice:

1. B
2. D
3. C
4. C
5. B
6. C
7. A
8. B
9. B
10. A
11. E
12. B
13. A
14. C
15. E

Full Solution (Answers and sketch solutions):

1. \$320. Let x be the amount of his paycheque. Then he gives x/2 to his brother and x/8 to his parents. Hence, we have x/2 + x/8 = \$200. Solving gives x = \$320.

2. 20. These can easily be systematically listed OR the number must start and end with the same digit. Hence it must start or end with 1 or 2. For each of these, any digit may occupy the middle position. Hence, there are $2 \times 10 = 20$ such positive integers.

3. 666. If his notes had 99 pages he would need $9 + 2 \times 90 = 189$ pages. If his notes had 999 pages he would need $9 + 2 \times 90 + 3 \times 900 = 2889$ pages. Hence, the number of pages has three digits. If x is the number of pages, then $189 + 3(x - 99) = 1890$ which gives $x = 666$.

4. $\frac{9}{4}$. Since the ABC is an acute triangle, triangles ABE and CBD are similar. Hence, BC/AB=DC/AE and this gives us that BC = $\frac{15}{4}$ by substituting in known values. Now using the Pythagorean Theorem on triangle CBD we get that DB = $\frac{9}{4}$.

5. 4. Let W, H, I, and S denote *whatsis*, *whosis*, *is*, and *so*, respectively. From the first assertion we have that H = I and IS = 2S imply W = S. Now if IS = 2S, we must have that
   I = H = 2 imply that W = S (1)
   So if H = S, $2S = S^2$, and I = 2, we must have that S = 2 (since $2S = S^2$) and so H = I = S = 2. So by (1), W = S and thus HW = 4.