

Instructions: Answer each question, and explain your answer. An answer alone is not enough for full credit. Your explanation must be clear and show how to get the answer. Each problem is worth 5 points, for a total of 30 points. Do not put your answers on the quiz handout; use additional sheets of paper.

[1] The UPC code on a can of Alpo dog food is 0 11132 00361 "?". What should the check digit be? (Remember: the UPC code is such that when you add every other digit starting with the first, triple the result and then add the remaining digits, you get an even multiple of 10.)

0 1 1 1 3 2 0 0 3 6 1 x

$$(0 + 1 + 3 + 0 + 3 + 1)3 + (1 + 1 + 2 + 0 + 6 + x) = 24*3 + 10 + x = 34 + x$$

For this to be a multiple of 10 we need $x = 6$.

[2] (a) Determine the remainder when 145 is divided by 17.

$$145 / 17 = 8.52 \text{ rounds down to } 8 \text{ and } 145 - 17*8 = \text{remainder} = 9.$$

(b) Determine the remainder when -145 is divided by 18.

$$-145 / 18 = -8.05 \text{ rounds down to } -9 \text{ and } -145 - 18*(-9) = \text{remainder} = 17.$$

[3] The Postnet bar code shown here has a single error in which either one vertical bar which should be long is short or vice versa:



Express the correct zip code in ordinary characters. (Remember: the outside bars are framing bars which you ignore; also, the digit Postnet bar codes are as follows:

1: ...|| 2: ..|. 3: ..|| 4: ..|. 5: ..|. 6: ..|| 7: |... 8: |... 9: |... 0: ||..

Moreover, the digits in a valid Postnet code must sum to an even multiple of 10.)

||... ..|. ...|| ..|| |... ..|. ..||... |... |... ||...
0 2 1 3 9 4 ? 0 7 1

The sum of the digits is $27 + ?$, so to get a multiple of 10 we need $?$ to be 3.

[4] What is n for a regular n -gon if the sum of the measures of all but one of the n vertex angles is 3795 degrees?

$((n-2)180/n)$ is a single vertex angle so $((n-2)180/n)*(n-1) = 3795$.

Thus $(n-2)((n-1)/n) = 3795/180 = 21.08$. But $(n-1)/n$ is close to but a little less than 1, so $(n-2)((n-1)/n) = 21.08$ is close to but a little less than $n-2$; i.e., $n-2 > 21.08$. Thus n is at least 24. Now start checking: $n=24$, $n=25$, etc. Plugging $n=24$ into $((n-2)180/n)*(n-1)$ gives $((24-2)180/24)*(24-1) = 3795$, so $n = 24$ works.

[5] Show how to tile the plane with the shaded quadrilateral:

Do this with a drawing in which the given polygonal tile is surrounded by 8 additional tiles, one for each vertex and side. (Use a separate piece of paper, tracing the given tile by placing the paper over it, and sliding the paper to a new position and tracing again, etc.)



