QUESTION DEPARTMENT.

1. I sent 20 cents for 20 pencils, the prices being 4 cents each, 2 for a cent, and 4 for a cent. How many of each kind will I receive?

Let x=No. of pencils at 4 cents each.

y= " " $\frac{1}{2}$ " "

z= " " $\frac{1}{4}$ " "

$$\text{Then } 4x+\tfrac{1}{2}y+\tfrac{1}{4}z=20 \quad (1)$$

$$\text{But } x+y+z=20 \quad (2)$$

$$\text{Then } 4x+4y+4z=80 \quad (3)$$

$$\text{Subtract (3)}-\text{(1) } 3\tfrac{1}{2}y+3\tfrac{3}{4}z=60 \quad (4)$$

$$14y+15z=240 \quad (5)$$

This is an indeterminate equation and may be easily solved by the usual methods for such equations; or by inspection thus: Assume $z=1$, then y must be equal to $16\frac{1}{2}$, which does not answer the conditions. Again, assume $z=2$, then y must be equal to 15 and $x=3$. These numbers fulfil all the conditions and are therefore the numbers required.

2. A and B start to walk from a given point. A walks uniformly 18 miles per day. After 9 days he turns and goes back as far as B has walked during those 9 days; then he turns and pursues his journey, overtaking B $22\frac{1}{2}$ days from the start. At what rate did B travel?

Let x=miles per day travelled by B.

Let a line M N R T represent the distance travelled by B, and NR the part of the road over which A

M N R T

travelled three times = the distance B travelled in 9 days = $9x$.

$$\text{Then A travelled 405 miles}=MN+3NR+RT \quad (1)$$

$$=MN+27x+RT \quad (2)$$

$$405-MN-RT=27x \quad (3)$$

$$\text{But B travelled } MN+NR+RT=22\tfrac{1}{2}x \quad (4)$$

$$MN+9x+RT=22\tfrac{1}{2}x \quad (5)$$

$$MN+RT=13\tfrac{1}{2}x \quad (6)$$

$$\text{Add (3), (6) } 405=40\tfrac{1}{2}x$$

$$x=10$$

Answers to Questions by a Teacher of N——k, N. B.

1. How many pounds of gold are actually as heavy as 12 pounds of iron?

1 lb. Avoirdupois=7000 grains.

12 lbs. " =84000 "

Gold is weighed by Troy weight.

5760 grains=1 lb. Troy.

$$84000 \text{ " } = \frac{84000}{5760} \text{ lbs. Troy} = 14\tfrac{7}{12}$$

∴ 12 lbs. iron (Avoirdupois)=$14\frac{7}{12}$ lbs. gold (Troy).

2. Distinguish between bilateral and radial symmetry.

The axis of symmetry is a line drawn through the middle of a figure so that the parts on one side are exactly repeated in a reverse order on the other side, as in a maple leaf, which illustrates bilateral symmetry. In radial symmetry these units of design radiate from a point, as in a rosette, or as in some compound leaves. Both terms are well illustrated in the Greek anthemion border.

3. What metal does slate contain?

Several, but principally aluminium and silicon.

For Mr. E. D. G., Victoria, N. B.

Solve Ex. 4, Series I, page 146, Hamblin Smith's arithmetic.

If the paper's number is 8505, there must have been that many week days and one-sixth as many Sabbaths, or in all 9922 days=27 years and $60\frac{1}{4}$ days, allowing $365\frac{1}{4}$ days to a year. Therefore the first number must have been published on the 19th April, 1850. But as there were 1417 weeks and 3 days besides, the first number must have been published three days back from Monday, that is on Friday.

For a Student, L. B. R.

1. Can any angle be trisected by geometry?

No general method for the trisection of all triangles has yet been discovered.

2. Describe a square in a semicircle.

Let a semicircle be described on the line AC. On the same side from the point C draw DC at right angles to AC and equal to it. Let B be the middle point of the line AC. Join DB, cutting the semicircle in E. From the point E, without the line BC, draw EF at right angles to BC. (Euc. I, 12). EF will be the side of the required square. Because EF is parallel to DC, therefore BF : FE :: BC : CD. But CD=2BC, therefore EF=2BF. Take BG=BF and draw GH perpendicular to AB, cutting the semicircle in H. Then GH can easily be shown to be equal to FE, and HE=GF. Therefore HGFE is the required square.

This problem can also be easily solved in Euc. II, 14.

3. How much larger is a triangle whose sides are 10, 11, 12, than another triangle within it whose sides are parallel to those of the former and two inches from them?

Produce the sides of the inner triangle until they cut those of the outer triangles. From the points of intersection let fall perpendiculars on the sides of the outer triangle. The sides of the right-angled triangles and of the parallelograms thus formed can be easily found by trigonometry. But the operations would be too long for our columns. The difference in the areas of the two triangles will of course show the area of the strips between the margins of the triangles.

4. If $a+b=1$, then must $(a^2-b^2)^2=a^3+b^3-ab$.

From the first equation, $a=1-b$, substitute this value of a in the second equation and we have

$$(1-2b+b^2-b^2)^2=1-3b+3b^2-b^3+b^3-b+b^2$$

$$(1-2b)^2=1-4b+4b^2$$

$$1-4b+4b^2=1-4b+4b^2$$