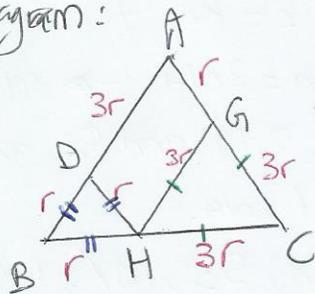


(B1) Note the following diagram:



Note that $\triangle ABC$ is equilateral with sides $4r$ each

Also, $\triangle CGH$ is equilateral with side $3r$ each.

If h_1 is the height for $\triangle ABC$ and h_2 is the height for $\triangle CGH$, then

Area of $\triangle ABC = |\triangle ABC| = \frac{1}{2} \times \text{base} \times \text{height} = \frac{1}{2} \times 4r \times h_1 = 240$ — (1)

Area of $\triangle CGH = |\triangle CGH| = \frac{1}{2} \times \text{base} \times \text{height} = \frac{1}{2} \times 3r \times h_2 = A$ — (2)

(1) \div (2) gives:
$$\frac{(\frac{1}{2} \times 4r \times h_1)}{(\frac{1}{2} \times 3r \times h_2)} = \frac{240}{A}$$

Simplifying,

$$A = 240 \times \frac{3}{4} \times \left(\frac{h_2}{h_1}\right)$$

$$A = 240 \times \frac{3}{4} \times \frac{3}{4}$$

$$A = 135.$$

note that since $\triangle ABC$ and $\triangle CGH$ are similar (being equilateral),

$\frac{h_2}{h_1} =$ ratio of corresponding sides

$$\frac{h_2}{h_1} = \frac{3r}{4r}$$

$$\frac{h_2}{h_1} = \frac{3}{4}$$

put here.

Answer: 135

(B2) Let our 3-digit positive integer N with digits 'abc' be expanded (in base 10):

$$N = 100a + 10b + c$$

Given that "N equals 5 times the product of digits of N"

means: $100a + 10b + c = 5 \times abc$

Since RHS is a multiple of 5, N too must be a multiple of 5 (LHS). This means the "last digit" of N must be either 0 or 5. $c=0$ is impossible since it forces RHS=0 and hence $N=0$ (not a 3-digit number).

Thus it must be that $c=5$. So,

$$100a + 10b + 5 = 5 \times ab(5)$$

which simplifies to:

$$20a + (2b + 1) = 5ab$$

Note that the integer-equation above implies that 5 must divide $(2b+1)$.

Now, since $0 \leq b \leq 9$ (being a digit),

$1 \leq 2b+1 \leq 19$. This together with the earlier requirement that $(2b+1)$ must

be a multiple of 5 imply that:

$(2b+1) = 5, 10, 15$ being the only multiples of 5 less than 19

or $b = 2, \frac{9}{2}, 7$

Since b is a positive integer,

$b = 2$ or 7 only which yields

if $b=2$ if $b=7$

$20a + 5 = 10a$	$20a + 15 = 35a$
$a = \frac{5}{-10}$	$a = 1 \checkmark$

Since a is also a positive integer.

we have the only solution for triplet (a, b, c) as $(1, 7, 5)$ yielding the 3-digit number: 175

Pg 6

Answer: $N = 175$