ALGEBRA SOLUTIONS.

1. (*b*) $(\frac{1}{2}x-y)^3-(x-\frac{1}{2}y)^3$ is exactly divisible by $(\frac{1}{2}x-y)-(x-\frac{1}{2}y)$ or $-\frac{1}{2}(x+y)$; c ∴ exactly divisible by $x+y$. Or, put $x+y=o$, write x for $-y$ in the expression $(\frac{1}{2}x-y)^3-(x-\frac{1}{2}y)^3$ and the result is $=o$ ∴ $x+y$ is a factor.

2. (*a*) Book-work.

3. (*a*). $(a+b)^4+(a-b)^4-2(a^2-b^2)^2=\{(a+b)^2\}^2+\{(a-b)^2\}^2-2(a+b)^2(a-b)^2=\{(a+b)^2-(a-b)^2\}^2=16a^2b^2$.

(*b*). $\{(a+c+b)\ (a+c-b)\}\ \{(a-c+b)\ (-\overline{a-c}+b)\}=\{(a+c)^2-b^2\}\ \{b^2-(a-c)^2\}=\{(a^2+c^2+2ac-b^2)(b^2-a^2-c^2+2ac)$. But $c^2=a^2+b^2$. Substituting and simplifying we get $(2ac\times 2a^2)\ (2ac-2a^2)=4a^2c^2-4a^4$. Substituting as above, the expression becomes $4a^2(a^2+b^2)-4a^4=4a^2b^2$.

4. Book-work. (*b*). $\frac{b}{8a}$.

5. Let x equal rate per hour of "City," $y=$ rate per hour of "Rothesay." $\frac{35}{x}+\frac{35}{y}=5\frac{1}{4}$ (1.) $\frac{42}{x}+\frac{42}{y-1}=6\frac{1}{2}$. Eliminate x by multiplication, resulting $=n$ will be $y(y-1)=210$, solving, $y=15$ or -14. Substitute positive value in (1) and x is found to be 12.

6. (*a*). Book-work. (*b*). $4\sqrt{3}$. (*c*). $5\sqrt[3]{7}$. (*d*). $a^{\frac{3}{2}}-b^{\frac{3}{2}}$. (*e*). $x-x^{\frac{1}{2}}y^{\frac{1}{2}}+y$.

7. (1). $x=\frac{a}{3}$, $y=\frac{a}{4}$.

(2). After transposing add 28 to each side of the $=n$ so as to get a quadratic in the quantity under the radical sign, a very common expedient. Solving in the usual way, $x=4$ or -9, or $\frac{5}{2}\pm\sqrt{-51}$.

8. Let $a=$middle number : then $(x-1)(x)(x+1)=45x$

$x^2-1=48$

$x^2=49$

$x=\pm 7$ ∴ Nos. 6, 7, 8, or -8, -7, -6.

9. (*a*). $a(x-a)(x-b)=a\{x^2-(a+b)x+ab\}$. But $a+b=-\frac{b}{a}$ and $ab=\frac{c}{a}$

∴ $a\{x^2-(a+b)x+ab\}=a\{x_2+\frac{b}{a}x+\frac{c}{a}\}=ax^2+bx+c=o$. (See Theory of Quadratics.

(*b*). $(2a^2-2ab)x+ab-b^2=o$ ∴ $x=-\frac{b}{2a}$. But when roots are $=l$ $b^2=4ac$ and roots of $ax^2+bx+c=o$, become each $-\frac{b}{2a}$ (See Theory of Quadratics).

10. $\frac{m}{x}=\frac{n}{y}=k$. ∴ $m=kx$, $n=ky$. Substitute these values in $\frac{m^2}{a^2}+\frac{n^2}{b^2}$, and expression becomes $\frac{k^2x^2}{a^2}+\frac{k^2y^2}{b^2}=k^2\left(\frac{x^2}{a^2}+\frac{y^2}{b^2}\right)=k^2$.

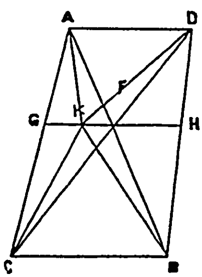
Also $\frac{m^2+n^2}{x^2+y^2}=\frac{k^2+k^2y^2}{n^2+y^2}=k^2$ ∴ equality is proved since each expression $=k^2$.

EUCLID SOLUTIONS.

2. (*a*) 120°. (*b*) 72°.

8. ABC being the given △, draw a straight line through A parallel to BC. Bisect BC in D, draw DE at right angles to BC. Join BE, EC. BEC is the required △.

9. Easily seen △ AFC=△BFD. If F be not the middle point, let K be. Join KA, KC, KB, KD. Then △ AGK = △ DHK, also △GKC =△BKH. ∴ △AKC =△DKB. Now △ AKC is <△AFC or △DFB. Hence △ DKB is <△DFB, which is absurd. ∴ K



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