Grammar School,

PONTARDAWE.

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Form IV L

Subject ALGEBRA HOMEWORK

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P.254 Ex. 21A Nos. 1, 2. 17-5-66

1. Let the total cost be £C per day when there are n passengers and the speed is V knots

$\therefore C = A + B$

where $A \propto n$

and $B \propto V^2$

$A = cn$ where c is a constant

$B = kV^2$ where k is a constant

$\therefore C = cn + kV^2$

When $C = 165, V = 20$ and $n = 130$

$\therefore 165 = 130c + 20^2 k$

When $C = 194$ $V = 16$, $n = 260$

$\therefore 194 = 260c + 16^2 k$ ——— (1)

$165 = 130c + 20^2 k$ ——— (2)

Mult (2) by 2: $330 = 260c + 800$ ——— (3)

Take (1) from (3) $136 = 544k$

$k = \frac{136}{544}$

$= \frac{1}{4}$

Sub (2) $165 = 130c + 400\left(\frac{1}{4}\right)$

$\therefore 130c = 65$

$c = \frac{65}{130}$

$= \frac{1}{2}$

$\therefore C = \frac{1}{2}n + \frac{1}{4}V^2$ ✓

When $n = 200$ $V = 17$

$\therefore C = \frac{1}{2} \times 200 + \frac{1}{4}(17^2)$

$= 100 + \frac{289}{4}$

~~$= 100 +$~~

$= 100 + 72\frac{1}{4}$

$= 172\frac{1}{4}$

∴ cost per day = £172 5s.
∴ cost per week = £1205 15s. ✓

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9. Let the cost of running the lot of C when number of visitors = n and fixed overhead charges = £Z

If Given for us need to introduce Z

∴ C = A + B
where A ∝ n
but B is a constant (given)
∴ Z is a constant
A = Kn where K is a constant
∴ C = Kn + Z
When C = 105½, n = 26
∴ 105½ = 26K + Z
When C = 193, n = 76
∴ 193 = 76K + Z ——— ①
105½ = 26K + Z ——— ②
Subtract ② from ① 87½ = 50K

$$K = \frac{87\frac{1}{2}}{50} = \frac{\frac{175}{2}\times\frac{1}{50}}{2} = \frac{7}{4}$$

$$K = 1\frac{3}{4}$$

In ① $193 = 76 \times \frac{7}{4} + Z$

$193 = 133 + Z$
$\therefore Z = 60$
$\therefore C = 1\frac{3}{4}n + 60$
When n = 64 $C = 1\frac{3}{4} \times 64 + 60$

$$= \frac{7}{4} \times \frac{64}{1} + 60$$

$= 112 + 60$

$= 172$

$\therefore$ Cost per week $= \frac{5}{7}172$

10/10/05 P. 265 No 5 — 24-5-65

Set cat per day $= \frac{4}{7}$C (oder overhead cats $= \frac{1}{7}$A and number of miles run $=$ n mls.

$C = A + B$ where A is a constant and where B $\propto$ n i.e. $B = Kn$ where K is a constant.

$\therefore C = A + Kn$

when $C = 4\frac{1}{5}$, $n = 180$

$\therefore 4\frac{1}{5} = A + 180K$

when $C = 4\frac{2}{15}$, $n = 220$

$\therefore 4\frac{2}{15} = A + 220K$ —— (1)

$4\frac{1}{5} = A + 180K$ —— (2)

Subt (2) from (1)

$\frac{4}{15} = 40K$

$\frac{1}{K} = \frac{40}{1} \times \frac{15}{4}$

$K = \frac{150}{4}$

on (1) if $K = \frac{150}{4}$

$4\frac{2}{15} = A + 150 \times 220$

$A = 15000 - 4\frac{2}{15}$

$= 14995\frac{8}{15}$

on (1) if $K = 150$

$4\frac{2}{15} = A + 150 \times 220$.

$4\frac{2}{15} = A + 33000$

$\therefore A = 32995\frac{8}{15}$

$\therefore A = -32995\frac{8}{15}$.

$C = 32995\frac{8}{15}$ $C = -32995\frac{8}{15} + 150n$.

$A = -32995\frac{8}{15}$.

$\therefore C = -32995\frac{8}{15} + 200 \times 150$

~~$\therefore C = 32\frac{4}{15}\frac{8}{15} + 30000$~~

$=$

In ① if $K = \frac{1}{150}$

$$4\tfrac{7}{15} = A + \frac{220}{150}$$

$$\therefore -A = \frac{22}{15} - \frac{67}{15}$$

$$A = \frac{45}{15}$$

$$= 3$$

$$\therefore C = 3 + \frac{n}{150}$$

When $n = 200$.

$$C = 3 + \frac{200}{150}$$

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

$$= 4\tfrac{1}{3}$$

$\therefore$ Cost of running the bus for 200 miles $= £4.\ 6s\ 8d.$

P.259 Ex. 219 Nos 13, 15, 22 — 31-5-65

13. 1st term $= a = 7$

15th term $= a + 14d = 112$

$\therefore 7 + 14d = 112$

$14d = 105$

$d = \frac{105}{14}$

$= 7 \cdot 5$

$\therefore$ common difference $= 7 \cdot 5$

16. The 3rd term $= a + 2d = 19$ — ①
19th term $= a + 18d = 99$ — ②
Solve ① from ②: $16d = 80$
$d = 5$
Sub ①: $a + 10 = 19$
$a = 9$
1st term = 9, common difference = 5 ✓

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22 $S_n = \frac{n}{2}(a + l)$

$450 = \frac{n}{2}(-15 + 75)$

$450 = \frac{n}{2} \times 60^{30}$

$n = \frac{450}{30}$

$= 15$ ✓ there are 15 terms.

1st term $= a = -15$
15th term $= a + 14d = 75$.
$\therefore -15 + 14d = 75$
$14d = 90$
$d = \frac{90}{14}$
$= \frac{45}{7}$
$= 6\frac{3}{7}$ ✓
common difference $= 6\frac{3}{7}$.

10/10

Christmas Sem, 1965

8-10-65

5) If $x = 3$ satisfies the equation $x^3 - 5x^2 - 2x + k = 0$, find the value k and the other two roots of the equation.

By Remainder Theorem

$f(x) = x^3 - 5x^2 - 2x + k$

But $(x-3)$ is a factor

$\therefore f(3) = (3)^3 - 5(3)^2 - 2(3) + k$

$= 0.$

$\therefore 27 - 45 - 6 + k = 0$

$\therefore k = 24$

$\therefore x^3 - 5x^2 - 2x + 24 = (x-3)(x^2 - 2x - 8)$

$= (x-3)(x-4)(x+2)$

$\therefore$ other two factors are $(x-4)(x+2)$.

P.324. 28 Nos. 22, 26, 30. 34 29 Nos 9, 25, 71, 78, 79. 14 to 6

22. $\frac{3x+8}{34} = \frac{1}{2}$

$2(3x+8) = 34$

$6x + 16 = 34$

$6x = 18$

$x = 3$ ✓

26. $\frac{x-7}{8} = \frac{1}{2}$

$2(x-7) = 8$

$2x - 14 = 8$

$2x = 22$

$x = 11$ ✓

30. $4.7 = \frac{13x - 10}{20}$

$20 \times 4.7 = 13x - 10$

$94 = 13x - 10$

$104 = 13x$

$x = 8$ ✓

34. 24. 9 $6/5 h = \frac{36}{25}$.

$h = \frac{36}{25} \times \frac{5}{6}$

$= \frac{6}{5}$

$= 1\frac{1}{5}$ 6/7

25. $17 = 117 - x^2$
$x^2 = 100$
$x = \pm 10$

77 $\frac{63}{y} = 9$
$9y = 63$
$y = 7$

78 $3x = 0$
$x = 0$

79 $\frac{17}{z} - 1\frac{1}{4} = 3$
$\frac{17}{z} = 4\frac{1}{4}$
$4\frac{1}{4}z = 17$
$z = 17 \times \frac{4}{17} = 4.$

P46 No 20 P47 Nos 6, 10. 15-10-65

20 Let number of cigarettes first man had = x cigarettes.
∴ " " " second " " $= (x - 8)$ cigarettes
∴ number of cigarettes first man had after selling half of them $= \frac{1}{2}x$ cig.

$\therefore (x - 8) - \frac{1}{2}x = 3$
$\frac{1}{2}x = 11$
$x = 22$

∴ First man had 22 cigarettes, second man had 14.

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b Let Mary's age = x years.
∴ Lottie's age = $(x + 5)$ years.
sister's age = $(x - 2)$ years.

$\therefore x + x + 5 + (x - 2) = 42$
$3x = 42 + 2 - 5$
$3x = 39$
$x = 13$

Mary's age = 13 yrs. ∴ Lottie's age = 18 years
sister's age = 11 years.

10 Set pennies given to each son = x pennies.
∴ wife receives 3x ∴ son receives 3x "
daughter " 2x

∴ 3x + 2x + 3x = 5
8x = 5
x = 5/8

∴ Each son receives £ 5/8 = 12s 6d in pennies
wife received £ 15/8 = £1. 17 6d. in pennies
daughter received £ 10/8 = £1 5s in pennies

9½/10

18-10-65.

P. 85 Nos 6, 8, 10, 12, 14

6. {r(s-t) - s(r-t)} - t(r-s)
= {rs - rt - rs + st} - tr + ts
= {st - rt} - tr + ts
= 2st - 2rt

8 r - {s - [r - (s - r)]}
= r - {s - [r - s + r]}
= r - {s - [2r - s]}
= r - {s - 2r + s}
= r - (2r + 2s)
= 3r + 2s = 3r - 2s

10 [(x+y) - (x-y)] x
= [x + y - x + y] x
= [2y] x
= 2xy 2yx

12 {3 - 6[2 - (x - 1)]} ÷ 3.
= {3 - 6[2 - x + 1]} ÷ 3.
= {3 - 6[3 - x]} ÷ 3

$= \{3 - 18 + 6x\} \div 3$

$= -15 + 6x \div 3$ ✓

$= -5 + 2x.$

14. $[3 - 2(1 \div 2 - 1) + 4]$

$= [3 - 2 + 4 \div 2 + 4)$

$= 11.7$

10/10

P 143 Ex. 115 nos 54–60 2-11-65

54 $F = \frac{9C}{5} + 32$

$\therefore 5F = 45C + 160$ ✗

$C = \frac{5F - 160}{45}$ ✓

$F = \frac{9C}{5} + 32$

$= \frac{5F - 32}{9}$

$5F = 9C + 160$

$C = \frac{5F - 160}{9}$

56. $a = \frac{v^2}{r}$

$r = \frac{v^2}{a}$ ✓

58. $t = 2\pi\sqrt{\frac{l}{g}}$

$t^2 = \frac{(2\pi)^2 l}{g}$

$t^2 g = (2\pi)^2 l$

$g = \frac{(2\pi)^2 l}{t^2} = \frac{4\pi^2 l}{t^2}$

55) $l_t = l_0(1 + \alpha t)$

$l_t = l_0 + l_0 \alpha t$

$\alpha = \frac{l_t - l_0}{t l_0}$ ✓

57) $t = 2\pi\sqrt{\frac{I}{MH}}$

$t^2 = \frac{(2\pi)^2 \cdot I}{MH} = \frac{4\pi^2 I}{MH}$

$MHt^2 = (2\pi)^2 I$

$I = \frac{MHt^2}{(2\pi)^2}$

59) $s = ut + \frac{1}{2}\alpha t^2$

$2s = 2ut + \alpha t^2$

$2s - 2ut = \alpha t^2$

$\alpha = \frac{2s - 2ut}{t^2}$

✓ $= \frac{2(s - ut)}{t^2}$

60. $\frac{1}{R} = \frac{1}{r_1} + \frac{1}{r_2}$

$r_1 r_2 = R r_2 + R r_1$

$r_1 r_2 - R r_1 = R r_2$

$r_1(r_2 - R) = R r_2$

$r_1 = \frac{R r_2}{(r_2 - R)}$ ✓

10/10

P.112 Ex. 93 Nos. 41-50 4-11-65

41) $10 - 16v + v^2$

= impossible without formula ✓

42) $8u^2 - 2u^3 + 4u^4$

$= 2u^2(4 - u + 2u^2)$ ✓

43) $u^2 - (u - 2v)^2$

$= u^2 - (u^2 - 4uv + 4v^2)$

$= 4uv - 4v^2$

$= 4v(u - v)$ ✓

44) $(76)^2 - (24)^2$

$= (76 - 24)(76 + 24)$

$= 52 \times 100$

$= 5200$ ✓

45) $ax + ac + dx + cd$

$= x(a + d) + c(a + d)$

$= (x + c)(a + d)$ ✓

46) $12 + 8b + b^2$

$(6 + b)(2 + b)$ ✓

47) $24 + x^2 - 11x$

$= (x - 8)(x - 3)$ ✓

48) $2u(1 - v) - w(v - 1)$

$= (1 - v)(2u + w)$ ✓

49) $2b + b^2 - 15$

$= (b + 5)(b - 3)$ ✓

50) $-6p + 1 + 9p^2$

$= 9p^2 - 6p + 1$

$= (3p - 1)(3p - 1)$

$= (3p - 1)^2$ ✓

10/10

5-11-65

21 $\frac{3z-16}{2} + \frac{5z+4}{11} + \frac{3z-2}{22} = 9.$

$11(3z-16) + 2(5z+4) + 1(3z-2) = 198$

$33z - 176 + 10z + 8 + 3z - 2 = 198$

$46z = 368$

$z = 8$ ✓

22 $\frac{8-5p}{8} - \frac{4+3p}{14} + \frac{2p-2}{7} + 4 = 0$

$7(8-5p) - 4(4+3p) + 8(2p-2) + 224 = 0$

$56 - 35p - 16 - 12p + 16p - 16 + 224 = 0$

$-31p = -248$

$p = 8$ ✓

23. $\frac{1}{2}(3x+12) + \frac{1}{3}(4x-9) - \frac{1}{4}(3x+2) = 15$

$6(3x+12) + 4(4x-9) - 3(3x+2) = 180$

$18x + 72 + 16x - 36 - 9x - 6 = 180$

$25x = 150$

$x = 6$ ✓

24 $\frac{3x+8}{4} + \frac{5x+8}{7} - \frac{6x+3}{3} = 0$

$21(3x+8) + 12(5x+8) - 28(6x+3) = 0$

$63x + 168 + 60x + 96 - 168x - 84 = 0$

$-45x = -180$

$x = 4$ ✓

25. $\frac{6+5x}{8} + \frac{13-2x}{9} = 5-x$

$9(6+5x) + 8(13-2x) = 72(5-x)$

$54 + 45x + 104 - 16x = 360 - 72x$

$101x = 202$

$x = 2$ ✓

~~46.~~

~~$\frac{2x^2+7x+3}{4-4x^2} = \frac{(2x+1)(x+3)}{(1+2x)(2-2x)}$~~

16. $\frac{9+12x+4x^2}{4x+6} = \frac{(3+2x)(3+2x)}{2(2x+3)} = \frac{3+2x}{2}$ ✓

17. $\frac{25-10x+x^2}{25-5x} = \frac{(5-x)(5-x)}{5(5-x)} = \frac{5-x}{5}$ ✓

18 $\frac{25-20x+4x^2}{25-4x^2} = \frac{(5-2x)(5-2x)}{(5-2x)(5+2x)} = \frac{5-2x}{5+2x}$ ✓

19 $\frac{x^2-36x+324}{x^2-19x+18} = \frac{(x-18)(x-18)}{(x-18)(x-1)} = \frac{(x-18)}{(x-1)}$ ✓

20 $\frac{1-4x^2}{1-4x+4x^2} = \frac{(1-2x)(1+2x)}{(1-2x)(1-2x)} = \frac{1+2x}{1-2x}$ ✓

10/10