[2] $(x^3y^2)^4 - 4(x^3y^2)^3(2xy^3) + 6(x^3y^2)^2(2xy^3)^2 - 4(x^3y^2)(2xy^3)^3 + (2xy^3)^4$ (1/2) (1/2) (1/2)

$= x^{12}y^8 - 8x^{10}y^9 + 24x^8y^{10} - 32x^6y^{11} + 16x^4y^{12}$ (1/2) (1/2) (1/2) (1/2)

[3] $\sum_{r=0}^{22} \binom{22}{r}(5x^{-3})^{22-r}(-11x^{\frac{1}{2}})^r$

$= \sum_{r=0}^{22} (-1)^r \binom{22}{r} 5^{22-r} 11^r x^{-66+\frac{7}{2}r}$

[a] $r=17 \longrightarrow (-1)^{17}\binom{22}{17}5^5 11^{17} x^{-66+\frac{7}{2}(17)}$ $\quad -\frac{132+119}{2} = -\frac{13}{2}$

(1/2) (1/2) (1/2) (1)

$= -22\cdot 21\cdot 19\cdot 3 \cdot 5^5 11^{17} x^{-\frac{13}{2}}$

$\binom{22}{17} = \frac{22!}{17!5!} = \frac{22\cdot 21\cdot 20\cdot 19\cdot 18\cdot 17!}{17!\cdot 5\cdot 4\cdot 3\cdot 2\cdot 1} = 22\cdot 21\cdot 19\cdot 3$ (1/2)

[b] $-66+\frac{7}{2}r = -45$ (1)

$\frac{7}{2}r = 21$

$r = 21\cdot\frac{2}{7} = 6$ (1/2)

$(-1)^6\binom{22}{6}5^{16}11^6 x^{-45} = 11\cdot 21\cdot 19\cdot 17 \cdot 5^{16}11^6 x^{-45}$ (1/2) (1/2)

$\binom{22}{6} = \frac{22!}{6!16!} = \frac{22\cdot 21\cdot 20\cdot 19\cdot 18\cdot 17\cdot 16!}{6\cdot 5\cdot 4\cdot 3\cdot 2\cdot 1\cdot 16!} = 11\cdot 21\cdot 19\cdot 17$ (1/2)

[4] 20% LEFTOVER EACH WEEK

[a] $5(0.2)+5 = 1+5 = \underline{6}$ QUARTS (½)
LEFTOVER + NEW

[b] $(5(0.2)+5)(0.2)+5 = 6(0.2)+5 = \underline{6.2}$ QUARTS (½)

$= 5(0.2)^2 + 5(0.2) + 5$

[c] $\underline{5(0.2)^{16} + 5(0.2)^{15} + \cdots + 5(0.2)^2 + 5(0.2) + 5}$ (1)

$= 5 + 5(0.2) + 5(0.2)^2 + \cdots + 5(0.2)^{15} + 5(0.2)^{16}$

$= \boxed{\frac{5(1-(0.2)^{17})}{1-0.2}} = \frac{5(1-(0.2)^{17})}{0.8} = \frac{50(1-(0.2)^{17})}{8}$

(½) OK AS SUBSTITUTE

$= \boxed{\frac{25}{4}(1-(0.2)^{17})}$ (½) QUARTS

[5] NUMERATORS $243, 162, 108, 72, 48, 32$ GEOMETRIC SEQUENCE $r = \frac{2}{3}$

$\frac{162}{243} = \frac{54}{81} = \frac{6}{9} = \frac{2}{3}$

$162 \cdot \frac{2}{3} = 108$

$108 \cdot \frac{2}{3} = 72$

$72 \cdot \frac{2}{3} = 48$

$48 \cdot \frac{2}{3} = 32$

DENOMINATORS $16^2, 13^2, 10^2, 7^2, 4^2, 1^2$ SQUARES OF ARITHMETIC SEQUENCE $d = -3$

(½) $\sum_{n=1}^{6} \frac{243\left(\frac{2}{3}\right)^{n-1}}{(16-3(n-1))^2}$ (1½) (1) OR $\sum_{n=0}^{5} \frac{243\left(\frac{2}{3}\right)^{n}}{(16-3n)^2}$

INFINITELY MANY SOLUTIONS — TALK TO ME

SUBTRACT (½) POINT IF LETTER UNDER $\sum$ DOESN'T MATCH LETTER IN FORMULA

[6] $\dfrac{\frac{-7}{1}}{\frac{21}{2}} = -\frac{7}{1} \cdot \frac{2}{21_3} = -\frac{2}{3}$

$-\frac{7}{1} \cdot -\frac{2}{3} = \frac{14}{3}$

$\frac{14}{3} \cdot -\frac{2}{3} = -\frac{28}{9}$

$-\frac{28}{9} \cdot -\frac{2}{3} = \frac{56}{27}$

INFINITE GEOMETRIC SERIES $r = -\frac{2}{3}$

$$S = \frac{\frac{21}{2}}{1-\left(-\frac{2}{3}\right)} = \frac{\frac{21}{2}}{\frac{5}{3}} \cdot \frac{6}{6} = \frac{63}{10}$$

(1) (1) (1½) (½)