MAT 012 **Extra Practice 7.** 5 Formulas SOLUTIONS

1) $E = mc^2$ for m (formula in physics)

$$\frac{E}{c^2} = \frac{m\cancel{c^2}}{\cancel{c^2}}$$

$$m = \frac{E}{c^2}$$

2) $\frac{x-b}{a} = 9$ cross multiply for x

$$x - b = 9a$$
$$+b \qquad +b$$
$$x = 9a + b$$

3) $3r + y = 8s$ for r

$$-y \qquad -y$$
$$\frac{3r}{3} = \frac{8s - y}{3}$$
$$r = \frac{8s - y}{3}$$

4) $A = \frac{Rt}{PV}$ for t (formula in jet engine design)

$$\frac{APV}{R} = \frac{\cancel{R}t}{\cancel{R}}$$

$$t = \frac{APV}{R}$$ same as $$t = \frac{PVA}{R}$$

5) $W = T(S_1 - S_2) - Q$ for S_1 (formula in refrigeration)

$$W = TS_1 - TS_2 - Q$$
$$+TS_2 + Q \qquad +TS_2 + Q$$
$$\frac{W + TS_2 + Q}{T} = \frac{\cancel{T}S_1}{\cancel{T}}$$
$$S_1 = \frac{W + TS_2 + Q}{T}$$

alternatively:

$$W = T(S_1 - S_2) - Q$$
$$+Q \qquad +Q$$
$$\frac{W + Q}{T} = \frac{T(S_1 - S_2)}{T}$$
$$\frac{W + Q}{T} = S_1 - S_2$$
$$+S_2 \qquad +S_2$$
$$\frac{W+Q}{T} + S_2 = S_1$$

6) $y = mx + b$ for m (Equation of a line)

$$\frac{y-b}{x} = \frac{mx}{x}$$

($-b \quad -b$)

$$\frac{y-b}{x} = m \text{ , so } m = \frac{y-b}{x}$$

7) $A = \frac{1}{2}bh$ for h (Area of a triangle)

$$2 \cdot A = \frac{1}{\cancel{2}}bh \cdot \cancel{2}$$

$$\frac{2A}{b} = \frac{\cancel{b}h}{\cancel{b}}$$

$$h = \frac{2A}{b}$$

alternatively: $\frac{A}{\frac{1}{2}b} = \frac{\cancel{\frac{1}{2}b}h}{\cancel{\frac{1}{2}b}}$

$$h = \frac{A}{\frac{1}{2}b}$$

8) $P = s_1 + s_2 + s_3$ for s_3

$-s_1 - s_2 \quad -s_1 - s_2$

$$P - s_1 - s_2 = s_3 \text{ , so } s_3 = P - s_1 - s_2$$

9) $F = \frac{9}{5}C + 32$ for C (Conversion from degrees Celsius to Fahrenheit)

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

$-32 \quad -32$

$$\frac{5}{9} \cdot (F - 32) = \frac{\cancel{9}}{\cancel{5}}C \cdot \frac{\cancel{5}}{\cancel{9}}$$

$$\frac{5}{9}(F - 32) = C$$

alternatively:

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

$-32 \quad -32$

$$\frac{F-32}{\frac{9}{5}} = \frac{\cancel{\frac{9}{5}}C}{\cancel{\frac{9}{5}}} \text{, so } C = \frac{F-32}{\frac{9}{5}}$$

alternatively:

$$5 \cdot F = \left(\frac{9}{5}C + 32\right) \cdot 5$$

$$5F = 9C + 160$$

$-160 \quad -160$

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

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

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

10) $S = 2\pi rh + 2\pi r^2$ for h (Surface area of a cylinder)

$-2\pi r^2 \quad -2\pi r^2$

$$\frac{S - 2\pi r^2}{2\pi r} = \frac{\cancel{2\pi r}h}{\cancel{2\pi r}}$$

$$h = \frac{S - 2\pi r^2}{2\pi r}$$

alternatively:

continue: $h = \frac{S - 2\pi r^2}{2\pi r}$

$$= \frac{S}{2\pi r} - \frac{\cancel{2\pi} r^{\cancel{2}}}{\cancel{2\pi r}}$$

$$h = \frac{S}{2\pi r} - r$$

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11) $I = \dfrac{nE}{nr+R}$ for R [Note: r and R are two different variables]

cross multiply

$$I(nr+R) = nE$$
$$Inr + IR = nE$$
$$-Inr \qquad -Inr$$
$$\frac{IR}{I} = \frac{nE - Inr}{I}, \text{ so } R = \frac{nE - Inr}{I}$$

alternatively:

$$\frac{I(nr+R)}{I} = \frac{nE}{I}$$
$$nr + R = \frac{nE}{I}$$
$$-nr \qquad -nr$$
$$R = \frac{nE}{I} - nr$$

12) $A = P(1+nr)$ for n

$$A = P + Pnr$$
$$-P \quad -P$$
$$\frac{A-P}{Pr} = \frac{\cancel{P}n\cancel{r}}{\cancel{P}\cancel{r}}$$
$$n = \frac{A-P}{Pr}$$

alternatively:

$$\frac{A}{P} = \frac{\cancel{P}(1+nr)}{\cancel{P}}$$
$$\frac{A}{P} = 1 + nr$$
$$-1 \quad -1$$
$$\frac{\frac{A}{P} - 1}{r} = \frac{nr}{r}, \text{ so } n = \frac{\frac{A}{P} - 1}{r}$$

13) $S = \dfrac{a}{1-r}$ for r

cross multiply:

$$S(1-r) = a$$
$$S - Sr = a$$
$$+Sr \qquad +Sr$$
$$S = a + Sr$$
$$-a \qquad -a$$
$$\frac{S-a}{S} = \frac{\cancel{S}r}{\cancel{S}}, \text{ so } r = \frac{S-a}{S}$$

alternatively:

$$\frac{S(1-r)}{S} = \frac{a}{S}$$
$$1 - r = \frac{a}{S}$$
$$-1 \qquad -1$$
$$(-1)(-r) = \left(\frac{a}{S} - 1\right)(-1)$$
$$r = -\frac{a}{S} + 1, \text{ so } r = 1 - \frac{a}{S}$$

14) After t seconds, a stone thrown upward with a velocity of v meters/second and with an acceleration due to gravity will be s meters above the ground, where $s = vt - \frac{1}{2}at^2$. Solve for v.

$$s = vt - \frac{1}{2}at^2$$
$$+\frac{1}{2}at^2 \qquad +\frac{1}{2}at^2$$
$$\frac{s + \frac{1}{2}at^2}{t} = \frac{v\cancel{t}}{\cancel{t}}$$
$$v = \frac{s + \frac{1}{2}at^2}{t}$$

alternatively:

continue: $v = \dfrac{s + \frac{1}{2}at^2}{t}$

$$= \frac{s}{t} + \frac{1}{2}\frac{at^{\cancel{2}}}{\cancel{t}}$$
$$v = \frac{s}{t} + \frac{at}{2}$$
$$= \frac{s}{t} + \frac{1}{2}at$$