'21 §2.6 #s 1–5, 7–11 ODDS, 25, 27, 29, 31, 38, 64

(5) Your grade, G, varies directly with the number, n, of hours spent studying. $G = kn$ for some k

(7) Volume of gas, V, is inversely proportional to the pressure, P. $V = \frac{k}{P}$ for some k

(9) The cost of building a silo varies jointly as the height and radius $C = khr$

(11) Y varies directly as x and inversely as the square root of z $Y = \frac{kx}{\sqrt{z}}$

#s 25–30 Find the constant of variation and construct the function that is described by each statement.

(25) y varies directly as x, and $y = 5$ when $x = 9$

$y = kx$

$5 = k(9) = 9k$

$\frac{5}{9} = k$ $\Rightarrow$ $y = \frac{5}{9}x$

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(27) T varies inversely with y, and $T = -30$ when $y = 5$

$$T = \frac{k}{y}$$

$$-30 = \frac{k}{5}$$

$$-150 = k$$

$$\boxed{T = \frac{-150}{y}}$$

(29) m varies directly as the square of t and $m = 54$ when $t = 3\sqrt{2}$

$$m = kt^2$$

$$54 = k(3\sqrt{2})^2 = k(9(2)) = 18k$$

$$k = \frac{54}{18} = \frac{27}{9} = 3$$

$$\boxed{m = 3t^2}$$

~~48~~ (31) y varies directly as x and inversely as the square root of z, and $y = 2.192$ when $x = 2.4$ and $z = 2.25$.

$$y = \frac{kx}{\sqrt{z}} = y$$

$$\frac{k(2.4)}{\sqrt{2.25}} = 2.192$$

$$k = \frac{(2.192)(\sqrt{2.25})}{2.4} \approx 1.37$$

$$\boxed{y = 1.37\frac{x}{\sqrt{z}}} \text{ or } \frac{1.37x}{\sqrt{z}}$$

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#s 33–40 Solve the variation problem.

(38) J is jointly proportional to G and V, and $J=\sqrt{3}$ when $G=\sqrt{2}$ and $V=\sqrt{8}=2\sqrt{2}$

$J=kGV=J$

$k(\sqrt{2})(2\sqrt{2})=\sqrt{3}$

$4k=\sqrt{3}$

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

$\boxed{J=\frac{\sqrt{3}}{4}GV}$

Now, what's J when $G=\sqrt{6}$ and $V=8$?

$J=\frac{\sqrt{3}}{4}(\sqrt{6})(8)=\frac{(\sqrt{3}\sqrt{6}\cdot 8)}{4}=2\sqrt{3\cdot 6}$

$=2\sqrt{2\cdot 3\cdot 3}=2\cdot 3\sqrt{2}=\boxed{6\sqrt{2}=J}$

(64) Rate of discharge, V, varies jointly as the hydraulic gradient, i, and the cross-sectional area of the well wall, A. Given, $A=10\,ft^2$, when, $V=3\frac{gal}{min}$, and $i=0.3$. What is A, if $i=0.4$, and $V=5\frac{gal}{min}$?

$V=kiA$, Given

$3=k(0.3)(10)\Rightarrow$

$3=3k\Rightarrow$

$\boxed{1=k}$

Then find A, from

$5=1(0.4)A\Rightarrow$

$\frac{5}{0.4}=\boxed{A=12.5\,ft^2}$

$\frac{10}{4}(5)=\frac{5}{2}\cdot 5=\frac{25}{2}=12.5$