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4–7 Transforming Formulas

Objective: To transform a formula.

Example 1 Solve the formula $F = ma$ for m. State the restrictions, if any, for the formula obtained to be meaningful.

Solution $F = ma$ To get m alone on one side, divide both sides by a.

$\frac{F}{a} = m, a \neq 0$ The denominator cannot be 0.

Solve the given formula for the indicated variable. State the restrictions, if any, for the formula obtained to be meaningful.

1. $C = \pi d$ for d $\mathbf{d = \frac{C}{\pi}}$
2. $F = ma$ for a $\mathbf{a = \frac{F}{m}; m \neq 0}$
3. $I = prt$ for t $\mathbf{t = \frac{I}{pr}; p \neq 0, r \neq 0}$
4. $V = Bh$ for h $\mathbf{h = \frac{V}{B}; B \neq 0}$
5. $d = rt$ for t $\mathbf{t = \frac{d}{r}; r \neq 0}$
6. $s = gt^2$ for g $\mathbf{g = \frac{s}{t^2}; t \neq 0}$

Example 2 The formula $A = \frac{1}{2}h(a + b)$ gives the area of a trapezoid with bases a units and b units and with height h units. Use this formula to solve for the variable b in terms of A, h, and a. State the restrictions, if any, for the formula obtained to be meaningful.

Solution

$A = \frac{1}{2}h(a + b)$ To get clear of fractions, multiply both sides by 2.

$2A = h(a + b)$ Divide both sides by h.

$\frac{2A}{h} = a + b$ Subtract a from both sides.

$\frac{2A}{h} - a = b, h \neq 0$ The denominator cannot be 0.

Solve the given formula for the indicated variable. State the restrictions, if any, for the formula obtained to be meaningful.

7. $A = \frac{1}{2}bh$ for h $\mathbf{h = \frac{2A}{b}; b \neq 0}$
8. $b = 2b + y$ for y $\mathbf{y = -b}$
9. $A = \frac{1}{2}h(b + c)$ for h $\mathbf{h = \frac{2A}{b + c}; b \neq -c}$
10. $A = P + Prt$ for r $\mathbf{r = \frac{A - P}{Pt}; P \neq 0, t \neq 0}$
11. $a = 2(l + w)$ for l $\mathbf{l = \frac{a - 2w}{2}}$
12. $C = \frac{5}{9}(F - 32)$ for F $\mathbf{F = \frac{9C + 160}{5}}$

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4–7 Transforming Formulas *(continued)*

Example 3 Solve the formula $C = \frac{mv^2}{r}$ for r. State the restrictions, if any, for the formula obtained to be meaningful.

Solution

$C = \frac{mv^2}{r}$ To get r out of the denominator, multiply both sides by r.

$Cr = mv^2$ To get r alone on one side, divide both sides by C.

$r = \frac{mv^2}{C}, C \neq 0$ The denominator cannot be 0.

Solve the given formula for the indicated variable. State the restrictions, if any, for the formula obtained to be meaningful.

13. $s = \frac{v}{r}$ for v $\mathbf{v = rs}$
14. $d = \frac{m}{v}$ for m $\mathbf{m = dv}$
15. $C = \frac{mv^2}{r}$ for m $\mathbf{\frac{Cr}{v^2} = m, v \neq 0}$
16. $2ax + 1 = ax + 5$ for x $\mathbf{x = \frac{4}{a}, a \neq 0}$
17. $a = \frac{v - u}{t}$ for u $\mathbf{u = v - at, t \neq 0}$
18. $v^2 = u^2 + 2as$ for a $\mathbf{a = \frac{v^2 - u^2}{2s}, s \neq 0}$
19. $S = \frac{n}{2}(a + 1)$ for a $\mathbf{a = \frac{2S - n}{n}, n \neq 0}$
20. $m = \frac{x + y + z}{3}$ for x $\mathbf{x = 3m - y - z}$
21. $l = a + (n - 1)d$ for d $\mathbf{d = \frac{l - a}{n - 1}, n \neq 1}$
22. $A = \frac{a + b + c + d}{4}$ for b $\mathbf{b = 4A - a - c - d}$
23. $3by - 2 = 2by + 1$ for b $\mathbf{b = \frac{3}{y}, y \neq 0}$
24. $3aw + 1 = aw - 7$ for a $\mathbf{a = -\frac{4}{w}, w \neq 0}$
25. $ax + b = c$ for b $\mathbf{b = c - ax}$
26. $D = \frac{a}{2}(2t - 1)$ for a $\mathbf{a = \frac{2D}{2t - 1}, t \neq \frac{1}{2}}$
27. $am - bm = c$ for a $\mathbf{a = \frac{bm + c}{m}, m \neq 0}$
28. $q = 1 + \frac{P}{100}$ for P $\mathbf{P = 100q - 100}$

Mixed Review Exercises

Simplify.

1. $(y - 4)(y + 2)$ $\mathbf{y^2 - 2y - 8}$
2. $(2n - 3)(3n - 4)$ $\mathbf{6n^2 - 17n + 12}$
3. $a[3a - 2(4 + a)]$ $\mathbf{a^2 - 8a}$
4. $xy(x - 2y)$ $\mathbf{x^2y - 2xy^2}$
5. $3x(x^2 - 2x + 3)$ $\mathbf{3x^3 - 6x^2 + 9x}$
6. $(-4x^2)^3$ $\mathbf{-64x^6}$
7. $n^2 \cdot n^3 \cdot n^4$ $\mathbf{n^9}$
8. $(2a^2)^3 \cdot (3a^3b^2)$ $\mathbf{24a^9b^2}$
9. $(x + 6)(x - 5)$ $\mathbf{x^2 + x - 30}$
10. $(a + 2b)ab$ $\mathbf{a^2b + 2ab^2}$
11. $(4m + 5)(8m + 7)$ $\mathbf{32m^2 + 68m + 35}$
12. $2y^2(y^3 + 2y - 1)$ $\mathbf{2y^5 + 4y^3 - 2y^2}$

Study Guide, ALGEBRA, Structure and Method, Book 1