# Chapter 2 Equations and Formulas

## 2.1 Solving Equations

**1.** $z+8=50$

$z+8-8=50-8$ *Subtract* 8.

$z=42$

**2.** $r+13=83$

$r+13-13=83-13$ *Subtract* 13.

$r=70$

**3.** $z+95=400$

$z+95-95=400-95$ *Subtract* 95.

$z=305$

**4.** $25=x+12$

$25-12=x+12-12$ *Subtract* 12.

$13=x$

**5.** $v-29=17$

$v-29+29=17+29$ *Add* 29.

$v=46$

**6.** $312=m-40$

$312+40=m-40+40$ *Add* 40.

$352=m$

**7.** $10k=42$

$\frac{10k}{10}=\frac{42}{10}$ *Divide by* 10.

$k=4.2$

**8.** $7s=84$

$\frac{7s}{7}=\frac{84}{7}$ *Divide by* 7.

$s=12$

**9.** $12q=144$

$\frac{12q}{12}=\frac{144}{12}$ *Divide by* 12.

$q=12$

**10.** $8z=136$

$\frac{8z}{8}=\frac{136}{8}$ *Divide by* 8.

$z=17$

**11.** $60=30m$

$\frac{60}{30}=\frac{30m}{30}$ *Divide by* 30.

$2=m$

**12.** $94=2z$

$\frac{94}{2}=\frac{2z}{2}$ *Divide by* 2.

$47=z$

**13.** $5.9y=17.7$

$\frac{5.9y}{5.9}=\frac{17.7}{5.9}$ *Divide by* 5.9.

$y=3$

**14.** $16.5x=39.6$

$\frac{16.5x}{16.5}=\frac{39.6}{16.5}$ *Divide by* 16.5.

$x=2.4$

**15.** $1.54=0.7y$

$\frac{1.54}{0.7}=\frac{0.7y}{0.7}$ *Divide by* 0.7.

$2.2=y$

**16.** $3.9a=15.6$

$\frac{3.9a}{3.9}=\frac{15.6}{3.9}$ *Divide by* 3.9.

$a=4$

**17.** $3.92w=3.136$

$\frac{3.92w}{3.92}=\frac{3.136}{3.92}$ *Divide by* 3.92.

$w=0.8$

**18.** $2.773m=3.3276$

$\frac{2.773m}{2.773}=\frac{3.3276}{2.773}$ *Divide by* 2.773.

$m=1.2$

**19.** $0.0002x=0.08$

$\frac{0.0002x}{0.0002}=\frac{0.08}{0.0002}$ *Divide by* 0.0002.

$x=400$

**20.** $0.0324 = 0.0135y$

$\dfrac{0.0324}{0.0135} = \dfrac{0.0135y}{0.0135}$ *Divide by* 0.0135.

$2.4 = y$

**21.** $\dfrac{s}{7} = 42$

$\dfrac{s}{7} \cdot 7 = 42 \cdot 7$ *Multiply by* 7.

$s = 294$

**22.** $\dfrac{m}{5} = 6$

$\dfrac{m}{5} \cdot 5 = 6 \cdot 5$ *Multiply by* 5.

$m = 30$

**23.** $\dfrac{r}{7} = 1$

$\dfrac{r}{7} \cdot 7 = 1 \cdot 7$ *Multiply by* 7.

$r = 7$

**24.** $\dfrac{c}{7} = 2$

$\dfrac{c}{7} \cdot 7 = 2 \cdot 7$ *Multiply by* 7.

$c = 14$

**25.** $\dfrac{2}{3}b = 8$

$\dfrac{3}{2} \cdot \dfrac{2}{3}b = \dfrac{3}{2} \cdot 8$ *Multiply by* $\dfrac{3}{2}$.

$b = 12$

**26.** $22 = \dfrac{5}{4}s$

$\dfrac{4}{5} \cdot 22 = \dfrac{4}{5} \cdot \dfrac{5}{4}s$ *Multiply by* $\dfrac{4}{5}$.

$\dfrac{88}{5} = s$

$17.6 = s$

**27.** $35 = \dfrac{7}{5}t$

$\dfrac{5}{7} \cdot 35 = \dfrac{5}{7} \cdot \dfrac{7}{5}t$ *Multiply by* $\dfrac{5}{7}$.

$25 = t$

**28.** $\dfrac{7}{3}s = 21$

$\dfrac{3}{7} \cdot \dfrac{7}{3}s = \dfrac{3}{7} \cdot 21$ *Multiply by* $\dfrac{3}{7}$.

$s = 9$

**29.** $2x = \dfrac{5}{3}$

$\dfrac{1}{2} \cdot 2x = \dfrac{1}{2} \cdot \dfrac{5}{3}$ *Multiply by* $\dfrac{1}{2}$.

$x = \dfrac{5}{6}$

**30.** $4y = \dfrac{1}{3}$

$\dfrac{1}{4} \cdot 4y = \dfrac{1}{4} \cdot \dfrac{1}{3}$ *Multiply by* $\dfrac{1}{4}$.

$y = \dfrac{1}{12}$

**31.** $3p = \dfrac{5}{12}$

$\dfrac{1}{3} \cdot 3p = \dfrac{1}{3} \cdot \dfrac{5}{12}$ *Multiply by* $\dfrac{1}{3}$.

$p = \dfrac{5}{36}$

**32.** $\dfrac{3}{4} = 9a$

$\dfrac{1}{9} \cdot \dfrac{3}{4} = \dfrac{1}{9} \cdot 9a$ *Multiply by* $\dfrac{1}{9}$.

$\dfrac{1}{12} = a$

**33.** $7b + 9 = 37$

$7b + 9 - 9 = 37 - 9$ *Subtract* 9.

$7b = 28$

$\dfrac{7b}{7} = \dfrac{28}{7}$ *Divide by* 7.

$b = 4$

**34.** $4x + 12 = 75$

$4x + 12 - 12 = 75 - 12$ *Subtract* 12.

$4x = 63$

$\dfrac{4x}{4} = \dfrac{63}{4}$ *Divide by* 4.

$x = 15\dfrac{3}{4} = 15.75$

**35.** $7y-23=58$

$7y-23+23=58+23$ *Add* 23.

$7y=81$

$\frac{7y}{7}=\frac{81}{7}$ *Divide by* 7.

$y=\frac{81}{7}=11\frac{4}{7}$

**36.** $12r-60=100$

$12r-60+60=100+60$ *Add* 60.

$12r=160$

$\frac{12r}{12}=\frac{160}{12}$ *Divide by* 12.

$r=\frac{40}{3}=13\frac{1}{3}$

**37.** $6p+41.5=69.4$

$6p+41.5-41.5=69.4-41.5$ *Subtract* 41.5.

$6p=27.9$

$\frac{6p}{6}=\frac{27.9}{6}$ *Divide by* 6.

$p=4.65$

**38.** $12.2s+13.8=47.96$

$12.2s+13.8-13.8=47.96-13.8$ *Subtract* 13.8.

$12.2s=34.16$

$\frac{12.2s}{12.2}=\frac{34.16}{12.2}$ *Divide by* 12.2.

$s=2.8$

**39.** $6c+\frac{3}{4}=8$

$6c+\frac{3}{4}-\frac{3}{4}=8-\frac{3}{4}$ *Subtract* $\frac{3}{4}$.

$6c=\frac{29}{4}$

$\frac{1}{6}\cdot 6c=\frac{1}{6}\cdot\frac{29}{4}$ *Multiply by* $\frac{1}{6}$.

$c=\frac{29}{24}=1\frac{5}{24}$

**40.** $5z+\frac{2}{3}=2$

$5z+\frac{2}{3}-\frac{2}{3}=2-\frac{2}{3}$ *Subtract* $\frac{2}{3}$.

$5z=\frac{4}{3}$

$\frac{1}{5}\cdot 5z=\frac{1}{5}\cdot\frac{4}{3}$ *Multiply by* $\frac{1}{5}$.

$z=\frac{4}{15}$

**41.** $7q-\frac{2}{3}=4$

$7q-\frac{2}{3}+\frac{2}{3}=4+\frac{2}{3}$ *Add* $\frac{2}{3}$.

$7q=\frac{14}{3}$

$\frac{1}{7}\cdot 7q=\frac{1}{7}\cdot\frac{14}{3}$ *Multiply by* $\frac{1}{7}$.

$q=\frac{2}{3}$

**42.** $7a-\frac{5}{4}=\frac{9}{4}$

$7a-\frac{5}{4}+\frac{5}{4}=\frac{9}{4}+\frac{5}{4}$ *Add* $\frac{5}{4}$.

$7a=\frac{7}{2}$

$\frac{1}{7}\cdot 7a=\frac{1}{7}\cdot\frac{7}{2}$ *Multiply by* $\frac{1}{7}$.

$a=\frac{1}{2}$

**43.** $5.2z-4=1.2$

$5.2z-4+4=1.2+4$ *Add* 4.

$5.2z=5.2$

$\frac{5.2z}{5.2}=\frac{5.2}{5.2}$ *Divide by* 5.2.

$z=1$

**44.**
$$3.6m+2=6.32$$
$$3.6m+2-2=6.32-2 \quad \textit{Subtract } 2.$$
$$3.6m=4.32$$
$$\frac{3.6m}{3.6}=\frac{4.32}{3.6} \quad \textit{Divide by } 3.6.$$
$$m=1.2$$

**45.**
$$27.85=3+7.1p$$
$$27.85-3=3-3+7.1p \quad \textit{Subtract } 3.$$
$$24.85=7.1p$$
$$\frac{24.85}{7.1}=\frac{7.1p}{7.1} \quad \textit{Divide by } 7.1.$$
$$3.5=p$$

**46.**
$$0.9=4t-3.5$$
$$0.9+3.5=4t-3.5+3.5 \quad \textit{Add } 3.5.$$
$$4.4=4t$$
$$\frac{4.4}{4}=\frac{4t}{4} \quad \textit{Divide by } 4.$$
$$1.1=t$$

**47.**
$$7m+4m-5m=78$$
$$6m=78 \quad \textit{Combine like terms.}$$
$$\frac{6m}{6}=\frac{78}{6} \quad \textit{Divide by } 6.$$
$$m=13$$

**48.**
$$13r-7r+3r=81$$
$$9r=81 \quad \textit{Combine like terms.}$$
$$\frac{9r}{9}=\frac{81}{9} \quad \textit{Divide by } 9.$$
$$r=9$$

**49.**
$$2s+s+3s=12$$
$$6s=12 \quad \textit{Combine like terms.}$$
$$\frac{6s}{6}=\frac{12}{6} \quad \textit{Divide by } 6.$$
$$s=2$$

**50.**
$$3.5k+k+k=11.55$$
$$5.5k=11.55 \quad \textit{Combine like terms.}$$
$$\frac{5.5k}{5.5}=\frac{11.55}{5.5} \quad \textit{Divide by } 5.5.$$
$$k=2.1$$

**51.**
$$5y+2=3(y+4)$$
$$5y+2=3y+12 \quad \textit{Distribute.}$$
$$5y+2-2=3y+12-2 \quad \textit{Subtract } 2.$$
$$5y=3y+10$$
$$5y-3y=3y-3y+10 \quad \textit{Subtract } 3y.$$
$$2y=10$$
$$\frac{2y}{2}=\frac{10}{2} \quad \textit{Divide by } 2.$$
$$y=5$$

**52.**
$$4z+2=2(z+2)$$
$$4z+2=2z+4 \quad \textit{Distribute.}$$
$$4z+2-2=2z+4-2 \quad \textit{Subtract } 2.$$
$$4z=2z+2$$
$$4z-2z=2z-2z+2 \quad \textit{Subtract } 2z.$$
$$2z=2$$
$$\frac{2z}{2}=\frac{2}{2} \quad \textit{Divide by } 2.$$
$$z=1$$

**53.**
$$3(m-4)=m+2$$
$$3m-12=m+2 \quad \textit{Distribute.}$$
$$3m-12+12=m+2+12 \quad \textit{Add } 12.$$
$$3m=m+14$$
$$3m-m=m-m+14 \quad \textit{Subtract } m.$$
$$2m=14$$
$$\frac{2m}{2}=\frac{14}{2} \quad \textit{Divide by } 2.$$
$$m=7$$

**54.**
$$s+8=3(s-6)$$
$$s+8=3s-18 \quad \textit{Distribute.}$$
$$s+8+18=3s-18+18 \quad \textit{Add } 18.$$
$$s+26=3s$$
$$s-s+26=3s-s \quad \textit{Subtract } s.$$
$$26=2s$$
$$\frac{26}{2}=\frac{2s}{2} \quad \textit{Divide by } 2.$$
$$13=s$$

**55.**
$$\begin{aligned} 4(y+8) &= 3(y+14) \\ 4y+32 &= 3y+42 && \textit{Distribute.} \\ 4y+32-32 &= 3y+42-32 && \textit{Subtract } 32. \\ 4y &= 3y+10 \\ 4y-3y &= 3y-3y+10 && \textit{Subtract } 3y. \\ y &= 10 \end{aligned}$$

**56.**
$$\begin{aligned} 7(z-5) &= 4(z+8) \\ 7z-35 &= 4z+32 && \textit{Distribute.} \\ 7z-35+35 &= 4z+32+35 && \textit{Add } 35. \\ 7z &= 4z+67 \\ 7z-4z &= 4z-4z+67 && \textit{Subtract } 4z. \\ 3z &= 67 \\ \frac{3z}{3} &= \frac{67}{3} && \textit{Divide by } 3. \\ z &= 22\frac{1}{3} \end{aligned}$$

**57.**
$$\begin{aligned} \frac{3}{4}s+\frac{1}{5}s &= \frac{4}{5} \\ \frac{15}{20}s+\frac{4}{20}s &= \frac{4}{5} \\ \frac{19}{20}s &= \frac{4}{5} && \textit{Combine like terms.} \\ \frac{20}{19}\cdot\frac{19}{20}s &= \frac{20}{19}\cdot\frac{4}{5} && \textit{Multiply by } \frac{20}{19}. \\ s &= \frac{16}{19} \end{aligned}$$

**58.**
$$\begin{aligned} \frac{3}{4}q-\frac{1}{9} &= \frac{1}{3}+\frac{1}{4}q \\ \frac{3}{4}q-\frac{1}{9}+\frac{1}{9} &= \frac{1}{3}+\frac{1}{9}+\frac{1}{4}q && \textit{Add } \frac{1}{9}. \\ \frac{3}{4}q &= \frac{3}{9}+\frac{1}{9}+\frac{1}{4}q \\ \frac{3}{4}q &= \frac{4}{9}+\frac{1}{4}q \\ \frac{3}{4}q-\frac{1}{4}q &= \frac{4}{9}+\frac{1}{4}q-\frac{1}{4}q && \textit{Subtract } \frac{1}{4}q. \\ \frac{1}{2}q &= \frac{4}{9} \\ \frac{2}{1}\cdot\frac{1}{2}q &= \frac{2}{1}\cdot\frac{4}{9} && \textit{Multiply by } \frac{2}{1}. \\ q &= \frac{8}{9} \end{aligned}$$

**59.**
$$\begin{aligned} \frac{3}{8}y+\frac{1}{4} &= \frac{9}{8}y-\frac{1}{4} \\ \frac{3}{8}y+\frac{1}{4}+\frac{1}{4} &= \frac{9}{8}y-\frac{1}{4}+\frac{1}{4} && \textit{Add } \frac{1}{4}. \\ \frac{3}{8}y+\frac{1}{2} &= \frac{9}{8}y \\ \frac{3}{8}y-\frac{3}{8}y+\frac{1}{2} &= \frac{9}{8}y-\frac{3}{8}y && \textit{Subtract } \frac{3}{8}y. \\ \frac{1}{2} &= \frac{3}{4}y \\ \frac{4}{3}\cdot\frac{1}{2} &= \frac{4}{3}\cdot\frac{3}{4}y && \textit{Multiply by } \frac{4}{3}. \\ \frac{2}{3} &= y \end{aligned}$$

**60.**
$$\begin{aligned} 3(2p-1) &= 4(2.2-p) \\ 6p-3 &= 8.8-4p && \textit{Distribute.} \\ 6p-3+3 &= 8.8+3-4p && \textit{Add } 3. \\ 6p &= 11.8-4p \\ 6p+4p &= 11.8-4p+4p && \textit{Add } 4p. \\ 10p &= 11.8 \\ \frac{10p}{10} &= \frac{11.8}{10} && \textit{Divide by } 10. \\ p &= 1.18 \end{aligned}$$

**61.**
$$\begin{aligned} 2(y+1) &= 4(4-2.5y) \\ 2y+2 &= 16-10y && \textit{Distribute.} \\ 2y+10y+2 &= 16-10y+10y && \textit{Add } 10y. \\ 12y+2 &= 16 \\ 12y+2-2 &= 16-2 && \textit{Subtract } 2. \\ 12y &= 14 \\ \frac{12y}{12} &= \frac{14}{12} && \textit{Divide by } 12. \\ y &= 1\frac{2}{12} = 1\frac{1}{6} \end{aligned}$$

**62.**
$$\begin{aligned} 9.1765y+0.3284y &= 6.65343 \\ 9.5049y &= 6.65343 \\ & && \textit{Combine like terms.} \\ \frac{9.5049y}{9.5049} &= \frac{6.65343}{9.5049} \\ & && \textit{Divide by } 9.5049. \\ y &= 0.7 \end{aligned}$$

**63.**
$$0.7452(3k-1) = 3.94956$$
$$2.2356k - 0.7452 = 3.94956$$
*Distribute.*
$$2.2356k - 0.7452 + 0.7452 = 3.94956 + 0.7452$$
*Add* 0.7452.
$$2.2356k = 4.69476$$
$$\frac{2.2356k}{2.2356} = \frac{4.69476}{2.2356}$$
*Divide by* 2.2356.
$$k = 2.1$$

**64.**
$$0.3255(1+7.5s) = 6.67275$$
$$0.3255 + 2.44125s = 6.67275$$
*Distribute.*
$$0.3255 - 0.3255 + 2.44125s = 6.67275 - 0.3255$$
*Subtract* 0.3255.
$$2.44125s = 6.34725$$
$$\frac{2.44125s}{2.44125} = \frac{6.34725}{2.44125}$$
*Divide by* 2.44125.
$$s = 2.6$$

**65.**
$$1.2(2+3r) = 0.8(2r+5)$$
$$2.4 + 3.6r = 1.6r + 4 \quad \textit{Distribute.}$$
$$2.4 - 2.4 + 3.6r = 1.6r + 4 - 2.4 \quad \textit{Subtract } 2.4.$$
$$3.6r = 1.6r + 1.6$$
$$3.6r - 1.6r = 1.6r - 1.6r + 1.6 \quad \textit{Subtract } 1.6r.$$
$$2r = 1.6$$
$$\frac{2r}{2} = \frac{1.6}{2} \quad \textit{Divide by } 2.$$
$$r = 0.8$$

**66.** Answers will vary.

**67.** Answers will vary.

**68.** Answers will vary.

## 2.2 Applications of Equations

**1.** 27 plus a number
$27 + x$

**2.** the sum of a number and $16\frac{1}{2}$
$x + 16\frac{1}{2}$

**3.** a number added to 22
$22 + x$

**4.** 6.8 added to a number
$6.8 + x$

**5.** 4 less than a number
$x - 4$

**6.** 12 fewer than a number
$x - 12$

**7.** subtract $3\frac{1}{2}$ from a number
$x - 3\frac{1}{2}$

**8.** subtract a number from 5.4
$5.4 - x$

**9.** triple a number
$3x$

**10.** the product of a number and 9
$9x$

**11.** three-fifths of a number
$\frac{3}{5}x$

**12.** four-thirds of a number
$\frac{4}{3}x$

**13.** the quotient of 9 and a number
$\frac{9}{x}$

**14.** the quotient of a number and 11
$\frac{x}{11}$