

Everything that you
need to know about
math

And had the courage to ask!

1.17 DIVIDING WHOLE NUMBERS

Recall the parts of a division question.

Quotient
Divisor | Dividend
Remainder

Example 1.

$$693 \div 7$$

Solution

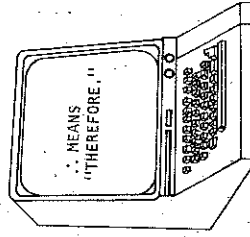
Write as $7 \overline{)693}$

Step 1

Choose a trial
quotient and multiply.

8 is the trial
quotient
 $7 \times 8 = 56$

$$\begin{array}{r} 8 \\ 7 \overline{)693} \\ \underline{56} \end{array}$$



Step 2

Subtract and
bring down the
next digit.

$$\begin{array}{r} 8 \\ 7 \overline{)693} \\ \underline{56} \quad 33 \end{array}$$

If the
remainder is
larger than
the divisor,
increase the
quotient by 1.

Step 3

Repeat Steps 1 and 2
until the entire
dividend is used.

$$\begin{array}{r} 84 \\ 7 \overline{)693} \\ \underline{56} \quad 33 \\ \underline{28} \quad 5 \end{array}$$

\therefore the answer (or quotient) is 84, remainder 5.

Example 2.

$$16 \overline{) 573}$$

Solution

Step 1

Choose the trial quotient 3.

$$\begin{array}{r} 3 \\ 16 \overline{) 573} \\ \underline{48} \\ 93 \end{array}$$

Step 2

Subtract; bring down the next digit.

$$\begin{array}{r} 35 \\ 16 \overline{) 573} \\ \underline{16} \overline{) 573} \\ \underline{48} \\ 93 \end{array}$$

Step 3

Repeat Steps 1 and 2.

$$\begin{array}{r} 35 \\ 16 \overline{) 573} \\ \underline{16} \overline{) 573} \\ \underline{48} \\ 93 \\ \underline{80} \\ 13 \end{array}$$

$$\begin{array}{r} 16 \\ 35 \\ \underline{80} \\ 560 \\ \underline{560} \\ +13 \\ \hline 573 \end{array}$$

∴ the quotient is 35, remainder 13.

We check a division question by using the division statement.

$$\text{Dividend} = \text{Divisor} \times \text{Quotient} + \text{Remainder}$$

$$573 = 16 \times 35 + 13$$

EXERCISE

1. Divide and state the remainder.

- (a) $7 \overline{) 428}$
 - (b) $9 \overline{) 260}$
 - (c) $6 \overline{) 246}$
 - (d) $352 \div 8$
 - (e) $8 \overline{) 562}$
 - (f) $5 \overline{) 356}$
 - (g) $922 \div 4$
2. Divide. Check, using the division statement.
- (a) $8 \overline{) 496}$
 - (b) $3 \overline{) 657}$
 - (c) $15 \overline{) 230}$
 - (d) $41 \overline{) 768}$
 - (e) $73 \overline{) 178}$
 - (f) $4520 \div 12$
 - (g) $481 \div 9$
 - (h) $12 \overline{) 252}$
 - (i) $684 \div 32$
 - (j) $82 \overline{) 986}$
 - (k) $61 \overline{) 488}$
 - (l) $16 \overline{) 1973}$

3. Use the division statement to check the following partial solutions. Correct those that are incorrect.

- (a) $\begin{array}{r} 16 \\ 36 \overline{) 594} \end{array}$
 - (b) $\begin{array}{r} 40 \\ 12 \overline{) 481} \end{array}$
 - (c) $\begin{array}{r} R \ 3 \\ 42 \overline{) 958} \end{array}$
 - (d) $\begin{array}{r} R \ 11 \\ 72 \overline{) 6207} \end{array}$
 - (e) $\begin{array}{r} R \ 34 \\ 14 \overline{) 625} \end{array}$
4. Divide and state the remainder.
- (a) $18 \overline{) 3154}$
 - (b) $21 \overline{) 1428}$
 - (c) $5278 \div 36$
 - (d) $43 \overline{) 8892}$
 - (e) $17 \overline{) 2193}$
 - (f) $22 \overline{) 5563}$
 - (g) $14 \overline{) 8625}$
 - (h) $2804 \div 31$
 - (i) $58 \overline{) 4144}$
 - (j) $37 \overline{) 1000}$

3. (a) 1230. (b) 720. (c) 3040. (d) 1280.

4. (a) 18 120. (b) 13 770. (c) 18 880. (d) 35 360.

5. (a) 5520. (b) 13 770. (c) 18 880. (d) 35 360.

6. (a) 12 950. (b) 13 770. (c) 18 880. (d) 35 360.

7. (a) 12 950. (b) 13 770. (c) 18 880. (d) 35 360.

8. (a) 12 950. (b) 13 770. (c) 18 880. (d) 35 360.

9. (a) 12 950. (b) 13 770. (c) 18 880. (d) 35 360.

10. (a) 12 950. (b) 13 770. (c) 18 880. (d) 35 360.

11. (a) 12 950. (b) 13 770. (c) 18 880. (d) 35 360.

12. (a) 12 950. (b) 13 770. (c) 18 880. (d) 35 360.

13. (a) 12 950. (b) 13 770. (c) 18 880. (d) 35 360.

14. (a) 12 950. (b) 13 770. (c) 18 880. (d) 35 360.

15. (a) 12 950. (b) 13 770. (c) 18 880. (d) 35 360.

16. (a) 12 950. (b) 13 770. (c) 18 880. (d) 35 360.

17. (a) 12 950. (b) 13 770. (c) 18 880. (d) 35 360.

18. (a) 12 950. (b) 13 770. (c) 18 880. (d) 35 360.

19. (a) 12 950. (b) 13 770. (c) 18 880. (d) 35 360.

20. (a) 12 950. (b) 13 770. (c) 18 880. (d) 35 360.

21. (a) 12 950. (b) 13 770. (c) 18 880. (d) 35 360.

22. (a) 12 950. (b) 13 770. (c) 18 880. (d) 35 360.

23. (a) 12 950. (b) 13 770. (c) 18 880. (d) 35 360.

24. (a) 12 950. (b) 13 770. (c) 18 880. (d) 35 360.

25. (a) 12 950. (b) 13 770. (c) 18 880. (d) 35 360.

26. (a) 12 950. (b) 13 770. (c) 18 880. (d) 35 360.

27. (a) 12 950. (b) 13 770. (c) 18 880. (d) 35 360.

28. (a) 12 950. (b) 13 770. (c) 18 880. (d) 35 360.

29. (a) 12 950. (b) 13 770. (c) 18 880. (d) 35 360.

30. (a) 12 950. (b) 13 770. (c) 18 880. (d) 35 360.

31. (a) 12 950. (b) 13 770. (c) 18 880. (d) 35 360.

32. (a) 12 950. (b) 13 770. (c) 18 880. (d) 35 360.

33. (a) 12 950. (b) 13 770. (c) 18 880. (d) 35 360.

34. (a) 12 950. (b) 13 770. (c) 18 880. (d) 35 360.

35. (a) 12 950. (b) 13 770. (c) 18 880. (d) 35 360.

36. (a) 12 950. (b) 13 770. (c) 18 880. (d) 35 360.

37. (a) 12 950. (b) 13 770. (c) 18 880. (d) 35 360.

38. (a) 12 950. (b) 13 770. (c) 18 880. (d) 35 360.

39. (a) 12 950. (b) 13 770. (c) 18 880. (d) 35 360.

40. (a) 12 950. (b) 13 770. (c) 18 880. (d) 35 360.

Exercise 1.16

- 1. (a) 8. (b) 2. (c) 6. (d) 5.
- 2. (a) 3×3 . (b) 2×5 . (c) 3×5 . (d) $2 \times 2 \times 2$.
- 3. (a) 35. (b) 12. (c) 16. (d) 4. (e) 30. (f) 7. (g) 2. (h) 4. (i) 7. (j) 2. (k) 2. (l) 2.

Exercise 1.17

- 1. (a) 51 R1. (b) 28 R8. (c) 41 R0. (d) 44 R0.
- 2. (a) 71 R1. (b) 174 R0. (c) 230 R2. (d) 78 R5.
- 3. (a) 35 R3. (b) 21 R0. (c) 219 R0. (d) 53 R4.
- 4. (a) 12 R2. (b) 123 R4. (c) 15 R5. (d) 21 R12.
- 5. (a) 375 R8. (b) 123 R4. (c) 2 R32. (d) 8 R0.
- 6. (a) 175 R4. (b) 68 R0. (c) 146 R22.
- 7. (a) 202 R6. (b) 23 R0. (c) 252 R19. (d) 516 R1.
- 8. (a) 90 R14. (b) 74 R0. (c) 27 R1.

Exercise 1.18

- 1. (a) 20 R5. (b) 57 R6. (c) 49 R1. (d) 200 R3.
- 2. (a) 517 R6. (b) 498 R0. (c) 2 R78. (d) 5 R40.
- 3. (a) 38 R60. (b) 59 R88. (c) 47 R60. (d) 5 R846.
- 4. (a) 8 R600. (b) 1 R0. (c) 430 R0. (d) 674 R4.
- 5. (a) 305 R0. (b) 78 R4. (c) 20 R95. (d) 40 R0.
- 6. (a) 571 R2. (b) 6 R84. (c) 40 R0. (d) 40 R0.
- 7. (a) 78 R0. (b) 4 R586. (c) 9 R0. (d) 56 R490.
- 8. (a) 509 R0. (b) 4716 R0.

Exercise 1.20

- 1. 50. 2. 51. 3. 12. 4. 104.
- 5. 135. 6. 1971. 7. 1971. 8. 1893.
- 9. 2007. 10. 5625. 11. 875. 12. 2783.
- 13. 1119. 14. 4692. 15. 394. 16. 285.
- 17. 312. 18. 298. 19. 694. 20. 741.
- 21. 1130. 22. 694. 23. 12.

Exercise 1.21

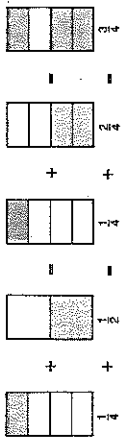
- 1. (a) 4 L. (b) 40 L.
- 2. Greyhound—120 km; Fox—84 km.
- 3. 488.
- 4. (a) 480. (b) 6. (c) 175.
- 5. (a) Magle, Mantis, Aaron, Mize, Martin. (b) \$1085. (c) \$150.
- 6. Speed in m/s. Speed in Mach.

Exercise 1.22

- 1. (a) 30. (b) 40. (c) 40. (d) 50.
- 2. (a) 80. (b) 90. (c) 90. (d) 100.
- 3. (a) 150. (b) 170.

4.6 ADDING FRACTIONS WITH DIFFERENT DENOMINATORS

The diagram below shows how we can add two fractions with different denominators.



To add $\frac{1}{4} + \frac{2}{3}$, we consider the list of equivalent fractions for $\frac{1}{4}$ and $\frac{2}{3}$.

$\frac{1}{4}$ is equivalent to $\frac{1}{4}, \frac{2}{8}, \frac{3}{12}, \dots$ $\frac{2}{3}$ is equivalent to $\frac{2}{3}, \frac{4}{6}, \frac{8}{12}, \dots$

$$\begin{aligned} \frac{1}{4} + \frac{2}{3} &= \frac{3}{12} + \frac{8}{12} \\ &= \frac{3+8}{12} \\ &= \frac{11}{12} \end{aligned}$$

$$\therefore \frac{1}{4} + \frac{2}{3} = \frac{11}{12}$$

Example.

Add.
 $\frac{3}{5} + \frac{1}{12}$

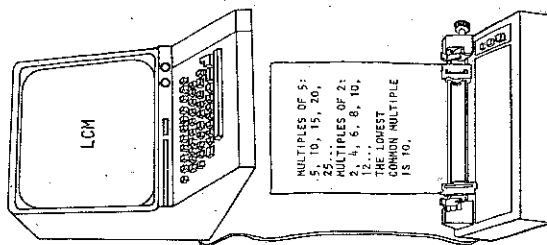
Solution.

$$\begin{aligned} \frac{3}{5} + \frac{1}{12} &= \frac{3 \cdot 12}{5 \cdot 12} + \frac{1 \cdot 5}{12 \cdot 5} \\ &= \frac{36}{60} + \frac{5}{60} \\ &= \frac{36+5}{60} \\ &= \frac{41}{60} \end{aligned}$$

OR

$$\begin{aligned} \frac{3}{5} + \frac{1}{12} &= \frac{18}{20} + \frac{3}{20} \\ &= \frac{18+3}{20} \\ &= \frac{21}{20} \\ &= 1\frac{1}{20} \end{aligned}$$

$$\therefore \frac{3}{5} + \frac{1}{12} = 1\frac{1}{20}$$



MULTIPLES OF 5:
5, 10, 15, 20, 25, ...
MULTIPLES OF 2:
2, 4, 6, 8, 10, 12, ...
LOWEST COMMON MULTIPLE
IS 10.

EXERCISE

1. Add. Express your answers in lowest terms.

(a) $\frac{2}{5} + \frac{1}{5}$
(b) $\frac{1}{4} + \frac{1}{4}$
(c) $\frac{5}{8} + \frac{1}{8}$
(d) $\frac{7}{10} + \frac{1}{10}$
(e) $\frac{1}{6} + \frac{1}{6}$
(f) $\frac{3}{8} + \frac{1}{8}$

(b) $3\frac{1}{2} + 2\frac{1}{4}$
(d) $3\frac{1}{4} + 2\frac{2}{3}$
(f) $6\frac{1}{4} + 3\frac{1}{3}$
(h) $3\frac{1}{4} + 1\frac{1}{6}$

5. Add.

(a) $2\frac{1}{4} + 3\frac{1}{2}$
(c) $4\frac{1}{6} + 2\frac{1}{2}$
(e) $5\frac{1}{2} + 2\frac{1}{4}$
(g) $4\frac{3}{5} + 7\frac{1}{3}$

(b) $2\frac{1}{2} + 1\frac{5}{6}$
(d) $4\frac{3}{5} + 2\frac{1}{2}$
(f) $6\frac{5}{8} + 5\frac{1}{2}$
(h) $8\frac{7}{10} + 2\frac{3}{4}$

2. Add. Express your answers in lowest terms.

(a) $\frac{1}{2} + \frac{1}{4}$
(c) $\frac{1}{2} + \frac{1}{8}$
(e) $\frac{1}{4} + \frac{5}{8}$

(b) $\frac{1}{2} + \frac{1}{6}$
(d) $\frac{1}{3} + \frac{1}{6}$
(f) $\frac{1}{2} + \frac{3}{10}$

3. Add.

(a) $\frac{1}{2} + \frac{1}{3}$
(c) $\frac{1}{2} + \frac{1}{5}$
(e) $\frac{1}{3} + \frac{3}{4}$

(b) $\frac{1}{4} + \frac{3}{4}$
(d) $\frac{3}{4} + \frac{1}{5}$
(f) $\frac{1}{4} + \frac{3}{10}$

4. Add.

(a) $\frac{1}{2} + \frac{3}{4}$
(c) $\frac{3}{4} + \frac{2}{5}$
(e) $\frac{5}{6} + \frac{1}{4}$

(b) $\frac{3}{4} + \frac{1}{3}$
(d) $\frac{4}{5} + \frac{1}{3}$
(f) $\frac{7}{10} + \frac{2}{3}$

7. Add.

(a) $2\frac{1}{5} + \frac{3}{5}$
(c) $3\frac{1}{3} + \frac{1}{2}$

(b) $3\frac{1}{2} + 4\frac{1}{4}$
(d) $5\frac{1}{6} + 2\frac{1}{2}$

(e) $\frac{3}{5} + 4\frac{1}{2}$

(f) $8\frac{2}{3} + 5\frac{1}{2}$

4.8 MULTIPLYING FRACTIONS

There are 8 students in the group shown at the right.

$\frac{1}{2}$ of the group are girls.

There are 4 girls.

$$\therefore \frac{1}{2} \times 8 = 4$$

$\frac{1}{4}$ of the group have light-coloured hair.

There are 2 students with light-coloured hair.

$$\therefore \frac{1}{4} \times 8 = 2$$

1 out of 8 is a girl with light-coloured hair. $\left(\frac{1}{8}\right)$

$$\therefore \frac{1}{2} \times \frac{1}{4} = \frac{1}{8}$$

Example 1.

Multiply.

$$\frac{3}{4} \times \frac{1}{3}$$

Solution

Step 1

Multiply the 2 numerators. Multiply the 2 denominators.

$$\frac{3 \times 1}{4 \times 3} = \frac{3}{12}$$

Step 2

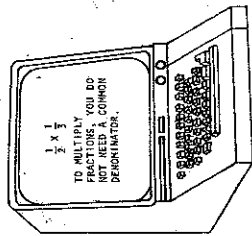
Form a fraction.

$$\frac{3}{12}$$

Step 3

Reduce the fraction to lowest terms.

$$\frac{3}{12} = \frac{1}{4}$$



Example 2.

Multiply.

$$3\frac{2}{3} \times 1\frac{1}{4}$$

Solution

Change the mixed numbers to improper fractions.

$$3\frac{2}{3} \times 1\frac{1}{4} = \frac{11}{3} \times \frac{5}{4}$$

$$= \frac{55}{12}$$

$$= 4\frac{7}{12}$$

$$\therefore 3\frac{2}{3} \times 1\frac{1}{4} = 4\frac{7}{12}$$

EXERCISE

1. Multiply. Express your answers in lowest terms.

(a) $\frac{1}{2} \times 4$

(b) $\frac{1}{3} \times 6$

(c) $\frac{4}{5} \times 20$

(d) $8 \times \frac{1}{2}$

(e) $12 \times \frac{5}{6}$

(f) $9 \times \frac{2}{3}$

2. Multiply. Express your answers in lowest terms.

(a) $\frac{1}{2} \times \frac{1}{3}$

(b) $\frac{3}{4} \times \frac{1}{2}$

(c) $\frac{4}{5} \times \frac{1}{3}$

(d) $\frac{5}{8} \times \frac{3}{5}$

(e) $\frac{1}{6} \times \frac{3}{4}$

(f) $\frac{3}{4} \times \frac{5}{6}$

3. Multiply.

(a) $2 \times \frac{1}{3}$

(b) $5 \times 2\frac{1}{2}$

(c) $4 \times 3\frac{1}{5}$

(d) $1\frac{3}{4} \times 5$

(e) $4\frac{1}{2} \times 10$

(f) $6\frac{1}{3} \times 12$

4. Multiply.

(a) $\frac{1}{2} \times 2\frac{1}{3}$

(b) $\frac{1}{3} \times 1\frac{2}{3}$

(c) $3\frac{1}{4} \times \frac{2}{3}$

(d) $\frac{1}{5} \times \frac{8}{4}$

5. Multiply.

(a) $1\frac{1}{2} \times 2\frac{1}{5}$

(b) $3\frac{1}{4} \times 1\frac{1}{2}$

(c) $4\frac{1}{5} \times 6\frac{1}{2}$

(d) $2\frac{3}{4} \times 3\frac{1}{3}$

(e) $1\frac{1}{6} \times 4\frac{2}{3}$

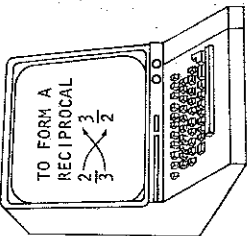
(f) $5\frac{1}{5} \times 2\frac{1}{6}$

LIFE MATH CHALLENGE

Can you draw this figure without lifting your pencil or crossing any line?



4.9 RECIPROCAL



$\frac{2}{3}$ is the reciprocal of $\frac{3}{2}$.

$$\frac{2}{3} \times \frac{3}{2} = \frac{2 \times 3}{3 \times 2} = \frac{6}{6} = 1$$

The product of a number and its reciprocal is 1.

Example.

What is the reciprocal of

(a) 2?

(b) $\frac{1}{3}$?

Solution

(a) The reciprocal of 2 is $\frac{1}{2}$

because $2 \times \frac{1}{2} = \frac{2}{2} \times \frac{1}{2} = \frac{2}{2} = 1$

(b) First change $\frac{1}{3}$ to an improper fraction.

$$\frac{1}{3} = \frac{4}{3}$$

the reciprocal of $\frac{4}{3}$ is $\frac{3}{4}$ because

$$\frac{4}{3} \times \frac{3}{4} = \frac{12}{12} = 1$$

\therefore the reciprocal of $\frac{1}{3}$ is $\frac{3}{4}$.

EXERCISE

1. State the reciprocal of each of the following.

- (a) 2
 (b) 5
 (c) 7
 (d) 16
 (e) 12
 (f) 1

2. Check whether each of the following pairs are reciprocals.

- (a) $\frac{1}{3}$ and $\frac{3}{4}$
 (b) $\frac{1}{2}$ and $\frac{3}{2}$
 (c) $\frac{3}{4}$ and $\frac{1}{2}$
 (d) $\frac{1}{2}$ and $\frac{2}{3}$
 (e) $\frac{4}{5}$ and $\frac{5}{4}$
 (f) $\frac{3}{3}$ and $\frac{3}{3}$

3. State the reciprocal of each of the following.

- (a) $\frac{2}{5}$
 (b) $\frac{3}{4}$
 (c) $\frac{5}{8}$
 (d) $\frac{7}{10}$
 (e) $\frac{3}{8}$
 (f) $\frac{5}{12}$

4. State the reciprocal of each of the following.

- (a) $\frac{1}{2}$
 (b) $\frac{12}{3}$
 (c) $\frac{4}{5}$
 (d) $\frac{15}{6}$
 (e) $\frac{2}{3}$
 (f) $\frac{3}{4}$
 (g) $\frac{2}{10}$
 (h) $\frac{4}{5}$

5. Calculate.

- (a) $\frac{2}{7} \times \frac{7}{2}$
 (b) $\frac{3}{5} \times \frac{5}{3}$
 (c) $\frac{5}{8} \times \frac{8}{5}$
 (d) $\frac{7}{10} \times \frac{10}{7}$
 (e) $\frac{1}{6} \times 6$
 (f) $8 \times \frac{1}{8}$

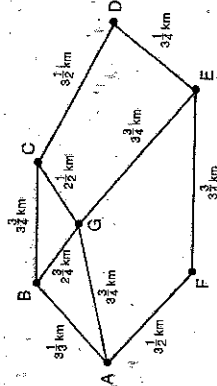
6. Calculate.

- (a) $\frac{2}{3} \times 1\frac{1}{2}$
 (b) $\frac{3}{4} \times 1\frac{1}{3}$
 (c) $\frac{4}{5} \times 1\frac{1}{4}$
 (d) $\frac{7}{8} \times 1\frac{1}{7}$
 (e) $1\frac{5}{6} \times \frac{6}{5}$
 (f) $3\frac{1}{3} \times \frac{3}{10}$
 (g) $15 \times \frac{7}{12}$
 (h) $2\frac{1}{2} \times \frac{2}{5}$

7. Which of the following pairs are reciprocals?

- (a) $\frac{3}{4}$ and $\frac{1}{4}$
 (b) $\frac{2}{3}$ and $\frac{1}{12}$
 (c) $\frac{4}{5}$ and $\frac{12}{5}$
 (d) $\frac{3}{5}$ and $\frac{12}{3}$
 (e) $2\frac{1}{2}$ and $\frac{2}{3}$
 (f) $2\frac{2}{3}$ and $\frac{3}{8}$
 (g) $2\frac{1}{2}$ and $2\frac{1}{2}$
 (h) $\frac{11}{10}$ and $\frac{1}{10}$
 (i) $2\frac{3}{4}$ and $\frac{11}{4}$
 (j) $3\frac{5}{6}$ and $\frac{18}{23}$

LIFE MATH CHALLENGE



- (a) The shortest distance from A to D is through G and C.
 How long is it?
 (b) What is the next shortest distance?
 (c) What is the difference in the distances using the route A-F-E-D and A-B-C-D?

4.10 DIVIDING FRACTIONS

How many groups of 2 are in 6?
There are 3 groups of 2.

$$6 \div 2 = 3 \text{ because } 2 \times 3 = 6.$$

How many $\frac{1}{2}$'s are in 6?

There are 12 $\frac{1}{2}$'s in 6.

$$6 \div \frac{1}{2} = 12 \text{ because } \frac{1}{2} \times 12 = 6.$$

Mathematically,

$$6 \div \frac{1}{2} = 6 \times \frac{2}{1}$$

To simplify division by a fraction, we multiply by the reciprocal.

Example.

Divide.

(a) $10 \div \frac{2}{3}$

Solution

$$\begin{aligned} \text{(a) } 10 \div \frac{2}{3} &= \frac{10}{1} \times \frac{3}{2} \\ &= \frac{30}{2} \\ &= 15 \end{aligned}$$

$$\therefore 10 \div \frac{2}{3} = 15$$



(b) $\frac{1}{2} \div 2\frac{1}{3}$

$$\begin{aligned} \text{(b) } \frac{1}{2} \div 2\frac{1}{3} &= \frac{1}{2} \div \frac{7}{3} \\ &= \frac{1}{2} \times \frac{3}{7} \\ &= \frac{1 \times 3}{2 \times 7} \\ &= \frac{3}{14} \end{aligned}$$

$$\therefore \frac{1}{2} \div 2\frac{1}{3} = \frac{3}{14}$$

First, change the question to its horizontal form.

EXERCISE

1. State the reciprocals of each of the following.

- (a) 3
(b) $\frac{1}{2}$
(c) $\frac{1}{4}$
(d) $1\frac{1}{3}$
(e) $2\frac{3}{4}$

- (f) $\frac{2}{3} + \frac{1}{5}$
(g) $\frac{3}{4} + \frac{2}{3}$
(h) $\frac{4}{5} + \frac{3}{4}$
(i) $\frac{5}{6} + \frac{4}{4}$

2. Divide.

- (a) $20 \div 2$
(b) $30 \div 6$
(c) $100 \div 20$
(d) $15 \div 5$
(e) $18 \div 4$
(f) $25 \div 6$

- (g) $1\frac{1}{2} \div 2$
(h) $4 \div 1\frac{1}{2}$
(i) $8 \div 1\frac{1}{4}$
(j) $10 \div 2\frac{1}{2}$

3. Divide.

- (a) $10 \div 2$
(b) $6 \div \frac{1}{4}$
(c) $12 \div \frac{1}{5}$
(d) $15 \div \frac{1}{3}$
(e) $8 \div \frac{2}{5}$
(f) $10 \div \frac{3}{8}$

- (g) $3\frac{1}{2} \div \frac{3}{4}$
(h) $5 \div 2\frac{1}{2}$
(i) $7 \div \frac{3}{4}$
(j) $4\frac{1}{2} \div \frac{1}{3}$

4. Divide.

- (a) $\frac{2}{3} \div 5$
(b) $\frac{1}{2} \div 6$
(c) $\frac{3}{4} \div 2$
(d) $\frac{4}{5} \div 3$
(e) $\frac{5}{6} \div 7$

- (f) $3\frac{1}{2} \div 1\frac{1}{2}$
(g) $1\frac{1}{2} \div \frac{2}{3}$
(h) $1\frac{3}{4} \div 3\frac{1}{2}$
(i) $3\frac{2}{5} \div 1\frac{1}{10}$

5. Divide.

- (a) $\frac{1}{2} \div \frac{1}{3}$
(b) $\frac{3}{4} \div \frac{2}{3}$
(c) $\frac{4}{5} \div \frac{3}{4}$
(d) $\frac{5}{6} \div \frac{4}{5}$

6. Divide.

- (a) $1\frac{1}{2} \div 2$
(b) $1\frac{1}{3} \div 3$
(c) $4 \div 1\frac{1}{2}$
(d) $5 \div 1\frac{2}{3}$
(e) $8 \div 1\frac{1}{4}$
(f) $10 \div 2\frac{1}{2}$

7. Divide.

- (a) $\frac{3}{4} \div 1\frac{1}{2}$
(b) $\frac{5}{6} \div 2\frac{1}{2}$
(c) $\frac{3}{10} \div 1\frac{1}{2}$
(d) $\frac{7}{8} \div 1\frac{3}{4}$
(e) $3\frac{1}{2} \div \frac{3}{4}$
(f) $4\frac{1}{2} \div \frac{1}{3}$

8. Divide.

- (a) $2\frac{1}{2} \div 1\frac{2}{5}$
(b) $3\frac{1}{3} \div 1\frac{1}{2}$
(c) $1\frac{1}{6} \div 1\frac{2}{3}$
(d) $1\frac{3}{4} \div 3\frac{1}{2}$
(e) $4\frac{3}{4} \div 1\frac{2}{5}$
(f) $3\frac{2}{5} \div 1\frac{1}{10}$

5.1 PERCENT

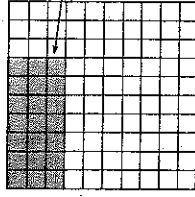
Percent means per hundred.

1% is $\frac{1}{100}$.

\$1.00 is 100 cents.

1 cent is $\frac{1}{100}$ of a dollar.

1 cent is 1% of a dollar.



21 out of 100 are shaded.
 $\frac{21}{100}$ are shaded.
21% are shaded.

3. (a) $\frac{3}{4}$ (b) $\frac{7}{12}$ (c) $\frac{2}{10}$ (d) $\frac{1}{20}$ (e) $\frac{1}{10}$ (f) $\frac{1}{20}$ (g) $\frac{1}{10}$ (h) $\frac{1}{20}$
4. (a) $\frac{1}{10}$ (b) $\frac{1}{12}$ (c) $\frac{1}{15}$ (d) $\frac{1}{18}$ (e) $\frac{1}{20}$ (f) $\frac{1}{25}$ (g) $\frac{1}{30}$ (h) $\frac{1}{36}$
5. (a) $\frac{5}{12}$ (b) $\frac{7}{18}$ (c) $\frac{9}{24}$ (d) $\frac{11}{30}$ (e) $\frac{13}{36}$ (f) $\frac{15}{42}$ (g) $\frac{17}{48}$ (h) $\frac{19}{54}$
6. (a) $\frac{4}{10}$ (b) $\frac{5}{15}$ (c) $\frac{6}{20}$ (d) $\frac{7}{25}$ (e) $\frac{8}{30}$ (f) $\frac{9}{35}$ (g) $\frac{10}{40}$ (h) $\frac{11}{45}$
7. (a) $\frac{3}{4}$ (b) $\frac{7}{8}$ (c) $\frac{11}{16}$ (d) $\frac{15}{20}$ (e) $\frac{19}{24}$ (f) $\frac{23}{28}$ (g) $\frac{27}{32}$ (h) $\frac{31}{36}$

Exercise 4.10

1. (a) $\frac{1}{2}$ (b) $\frac{1}{3}$ (c) $\frac{1}{4}$ (d) $\frac{1}{5}$ (e) $\frac{1}{6}$ (f) $\frac{1}{7}$ (g) $\frac{1}{8}$ (h) $\frac{1}{9}$ (i) $\frac{1}{10}$
2. (a) 10 (b) 15 (c) 20 (d) 25 (e) 30 (f) 35 (g) 40 (h) 45 (i) 50
3. (a) 20 (b) 30 (c) 40 (d) 50 (e) 60 (f) 70 (g) 80 (h) 90 (i) 100
4. (a) $\frac{1}{2}$ (b) $\frac{1}{3}$ (c) $\frac{1}{4}$ (d) $\frac{1}{5}$ (e) $\frac{1}{6}$ (f) $\frac{1}{7}$ (g) $\frac{1}{8}$ (h) $\frac{1}{9}$ (i) $\frac{1}{10}$
5. (a) $\frac{1}{2}$ (b) $\frac{1}{3}$ (c) $\frac{1}{4}$ (d) $\frac{1}{5}$ (e) $\frac{1}{6}$ (f) $\frac{1}{7}$ (g) $\frac{1}{8}$ (h) $\frac{1}{9}$ (i) $\frac{1}{10}$
6. (a) $\frac{1}{2}$ (b) $\frac{1}{3}$ (c) $\frac{1}{4}$ (d) $\frac{1}{5}$ (e) $\frac{1}{6}$ (f) $\frac{1}{7}$ (g) $\frac{1}{8}$ (h) $\frac{1}{9}$ (i) $\frac{1}{10}$
7. (a) $\frac{1}{2}$ (b) $\frac{1}{3}$ (c) $\frac{1}{4}$ (d) $\frac{1}{5}$ (e) $\frac{1}{6}$ (f) $\frac{1}{7}$ (g) $\frac{1}{8}$ (h) $\frac{1}{9}$ (i) $\frac{1}{10}$
8. (a) $\frac{1}{2}$ (b) $\frac{1}{3}$ (c) $\frac{1}{4}$ (d) $\frac{1}{5}$ (e) $\frac{1}{6}$ (f) $\frac{1}{7}$ (g) $\frac{1}{8}$ (h) $\frac{1}{9}$ (i) $\frac{1}{10}$

Exercise 4.7

1. (a) $\frac{1}{2}$ (b) $\frac{1}{3}$ (c) $\frac{1}{4}$ (d) $\frac{1}{5}$ (e) $\frac{1}{6}$ (f) $\frac{1}{7}$ (g) $\frac{1}{8}$ (h) $\frac{1}{9}$ (i) $\frac{1}{10}$
2. (a) $\frac{1}{2}$ (b) $\frac{1}{3}$ (c) $\frac{1}{4}$ (d) $\frac{1}{5}$ (e) $\frac{1}{6}$ (f) $\frac{1}{7}$ (g) $\frac{1}{8}$ (h) $\frac{1}{9}$ (i) $\frac{1}{10}$
3. (a) $\frac{1}{2}$ (b) $\frac{1}{3}$ (c) $\frac{1}{4}$ (d) $\frac{1}{5}$ (e) $\frac{1}{6}$ (f) $\frac{1}{7}$ (g) $\frac{1}{8}$ (h) $\frac{1}{9}$ (i) $\frac{1}{10}$
4. (a) $\frac{1}{2}$ (b) $\frac{1}{3}$ (c) $\frac{1}{4}$ (d) $\frac{1}{5}$ (e) $\frac{1}{6}$ (f) $\frac{1}{7}$ (g) $\frac{1}{8}$ (h) $\frac{1}{9}$ (i) $\frac{1}{10}$
5. (a) $\frac{1}{2}$ (b) $\frac{1}{3}$ (c) $\frac{1}{4}$ (d) $\frac{1}{5}$ (e) $\frac{1}{6}$ (f) $\frac{1}{7}$ (g) $\frac{1}{8}$ (h) $\frac{1}{9}$ (i) $\frac{1}{10}$
6. (a) $\frac{1}{2}$ (b) $\frac{1}{3}$ (c) $\frac{1}{4}$ (d) $\frac{1}{5}$ (e) $\frac{1}{6}$ (f) $\frac{1}{7}$ (g) $\frac{1}{8}$ (h) $\frac{1}{9}$ (i) $\frac{1}{10}$
7. (a) $\frac{1}{2}$ (b) $\frac{1}{3}$ (c) $\frac{1}{4}$ (d) $\frac{1}{5}$ (e) $\frac{1}{6}$ (f) $\frac{1}{7}$ (g) $\frac{1}{8}$ (h) $\frac{1}{9}$ (i) $\frac{1}{10}$
8. (a) $\frac{1}{2}$ (b) $\frac{1}{3}$ (c) $\frac{1}{4}$ (d) $\frac{1}{5}$ (e) $\frac{1}{6}$ (f) $\frac{1}{7}$ (g) $\frac{1}{8}$ (h) $\frac{1}{9}$ (i) $\frac{1}{10}$

Exercise 4.8

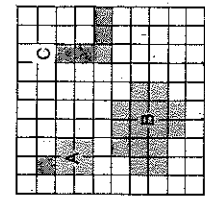
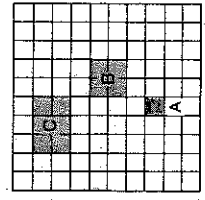
1. (a) 2 (b) 3 (c) 4 (d) 5 (e) 6 (f) 7 (g) 8 (h) 9 (i) 10
2. (a) 1 (b) 2 (c) 3 (d) 4 (e) 5 (f) 6 (g) 7 (h) 8 (i) 9 (j) 10
3. (a) 2 (b) 3 (c) 4 (d) 5 (e) 6 (f) 7 (g) 8 (h) 9 (i) 10 (j) 11 (k) 12
4. (a) 1 (b) 2 (c) 3 (d) 4 (e) 5 (f) 6 (g) 7 (h) 8 (i) 9 (j) 10 (k) 11 (l) 12
5. (a) 3 (b) 4 (c) 5 (d) 6 (e) 7 (f) 8 (g) 9 (h) 10 (i) 11 (j) 12

Exercise 4.9

1. (a) $\frac{1}{2}$ (b) $\frac{1}{3}$ (c) $\frac{1}{4}$ (d) $\frac{1}{5}$ (e) $\frac{1}{6}$ (f) $\frac{1}{7}$ (g) $\frac{1}{8}$ (h) $\frac{1}{9}$ (i) $\frac{1}{10}$
2. (a) Yes (b) No (c) Yes (d) No (e) Yes (f) No (g) Yes (h) No (i) Yes (j) No

EXERCISE

1. Write the percent that expresses how much of the entire square is shaded by A, B, and C.

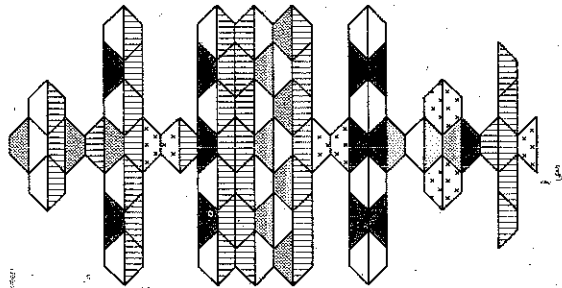


2. Show each percent by shading the proper number of squares.

- (a) 15% (b) 3% (c) 5%
 (d) 27% (e) 35% (f) 99%

3. Out of 100 people surveyed, 18 liked Astrocade, 24 liked Videocade, and the rest liked Spacacade.

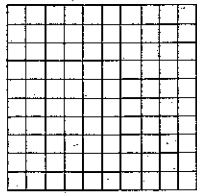
- What percent like
 (a) Astrocade?
 (b) Videocade?
 (c) Spacacade?



There are a total of 100
 What percent of the design is shaded?

- (a)
 (b)
 (c)
 (d)
 (e)

5.



Copy the above grid into your notebook.

- (a) Colour each percent of the grid as indicated.
 (i) 8% blue (ii) 3% purple (iii) 21% green
 (iv) 1% black (v) 19% red (vi) 28% orange
- (b) What percent is coloured?
 (c) What percent is not coloured?

5.2 USING PERCENTS

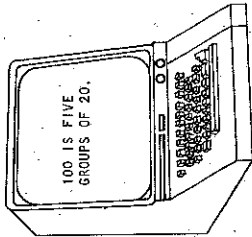
When surveys are taken, the number of people involved can vary. In order to make comparisons, we express the results as percents. This allows us to use a variety of groups.

Example.

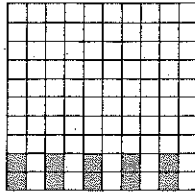
In a survey of 20 people, only two did not like arcade games.

What percent did not like arcade games?

Solution



2 out of 20.



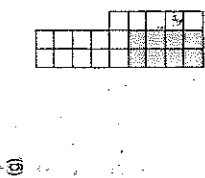
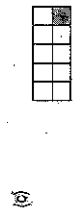
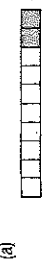
Shade 2 squares in each group of 20.

2 out of 20 is the same as
 10 out of 100.

∴ 2 out of 20 is 10%.

EXERCISE

1. Copy each of the following. Convert to a diagram out of 100 and write as a percent.



2. Change each of the following to a fraction with the denominator 100.

eg. $\frac{2}{5} = \frac{2 \times 20}{5 \times 20} = \frac{40}{100}$

- (a) $\frac{3}{5}$ (b) $\frac{7}{10}$ (c) $\frac{3}{10}$
- (d) $\frac{3}{4}$ (e) $\frac{1}{4}$ (f) $\frac{4}{25}$
- (g) $\frac{19}{25}$ (h) $\frac{7}{50}$ (i) $\frac{37}{50}$

CALCULATOR MATH

Guess and then check your answers on your calculator.

Multiply	Guess	Check
56×1.4		
75×3.2		
98×4.5		
63×7.4		
47×6.8		
56×2.9		
83×6.3		

5.3 FRACTIONS AS PERCENTS

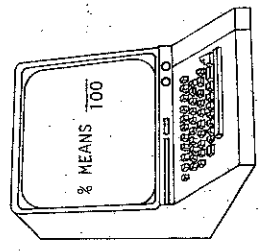
Example 1.

Write $\frac{67}{100}$ as a fraction.

Solution

Since percent is per hundred,

$$\frac{67}{100} = 67\%$$



Example 2.

Write $\frac{33}{100}$ as a percent.

Solution

Since percent is per hundred,

$$\frac{33}{100} = 33\%$$

Example 3.

Write $\frac{7}{20}$ as a percent.

Solution

Step 1

Change to a fraction $\frac{7}{100}$.

$$\frac{7}{20} \times \frac{5}{5} = \frac{35}{100}$$

Step 2

Write as a percent.

$$\frac{35}{100} = 35\%$$

EXERCISE

1. Copy and complete.

- (a) $33\% = \frac{\square}{100}$ (b) $59\% = \frac{\square}{100}$
 (c) $7\% = \frac{\square}{100}$ (d) $17\% = \frac{\square}{100}$
 (e) $90\% = \frac{\square}{100}$ (f) $75\% = \frac{\square}{100}$
 (g) $40\% = \frac{\square}{100}$ (h) $98\% = \frac{\square}{100}$

2. Copy and complete.

- (a) $\frac{13}{100} = \square\%$ (b) $\frac{29}{100} = \square\%$
 (c) $\frac{73}{100} = \square\%$ (d) $\frac{37}{100} = \square\%$
 (e) $\frac{\square}{100} = 27\%$ (f) $\frac{\square}{100} = 53\%$

3. Copy and complete.

- (a) $\frac{3}{10} = \frac{\square}{100}$, then $\frac{3}{\square} = \square\%$
 (b) $\frac{7}{50} = \frac{\square}{100}$, then $\frac{7}{\square} = \square\%$
 (c) $\frac{3}{25} = \frac{\square}{100}$, then $\frac{3}{\square} = \square\%$

4. Copy and complete.

- (a) $\frac{80}{100} = \frac{\square}{100}$, then $\frac{\square}{10} = 80\%$
 (b) $\frac{40}{25} = \frac{\square}{100}$, then $\frac{\square}{25} = 40\%$
 (c) $\frac{1}{25} = \frac{\square}{100}$, then $\frac{1}{\square} = 25\%$
 (d) $\frac{1}{2} = \frac{\square}{100}$, then $\frac{1}{\square} = \square\%$

5. Change the following percents to fractions in lowest terms.

- (a) 73% (b) 41%
 (c) 83% (d) 9%
 (e) 10% (f) 20%
 (g) 80% (h) 25%
 (i) 48% (j) 12%
 (k) 19% (l) 98%

6. Change each of the following fractions to percents.

- (a) $\frac{21}{100}$ (b) $\frac{73}{100}$
 (c) $\frac{9}{10}$ (d) $\frac{17}{50}$
 (e) $\frac{9}{25}$ (f) $\frac{17}{20}$
 (g) $\frac{4}{5}$ (h) $\frac{1}{4}$
 (i) $\frac{79}{100}$ (j) $\frac{5}{10}$

CALCULATOR MATH

An interesting pattern occurs when the following calculations are made.
 What is the pattern?

$$\begin{aligned} 9 \times 9 + 7 &= \\ 98 \times 9 + 6 &= \\ 987 \times 9 + 5 &= \\ 9876 \times 9 + 4 &= \\ 98765 \times 9 + 3 &= \\ 987654 \times 9 + 2 &= \end{aligned}$$

5.4 DECIMALS AS PERCENTS

Example 1.

Write 0.36 as a percent.

Solution

$$0.36 = \frac{36}{100} = 36\%$$

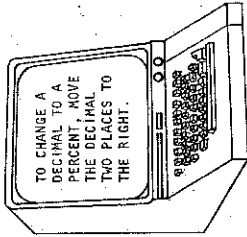
Example 2.

Write 0.67 as a percent.

Solution

Multiply by 100%.
 Move the decimal two places to the right.

$$\begin{aligned} 0.67 \times 100\% &= 67\% \\ &\therefore 0.67 = 67\% \end{aligned}$$



EXERCISE

1. Copy and complete the following.

- (a) $0.35 = \frac{\square}{100} = \square\%$
 (b) $0.09 = \frac{\square}{100} = \square\%$
 (c) $0.93 = \frac{\square}{100} = \square\%$
 (d) $0.68 = \frac{\square}{100} = \square\%$
 (e) $0.01 = \frac{\square}{100} = \square\%$
 (f) $0.04 = \frac{\square}{100} = \square\%$

2. Copy and complete.

- (a) $0.07 = \frac{\square}{100} = \square\%$
 (b) $1.23 = \frac{\square}{100} = \square\%$
 (c) $\square = \frac{70}{100} = \square\%$
 (d) $\square = \frac{\square}{100} = 17\%$
 (e) $0.6 = \frac{\square}{100} = \square\%$
 (f) $\square = \frac{\square}{100} = 5\%$

LIFE MATH CHALLENGE

Pick any number.

$$\begin{array}{r} \blacksquare \\ + 8.5 \\ \hline \blacksquare \end{array}$$

Add 8.5.

Divide by 0.5.

$$\begin{array}{r} \blacksquare \\ \div 0.5 \\ \hline \blacksquare \end{array}$$

Subtract 3.

$$\begin{array}{r} \blacksquare \\ - 3 \\ \hline \blacksquare \end{array}$$

Multiply by 0.5.

$$\begin{array}{r} \blacksquare \\ \times 0.5 \\ \hline \blacksquare \end{array}$$

Subtract your starting number.

$$\begin{array}{r} \blacksquare \\ - \blacksquare \\ \hline \blacksquare \end{array}$$

1. Start with another number and try this again.

2. Try it on a friend.

3. Write each decimal as a percent.

- (a) 0.04 (b) 0.71
 (c) 0.41 (d) 0.6
 (e) 0.731 (f) 0.9
 (g) 0.045 (h) 0.62
 (i) 0.1 (j) 0.05
 (k) 1.02 (l) 5.1

4. Copy and complete.

- (a) $15\% = \frac{\blacksquare}{100} = 0.15$
 (b) $37\% = \frac{\blacksquare}{100} = 0.\blacksquare$
 (c) $9\% = \frac{\blacksquare}{100} = 0.\blacksquare$
 (d) $176\% = \frac{\blacksquare}{100} = \blacksquare$

5. Change the following percents to decimals.

- (a) 49% (b) 17%
 (c) 92% (d) 32%
 (e) 87% (f) 71%
 (g) 90% (h) 20%
 (i) 121% (j) 2%
 (k) 1.2% (l) 0.7%

6. Change the following decimals to percents.

- (a) 0.61 (b) 0.05
 (c) 0.3 (d) 0.7
 (e) 0.62 (f) 1.0

5.5 PERCENTS OF WHOLE NUMBERS

To find the percent of a number, change the percent to a decimal and multiply.

Example 1.

Find 35% of 140.

Solution

Step 1

Change the % to a decimal.

$$35\% \text{ of } 140$$

$$= 0.35 \text{ of } 140$$

$$\therefore 35\% \text{ of } 140 \text{ is } 49.$$

Step 2

Multiply.

$$0.35 \times 140$$

$$= 49$$

Example 2.

Find 7% of \$70.00.

Solution

Step 1

Change the % to a decimal.

$$7\% \text{ of } \$70.00$$

$$= 0.07 \text{ of } 70.00$$

$$\therefore 7\% \text{ of } \$70.00 \text{ is } \$4.90.$$

Step 2

Multiply.

$$0.07 \times \$70.00$$

$$= 4.90$$

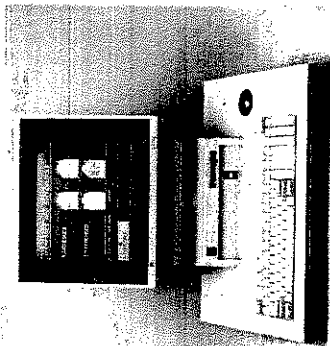
EXERCISE

- 50% of 60
 - 75% of 200
 - 20% of 80
 - 1% of 900
- 5% of 200
 - 40% of 65
 - 29% of 10 000
 - 12% of 800
 - 90% of 7250
 - 10% of 86
- 15% of 32
 - 48% of 95
 - 35% of 72
 - 4% of 50
 - 10% of 52
 - 12% of 45
 - 40% of 2000
 - 5% of 16
 - 25% of 36
 - 11% of 95
 - 47% of 840
 - 7% of 210
- Find to the nearest cent.
 - 10% of \$5.00
 - 7% of \$2.00
 - 25% of \$16.00
 - 50% of \$2000.00
 - 14% of \$60.00
 - 12% of \$18.00
 - 35% of \$75.00
 - 7% of \$1.50
 - 20% of \$4.80
 - 45% of \$16.20
- In a survey of 200 people, 50% liked pay television, 30% preferred to rent movies, and 20% preferred a satellite dish. In the survey,
 - how many people liked pay television?
 - how many preferred to rent movies?
 - how many preferred a satellite dish?

MICRO MATH

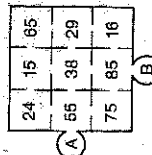
```

NEW
10 PRINT "PERCENT OF A NUMBER"
20 INPUT "NUMBER IS";A
30 INPUT "PERCENT IS";B
40 LET P=A*B/100
50 PRINT "THE ANSWER IS";P
60 END
RUN
  
```



LIFE MATH CHALLENGE

Find a path from A to B with a sum of 262.



PERCENTS 163

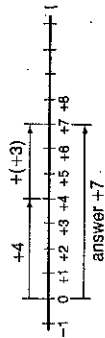
13.3 ADDING INTEGERS

In Exercise 13.1 we added integers on the thermometer scale. For example, an old temperature of $+4^{\circ}\text{C}$ and an increase of 3°C results in a new temperature of $+7^{\circ}\text{C}$.
Mathematically $(+4) + (+3) = +7$

Other examples of addition of integers are:

- In golf, a score of $+2$ on one hole and a score of -1 on another hole gives a total of $+1$.
Mathematically $(+2) + (-1) = +1$
- A debt of \$7 (owing \$7) and having \$10 leaves you \$3.
Mathematically $(-7) + (+10) = +3$

The example $(+4) + (+3) = +7$ can be illustrated by a walk on a number line starting at 0.



We can summarize the addition of integers with the following examples.

Example.

Calculate

(a) $(+6) + (+4)$

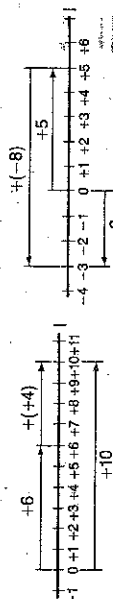
(b) $(+5) + (-8)$

(c) $(-3) + (+5) + (-2)$

Solution

(a) $(+6) + (+4)$

(b) $(+5) + (-8)$

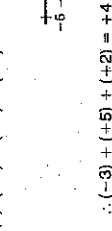


$\therefore (+6) + (+4) = +10$

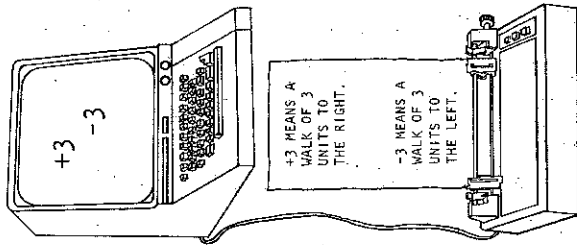
$\therefore (+5) + (-8) = -3$

(c) $(-3) + (+5) + (-2)$

$\therefore (+5) + (-8) = -3$



$\therefore (-3) + (+5) + (-2) = +4$



EXERCISE

1. Calculate.

- (a) $(+3) + (+5)$
 (b) $(-4) + (-3)$
 (c) $(+5) + (+9)$
 (d) $(-11) + (-5)$
 (e) $(+1) + (+1)$
 (f) $(-4) + (-3)$
 (g) $(+5) + (+11)$
 (h) $(-9) + (-2)$
 (i) $(-5) + (-11)$

2. Calculate.

- (a) $(+3) + (-1)$
 (b) $(+4) + (-2)$
 (c) $(-5) + (+3)$
 (d) $(-6) + (+2)$
 (e) $(+8) + (-5)$
 (f) $(-6) + (+7)$
 (g) $(-9) + (+4)$
 (h) $(-5) + (+5)$
 (i) $(-6) + (+1)$
 (j) $(-1) + (+1)$
 (k) $(-1) + (+1)$
 (l) $(-7) + (+4)$
 (m) $(-3) + (+8)$
 (n) $(-7) + (-2)$
 (o) $(+10) + (-7)$
 (p) $(-6) + (+10)$

3. Calculate.

- (a) $(+21) + (+18)$
 (b) $(+37) + (+29)$
 (c) $(-37) + (-12)$
 (d) $(-28) + (-14)$
 (e) $(-19) + (-28)$
 (f) $(-97) + (-56)$
 (g) $(-37) + (-112)$
 (h) $(+297) + (+146)$
 (i) $(-317) + (-113)$
 (j) $(-486) + (-295)$

4. Calculate.

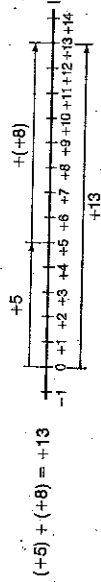
- (a) $(-18) + (+28)$
 (b) $(-14) + (+7)$
 (c) $(-25) + (+17)$
 (d) $(-47) + (+58)$
 (e) $(+36) + (-19)$
 (f) $(-51) + (-97)$
 (g) $(+46) + (-19)$
 (h) $(-100) + (+58)$
 (i) $(+37) + (+37)$
 (j) $(-29) + (+37)$

5. Calculate.

- (a) $(-1) + (-1) + (-1)$
 (b) $(-1) + (+1) + (-1)$
 (c) $(-1) + (-1) + (+1)$
 (d) $(-1) + (+1) + (+1)$
 (e) $(-1) + (-1) + (-1) + (-1)$
 (f) $(-1) + (+1) + (+1) + (-1)$
 (g) $(-1) + (-1) + (+1) + (-1) + (+1)$

13.4 SUBTRACTING INTEGERS

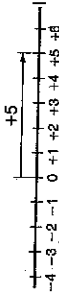
In order to subtract integers, we will look at the earlier work with addition of integers.



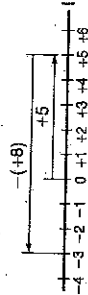
To subtract $(+8)$ from $(+5)$

$(+5) - (+8)$

first draw a line representing $(+5)$.

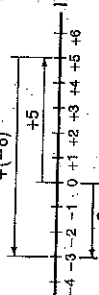


Next draw a line 8 units long in the opposite direction from the end of the first line.



The second line stops at the answer.

$(+5) - (+8) = -3$



It is important to understand that in subtracting $(+8)$, we added an 8 but in the opposite direction. Actually we added (-8) .

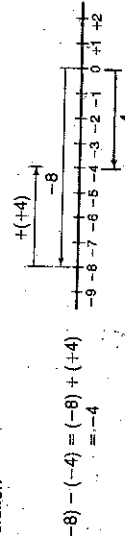
RULE FOR SUBTRACTION:

To subtract an integer, add the opposite integer.

Example.

Calculate $(-8) - (-4)$

Solution



6. Calculate.

- (a) $(-4) + (-7) + (-5)$
 (b) $(-11) + (-8) + (+3)$
 (c) $(+14) + (-9) + (+8)$
 (d) $(-17) + (-9) + (-11)$
 (e) $(+19) + (-27) + (-36)$
 (f) $(+37) + (-10) + (+28)$
 (g) $(-28) + (-14) + (-19)$
 (h) $(-37) + (-47) + (+29)$
 (i) $(-4) + (-7) + (-11) + (-9)$

7. Calculate.

- (a) $(-21) + (-6) + (+5) + (+8)$
 (b) $(-14) + (-9) + (-14) + (-8)$
 (c) $(-27) + (+8) + (-8) + (+27)$
 (d) $(-103) + (-37) + (-114) + (-97)$
 (e) $(+212) + (-143) + (-127)$
 (f) $(+112) + (-224) + (+112)$
 (g) $(-312) + (-216) + (+512)$
 (h) $(-512) + (-297) + (+416)$
 (i) $(-327) + (-296) + (-312)$

LIFE MATH CHALLENGE

Copy the magic squares in your notebook. Determine the magic number and complete each magic square below.

(a)

-8	-1	-6
■	-5	■
■	■	■

magic number is ■

(b)

-6	4	5	-9
-1	-3	■	2
-5	1	■	■
■	■	■	3

magic number is ■

EXERCISE

1. State the opposite of each of the following.

- (a) -4 (b) +8 (c) -6
 (d) -15 (e) +27 (f) +193
 (g) -310 (h) 0 (i) -407

2. Replace \blacksquare by the correct integer.

- (a) $(+4) - (-3) = (+4) + \blacksquare$
 (b) $(+14) - (-6) = (+14) + \blacksquare$
 (c) $(-1) - (-14) = \blacksquare + (+14)$
 (d) $(-16) - (+12) = \blacksquare + \blacksquare$
 (e) $(-12) - (+21) = \blacksquare + \blacksquare$
 (f) $(-11) - (+13) = \blacksquare + \blacksquare$

3. Add the following. Illustrate with a number line.

- (a) $(+12) + (-4)$ (b) $(+9) + (-6)$
 (c) $(+2) + (-8)$ (d) $(-2) + (-6)$
 (e) $(-9) + (+7)$ (f) $(+9) + (+4)$
 (g) $(-6) + (+6)$ (h) $(-6) + (-6)$
 4. Calculate.
 (a) $(+9) - (+2)$ (b) $(+10) - (-6)$
 (c) $(+8) - (+6)$ (d) $(+21) - (+10)$
 (e) $(+8) - (-12)$ (f) $(+20) - (+25)$
 (g) $(+30) - (+46)$ (h) $(+100) - (+125)$
 (i) $(+14) - (+16)$ (j) $(+27) - (0)$

5. Calculate.

- (a) $(+10) - (-6)$ (b) $(+14) - (-8)$
 (c) $(+27) - (-14)$ (d) $(+13) - (-27)$
 (e) $(+18) - (-8)$ (f) $(+37) - (-26)$
 (g) $(+19) - (-19)$ (h) $(+49) - (-56)$
 (i) $(+100) - (-100)$ (j) $(+149) - (-92)$
 (k) $(+312) - (-196)$ (l) $(+472) - (-472)$

5. 48 (a) 4.5 (b) 16 (c) 14
 7. (a) scalene (b) isosceles (c) equilateral
 8. (a) acute (b) obtuse (c) right-angled
 12. (a) 63.24 cm^3 , 97.22 cm^3
 (b) 26.691 cm^3 , 91.79 cm^3
 13. (a) $\frac{1}{6}$ (b) $\frac{1}{12}$ (c) $\frac{1}{2}$ (d) $\frac{5}{6}$
 14. (a) $\frac{1}{8}$ (b) $\frac{3}{8}$ (c) $\frac{7}{8}$
 16. (a) 15, 15, 15 (b) 72.3, 65, 65
 (c) 14.5, 14.6, none

CHAPTER 13

Exercise 13.1

1. (a) $+35^\circ\text{C}$ (b) -5°C (c) -14°C
 3. (c) $+10^\circ\text{C}$ (d) $+1^\circ\text{C}$ (e) -3°C (f) 0°C
 (g) -13°C (h) -11°C (i) -3°C
 4. (a) loss of \$2 (b) loss of \$4.50
 5. (a) up 10°C (b) down 8°C
 (c) up 9°C (d) up 5°C (e) down 2°C
 6. (a) +6, -3, +11, -4 (b) Player D

Exercise 13.2

1. (a) -7 (b) -12 (c) -4 (d) 0
 2. (a) -27 (b) +2 (c) +4 (d) +7
 3. (a) +10 (b) +8 (c) 0 (d) +1
 (e) +8 (f) +11 (g) -3 (h) -11
 4. (a) +4 (b) 0 (c) -3 (d) -10
 (e) -8 (f) -6 (g) -7 (h) -9
 (i) -11 (j) -18 (k) -100 (l) -3
 6. (a) $>$ (b) $>$ (c) $>$ (d) $<$ (e) $<$
 (f) $<$ (g) $<$ (h) $<$ (i) $<$ (j) $<$
 7. (a) -27, -6, +5, +8 (b) -16, -8, +16
 (c) -19, -11, -4, +7 (d) -18, -17, 0, +6, +19
 (e) -27, -10, -9, -4, +1 (f) -6, -5, -4, -3, -2, -1
 8. (a) +12, +4, -6, -9 (b) +18, +7, 0, -21
 (c) +61, +6, -16, -60 (d) +8, -10, -14, -16
 (e) +8, -3, -14, -19, -27 (f) -7, -8, -9, -10, -11, -12
 9. (a) +25, +30, +35 (b) +9, +11, +13
 (c) -8, -12, -16 (d) -3, -11, -19
 (e) -23, -29, -35 (f) -32, -64, -128

Exercise 13.3

1. (a) +9 (b) -7 (c) +14 (d) -16 (e) +2
 (f) -7 (g) +16 (h) -11 (i) +14 (j) -16

2. (a) +2 (b) +2 (c) -2 (d) -4
 (e) +3 (f) +1 (g) -5 (h) 0
 (i) -5 (j) 0 (k) -2 (l) -3
 (m) +5 (n) -9 (o) +3 (p) +4
 3. (a) +39 (b) +66 (c) -46 (d) -42
 (e) -153 (f) -149 (g) +443 (h) -430
 (i) -791 (j) -153 (k) -149 (l) +11
 (m) -6 (n) -148 (o) +33
 (p) -42 (q) +8 (r) +8
 5. (a) -3 (b) -1 (c) -1 (d) +2
 (e) -5 (f) +1 (g) -1 (h) -16
 (i) -16 (j) +13 (k) +13
 6. (a) -37 (b) -44 (c) +55
 (d) -37 (e) -55 (f) -31
 (g) -61 (h) -55 (i) 0
 7. (a) -14 (b) -45 (c) 0
 (d) -351 (e) -56 (f) 0
 (g) -16 (h) -393 (i) -935

Exercise 13.4

1. (a) +4 (b) -8 (c) +6
 (d) +15 (e) -27 (f) -193
 (g) +310 (h) 0 (i) +407
 2. (a) +3 (b) +6 (c) -1
 (d) -16, -12 (e) -12, -21 (f) -11, -13
 3. (a) +8 (b) +3 (c) -6 (d) -8
 (e) -2 (f) +13 (g) 0 (h) -12
 4. (a) +7 (b) +4 (c) +2 (d) +11 (e) -4
 (f) -5 (g) -16 (h) -25 (i) -2 (j) +27
 5. (a) +16 (b) +22 (c) +41 (d) +40
 (e) +28 (f) +63 (g) +38 (h) +107
 (i) +200 (j) +241 (k) +508 (l) +944
 6. (a) -17 (b) -27 (c) -31 (d) -42 (e) -23
 (f) -78 (g) -70 (h) -211 (i) -960 (j) -1744
 7. (a) -1 (b) -9 (c) -29 (d) -17 (e) 0
 (f) +14 (g) +16 (h) +9 (i) -63 (j) +295
 8. (a) +12 (b) -24 (c) -7
 (d) -38 (e) +21 (f) -36
 9. (a) -29 (b) +46 (c) +74 (d) -35
 10. (a) +15 (b) -22 (c) +19
 (d) -4 (e) -37 (f) +81

Exercise 13.5

1. (a) 10.9 (b) 21.9 (c) 15.0 (d) -4.9
 (e) -5.9 (f) -14.3 (g) -0.7 (h) -3.6
 2. (a) 13.0 (b) 10.1 (c) 5.8
 (d) 1.3 (e) 2.25 (f) 5.0
 3. (a) 6°C (b) 2°C (c) 8°C (d) 17°C
 4. (a) 10°C (b) 11°C (c) 9°C (d) $+8^\circ\text{C}$ (e) $+8^\circ\text{C}$

Exercise 13.6

1. (a) +6 (b) +28 (c) +18 (d) +40
 (e) +12 (f) +20 (g) +42 (h) +16
 2. (a) -10 (b) -16 (c) -28 (d) -1
 (e) -30 (f) -30 (g) -4 (h) -1
 3. (a) +8 (b) +15 (c) +28 (d) +30
 (e) +30 (f) +32 (g) +66 (h) +60