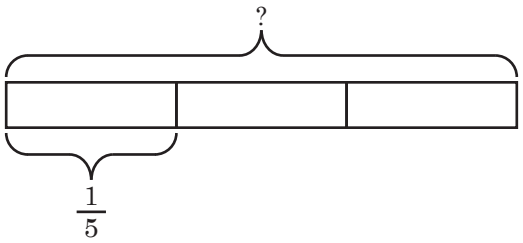
Chapter 2: Fractions
Multiplication of Fractions

2.1A Multiplication of a Proper Fraction by a Whole Number

Basics

1.



Method 1

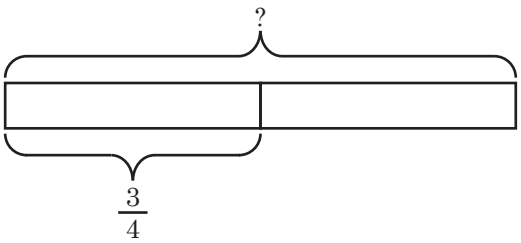
1 unit = $\frac{1}{5}$

3 units = $3 \times \frac{1}{5} = \frac{3}{5}$

Method 2

$3 \times \frac{1}{5} = \frac{3 \times 1}{5} = \frac{3}{5}$

2.



Method 1

From the model,

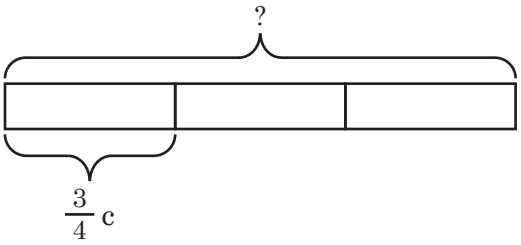
1 unit = $\frac{3}{4}$

2 units = $2 \times \frac{3}{4} = \frac{6}{4} = 1\frac{1}{2}$

Method 2

$\frac{3}{4} \times 2 = \frac{3 \times 2}{4} = \frac{6}{4} = 1\frac{1}{2}$

3.



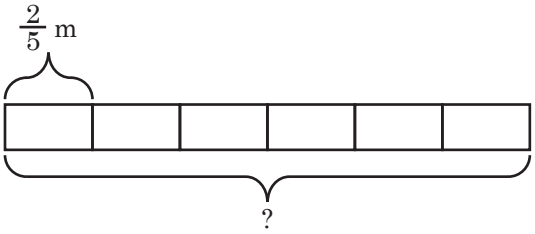
From the model,

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

3 units = $\frac{3}{4}$ c $\times 3 = \frac{3 \times 3}{4}$ c = $\frac{9}{4}$ c = $2\frac{1}{4}$ c

May used $2\frac{1}{4}$ c of raisins.

4.



From the model,

1 unit = $\frac{2}{5}$ m

6 units = $\frac{2}{5}$ m $\times 6 = \frac{2 \times 6}{5}$ m = $\frac{12}{5}$ m

$= 2\frac{2}{5}$ m

Hector needs $2\frac{2}{5}$ m of wood.

Practice

5. $48 \times \frac{2}{3}$ mi = $\frac{48 \times 2}{3}$ mi = 16×2 mi = 32 mi

Julia walked 32 miles.

2.1C Multiplication of an Improper Fraction or a Mixed Number by a Whole Number

Basics

15. **(a)** $\frac{7}{5} \times 3 = \frac{7 \times 3}{5} = \frac{21}{5} = 4\frac{1}{5}$

(b) $\frac{31}{\cancel{8}_{2}} \times \cancel{4}^{1} = \frac{31}{2} = 15\frac{1}{2}$

(c) $\cancel{6}^{1} \times \frac{17}{\cancel{12}_{2}} = \frac{17}{2} = 8\frac{1}{2}$

(d) $\cancel{15}^{3} \times \frac{21}{\cancel{10}_{2}} = \frac{3 \times 21}{10} = \frac{63}{2} = 31\frac{1}{2}$

Practice

16. $4 \times 2\frac{2}{3}$ kg $= 4 \times \frac{8}{3}$ kg $= \frac{32}{3}$ kg $= 10\frac{2}{3}$ kg

The combined weight of the packages that Wyatt wants to mail is $10\frac{2}{3}$ kg.

17. $12 \times 2\frac{3}{8}$ oz

$= \cancel{12}^{3} \times \frac{19}{\cancel{8}_{2}}$ oz $= \frac{3 \times 9}{2}$ oz $= \frac{57}{2}$ oz $= 28\frac{1}{2}$ oz

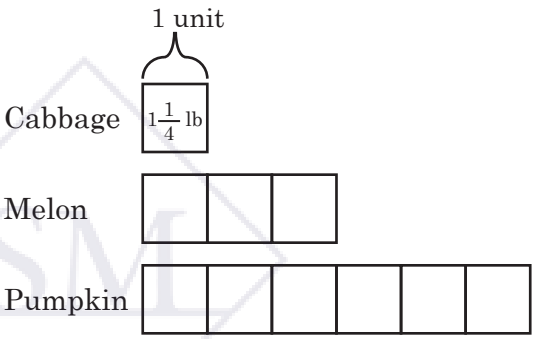
Linda bought $28\frac{1}{2}$ oz of seeds.

18. Method 1

$3 \times 1\frac{1}{4}$ lb $= 3 \times \frac{5}{4}$ lb $= \frac{3 \times 5}{4}$ lb $= \frac{15}{4}$ lb

$\cancel{2}^{1} \times \frac{15}{\cancel{4}_{2}}$ lb $= \frac{15}{2}$ lb $= 7\frac{1}{2}$ lb

Method 2



From the model,

1 unit $= 1\frac{1}{4}$ lb

6 units $\longrightarrow 6 \times 1\frac{1}{4}$ lb $= 7\frac{1}{2}$ lb

The pumpkin weighs $7\frac{1}{2}$ lb.

Challenge

19. Method 1

Baseball cards:

$\frac{5}{3} \times 45 = \frac{5 \times 45}{3} = \frac{225}{3} = 75$ cards

Football cards and baseball cards:

$45 + 75 = 120$ cards

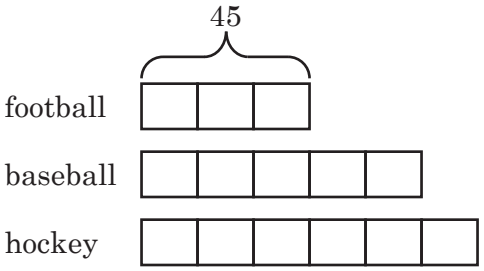
Hockey cards:

$\frac{3}{4} \times 120 = \frac{3 \times 120}{3} = \frac{360}{4} = 90$ cards

Total cards:

$120 + 90 = 210$ cards

Method 2



$\frac{3}{4}$ as many hockey cards means $\frac{3}{4}$ of 8 units, which is 6 units.

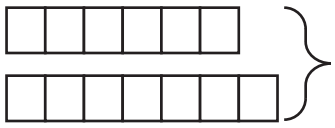
From the model,

3 units = 45 cards

1 unit $\longrightarrow \frac{45}{3} = 15$ cards

14 units $\longrightarrow 14 \times 15 = 210$ cards

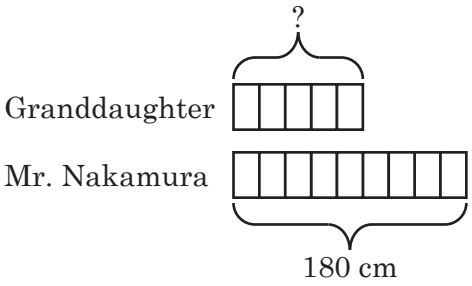
There are 210 cards in Josef's collection.

6. Paula
Kawai


From the model,
13 units ⟶ $312
1 unit ⟶ $\frac{\$312}{13}$ = $24
6 units ⟶ 6 × $24 = $144
7 units ⟶ 7 × $24 = $168
Paula got $144. Kawai got $168.

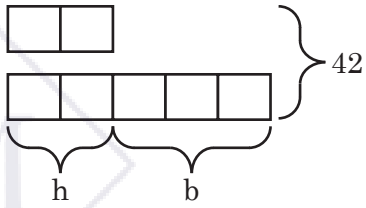
7. 12 : 2 : 1 : 16

8. **(a)** 5 : 9

(b)


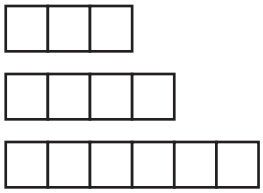
Method 1
From the model,
9 units ⟶ 180 cm
1 unit ⟶ $\frac{180 \text{ cm}}{9}$ = 20 cm
5 units ⟶ 5 × 20 cm = 100 cm

Method 2
Find $\frac{5}{9}$ of 180.
$\frac{5}{\cancel{9}_{1}} \times \cancel{180}^{20}$ cm = 100 cm
Mr. Nakamura's granddaughter is 100 cm (or 1 m) tall.

9. Santiago's cards
Amanda's cards


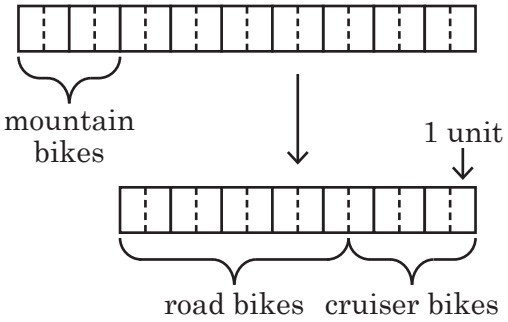
From the model,
7 units ⟶ 42 cards
1 unit ⟶ $\frac{42}{7}$ = 6 cards
Amanda has 2 units of hockey cards and 3 units of baseball cards. Amanda has 6 more baseball than hockey cards.

Challenge

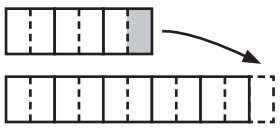
10. (a) Eli's age
Jamal's age
Avery's age


From the model, Eli's age to Avery's age is $\frac{3}{6} = \frac{1}{2}$.

(b) From the model,
4 units ⟶ 28 years
1 unit ⟶ $\frac{28 \text{ years}}{4}$ = 7 years
3 units ⟶ 3 × 7 years = 21 years
Avery is 21 years older than Eli.

11.


From the model,
cruiser bikes ⟶ 5 units
mountain bikes ⟶ 4 units
5 units − 4 units = 1 unit
1 unit ⟶ 15 bikes
9 units ⟶ 9 × 15 bikes = 135 bikes
There are 135 road bikes in the bicycle shop.

12. Jenna's beads
Koni's beads


3 : 5 = 6 : 10
The fraction is $\frac{5}{11}$.

7.2 Percentage of a Quantity

Basics

1. **(a)** Method 1

$100\% \longrightarrow \$90$

$10\% \longrightarrow \$90 \div 10 = \$9$

$60\% \longrightarrow 6 \times \$9 = \$54$

Method 2

60% of $\$90$

$= \frac{60}{100} \times \$90$

$= \$54$

60% of $\$90$ is $\$54$.

(b) Method 1

$100\% \longrightarrow \$90$

$25\% \longrightarrow \$90 \div 4 = \$22.50$

$75\% \longrightarrow 3 \times \$22.50 = \$67.50$

Method 2

75% of $\$90$

$= \frac{75}{100} \times \$90$

$= \$67.50$

75% of $\$90$ is $\$67.50$.

(c) Method 1

$100\% \longrightarrow \$90$

$5\% \longrightarrow \$90 \div 20 = \$4.50$

Method 2

5% of $\$90$

$= \frac{5}{100} \times \$90$

$= \$4.50$

5% of $\$90$ is $\$4.50$.

(d) Method 1

$100\% \longrightarrow 180$ in

$25\% \longrightarrow 180 \text{ in} \div 4 = 45$ in

Method 2

25% of 180 in

$= \frac{25}{100} \times 180 \text{ in} = 45$ in

25% of 180 inches is 45 inches.

(e) $33\frac{1}{3}\% = \frac{\frac{100}{3}}{100}$

$= \frac{100}{3} \times \frac{1}{100}$

$= \frac{1}{3}$

$33\frac{1}{3}\%$ of 105 km $= \frac{1}{3}$ of 105 km

$= \frac{1}{3} \times 105$ km

$= 35$ km

$33\frac{1}{3}\%$ of 105 km is 35 km.

(f) Method 1

$100\% \longrightarrow 184$ cm

$25\% \longrightarrow 184 \text{ cm} \div 4 = 46$ cm

$75\% \longrightarrow 3 \times 46 \text{ cm} = 138$ cm

Method 2

75% of 184 cm

$= \frac{75}{100} \times 184$ cm

$= 138$ cm

75% of 184 cm is 138 cm.

(g) Method 1

$100\% \longrightarrow \$200$

$1\% \longrightarrow \$200 \div 100 = \$2$

$8\frac{1}{2}\% \longrightarrow 8\frac{1}{2} \times \$2 = \$17$

Method 2

$8\frac{1}{2}\% = \frac{8.5}{100} \times \$200 = \$17$

$8\frac{1}{2}\%$ of $\$200$ is $\$17$.

2. **(a)** $\frac{13}{25} \times 100\% = \frac{52}{100} \times 100\% = 52\%$

(b) $\frac{105}{300} \times 100\% = \frac{7}{20} \times 100\% = 35\%$

(d) $5 \times \frac{2}{5}d = 5 \times \frac{1}{2}$

$2d = \frac{5}{2}$

$2d \times \frac{1}{2} = \frac{5}{2} \times \frac{1}{2}$

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

Check

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

(e) $\frac{7}{9}b + 3 - 3 = 66 - 3$

$\frac{7}{9}b = 63$

$\frac{7}{9}b \times \frac{9}{7} = 63 \times \frac{9}{7}$

$b = 9 \times 9$

$b = 81$

Check

$\frac{7}{9} \times 81 + 3 = 63 + 3 = 66$

11. Method 1

Let c represent the number of baseball cards Isaac had before his birthday.

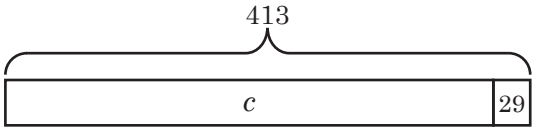
Algebraically:

$c + 29 = 413$

$c + 29 - 29 = 413 - 29$

$c = 384$

Method 2



From the model,

$c = 413 - 29$

$c = 384$

He had 384 baseball cards before his birthday.

12. Method 1

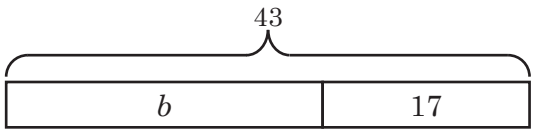
Algebraically, let b represent the number of math tests corrected in the morning.

$b + 17 = 43$

$b + 17 - 17 = 43 - 17$

$b = 26$

Method 2



From the model,

$b = 43 - 17$

$b = 26$

There were 26 math tests corrected in the morning.

13. Method 1

Algebraically, let f represent the amount of fabric in yards that Ellen had before she made the dress.

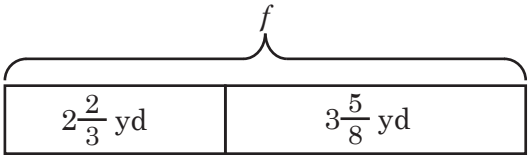
$f - 2\frac{2}{3} = 3\frac{5}{8}$

$f - 2\frac{2}{3} + 2\frac{2}{3} = 3\frac{5}{8} + 2\frac{2}{3}$

$f = 3\frac{15}{24} + 2\frac{14}{24}$

$f = 5\frac{31}{24} = 6\frac{7}{24}$

Method 2



From the model,

$f = 2\frac{2}{3} + 3\frac{5}{8}$

$f = 2\frac{16}{24} + 3\frac{15}{24}$

$f = 5\frac{31}{24} = 6\frac{7}{24}$

Ellen had $6\frac{7}{24}$ yards of fabric before she made the dress.