Answers - Fractions: add, subtract, multiply and divide

Year: Year 6

Answer to Question 1

a. The highest common factors are 6, 20, 12 and 15. So the answers are $\frac{3}{4}$, $\frac{2}{5}$, $\frac{3}{4}$ and $\frac{3}{4}$.
b. $\frac{2}{3} = \frac{8}{12}$ (multiply by 4). $\frac{3}{5} = \frac{18}{30}$ (multiply by 6). $\frac{7}{8} = \frac{35}{40}$ (multiply by 5). The missing numbers are **8, 30 and 35**.
c. Change to a common denominator of 24: $\frac{5}{8} = \frac{15}{24}$ and $\frac{2}{3} = \frac{16}{24}$. So $\frac{2}{3}$ **is bigger**, by $\frac{1}{24}$.

Answer to Question 2

a. The common denominator is 12: $\frac{3}{12} + \frac{8}{12} = \frac{11}{12}$.
b. The common denominator is 12: $\frac{10}{12} - \frac{3}{12} = \frac{7}{12}$.
c. The common denominator is 10: $\frac{6}{10} + \frac{7}{10} = \frac{13}{10} = 1\frac{3}{10}$.
d. The common denominator is 8: $\frac{7}{8} - \frac{6}{8} = \frac{1}{8}$.
e. The common denominator is 18: $\frac{4}{18} + \frac{3}{18} = \frac{7}{18}$.

Answer to Question 3

a. Add the wholes: 2 + 1 = 3. Add the fractions with denominator 4: $\frac{2}{4} + \frac{3}{4} = \frac{5}{4} = 1\frac{1}{4}$. Total: $3 + 1\frac{1}{4} = 4\frac{1}{4}$.
b. Wholes: 3 + 1 = 4. Tenths: $\frac{4}{10} + \frac{7}{10} = \frac{11}{10} = 1\frac{1}{10}$. Total $5\frac{1}{10}$.
c. Wholes: 1 + 2 = 3. Twelfths: $\frac{8}{12} + \frac{9}{12} = \frac{17}{12} = 1\frac{5}{12}$. Total $4\frac{5}{12}$.
d. Wholes: 4 + 2 = 6. Sixths: $\frac{5}{6} + \frac{2}{6} = \frac{7}{6} = 1\frac{1}{6}$. Total $7\frac{1}{6}$.

Answer to Question 4

a. Common denominator 6: $3\frac{2}{6} - 1\frac{5}{6}$. Write $3\frac{2}{6}$ as $2\frac{8}{6}$. Then $2 - 1 = 1$ and $\frac{8}{6} - \frac{5}{6} = \frac{3}{6}$. Answer $1\frac{1}{2}$.
b. Common denominator 10: $4\frac{2}{10} - 1\frac{7}{10}$. Write $4\frac{2}{10}$ as $3\frac{12}{10}$. Then 2 and $\frac{5}{10}$. Answer $2\frac{1}{2}$.
c. Write 5 as $4\frac{8}{8}$. Then $4 - 2 = 2$ and $\frac{8}{8} - \frac{3}{8} = \frac{5}{8}$. Answer $2\frac{5}{8}$.
d. Write $6\frac{1}{4}$ as $5\frac{5}{4}$ and $2\frac{1}{2}$ as $2\frac{2}{4}$. Then 3 and $\frac{3}{4}$. Answer $3\frac{3}{4}$.

Answer to Question 5

a. Multiply the numerators and multiply the denominators: $\frac{1\times1}{2\times3} = \frac{1}{6}$. Half of a third is a sixth.
b. Multiply the numerators and the denominators: $\frac{2\times3}{3\times4} = \frac{6}{12}$, which simplifies to $\frac{1}{2}$. You can also cancel the 3s first to get $\frac{2}{4} = \frac{1}{2}$.
c. Cancel 4 with 8 (giving 1 and 2) and 3 with 9 (giving 1 and 3): $\frac{1}{2} \times \frac{1}{3} = \frac{1}{6}$.
d. Find one quarter, then three quarters: $20 \div 4 = 5$ and $5 \times 3 = \mathbf{15}$.
e. One sixth of 48 is $48 \div 6 = 8$, so five sixths is $8 \times 5 = \mathbf{40}$.

Answer to Question 6

a. Dividing by 3 shares each half into 3 equal parts, so the pieces become sixths: $\frac{1}{2\times3} = \frac{1}{6}$.
b. Multiply the denominator by 2: $\frac{3}{4\times2} = \frac{3}{8}$. Half of three quarters is three eighths.
c. The numerator 4 divides exactly by 4, so the quickest way is $4 \div 4 = 1$: the answer is $\frac{1}{5}$ (the same as $\frac{4}{20}$ simplified).
d. 2 does not divide by 5, so multiply the denominator: $\frac{2}{3\times5} = \frac{2}{15}$.
e. 6 divides by 3, so divide the numerator: $6 \div 3 = 2$, giving $\frac{2}{7}$. Check: $\frac{2}{7} \times 3 = \frac{6}{7}$.

Answer to Question 7

a. Sam: $12 \div 4 = 3$ slices. Mia: $12 \div 3 = 4$ slices. Dad: $12 \div 6 = 2$ slices.
b. $\frac{1}{4} + \frac{1}{3} = \frac{3}{12} + \frac{4}{12} = \frac{7}{12}$.
c. $\frac{7}{12} + \frac{2}{12} = \frac{9}{12}$ eaten. Left: $1 - \frac{9}{12} = \frac{3}{12} = \frac{1}{4}$.
d. $\frac{1}{4} \div 2 = \frac{1}{8}$ of the whole pizza each. (3 slices shared by 2 means 1.5 slices each, and $\frac{1.5}{12} = \frac{1}{8}$.)

Answer to Question 8

a. $\frac{3}{4} \div 6 = \frac{3}{24} = \frac{1}{8}$ of a litre. One litre is 1 000 ml, so $1\,000 \div 8 = \mathbf{125\ ml}$ in each glass.
b. $\frac{2}{3} \div 4 = \frac{2}{12}$, which simplifies to $\frac{1}{6}$ of a litre (about 167 ml).
c. Use the common denominator 12: $\frac{9}{12} + \frac{8}{12} = \frac{17}{12}$. As a mixed number this is $1\frac{5}{12}$ **litres**.
d. $2 = 1\frac{12}{12}$, so $1\frac{12}{12} - 1\frac{5}{12} = \frac{7}{12}$ **of a litre** more.

Answer to Question 9

a. $\frac{3}{5}$ of 40: $40 \div 5 = 8$ and $8 \times 3 =$ **24** children.
b. $\frac{1}{4}$ of 24 = **6** children.
c. $\frac{3}{5} \times \frac{1}{4} = \frac{3}{20}$. Check: $\frac{3}{20}$ of 40 = 6.
d. $\frac{1}{8}$ of 40 = **5** children. Fraction by other means: $1 - \frac{3}{5} - \frac{1}{8} = \frac{40}{40} - \frac{24}{40} - \frac{5}{40} = \frac{11}{40}$.

Answer to Question 10

a. Write the mixed number as an improper fraction: $2\frac{1}{2} = \frac{5}{2}$. Then $\frac{5}{2} \times \frac{3}{4} = \frac{15}{8} = 1\frac{7}{8}$ **kg**.
b. $2 = 1\frac{8}{8}$, so $1\frac{8}{8} - 1\frac{7}{8} = \frac{1}{8}$ **kg**, which is 1 000 ÷ 8 = 125 g.
c. $\frac{1}{3} \times \frac{15}{8} = \frac{15}{24}$. Divide top and bottom by 3: $\frac{5}{8}$ **kg** (625 g).

Answer to Question 11

a. $\frac{1}{2} + \frac{1}{3} = \frac{5}{6}$, so lawn $= 1 - \frac{5}{6} = \frac{1}{6}$.
b. Vegetables: 60 m². Flowers: 40 m². Lawn: 20 m².
c. $\frac{3}{4}$ of 60 = **45 m²**.
d. $\frac{1}{4} \times \frac{1}{6} = \frac{1}{24}$ of the garden, which is 5 m².

Answer to Question 12

a. Change to eighths: $2\frac{6}{8} + 1\frac{5}{8}$. Wholes: 3. Eighths: $\frac{11}{8} = 1\frac{3}{8}$. Total $4\frac{3}{8}$ **km**.
b. $3\frac{1}{2} = 3\frac{4}{8}$. Wholes: 4 + 3 = 7; eighths: $\frac{3}{8} + \frac{4}{8} = \frac{7}{8}$. Total $7\frac{7}{8}$ **km**.
c. Count on from $7\frac{7}{8}$: $\frac{1}{8}$ more makes 8, and 2 more make 10. He needs $2\frac{1}{8}$ **km** more.
d. $\frac{1}{5}$ of 10 km is 2 km, so $\frac{2}{5}$ is 2 × 2 = **4 km**.

Answer to Question 13

a. $\frac{1}{5}$ of £45 is $45 \div 5 = 9$, so $\frac{2}{5}$ is $9 \times 2 =$ **£18**.
b. $\frac{1}{3}$ of £45 is $45 \div 3 =$ **£15**.
c. Common denominator 15: $\frac{6}{15} + \frac{5}{15} = \frac{11}{15}$ of her money.
d. $45 - 18 - 15 =$ **£12** left. As a fraction: $1 - \frac{11}{15} = \frac{4}{15}$. Check: $45 \div 15 = 3$ and $3 \times 4 = 12$.

Answer to Question 14

a. Three bows of $\frac{3}{4}$ m: $3 \times \frac{3}{4} = \frac{9}{4} = 2\frac{1}{4}$ **m**.

b. $3\frac{1}{2} = 3\frac{2}{4}$, so $3\frac{2}{4} - 2\frac{1}{4} = 1\frac{1}{4}$ **m**.
c. $1\frac{1}{4} = \frac{5}{4}$, and $\frac{5}{4} \div 5 = \frac{1}{4}$ **m**, which is 25 cm.
d. No. A bow needs $\frac{3}{4}$ m but each piece is only $\frac{1}{4}$ m, three times too short. She would need three pieces joined together.

Answer to Question 15

a. Sprint: $120 \div 4 = 30$. Relay: $120 \div 3 = 40$. Long jump: $120 \div 6 = 20$.
b. $\frac{1}{4} + \frac{1}{3} + \frac{1}{6} = \frac{3}{12} + \frac{4}{12} + \frac{2}{12} = \frac{9}{12}$. The hurdles are $1 - \frac{9}{12} = \frac{3}{12} = \frac{1}{4}$.
c. $\frac{1}{4}$ of 120 = **30** children. Check: 120 − 30 − 40 − 20 = 30.
d. $\frac{3}{5}$ of 40: $40 \div 5 = 8$, $8 \times 3 =$ **24** children.
e. Sprint girls: $\frac{1}{2}$ of 30 = 15. Long jump girls: $\frac{2}{5}$ of 20 = 8. Total **23** girls.
f. Sprint and relay together are $\frac{1}{4} + \frac{1}{3} = \frac{7}{12}$, and $\frac{7}{12}$ is more than $\frac{6}{12} = \frac{1}{2}$. She is **right**. (30 + 40 = 70 children, which is more than 60.)

Answer to Question 16

a. Saturday: $240 \div 8 = 30$ and $30 \times 3 = 90$ pages. Sunday: $240 \div 4 = 60$ pages.
b. $\frac{3}{8} + \frac{1}{4} = \frac{3}{8} + \frac{2}{8} = \frac{5}{8}$.
c. $1 - \frac{5}{8} = \frac{3}{8}$, which is $240 - 150 =$ **90 pages**.
d. $\frac{1}{3}$ of 90 = **30 pages**. As a fraction of the whole book: $\frac{1}{3} \times \frac{3}{8} = \frac{1}{8}$.
e. $90 - 30 =$ **60 pages**. As a fraction: $\frac{3}{8} - \frac{1}{8} = \frac{2}{8} = \frac{1}{4}$ of the book.

Answer to Question 17

a. $\frac{3}{4} \times 5\frac{1}{2} = \frac{3}{4} \times \frac{11}{2} = \frac{33}{8} = 4\frac{1}{8}$ **litres**.
b. $5\frac{1}{2} - 4\frac{1}{8} = 5\frac{4}{8} - 4\frac{1}{8} = 1\frac{3}{8}$ **litres**.
c. $3\frac{3}{4} - 1\frac{1}{2} = 3\frac{3}{4} - 1\frac{2}{4} = 2\frac{1}{4}$ **litres**.
d. $1\frac{3}{8} + 2\frac{1}{4} = 1\frac{3}{8} + 2\frac{2}{8} = 3\frac{5}{8}$, so $3\frac{5}{8}$ **litres**.
e. There are $2\frac{1}{4} = \frac{9}{4}$ litres of milk. Each bottle is $\frac{1}{4}$ litre, so 9 bottles. She fills **9 bottles**.

Answer to Question 18

a. No. Ali has added the numerators and the denominators. The common denominator is 12: $\frac{4}{12} + \frac{3}{12} = \frac{7}{12}$. (A sum of two fractions cannot be smaller than $\frac{1}{3}$, and $\frac{2}{7}$ is smaller.)
b. Yes. $3 \times 2 = 6$, $4 \times 5 = 20$, and $\frac{6}{20} = \frac{3}{10}$ when divided by 2. Bea is **right**.
c. No. Chen multiplied by 4 instead of dividing. Dividing by 4 makes the fraction

smaller: $\frac{2}{3\times4} = \frac{2}{12} = \frac{1}{6}$.

d. Dee subtracted the smaller fraction from the bigger fraction instead of the other way round. $3\frac{1}{4} = 2\frac{5}{4}$ and $1\frac{1}{2} = 1\frac{2}{4}$, so the answer is $1\frac{3}{4}$. The correct answer is $1\frac{3}{4}$.

Answer to Question 19

a. $240 \div 8 = 30$ and $30 \times 5 =$ **150 litres**.
b. $\frac{2}{5}$ of 150: $150 \div 5 = 30$, $30 \times 2 =$ **60 litres**.
c. $150 - 60 =$ **90 litres**.
d. $\frac{1}{6}$ of 240 = **40 litres**.
e. $90 + 40 = 130$ litres. As a fraction: $\frac{130}{240} = \frac{13}{24}$. Half of the tank is 120 litres, so it is **more than half full**.

Answer to Question 20

a. $1\frac{1}{12} = \frac{13}{12}$. $\frac{13}{12} - \frac{3}{12} = \frac{10}{12} = \frac{5}{6}$.
b. $\frac{5}{6} \times \frac{3}{5} = \frac{15}{30} = \frac{1}{2}$.
c. $\frac{1}{2} + \frac{1}{3} = \frac{3}{6} + \frac{2}{6} = \frac{5}{6}$, so the third fraction is $1 - \frac{5}{6} = \frac{1}{6}$. It is a unit fraction because its numerator is 1.