

## ARITHMETIC OF FRACTIONS

## A COUPLE OF POINTS BEFORE WE BEGIN

- When we talk of **fractions**, we are using a shorthand for fractions which are written in the form of a number consisting of a horizontal line dividing an integer denominator (bottom) into a integer numerator (top). Technically 0.45 is also a fraction, but in a decimal format. In common fraction form, this would be  $\frac{9}{20}$ .
- Please sneer at people who talk about **Vulgar fractions**, as they are using the Latin word **vulgar** in its original sense of **common**. Because the word **vulgar**, in English has changed its meaning somewhat, due to the fact that English thought is inherently elitist and equates what is common with what is coarse and unpleasant. This is why you must sneer at all people who talk about **vulgar fractions**.
- Each exercise relates to a specific technique or idea.
- Each of the exercises below, start easy and get more tricky as they go.
- As you go through the exercises, don't waste your time on stuff you already know. If 1 a) is easy and you get it right immediately, try the last question, check it and if you are right again, move on.
- Check your answers as you go. As any musician, sportsperson or dancer will confirm, practising something wrong means you become really good at the mistakes you make repeatedly. So check every answer as you go; not at the end. The booklet has been organized so that the exercises and answers can be printed separately.

## EXERCISE 1 – ADDING &amp; SUBTRACTING (SAME DENOMINATORS)

This first exercise looks at the simplest types of fractional adding and subtracting, where the denominators are the same. It ends with a couple of the dreaded **wordy** questions. Don't miss these out as they are kind of the point!

Evaluate the following sums and differences.

- |    |                                    |                                  |                                    |                                   |
|----|------------------------------------|----------------------------------|------------------------------------|-----------------------------------|
| 1. | a) $\frac{1}{3} + \frac{1}{3}$     | b) $\frac{3}{5} + \frac{1}{5}$   | c) $\frac{2}{9} + \frac{5}{9}$     | d) $\frac{2}{5} + \frac{1}{5}$    |
|    | e) $\frac{2}{7} + \frac{3}{7}$     | f) $\frac{1}{9} + \frac{1}{9}$   | g) $\frac{1}{15} + \frac{1}{15}$   | h) $\frac{4}{9} + \frac{4}{9}$    |
| 2. | a) $\frac{5}{13} - \frac{2}{13}$   | b) $\frac{3}{11} - \frac{2}{11}$ | c) $\frac{4}{7} - \frac{1}{7}$     | d) $\frac{2}{3} - \frac{1}{3}$    |
|    | e) $\frac{2}{5} - \frac{1}{5}$     | f) $\frac{4}{7} - \frac{2}{7}$   | g) $\frac{6}{11} - \frac{4}{11}$   | h) $\frac{3}{8} - \frac{2}{8}$    |
| 3. | a) $\frac{3}{11} + \frac{2}{11}$   | b) $\frac{3}{11} + \frac{6}{11}$ | c) $\frac{5}{23} + \frac{7}{23}$   | d) $\frac{2}{9} + \frac{5}{9}$    |
|    | e) $\frac{5}{13} - \frac{1}{13}$   | f) $\frac{4}{17} - \frac{1}{17}$ | g) $\frac{27}{29} - \frac{15}{29}$ | h) $\frac{15}{19} - \frac{4}{19}$ |
| 4. | a) $\frac{4}{15} - \frac{1}{15}$   | b) $\frac{6}{7} + \frac{1}{7}$   | c) $\frac{3}{4} - \frac{1}{4}$     | d) $\frac{5}{8} + \frac{1}{8}$    |
|    | e) $\frac{5}{6} - \frac{1}{6}$     | f) $\frac{5}{7} + \frac{3}{7}$   | g) $\frac{6}{7} + \frac{3}{7}$     | h) $\frac{7}{12} - \frac{5}{12}$  |
| 5. | a) $\frac{4}{5} + \frac{4}{5}$     | b) $\frac{7}{10} - \frac{3}{10}$ | c) $\frac{9}{13} + \frac{8}{13}$   | d) $\frac{3}{10} - \frac{3}{10}$  |
|    | e) $\frac{5}{8} - \frac{3}{8}$     | f) $\frac{4}{9} + \frac{2}{9}$   | g) $\frac{6}{5} + \frac{4}{5}$     | h) $\frac{8}{9} - \frac{2}{9}$    |
| 6. | a) $\frac{11}{15} + \frac{6}{15}$  | b) $\frac{5}{10} - \frac{3}{10}$ | c) $\frac{6}{8} + \frac{2}{8}$     | d) $\frac{18}{12} - \frac{6}{12}$ |
|    | e) $\frac{15}{25} - \frac{10}{25}$ | f) $\frac{9}{18} + \frac{3}{18}$ | g) $\frac{14}{20} - \frac{8}{20}$  | h) $\frac{24}{32} + \frac{8}{32}$ |

7. A school has 700 pupils. One fifth have blond hair, two fifths have brown hair, one fifth have ginger hair and the rest have black hair.
- What fraction of the school has black hair?
  - How many students have black hair?
8. Four friends share a pizza which has been cut into 8 slices of equal size. George eats one slice, Rachel eats 2 slices and Harman eats 3 slices. Sophie eats the rest of the pizza.
- How many slices does Sophie eat?
  - What fraction of the pizza does she eat?

## EXERCISE 2 – ADDING &amp; SUBTRACTING #2

In questions 1 – 3, the denominators do not share a common factor.

In questions 4 – 6, one denominator is a factor of the other.

Evaluate the following sums and differences.

- |    |    |                              |    |                              |    |                              |    |                               |
|----|----|------------------------------|----|------------------------------|----|------------------------------|----|-------------------------------|
| 1. | a) | $\frac{1}{2} - \frac{1}{3}$  | b) | $\frac{1}{5} + \frac{1}{2}$  | c) | $\frac{2}{5} - \frac{1}{3}$  | d) | $\frac{1}{7} + \frac{1}{2}$   |
|    | e) | $\frac{3}{7} + \frac{1}{4}$  | f) | $\frac{2}{3} - \frac{1}{4}$  | g) | $\frac{3}{5} - \frac{1}{6}$  | h) | $\frac{2}{5} + \frac{3}{7}$   |
| 2. | a) | $\frac{2}{3} - \frac{4}{11}$ | b) | $\frac{4}{7} + \frac{2}{9}$  | c) | $\frac{4}{7} + \frac{3}{4}$  | d) | $\frac{3}{5} - \frac{3}{8}$   |
|    | e) | $\frac{2}{9} - \frac{1}{5}$  | f) | $\frac{2}{11} + \frac{2}{3}$ | g) | $\frac{5}{7} - \frac{1}{6}$  | h) | $\frac{1}{3} + \frac{3}{5}$   |
| 3. | a) | $\frac{3}{4} + \frac{4}{15}$ | b) | $\frac{3}{10} - \frac{2}{7}$ | c) | $\frac{2}{3} - \frac{2}{7}$  | d) | $\frac{5}{9} + \frac{7}{10}$  |
|    | e) | $\frac{4}{9} - \frac{2}{11}$ | f) | $\frac{5}{11} + \frac{4}{5}$ | g) | $\frac{9}{11} + \frac{5}{8}$ | h) | $\frac{5}{9} - \frac{3}{7}$   |
| 4. | a) | $\frac{1}{2} - \frac{1}{4}$  | b) | $\frac{1}{3} + \frac{1}{6}$  | c) | $\frac{1}{2} - \frac{1}{6}$  | d) | $\frac{1}{8} + \frac{1}{2}$   |
|    | e) | $\frac{1}{5} - \frac{1}{10}$ | f) | $\frac{1}{2} + \frac{3}{4}$  | g) | $\frac{2}{3} - \frac{4}{9}$  | h) | $\frac{3}{4} + \frac{3}{8}$   |
| 5. | a) | $\frac{2}{3} + \frac{1}{6}$  | b) | $\frac{5}{6} - \frac{7}{12}$ | c) | $\frac{5}{16} + \frac{3}{4}$ | d) | $\frac{3}{4} - \frac{3}{8}$   |
|    | e) | $\frac{3}{10} - \frac{1}{5}$ | f) | $\frac{2}{15} + \frac{2}{3}$ | g) | $\frac{5}{12} - \frac{1}{6}$ | h) | $\frac{2}{9} + \frac{1}{3}$   |
| 6. | a) | $\frac{3}{5} - \frac{4}{15}$ | b) | $\frac{1}{4} + \frac{7}{8}$  | c) | $\frac{4}{9} - \frac{5}{18}$ | d) | $\frac{5}{7} + \frac{20}{21}$ |
|    | e) | $\frac{5}{6} - \frac{7}{18}$ | f) | $\frac{3}{4} + \frac{7}{8}$  | g) | $\frac{4}{5} - \frac{3}{10}$ | h) | $\frac{7}{30} + \frac{7}{10}$ |

## EXERCISE 3 – ADDING &amp; SUBTRACTING #3

In these questions, the denominators share a common factor.

Evaluate the following sums and differences.

- |    |                                  |                                   |                                   |                                  |
|----|----------------------------------|-----------------------------------|-----------------------------------|----------------------------------|
| 1. | a) $\frac{1}{6} + \frac{1}{4}$   | b) $\frac{1}{6} - \frac{1}{8}$    | c) $\frac{1}{10} + \frac{2}{15}$  | d) $\frac{2}{9} - \frac{1}{12}$  |
|    | e) $\frac{5}{6} - \frac{1}{10}$  | f) $\frac{2}{9} + \frac{4}{15}$   | g) $\frac{3}{4} - \frac{3}{10}$   | h) $\frac{3}{4} + \frac{5}{6}$   |
| 2. | a) $\frac{5}{6} + \frac{7}{9}$   | b) $\frac{5}{12} - \frac{2}{9}$   | c) $\frac{3}{8} - \frac{1}{6}$    | d) $\frac{5}{12} + \frac{5}{8}$  |
|    | e) $\frac{3}{10} + \frac{7}{12}$ | f) $\frac{9}{10} - \frac{7}{15}$  | g) $\frac{2}{21} + \frac{5}{14}$  | h) $\frac{7}{12} - \frac{5}{18}$ |
| 3. | a) $\frac{9}{10} - \frac{5}{12}$ | b) $\frac{5}{12} + \frac{5}{18}$  | c) $\frac{8}{15} + \frac{11}{20}$ | d) $\frac{3}{14} - \frac{4}{21}$ |
|    | e) $\frac{13}{20} - \frac{5}{8}$ | f) $\frac{7}{15} + \frac{13}{20}$ | g) $\frac{8}{9} - \frac{5}{6}$    | h) $\frac{3}{16} + \frac{5}{12}$ |

## EXERCISE 4 – ADDING &amp; SUBTRACTING (MIXED EXERCISE)

Evaluate the following sums and differences.

- |    |                                   |                                  |                                |                                  |
|----|-----------------------------------|----------------------------------|--------------------------------|----------------------------------|
| 1. | a) $\frac{22}{47} + \frac{5}{47}$ | b) $\frac{6}{11} - \frac{2}{11}$ | c) $\frac{5}{6} + \frac{1}{7}$ | d) $\frac{7}{10} - \frac{4}{9}$  |
|    | e) $\frac{4}{5} + \frac{1}{9}$    | f) $\frac{5}{6} - \frac{3}{4}$   | g) $\frac{1}{2} - \frac{1}{5}$ | h) $\frac{13}{36} + \frac{5}{9}$ |
| 2. | a) $\frac{1}{29} + \frac{22}{29}$ | b) $\frac{3}{4} - \frac{7}{10}$  | c) $\frac{1}{6} + \frac{5}{7}$ | d) $\frac{1}{5} + \frac{1}{2}$   |
|    | e) $\frac{3}{10} + \frac{7}{20}$  | f) $\frac{2}{3} - \frac{4}{9}$   | g) $\frac{1}{5} + \frac{5}{8}$ | h) $\frac{7}{8} - \frac{2}{3}$   |
| 3. | a) $\frac{9}{10} - \frac{1}{2}$   | b) $\frac{2}{3} + \frac{3}{8}$   | c) $\frac{3}{7} - \frac{2}{7}$ | d) $\frac{7}{8} + \frac{2}{9}$   |
|    | e) $\frac{5}{6} - \frac{7}{24}$   | f) $\frac{7}{8} + \frac{3}{40}$  | g) $\frac{2}{5} + \frac{1}{6}$ | h) $\frac{12}{35} - \frac{2}{7}$ |

## EXERCISE 5 – ADDING MIXED NUMBERS

Evaluate the following sums:

- |    |    |                                |    |                                 |    |                                  |    |                                 |
|----|----|--------------------------------|----|---------------------------------|----|----------------------------------|----|---------------------------------|
| 1. | a) | $1\frac{1}{5} + 2\frac{1}{5}$  | b) | $1\frac{1}{6} + 2\frac{5}{6}$   | c) | $2\frac{2}{7} + 1\frac{3}{7}$    | d) | $3\frac{1}{4} + 1\frac{1}{4}$   |
|    | e) | $2\frac{3}{8} + 1\frac{1}{8}$  | f) | $3\frac{3}{5} + 1\frac{2}{5}$   | g) | $1\frac{1}{2} + \frac{1}{3}$     | h) | $1\frac{1}{3} + 1\frac{1}{4}$   |
| 2. | a) | $2\frac{1}{5} + 1\frac{1}{2}$  | b) | $4\frac{4}{7} + 3\frac{7}{8}$   | c) | $2\frac{3}{8} + 3\frac{2}{5}$    | d) | $5\frac{4}{9} + 3\frac{5}{7}$   |
|    | e) | $1\frac{1}{2} + 2\frac{1}{4}$  | f) | $3\frac{1}{6} + 1\frac{1}{3}$   | g) | $2\frac{5}{8} + 1\frac{1}{4}$    | h) | $2\frac{5}{9} + 3\frac{5}{18}$  |
| 3. | a) | $3\frac{3}{5} + 2\frac{7}{10}$ | b) | $2\frac{7}{12} + 3\frac{5}{6}$  | c) | $1\frac{2}{9} + 2\frac{5}{6}$    | d) | $2\frac{5}{8} + 3\frac{5}{6}$   |
|    | e) | $4\frac{2}{9} + 3\frac{7}{12}$ | f) | $3\frac{3}{10} + 5\frac{4}{15}$ | g) | $4\frac{7}{24} + 3\frac{11}{18}$ | h) | $3\frac{5}{8} + 6\frac{11}{12}$ |

## EXERCISE 6 – SUBTRACTING MIXED NUMBERS

Evaluate the following differences:

- |    |    |                                  |    |                                |    |                                |    |                                 |
|----|----|----------------------------------|----|--------------------------------|----|--------------------------------|----|---------------------------------|
| 1. | a) | $3\frac{1}{2} - 2\frac{1}{2}$    | b) | $5\frac{3}{4} - 2\frac{1}{4}$  | c) | $3\frac{1}{5} - 1\frac{3}{5}$  | d) | $2\frac{2}{7} - 1\frac{6}{7}$   |
|    | e) | $5\frac{1}{6} - 2\frac{5}{6}$    | f) | $6\frac{2}{9} - 5\frac{5}{9}$  | g) | $3\frac{1}{3} - 2\frac{1}{2}$  | h) | $4\frac{1}{4} - 2\frac{2}{5}$   |
| 2. | a) | $6\frac{2}{5} - \frac{3}{7}$     | b) | $4\frac{3}{9} - 3\frac{3}{4}$  | c) | $2\frac{4}{5} - 1\frac{5}{6}$  | d) | $5\frac{3}{10} - 1\frac{5}{6}$  |
|    | e) | $2\frac{1}{2} - 1\frac{3}{4}$    | f) | $5\frac{5}{8} - 3\frac{3}{4}$  | g) | $5\frac{1}{2} - 3\frac{7}{8}$  | h) | $4\frac{3}{4} - 2\frac{3}{8}$   |
| 3. | a) | $2\frac{2}{9} - 1\frac{2}{3}$    | b) | $3\frac{5}{12} - 1\frac{5}{6}$ | c) | $6\frac{2}{9} - 2\frac{7}{15}$ | d) | $7\frac{3}{8} - 5\frac{5}{6}$   |
|    | e) | $7\frac{5}{12} - 2\frac{13}{18}$ | f) | $11\frac{1}{6} - 1\frac{7}{9}$ | g) | $11\frac{1}{6} - 1\frac{7}{9}$ | h) | $8\frac{1}{6} - 2\frac{11}{12}$ |

## EXERCISE 7 – MULTIPLYING FRACTIONS

Evaluate the following products:

- |    |    |                                      |    |                                     |    |                                      |    |                                      |
|----|----|--------------------------------------|----|-------------------------------------|----|--------------------------------------|----|--------------------------------------|
| 1. | a) | $\frac{1}{5}$ of 10                  | b) | $\frac{2}{3} \times 6$              | c) | $\frac{3}{4}$ of 18                  | d) | $\frac{5}{6} \times 27$              |
|    | e) | $\frac{2}{3} \times \frac{1}{4}$     | f) | $\frac{5}{6}$ of $\frac{3}{10}$     | g) | $\frac{7}{8} \times \frac{4}{5}$     | h) | $\frac{8}{9}$ of $\frac{3}{4}$       |
| 2. | a) | $\frac{4}{5} \times \frac{5}{4}$     | b) | $\frac{2}{3} \times \frac{4}{5}$    | c) | $\frac{3}{11} \times \frac{11}{15}$  | d) | $\frac{6}{7} \times \frac{2}{9}$     |
|    | e) | $\frac{8}{15} \times \frac{5}{12}$   | f) | $\frac{9}{10} \times \frac{5}{18}$  | g) | $\frac{9}{10} \times \frac{20}{27}$  | h) | $\frac{10}{11} \times \frac{2}{15}$  |
| 3. | a) | $\frac{16}{25} \times \frac{15}{32}$ | b) | $\frac{3}{8} \times \frac{6}{11}$   | c) | $\frac{14}{15} \times \frac{10}{21}$ | d) | $\frac{34}{35} \times \frac{14}{17}$ |
|    | e) | $\frac{14}{15} \times \frac{5}{8}$   | f) | $\frac{9}{16} \times \frac{11}{27}$ | g) | $\frac{8}{9} \times \frac{15}{22}$   | h) | $\frac{54}{77} \times \frac{56}{81}$ |

## EXERCISE 8 – MULTIPLYING MIXED NUMBERS

Evaluate the following products:

- |    |    |                                      |    |                                       |    |  |    |  |
|----|----|--------------------------------------|----|---------------------------------------|----|--|----|--|
| 1. | a) | $1\frac{1}{2} \times 2$              | b) | $1\frac{1}{3} \times \frac{3}{4}$     | c) | $2\frac{3}{5} \times \frac{10}{13}$    | d) | $3\frac{1}{5} \times \frac{15}{16}$    |
|    | e) | $2\frac{2}{3} \times 1\frac{1}{8}$   | f) | $1\frac{5}{13} \times 2\frac{8}{9}$   | g) | $3\frac{3}{4} \times 2\frac{2}{3}$     | h) | $3\frac{3}{5} \times 3\frac{1}{3}$     |
| 2. | a) | $5\frac{1}{3} \times 1\frac{1}{8}$   | b) | $3\frac{3}{4} \times 1\frac{3}{5}$    | c) | $1\frac{7}{17} \times 1\frac{5}{12}$   | d) | $2\frac{4}{5} \times 4\frac{2}{7}$     |
|    | e) | $1\frac{7}{15} \times 2\frac{3}{11}$ | f) | $2\frac{3}{4} \times 1\frac{1}{3}$    | g) | $2\frac{11}{12} \times 1\frac{13}{14}$ | h) | $1\frac{3}{10} \times 1\frac{12}{13}$  |
| 3. | a) | $1\frac{1}{21} \times 1\frac{2}{33}$ | b) | $1\frac{10}{11} \times 2\frac{5}{14}$ | c) | $1\frac{13}{25} \times 3\frac{3}{4}$   | d) | $1\frac{13}{14} \times 1\frac{17}{18}$ |
|    | e) | $4\frac{3}{8} \times 3\frac{5}{7}$   | f) | $1\frac{9}{16} \times 2\frac{2}{5}$   | g) | $1\frac{2}{13} \times 5\frac{7}{9}$    | h) | $6\frac{3}{5} \times 2\frac{2}{9}$     |

## EXERCISE 9 – DIVIDING FRACTIONS

Evaluate the following quotients:

- |    |                                       |                                       |                                       |                                     |
|----|---------------------------------------|---------------------------------------|---------------------------------------|-------------------------------------|
| 1. | a) $\frac{5}{6} \div 2$               | b) $\frac{5}{6} \div 3$               | c) $\frac{3}{8} \div 2$               | d) $\frac{5}{8} \div 10$            |
|    | e) $5 \div \frac{1}{2}$               | f) $16 \div \frac{4}{5}$              | g) $24 \div \frac{6}{7}$              | h) $21 \div \frac{7}{9}$            |
| 2. | a) $\frac{1}{4} \div \frac{1}{3}$     | b) $\frac{3}{5} \div \frac{1}{2}$     | c) $\frac{3}{7} \div \frac{4}{5}$     | d) $\frac{5}{6} \div \frac{3}{7}$   |
|    | e) $\frac{4}{5} \div \frac{4}{5}$     | f) $\frac{5}{7} \div \frac{5}{7}$     | g) $\frac{9}{11} \div \frac{9}{11}$   | h) $\frac{2}{3} \div \frac{2}{3}$   |
| 3. | a) $\frac{5}{8} \div \frac{15}{32}$   | b) $\frac{7}{10} \div \frac{14}{25}$  | c) $\frac{5}{12} \div \frac{5}{18}$   | d) $\frac{8}{9} \div \frac{2}{3}$   |
|    | e) $\frac{12}{17} \div \frac{27}{34}$ | f) $\frac{14}{15} \div \frac{21}{25}$ | g) $\frac{15}{34} \div \frac{10}{51}$ | h) $\frac{6}{25} \div \frac{4}{15}$ |

## EXERCISE 10 – DIVIDING MIXED NUMBERS

Evaluate the following quotients:

- |    |                                     |  |                                      |                                      |
|----|-------------------------------------|--|--------------------------------------|--------------------------------------|
| 1. | a) $9 \div 1\frac{1}{2}$            | b) $10 \div 1\frac{1}{4}$              | c) $8 \div 3\frac{1}{5}$             | d) $12 \div 2\frac{2}{5}$            |
|    | e) $1\frac{1}{5} \div 6$            | f) $3\frac{3}{4} \div 5$               | g) $2\frac{1}{3} \div 7$             | h) $8\frac{2}{3} \div 13$            |
| 2. | a) $2\frac{4}{5} \div \frac{1}{10}$ | b) $2\frac{1}{3} \div \frac{1}{9}$     | c) $3\frac{3}{4} \div 1\frac{4}{5}$  | d) $2\frac{1}{3} \div 2\frac{4}{5}$  |
|    | e) $7\frac{1}{2} \div 1\frac{1}{2}$ | f) $5\frac{5}{6} \div 1\frac{1}{9}$    | g) $2\frac{1}{12} \div 1\frac{1}{9}$ | h) $1\frac{1}{15} \div 2\frac{2}{5}$ |
| 3. | a) $3\frac{1}{4} \div 1\frac{4}{9}$ | b) $4\frac{9}{10} \div 2\frac{4}{5}$   | c) $4\frac{2}{3} \div 3\frac{1}{2}$  | d) $2\frac{1}{2} \div 4\frac{1}{6}$  |
|    | e) $4\frac{2}{3} \div 3\frac{1}{2}$ | f) $1\frac{11}{13} \div 2\frac{2}{39}$ | g) $2\frac{4}{9} \div 1\frac{5}{6}$  | h) $6\frac{2}{3} \div 2\frac{8}{9}$  |

## EXERCISE 11 – MIXED QUESTIONS

Evaluate the following:

$$1. \quad \text{a) } \left(\frac{2}{3} - \frac{2}{5}\right) \times \frac{5}{8} \qquad \text{b) } \frac{2}{5} + \frac{4}{5} \times \frac{5}{8} \qquad \text{c) } \left(\frac{3}{5} + \frac{1}{4}\right) \times \frac{5}{17}$$

$$\text{d) } 1\frac{3}{4} - \frac{2}{3} \div \frac{8}{9} \qquad \text{e) } \frac{4}{5} \times \frac{15}{16} - \frac{3}{4} \qquad \text{f) } \frac{3}{7} \times \frac{7}{9} + \frac{2}{3}$$

$$2. \quad \text{a) } 4\frac{5}{6} + 4\frac{4}{9} \times 1\frac{7}{8} \qquad \text{b) } \left(3\frac{3}{4} - 2\frac{5}{6}\right) \times \frac{3}{11} \qquad \text{c) } \left(2\frac{1}{6} - 1\frac{1}{3}\right) \div \frac{25}{36}$$

$$\text{d) } 1\frac{13}{22} \times 3\frac{3}{10} + 2\frac{3}{4} \qquad \text{e) } \frac{14}{27} \times 1\frac{13}{35} \times 1\frac{13}{32} \qquad \text{f) } 4\frac{1}{5} \times 3\frac{1}{7} \div \frac{3}{5}$$

3. In a class of children one third have blue eyes, one half have brown eyes and the rest have hazel coloured eyes.
  - a) What fraction of the class have hazel coloured eyes?
  - b) If there are 36 children in the class, how many have blue eyes?
4. George spends three fifths of his income on his rent, heating and light. He spends one quarter of his income on groceries and the rest he divides equally between spending money and savings. What fraction of his income does he save?
5. Which is bigger four fifths of £20 or three quarters of £24?
6. How many strips of sticky tape can I cut from a roll of 20m, if each strip is  $2\frac{1}{2}$  cm long?
7. A school supplier buys  $3\frac{3}{4}$  tonnes of printer paper. Each of the schools they supply requires one third of a tonne at the start of the year.
  - a) How many schools can they supply?
  - b) What weight of printer paper are they left with?
8. One third of three quarters of a sum of money is £5.60. What is the original sum of money?
9. Sandra ate three eighths of a cake and then eats one quarter of what remains.
  - a) What fraction of the cake did she eat altogether?
  - b) What fraction of the cake is left after she has eaten the 2<sup>nd</sup> slice?
10. Billy spends one fifth of his weekly pocket money on sweets and three quarters goes on books and comics. He saves the rest in a piggy bank.
  - a) What fraction of his pocket money does he save each week?
  - b) If Billy gets £5.80 per week, how much does he spend on sweets?
11. How many seconds is one quarter of one sixth of one eighth of one day?





## ANSWERS

## EXERCISE 1 – ADDING &amp; SUBTRACTING (SAME DENOMINATORS) – ANSWERS

- |       |                   |      |                |    |                 |    |                 |
|-------|-------------------|------|----------------|----|-----------------|----|-----------------|
| 1. a) | $\frac{2}{3}$     | a)   | $\frac{4}{5}$  | c) | $\frac{7}{9}$   | d) | $\frac{3}{5}$   |
| e)    | $\frac{5}{7}$     | f)   | $\frac{2}{9}$  | g) | $\frac{2}{15}$  | h) | $\frac{8}{9}$   |
| 2. a) | $\frac{3}{13}$    | b)   | $\frac{1}{11}$ | c) | $\frac{3}{7}$   | d) | $\frac{1}{3}$   |
| e)    | $\frac{1}{5}$     | f)   | $\frac{2}{7}$  | g) | $\frac{2}{11}$  | h) | $\frac{1}{8}$   |
| 3. a) | $\frac{5}{11}$    | b)   | $\frac{9}{11}$ | c) | $\frac{12}{23}$ | d) | $\frac{7}{9}$   |
| e)    | $\frac{4}{13}$    | f)   | $\frac{3}{17}$ | g) | $\frac{12}{29}$ | h) | $\frac{11}{19}$ |
| 4. a) | $\frac{1}{5}$     | b)   | 1              | c) | $\frac{1}{2}$   | d) | $\frac{3}{4}$   |
| e)    | $\frac{2}{3}$     | f)   | $1\frac{1}{7}$ | g) | $1\frac{2}{7}$  | h) | $\frac{1}{6}$   |
| 5. a) | $1\frac{3}{5}$    | b)   | $\frac{2}{5}$  | c) | $1\frac{4}{13}$ | d) | 0               |
| e)    | $\frac{1}{4}$     | f)   | $\frac{2}{3}$  | g) | 2               | h) | $\frac{2}{3}$   |
| 6. a) | $1\frac{2}{15}$   | b)   | $\frac{1}{5}$  | c) | 1               | d) | 1               |
| e)    | $\frac{1}{5}$     | f)   | $\frac{2}{3}$  | g) | $\frac{3}{10}$  | h) | 1               |
| 7.    | (i) $\frac{1}{5}$ | (ii) | 140            |    |                 |    |                 |
| 8.    | (i) 2 slices      | (ii) | $\frac{1}{4}$  |    |                 |    |                 |

## EXERCISE 2 – ADDING &amp; SUBTRACTING #2 – ANSWERS

- |       |                 |    |                  |    |                  |    |                  |
|-------|-----------------|----|------------------|----|------------------|----|------------------|
| 1. a) | $\frac{1}{6}$   | a) | $\frac{7}{10}$   | c) | $\frac{1}{15}$   | d) | $\frac{9}{14}$   |
| e)    | $\frac{19}{28}$ | f) | $\frac{5}{12}$   | g) | $\frac{13}{30}$  | h) | $\frac{29}{35}$  |
| 2. a) | $\frac{10}{33}$ | b) | $\frac{50}{63}$  | c) | $1\frac{9}{28}$  | d) | $\frac{9}{40}$   |
| e)    | $\frac{1}{45}$  | f) | $\frac{28}{33}$  | g) | $\frac{23}{42}$  | h) | $\frac{14}{15}$  |
| 3. a) | $1\frac{1}{60}$ | b) | $\frac{1}{70}$   | c) | $\frac{8}{21}$   | d) | $1\frac{23}{90}$ |
| e)    | $\frac{26}{99}$ | f) | $1\frac{14}{55}$ | g) | $1\frac{39}{88}$ | h) | $\frac{8}{63}$   |
| 4. a) | $\frac{1}{4}$   | b) | $\frac{1}{2}$    | c) | $\frac{1}{3}$    | d) | $\frac{5}{8}$    |
| e)    | $\frac{1}{10}$  | f) | $1\frac{1}{4}$   | g) | $\frac{2}{9}$    | h) | $1\frac{1}{8}$   |
| 5. a) | $\frac{5}{6}$   | b) | $\frac{1}{4}$    | c) | $1\frac{1}{16}$  | d) | $\frac{3}{8}$    |
| e)    | $\frac{1}{10}$  | f) | $\frac{4}{5}$    | g) | $\frac{1}{4}$    | h) | $\frac{5}{9}$    |
| 6. a) | $\frac{1}{3}$   | b) | $1\frac{1}{8}$   | c) | $\frac{1}{6}$    | d) | $1\frac{2}{3}$   |
| e)    | $\frac{4}{9}$   | f) | $1\frac{5}{8}$   | g) | $\frac{1}{2}$    | h) | $\frac{14}{15}$  |

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 EXERCISE 3 – DENOMINATORS SHARE A COMMON FACTOR – ANSWERS

- |       |                  |    |                 |    |                 |    |                 |
|-------|------------------|----|-----------------|----|-----------------|----|-----------------|
| 1. a) | $\frac{5}{12}$   | a) | $\frac{1}{24}$  | c) | $\frac{7}{30}$  | d) | $\frac{5}{36}$  |
| e)    | $\frac{11}{15}$  | f) | $\frac{22}{45}$ | g) | $\frac{9}{20}$  | h) | $1\frac{7}{12}$ |
| 2. a) | $1\frac{11}{18}$ | b) | $\frac{7}{36}$  | c) | $\frac{5}{24}$  | d) | $1\frac{1}{24}$ |
| e)    | $\frac{53}{60}$  | f) | $\frac{13}{30}$ | g) | $\frac{19}{42}$ | h) | $\frac{11}{36}$ |

3. a)	$\frac{29}{60}$	b)	$\frac{25}{36}$	c)	$1\frac{1}{12}$	d)	$\frac{1}{42}$
e)	$\frac{1}{40}$	f)	$1\frac{7}{60}$	g)	$\frac{1}{18}$	h)	$\frac{29}{48}$

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 EXERCISE 4 – MIXED EXERCISE – ANSWERS

1. a)	$\frac{27}{47}$	b)	$\frac{4}{11}$	c)	$\frac{41}{42}$	d)	$\frac{23}{90}$
e)	$\frac{41}{45}$	f)	$\frac{1}{12}$	g)	$\frac{3}{10}$	h)	$\frac{11}{12}$
2. a)	$\frac{23}{29}$	b)	$\frac{1}{20}$	c)	$\frac{37}{42}$	d)	$\frac{7}{10}$
e)	$\frac{13}{20}$	f)	$\frac{2}{9}$	g)	$\frac{33}{40}$	h)	$\frac{5}{24}$
3. a)	$\frac{2}{5}$	b)	$1\frac{1}{24}$	c)	$\frac{1}{7}$	d)	$1\frac{7}{72}$
e)	$\frac{13}{24}$	f)	$\frac{19}{20}$	g)	$\frac{17}{30}$	h)	$\frac{2}{35}$

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 EXERCISE 5 – ADDING MIXED NUMBERS – ANSWERS

1. a)	$3\frac{2}{5}$	b)	4	c)	$3\frac{5}{7}$	d)	$4\frac{1}{2}$
e)	$3\frac{1}{2}$	f)	5	g)	$1\frac{5}{6}$	h)	$2\frac{7}{12}$
2. a)	$3\frac{7}{10}$	b)	$8\frac{25}{56}$	c)	$5\frac{31}{40}$	d)	$9\frac{10}{63}$
e)	$3\frac{3}{4}$	f)	$4\frac{1}{2}$	g)	$3\frac{7}{8}$	h)	$5\frac{5}{6}$
3. a)	$6\frac{3}{10}$	b)	$6\frac{5}{12}$	c)	$4\frac{1}{18}$	d)	$6\frac{11}{24}$
e)	$7\frac{29}{36}$	f)	$6\frac{41}{45}$	g)	$7\frac{65}{72}$	h)	$10\frac{13}{24}$

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 EXERCISE 6 – SUBTRACTING MIXED NUMBERS – ANSWERS

- |                        |                    |                     |                     |
|------------------------|--------------------|---------------------|---------------------|
| 1. a) 1                | b) $3\frac{1}{2}$  | c) $1\frac{3}{5}$   | d) $\frac{3}{7}$    |
| e) $2\frac{1}{3}$      | f) $\frac{2}{3}$   | g) $\frac{5}{6}$    | h) $1\frac{17}{20}$ |
| 2. a) $5\frac{34}{35}$ | b) $\frac{7}{12}$  | c) $\frac{29}{30}$  | d) $3\frac{7}{15}$  |
| e) $\frac{3}{4}$       | f) $1\frac{7}{8}$  | g) $1\frac{5}{8}$   | h) $2\frac{3}{8}$   |
| 3. a) $\frac{5}{9}$    | b) $1\frac{7}{12}$ | c) $3\frac{34}{45}$ | d) $1\frac{13}{24}$ |
| e) $4\frac{25}{36}$    | f) $9\frac{7}{18}$ | g) $8\frac{14}{15}$ | h) $5\frac{1}{4}$   |

## EXERCISE 7 – MULTIPLYING FRACTIONS – ANSWERS

- |                      |                    |                    |                    |
|----------------------|--------------------|--------------------|--------------------|
| 1. a) 2              | b) 4               | c) $13\frac{1}{2}$ | d) $22\frac{1}{2}$ |
| e) $\frac{1}{6}$     | f) $\frac{1}{4}$   | g) $\frac{7}{10}$  | h) $\frac{2}{3}$   |
| 2. a) 1              | b) $\frac{8}{15}$  | c) $\frac{1}{5}$   | d) $\frac{4}{21}$  |
| e) $\frac{2}{9}$     | f) $\frac{1}{4}$   | g) $\frac{2}{3}$   | h) $\frac{4}{33}$  |
| 3. a) $\frac{3}{10}$ | b) $\frac{9}{44}$  | c) $\frac{4}{9}$   | d) $\frac{4}{5}$   |
| e) $\frac{7}{12}$    | f) $\frac{11}{48}$ | g) $\frac{20}{33}$ | h) $\frac{16}{33}$ |

## EXERCISE 8 – MULTIPLYING MIXED NUMBERS – ANSWERS

- |                      |                   |                    |                   |
|----------------------|-------------------|--------------------|-------------------|
| 1. a) 3              | b) 1              | c) 2               | d) 3              |
| e) 3                 | f) 4              | g) 10              | h) 12             |
| 2. a) 6              | b) 6              | c) 2               | d) 12             |
| e) $3\frac{1}{3}$    | f) $3\frac{2}{3}$ | g) $5\frac{5}{8}$  | h) $2\frac{1}{2}$ |
| 3. a) $1\frac{1}{9}$ | b) $4\frac{1}{2}$ | c) $5\frac{7}{10}$ | d) $3\frac{3}{4}$ |

e)  $16\frac{1}{4}$

f)  $3\frac{3}{4}$

g)  $6\frac{2}{3}$

h)  $14\frac{2}{3}$

## EXERCISE 9 – DIVIDING FRACTIONS – ANSWERS

1. a)  $\frac{5}{12}$

b)  $\frac{5}{18}$

c)  $\frac{3}{16}$

d)  $\frac{1}{16}$

e) 10

f) 20

g) 28

h) 27

2. a)  $\frac{3}{4}$

b)  $1\frac{1}{5}$

c)  $\frac{15}{28}$

d)  $1\frac{17}{18}$

e) 1

f) 1

g) 1

h) 1

3. a)  $1\frac{1}{3}$

b)  $1\frac{1}{4}$

c)  $1\frac{1}{2}$

d)  $1\frac{1}{3}$

e) 2

f)  $1\frac{1}{9}$

g)  $2\frac{1}{4}$

h)  $\frac{9}{10}$

## EXERCISE 10 – DIVIDING MIXED NUMBERS – ANSWERS

1. a) 6

b) 8

c)  $2\frac{1}{2}$

d) 5

e)  $\frac{1}{5}$

f)  $\frac{3}{4}$

g)  $\frac{1}{3}$

h)  $\frac{2}{3}$

2. a) 28

b) 21

c)  $2\frac{1}{12}$

d)  $\frac{5}{6}$

e) 5

f)  $5\frac{1}{4}$

g)  $1\frac{7}{8}$

h)  $\frac{4}{9}$

3. a)  $2\frac{1}{4}$

b)  $1\frac{3}{4}$

c)  $1\frac{1}{3}$

d)  $\frac{3}{5}$

e)  $1\frac{1}{3}$

f)  $\frac{9}{10}$

g)  $1\frac{1}{3}$

h)  $2\frac{4}{13}$

## EXERCISE 11 – MIXED QUESTIONS – ANSWERS

1. a)  $\frac{1}{6}$

b)  $\frac{9}{10}$

c)  $\frac{1}{4}$

d) 1

e) 0

f) 1

2. a)  $13\frac{1}{6}$

b)  $\frac{1}{4}$

c)  $1\frac{1}{5}$

