Grade 8 – Book B

(Revised CAPS edition)

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Chapter B1

Rational numbers – common fractions

B1.1 Number systems:

Complete:
Rational numbers: $\mathbb{Q}$ = { ____________________ }

Remember the properties of 1: (i) $a \times 1 = a$
(ii) $\frac{a}{1} = a$
(iii) $\frac{a}{a} = 1$

B1.2 Equivalent fractions:

E.g.1 Write two equivalent fractions for $\frac{1}{2}$:

$\frac{1 \times 3}{2 \times 3} = \frac{3}{\underline{6}}$ *or* $\frac{1 \times 5}{2 \times 5} = \frac{5}{\underline{10}}$ *[These are* ***possible*** *answers!]*

Exercise 1: Date: ____________________

(1) Write three equivalent fractions for each of the following rational numbers:

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

(c) $\frac{-1}{3}$ ____________________ (d) $\frac{2}{5}$ ____________________

(e) $\frac{2}{-7}$ ____________________ (f) $\frac{-4}{3}$ ____________________

(g) $\frac{1}{6}$ ____________________ (h) $\frac{3}{2}$ ____________________

(i) $\frac{10}{14}$ ____________________ (j) $\frac{-36}{-9}$ ____________________

(k) $2\frac{6}{11}$ ____________________ (l) 3 ____________________

(2) Are the following equivalent fractions or not? (Answer only yes or no.)

(a) $\frac{1}{2} = \frac{7}{14}$ ________ (b) $\frac{3}{7} = \frac{7}{3}$ ________ (c) $\frac{5}{-2} = \frac{10}{4}$ ________

(d) $\frac{-3}{-5} = \frac{9}{15}$ ________ (e) $\frac{2}{3} = \frac{5}{6}$ ________ (f) $\frac{3}{1} = \frac{48}{16}$ ________

(g) $\frac{4}{-3} = \frac{-12}{9}$ ________ (h) $\frac{25}{10} = \frac{5}{2}$ ________ (i) $\frac{5}{4} = \frac{25}{16}$ ________

(3) Complete the following equivalent fractions:

(a) $\frac{3}{8} = \frac{\quad}{24}$ (b) $\frac{\quad}{14} = \frac{6}{7}$ (c) $\frac{-2}{9} = \frac{\quad}{27}$

(d) $\frac{5}{\quad} = \frac{35}{42}$ (e) $\frac{\quad}{-4} = \frac{12}{16}$ (f) $1\frac{1}{3} = \frac{\quad}{9}$

(g) $\frac{-6}{33} = \frac{-4}{\quad}$ (h) $3\frac{2}{5} = \frac{\quad}{-10}$ (i) $\frac{6}{\quad} = \frac{11}{11}$

B1.3 Arrange rational numbers:

E.g.2 (a) Arrange in ascending order : $\frac{1}{2}$; $\frac{3}{4}$ *and* $\frac{2}{3}$

$\frac{1}{2} = \frac{6}{12}$; $\frac{3}{4} = \frac{9}{12}$ *and* $\frac{2}{3} = \frac{8}{12}$

$\therefore \underline{\frac{1}{2} < \frac{2}{3} < \frac{3}{4}}$

(b) Write a rational number between $\frac{3}{4}$ *and* $\frac{1}{3}$:

$\frac{3}{4} = \frac{9}{12}$ *and* $\frac{1}{3} = \frac{4}{12}$

$\therefore \underline{\frac{1}{3} < \frac{5}{12} \text{ or } \frac{6}{12} \text{ or } \frac{7}{12} \text{ or } \frac{8}{12} < \frac{3}{4}}$

Exercise 2: Date: ____________________

(1) Arrange the following fractions in ascending order:

(a) $\frac{5}{6}$; $\frac{3}{4}$ and $\frac{4}{5}$

____

____

(b) $\frac{2}{3}$; $\frac{5}{7}$ and $\frac{4}{6}$

____

____

(c) $\frac{1}{2}$; $\frac{2}{3}$ and $\frac{5}{6}$

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____

(d) $\frac{-3}{7}$; $\frac{-1}{3}$ and $\frac{-2}{5}$

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(2) Arrange the following fractions in descending order:

(a) $\frac{3}{8}$; $\frac{2}{3}$ and $\frac{5}{6}$

____

____

(b) $\frac{3}{5}$; $\frac{5}{7}$ and $\frac{6}{8}$

____

____

(c) $\frac{-1}{2}$; $\frac{-2}{3}$ and $\frac{-3}{5}$

____

____

(d) $\frac{2}{4}$; $\frac{6}{12}$ and $\frac{-5}{-10}$

____

____

(3) Write one rational number between the following fractions:

(a) $\frac{5}{6}$ and $\frac{3}{4}$

____

____

(b) $\frac{-1}{3}$ and $\frac{-3}{5}$

____

____

(c) $\frac{1}{2}$ and $\frac{3}{8}$

____

____

(d) $\frac{6}{7}$ and $\frac{7}{10}$

____

____

(e) $\frac{-3}{9}$ and $\frac{-5}{12}$

____

____

(f) $\frac{5}{2}$ and 3

____

____

☺ **There are four cakes of the same size. Dean eats $\frac{3}{8}$ of the first cake. Phillip eats $\frac{4}{9}$ of the second cake. André eats $\frac{1}{2}$ of the third cake and Mark eats $\frac{4}{6}$ of the last cake. Whose cake had the biggest piece left over?**

____

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B1.4 Addition and subtraction of fractions:

E.g.3 Simplify:

(a)

$$\begin{aligned}
&\frac{1}{2} + \frac{4}{3} - \frac{3}{4}\\
&= \frac{1}{2} \times \frac{6}{6} + \frac{4}{3} \times \frac{4}{4} - \frac{3}{4} \times \frac{3}{3}\\
&= \frac{6}{12} + \frac{16}{12} - \frac{9}{12}\\
&= \frac{6 + 16 - 9}{12}\\
&= \frac{13}{12}\\
&= \underline{1\frac{1}{12}}
\end{aligned}$$

(b)

$$\begin{aligned}
&3x + \frac{2}{3}y - \frac{3}{5}x + 1\frac{3}{4}y\\
&= \frac{3}{1}x - \frac{3}{5}x + \frac{2}{3}y + \frac{7}{4}y\\
&= \frac{5}{5} \times \frac{3}{1}x - \frac{3}{5}x + \frac{4}{4} \times \frac{2}{3}y + \frac{3}{3} \times \frac{7}{4}y\\
&= \frac{15}{5}x - \frac{3}{5}x + \frac{8}{12}y + \frac{21}{12}y\\
&= \frac{15x - 3x}{5} + \frac{8y + 21y}{12}\\
&= \frac{12x}{5} + \frac{29y}{12} = \underline{2\frac{2}{5}x + 2\frac{5}{12}y}
\end{aligned}$$

Exercise 3: Date: ____________

Simplify:

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

(2) $\frac{3}{7} - \frac{3}{5}$

(3) $\frac{1}{4} + 1\frac{1}{2} - \frac{5}{8}$

(4) $2\frac{7}{10} + 3\frac{9}{10}$

(5) $2\frac{1}{3} - 3$

(6) $-1\frac{2}{5} + 2\frac{1}{10}$

(7) $\frac{5}{8} + \frac{7}{12}$

(8) $\frac{1}{5} - 2\frac{2}{3} - \frac{5}{6}$

(9) $4\frac{4}{5} - 3\frac{7}{10}$

(10) $\frac{3}{4} + \frac{2}{3}$

(11) $4\frac{1}{2} - \frac{2}{5} + \frac{5}{6}$

(12) $\left(\frac{3}{7} - \frac{2}{6}\right) - \left(\frac{1}{3} + \frac{1}{7}\right)$

(13) $\frac{3}{8}p - \frac{3}{4}p$

(14) $\frac{1}{6} - \frac{1}{3} - \frac{1}{4}$

(15) $\left(6 - \frac{1}{4}\right) + \left(\frac{1}{5} - 1\right)$

(16) $\frac{4}{3} + \frac{6}{5} - \frac{5}{4}$

(17) $\frac{1}{12} - 15\frac{3}{8} + 1$

(18) $\frac{3}{5} - \left(3\frac{1}{3} + \frac{1}{2}\right) - \frac{4}{6}$

(19) $8 - 2\frac{1}{9} + \frac{7}{3}$

(20) $\frac{2}{3}x + \frac{1}{6}x$

(21) $\frac{1}{2}p - 3q + 7\frac{1}{4}p - \frac{1}{3}q$

(22) $-3\frac{1}{5} - \left(-\frac{7}{10}\right)$

(23) $1\frac{1}{2} + 2\frac{2}{3} + 3\frac{1}{6}$

(24) $4\frac{1}{2}y + 3\frac{1}{4}y - 2\frac{2}{3}y$

(25) $\frac{3}{5}m + \frac{4}{6}m$

(26) $6\frac{3}{4} - \left(2\frac{1}{3} - 1\frac{1}{3}\right)$

(27) $\frac{-10}{11}xy + \frac{1}{2}x + \frac{1}{2}xy$

(28) $25\frac{3}{20} - 33\frac{3}{20}$

(29) $\left(3\frac{1}{4} - 2\frac{1}{5}\right) - 2\frac{1}{4}$

(30) $\frac{3}{4}m - \frac{1}{2}k + \frac{1}{2}k + \frac{3}{4}m$

E.g.4 Simplify :

(a)
$$\begin{aligned} &\frac{2}{3x} + \frac{6}{x} \\ &= \frac{2}{3x} + \frac{6}{x} \times \frac{3}{3} \\ &= \frac{2 + 18}{3x} = \underline{\frac{20}{3x}} \end{aligned}$$

(b)
$$\begin{aligned} &\frac{y}{2} - \frac{y^2}{5} \\ &= \frac{y}{2} \times \frac{5}{5} - \frac{y^2}{5} \times \frac{2}{2} \\ &= \underline{\frac{5y - 2y^2}{10}} \end{aligned}$$

Exercise 4:

Date: ____________________

Simplify:

(1) $\frac{m}{2} + \frac{2m}{3}$

(2) $\frac{5}{x} - \frac{3}{x^2}$

(3) $\frac{2y}{5} - \frac{y^2}{3} - \frac{1}{2}$

(4) $-\frac{1}{4}q + \frac{2}{3}q$

(5) $k - 4 - \frac{2}{k^2}$

(6) $\frac{2}{x} + \frac{x}{2}$

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

(8) $\frac{-x^2}{5} + \frac{x}{4} - \frac{1}{2}$

(9) $c + \frac{3c}{7} - 2$

(10) $\frac{5}{x} - \frac{3}{xy}$

(11) $\frac{-2}{3p} + \frac{5}{2p}$

(12) $\frac{4k}{7} - k$

☺ **Complete the next three terms in the sequence: $1\frac{3}{4}$; $2\frac{1}{4}$; $2\frac{3}{4}$;** ____________________

Can you predict the hundredth term? Write it down. ____________________

B1.5 Multiplication and division:

E.g.5 Simplify

(a) $\frac{2}{3} \times \frac{8}{12}$

$= \frac{{}^{1}\cancel{2}}{3} \times \frac{8}{\cancel{12}^{6}}$

$= \frac{1}{3} \times \frac{\cancel{8}^{4}}{\cancel{6}^{3}}$

$= \underline{\frac{4}{9}}$

(b) $1\frac{1}{3} \div \frac{4}{15}$

$= \frac{4}{3} \times \frac{15}{4}$

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

$= \underline{5}$

Exercise 5: Date: ____________________

Simplify:

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

(2) $\frac{4}{5} \times \frac{7}{2}$

(3) $\frac{5}{3} \times \frac{9}{2}$

(4) $\frac{4}{7} \times \frac{5}{9}$

(5) $\frac{12}{25} \times \frac{15}{16}$

(6) $\frac{18}{7} \times 14$

(7) $\frac{4}{5} \div \frac{3}{5}$

(8) $1\frac{6}{7}$ of $4\frac{2}{3}$

(9) $2 \div \frac{3}{4}$

(10) $2\frac{4}{5} \div 4\frac{1}{5}$

(11) $6 \div 2\frac{1}{4}$

(12) $2\frac{2}{3} \times 1\frac{1}{5} \times 3\frac{3}{4}$

(13) $6\frac{7}{8} \div 5$

(14) $\frac{-3}{9} \times 2\frac{1}{4}$

(15) $-2\frac{2}{3} \div 4\frac{1}{2}$

(16) $5\frac{1}{7}$ of $\left(-2\frac{3}{4}\right) \div \frac{-5}{14}$

(17) $6\frac{1}{4} \times \left(3\frac{3}{5} \div 3\frac{3}{4}\right)$

(18) $\frac{1}{3} \div \left(\frac{2}{3} \times \frac{1}{2}\right) \div 2$

(19) $\frac{1}{3} \div \frac{-1}{6} \div 1\frac{3}{5}$

E.g.6 Simplify

(a) $\frac{4b}{12a} \times \frac{24a}{8b}$

$= \frac{{}^1\cancel{4}\cancel{b}}{{}^1\cancel{1}\cancel{2}\cancel{a}} \times \frac{{}^2\cancel{2}\cancel{4}\cancel{a}}{{}^2\cancel{8}\cancel{b}}$

$= \frac{2}{2}$

$= \underline{1}$

(b) $\frac{4y^2}{3} \div \frac{2y}{x}$

$= \frac{4\,y^2}{3} \times \frac{x}{2y}$

$= \frac{{}^2\cancel{4}\,y\,.\,\cancel{y}}{3} \times \frac{x}{\cancel{2}\cancel{y}}$

$= \underline{\frac{2xy}{3}}$

Exercise 6: Date: ____________________

Simplify:

(1) $6 \times \frac{m}{9}$

(2) $\frac{4p^2}{3} \times \frac{6}{8p}$

(3) $\frac{gh}{k} \div \frac{h}{gk}$

(4) $\frac{-5x^2y}{3} \times \frac{15y}{xy}$

(5) $\frac{3p}{4q} \div \frac{-27}{2q}$

(6) $\frac{7m}{12n} \div \frac{14mn}{3}$