HW Set 38 | Section 9.2 | p 214 – 215

1(a) $\frac{1}{8}$ (b) $\frac{7}{80}$ (c) $\frac{21}{40}$ (d) $\frac{9}{32}$

2(a) $\frac{137 \cdot 16}{625 \cdot 16} = \frac{2192}{10000} = .2192$

(b) $\frac{221}{1500}$ cannot be written as a finite decimal
(in simplified form; the denom has a factor of 3 in its factorization)

(c) $\frac{27^{9}3}{180_{60}\ 20} = \frac{3 \cdot 5}{20 \cdot 5} = \frac{15}{100} = .15$

(d) $\frac{123}{184}$ cannot be written as a finite decimal
(in simplified form; $184 = 2^3 \cdot (23)$)

(e) $\frac{44}{260} = \frac{11}{65}$ cannot be written as a finite decimal $(65 = 5 \cdot (13))$

(f) $\frac{84^{12}}{350_{50}} = \frac{12 \cdot 2}{50 \cdot 2} = \frac{24}{100} = .24$

3(a) $\frac{3}{8} = .375$

(b) $\frac{23}{20} = 1\frac{3}{20} = 1\frac{15}{100} = 1.15$

3(c) $\frac{11}{21} = .\overline{523809}$

$$
\begin{array}{r|l}
21 & 11.0000000 \quad .523809\ldots \\
 & 105 \\
 & \hline 50 \\
 & 42 \\
 & \hline 80 \\
 & 63 \\
 & \hline 170 \\
 & 168 \\
 & \hline 20 \\
 & 0 \\
 & \hline 200 \\
 & 189 \\
 & \hline 11 \quad \text{stop!}
\end{array}
$$

(d) $\frac{24}{9} = 2.\overline{6}$

$$
\begin{array}{r|l}
9 & 24.000 \quad 2.6\ldots \\
 & 18 \\
 & \hline 60 \\
 & 54 \\
 & \hline 6 \quad \text{stop!}
\end{array}
$$

(e) $\frac{3}{13} = .\overline{230769}$

$$
\begin{array}{r|l}
13 & 3.0000000 \quad .230769\ldots \\
 & 26 \\
 & \hline 40 \\
 & 39 \\
 & \hline 10 \\
 & 0 \\
 & \hline 100 \\
 & 91 \\
 & \hline 90 \\
 & 78 \\
 & \hline 120 \\
 & 117 \\
 & \hline 3 \quad \text{stop!}
\end{array}
$$

(g) $\frac{17}{22} = .7\overline{72}$

$$
\begin{array}{r|l}
22 & 17.000 \quad .772\ldots \\
 & 154 \\
 & \hline 160 \\
 & 154 \\
 & \hline 60 \\
 & 44 \\
 & \hline 16 \quad \text{stop!}
\end{array}
$$

(h) $\frac{3}{29} = .\overline{10344827586206896551724137931}$

4) (a) Let $x = 0.\overline{1}$

Multiply by 10 and subtract:

$$
\begin{aligned}
10x &= 1.111\ldots \\
-x &= -0.111\ldots \\
\hline 9x &= 1 \\
x &= \tfrac{1}{9}
\end{aligned}
$$

$$\boxed{0.\overline{1} = \frac{1}{9}}$$

(b) Let $x = 0.\overline{01}$

Multiply by 100 and subtract:

$$
\begin{aligned}
100x &= 1.010101\ldots \\
-x &= -0.010101\ldots \\
\hline 99x &= 1 \\
x &= \tfrac{1}{99}
\end{aligned}
$$

$$\boxed{0.\overline{01} = \frac{1}{99}}$$

4(e) Let $x = 0.\overline{189}$ Multiply by 1000 and subtract.

$$1000x = 189.189189\ldots.$$
$$-x = -0.189189\ldots.$$
$$999x = 189$$
$$\frac{999x}{999} = \frac{189}{999} \longrightarrow x = \frac{189}{999} \xrightarrow{\text{reduce}} \frac{21}{111} = \frac{7}{37}$$

$$\boxed{0.\overline{189} = \frac{7}{37}}$$

(f) $.5\overline{05} = .5050505\ldots.$

Note this is exactly $.\overline{50}$ which now has the decimal point immediately before the decimal point

Let $x = .\overline{50}$ Mult thru by 10^2 or 100

$$100x = 50.\overline{50}$$
$$-x = -.\overline{50}$$
$$99x = 50$$
$$x = \frac{50}{99}$$

$$\boxed{.\overline{50} = \frac{50}{99}}$$

(h) Let $x = 2.31\overline{56}$

Extra step (to get decimal point immediately before the decimal point)

Mult thru by 100 (to move the decimal point 2 places to the right)

$100x = 231.\overline{56}$ ← 2 digit repetend

Mult thru by 10^2 or 100

$2.31\overline{56}$

$$10000x = 23156.\overline{56}$$
$$-100x = -231.\overline{56}$$
$$9900x = 22925$$

(← Shift to end of 1st repetend − Shift to start of 1st repetend)

$$x = \frac{22925}{9900} = \frac{917}{396} \text{ or } 2\frac{125}{396}$$

(divide top/bott by 25)

$$\boxed{2.31\overline{56} = \frac{917}{396} \text{ or } 2\frac{125}{396}}$$

5 a) Let $x = .\overline{9}$ Mult thru by 10

$$10x = 9.\overline{9}$$
$$-x = -.\overline{9}$$
$$9x = 9 \longrightarrow x = \frac{9}{9} = 1$$

So $\boxed{.\overline{9} = 1}$

b) $4329.\overline{9} = 4329 + .\overline{9} = 4329 + 1 = \underline{\underline{4330}}$

7 (a) $0.\overline{03} = 3 \times 0.\overline{01}$

$= 3 \times \frac{1}{99} = \boxed{\frac{1}{33}}$

(b) $0.\overline{324} = 324 \times 0.\overline{001}$

$= 324 \times \frac{1}{999} = \boxed{\frac{12}{37}}$

(c) $5.\overline{32} = 5 + 32 \times 0.\overline{01}$

$= 5 + 32 \times \frac{1}{99} = \boxed{5\frac{32}{99}}$ or $\frac{527}{99}$

(d) $0.\overline{983} = 983 \times 0.\overline{001}$

$= 983 \times \frac{1}{999} = \boxed{\frac{983}{999}}$