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#2. (a) $\frac{1}{6}$ (b) $\frac{1}{4}$ (c) $\frac{2}{6} = \frac{1}{3}$ (d) $\frac{7}{12}$

#3. The four diagrams together show the Fundamental Law of Fractions: $\frac{a}{b} = \frac{an}{bn}$.

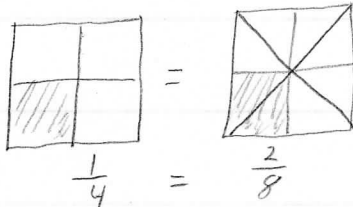
(a) $\frac{2}{3}$ (b) $\frac{2}{3} = \frac{4}{6}$ (c) $\frac{2}{3} = \frac{6}{9}$ (d) $\frac{2}{3} = \frac{8}{12}$

#4. (a) No, the four regions are not the same size.

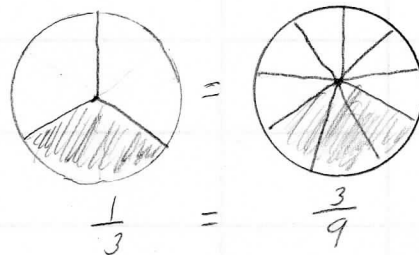
(b) Yes, the area of the four regions are equal.

(c) Yes, the area of the four regions are equal.

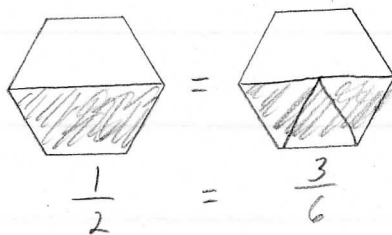
#5. (a)



(b)



(c)



#6. (a) $\frac{9}{24} = \frac{3 \cdot 3}{3 \cdot 8} = \frac{3}{8}$

(b) $\frac{12}{24} = \frac{12 \cdot 1}{12 \cdot 2} = \frac{1}{2}$

(c) $\frac{4}{24} = \frac{4 \cdot 1}{4 \cdot 6} = \frac{1}{6}$

(d) $\frac{8}{24} = \frac{8 \cdot 1}{8 \cdot 3} = \frac{1}{3}$

#7. (a) $\frac{2 \cdot 2}{9 \cdot 2} = \frac{4}{18}$, $\frac{2 \cdot 3}{9 \cdot 3} = \frac{6}{27}$, $\frac{2 \cdot 4}{9 \cdot 4} = \frac{8}{36}$ (b) $\frac{-2 \cdot 2}{5 \cdot 2} = \frac{-4}{10}$, $\frac{-2 \cdot 3}{5 \cdot 3} = \frac{-6}{15}$, $\frac{-2 \cdot 4}{5 \cdot 4} = \frac{-8}{20}$

(c) $\frac{0}{1} = \frac{0}{2} = \frac{0}{4}$

(d) $\frac{2 \cdot a}{2 \cdot 2} = \frac{2a}{4}$, $\frac{3 \cdot a}{3 \cdot 2} = \frac{3a}{6}$, $\frac{4 \cdot a}{4 \cdot 2} = \frac{4a}{8}$

#8. (a) $\frac{156}{93} = \frac{2 \cdot 2 \cdot 3 \cdot 13}{3 \cdot 31} = \frac{2 \cdot 2 \cdot 13}{31} = \frac{52}{31}$ (b) $\frac{-27}{45} = \frac{9 \cdot 3}{9 \cdot 5} = \frac{3}{5}$

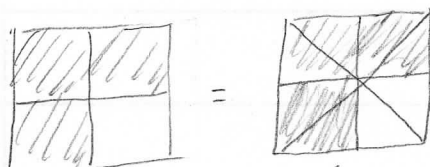
(c) $\frac{-65}{91} = \frac{-5 \cdot 13}{7 \cdot 13} = \frac{-5}{7}$

#9. (a) $\frac{0}{0}$ undefined (b) $\frac{5}{0}$ undefined (c) $\frac{0}{5} = 0$


(d) $\frac{2+a}{a}$ cannot be simplified (e) $\frac{15+x}{3x}$ cannot be simplified

#11. (a) $\frac{3}{8} = \frac{3 \cdot 125}{8 \cdot 125} = \frac{375}{8}$ (b) $\frac{18}{54} = \frac{18 \cdot 1}{18 \cdot 3} = \frac{1}{3} = \frac{23 \cdot 1}{23 \cdot 3} = \frac{23}{69}$

#12. (a) $\frac{10}{16} = \frac{5 \cdot 2}{8 \cdot 2} = \frac{5}{8} = \frac{3 \cdot 5}{3 \cdot 8} = \frac{15}{24}$ (b) $-\frac{21}{86} = \frac{-21 \cdot 215}{86 \cdot 215} = \frac{-4515}{18490}$
 $\frac{12}{18} = \frac{6 \cdot 2}{6 \cdot 3} = \frac{2}{3} = \frac{8 \cdot 2}{8 \cdot 3} = \frac{16}{24}$ $-\frac{51}{215} = \frac{-51 \cdot 86}{215 \cdot 86} = \frac{-4386}{18490}$
 $\frac{10}{16} = \frac{15}{24} \neq \frac{16}{24} = \frac{12}{18}$ $-\frac{21}{86} = \frac{-4515}{18490} \neq \frac{-4386}{18490} = \frac{-51}{215}$

#13. 
 $\frac{3}{4} = \frac{6}{8}$

#14. $\frac{3}{4} = \frac{3n}{4n}$ and $3n + 4n = 84$
 $7n = 84$
 $n = 12$
 The fraction is $\frac{36}{48}$.

#15. 
 $\frac{16-6}{16} = \frac{10}{16} = \frac{5 \cdot 2}{8 \cdot 2} = \frac{5}{8}$

#17. (a) $\frac{7}{8} = \frac{7 \cdot 3}{8 \cdot 3} = \frac{21}{24}$ (b) $2\frac{4}{5} = 2\frac{6 \cdot 4}{6 \cdot 5} = 2\frac{24}{30}$ (c) $-\frac{7}{8} = \frac{-7 \cdot 5}{8 \cdot 5} = \frac{-35}{40}$
 $\frac{5}{6} = \frac{5 \cdot 4}{6 \cdot 4} = \frac{20}{24}$ $2\frac{3}{6} = 2\frac{5 \cdot 3}{5 \cdot 6} = 2\frac{15}{30}$ $-\frac{4}{5} = \frac{-4 \cdot 8}{5 \cdot 8} = \frac{-20}{40}$
 $\frac{7}{8} > \frac{5}{6}$ $2\frac{4}{5} > 2\frac{3}{6}$ $-\frac{7}{8} < -\frac{4}{5}$

#18. (a) $\frac{11}{13}, \frac{11}{16}, \frac{11}{22}$ (b) $-\frac{1}{5}, -\frac{19}{36}, -\frac{17}{30}$
 $-\frac{1}{5} = \frac{-1 \cdot 36}{5 \cdot 36} = \frac{-36}{180}$ $-\frac{17}{30} = \frac{-17 \cdot 6}{30 \cdot 6} = \frac{-102}{180}$
 $-\frac{19}{36} = \frac{-19 \cdot 5}{36 \cdot 5} = \frac{-95}{180}$

#19. Show $\frac{a}{a+2} < \frac{a+1}{a+3}$ where a and b are natural numbers.

$$\frac{a}{a+2} = \frac{a(a+3)}{(a+2)(a+3)} = \frac{a^2+3a}{(a+2)(a+3)}, \quad \frac{a+1}{a+3} = \frac{(a+1)(a+2)}{(a+3)(a+2)} = \frac{a^2+3a+2}{(a+2)(a+3)}$$

We compare the numerators.

Since $0 < 2$, $a^2+3a+0 < a^2+3a+2$.

Therefore, $\frac{a}{a+2} < \frac{a+1}{a+3}$.

#20. (Answers may vary.) (Sample solutions follow.)

(a) $\frac{3}{7} = \frac{3 \cdot 4}{7 \cdot 4} = \frac{12}{28}$

$\frac{4}{7} = \frac{4 \cdot 4}{7 \cdot 4} = \frac{16}{28}$

$\frac{3}{7} < \frac{13}{28} < \frac{14}{28} < \frac{15}{28} < \frac{16}{28}$

$\frac{13}{28}, \frac{1}{2}, \frac{15}{28}$

(b) $-\frac{7}{9} = \frac{-7 \cdot 5}{9 \cdot 5} = \frac{-35}{45}$

$-\frac{8}{9} = \frac{-8 \cdot 5}{9 \cdot 5} = \frac{-40}{45}$

$-\frac{40}{45} < -\frac{39}{45} < -\frac{38}{45} < -\frac{37}{45} < -\frac{36}{45} < -\frac{35}{45}$

$-\frac{13}{15}, -\frac{38}{45}, -\frac{37}{45}, -\frac{4}{5}$

#22. (a) $\frac{6}{16} = \frac{3 \cdot 2}{8 \cdot 2} = \frac{3}{8}$

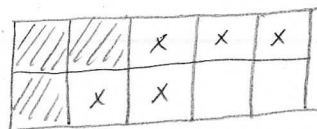
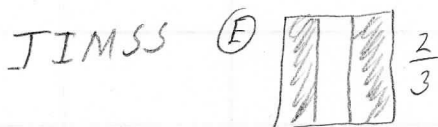
$\frac{6}{16 \cdot 2000} = \frac{3}{16000}$

(c) $\frac{15}{60} = \frac{15 \cdot 1}{15 \cdot 4} = \frac{1}{4}$

(b) $\frac{10}{100} = \frac{10 \cdot 1}{10 \cdot 10} = \frac{1}{10}$

(d) $\frac{8}{24} = \frac{8 \cdot 1}{8 \cdot 3} = \frac{1}{3}$

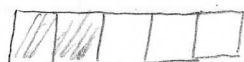
p.361 #17. $\frac{999}{1000} = \frac{9990}{10,000} < \frac{9991}{10,000} < \frac{9992}{10,000} < \dots < \frac{9999}{10,000} < 1$



$\frac{4}{5} = \frac{2 \cdot 4}{2 \cdot 5} = \frac{8}{10}$

(a) 5

NAEP



$\frac{2}{5}$

(a) $\frac{2}{7} < \frac{1}{2} < \frac{5}{9}$