Part A: Ratios and Proportions

Practice 1

1.

2:3 $\frac{10}{15} \div \frac{5}{5} = \frac{2}{3}$

2.

3:2 $\frac{15}{10} \div \frac{5}{5} = \frac{3}{2}$

3.

No because the order given for the ratio matters.

4.

There are 15 flute players and a total of 25 students. In simplest form, 15:25 is 3:5.

5.

8:12 $\frac{8}{12} \div \frac{4}{4} = \frac{2}{3}$

10:15 $\frac{10}{15} \div \frac{5}{5} = \frac{2}{3}$

6.

$\frac{y}{9} = \frac{4}{3}$

$3y = 36$

$y = 12$

7.

$\frac{5}{a} = \frac{20}{11}$

$(5)(11) = (20)(a)$

$55 = 20a$

$a = \frac{55}{20}$

This answer can be simplified to $\frac{11}{4}$ if your student prefers.

8.

$\frac{a}{g} = \frac{6}{5}$

$\frac{6}{5} = \frac{12}{g}$

$6g = 60$

$g = 10$

10 grapefruits are needed for the fruit salad.

9.

$\frac{c}{t} = \frac{1}{3}$

$\frac{s}{t} = \frac{2}{3}$

$\frac{1}{3} = \frac{c}{30}$

$3c = 30$

$c = 10$ cloudy days

$30 - 10 = 20$ sunny days

10.

$\frac{(2x+1)}{7} = \frac{4}{9}$

$(9)(2x+1) = (7)(4)$

$18x + 9 = 28$

$18x = 19$

$x = \frac{19}{18}$

11.

$\frac{8}{(x-2)} = \frac{9}{(x+3)}$

$(8)(x+3) = (9)(x-2)$

$8x + 24 = 9x - 18$

$x = 42$

12.

$\frac{(x+15)}{35} = \frac{x}{20}$

$(x+15)(20) = (35)(x)$

$20x + 300 = 35x$

$300 = 15x$

$x = 20$

13.

$\frac{2x}{(x+1)} = \frac{5}{8}$

$(2x)(8) = (x+1)(5)$

$16x = 5x + 5$

$11x = 5$

$x = \frac{5}{11}$

14.
y: yards of fabric

$$\frac{6}{76.50} = \frac{y}{134}$$

$(6)(134) = (76.50)(y)$

$804 = 76.50y$

$y = 10.51$

For \$134, 10.51 yards of fabric can be purchased.

15.
p: pizza cost

$$\frac{25}{63} = \frac{150}{p + 20}$$

OR

$$\frac{25}{150} = \frac{63}{p + 20}$$

$$\frac{1}{6} = \frac{63}{p + 20}$$

$p + 20 = (6)(63)$

$p + 20 = 378$

$p = 358$

The pizzas will cost \$358 with the coupon deducted.

Part A: Ratios and Proportions

Practice 2

1.

7:2 $\frac{56}{16} \div \frac{8}{8} = \frac{7}{2}$

2.

2:7 $\frac{16}{56} \div \frac{8}{8} = \frac{2}{7}$

3.

2:9 $\frac{16}{72} \div \frac{8}{8} = \frac{2}{9}$

4.

5 dogs : 2 cats

10 dogs : 4 cats

Four cats would be adopted if ten dogs were adopted.

5.

5 dogs : 2 cats

15 dogs : 6 cats

15 + 6 = 21

Twenty-one pets would be adopted.

6.

$\frac{3}{5} = \frac{h}{8}$

$5h = 24$

$h = \frac{24}{5}$ or 4.8

7.

$\frac{sports}{studying} = \frac{2}{3}$

$\frac{2}{3} = \frac{4}{t}$

$12 = 2t$

6 hours studying = t

8.

$\frac{a}{b} = \frac{4}{5}$

$\frac{4}{5} = \frac{22}{b}$

$4b = 110$

$b = 27.5$ inches of snow for the second town

9.

$\frac{r}{s} = \frac{7}{8}$

$\frac{7}{8} = \frac{56}{s}$

$7s = 448$

$s = 64$

10.

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

$(10)(x-3) = (5)(3)$

$10x - 30 = 15$

$10x = 45$

$x = 4.5$

11.

$\frac{x}{18} = \frac{x+1}{100}$

$(x)(100) = (18)(x+1)$

$100x = 18x + 18$

$82x = 18$

$x = \frac{18}{82} = \frac{9}{41}$

12.

$$\frac{x}{30} = \frac{x}{400}$$
$$(x)(400) = (30)(x)$$
$$400x = 30x$$
$$370x = 0$$
$$x = 0$$

13.

$$\frac{(6-x)}{3} = \frac{x}{5}$$
$$(6-x)(5) = (3)(x)$$
$$30 - 5x = 3x$$
$$30 = 8x$$
$$x = \frac{15}{4}$$

14.

p: gallons of paint

$$\frac{\frac{1}{2}}{250} = \frac{p}{820}$$
$$(\frac{1}{2})(820) = (250)(p)$$
$$410 = 250p$$
$$p = 1.64$$

Rob needs 2 gallons of paint to cover 820 square feet.

15.

m: time in minutes

$$\frac{\frac{3}{5}}{30} = \frac{1}{x}$$
$$\frac{3}{5}x = 30$$
$$x = 50$$

It will take Bill 50 minutes to complete the entire project.

Part B: Unit Conversions

Practice 1

1.

Conversion: 1 in = 2.54 cm

A)

Inches belongs in the numerator because the desired unit is inches.

B)

The unit centimeters belongs in the denominator because in the original problem centimeters is given in the numerator. This unit must factor out for the solution to be in inches.

C)

$(5 \text{ cm})(\frac{1\ in}{2.54\ cm}) = 1.9\ldots \text{ in} \approx 2 \text{ in}$

2.
(1 Tbsp = 3 tsp)
(2 Tbsp)$(\frac{3\ tsp}{1\ Tbsp})$ = 6 tsp

3.
(1.75 × 10^4 lb)$(\frac{1\ ton}{2000\ lb})$ = (17,500 lb)$(\frac{1\ ton}{2000\ lb})$ = 8.75 ton OR 8.75 × 10^0 ton

4.
1 Tbsp = 15 ml
(10 ml)$(\frac{1\ Tbsp}{15\ ml})$ = $\frac{10}{15}\ Tbsp = \frac{2}{3}\ Tbsp$

5.
(0.8 ft²)$(\frac{12\ in}{1\ ft})(\frac{12\ in}{1\ ft})$ = (0.8 ft²)$(\frac{12\ in}{1\ ft})^2$ = (0.8 ft²)$(\frac{144\ in^2}{1\ ft^2})$ = 115.2 in²

6.
(750 cm²)$(\frac{1\ in}{2.54\ cm})(\frac{1\ in}{2.54\ cm})$
= (750 cm²)$(\frac{1\ in}{2.54\ cm})^2$
= (750 cm²)$(\frac{1\ in^2}{6.4516\ cm^2})$
= 116.250… in² ≈ 116.25 in²

7.
Sample: Nick could multiply the solution by $\frac{12\ in}{1\ ft}$, (7.2 ft in²)$(\frac{12\ in}{1\ ft})$ = 86.4 in³

8.
1pt = 2*c*
1qt = 2pt
(7.5*c*)$(\frac{1\ pt}{2\ c})(\frac{1\ qt}{2\ pt})$ = 1.875 qt ≈ 1.88 qt

9.
1 min = 60 sec
1 hr = 60 min
1 day = 24 hr
(5 day)$(\frac{24\ hr}{1\ day})(\frac{60\ min}{1\ hr})(\frac{60\ sec}{1\ min})$ = 432,000 sec

10.
1 ft = 12 in
1 in = 2.54 cm
1 m = 100 cm
(25 ft)$(\frac{12\ in}{1\ ft})(\frac{2.54\ cm}{1\ in})(\frac{1\ m}{100\ cm})$ = 7.62 m

11.
$(\frac{\$0.52}{1\ order})(\frac{1\ hr}{\$12.50})(\frac{60\ min}{1\ hr})$ = 2.49… min/order ≈ 2.5 min/order

12.
$378\ mm\left(\frac{1\ in}{25.4\ mm}\right) = 14.88$
Juneau – Ulaanbaatar: 92.2 – 14.88 = 77.32 in difference

13.
3.8 million = 3,800,000
$\frac{3{,}800{,}000\ sq\ mi}{732{,}000\ people} = 5.19\ sq\ mi/person$

14.
1.56 million km = 1,560,000 sq km
3.2 million people = 3,200,000 people
$\frac{1{,}560{,}000\ sq\ km}{3{,}200{,}000\ people}\left(\frac{0.386\ sq\ mi}{1\ sq\ km}\right) = 0.19\ sq\ mi$

Part B: Unit Conversions
Practice 2

1.
Conversion: 1 hr = 60 min
A)
Minutes belongs in the numerator because the desired unit is minutes. (1 hr = 60 min)
B)
The unit hours belongs in the denominator because in the original problem hours is given in the numerator. This unit must factor out for the solution to be in minutes.
C)
(3.2 hr)$(\frac{60\ min}{1\ hr})$ = 192 min ≈190 min

2.
1 yd = 3 ft
($\frac{3}{4}$ yd)$(\frac{3\ ft}{1\ yd})$ = $\frac{9}{4}$ft OR $2\frac{1}{4}$ft (either option is valid)

3.
1 lb = 16 oz
(84 oz)$(\frac{1\ lb}{16\ oz})$ = 5.25 lb OR $\frac{21}{4}$lb OR $5\frac{1}{4}$lb (any of these options are valid)

4.
1 lb = 16 oz
(7.5 lb)$(\frac{16\ oz}{1\ lb})$ = 120 oz

5.
1 yd = 3 ft

$(4.5 \text{ ft}^2)(\frac{1\ yd}{3\ ft})(\frac{1\ yd}{3\ ft}) = (4.5 \text{ ft}^2)(\frac{1\ yd}{3\ ft})^2 = (4.5 \text{ ft}^2)(\frac{1\ yd^2}{9\ ft^2}) = 0.5 \text{ yd}^2$

6.
1 mi = 5,280 ft

$(1 \text{ mi}^2)(\frac{5{,}280\ ft}{1\ mi})(\frac{5{,}280\ ft}{1\ mi}) = (1 \text{ mi}^2)(\frac{5{,}280\ ft}{1\ mi})^2 = (1 \text{ mi}^2)(\frac{27{,}878{,}400\ ft^2}{1\ mi^2}) = 27{,}878{,}400 \text{ ft}^2$

7.
$(165 \text{ sec})(\frac{1\ min}{60\ sec}) = 2.75 \text{ min}$
Shayla swam 25 m faster than Shane.

8.
1 hr = 60 min and 1 day = 24 hr

$(115{,}200 \text{ min})(\frac{1\ hr}{60\ min})(\frac{1\ day}{24\ hr}) = 80 \text{ days}$

9.
$1 \text{ acre} = 43{,}560 \text{ ft}^2$

$(1 \text{ mi}^2)(\frac{5280\ ft}{1\ mi})^2(\frac{1\ acre}{43560\ ft^2}) = (1 \text{ mi}^2)(\frac{27{,}878{,}400\ ft^2}{1\ mi^2})^2(\frac{1\ acre}{43560\ ft^2}) = 640 \text{ acres}$

10.

$(2{,}000 \text{ buttons})(\frac{1\ spool}{150\ buttons})(\frac{\$21}{1\ spool}) = \$280$
It would cost Blake $280 to print 2,000 buttons.

11.

$(\frac{\$15}{1\ hr})(\frac{30\ hr}{1\ wk})(\frac{50\ wk}{1\ yr}) = \$22{,}500/\text{yr}$
Tanya would earn $22,500 in a year.

12.

$1 \text{ in} = \frac{1}{12} \text{ ft}$

$V = lwh$; $l = 200$ ft, $w = 85$ ft, $h = \frac{1}{12}$ ft

$V = (200)(85)(\frac{1}{12})$

$V = 1{,}416\frac{2}{3}$ cubic feet

$1{,}416\frac{2}{3}$ cubic feet (57.2 lb/cubic ft) = $81{,}033\frac{1}{3}$ pounds

13.

$48 \text{ hr } (60 \text{ min/hr})(\frac{1}{32} \text{ layer}) = 90 \text{ minutes/layer}$

Targeted Review

Problem	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Lesson Origin	1	1	2	2	3	3	4	4	4	PA	PA	PA	4	3

1.
Real numbers include irrational ($\mathbb{I}$) and rational ($\mathbb{Q}$).
Subsets of rationals are integers ($\mathbb{Z}$), whole ($\mathbb{W}$), and natural ($\mathbb{N}$) numbers.

2.
A rational number is a number that can be written as a ratio of two integers where the denominator does not equal zero.

3.
$$5(3x + y) = p$$
$$(\tfrac{1}{5})(5)(3x + y) = (\tfrac{1}{5})(p)$$
$$3x + y = \frac{p}{5}$$
$$3x - 3x + y = \frac{p}{5} - 3x$$
$$y = \frac{p}{5} - 3x$$

4.
m: monthly earnings
$200m + 750 = 75 + 350m$
$675 = 150m$
$m = 4.5$
It will take 4.5 months for Kwame and Daliah to have the same amount of money.

5.
no solution
The absolute value cannot be equal to a negative number.

6.

$6\left\|\frac{3}{4}p - 2\right\| = 18$	Given
$\left\|\frac{3}{4}p - 2\right\| = 3$	Inverse Property and Multiplication Property of Equality (Multiply both sides by $\frac{1}{6}$.)
Case 1: $\frac{3}{4}p - 2 = 3$ Case 2: $-(\frac{3}{4}p - 2) = 3$ $\frac{3}{4}p - 2 = -3$	Definition of absolute value (Write the equation as two cases.) Multiplication Property of Equality (Multiply both sides of Case 2 by –1.)
$\frac{3}{4}p = 5$ $\frac{3}{4}p = -1$	Addition Property of Equality (Add 2 to both sides of the equation in both cases.)
$p = \frac{20}{3}$ $p = -\frac{4}{3}$	Inverse Property and Multiplication Property of Equality (Multiply both sides by $\frac{4}{3}$.)

7.

w: weight

$|w - 14| \leq 0.75$

$w - 14 \leq 0.75$ AND $-(w - 14) \leq 0.75$

$w \leq 14.75$ $w - 14 \geq -0.75$

$w \geq 13.25$

The multigrain cracker box weights will range from 13.25 oz and 14.75 oz.

8.

$n \geq 3$

$-n \leq -3$

9.

Sample: The inequalities have the same graph because the same values satisfy them. If you multiply $-n \leq -3$ by negative one, it becomes $n \geq 3$. The relationship between expressions is the same.

10.

$$\frac{((60(6) + 70(5) + 80(5) + 90(4) + 100(1))}{(6 + 5 + 5 + 4 + 1)} = \frac{(360 + 350 + 400 + 360 + 100)}{(6 + 5 + 5 + 4 + 1)} = \frac{1{,}570}{21} \approx 75$$

11.

$$\frac{((60(2) + 70(4) + 80(5) + 90(6) + 100(8))}{(2 + 4 + 5 + 6 + 8)} = \frac{(120 + 280 + 400 + 540 + 800)}{(2 + 4 + 5 + 6 + 8)} = \frac{2{,}140}{25} \approx 86$$

12.
Sample: It appears that the quiz favored the Morning Class, because the majority of Morning Class Students earned high scores on the quiz. However, the majority of the Afternoon Class earned low scores on the quiz.

13. B

A) This represents an AND inequality (the given is OR).
C) This is an AND inequality with closed points.
D) This is an OR inequality but the points are closed.

$$|3x + 4| > 7$$
$$3x + 4 > 7 \quad \text{or} \quad -(3x + 4) > 7$$
$$3x + 4 < -7$$
$$3x > 3 \quad \text{or} \quad 3x < -11$$
$$x > 1 \quad \text{or} \quad x < -\frac{11}{3}$$

14. B
A) This is one of two solutions (your student would have this answer if they forget to solve for both solutions).
C) If your student misses the negative signs on both sides, they may find there is no solution.
D) This would be possible if the equal symbol was the greater than symbol.

$$-\frac{1}{3}\left|\frac{1}{2}x + 5\right| = -1$$
$$\left|\frac{1}{2}x + 5\right| = 3$$
$$\frac{1}{2}x + 5 = 3 \quad \text{or} \quad -\left(\frac{1}{2}x + 5\right) = 3$$
$$\frac{1}{2}x + 5 = -3$$
$$\frac{1}{2}x = -2 \quad \text{or} \quad \frac{1}{2}x = -8$$
$$x = -4 \quad \text{or} \quad x = -16$$