01a. Find the area and perimeter of a rectangle whose length is 14 inches and whose width is 8 inches. Be sure to include the correct units in your answers.

Area $= 8 \times 14 = 112\ in^2$	2.5 pts
If missing units take off 0.5 pt	
Perimeter $= 2(8 + 14) = 44$ inches	2.5 pts
If missing units take off 0.5 pt	

01b. Find the area and perimeter of a rectangle whose length is 7 meters and whose width is 14 meters. Be sure to include the correct units in your answers.

Area $= 7 \times 14 = 98\ m^2$	2.5 pts
If missing units take off 0.5 pt	
Perimeter $= 2(7 + 14) = 42$ meters	2.5 pts
If missing units take off 0.5 pt	

01c. Find the area and perimeter of a rectangle whose length is 11 feet and whose width is 5 feet. Be sure to include the correct units in your answers.

Area $= 5 \times 11 = 55\ ft^2$	2.5 pts
If missing units take off 0.5 pt	
Perimeter $= 2(5 + 11) = 32$ feet	2.5 pts
If missing units take off 0.5 pt	

01d. Find the area and perimeter of a rectangle whose length is 12 miles and whose width is 6 miles. Be sure to include the correct units in your answers.

Area $= 6 \times 12 = 72\ mi^2$	2.5 pts
If missing units take off 0.5 pt	
Perimeter $= 2(6 + 12) = 36$ miles	2.5 pts
If missing units take off 0.5 pt	

01.5a. A rectangle has a length of 14 inches and an area of 84 square inches. Find the **width** and the **perimeter** of the rectangle. Be sure to include the correct units in each answer.

Area $= \ell \times w$	
$84 = 14w$	
Width $= \dfrac{84}{14} = 6$ inches	2.5 pts; if missing units, deduct 0.5 pt.
Perimeter $= 2(14 + 6) = 40$ inches	2.5 pts; if missing units, deduct 0.5 pt.

01.5b. A rectangle has a length of 12 inches and an area of 84 square inches. Find the **width** and the **perimeter** of the rectangle. Be sure to include the correct units in each answer.

Area $= \ell \times w$	
$84 = 12w$	
Width $= \dfrac{84}{12} = 7$ inches	2.5 pts; if missing units, deduct 0.5 pt.
Perimeter $= 2(12 + 7) = 38$ inches	2.5 pts; if missing units, deduct 0.5 pt.

01.5c. A rectangle has a length of 12 inches and an area of 72 square inches. Find the **width** and the **perimeter** of the rectangle. Be sure to include the correct units in each answer.

Area $= \ell \times w$	
$72 = 12w$	
Width $= \dfrac{72}{12} = 6$ inches	2.5 pts; if missing units, deduct 0.5 pt.
Perimeter $= 2(12 + 6) = 36$ inches	2.5 pts; if missing units, deduct 0.5 pt.

01.5d. A rectangle has a length of 18 inches and an area of 72 square inches. Find the **width** and the **perimeter** of the rectangle. Be sure to include the correct units in each answer.

Area $= \ell \times w$	
$72 = 18w$	
Width $= \dfrac{72}{18} = 4$ inches	2.5 pts; if missing units, deduct 0.5 pt.
Perimeter $= 2(18 + 4) = 44$ inches	2.5 pts; if missing units, deduct 0.5 pt.

02a. Simplify $-2\{x^2 - 3[x - (x - 2x^2)]\}$.

$-2\{x^2 - 3[x - x + 2x^2]\}$	1 pt
$-2\{x^2 - 3[2x^2]\}$	2 pts to here
$-2\{x^2 - 6x^2\}$	3 pts to here
$-2\{-5x^2\}$	4 pts to here
$10x^2$	5 pts to here

02b. Simplify $-3\{x^2 - 4[x - (x - 2x^2)]\}$.

$-3\{x^2 - 4[x - x + 2x^2]\}$	1 pt
$-3\{x^2 - 4[2x^2]\}$	2 pts to here
$-3\{x^2 - 8x^2\}$	3 pts to here
$-3\{-7x^2\}$	4 pts to here
$21x^2$	5 pts to here

02c. Simplify $-5\{x^2 - 3[x - (x - 2x^2)]\}$.

$-5\{x^2 - 3[x - x + 2x^2]\}$	1 pt
$-5\{x^2 - 3[2x^2]\}$	2 pts to here
$-5\{x^2 - 6x^2\}$	3 pts to here
$-5\{-5x^2\}$	4 pts to here
$25x^2$	5 pts to here

02d. Simplify $-4\{x^2 - 2[x - (x - 3x^2)]\}$.

$-4\{x^2 - 2[x - x + 3x^2]\}$	1 pt
$-4\{x^2 - 2[3x^2]\}$	2 pts to here
$-4\{x^2 - 6x^2\}$	3 pts to here
$-4\{-5x^2\}$	4 pts to here
$20x^2$	5 pts to here

02.5a. Simplify $-3[2x^2 - (4x^2 - y)]$.

$-3[2x^2 - 4x^2 + y]$	2 pts to here
$-3[-2x^2 + y]$	3 pts to here
$6x^2 - 3y$	5 pts to here

02.5b. Simplify $-4[3x^2 - (7x^2 - 2y)]$.

$-4[3x^2 - 7x^2 + 2y]$	2 pts to here
$-4[-4x^2 + 2y]$	3 pts to here
$16x^2 - 8y$	5 pts to here

02.5c. Simplify $-2[4x^2 - (5x^2 - 3y)]$.

$-2[4x^2 - 5x^2 + 3y]$	2 pts to here
$-2[-x^2 + 3y]$	3 pts to here
$2x^2 - 6y$	5 pts to here

02.5d. Simplify $-5[3x^2 - (8x^2 - 2y)]$.

$-5[3x^2 - 8x^2 + 2y]$	2 pts to here
$-5[-5x^2 + 2y]$	3 pts to here
$25x^2 - 10y$	5 pts to here

03a. Solve for m. Simplify your answer.

$$92m + 12 - 62m = 50 - 16m$$

$30m + 12 = 50 - 16m$	1 pt to here
$30m + 16m = 50 - 12$	2 pts to here
$46m = 38$	3 pts to here
$m = 38/46$	4 pts to here
$m = 19/23$	5 pts total

03b. Solve for m. Simplify your answer.

$$32m + 28 - 12m = 10 - 14m$$

$20m + 28 = 10 - 14m$	1 pt to here
$20m + 14m = 10 - 28$	2 pts to here
$34m = -18$	3 pts to here
$m = -18/34$	4 pts to here
$m = -9/17$	5 pts total

03c. Solve for m. Simplify your answer.

$$4 - 7m - 13 = 8m - 3 - 5m$$

$-7m - 9 = 3m - 3$	1 pt to here
$-7m - 3m = -3 + 9$	2 pts to here
$-10m = 6$	3 pts to here
$m = -6/10$	4 pts to here
$m = -3/5$	5 pts total

03d. Solve for m. Simplify your answer.

$$6m + 8 - 3m = 11 - 12m - 13$$

$3m + 8 = -12m - 2$	1 pt
$3m + 12m = -2 - 8$	2 pts to here
$15m = -10$	3 pts to here
$m = - = 10/15$	4 pts to here
$m = -2/3$	5 pts total

03.5a. Solve for c. Simplify answers.

$$5(2c + 3) - 4 = -5c + 6$$

$10c + 15 - 4 = -5c + 6$	1 pt to here
$10c + 5c = -15 + 4 + 6$	2 pts to here
$15c = -5$	3 pts to here
$c = -\frac{5}{15}$	4 pts to here
$c = -\frac{1}{3}$	5 pts total

03.5b. Solve for c. Simplify answers.

$$6(3c + 4) - 5 = -7c + 9$$

$18c + 24 - 5 = -7c + 9$	1 pt to here
$18c + 7c = -24 + 5 + 9$	2 pts to here
$25c = -10$	3 pts to here
$c = -\frac{10}{25}$	4 pts to here
$c = -\frac{2}{5}$	5 pts total

03.5c. Solve for c. Simplify answers.

$$4(3c + 2) - 7 = -8c - 4$$

$12c + 8 - 7 = -8c - 4$	1 pt to here
$12c + 8c = -8 + 7 - 4$	2 pts to here
$20c = -5$	3 pts to here
$c = -\frac{5}{20}$	4 pts to here
$c = -\frac{1}{4}$	5 pts total

03.5d. Solve for c. Simplify answers.

$$9(4c + 5) - 7 = -14c + 8$$

$36c + 45 - 7 = -14c + 8$	1 pt to here
$36c + 14c = -45 + 7 + 8$	2 pts to here
$50c = -30$	3 pts to here
$c = -\frac{30}{50}$	4 pts to here
$c = -\frac{3}{5}$	5 pts total

04a. Solve the following equation for y.

$$\frac{1}{4}y + 5 = \frac{2}{3}y$$

$12(\frac{1}{4}y + 5) = 12(\frac{2}{3}y)$	1 pt to here
$3y + 60 = 8y$	2 pts to here
$60 = 5y$	3 pts to here
$y = 12$	4 pts total

04b. Solve the following equation for y.

$$\frac{2}{7}y + 3 = \frac{1}{2}y$$

$14(\frac{2}{7}y+3)=14(\frac{1}{2}y)$	1 pt to here
$4y+42=7y$	2 pts to here
$42=3y$	3 pts to here
$y=14$	4 pts total

04c. Solve the following equation for y.

$$5-\frac{1}{3}y=\frac{1}{12}y$$

$12(5-\frac{1}{3}y)=12(\frac{1}{12})y$	1 pts to here
$60-4y=y$	2 pts to here
$60=5y$	3 pts to here
$12=y$	4 pts total

04d. Solve the following equation for y.

$$15-\frac{1}{2}y=\frac{1}{4}y$$

$4(15-\frac{1}{2}y)=4(\frac{1}{4})y$	1 pt to here
$60-2y=y$	2 pts to here
$60=3y$	3 pts to here
$y=20$	4 pts to here

04.5a. Solve the following equation for y.

$$\frac{1}{3}(y-9)=\frac{1}{6}y+2$$

$\frac{1}{3}y-3=\frac{1}{6}y+2$	1 pt to here
$6\left(\frac{1}{3}y-3\right)=6\left(\frac{1}{6}y+2\right)$	2 pts to here
$2y-18=y+12$	3 pts to here
$y=30$	4 pts total

04.5b. Solve the following equation for y.

$$\frac{1}{2}(y-8)=\frac{1}{6}y+5$$

$\frac{1}{2}y-4=\frac{1}{6}y+5$	1 pt to here
$6\left(\frac{1}{2}y-4\right)=6\left(\frac{1}{6}y+5\right)$	2 pts to here
$3y-24=y+30$	3 pts to here
$y=27$	4 pts total

04.5c. Solve the following equation for y.

$$\frac{1}{4}(y-12)=\frac{1}{12}y+2$$

$\frac{1}{4}y-3=\frac{1}{12}y+2$	1 pt to here
$12\left(\frac{1}{4}y-3\right)=12\left(\frac{1}{12}y+2\right)$	2 pts to here
$3y-36=y+24$	3 pts to here
$y=30$	4 pts total

04.5d. Solve the following equation for y.

$$\frac{1}{3}(y-12)=\frac{1}{6}y+4$$

$\frac{1}{3}y-4=\frac{1}{6}y+4$	1 pt to here
$6\left(\frac{1}{3}y-4\right)=6\left(\frac{1}{6}y+4\right)$	2 pts to here
$2y-24=y+24$	3 pts to here
$y=48$	4 pts total

05a. Write the following verbal statement in algebraic form. "x minus 3 equals four times the quantity of two times x minus 9"

$x-3=4(2x-9)$	5 pts
No partial credit	

05b. Write the following verbal statement in algebraic form. "x minus 47 equals three times the quantity of six times x plus 5"

$x-47=3(6x+5)$	5 pts
No partial credit.	

05c. Write the following verbal statement in algebraic form. "x plus 5 equals three times the quantity of five times x minus 2"

$x+5=3(5x-2)$	5 pts
No partial credit.	

05d. Write the following verbal statement in algebraic form. "12 minus x equals two times the quantity of five minus two times x"

$12-x=2(5-2x)$	5 pts
No partial credit.	

05.5a. Write an algebraic expression for the quantities being compared. "The length of the rectangle is 7 inches more than double the width."

$w=$ width of the rectangle (inches)	2 pts
$2w+7=$ length of the rectangle (inches)	3 pts
Deduct 1 point if units are missing.	

05.5b. Write an algebraic expression for the quantities being compared. "The amount of rainfall in New Haven is 25 inches less than double the amount of rainfall in Seattle."

r = amount of rainfall in Seattle (inches)	2 pts
$2r - 25$ = amount of rainfall in New Haven (inches)	3 pts
Deduct 1 point if units are missing.	

05.5c. Write an algebraic expression for the quantities being compared. "The price of a share of AT&T stock is \$15 less than triple the price of a share of Comcast stock."

C = price of a share of Comcast stock (dollars)	2 pts
$3C - 15$ = price of a share of AT&T stock (dollars)	3 pts
Deduct 1 point if units are missing.	

05.5d. Write an algebraic expression for the quantities being compared. "The price of a 2016 Tesla is \$4000 more than triple the price of a 2012 Tesla."

T = price of a 2012 Tesla (dollars)	2 pts
$3T + 4000$ = price of a 2016 Tesla (dollars)	3 pts
Deduct 1 point if units are missing.	

06a. An athlete's average time for all six track meets was 21.8 seconds. The athlete was unable to find their time in the last meet, but knew all of the other times: 21.7 seconds, 21.6 seconds, 22 seconds, 22.1 seconds, 21.9 seconds. What was her running time for her last meet?

$\frac{21.7+21.6+22+22.1+21.9+x}{6} = 21.8$	2 pts to here
$109.3 + x = 130.8$	3 pts to here
$x = 130.8 - 109.3 = 21.5$	4 pts to here
The athlete ran a 21.5 second race.	5 pts total

06b. The average weekday high temperature last week was 43°. The high temperatures on Monday through Thursday were 35°, 38°, 44°, and 47°. What was the high temperature on Friday?

$\frac{35+38+44+47+x}{5} = 43$	2 pts to here
$164 + x = 215$	3 pts to here
$x = 215 - 164 = 51$	4 pts to here
It was 51° on Friday.	5 pts total

06c. An athlete's average time for all six track meets was 11.8 seconds. The athlete was unable to find their time in the last meet, but knew all of the other times: 11.7 seconds, 11.6 seconds, 12 seconds, 12.1 seconds, 11.9 seconds. What was her running time for her last meet?

$\frac{11.7+11.6+12+12.1+11.9+x}{6} = 11.8$	2 pts to here
$59.3 + x = 70.8$	3 pts to here
$x = 70.8 - 59.3 = 11.5$	4 pts to here
The athlete ran an 11.5 second race.	5 pts total

06d. The average weekday high temperature last week was 83°. The high temperatures on Monday through Thursday were 75°, 78°, 84°, and 87°. What was the high temperature on Friday?

$\frac{75+78+84+87+x}{5} = 83$	2 pts to here
$324 + x = 415$	3 pts to here
$x = 415 - 324 = 91$	4 pts to here
It was 91° on Friday.	5 pts total

06.5a. Leroy wants to buy a new laptop. After searching online, he found a laptop on sale for 20% off the original price. There was a $10 charge for shipping, but no tax. The original price was $500.00. What was his total cost after the discount and shipping charge? Define your variable, solve, and give your answer in a sentence.

$x =$ the discounted price with the shipping charge (in dollars)	1 pt
$0.20(\$500) = \$100$ (the 20% discount)	1 pt
$x = \$500 - \$100 + \$10$	1 pt
$x = \$410$	1 pt
The cost of his laptop, including shipping, was $410.	1 pt
Only take off 0.5 points if no dollar sign in the sentence.	

06.5b. Grace buys a dress at Forever 21. The original price of the dress is 45, but she uses a coupon for 30% off. She also has to pay 6% sales tax on the sale price. How much, in total, does she have to pay for the dress? Define your variable, solve, and give your answer in a sentence.

$p =$ the discounted price with the sales tax	1 pt
$0.30(\$45) = \$13.50$ (the 30% discount)	1 pt
$0.06(\$45 - \$13.50) = \$1.89$ (the tax on the discounted price)	1 pt
$p = \$45 - \$13.5 + \$1.89 = \$33.39$	1 pt
The price of the dress, including sales tax, was $33.39.	1 pt
Only take off 0.5 points if no dollar sign in the sentence.	

06.5c. Henry buys a new lawnmower from Amazon. The original price of the lawnmower was $300, but they are having their end of the year sale, so all lawnmowers are 25% off. The delivery charge on the lawnmower is $18. What was the cost of the lawnmower, including shipping? Define your variable, solve, and give your answer in a sentence.

$\ell =$ the discounted price with the shipping charge	1 pt
$0.25(\$300) = \$75$ (the 25% discount)	1 pt
$\ell = \$300 - \$75 + \$18$	1 pt
$\ell = \$243$	1 pt
The cost of his lawnmower, including shipping, was $243.	1 pt
Only take off 0.5 points if no dollar sign in the sentence.	

06.5d. The normal cost of a hotel room at the Dew Drop Inn is $90, but because they need to fill the rooms, all rooms are now 15% off. The hotel also charges a 20% hotel tax on

the discounted room rate. How much would a hotel room at the Dew Drop Inn cost after the discount (including taxes)? Define your variable, solve, and give your answer in a sentence.

$p =$ the discounted price with the hotel tax added in	1 pt
$0.15(\$90) = \$13.50$ (the 15% discount)	1 pt
$0.20(\$90 - \$13.50) = \$15.30$ (the hotel tax)	1 pt
$p = \$90 - \$13.50 + \$15.30 = \$91.80$	1 pt
The price of the hotel room, including the hotel tax, is \$91.80.	1 pt
Only take off 0.5 points if no dollar sign in the sentence.	

07a. Solve the inequality for y.

$$-7y - 19 \leq -3y - 11$$

$-7y + 3y \leq -11 + 19$ (or $11 - 19 \leq -3y + 7y$)	2 pts to here
$-4y \leq 8$ (or $-8 \leq 4y$)	4 pts to here
$y \geq -2$ (or $-2 \leq y$)	5 pts total.

07b. Solve the inequality for y.

$$2y + 9 \leq 4y - 11$$

$2y - 4y \leq -11 - 9$ (or $9 + 11 \leq 4y - 2y$)	2 pts to here
$-2y \leq -20$ (or $20 \leq 2y$)	4 pts to here
$y \geq 20$ (or $2 \leq y$)	5 pts total

07c. Solve the inequality for y.

$$2y + 5 \leq 8y - 13$$

$2y - 8y \leq -13 - 5$ (or $13 + 5 \leq 8y - 2y$)	2 pts to here
$-6y \leq -18$ (or $18 \leq 6y$)	4 pts to here
$y \geq 3$ (or $3 \leq y$)	5 pts total

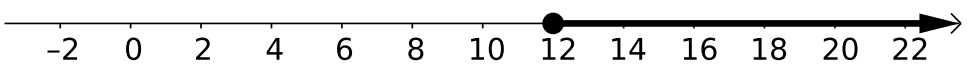
07d. Solve the inequality for y.

$$-8y + 5 \leq -2y - 7$$

$-8y + 2y \leq -7 - 5$ (or $5 + 7 \leq -2y + 8y$)	2 pts to here
$-6y \leq -12$ (or $12 \leq 6y$)	4 pts to here
$y \geq 2$ (or $2 \leq y$)	5 pts total

07.5a. Solve and graph on the number line.

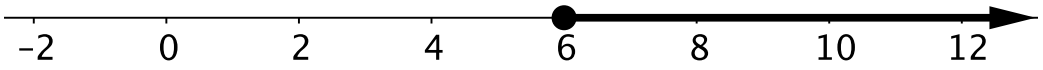
$$\frac{1}{2}x + 3 \leq \frac{3}{4}x$$



$\frac{4}{1}\left(\frac{1}{2}x+3\right) \le \frac{4}{1}\left(\frac{3}{4}x\right)$	1 pt to here
$2x+12 \le 3x$	2 pts to here
$12 \le x$ OR $x \ge 12$	3 pts to here
	add 2 pts for correct number line.

07.5b. Solve and graph on the number line.

$$\frac{7}{6}x - 3 \ge \frac{2}{3}x$$



$\frac{6}{1}\left(\frac{7}{6}x-3\right) \ge \frac{6}{1}\left(\frac{2}{3}x\right)$	1 pt to here
$7x-18 \ge 4x$	2 pts to here
$x \ge 6$ OR $6 \le x$	3 pts to here
	add 2 pts for correct number line.

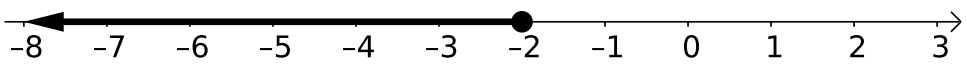
07.5c. Solve and graph on the number line.

$$\frac{4}{5}x + 2 \le \frac{3}{10}x$$

$\frac{10}{1}\left(\frac{4}{5}x+2\right) \le \frac{10}{1}\left(\frac{3}{10}x\right)$	1 pt to here
$8x+20 \le 3x$	2 pts to here
$x \le -4$ OR $-4 \ge x$	3 pts to here
	add 2 pts for correct number line.

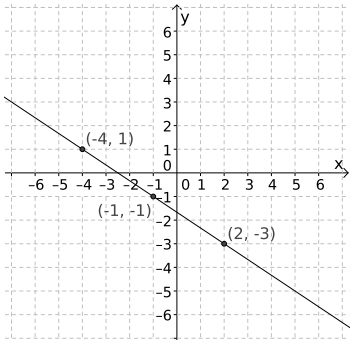
07.5d. Solve and graph on the number line.

$$\frac{1}{3}x - 1 \ge \frac{5}{6}x$$



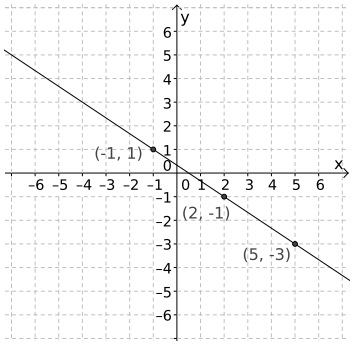
$\frac{6}{1}\left(\frac{1}{3}x-1\right)\geq\frac{6}{1}\left(\frac{5}{6}x\right)$	1 pt to here
$2x-6\geq 5x$	2 pts to here
$x\leq -2$ OR $-2\geq x$	3 pts to here
	add 2 pts for correct number line.

08a. Graph the line with slope $\frac{-2}{3}$ that passes through the point $(-4,1)$. Be sure to label axes with x, y, and with numbers. Identify at least three points on your line.



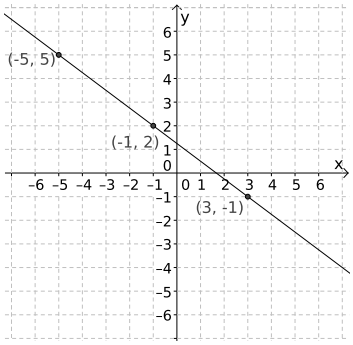
1 point for correct labeling of axes and number on them.
3 points for correctly identifying 3 pts.
1 points for the correct line.

08b. Graph the line with slope $\frac{-2}{3}$ that passes through the point $(2,-1)$. Be sure to label axes with x, y, and with numbers. Identify at least three points on your line.



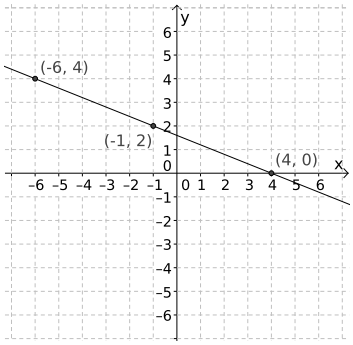
1 point for correct labeling of axes and numbers on them.
3 points for correctly identifying 3 pts.
1 pt for the correct line.

08c. Graph the line with a slope $\frac{-3}{4}$ that passes through the point $(-1,2)$. Be sure to label axes with x, y, and with numbers. Identify at least three points on your line.



1 point for correct labeling of axes and numbers on them. 3 points for correctly identifying 3 pts. 1 pt for the correct line.

08d. Graph the line with a slope $\frac{-2}{5}$ that passes through the point $(-1, 2)$. Be sure to label axes with x, y, and with numbers. Identify at least three points on your line.



1 point for correct labeling of axes and numbers on them. 3 points for correctly identifying 3 pts. 1 pt for the correct line.

08.5a. Find the slope, y-intercept, and x-intercept of the line.

$$7x - 2y = 4$$

slope:	$\frac{7}{2}$	1 pt
y-intercept:	$(0, -2)$	2 pts
x-intercept:	$\left(\frac{4}{7}, 0\right)$	2 pts

08.5b. Find the slope, y-intercept, and x-intercept of the line.

$$-8x + 6y = 7$$

slope: $\frac{4}{3}$	1 pt
y-intercept: $\left(0, \frac{7}{6}\right)$	2 pts
x-intercept: $\left(-\frac{7}{8}, 0\right)$	2 pts

08.5c. Find the slope, y-intercept, and x-intercept of the line.

$$10x + 7y = -5$$

slope: $-\frac{10}{7}$	1 pt
y-intercept: $\left(0, -\frac{5}{7}\right)$	2 pts
x-intercept: $\left(-\frac{1}{2}, 0\right)$	2 pts

08.5d. Find the slope, y-intercept, and x-intercept of the line.

$$7x + 8y = -5$$

slope: $-\frac{7}{8}$	1 pt
y-intercept: $\left(0, -\frac{5}{8}\right)$	2 pts
x-intercept: $\left(-\frac{5}{7}, 0\right)$	2 pts

09a. Find the equation of the line that passes through $(-9, 4)$ and is perpendicular to the line $y = 3x + 10$.

Slope of the line $y = 3x + 10$ is 3	1 pt to here
Perpendicular slope: $m = -1/3$	2 pts to here
$4 = -\frac{1}{3}(-9) + b$	3 pts to here
$4 = 3 + b$ so $b = 1$	4 pts to here
$y = \frac{-1}{3}x + 1$	5 pts total

09b. Find the equation of the line that passes through $(-8, 4)$ and is perpendicular to the line $y = 4x + 12$.

Slope of the line $y = 4x + 12$ is 4	1 pt to here
Perpendicular slope: $m = -1/4$	2 pts to here
$4 = -\frac{1}{4}(-8) + b$	3 pts to here
$4 = 2 + b$ so $b = 2$	4 pts to here
$y = \frac{-1}{4}x + 2$	5 pts total

09c. Find the equation of the line that passes through $(2, -3)$ and is perpendicular to the line $y = 2x - 9$.

Slope of the line $y = 2x - 9$ is 2	1 pt to here
Perpendicular slope: $m = -1/2$	2 pts to here
$-3 = -\frac{1}{2}(2) + b$	3 pts to here
$-3 = -1 + b$ so $b = -2$	4 pts to here
$y = \frac{-1}{2}x - 2$	5 pts total

09d. Find the equation of the line that passes through $(-8, -7)$ and is perpendicular to the line $y = 8x + 2$.

Slope of the line $y = 8x + 2$ is 8	1 pt to here
Perpendicular slope: $m = -1/8$	2 pts to here
$-7 = -\frac{1}{8}(-8) + b$	3 pts to here
$-7 = 1 + b$ so $b = -8$	4 pts to here
$y = \frac{-1}{8}x - 8$	5 pts total

09.5a. Find an equation of the line that passes through $(-5, 7)$ and $(-7, -5)$.

$m = \frac{-5-7}{-7+5}$	1 pt
$m = 6$	1 pt
$y = 6x + 37$	3 pts for
$y + 5 = 6(x + 7)$	correct equation
$y - 7 = 6(x + 5)$	(any of these)

09.5b. Find an equation of the line that passes through $(6, 8)$ and $(4, 2)$.

$m = \frac{2-8}{4-6}$	1 pt
$m = 3$	1 pt
$y = 3x - 10$	3 pts for
$y - 2 = 3(x - 4)$	correct equation
$y - 8 = 3(x - 6)$	(any of these)

09.5c. Find an equation of the line that passes through $(-10, 9)$ and $(-8, 25)$.

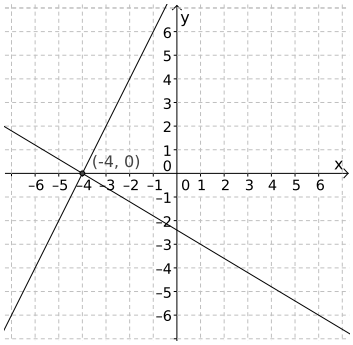
$m = \frac{25-9}{-8+10}$	1 pt
$m = 8$	1 pt
$y = 8x + 89$	3 pts for
$y - 25 = 8(x + 8)$	correct equation
$y - 9 = 8(x + 10)$	(any of these)

09.5d. Find an equation of the line that passes through $(-11, -8)$ and $(-13, -14)$.

$m = \dfrac{-14+8}{-13+11}$	1 pt
$m = 3$	1 pt
$y = 3x + 25$	3 pts for
$y + 14 = 3(x + 13)$	correct equation
$y + 8 = 3(x + 11)$	(any of these)

10a. Solve by graphing the given system of equations. Be sure to label axes with x, y, and with numbers. Identify and label the intersection point.

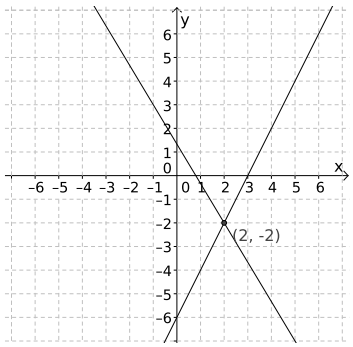
$$\begin{cases} 3x + 5y = -12 \\ 2x - y = -8 \end{cases}$$



Correct system is graphed	award 2 pts
Axes are labeled	award 1 pt
Intersection point $(-4, 0)$	award 2 pts

10b. Solve by graphing the given system of equations. Be sure to label axes with x, y, and with numbers. Identify and label the intersection point.

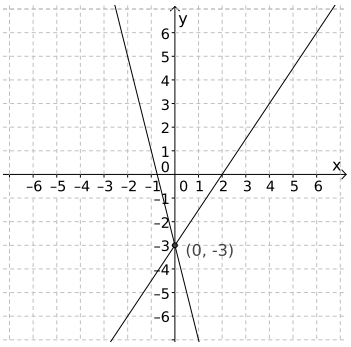
$$\begin{cases} 5x + 3y = 4 \\ 2x - y = 6 \end{cases}$$



Correct system is graphed	award 2 pts
Axes are labeled	award 1 pt
Intersection point $(2, -2)$	award 2 pts

10c. Solve by graphing the given system of equations.Be sure to label axes with x, y, and with numbers. Identify and label the intersection point.

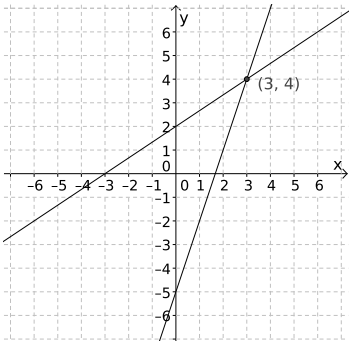
$$\begin{cases} 3x - 2y = 6 \\ 4x + y = -3 \end{cases}$$



Correct system is graphed	award 2 pts
Axes are labeled	award 1 pt
Intersection point $(0, -3)$	award 2 pts

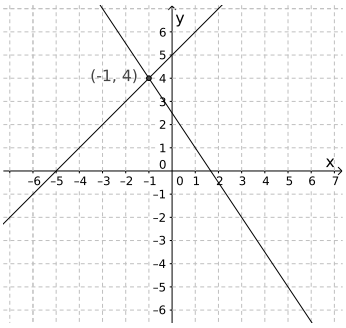
10d. Solve by graphing the given system of equations. Be sure to label axes with x, y, and with numbers. Identify and label the intersection point.

$$\begin{cases} 3x - y = 5 \\ 2x - 3y = -6 \end{cases}$$



Correct system is graphed	award 2 pts
Axes are labeled	award 1 pt
Intersection point $(3, 4)$	award 2 pts

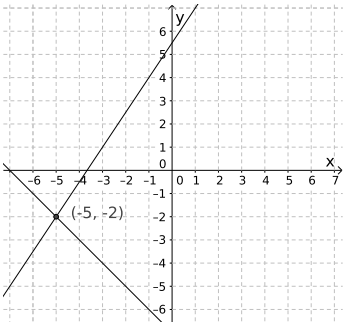
10.5a. Solve the system of equations by graphing. Be sure to label axes with x, y, and numbers. Identify and label the point of intersection.



$$\begin{cases} y = -\dfrac{3}{2}x + \dfrac{5}{2} \\ y = x + 5 \end{cases}$$

Correct system is graphed	award 2 pts
Axes are labeled	award 1 pt
Intersection point $(-1, 4)$	award 1 pt

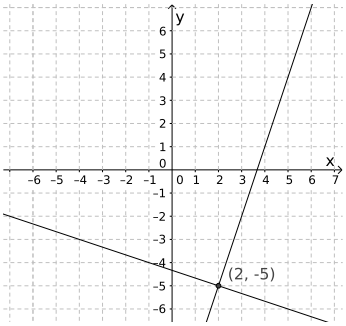
10.5b. Solve the system of equations by graphing. Be sure to label axes with x, y, and numbers. Identify and label the point of intersection.



$$\begin{cases} y = \dfrac{3}{2}x + \dfrac{11}{2} \\ y = -x - 7 \end{cases}$$

Correct system is graphed	award 2 pts
Axes are labeled	award 1 pt
Intersection point $(-5, -2)$	award 2 pts

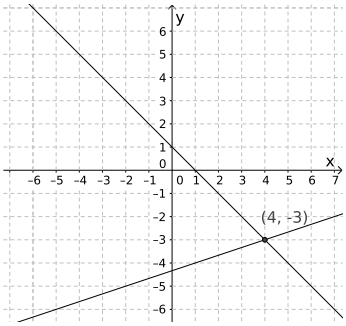
10.5c. Solve the system of equations by graphing. Be sure to label axes with x, y, and numbers. Identify and label the point of intersection.



$$\begin{cases} y = -\dfrac{1}{3}x - \dfrac{13}{3} \\ y = 3x - 11 \end{cases}$$

Correct system is graphed	award 2 pts
Axes are labeled	award 1 pt
Intersection point $(-5, -2)$	award 2 pts

10.5d. Solve the system of equations by graphing. Be sure to label axes with x, y, and numbers. Identify and label the point of intersection.



$$\begin{cases} y = \dfrac{1}{3}x - \dfrac{13}{3} \\ y = -x + 1 \end{cases}$$

Correct system is graphed	award 2 pts
Axes are labeled	award 1 pt
Intersection point $(-5, -2)$	award 2 pts

11a. An employment agency specializing in temporary construction help pays heavy equipment operators \$140 per day and general laborers \$90 per day. If thirty-five people were hired and the payroll was \$3950, how many heavy equipment operators were employed? How many laborers?

Let x = the number of heavy equipment operators	
and y = the number of laborers	1 pt to here
$x + y = 35$ and $140x + 90y = 3950$	2 pts to here
$x = 35 - y$ and $140(35 - y) + 90y = 3950$	3 pts to here
$4900 - 140y + 90y = 3950$	
$4900 - 50y = 3950$	4 pts up to here
$-50y = -950$	
$y = 19$ so $x = 35 - 19 = 16$	5 pts to here
There were 19 laborers	
and 16 heavy equipment operators.	6 pts total

11b. A Broadway performance had a paid attendance of 308 people. Balcony tickets cost \$38 and orchestra tickets cost \$60. Ticket sales receipts totaled \$15,576. How many balcony tickets were sold? How many orchestra tickets were sold?

Let x = the number of balcony tickets sold	
and y = the number of orchestra tickets sold	1 pt to here
$x + y = 308$ and $38x + 60y = 15576$	2 pts to here
$x = 308 - y$ and $38(308 - y) + 60y = 15576$	3 pts to here
$11704 - 38y + 60y = 15576$	
$11704 + 22y = 15576$	4 pts up to here
$22y = 3872$	
$y = 176$ so $x = 308 - 176 = 132$	5 pts up to here
There were 176 orchestra tickets sold	
and 132 balcony tickets sold.	6 pts total

11c. Ninety-eight passengers rode in an Amtrak train from Boston to Denver. Tickets for regular coach seats cost \$120. Tickets for sleeper car seats cost \$290. The receipts for the trip totaled \$19,750. How many passengers purchased regular coach seats? How many passengers purchased sleeper seats?

Let x = the number of regular coach seats	
and y = the number of sleeper seats	1 pt to here
$x + y = 98$ and $120x + 290y = 19750$	2 pts to here
$x = 98 - y$ and $120(98 - y) + 290y = 19750$	3 pts to here
$11760 - 120y + 290y = 19750$	
$11760 + 170y = 19750$	4 pts up to here
$170y = 7990$	
$y = 47$ so $x = 98 - 47 = 51$	5 pts up to here
There were 47 sleeper seats sold	
and 51 regular coach seats sold.	6 pts total

11d. The Tupper Farm has 450 acres of land allotted for raising corn and wheat. The cost to cultivate corn is \$42 per acre. The cost to cultivate wheat is \$35 per acre. The Tuppers have \$16,520 available to cultivate these crops. How many acres of each crop should the Tuppers plant?

Let $x =$ the number of arces of corn	
and $y =$ the number of acres of wheat	1 pt to here
$x + y = 450$ and $42x + 35y = 16520$	2 pts to here
$x = 450 - y$ and $42(450 - y) + 35y = 16520$	3 pts to here
$18900 - 42y + 35y = 16520$	
$18900 - 7y = 16520$	4 pts up to here
$-7y = -2380$	
$y = 340$ so $x = 450 - 340 = 110$	5 pts up to here
They should plant 340 acres of wheat	
and 110 acres of corn.	6 pts total

11.5a. On Monday, Tiana picked up 9 muffins and 18 cups of tea for the office staff and paid a total of \$44.73. On Saturday, Tiana picked up 10 muffins and 30 cups of tea (from the same coffee shop) and paid a total of \$64.60. How much does the coffee shop charge for one muffin? How much do they charge for one cup of tea?

Let $x =$ the price of a muffin (in dollars)	
and $y =$ the price of a cup of tea (in dollars)	1 pt to here
$9x + 18y = 44.73$ and $10x + 30y = 64.60$	3 pts to here
$x = 1.99$ and $y = 1.49$	5 pts to here
One muffin costs \$1.99	
and one cup of tea costs \$1.49.	6 pts total

11.5b. On Friday, Leah picked up 8 cruellers and 16 cups of tea for the office staff and paid a total of \$36.56. On Saturday, Leah picked up 4 cruellers and 12 cups of tea (from the same coffee shop) and paid a total of \$22.64. How much does the coffee shop charge for one crueller? How much do they charge for one cup of tea?

Let $x =$ the price of a crueller (in dollars)	
and $y =$ the price of a cup of tea (in dollars)	1 pt to here
$8x + 16y = 36.56$ and $4x + 12y = 22.64$	3 pts to here
$x = 2.39$ and $y = 1.09$	5 pts to here
One crueller costs \$2.39	
and one cup of tea costs \$1.09.	6 pts total

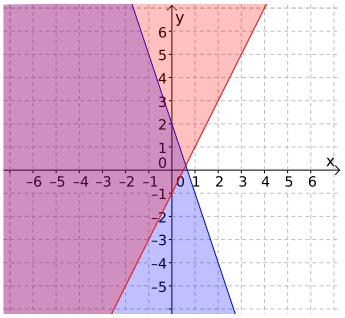
11.5c. On Wednesday, Gabriel picked up 10 cookies and 30 cups of hot cider for the office staff and paid a total of \$56.60. On Tuesday, Gabriel picked up 9 cookies and 18 cups of hot cider (from the same coffee shop) and paid a total of \$38.43. How much does the coffee shop charge for one cookie? How much do they charge for one cup of hot cider?

Let $x =$ the price of a cookie (in dollars)	
and $y =$ the price of a cup of hot cider (in dollars)	1 pt to here
$10x + 30y = 56.60$ and $9x + 18y = 38.43$	3 pts to here
$x = 1.49$ and $y = 1.39$	5 pts to here
One cookie costs \$1.49	
and one cup of hot cider costs \$1.39.	6 pts total

11.5d. On Friday, Marissa picked up 4 brownies and 8 cups of chai for the office staff and paid a total of \$19.08. On Saturday, Marissa picked up 7 brownies and 28 cups of chai (from the same coffee shop) and paid a total of \$47.25. How much does the coffee shop charge for one brownie? How much do they charge for one cup of chai?

Let $x =$ the price of a brownie (in dollars)	
and $y =$ the price of a cup of chai (in dollars)	1 pt to here
$4x + 8y = 19.08$ and $7x + 28y = 47.25$	3 pts to here
$x = 2.79$ and $y = 0.99$	5 pts to here
One brownie costs \$2.79	
and one cup of chai costs \$0.99.	6 pts total

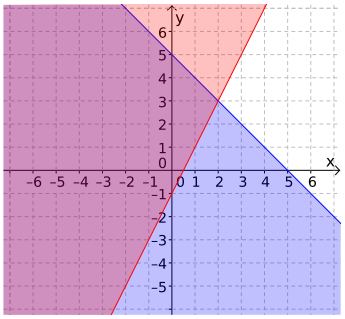
12a. Graph the solution to the following system of inequalities. Be sure to label axes with x, y, and with numbers. Identify and label the intersection.



$$\begin{cases} y < -3x + 2 \\ y \geq 2x - 1 \end{cases}$$

1 pt for each correct inequality (2 pts total)
2 pts for correct intersection
1 pt for the x and y axis labels

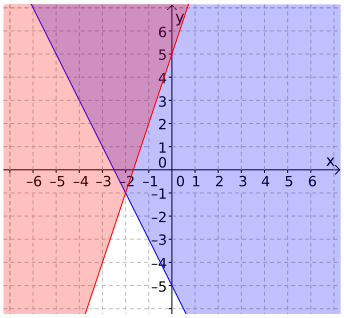
12b. Graph the solution to the following system of inequalities. Be sure to label axes with x, y, and with numbers. Identify and label the intersection.



$$\begin{cases} y < -x + 5 \\ y \geq 2x - 1 \end{cases}$$

1 pt for each correct inequality (2 pts total) 2 pts for correct intersection 1 pt for the x and y axis labels

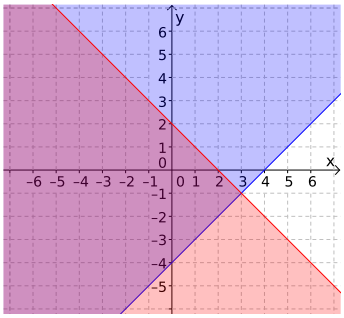
12c. Graph the solution to the following system of inequalities. Be sure to label axes with x, y, and with numbers. Identify and label the intersection.



$$\begin{cases} y \geq -2x - 5 \\ y \geq 3x + 5 \end{cases}$$

1 pt for each correct inequality (2 pts total) 2 pts for correct intersection 1 pt for the x and y axis labels

12d. Graph the solution to the following system of inequalities. Be sure to label axes with x, y, and with numbers. Identify and label the intersection.

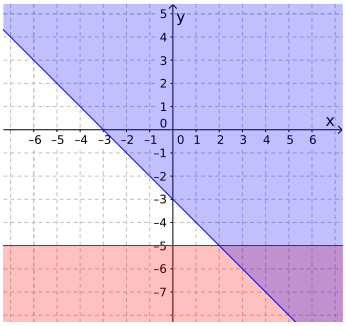


$$\begin{cases} y \geq x - 4 \\ y \leq -x + 2 \end{cases}$$

1 pt for each correct inequality (2 pts total) 2 pts for correct intersection 1 pt for the x and y axis labels

12.5a. Graph the solution to the system of inequalities. Be sure to label the x and y axes.

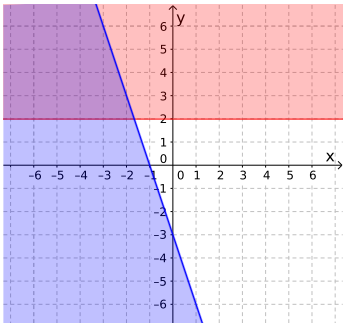
$$\begin{cases} y \geq -x - 3 \\ y < -5 \end{cases}$$



1 pt for each correct line 1 pt for each correct shading 1 pt for the x and y axis labels (5 pts total)

12.5b. Graph the solution to the system of inequalities. Be sure to label the x and y axes.

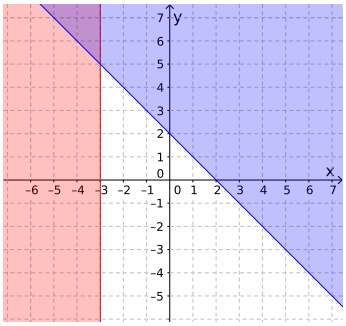
$$\begin{cases} y \leq -3x - 3 \\ y > 2 \end{cases}$$



1 pt for each correct line 1 pt for each correct shading 1 pt for the x and y axis labels (5 pts total)

12.5c. Graph the solution to the system of inequalities. Be sure to label the x and y axes.

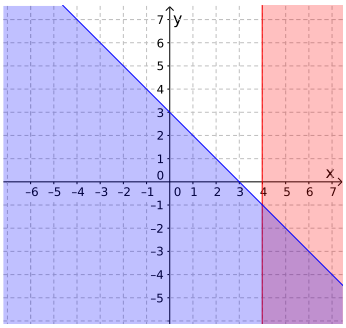
$$\begin{cases} y \geq -x + 2 \\ x < -3 \end{cases}$$



1 pt for each correct line 1 pt for each correct shading 1 pt for the x and y axis labels (5 pts total)

12.5d. Graph the solution to the system of inequalities. Be sure to label the x and y axes.

$$\begin{cases} y \leq -x + 3 \\ x > 4 \end{cases}$$



1 pt for each correct line 1 pt for each correct shading 1 pt for the x and y axis labels (5 pts total)

13a. Multiply and simplify your answer.

$$10x^{-6}y^{9}z^{-4} \cdot 4x^{10}y^{-4}z^{9} \cdot 3x^{8}$$

$120x^{12}y^{5}z^{5}$	1 pt for each variable with correct exponent and 2 pts for the number 120

13b. Multiply and simplify your answer.

$$6x^{-3}y^{6}z^{-4} \cdot 4x^{5}y^{-4}z^{5} \cdot 3x^{5}$$

$72x^{7}y^{2}z$	1 pt for each variable with correct exponent and 2 pts for the number 72

13c. Multiply and simplify your answer.

$$4x^{-2}y^5z^4 \cdot 3x^{10}y^{-4}z^6 \cdot 12x^8$$

$144x^{16}yz^{10}$	1 pt for each variable with correct exponent and 2 pts for the number 144

13d. Multiply and simplify your answer.

$$5xy^{-4}z^{11} \cdot 6x^3y^8z^{-5} \cdot 5x^5$$

$150x^9y^4z^6$	1 pt for each variable with correct exponent and 2 pts for the number 150

13.5a. Multiply and simplify your answer.

$$9x^8y^7z^5 \cdot 3x^4y^{11}z^7 \cdot 2x^6$$

$54x^{18}y^{18}z^{12}$	1 pt for each variable with correct exponent and 2 pts for the number 54

13.5b. Multiply and simplify your answer.

$$5x^3y^5z^9 \cdot 4x^2y^9z^{11} \cdot 8y^4$$

$160x^5y^{18}z^{20}$	1 pt for each variable with correct exponent and 2 pts for the number 160

13.5c. Multiply and simplify your answer.

$$4x^8y^6z^5 \cdot 6x^{12}y^7z^4 \cdot 3z^6$$

$72x^{20}y^{13}z^{15}$	1 pt for each variable with correct exponent and 2 pts for the number 72

13.5d. Multiply and simplify your answer.

$$6x^3y^8z^4 \cdot 3x^7y^9z^{13} \cdot 5x^{10}$$

$90x^{20}y^{17}z^{17}$	1 pt for each variable with correct exponent and 2 pts for the number 90

14a. (a) Rewrite without an exponent: $(-13)^{-2}$

(b) Rewrite without using a negative exponent: $-18x^{-6}$

(a) $\dfrac{1}{169}$	2.5 pts
	No partial credit.
(b) $\dfrac{-18}{x^6}$	2.5 pts
	No partial credit.

14b. (a) Rewrite without an exponent: $(-15)^{-2}$

(b) Rewrite without using a negative exponent: $-16y^{-9}$

(a) $\dfrac{1}{225}$	2.5 pts
	No partial credit.
(b) $\dfrac{-16}{y^9}$	2.5 pts
	No partial credit.

14c. (a) Rewrite without an exponent: $(-11)^{-2}$

(b) Rewrite without using a negative exponent: $-17y^{-5}$

(a) $\dfrac{1}{121}$	2.5 pts
	No partial credit.
(b) $\dfrac{-17}{y^5}$	2.5 pts
	No partial credit.

14d. (a) Rewrite without an exponent: $(-12)^{-2}$

(b) Rewrite without using a negative exponent: $-8y^{-10}$

(a) $\dfrac{1}{144}$	2.5 pts
	No partial credit.
(b) $\dfrac{-8}{y^{10}}$	2.5 pts
	No partial credit.

14.5a. Simplify. Express your answer with positive exponents. Assume that all variables are nonzero.

$$\frac{x^{-4}y^{-2}z^4}{z^{-5}}.$$

$\dfrac{z^5z^4}{x^4y^2}$	1 pt each for variables x and y (with positive exponent)
$\dfrac{z^9}{x^4y^2}$	2 pts for getting exponent of z correct and 1 pt extra for getting it all correct.

14.5b. Simplify. Express your answer with positive exponents. Assume that all variables are nonzero.

$\dfrac{x^{-5}y^{-3}}{x^4z^{-2}}$.

$\dfrac{z^2}{x^4x^5y^3}$	1 pt each for variables y and z (with positive exponent)
$\dfrac{z^2}{x^9y^3}$	2 pts for getting exponent of x correct and 1 pt extra for getting it all correct.

14.5c. Simplify. Express your answer with positive exponents. Assume that all variables are nonzero.

$\dfrac{y^{-2}z^4}{x^{-5}z^{-3}}$.

$\dfrac{x^5z^4z^3}{y^2}$	1 pt each for variables x and y (with positive exponent)
$\dfrac{x^5z^7}{y^2}$	2 pts for getting exponent of z correct and 1 pt extra for getting it all correct.

14.5d. Simplify. Express your answer with positive exponents. Assume that all variables are nonzero.

$\dfrac{x^4y^{-3}}{x^{-2}z^{-5}}$.

$\dfrac{x^4x^2z^5}{y^3}$	1 pt each for variables y and z (with positive exponent)
$\dfrac{x^6z^5}{y^3}$	2 pts for getting exponent of x correct and 1 pt extra for getting it all correct.

15a. (a) Write 265,030,000 in scientific notation.

(b) Write 0.00070253 in scientific notation.

(a) 2.6503×10^{8}	2.5 pts
	No partial credit.
(b) 7.0253×10^{-4}	2.5 pts
	No partial credit.

15b. (a) Write 8,540,200,000 in scientific notation.

(b) Write 0.000016403 in scientific notation.

(a) 8.5402×10^{9}	2.5 pts
	No partial credit.
(b) 1.6403×10^{-5}	2.5 pts
	No partial credit.

15c. (a) Write 1,037,000 in scientific notation.

(b) Write 0.000020134 in scientific notation.

(a) 1.037×10^{6}	2.5 pts
	No partial credit.
(b) 2.0134×10^{-5}	2.5 pts
	No partial credit.

15d. (a) Write 90,037,000 in scientific notation.

(b) Write 0.00005012 in scientific notation.

(a) 9.0037×10^{7}	2.5 pts
	No partial credit.
(b) 5.012×10^{-5}	2.5 pts
	No partial credit.

15.5a. (a) Write 4.13×10^{5} in decimal notation.

(b) Write 1.74×10^{-4} in decimal notation.

(a) 413,000	2.5 pts
	No partial credit.
(b) 0.000174	2.5 pts
	No partial credit.

15.5b. (a) Write 3.814×10^{7} in decimal notation.

(b) Write 9.62×10^{-3} in decimal notation.

(a) 38,140,000	2.5 pts
	No partial credit.
(b) 0.00962	2.5 pts
	No partial credit.

15.5c. (a) Write 2.4×10^{-5} in decimal notation.

(b) Write 4.31×10^{6} in decimal notation.

(a) 0.000024	2.5 pts
	No partial credit.
(b) 4,310,000	2.5 pts
	No partial credit.

15.5d. (a) Write 5.412×10^{-6} in decimal notation.

(b) Write 8.31×10^{7} in decimal notation.

(a) 0.000005412	2.5 pts
	No partial credit.
(b) 83,100,000	2.5 pts
	No partial credit.

16a. Identify the degree and leading coefficient of the polynomial.

$$-2y^3 + 25y^2 - 8y - 10y^8 + 5y^4$$

Degree:_____
Leading Coefficient: _____

Degree: 8	2.5 pts
Leading Coefficient: -10	2.5 pts
No partial credit.	

16b. Identify the degree and leading coefficient of the polynomial.

$$-6y^3 + 13y^2 - 2y - 14y^7 + 3y^4$$

Degree:_____
Leading Coefficient: _____

Degree: 7	2.5 pts
Leading Coefficient: -14	2.5 pts
No partial credit.	

16c. Identify the degree and leading coefficient of the polynomial.

$$2x^2 - 10 + 2x^6 - 5x^4 + 3x$$

Degree:_____
Leading Coefficient: _____

Degree: 6	2.5 pts
Leading Coefficient: 2	2.5 pts
No partial credit.	

16d. Identify the degree and leading coefficient of the polynomial.

$$5 + 6x^9 + 4x^8 + 3x^7 - 2x$$

Degree:_____
Leading Coefficient: _____

Degree: 9	2.5 pts
Leading Coefficient: 6	2.5 pts
No partial credit.	

16.5a. Identify the degree and leading coefficient of the polynomial.

$$-4y^8 + 12y^5 - 8y^3 + 5y$$

Degree:_____
Leading Coefficient: _____

Degree: 8	2.5 pts
Leading Coefficient: -4	2.5 pts
No partial credit.	

16.5b. Identify the degree and leading coefficient of the polynomial.

$$13y^7 - 2y^5 - 14y^2 + 3$$

Degree:_____
Leading Coefficient: _____

Degree: 7	2.5 pts
Leading Coefficient: 13	2.5 pts
No partial credit.	

16.5c. Identify the degree and leading coefficient of the polynomial.

$$-10x^6 - 5x^4 + 7x$$

Degree:_____
Leading Coefficient: _____

Degree: 6	2.5 pts
Leading Coefficient: -10	2.5 pts
No partial credit.	

16.5d. Identify the degree and leading coefficient of the polynomial.

$$8x^7 - 3x^5 + 2x^3 - 2x^2$$

Degree:_____
Leading Coefficient: _____

Degree: 7	2.5 pts
Leading Coefficient: 8	2.5 pts
No partial credit.	

17a. Simplify $(-12u^2 + 8u - 32) - (11u - 14u^2 - 10) + (-5 - 7u - 4u^2)$.

$-12u^2 + 8u - 32 - 11u + 14u^2 + 10 - 5 - 7u - 4u^2$ 2 pts to here
$= -2u^2 - 10u - 27$ 5 pts total
Partial credit: 1.5 pts for each correct term

17b. Simplify $(-10u^2 + 4u + 5) - (-12u - 3u^2 - 13) + (6 - 3u - 2u^2)$.

$-10u^2 + 4u + 5 + 12u + 3u^2 + 13 + 6 - 3u - 2u^2$ 2 pts to here
$= -9u^2 + 13u + 24$ 5 pts total
Partial credit: 1.5 pt for each correct term

17c. Simplify $(-9x^2 + 5x - 3) - (2x - 4 - 8x^2) + (-6x + 7 - 4x^2)$.

$-9x^2 + 5x - 3 - 2x + 4 + 8x^2 - 6x + 7 - 4x^2$ 3 pts to here
$= -5x^2 - 3x + 8$ 5 pts total
Partial credit: 1.5 pt for each correct term

17d. Simplify $(-4x^2 + 7x - 2) + (-4x - 5 + 10x^2) - (2x - 3 - 4x^2)$.

$-4x^2 + 7x - 2 - 4x - 5 + 10x^2 - 2x + 3 + 4x^2$ 3 pts to here
$= 10x^2 + x - 4$ 5 pts total
Partial credit: 1.5 pt for each correct term

17.5a. Simplify $(-9r^2 + 5r - 16) - 2(12r - 15r^2 - 8)$.

$-9r^2 + 5r - 16 - 24r + 30r^2 + 16$ 3 pts to here
$= 21r^2 - 19r$ 5 pts total

17.5b. Simplify $(-7r^2 + 6r - 4) - 3(10r - 7r^2 + 4)$.

$-7r^2 + 6r - 4 - 30r + 21r^2 - 12$ 3 pts to here
$= 14r^2 - 24r - 16$ 5 pts total

17.5c. Simplify $(-8r^2 + 9r - 14) - 4(7r - 9r^2 - 6)$.

$-8r^2 + 9r - 14 - 28r + 36r^2 + 24$ 3 pts to here
$= 28r^2 - 19r + 10$ 5 pts total

17.5d. Simplify $(-5r^2 + 11r - 15) - 3(7r - 13r^2 - 7)$.

$-5r^2 + 11r - 15 - 21r + 39r^2 + 21$ 3 pts to here
$= 34r^2 - 10r + 6$ 5 pts total

18a. Multiply and simplify $(2x - 6)(5x + 4)$.

$10x^2 + 8x - 30x - 24$ 3 pts to here
$= 10x^2 - 22x - 24$ 5 pts total

18b. Multiply and simplify $(2x-3)(3x-5)$.

$6x^2-10x-9x+15$	3 pts to here
$=6x^2-19x+15$	5 pts total

18c. Multiply and simplify $(3x-4)(4x+5)$.

$12x^2+15x-16x-20$	3 pts to here
$12x^2-x-20$	5 pts total

18d. Multiply and simplify $(5x+3)(3x-2)$.

$15x^2-10x+9x-6$	3 pts to here
$15x^2-x-6$	5 pts total

18bada. Multiply and simplify $(x-6)(2x^2-5x+4)$.

$2x^3-5x^2+4x-12x^2+30x-24$	3 pts to here
$=2x^3-17x^2+34x-24$	5 pts total

18badb. Multiply and simplify $(x-3)(3x^2-2x-1)$.

$3x^3-2x^2-x-9x^2+6x+3$	3 pts to here
$=3x^3-11x^2+5x+3$	5 pts total

18badc. Multiply and simplify $(x-3)(4x^2-x+5)$.

$4x^3-x^2+5x-12x^2+3x-15$	3 pts to here
$4x^3-13x^2+8x-15$	5 pts total

18badd. Multiply and simplify $(x+5)(3x^2+3x-2)$.

$3x^3+3x^2-2x+15x^2+15x-10$	3 pts to here
$3x^3+18x^2+13x-10$	5 pts total

18.5a. Multiply and simplify $-7x^2y(-4x^2-6x+2y^3)$.

$-7x^2y(-4x^2)-7x^2y(-6x)-7x^2y(2y^3)$	2 pts to here
$=28x^4y+42x^3y-14x^2y^4$	1 pt for each correct term

18.5b. Multiply and simplify $-6xy^2(7x^2-5y+4y^2)$.

$-6xy^2(7x^2)-6xy^2(-5y)-6xy^2(4y^2)$	2 pts to here
$=-42x^3y^2+30xy^3-24xy^4$	1 pt for each correct term

18.5c. Multiply and simplify $-5x^2y(-7x^2+8x-y^4)$.

$-5x^2y(-7x^2)-5x^2y(8x)-5x^2y(-y^4)$	2 pts to here
$=35x^4y-40x^3y+5x^2y^5$	1 pt for each correct term

18.5d. Multiply and simplify $-4xy^2(6x^2 - 8y - 7y^3)$.

$-4xy^2(6x^2) - 4xy^2(-8y) - 4xy^2(-7y^3)$	2 pts to here
$= -24x^3y^2 + 32xy^3 + 28xy^5$	1 pt for each correct term

19a. Simplify. Express your answer with only positive exponents.

$$\frac{18a^3b^8c^2}{12b^4c^8}$$

$\frac{3a^3b^4}{2c^6}$	1 pt for each variable with correct exponent 2 pts for the number $\frac{3}{2}$

19b. Simplify. Express your answer with only positive exponents.

$$\frac{20a^7b^6c^8}{15b^9c^2}$$

$\frac{4a^7c^6}{3b^3}$	1 pt for each variable with correct exponent 2 pts for the number $\frac{4}{3}$

19c. Simplify. Express your answer with only positive exponents.

$$\frac{24a^8b^6c^9}{15a^7b^9}$$

$\frac{8ac^9}{5b^3}$	1 pt for each variable with correct exponent 2 pts for the number $\frac{8}{5}$

19d. Simplify. Express your answer with only positive exponents.

$$\frac{12a^5b^9c^7}{20a^8c^3}$$

$\frac{3b^9c^4}{5a^3}$	1 pt for each variable with correct exponent 2 pts for the number $\frac{3}{5}$

19bada. Simplify $(-2x^2y^8z^5) \cdot (-6x^3y^5z^3)^2$.

$-72x^8y^{18}z^{11}$	1 pt for each variable with correct exponent and 2 pts for the coefficient of -72.

19badb. Simplify $(-7x^4y^2z^3)(-2x^5y^3z^3)^2$.

$-28x^{14}y^8z^9$	1 pt for each variable with correct exponent and 2 pts for the number -28

19badc. Simpify $(-4x^3y^7z^4)(-3x^3y^4z^2)^2$.

$-36x^9y^{15}z^8$	1 pt for each variable with correct exponent and 2 pts for the number -36

19badd. Simplify $(-5x^6yz^2)(-2x^5y^3z^4)^2$.

$-20x^{16}y^7z^{10}$	1 pt for each variable with correct exponent and 2 pts for the number -20

19.5a. Simplify. Express your answer with only positive exponents.

$$\frac{(2ab^8c^2)^3}{20c^{12}}$$

$\frac{2a^3b^{24}}{5c^6}$	1 pt for each variable with correct exponent 2 pts for the number $\frac{2}{5}$ (or anything equal to $\frac{2}{5}$)

19.5b. Simplify. Express your answer with only positive exponents.

$$\frac{(3a^4b^2c)^4}{12b^{15}}$$

$\frac{27a^{16}c^4}{4b^7}$	1 pt for each variable with correct exponent 2 pts for the number $\frac{27}{4}$ (or anything equal to $\frac{27}{4}$)

19.5c. Simplify. Express your answer with only positive exponents.

$$\frac{(4a^6bc^4)^3}{48a^{20}}$$

$\frac{4b^3c^{12}}{3a^2}$	1 pt for each variable with correct exponent 2 pts for the number $\frac{4}{3}$ (or anything equal to $\frac{4}{3}$)

19.5d. Simplify. Express your answer with only positive exponents.

$$\frac{(2a^5b^3c)^4}{24c^9}$$

$\dfrac{3a^{20}b^{12}}{4c^5}$	1 pt for each variable with correct exponent 2 pts for the number $\dfrac{3}{4}$ (or anything equal to $\frac{3}{4}$)

20a. Divide. Write your answer in standard form, $Q(x) + \dfrac{R}{3x}$.

$$(24x^3 - 6x^2 - 12x + 8) \div (3x)$$

$\dfrac{24x^3}{3x} - \dfrac{6x^2}{3x} - \dfrac{12x}{3x} + \dfrac{8}{3x}$	3 pts to here
$8x^2 - 2x - 4 + \dfrac{8}{3x}$	5 pts total

20b. Divide. Write your answer in standard form, $Q(x) + \dfrac{R}{2x}$.

$$(6x^3 - 8x^2 - 10x + 5) \div (2x)$$

$\dfrac{6x^3}{2x} - \dfrac{8x^2}{2x} - \dfrac{10x}{2x} + \dfrac{5}{2x}$	3 pts to here
$3x^2 - 4x - 5 + \dfrac{5}{2x}$	5 pts total

20c. Divide. Write your answer in standard form, $Q(x) + \dfrac{R}{5x}$.

$$(15x^3 + 20x^2 - 30x + 4) \div (5x)$$

$\dfrac{15x^3}{5x} + \dfrac{20x^2}{5x} - \dfrac{30x}{5x} + \dfrac{4}{5x}$	3 pts to here
$3x^2 + 4x - 6 + \dfrac{4}{5x}$	5 pts total

20d. Divide. Write your answer in standard form, $Q(x) + \dfrac{R}{3x}$.

$$(18x^3 - 9x^2 + 3x + 5) \div (3x)$$

$\dfrac{18x^3}{3x} - \dfrac{9x^2}{3x} - \dfrac{3x}{3x} + \dfrac{5}{3x}$	3 pts to here
$6x^2 - 3x + 1 + \dfrac{5}{3x}$	5 pts total

20.5a. Using long division, divide.

$$(6x^3 + 5x^2 - 16x + 6) \div (2x - 1)$$

Set up long division properly	2 points
$3x^2 + 4x - 6$	1 point for each correct term

20.5b. Using long division, divide.

$$(12x^3 - 11x^2 + 4x + 3) \div (3x + 1)$$

Set up long division properly	2 points
$4x^2 - 5x + 3$	1 point for each correct term

20.5c. Using long division, divide.

$$(8x^3 - 26x^2 + 13x + 5) \div (4x + 1)$$

Set up long division properly	2 points
$2x^2 - 7x + 5$	1 point for each correct term

20.5d. Using long division, divide.

$$(12x^3 + 5x^2 + 15x - 6) \div (3x - 1)$$

Set up long division properly	2 points
$4x^2 + 3x + 6$	1 point for each correct term