Classwork 8.

Problems with proportions:

Problem 1. To prepare 6 large pizzas, the cook needs 2.5 kg of flour. How much flour does the cook need to prepare 8 pizzas? We can write the problem as follows:

6 pizzas → 2.5 kg

8 pizzas → x kg

We can create several proportions:

1. How many kilograms of flour are needed to make one pizza:

$$\frac{2.5\ kg.}{6} = \frac{x\ kg.}{8}$$

2. Flour consumption is proportional to the number of pizzas made, so if twice as many pizzas are made, twice as much flour should be used.

$$\frac{6}{8} = \frac{2.5\ kg.}{x\ kg.}$$

3. How many pizzas can be made with 1 kg of flour?

$$\frac{6}{2.5\ kg} = \frac{8}{x\ kg.}$$

For the first proportion:

$$\frac{2.5\ kg.}{6} = \frac{x\ kg.}{8}; \quad 8 \cdot 2.5kg = 6 \cdot x\ kg.; \quad x = \frac{8 \cdot 2.5\ kg.}{6} = \frac{4 \cdot 2.5\ kg}{3} = \frac{10}{3} = 3\frac{1}{3}kg.$$

For the second and third:

$$\frac{6}{8} = \frac{2.5\ kg.}{x\ kg.}; \quad 6 \cdot x\ kg = 8 \cdot 2.5kg; \quad x = \frac{8 \cdot 2.5\ kg.}{6} = \frac{4 \cdot 2.5\ kg}{3} = \frac{10}{3} = 3\frac{1}{3}kg$$

$$\frac{6}{2.5\ kg} = \frac{8}{x\ kg.}; \quad 6 \cdot x\ kg = 8 \cdot 2.5kg; \quad x = \frac{8 \cdot 2.5\ kg.}{6} = \frac{4 \cdot 2.5\ kg}{3} = \frac{10}{3} = 3\frac{1}{3}kg$$

6 pizzas → 2.5 kg

8 pizzas → x kg

Problem 2. 6 typists working 5 hours a day can type the manuscript of a book in 16 days. How many days will 4 typists take to do the same job, each working 6 hours a day?

$$6\ typists \cdot 5\ hours \rightarrow 16\ days$$
$$4\ typists \cdot 6\ hours \rightarrow x\ days$$

When writing a proportion, we must be careful to choose the right one: more typists, more hours a day, less time to get the job done.

$$\frac{6\cdot 5}{4\cdot 6} \neq \frac{16}{x}; \quad \frac{6\cdot 5}{4\cdot 6} = \frac{x}{16};$$

$$\frac{5}{4} = \frac{x}{16}; \qquad 4x = 16\cdot 5; \qquad x = \frac{16\cdot 5}{4} = 20\ days.$$

This problem can be solved without writing the proportion. Number of hours of typing for one typist needed to do the job is $16\ days \cdot 6\ typists \cdot 5\ hour\ per\ day$ should be equal to $x\ days \cdot 4\ typists \cdot 6\ hour\ per\ day$

$$16\cdot 6\cdot 5 = x\cdot 4\cdot 6; \quad x = \frac{16\cdot 6\cdot 5}{4\cdot 6} = 20\ days$$

Algebraic expression.

Expressions where variables, and/or numbers are added, subtracted, multiplied, and divided.
For example:

$$2a; \quad 3b+2; \quad 3c^2 - 4xy^2$$

We can do a lot with algebraic expressions, even so we don't know exact values of variables. First, we always can combine like terms:

$$2x+2y-5+2x+5y+6 = 2x+2x+5y+2y+6-5 = 4x+7y+1$$

We can multiply an algebraic expression by a number or a variable:

$$3\cdot(1+3y) = 3\cdot 1 + 3\cdot 3y = 3+9y$$

In this example the distributive property was used. Using the definition of multiplication we can write:

$$3\cdot(1+3y) = (1+3y)+(1+3y)+(1+3y) = 3+3\cdot y = 3+9y$$

Another example:

$$5a(5-5x) = \underbrace{(5-5x)+(5-5x)+\cdots+(5-5x)}_{5a\ times} = \underbrace{5+5+\cdots+5}_{5a\ times} - \underbrace{5x-5x-\cdots-5x}_{5a\ times}$$

$$= \underbrace{5+5+\cdots+5}_{5a\ times} - \underbrace{5x-5x-\cdots-5x}_{5a\ times} = 5a\cdot 5 - 5a\cdot 5x = 25a - 25ax$$

Exercises:

1. The sorcerer used seaweed and mushrooms in a ratio of 5 to 2 when brewing a potion. How much seaweed does he need if there are only 450 grams of mushrooms?

2. A car travels from one city to another in 13 hours at a speed of 75 km/h. How long will it take if the car moves at a speed of 52 km/h?

3. Simplify the following expression (combine like terms, think about which terms you can add together and which you can't):

$$\left(\frac{1}{7}klm^2 - \frac{4}{3}kl^2m + 7klm\right) + \left(-\frac{3}{21}klm^2 + \frac{4}{9}kl^2m - 5klm\right)$$

4. Factor out the common factor;

$a.\ \ a^2 + ab;$ $\quad b.\ \ x^2 - x;$ $\quad c.\ \ a + a^2;$ $\quad d.\ \ 2xy - x^3;$ $\quad e.\ \ b^3 - b^2$

$e.\ \ a^4 + a^3b;$ $\quad f.\ \ x^2y^2 - y^4;$ $\quad g.\ \ 4a^6 - 2a^3b;$ $\quad h.\ \ 9x^4 - 12x^2y^4;$

1. Simplify the following expressions (combine like terms):

$a.\ \ 7a + (2a + 3b);$ $\quad b.\ \ 9x + (2y - 5x);$
$c.\ \ (5x + 7a) + 4x;$ $\quad d.\ \ (5x - 7a) + 5a;$
$e.\ \ (3x - 6y) - 4y;$ $\quad f.\ \ (2a + 5b) - 7b;$
$g.\ \ 3m - (5n + 2m);$ $\quad h.\ \ 6p - (5p - 3a);$

2.

$a.\ \ (x^2 + 4x) + (x^2 - x + 1) - (x^2 - x);$
$b.\ \ (a^5 + 5a^2 + 3a - a) - (a^3 - 3a^2 + a);$
$c.\ \ (x^2 - 3x + 2) - (-2x - 3);$
$d.\ \ (abc + 1) + (-1 - abc);$

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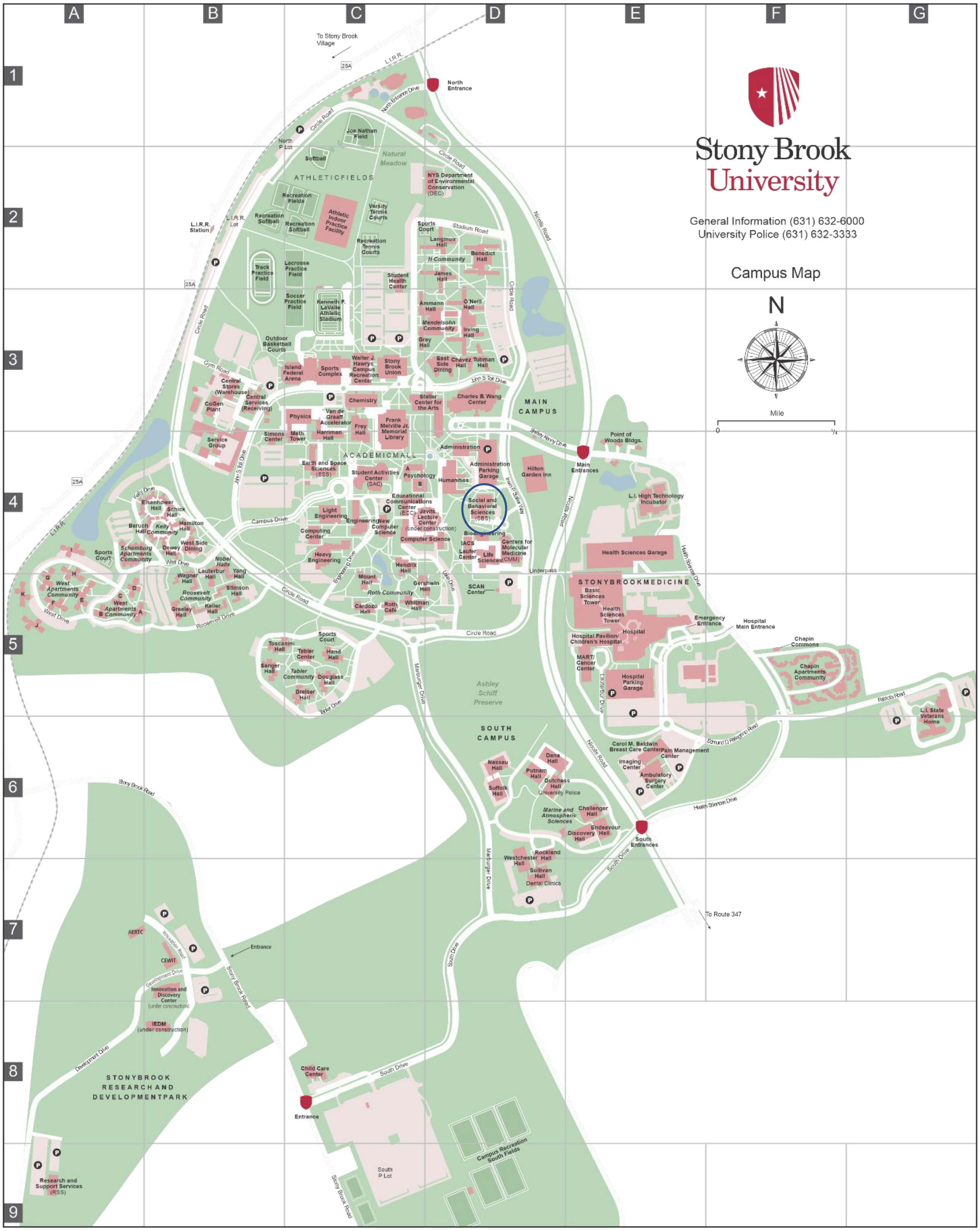
3. Factorize the following expressions:

$a.\ \ x(1 + b) + y(1 + b);$ $\quad f.\ \ (a + b)a - b(a + b);$
$b.\ \ m(2k - 3) + 2(2k - 3);$ $\quad g.\ \ (x + y)3 - a(x + y);$
$c.\ \ 2a(1 - b) - 3(1 - b);$ $\quad h.\ \ a(b + 3) - b(3 + b);$
$d.\ \ 7x(x - 2y) - 2(2y + x);$ $\quad i.\ \ a(a + b) + (a + b);$
$e.\ \ 2x(x - 2y) + 3y(x + 2y);$ $\quad j.\ \ 2x(a - 1) - (a - 1);$



Stony Brook University
General Information (631) 632-6000
University Police (631) 632-3333
Campus Map
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G
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8
9
To Stony Brook Village
L.I.R.R.
North Entrance
North P Lot
Joe Nathan Field
Softball
Natural Meadow
ATHLETIC FIELDS
NYS Department of Environmental Conservation (DEC)
Recreation Fields
Recreation Softball
Athletic Indoor Practice Facility
Varsity Tennis Courts
L.I.R.R. Station
L.I.R.R. Lot
Sports Court
Stadium Road
Langmuir Hall
Benedict Hall
H Community
Recreation Tennis Courts
Track Practice Field
Lacrosse Practice Field
Student Health Center
James Hall
Soccer Practice Field
Kenneth P. LaValle Athletic Stadium
Ammann Hall
O'Neill Hall
Mendelsohn Community
Irving Hall
Gray Hall
Outdoor Basketball Courts
Island Federal Arena
Sports Complex
Walter J. Hawrys Campus Recreation Center
Stony Brook Union
East Side Dining
Chávez Hall
Tubman Hall
Central Stores (Warehouse)
Central Services (Receiving)
CoGen Plant
Chemistry
Staller Center for the Arts
Charles B. Wang Center
MAIN CAMPUS
Physics
Van de Graaff Accelerator
Math Tower
Harriman Hall
Frey Hall
Frank Melville Jr. Memorial Library
Simons Center
Service Group
ACADEMIC MALL
Administration
Main Entrances
Point of Woods Bldgs.
Earth and Space Sciences (ESS)
Student Activities Center (SAC)
Psychology
Humanities
Administration Parking Garage
Hilton Garden Inn
L.I. High Technology Incubator
Educational Communications Center (ECC)
Light Engineering
Engineering
New Computer Science
Javits Lecture Center (under construction)
Social and Behavioral Sciences (SBS)
Bioengineering
Computing Center
Computer Science
IACS
Laufer Center
Life Sciences
Centers for Molecular Medicine (CMM)
Health Sciences Garage
Heavy Engineering
Hendrix Hall
Underpass
STONY BROOK MEDICINE
Eisenhower Hall
Schick Hall
Baruch Hall
Kelly Community
Hamilton Hall
Dewey Hall
West Side Dining
Sports Court
Schomburg Apartments Community
Nobel Halls
Lauterbur Hall
Yang Hall
Wagner Hall
Stimson Hall
Roosevelt Community
Keller Hall
Greeley Hall
West Apartments Community
West Apartments Community
Mount Hall
Gershwin Hall
SCAN Center
Roth Community
Cardozo Hall
Roth Cafe
Whitman Hall
Basic Sciences Tower
Health Sciences Tower
Hospital
Emergency Entrance
Hospital Main Entrance
Hospital Pavilion/ Children's Hospital
MART/ Cancer Center
Hospital Parking Garage
Chapin Commons
Chapin Apartments Community
L.I. State Veterans Home
Sports Court
Toscanini Hall
Tabler Center
Hand Hall
Sanger Hall
Tabler Community
Douglass Hall
Dreiser Hall
Ashley Schiff Preserve
SOUTH CAMPUS
Carol M. Baldwin Breast Care Center
Pain Management Center
Imaging Center
Ambulatory Surgery Center
Nassau Hall
Dana Hall
Putnam Hall
Dutchess Hall
Suffolk Hall
University Police
Marine and Atmospheric Sciences
Challenger Hall
Endeavour Hall
Discovery Hall
South Entrances
Westchester Hall
Rockland Hall
Sullivan Hall
Dental Clinics
To Route 347
AERTC
CEWIT
Entrance
Innovation and Discovery Center (under construction)
IEDM (under construction)
STONY BROOK RESEARCH AND DEVELOPMENT PARK
Child Care Center
Entrance
Campus Recreation South Fields
South P Lot
Research and Support Services (RSS)
Circle Road
Nicolls Road
Gym Road
John S Toll Drive
Campus Drive
Engineering Drive
Loop Road
Marburger Drive
South Drive
Health Sciences Drive
Stony Brook Road
Development Drive
Innovation Road
Tabler Drive
West Drive
Roosevelt Drive
Kelly Drive
Sherry Kerry Drive
Edmund D. Pellegrino Road
Patriots Road
Lauterbur Drive

Fields:

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