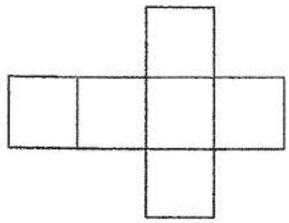
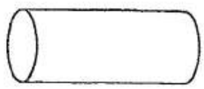
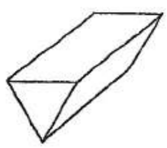
Math 8 – Unit 5
Measurement

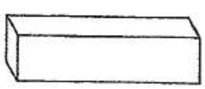
A net is a 2-D pattern that you can fold to create a 3-D object. For example, this is a net for a cube.

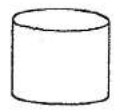


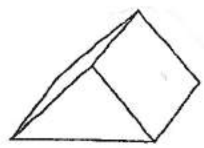
Match each object to its net.

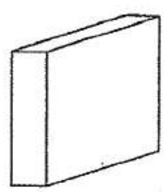
a) ____ 

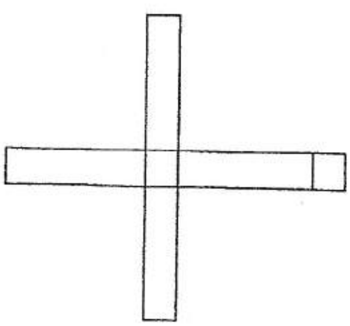
b) ____ 

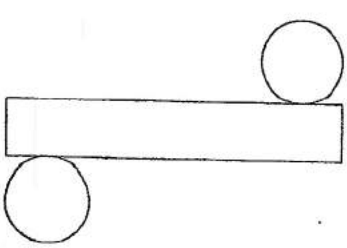
c) ____ 

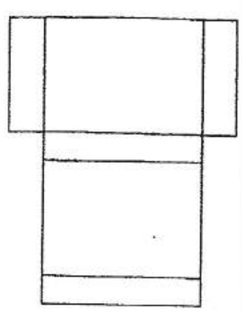
d) ____ 

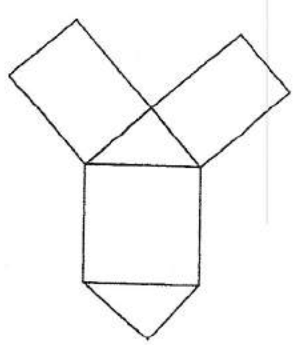
e) ____ 

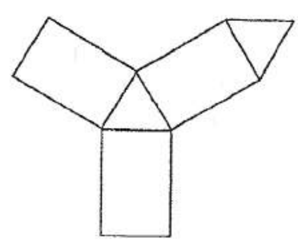
f) ____ 

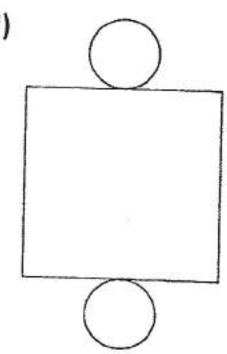
i) 

ii) 

iii) 

iv) 

v) 

vi) 

Determining the Surface Area of Prisms and Cylinders.

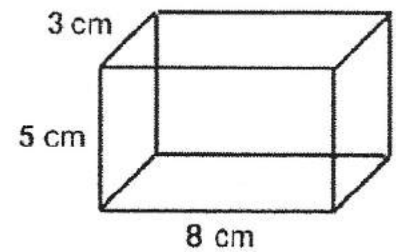
The **surface area** of a prism is the sum of the areas of all its **faces**.

Area of top and bottom faces = 2(8x3) = 48 cm^2

Area of front and back faces = 2(5x8) = 80 cm^2

Area of side and side = 2(3x5) = 30 cm^2

Surface Area = 158 cm^2



The **general formula** for the surface area of a rectangular prism is

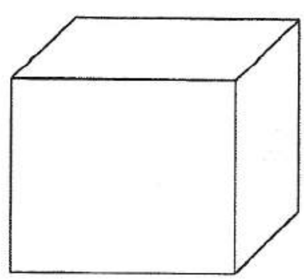
$$S.A. = 2(L \times W) + 2(H \times L) + 2(W \times H)$$

SA = (AREA FRONT + AREA BACK) +
(AREA TOP + AREA BOTTOM)
(AREA RIGHT + AREA SIDE

The formula for the surface area of a cube is:

$$S.A. = 6e^2$$

e = edge (side)



The formula for the surface area of **triangular prisms** is:

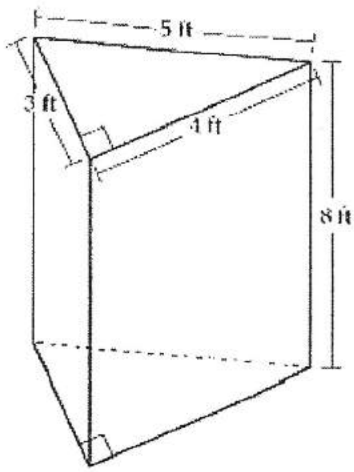
$$S.A. = ab + ph$$

a = altitude of the base triangle

b = base of the base triangle

p = perimeter of the triangle

h = height (distance between triangles)



Note: The figure is not drawn to scale.

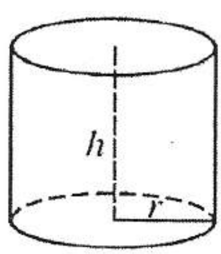
$$\begin{aligned} S.A. &= ab + ph \\ &= (3)(4) + (3+5+4)(8) \\ &= 12 + (12)(8) \\ &= 12 + 96 \\ &= 108 \text{ square feet} \end{aligned}$$

The formula for the surface area of **cylinders** is:

$$S.A. = 2\pi r^2 + 2\pi rh$$

r = radius

h = height



Find the surface are of a cylinder if:
h = 10 m
r = 5 m

$$\begin{aligned} S.A. &= 2\pi r^2 + 2\pi rh \\ &= 2(3.14)(5)(5) + 2(3.14)(5)(10) \\ &= 157 + 314 \\ &= 471 \text{ m}^2 \end{aligned}$$

Determining the Volume of Prisms and Cylinders.

Volume - is the amount of space filled by an object.
- has 3 dimensions
- is measured in cubic units (cm^3)

VOLUME = Area of the base x height

Volume of Rectangular Prisms:

V = area of base x height

V = lwh

Volume of Cubes:

V = area of base x height

V = lwh

V = e(e)(e)

$V = e^3$

Volume of Triangular Prisms:

V = area of base x height

V = 1/2ab (h)

V = 1/2abh

Volume of Cylinders:

V = area of base x height

$V = \pi r^2 h$

Try the following questions.

1. Sam is painting a box that is 20 cm by 18 cm by 8 cm. What surface area does he need to paint? What's the volume of this box?

2. Calculate the surface area and volume of a cube with all sides 7 cm long.

3. Calculate the surface area of a triangular prism that is 9 cm long. The base is an isosceles triangle that is 6 cm wide and 2 cm high.

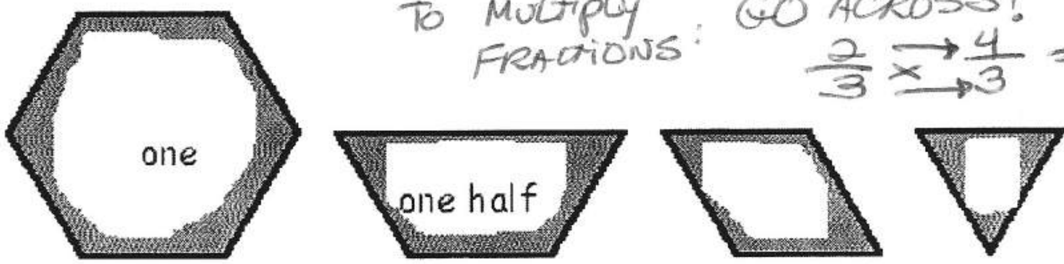
MATH 8

FRACTION OPERATIONS REVIEW
-- MULTIPLY and DIVIDE --

OBJECTIVE: You have learned how to multiply and divide fractions and mixed numbers, using manipulatives, diagrams and symbols

MULTIPLY A FRACTION BY A WHOLE NUMBER

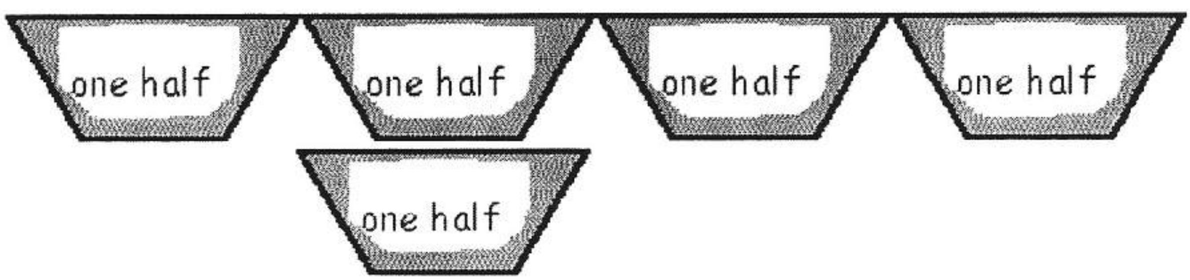
TO MULTIPLY FRACTIONS: GO ACROSS! $\frac{2}{3} \times \frac{4}{3} = \frac{2\times4}{3\times3} = \frac{8}{9}$



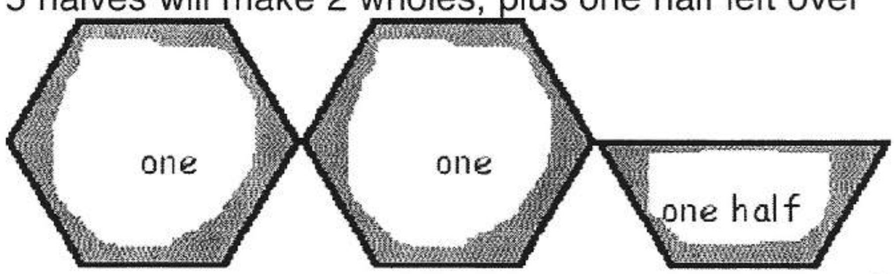
MAKE THE 5 INTO A FRACTION

EX. #1 USE A MODEL TO SOLVE $(5)(\frac{1}{2}) = x$ $\frac{5}{1} \times \frac{1}{2}$

Choose the fraction tile required to model the question -- use 5 of the 'one half' tiles



To solve, put the tiles together to make as many wholes as you can -- 5 halves will make 2 wholes, plus one half left over



which makes two and one half

$(5)(\frac{1}{2}) = x$, $x = \frac{5}{2}$ *or* $2\frac{1}{2}$

EX. #3 USE A MATH RULE TO MULTIPLY A FRACTION BY A WHOLE #

$$(5)(\frac{1}{2}) = x\ ,\ (5)(\frac{3}{4}) = x$$

After looking at the solutions that we achieved using the manipulatives and the numberline, it appears that there may be a pattern (rule) to follow when we multiply fractions.

If the whole number, in each case, was made to look like a fraction with a numerator and denominator, it looks as if we only have to multiply the numerators and the denominators to find the product of the fractions.

The denominator of a whole number is always one (1).

$$(5)(\frac{1}{2}) = x \qquad (5)(\frac{3}{4}) = x$$

$$(\frac{5}{1})(\frac{1}{2}) = x \qquad (\frac{5}{1})(\frac{3}{4}) = x$$

$$\frac{(5)(1)}{(1)(2)} = x \qquad \frac{(5)(3)}{(1)(4)} = x$$

$$\frac{5}{2} = x \qquad \frac{15}{4} = x$$

PRACTICE #1

Please use a manipulative diagram or numberline to determine the following products. Please be certain that your answers are reduced to basic fractions.

1. $(3)(\frac{1}{5}) = x$
2. $(5)(\frac{2}{3}) = x$

Multiplication using a Diagram:

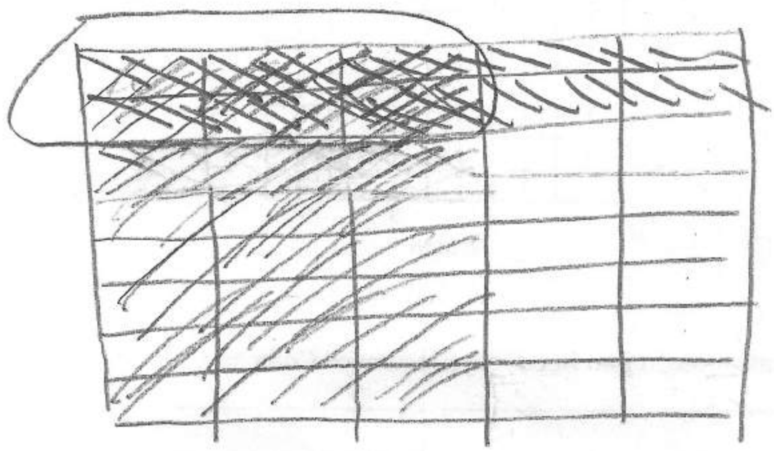
$\frac{3}{5} \times \frac{2}{8}$

$\frac{3}{5}$ ↓ Columns

5 columns
3 are shaded
use ////

$\frac{2}{8}$ ↓ Rows ↓

8 Rows
2 are shade
use ≡



Look for the double shaded area

Out of 40, only 6 are shaded. So:

$$\frac{3}{5} \times \frac{2}{8} = \frac{6}{40}$$

Simplify

$$\downarrow$$

$$\frac{3}{20}$$

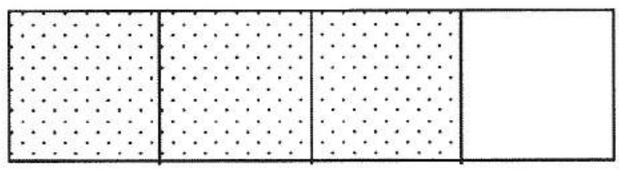
Now:
- Easier if you do it numerically first
- Simplify the answer
- Match it with the drawing.

MULTIPLY A FRACTION BY A FRACTION

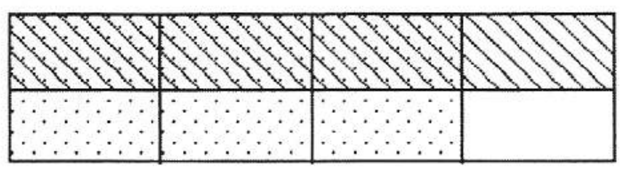
EX. #1 USE A DIAGRAM TO MODEL THE MULTIPLICATION

$(\frac{3}{4})(\frac{1}{2}) = x$ Go ACROSS!

We will start by drawing a figure (a rectangle, this time), dividing and shading it to illustrate the first fraction, $\frac{3}{4}$.



We now divide and shade the figure to show the second fraction, $\frac{1}{2}$, on top of the first fraction.



The rectangle that we started with is now divided into 8 sections, the denominator of the product. The sections that are shaded with both styles of shading, three of them, represent the numerator of the product.

This procession shows how to illustrate that $(\frac{3}{4})(\frac{1}{2}) = \frac{3}{8}$.

EX. #2 USE A MATH RULE TO MULTIPLY 2 FRACTIONS

After looking at the progression with the diagrams shown above, it looks as if the process for multiplying 2 fractions is the same as for multiplying a fraction by a whole number -- multiply the numerators to get the product numerator, multiply the denominators to get the product denominator, check to see that the product is reduced to basic.

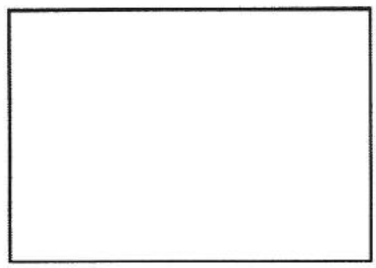
MULTIPLY A MIXED FRACTION BY A MIXED FRACTION

EX #1 USE AREAS TO SOLVE

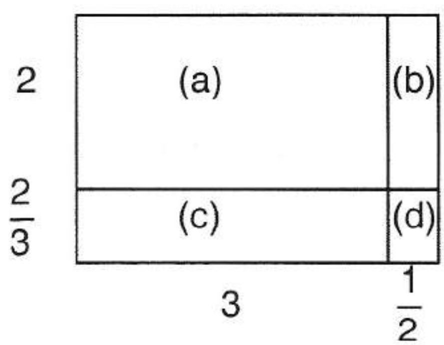
$$(3\frac{1}{2})(2\frac{2}{3}) = x$$

In order to see all of the separate multiplications that need to be done to solve this question, we will model it on a rectangle.

First, draw a rectangle.



Secondly divide the altitude and the base into 2 parts, one part representing the whole number, a smaller part representing the fraction -- extend these divisions so that the whole rectangle is divided into 4 smaller rectangles, which we will designate as (a), (b), (c), and (d)



METHOD WE TALKED ABOUT IN CLASS:

- CONVERT THE MIXED NUMBERS INTO FRACTIONS
- MULTIPLY THE FRACTIONS.

EX. #3 THE MATH RULE FOR DIVIDING FRACTIONS

$$\frac{2}{3} \div 3 = x$$

$$\frac{2}{3} \div \frac{3}{1} = x$$

$$\frac{2}{9} = x$$

When we look at the fractions from the last diagram model, it looks as if we need to flip the divison (fraction behind the '÷') and then multiply the fractions to get the final answer that we modelled, $\frac{2}{9} = x$.

The name given to a fraction that has been flipped upside down is RECIPROCAL.

The math rule for dividing any 2 fractions, without using a model or a diagram, tells us to:

1. write the first fraction (dividend), unchanged
2. change the ÷ sign to multiplication
3. write the reciprocal of the divisor (second fraction)
4. multiply as usual

$$\frac{2}{3} \div 3 = x$$

$$\frac{2}{3} \div \frac{3}{1} = x$$

$$(\frac{2}{3})(\frac{1}{3}) = x$$

$$\frac{2}{9} = x$$

MR. MARTINEZ'S METHOD:

Big C, Little C

$$\frac{3}{2} \div \frac{4}{3} = \frac{\frac{3}{2}}{\frac{4}{3}} = \frac{9}{8}$$

$\frac{\text{Big C}}{\text{small c}} = \frac{3 \times 3}{2 \times 4}$

PRACTICE #1

Please write the reciprocal of each of the following fractions.

1. $\frac{3}{4}$ =
2. $\frac{5}{2}$ =
3. 6 =
4. $\frac{4}{13}$ =

** In order to take the reciprocal of a mixed fraction, first write it in the form '$\frac{a}{b}$'. **

5. $2\frac{1}{2}$ =
6. $1\frac{7}{10}$ =
7. $12\frac{3}{5}$ =
8. $7\frac{3}{8}$ =

(Big C / Little c) or (RECIPROCAL) OR (CROSS MULTIPLICATION)

PRACTICE #2

Please use the division rule to answer the following division questions.

1. $3 \div \frac{3}{4} = x$

Remember: this is $\frac{3}{1}$

2. $\frac{5}{8} \div \frac{2}{3} = x$
3. $\frac{3}{5} \div \frac{6}{7} = x$
4. $7 \div 4\frac{2}{3} = x$
5. $1\frac{5}{6} \div \frac{7}{12} = x$
6. $1\frac{2}{3} \div 2\frac{5}{9} = x$

SIMPLIFY USING ORDER OF OPERATIONS

In order to simplify a series of operations performed on fractions, remember to follow the correct ORDER OF OPERATIONS. The term 'BEDMAS' provides the correct order of operations to look for when simplifying.

Brackets - perform operations inside of brackets first
Exponents - simplify exponents secondly
Divide, Multiply - perform these operations, in order, from left to right in the expression thirdly
Add, Subtract - perform these operations, in order, from left to right in the expression to finish the simplification

EX. #1 Simplify the expression shown below.

$$\frac{2}{3}+\frac{7}{5}+\frac{11}{6}\times 2\frac{1}{4}$$

- nothing in brackets, no exponents to simplify, no division, do the multiplication first

$$\frac{2}{3}+\frac{7}{5}+\frac{11}{6}\times\frac{9}{4}$$

$$\frac{2}{3}+\frac{7}{5}+\frac{33}{8}$$

- complete the simplification by adding, from left to right

$$\frac{30}{120}+\frac{168}{120}+\frac{495}{120}$$

$$\frac{80+168+495}{120}$$

$$\frac{743}{120} \text{ or } 6\frac{23}{120}$$ -- final simplification

EX. #2 Simplify the following expression

$$\left(\frac{4}{3}-\frac{1}{2}\right) \div \frac{5}{3} \times 1\frac{3}{4}$$

- do the work in the brackets first

$$\left(\frac{8}{6}-\frac{3}{6}\right) \div \frac{5}{3} \times 1\frac{3}{4}$$

$$\frac{5}{6} \div \frac{5}{3} \times 1\frac{3}{4}$$

- only dividing and multiplying remain -- do this in order, from left to right

$$\left(\frac{5}{6}\right)\left(\frac{3}{5}\right)\left(\frac{7}{4}\right)$$

- cancel common factors to give

$$\left(\frac{1}{2}\right)\left(\frac{1}{1}\right)\left(\frac{7}{4}\right)$$

$\frac{7}{8}$ -- final simplification

PRACTICE

Please simplify each of the following expressions, using the correct order of operations. Please show your work.

1. $\frac{1}{2} \div \frac{1}{2} + \frac{1}{2} \div \frac{1}{2}$

2. $\left(1 - \frac{3}{4}\right) \times \frac{3}{7} \times 2$

3. $1\frac{2}{5} \times 2\frac{1}{2} \div \left(1\frac{1}{8} - \frac{2}{3}\right)$

4. $\left(4\frac{1}{2} - 3\frac{1}{4}\right)^2 \div 1\frac{7}{8}$

Integers

Objective: Demonstrate an understanding of multiplication and division of integers concretely, pictorially and symbolically.

Multiplying and Dividing integers

The product or quotient of two integers with the same sign is a positive integer

Ex: (+6) x (+4) = +24   (+12) (+4) = (+3)

(-3) x (-6) = +18   (+16) (+2) = (+8)

The product or quotient of two integers with different signs is a negative integer

Ex: (-4) x (+3) = -12   (-20) (+5) = -4

(+2) x (-8) = -16   (+25) (-5) = -5

You can model multiplication and division with a number line or counters.

Division question	Counter model	Number line model	Related multiplication
12 ÷ 3 = 4	The number of groups is the quotient.	0 3 6 9 12 The number of small arrows is the quotient.	12 ÷ 3 = is related to · 3 = 12
−12 ÷ (−3) = 4	The number of groups is the quotient.	−12 −9 −6 −3 0 The number of small arrows is the quotient.	−12 ÷ (−3) is related to × (−3) = −12
−12 ÷ 3 = −4	The number of blue counters in each group is the quotient.	−12 −8 −4 0 The length and direction of each small arrow is the quotient.	−12 ÷ 3 = is related to × 3 = −12
12 ÷ (−3) = −4	Dividing a positive integer by a negative integer cannot be represented easily using counters or a number line.		12 ÷ (−3) = is related to × (−3) = 12

Source: Nelson Math Focus 8

Remember:

(+) × (+) = +

(−) × (−) = +

(+) × (−) = −

Same as Division

(+) ÷ (+) = +

(−) ÷ (−) = +

(+) ÷ (−) = −

Order of operations

- Do the operations in brackets first
- Multiply and Divide, in order, left to right
- Add and subtract, in order, left to right
- When the expression is written as a fraction:
    - Evaluate the numerator (the equations on top) and denominator separately
    - Then divide the numerator by the denominator

Practice questions

1. Use counters or a number line to represent each expression.
    a. 5 x (2)
    b. -2 x (8)
    c. 6 x (-10)
    d. -5 x (-5)
    e. 15 / 3
    f. -25 / 5
    g. 36 / (-9)
    h. -27 / -3

2. Calculate.
    a. 6 x (-1)
    b. -9 x 3
    c. -12 x (-12)
    d. -96 / (-16)
    e. -98 / 14
    f. 88 / (-11)

3. Determine the missing values.
    a. -34 x ___ = 306
    b. 28 x ___ = -336
    c. ___ / 8 = -7
    d. ___ / (-18) = 23

Remember: an ordered pair looks like this

(2, 3)
(2 → always x; 3 → always y)

Linear Relations

Review:

A **relationship** is a pattern formed by two sets of numbers.

There are many different ways to communicate a relationship:

- **In words**
- **Using an algebraic expression**
- **Using a table of values**
- **Graphing**

We call a relationship a **linear relation** if the set of points lie in a straight line, and if the consecutive values in a table of values always change by the same amount.

After making a table → If x shows a pattern AND y shows a pattern ⇒ LINEAR RELATION

Practice:

1. For each of the following statements, write a mathematical expression:

a. Double the length, increased by 2

b. 4 less than a number

c. Candies shared equally among 5 students

d. A gain of 10 points from yesterday

e. 3 times as many seeds

Remember:

- to solve linear equation problems:

1. Use $x = 0, 1, 2, 3$
2. Make a table. Substitute each value of x on the equation.

$y = 4x - 1$ →

x	y
0	-1
1	3
2	7
3	11

(+4, +4)

x goes up by 1
y goes up by 4

Because both have a pattern, this is a linear ...

2. The cost to rent a banquet hall is $50, plus $2 per person.

a. Complete a table of values for this data:

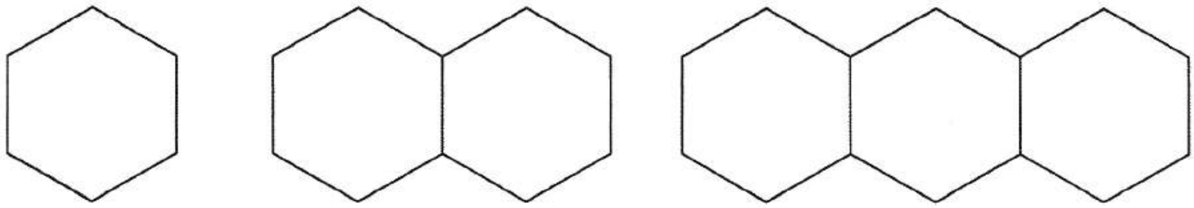
# guests	0	10	20	30	40	50
cost ($)						

b. Use an expression to show the relationship:

c. Create a graph.

d. Is the relationship linear? Explain how you know.

3. The regular hexagons in the diagrams are made from toothpicks.



a. Draw the next two diagrams.

b. Express the pattern in words

c. Use an expression to show the pattern

d. Complete a table of values

4. Express each of the following mathematical expressions in *words*.

a. $x + 17$

b. $25 - x$

c. $2(x + 2)$

d. $y + 3y$

e. $20n$

GR 8 REVIEW LINEAR RELATIONS

KEY WORDS: •relationship •table of values •expression •linear relation •variable •formula •equation

1. Equipment rentals at a ski shop require a one-time fee of \$65 plus an additional daily charge of \$20. The cost is represented by the linear relation , where *c* is the total cost and *n* is the number of days.

a) Complete the table of values for up to five days of rentals.

Number of Days, *n*	**Cost, *c* (\$)**
1	
3	
	145
5	165

b) Graph the ordered pairs.

2. The cost of a TV repair is $25/h plus a house-call fee of $65.
a) Complete the table of values for up to five hours work.

Number of Hours, *n*	**Total Cost, *c* ($)**

b) If a repair takes two hours, what will the total cost be?

3 **a)** Follow the pattern to complete the table of values below.

Term, *t*	1	2	3	4	5	6	7	8	9	10
Value, *v*	6	12	18	24						

b) Is this a linear relation? Explain how you know.

Remember: Both X an Y have to have a constant pattern to make the equation a Linear equation.

GRADE 8 MATH - LINEAR EQUATIONS

KEY WORDS. •equation •linear equation •variable
•constant •distributive property
•numerical coefficient

1. Todd is solving the equation $t + 14 = 28$. What is wrong with his solution?

$t + 14 = 28$

$t + 14 - 28 = 28 + 28$

$t - 14 = 0$

To solve equations:
- You want to make sure the variable ends up by itself on one side of the equal sign.
- To do that, you must perform the opposite operation of whatever you want to get rid of
Adding ←opposite→ Subtracting
Multiplying ←opposite→ Dividing

2. Solve the equation. Verify your answer.

• whatever you do on one side, you MUST do on the other side.

$2x + 3.5 = 11.5$

1. get rid of the +3.5:
$2x + 3.5 - 3.5 = 11.5 - 3.5$
(this eliminates 3.5). so:
$2x = 8$
2. Eliminate the 2 by the x. Since the 2 is multiplying the x, you must divide by 2 → $\frac{2x}{2} = \frac{8}{2}$ so
$x = \frac{8}{2} = 4$

3. Using tiles to model the equation $3x + 2 = 11$.

4. A rectangular garden has a length of 24 m and a perimeter of 92 m. Write and solve an equation to determine the width, w. Verify your solution.

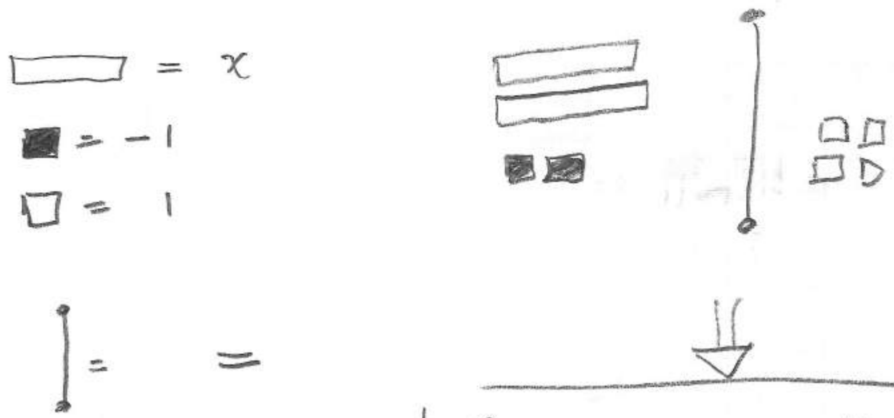
5. If the perimeter of a square is known, the formula for the side length, *s*, is $\frac{p}{4}$. If the perimeter of a square field is 12 km, what is the length of one side of the field? Verify your solution.

6. Solve using symbols . $\frac{x}{5} = 12$

7. Solve using symbols. $5(x - 1) = 35$

8. Model and solve with tiles. $\frac{x}{2} - 1 = 18$

• In a graph representation of an equation:



$$2x - 2 = 4$$

Then, solve the equation

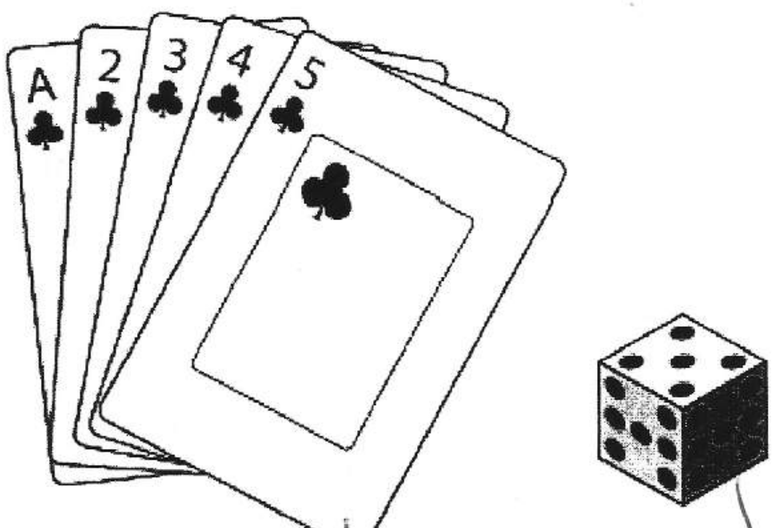
Remember: • FOR independent (or different) events, you must MULTIPLY All THE PROBABILITIES TOGETHER

GRADE 8 MATH REVIEW PROBABILITY

Probability = $\frac{\text{\# favourable outcomes}}{\text{\# Total possible outcomes}}$

KEY WORDS: •independent events •probability •favorable outcome •simulations

1. Draw a table to show all of the possible outcomes when a card is drawn and the die is tossed. What are the chances of randomly rolling a 2 and drawing the 2 of clubs?



THESE TWO EVENTS ARE INDEPENDENT. THEREFORE, YOU MUST MULTIPLY

CHANCE OF DRAWING A 2 : 2 of 5 or 2:5 or $\frac{2}{5}$

Chance of Rolling a 2 : $\frac{1}{6}$ or 1 of 6

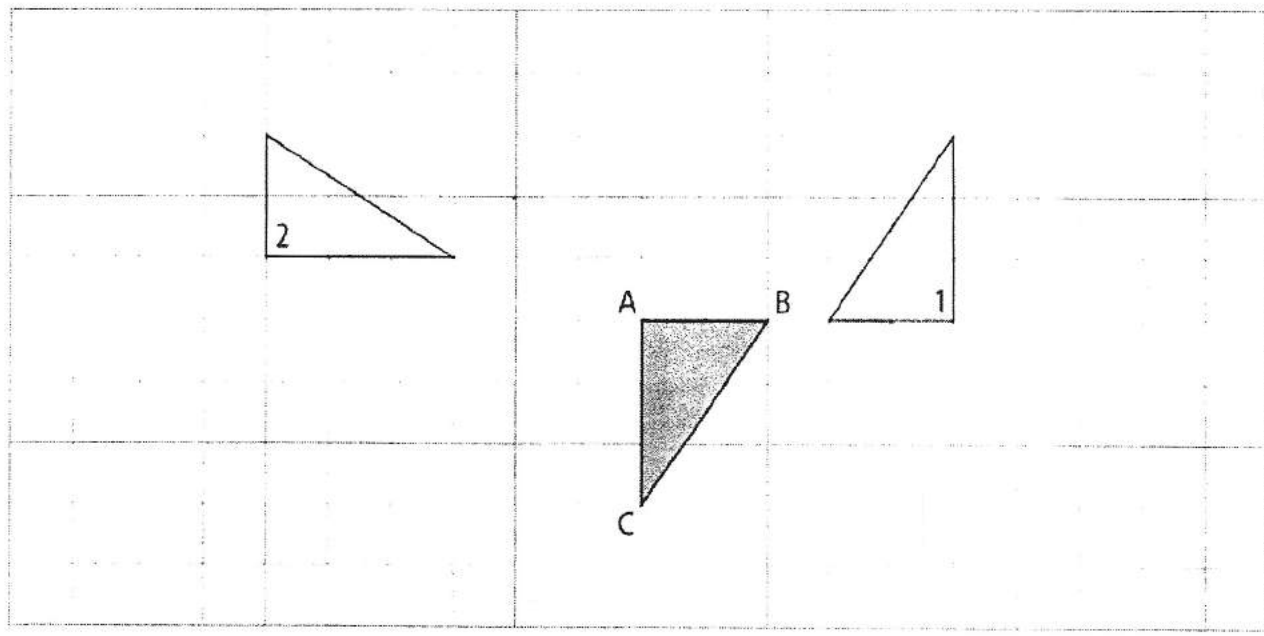
$$\frac{2}{5} \times \frac{1}{6} = \frac{2}{30} = \frac{1}{15}$$

1 of 15

2. Two six-sided dice are rolled. What is the probability of rolling two numbers that have a sum of five?

3. Scott's sock drawer contains one pair of green socks, four pairs of white socks, and two pairs of black socks. His shirt drawer contains three white T-shirts, two blue T-shirts, and one green T-shirt. What is the probability of pulling out a pair of white socks and a white T-shirt?

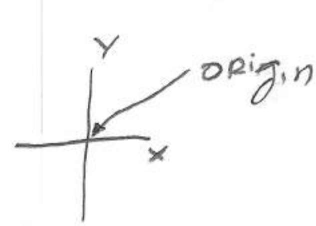
5. Figure 1 and Figure 2 are transformations of ΔABC. Identify the type of transformation for each.



Types of Transformations

Reflection: A mirror image
- If Reflected on the x-axis, only the y coordinates change
(2, 3) → (2, -3)
- If Reflected on the y-axis, only the x coordinates change
(4, -3) → (-4, -3)

Rotation: (figure changes)
• about the origin means
• Rotation of 90° or 180°
90° ↓ makes an "L"
180° → the inverse



Translation: • the figure does not change. It just moves!

Math 8 Review – Statistics and Data Analysis

Alberta Education Curriculum

General Outcome - Collect, display and analyze data to solve problems.

Specific Outcomes - Critique ways in which data is presented in circle graphs, line graphs, bar graphs and pictographs.

Key Words :

Circle Graph	**Line Graph**
Bar Graph	**Double Bar Graph**
Discrete Data	**Pictograph**

Q. Why do we use graphs?

A. When a survey or study is done and the data of interest is collected, graphs are very useful to visually display the results so it can be easier to interpret the data and make comparisons.

The Process

When doing a survey or research data is acquired and can be presented in many ways. Graphs are very effective. The type of graph can greatly aid in the presenting of the data. However, if it is not presented fairly or completely a graph can misrepresent the data.

Here are some suggested steps to guide in the making of different types of graphs:

The example which will be used will be a survey of a Grade 8A homeroom as they try to decide on what kind of classroom pet they would like to get. For the double bar graph a second class was surveyed for their input.

Step 1 – Choose a specific fair-minded question to survey the group with.
ie. "Which of the following pet types would you choose for in our class this year; a lizard, aquarium fish, a frog, a spider or a snake?"

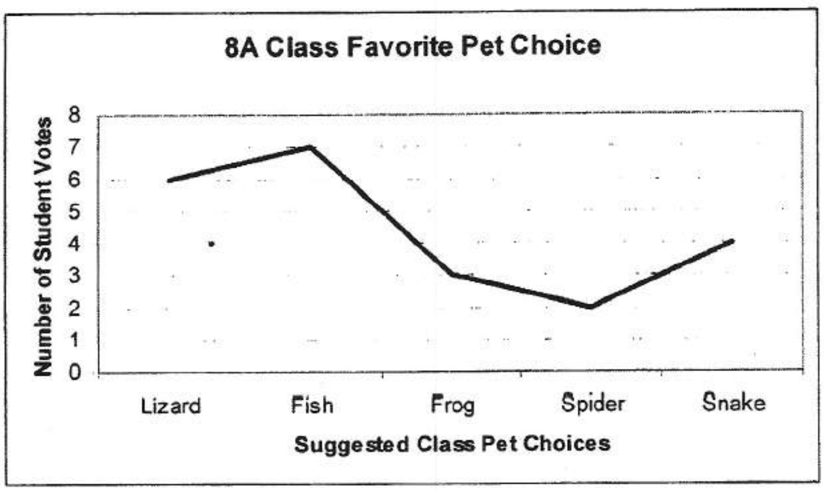
Step 2 – Create a tally chart or table to collect and summarize the data. Include a title and sub-heading to identify each column.

Step 4 – Decide on the:

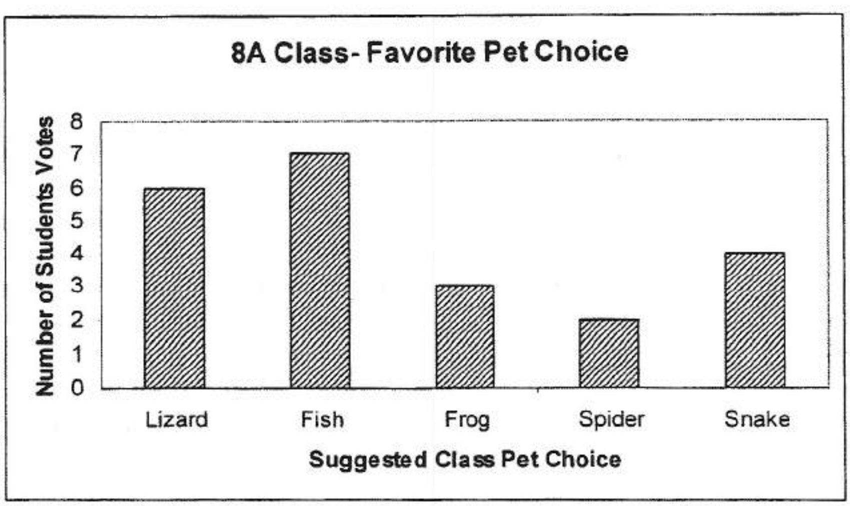
- title, specify the objective of the data,
- graph orientation (horizontal or vertical),
- intervals or scale of the values depicting the data on the appropriate axis,
- categories of the subjects.

Step 5 – Create the graph using a straight edge or rule. Make it neat, clear and accurate. Model the example illustrated below:

Line Graph

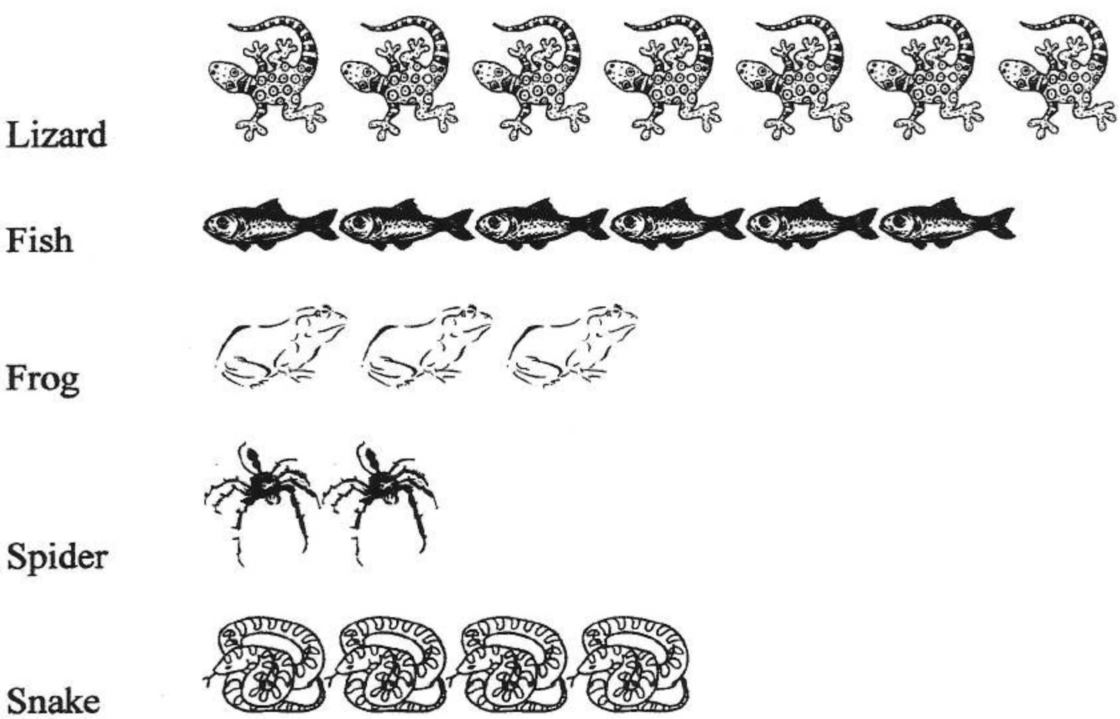


Bar Graph



Pictograph

8A Class – Favorite Pet Choice



[Each picture represents one student's vote.]

Computer Generated Graphs : To learn to quickly how to create computer generated graphs try using the "Microsoft Excel" spreadsheet. Make a table on the spreadsheet with the desired categories and data, then drag the mouse across and highlight the cells of the table created. Click on the "Chart Wizard" button in the top tool bar, which looks like a small bar graph. Then follow the suggested procedure but do not be afraid to experiment with the settings to find out the various options.
(Also refer to Textbook – Math Sense 8 , published by Pearsons, 2008, page 391.)

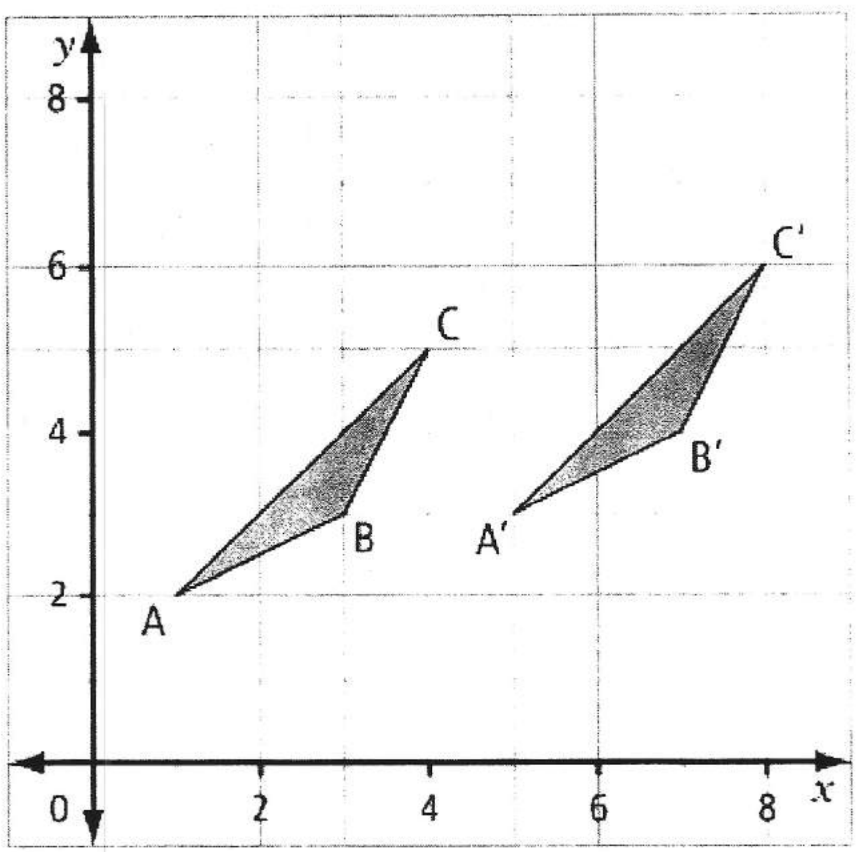
GR. 8 MATH REVIEW TESSELLATIONS

KEY WORDS
- vertices
- translation
- coordinates
- rotation
- reflection
- image

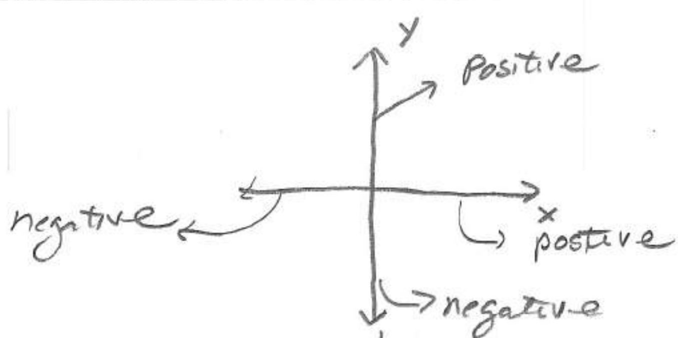
1. Find the new coordinates for each point after the given translation.

	Point	**Translation**
a)	A(1, 1)	3 units right
b)	B(3, 1)	1 unit down
c)	C(4, 2)	1 unit right and 2 units up

2. Describe the transformation that creates the new image ΔA'B'C'.



Remember



3. A figure has vertices at A(1, 5), B(2, 5), C(2, 4), D(3,4), E(3, 3), F(4,3), G(4,2), and H(1, 2). Draw the figure on the coordinate grid. Identify the image, and draw the image of the figure after a reflection along the mirror line. The mirror line is formed by joining the points (5, 6) and (5, 1).

4. Which capital letters of the alphabet have identical images after a reflection? Identify each letter and explain how to reflect it to get an identical image. Also identify the letters that do not reflect.