Chapter 1: Real numbers

- **Pythagorean Theorem**: $a^2 + b^2 = c^2$

  $b^2 = c^2 - a^2$
- **Laws of Exponents**:

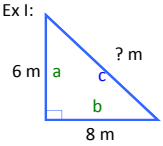
$a^0 = 1$ $\quad a^1 = a$ $\quad a^{-n} = \frac{1}{a^n}$

$(a^n a^m) = a^{m+n}$ $\quad \frac{a^m}{a^n} = a^{m-n}$

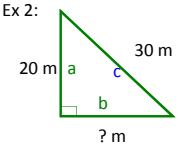
$(a^n)^m = a^{m \times n}$ $\quad (ab)^m = a^m b^m$ $\quad \left(\frac{a}{b}\right)^m = \frac{a^m}{b^m}$

- **Scientific notation**: a x 10^n

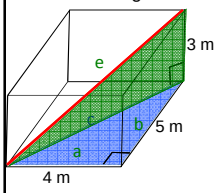
Ex I:



Ex 2:



Ex. 3 How long is the RED string in this box?



Ex 4: Simplify the following expression

$$\frac{((x^9y^3)^6)^{\frac{1}{3}} \cdot (x^4y^2)^{-2}}{((x^5y^8)^{-4})^{-\frac{1}{2}} \cdot (y^3)^{-4}}$$

Ex. 5 Express using scientific notation

POSITIVE EXPONENT

a) 5600

NEGATIVE EXPONENT

b) 0.00042

Chapter 2: Algebraic Expressions

- **Polynomials**: Monomials, Binomials, Trinomials
- **Vocabulary**: Coefficient, like terms, degree $3x^7$
- **Adding/Subtracting polynomials**
  - Group like terms only
  - Exponents don't change
- **Multiplying/Dividing polynomials**
  - Add/subtract exponents of terms with same base
  - F O I L: multiplying 2 binomials
- **Common factor .**

Ex. 1 Adding Polynomials: Group like terms

$3x^2 + 5x + 10x =$

$8xy^2 + 9x^2y + 5xy^2 =$

$6a + 7a + 12b + 5b =$

$7y + 6 + 8y^2 + 10 =$

Ex. 2 Subtracting Polynomials

$7x - (5x + 10x) =$

$8x^2 + 4x - (6x^2 + 2x) =$

$4a + 7b - (12a - 5b) =$

$7c + 6c^2 - (8c^2 - 10) =$

Ex. 3 Multiplying Polynomials

$3x(5x^2 + 2x) =$

$-5(2x + 1) =$

$-2x^2(3x + 5) =$

$\frac{2}{3}x^2(6x^3 - 9x + 3) =$

Ex. 4 Foil

$(x+2)(x+2) =$

$(x-3)^2 =$

$(4x-3)(2x+1) =$

Ex 5: Expand and Simplify:

a) (3x+5)(2x-4)=

b) $(3x^2 - 5x) - (6x^2 - 2x + 4)$=

c) $\frac{(4x^2y^3)^2}{(3^2y^2)^2}$ =

d) $5x + 7y - 2(2x - 6y) =$

Ex. 6 Division of a Polynomial- *Divide each monomial individually*

$\frac{9x^3 + 6x^2 - 12x}{3x}$

$\frac{18a^2 + 12ab}{3a}$

$\frac{18x^2 + 8x + 6}{3}$

$\frac{20xy^5 - 15xy^2 + 30x^2y^4}{5xy}$

Ex. 7 Factor by pulling out the GCF

4x+6=

9x-15=

$6x^2+10x$=

$49x^3y^2 - 21x^2y^2 + 14x^3y^3$=

$2a^2b^2-6ab^3+4ab^2$=

x(x+3) +2(x+3)=

Chapter 3: Equations & Inequalities

- **Solving Equations (=)**
  - Keywords: same as, equal, equivalent,
  - Solve for the unknown variable
  - There is one unique solution
- **Solving Inequalities (< ; ≤ ; > ; ≥)**
  - Keywords: less than; less than or equal to(maximum); greater than(more); greater or equal to(minimum)
  - There is an interval of possible solutions.

Ex 1: 5x + 12 ≤ 3x+ 20

Line Interval Set Builder

Ex 2 -5x ≤ 2x- 21

Line Interval Set Builder

Ex 3 2(2x-1) - 3(x+1) ≤ 2(x-3)

Line Interval Set Builder

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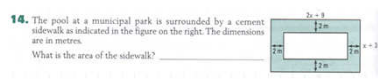
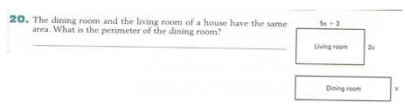




Chapter 4: Relations & Functions

- Linear Function
  - ➢ y = ax + b; a: Rate of Change; b: Initial value (or y-intercept)
  - ➢ Constant: y = b; a = 0; horizontal line
  - ➢ Direct: y = ax; b = 0; line through origin
  - ➢ Partial: y = ax + b; line not thru origin
- System of linear equations
  - ➢ Solve for the point of intersection (x,y)
- Rational function
  - ➢ $y = \frac{k}{x}$ Curve , never touches either axes.

Find the rate of Change for the Following

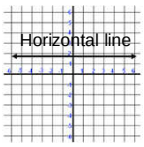
Ex 1: A tank initially contains 56 000 L of eggnog. The tank is leaking!
After 5 hrs the tank has 45 000 L .

Ex 2: Jen earns $240 for 20 hours of work. For 10 hours of work she earns $120. What is her hourly rate?

1. Constant Function: Degree 0

General form : f(x)= b or y = b

x	y	1st Difference
0	3	0
1	3	0
2	3	

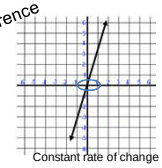


First differences are **ZERO**

2. Direct Linear Function: Degree 1

General form : f(x)=ax or y = ax

x	y	1st Difference
0	0	3
1	3	3
2	6	3
3	9	

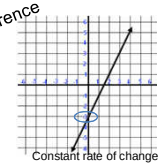


The first differences are **CONSTANT**

3. Partial Linear Function: Degree 1

General form : f(x)=ax + b or y = ax+ b

x	y	1st Difference
0	-3	2
1	-1	2
2	1	2
3	3	



The first differences are **CONSTANT**

A travel agency has posted the following sign in its display window:

Ex 4:

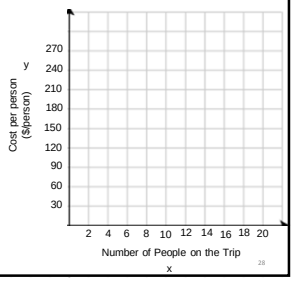
What rule does the agency use to determine the price of its travel packages given that this price depends on the number of nights a customer spends at the hotel?

How much will 10 days cost? (4, 893) and (7, 1295)

Ex 5: A giant tank of eggnog containing 6500 L of eggnog is being emptied at a rate of 95 L/min into a giant container. If the container already had 80 L of eggnog, when will the container have the same amount of liquid as the tank?

EX 6: Our class goes on a trip to _____. The bus we rent, costs at total of $240 for the weekend.

# of People	Cost per person ($)
1	
2	
4	
8	
12	
16	
20	
24	



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match the situation with the appropriate table of values and graph.

Situations

1. The number of painters and the number of hours required to paint the house

2. The cost of renting a shop vacuum that includes an initial amount and a fixed hourly rate

3. The hourly wage for each painter once they are hired.

Table of Values

A

X	Y
0	0
15	30
20	40

B

X	Y
1	23
2	31
3	39

C

X	Y
2	30
3	20
4	15

Graph

X Y Z

Situation	Table of Value	Graph
1		
2		
3		

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Chapter 5: Solids

- Views of solids:
  - Top, Bottom, Left, Right, Front, Back
- Perspectives:
  - Oblique
  - Axonometric
  - Linear.

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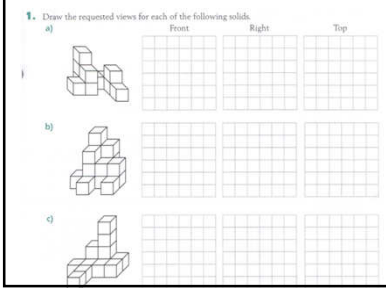
4. Views of a Cube (*Exam question)



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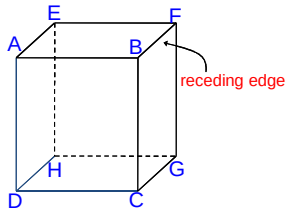
1. Oblique Perspective



- The face ABCD is parallel with the sheet's plane
- The receding edges are the same length and parallel with each other.

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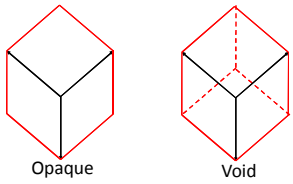
2. Axonometric Perspective



- The edges are parallel to the axes
- Not all edges are necessarily congruent (same length)

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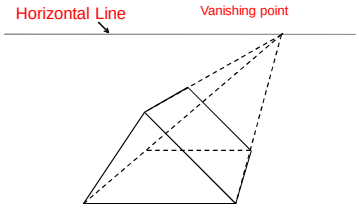
3. Linear Perspective



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Chapter 6: Area and Volume of Solids

- Areas and Volumes of solids
  - Cube, Prism, Cylinder, Cone, Pyramid, Sphere
- Areas and Volume of decomposable solids
- Finding the missing measure
- Conversion charts

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Recall the AREA of a:

1. Rectangle = $l \bullet w$
2. Square = b^2
3. Parallelogram = $b \bullet h$
4. Circle = πr^2
5. Triangle = $\frac{b \bullet h}{2}$
6. Trapezoid = $(\frac{B+b}{2}) \bullet h$
7. Rhombus = $\frac{D \bullet d}{2}$
8. Regular polygon = $\frac{P_{base} \bullet a}{2}$

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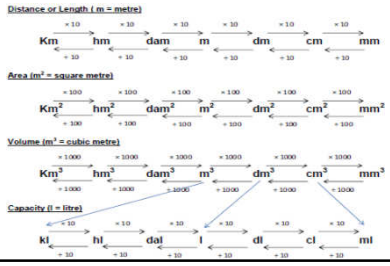
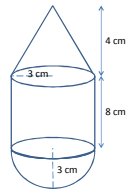
SOLIDS	LATERAL AREA	TOTAL AREA	Volume
RIGHT PRISMS	$A_{LAT} = P_B \bullet h$	$A_{TOT} = P_B h + 2A_B$	$V_{prism} = A_b \bullet h$
RIGHT CYLINDERS	$A_{LAT} = 2\pi rh$	$A_{TOT} = 2\pi rh + 2\pi r^2$	$V_{cylinder} = \pi r^2 \bullet h$
RIGHT REGULAR PYRAMIDS	$A_{LAT} = \frac{P_b\, s}{2}$	$A_{TOT} = \frac{P_b\, s}{2} + A_b$	$V_{pyramid} = \frac{A_b \bullet h}{3}$
RIGHT CONES	$A_{LAT} = \pi rs$	$A_{TOT} = \pi rs + \pi r^2$	$V_{cone} = \frac{\pi r^2 \bullet h}{3}$
SPHERES	$A_{LAT} = A_{TOT} = 4\pi r^2$		$V_{sphere} = \frac{4\pi r^3}{3}$
HEMISPHERE	$A_{LAT} = A_{TOT} = 2\pi r^2$ Note: if the base is included, add πr^2		$V_{sphere} = \frac{2\pi r^3}{3}$

King Henry's Dreadful Mother Didn't Care Much

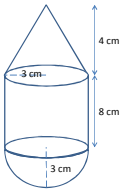


Ex 1: Find the total surface area of this space probe.



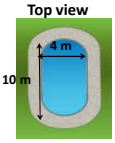
Note the hidden bases between the cone, cylinder, and the hemisphere.

Ex 2: Find the volume of this space probe.



Ex 3: Find the area of the liner that covers this 3m deep pool.

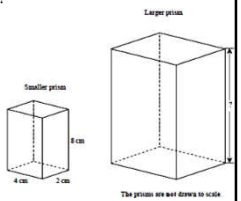
Top view



Chapter 7: Isometry and Similitude

- When two solids are similar
  - The ratio of their sides is K
    - Sides of the larger solid are K times bigger than the smaller one.
  - The ratio of their areas is K^2
    - Area of the larger solid is K^2 times bigger than the smaller one
  - The ratio of their volumes is k^3
    - Volume of the larger solid is k^3 times bigger than the smaller one.

Ex 1: The 2 rectangular right prisms below are similar. The dimensions of the smaller prism are given in the diagram. The volume of the larger prism is 1728 cm^3. What is the height of the larger prism?



Chapter 8: Probability

- Basic counting principle
  - Permutation (with/without repetition)
  - Combination (with/without repetition)
- Probability of events
  - Prob = $\frac{\text{\# of desired outcomes}}{\text{total \# of outcomes}}$
- Geometric Probability
  - 1D P(Target) = $\frac{\text{Target length}}{\text{Total length}}$
  - 2D P(Target) = $\frac{\text{Target area}}{\text{Total area}}$
  - 3D P(Target) = $\frac{\text{Target volume}}{\text{Total volume}}$

	With repetition (or replacement)	Without repetition (or replacement)
Permutations (with order)	n^k	n! (if all items) or $\underline{n}\,(\underline{n-1})\,(\underline{n-2})\ldots$ (if k items)
Combination (without order)	$\frac{(n+k-1)!}{(n-1)!\,k!}$	$C_k^n = \frac{n!}{(n-k)!\,k!}$

n is the total available items/choices
k is the number of items/choices needed

Ex 1: 8 students are auditioning for parts in a school musical. Adam, Bob, Carl, Dan, Ed, Frank, George, and Howard. If only 5 will be chosen, what is the probability that it will be: Bob, Carl, Dan, Ed, and Howard?

$$\text{Prob} = \frac{\text{\# of desired outcomes}}{\text{total \# of outcomes}}$$

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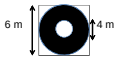
Ex 2: What is the probability of hitting the black target?

Target



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Ex 3: The NUT HOUSE factory has two types of containers, a square base prism and a cylinder. Each hour they package 20 of the prism and 25 of the cylinder. Between 2 pm and 3 pm, they had some problem with their machine and lost one of their bolts in one of the containers. What is the probability that it fell in a cylinder container?

Chapter 9: Statistics

- Type of Survey: ➢Census, Poll, or Study
- Type of variable/data: ➢Qualitative ➢Quantitative: discrete or continuous
- Sampling methods: ➢Random, Systematic, Stratified, Cluster
- Tables and Diagrams: ➢Histogram, Box and Whiskers plot
- Measures of central tendency: ➢Mode, Median, & Mean
- Measures of position: ➢Quartiles
- Measures of dispersion: ➢Range, & Interquartile range

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Ex 1: The following table shows the distribution of the 1200 students in a school.

	# of girls	# of boys
First cycle	360	345
Second cycle	240	255

A sample of 180 students is required, it must be representative of the population. How many girls from the second cycle should be in the sample?

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Ex 2: (Grouped data) find the mean height

Height	Frequency
[100,110[	8
[110,120[	2
[120,130[	7
Total	17

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Find the median

Ex 3:

Value	Frequency
2	10
4	6
5	2
6	9
9	5

Ex 4:

Value	Frequency
20	2
25	8
30	4
40	9
50	9

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Ex 5: # of movies watched at the cinema in a year. Make a Box and Whiskers plot.

3	5	8	9	12	14	16	17	17	18	19	20	20

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