

**Topics On January Mathematics Final**

(Notes By: Michal Aiash/Compilation By: Allen Shalam)

- Laws of Algebra (Packet 1-Chertok)
  - Commutative, Associative, Distributive, Identity Element, Multiplicative Inverse, Math Systems, Evaluating Expressions
- Monomials + Polynomials (Packet 2-Chertok)
  - Add, Subtract, Multiply, Divide
  - Zero, Negative Exponents (Exponential Rules)
  - Scientific Notation
- Equations + Verbal Equations (Packet 3-Chertok)
  - Solving All Equations-Including Parentheses
  - Verbal Problems including
    - Number Problems
    - Consecutive Integers
    - Coin
    - Motion
    - Perimeter-Numerical + Verbal Problems (Equations)
    - Area-Numerical (Shaded Area) + Verbal Problems (Equations)
- Inequalities (Packet 4-Chertok)
  - Graphing On A Number Line
  - Interval Notation- e.g.  $( )$ ,  $[ ]$ ,  $( ]$ ,  $[ )$
  - Verbal Problems → at most, at least, maximum, minimum, etc.
- Ratios and Proportions w/ Verbal Problems (Packet 5-Chertok)
- Circles/3D-Shapes Perimeter, Volume, Surface Area (Packet 6-Chertok)
  - Circumference/Area/Mixed W/ Other Geometric Figures + Shaded Area
  - Surface Area-Rectangular Solid, Cube, Cylinder
  - Volume-All Shapes
- Factoring (Packet 7-Chertok)
- Fractions (Packet 8-Chertok)

- Reducing
- Add
- Subtract
- Divide
- Multiply
- Verbal Quadratic Equations (Packet 9-Chertok)
- Radicals And Square Roots (Packet 10-Chertok)
- Triangles (Packet 11-Chertok)

(16) (AF)

### Aim: Perimeters

#### Area

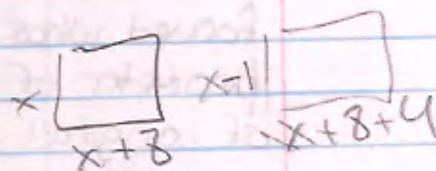
Rectangle =  $L \times W$  /  $B \times H$

Square =  $S^2$

parallelogram =  $b \times h$

Triangle =  $\frac{b \times h}{2}$

Trapezoid  $\rightarrow \frac{H(b_1 + b_2)}{2}$

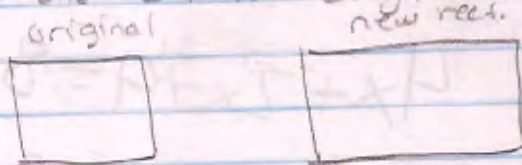


$$x + x + 8 = x - 1 + x + 4 + 8$$

$$\cancel{2x} + 8 = \cancel{2x} + 11$$

### Changing Area Problems

The length of a rect is 8 inch more than its width. If the length is increased by 4 inch + the width is decreased by 1 inch the the Area is unchanged. Find the dimensions of the original rectangle.



$l_1 = \text{length} = x + 8 \rightarrow \text{length} = x + 12$   
 $w_1 = \text{width} = x \rightarrow \text{width} = x - 1$

$$x(x + 8) = (x + 12)(x - 1)$$

$$x^2 + 8x = x^2 + 12x - 12$$

$$x^2 + 8x = x^2 + 12x - 12$$

$$-x^2 \quad -x^2$$

$$8x = 12x - 12$$

$$-12x \quad -12x$$

$$-4x = -12 \quad \boxed{x = 4}$$

$$-4 \quad -4$$



79 87

Am! Circumference + Area  $\rightarrow$  Circle

Circumference



$\frac{C}{d} = 3.14\dots = \pi$   
irrational # - non ending  
 $\pi, \sqrt{2}, \sqrt{3}$

~~$\frac{C}{d} = \pi$~~   
 $d = 2r$

$C = d\pi$   
 $C = 2\pi r$



$r = 5$  Find  $C$

$C = 2\pi r$   
 $C = 10\pi$



$C = 18\pi$   
Find:  $r$

$C = 2\pi r$   
 $\frac{18\pi}{2\pi} = \frac{2\pi r}{2\pi}$   $r = 9$

Area

Area =  $\pi r^2$   
 $A = 36\pi$



Given: Area  $\odot = 100\pi$

Find: radius

$A = \pi r^2$   
 $\frac{100\pi}{\pi} = \frac{\pi r^2}{\pi}$

$100 = r^2$   
 $\sqrt{100} = \sqrt{r^2}$   
 $r = 10$

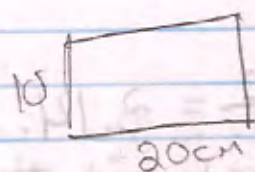
$\frac{26\pi}{2\pi} = \frac{2\pi r}{2\pi}$   
 $13 = r$

$\pi r^2$   
 $169\pi$

$\frac{13}{13} = \frac{13}{13}$   
 $\frac{169}{169} = \frac{169}{169}$

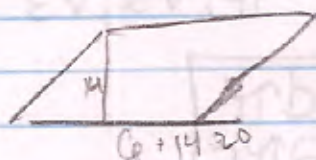
H.W. sheet

9.



$$2000 \text{ cm}$$

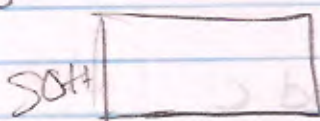
10.



$$\begin{array}{r} 2 \\ 14 \\ \times 20 \\ \hline 280 \end{array}$$

$$240 \text{ cm}$$

30



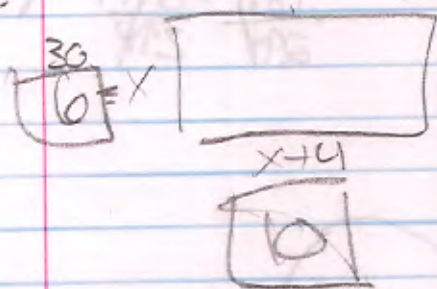
$$200 \text{ yds}$$

$$1000 \text{ ft}$$

$$30,000 \text{ ft}$$

$$10,000 \text{ yds}$$

p. 139

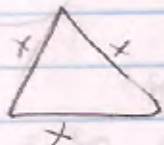
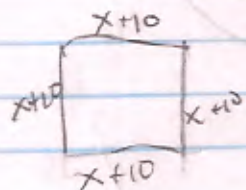


per.  $2x + 2x + 8$   
 $\leftarrow 4x + 8$

$$\begin{array}{r} 4x + 2x + 4 = 4x + 16 \\ 6x + 4 = 4x + 16 \\ -4x \quad -4x \\ \hline 2x + 4 = 16 \\ -4 \quad -4 \\ \hline 2x \quad 12 \\ \hline x = 6 \end{array}$$

Equilateral

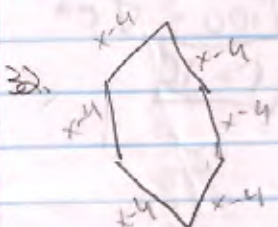
31



$$4(x+10) = 3(3x)$$

$$4x + 40 = 9x$$

$$\begin{array}{r} -4x \quad -4x \\ \hline +40 \quad 5x \\ \hline 5 \quad 5 \\ \hline x = 8 \end{array}$$



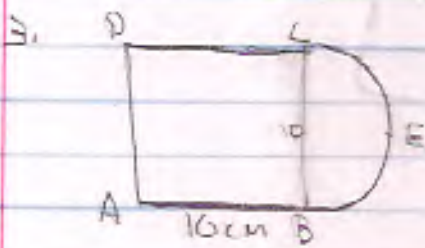
$$6(x-4) = 4x$$

$$6x - 24 = 4x$$

$$\begin{array}{r} -4x \quad -6x \\ \hline -24 = -2x \\ \hline -2 \quad -2 \\ \hline x = +12 \end{array}$$



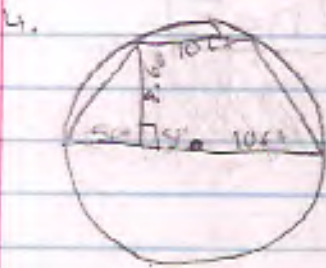
H.W. p. 281



$$\begin{array}{r}
 25 \\
 \times 54 \\
 \hline
 100 \\
 250 \\
 \hline
 1350
 \end{array}$$

ABCD = 100

Area =  $139.25$  or  $100 + 39.25$



EBCD =  $8.00 \left( \frac{15 + 10}{2} \right)$

Area =  $108.25$

$$\begin{array}{r}
 15 \\
 \times 7.25 \\
 \hline
 108.75
 \end{array}$$

p. 290  
3.  $140$   $l = 5$   $w = 4$   $h = 7$

$$\begin{array}{r}
 34 \\
 \times 35.7 \\
 \hline
 214.2
 \end{array}$$

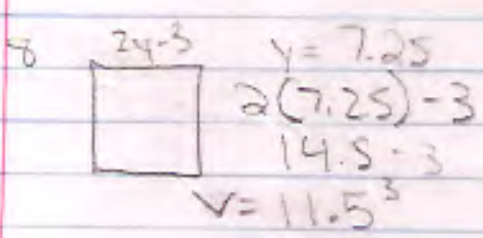
4.  $l = 8.5$   $w = 4.2$   $h = 6$   $214.2$

$$\begin{array}{r}
 2 \\
 \times 8.5 \\
 \hline
 170 \\
 1700 \\
 \hline
 3570
 \end{array}$$

6.  $l = 7.25$   $w = 6.4$   $h = .25 \times 3$   $139$

$$\begin{array}{r}
 7.35 \\
 \times 6.4 \\
 \hline
 2900 \\
 46200 \\
 \hline
 47100
 \end{array}$$

7.  $8\frac{3}{5} = 8.6$   $8.6^3 = 636.056 \text{ cm}^3$



$$\begin{array}{r}
 11.5 \\
 \times 11.5 \\
 \hline
 126.25 \\
 1262.5 \\
 \hline
 1322.50
 \end{array}$$

$V = 1520.875$

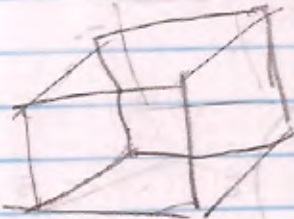
Wahid

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Find Volume

basic unit  $\rightarrow$  inch<sup>3</sup>

rectangular prism -



$$V = L \cdot W \cdot H$$

$$L = 4 \quad V = 140 \text{ in}^3$$

$$W = 7$$

$$H = 8$$

$$\text{Volume} = 140 \text{ in}^3$$

$$L = 4$$

$$W = 7$$

$$V = L \cdot W \cdot H$$

$$140 = 4 \cdot 7 \cdot H$$

Find: Height

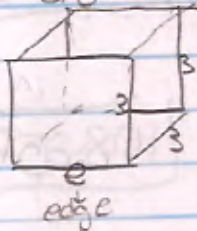
$$140 = 28H \quad \boxed{H = 5}$$

Cube  $\rightarrow$

$$V = L \times W \times H$$

$$V = e \times e \times e$$

$$V = e^3 \text{ (side)}$$

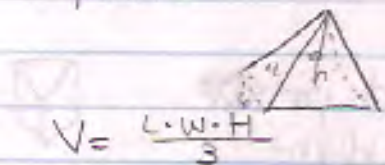


$$V = 3^3 \quad 3 \times 3 \times 3 = 27 \text{ in}^3$$



Pyramid

83 58

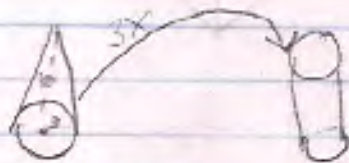


$$L=4 \quad W=6 \quad H=10$$

$$V = \frac{L \cdot W \cdot H}{3}$$

$$\frac{240}{3} = \boxed{80 \text{ unit}^3}$$

Cone



$$V = \frac{\pi r^2 \times H}{3}$$

$$r=3 \quad H=10$$

$$\pi 3^2 \times 10$$

$$90\pi$$

$$\frac{90\pi}{3} = 30\pi$$

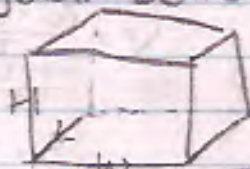
### Surface Area

1) Rectangular Solid

$$H=8$$

$$L=4$$

$$W=6$$



6 faces  
6 lateral surfaces

$$S.A. = 2 \cdot L \cdot W + 2 \cdot L \cdot H + 2 \cdot W \cdot H$$

$$+ 2 \cdot 4 \cdot 6 = 48$$

$$+ 2 \cdot 4 \cdot 8 = 64$$

$$+ 2 \cdot 6 \cdot 8 = 96$$

$$208$$

$$\boxed{208 \text{ unit}^2}$$

2) Cube



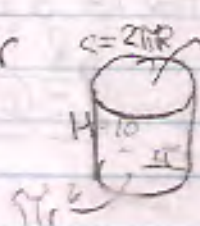
$$s=3''$$

$$S.A. = \boxed{6 \cdot s^2}$$

$$6 \cdot 9$$

$$\boxed{54 \text{ inch}^2}$$

3) Cylinder



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

$$2\pi 4^2 + 2\pi 4 \cdot 10$$

$$2\pi 16 + 80\pi$$

$$32\pi + 80\pi$$

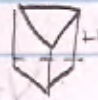
$$\boxed{112\pi}$$



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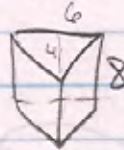
Volume

Triangular Right prism



$V = \text{area of triangle} \times \text{height}$

$V = \frac{b \cdot h}{2} \cdot H$



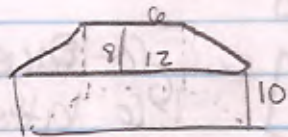
$V = \frac{6 \times 4}{2} \cdot 8$

$\frac{24}{2} \cdot 8$

$12 \cdot 8$

$V = 96 \text{ unit}^3$

Trapezoidal Right prism



$V = \text{area base} \cdot \text{height}$

$V = \frac{(b_1 + b_2)h}{2} \cdot H$

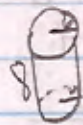
$\frac{6 + 12 \cdot 8}{2} \cdot 10$

$\frac{18 \cdot 8}{2} \cdot 10$

$\frac{144}{2} \cdot 10$

$72 \cdot 10 = 720 \text{ unit}^3$

Cylinder

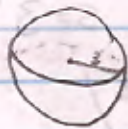


$V = \pi r^2 \cdot H$

$\pi 6^2 \cdot 8$

$304 \cdot 8 = 288 \pi \text{ units}^3$

Sphere



$V = \frac{4}{3} \pi r^3$

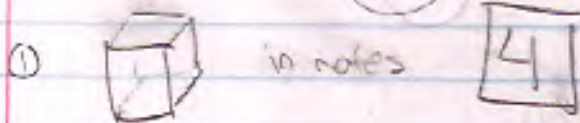
$V = \frac{4}{3} \pi 3^3$

$\frac{4}{3} \pi 27 = \frac{4}{3} \cdot 27 \cdot \pi$

$36 \pi \text{ units}^3$

cube

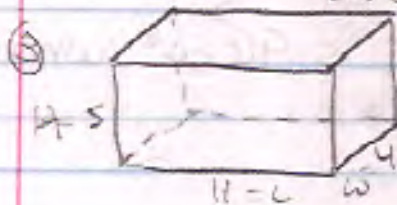
85



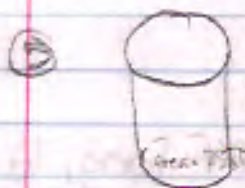
② 
$$\frac{500\pi}{3} = \frac{4}{3}\pi r^3$$

$$\frac{500\pi}{3} = \frac{4\pi}{3} r^3$$

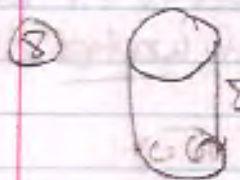
$$(5)(5)(5) \leftarrow 125 = r^3 \quad \boxed{r=5}$$



S.A. =  $2LW + 2LH + 2WH$   
 $2 \cdot 11 \cdot 4 + 2 \cdot 11 \cdot 5 + 2 \cdot 4 \cdot 5$   
 $88 + 110 + 40$   
238 cm<sup>2</sup>



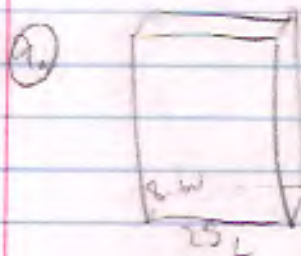
$V = \pi r^2 \cdot H$   
 $V = 25\pi \cdot 16$   
 $400\pi \text{ unit}^3$



S.A. =  $2\pi r^2 + 2\pi rH$   
 $2\pi 3^2 + 2\pi 3 \cdot 8$   
 $18\pi + 48\pi$   
66π

$C = 2\pi r = 2\pi \cdot 3$   
 $6\pi = R$

$V = 2\pi r^2 \cdot H$



S.A. =  $2LW + 2LH + 2WH$   
 $2 \cdot 25 \cdot 8 + 2 \cdot 25 \cdot 30 + 2 \cdot 8 \cdot 30$   
 $400 + 1500 + 480$   
2380 cm<sup>2</sup>

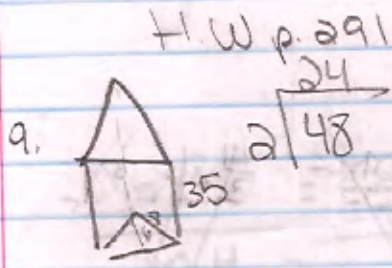
$V = L \cdot W \cdot H$   
 $8 \cdot 25 \cdot 30$   
6000 cm<sup>3</sup>

MICHAEL  
A. IASH

MICHAEL



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$$\begin{array}{r}
 24 \\
 \times 35 \\
 \hline
 120 \\
 720 \\
 \hline
 840
 \end{array}$$

8 cm<sup>3</sup>

If the S.A. of a cube is 96 cm<sup>2</sup> what is the length of the side.

$$\begin{aligned}
 6 \cdot s^2 &= 96 \\
 \frac{6 \cdot s^2}{6} &= \frac{96}{6} \\
 s^2 &= 16 \\
 \sqrt{s^2} &= \sqrt{16} \\
 \boxed{4}
 \end{aligned}$$

A swimming pool is 8 ft deep, 25 ft long, 6 ft wide. The water in it comes up to a level 2 ft below the top edge. Find the volume of water in the pool.