note to teacher: also show how to do other conversions so can be better equipped (also for sofad page 43)

Lesson 8:

60 min = 1 hr
equivalent
same thing
different form

June 1st, 2023

Unit Conversions and Nets of 3D solids

The Metric System

(random) (like #)

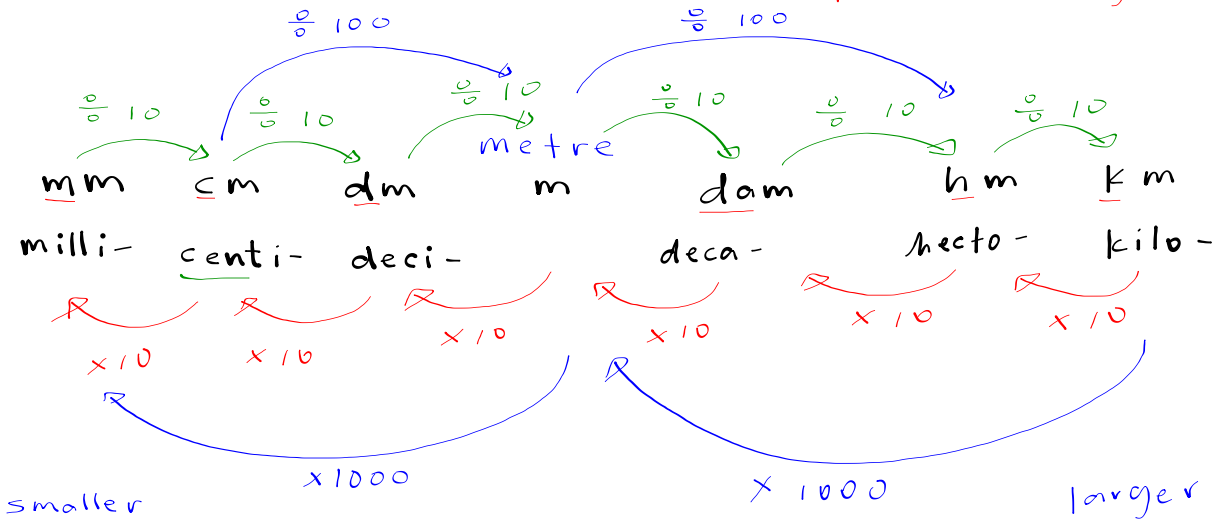
↳ an arbitrary yet convenient system/way of measuring things (like lengths/distances, area, volume)

based on the metre (e.x. keep distance of 2 m. = 6.6 feet)

metric imperial

Conversion Diagram for Metric Distance

v. useful → put on memory aid.



1 m = 10 dm

1 m = 100 cm

1 m = 1000 mm

1 dam = 10 m

1 hm = 100 m

1 km = 1000 m

Convert:

$3\text{ cm} = \_\_\_\_\_ \text{ dam}$

keep/change/flip

$\frac{3}{1} \times \frac{1}{10^{1}} \times \frac{1}{10^{1}} \times \frac{1}{10^{1}}$

law #3

scientific notation: $a \times 10^{n}$

$3 \times \frac{1}{10^{3}}$

law #8 #9

3×10^{-3}

3×10^{-3}

0.003 dam

from cm to dam

smaller to larger units

$\therefore$ smaller #

$\therefore \frac{0}{0}$

min to hours

$30\text{ min} = 0.5\text{ hr}$

equivalent

OR JUST USE CALCULATOR

$\therefore$

$3\text{ cm} = 0.003\text{ dam}$

equivalent
- same thing
- different form

Convert

$6.7\ km = \_\_\_\_\_\ dm$

from km to dm

big unit → small unit

∴ bigger #

∴ ×

$6.7 \times 10^1 \times 10^1 \times 10^1 \times 10^1$

6.7×10^4

6.7×10^4

6.7000

67 000 dm

∴

$6.7\ km = 67\,000\ dm$

like:

hours to mins

2 hr = ____ mins

2 hr = 120 mins

Convert

$7.3\,mm = \_\_\_\_\_\ m$

$\frac{0}{0}$

$7.3 \div 10^3$

$7.3 \times \frac{1}{10^3}$

7.3×10^{-3}

0.0073×10^{-3}

$0.0073\,m$

You do:
1st page of handout!

$7.3\,mm = 0.0073\,m$

Convert the following units (express the result in scientific notation as well):

(a) 300 mm = 0.0003 km

(b) 67 hm = 67 000 dm

(c) 7.3 cm = 0.0073 dam

(d) 0.3 m = 0.0003 km

(e) 0.476 hm = 4760 cm

(f) 7890865446 cm = 7890865.446 dam

3×10^{-4} km

6.7×10^{4} dm

7.3×10^{-3} dam

3×10^{-4} km

4.76×10^{3} cm

7.89×10^{6} dam

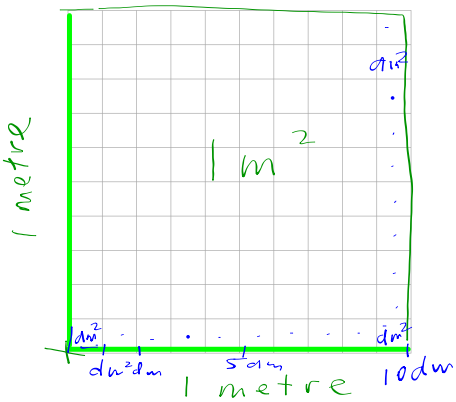
The Metric System for Area

units^2

1.3 Converting Area

Let's discover how to come up with a conversion procedure for area in the metric system:

graphically:



$1\,m = 10\,dm$

$1\,m^2 = 100\,dm^2$ ✓

algebraically:

$1\,m = 10\,dm$

$(1\,m)^2 = (10\,dm)^2$

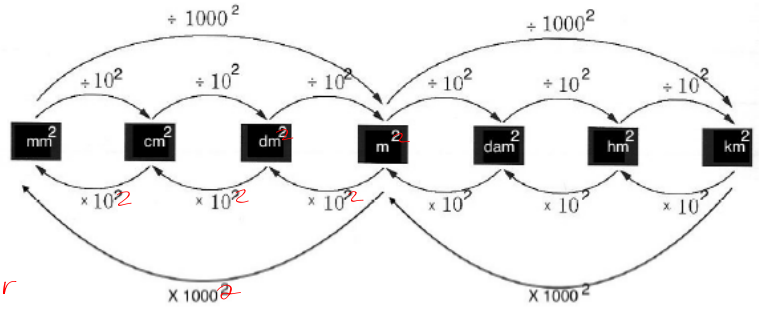
$1\,m^2 = 100\,dm^2$

To convert area, use the following *conversion diagram*:

put on memory aid

OR

note the one difference between other diagram



Convert

$50\ cm^2 = \_\_\_\_\_\ m^2$

$50 \frac{0}{0} \frac{10^2}{1} \frac{0}{0} \frac{10^2}{1}$

$50 \times \frac{1}{10^2} \times \frac{1}{10^2}$

$a^m \times a^n = a^{m+n}$

$50 \times \frac{1}{10^4}$

50×10^{-4}

0.0050×10^{-4}

$0.005\ m^2$

$50\ cm^2 = 0.005\ m^2$

Convert

$15.64\ km^2 = \_\_\_\_\ dam^2$

$15.64 \times (10^2)^2$

15.64×10^4

15.64×10^4

$15\ 6400\ dam^2$

law of exponents: $(a^m)^n = a^{m \times n}$

$\therefore$

$15.64\ km^2 = 15\ 6400\ dam^2$

Convert

$20\ dm^2 = \_\_\_\_\ hm^2$

$20 \div (10^2)^3$

$20 \div 10^6$

$20 \times \frac{1}{10^6}$

20×10^{-6}

20×10^{-6}

$0.00002\ hm^2$

You do pg 3.

$\therefore\ 20\ dm^2 = 0.00002 hm^2$

1.3.1 Example

Convert the following:

(a) $2\ m^2 =$ 20 000 cm^2

(b) $2.7\ cm^2 =$ 270 mm^2

(c) $17\ dam^2 =$ 0.0017 km^2

1.3.2 Practice

Convert the following:

(a) $22\ m^2 =$ 220 000 cm^2

(b) $4.79\ dm^2 =$ 479 cm^2

(c) ~~$170\ hm^2 =$ hm^2~~ (c) $170\ hm^2 =$ 1.7×10^{12} mm^2

change to mm

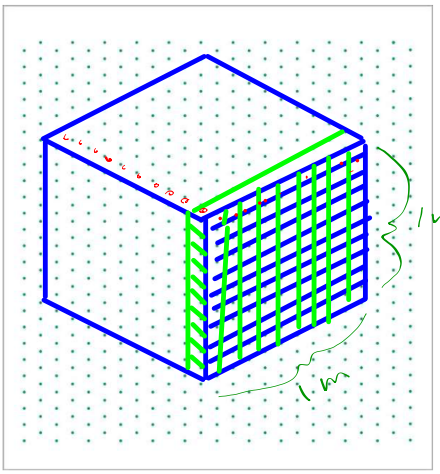
(d) $88.5\ km^2 =$ 885 000 dam^2

(e) $100\ mm^2 =$ 0.01 dm^2

(f) $1.08\ km^2 =$ 1 080 000 m^2

1.4 Converting Volume

Let's discover how to come up with a conversion procedure for area in the metric system:



axonometric grid

draw cube

10 x 10 x 10

start top

$1\ m^2 = 100\ dm^2$

$1\ m^3 = 1000\ dm^3$

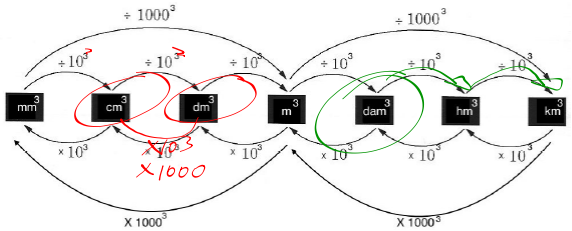
algebraically

$1\ m = 10\ dm$

$(1\ m)^3 = (10\ dm)^3$

$1\ m^2 = 1000\ dm^3$

Thus, to convert volume, we can use the following *conversion diagram*:



1.4.1 Ex: Convert

a) $2700\ mm^3 = \_\_\_\_\_\ cm^3$

$2700 \div 10^3 = 2.7\ cm^3$

b) $3.98\ m^3 = \_\_\_\_\_\ cm^3$

$3.98 \times 10^3 \times 10^3 = 3\,980\,000\ cm^3$

c) $1099\ dam^3 = \_\_\_\_\_\ km^3$

$1099 \div 10^3 \div 10^3 = 0.001099\ km^3$

You do 1.4.2 on pg 5.

Convert the following:

(a) $2.8\ \text{dm}^3 =$ 2 800 cm^3

(b) $38.9\ \text{mm}^3 =$ 0.000000038 9 m^3

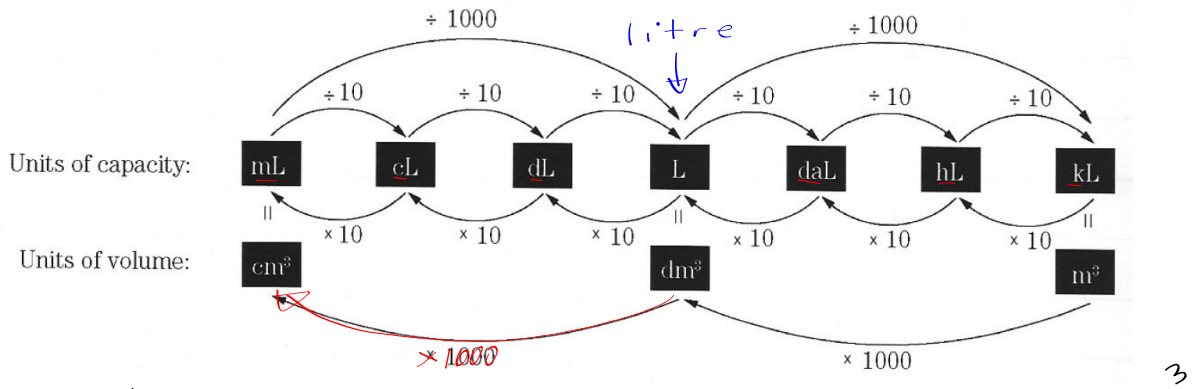
(c) $0.89\ \text{km}^3 =$ 890 hm^3

(d) $0.0678\ \text{m}^3 =$ 67 800 000 mm^3

(e) $16\ \text{dm}^3 =$ 0.000016 dam^3

(f) $0.93\ \text{hm}^3 =$ 930 000 000 dm^3

Conversion Diagram for metric Volumes based on the litre (L)



1 L = 1 dm^3

1 mL = 1 cm^3

1 kL = 1 m^3

1.5.1 Example

A container has a 27000L capacity. What is the volume of this container in m^3?

Convert to

27000 L = 2700 dm^3

27000 dm^3 = _____ m^3

27000 ÷ 1000

27 m^3 ∴ 27000 L = 27 m^3

1.5.2 Example

unit^3

~~Coul~~ $950mL$ of juice be poured into a container measuring $7cm \times 8cm \times 10.9cm$?

Could

To answer: convert to cm^3

$V = 7 \times 8 \times 10.9$

$V = 610.4\ cm^3$

$950\ mL = \frac{950}{950 \times 1}\ (cm^3)$

No since $950\ cm^3 > 610.4\ cm^3$

1.5.3 Practice

You do

Convert the following:

(a) 25000 daL into m^3. $= 250\ m^3$

(b) 340 cL into cm^3. $= 3400\ cm^3$

(c) 58900 dL into m^3. $= 5.89\ m^3$

(d) 156000 cm^3 into L. $= 156\ L$

(e) 1.89 m^3 into mL. $= 1\ 890\ 000\ mL$

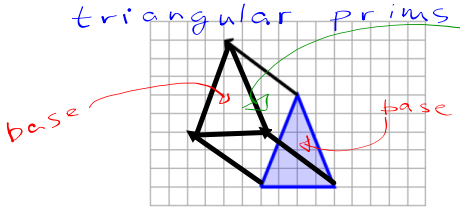
Terminology of 3D solids

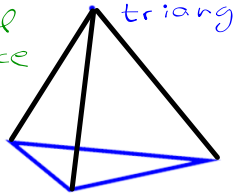
prisms v.s. pyramids

→ results from translating a polygon through 3D space

→ results from connecting all the vertices of a polygon to a single point (the apex)

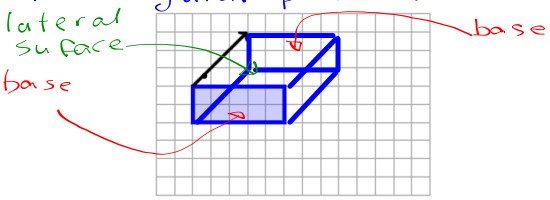
triangular prism:

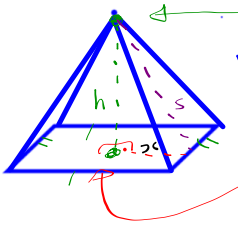




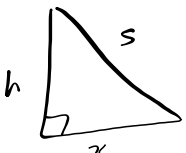
You draw and answers: how bases do prisms? how bases do pyramids have?

rectangular prism:





rectangular pyramid:



2 parallel bases

· 1 base
· 1 apex

h = height

s = slanted height (apothem)

nota bene: we name prisms and pyramids according to their bases.

Cylinder v.s. Cone

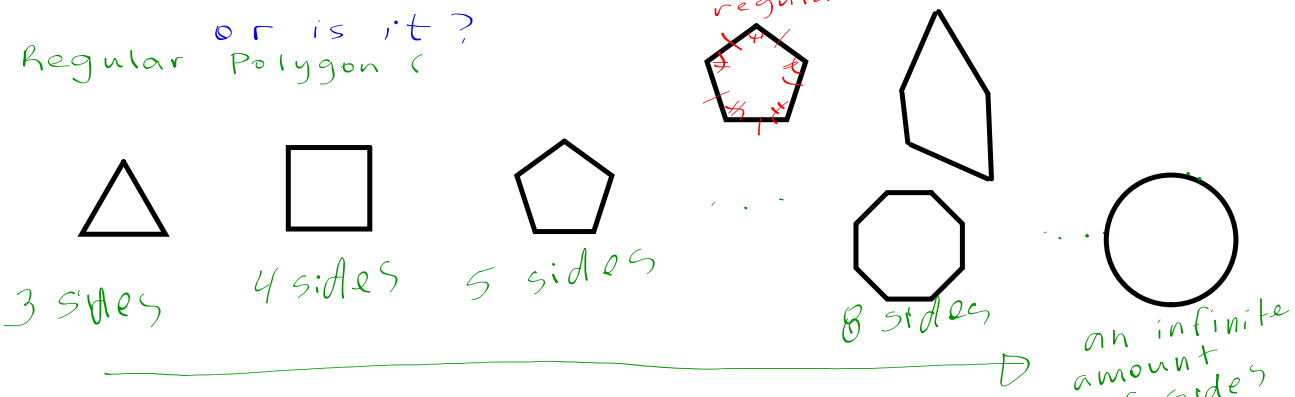
"circular prism" "circular pyramid"

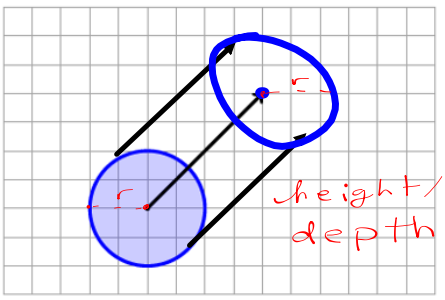
" " since the base, the circle is technically a polygon (has sides)

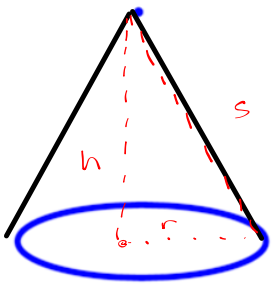
or is it?

Regular Polygon (

regular not regular.



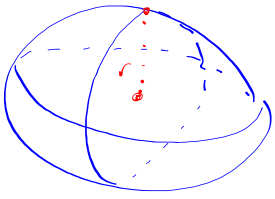




s - slanted height

apothem

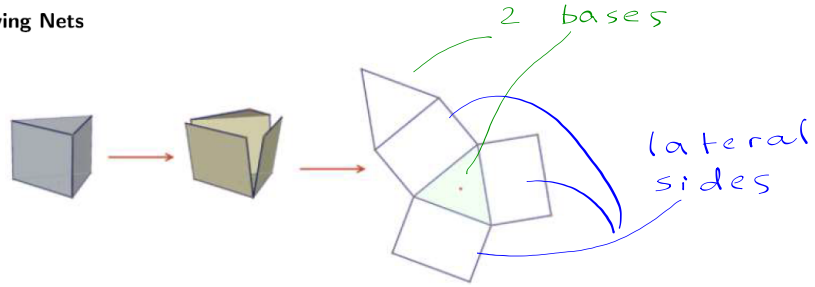
Sphere



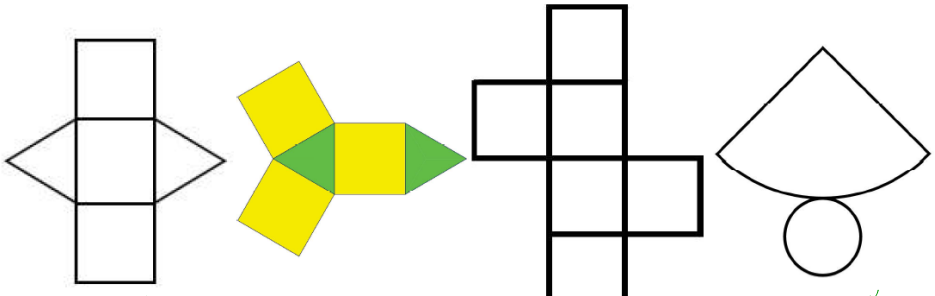
r = radius

4 Nets

4.1 Identifying Nets



Nets are 2D surfaces that can be folded to create 3D objects. Consider the following nets. What kind of three-dimensional objects could be made by folding them?



triangular prism

t. prism

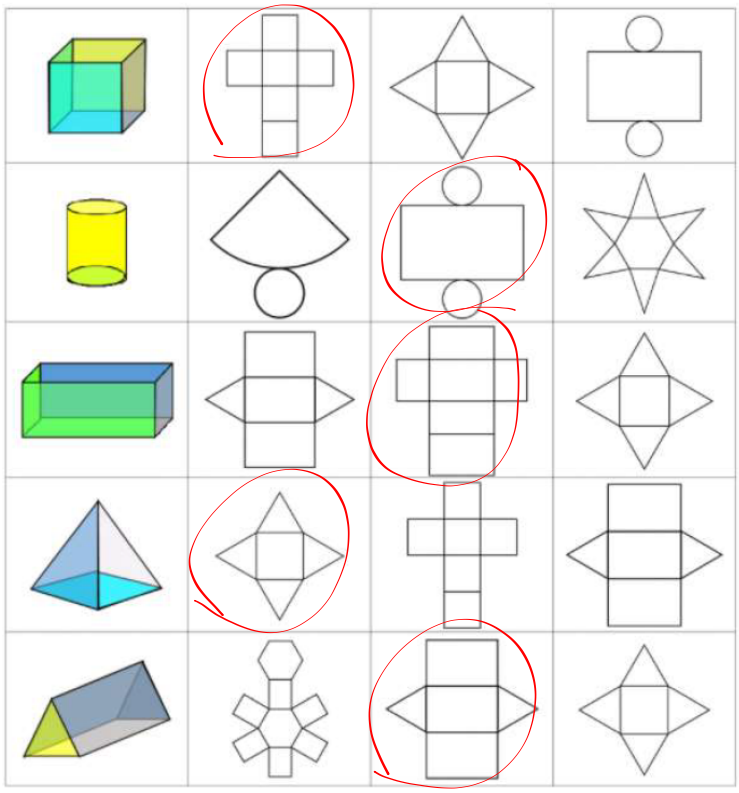
cube

cone

4.1.1 Practice

For each solid, identify the correct net.

#1 #2 #3



You do next ones!

4.1.2 Practice

For each solid, identify the correct net.

#1 #2 #3

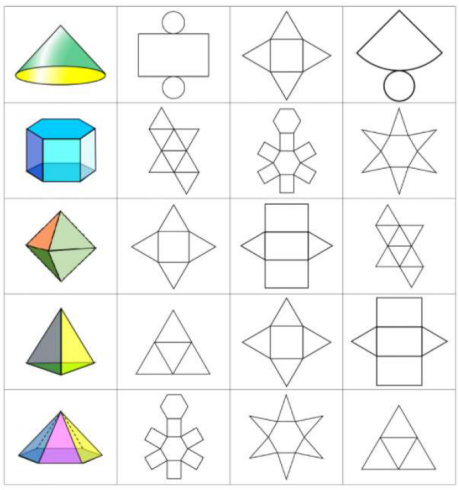
a)

b)

c)

d)

e)



answers:

a) #3 b) #2 c) #3 d) #1 e) #2

HMWK:

pg 43 #1.33,

plus more

good practice

from yesterday

pg 96 #2.30

4.1.3 Practice

For each solid, identify the correct net.

#1 #2 #3

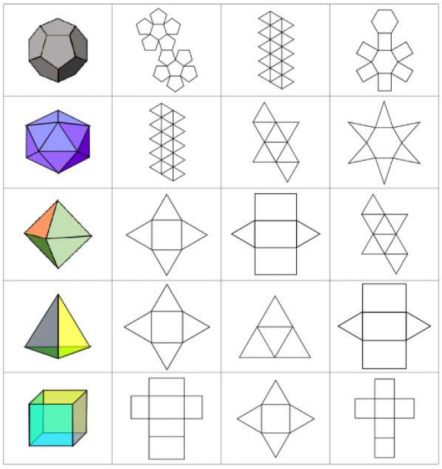
a)

b)

c)

d)

e)



Answers:

a) #1 b) #1 c) #3 d) #2 e) #3