Math 9 – Unit 4: Measurement Name: Mrs. Jacob

Measurement- Applications (Lesson 4.1+4.2) Date: _____

Formulas to Remember:

Perimeter – it is the length of the boundary. So, simply add up all the outside edges, regardless of the shape (not circles!)

Area of a square/rectangle: ***A = lw*** Area of a triangle: $A = \frac{1}{2}bh$ or $A = \frac{bh}{2}$

Area of a trapezoid: $A = \frac{(a+b)h}{2}$ Area of a parallelogram: **A = bh**

Area of a circle: $A = \pi r^2$ (pi = 3.14) Circumference of a circle: $C = 2\pi r$

Surface Area of Triangular Prism = **Area of four lateral faces (rectangles) + 2. Area of triangle base**

Surface Area of Rectangular Prism/Cuboid = Area of four lateral faces (rectangles) + 2. Area of base
= 2*lw* + 2*lh* + 2*wh*

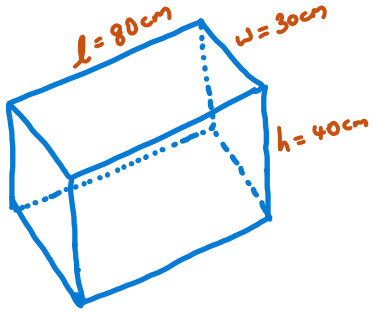
Surface Area of Rectangular Cube = $6s^2$

Surface Area of Cylinder = $2\pi r^2 + 2\pi rh$

Volume of prisms and cylinders = **"area of the base" × "the height"**

1. An aquarium is in the form of a rectangular prism whose external measures are 80 cm × 30 cm × 40 cm. The base, side faces and back face are to be covered with a coloured paper. Find the area of the paper needed?

l × w × h



Area of the coloured paper needed

= Area (Base + Left Face + Right Face + Back)

= BASE + LEFT + RIGHT + BACK
= (80×30) + (30×40) + (30×40) + (80×40)

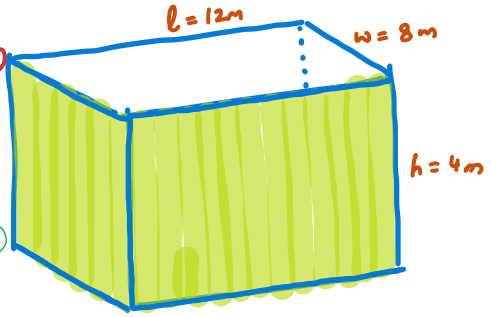
= 2400 + 1200 + 1200 + 3200

= 8000 cm²

2. The internal measures of a cuboidal room are 12 m × 8 m × 4 m. Find the total cost of painting all four walls of a room if the cost of painting is \$5 per m^2. What will be the cost of painting if the ceiling of the room is also to be painted?

$l \times w \times h$

Roof



Area of the 4 walls $= (12\times4)+(12\times4)+(8\times4)+(8\times4)$

$= 48+48+32+32$

$= 160\ m^2$

$\therefore$ Cost of painting @ \$5 per $m^2 = 160\times5 = \$800$

Area of the ceiling (roof) $= 12\times8 = 96\ m^2$

$\therefore$ Cost of painting roof $= 96\times5 = \$480$

$\therefore$ TOTAL COST OF PAINTING $= 800+480 = \$1280$

3. In a building there are 24 cylindrical pillars. The radius of each pillar is 28 cm and height is 4 m. Find the total cost of painting the curved surface area of all the pillars at the rate of \$8 per m^2. NOTE: 1m = 100cm

Curved Surface Area of one pillar $= 2\pi rh$

$= 2(3.14)(0.28)(4) = 7.0336\ m^2$

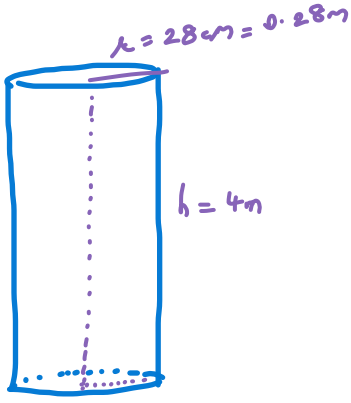
$\therefore$ Cost of painting one pillar @\$8/m^2

$= 7.0336\times8 = \$56.2688$

$\therefore$ Cost for 24 such pillars $= 24\times56.2688$

$= \$1350.4512$

$\approx \$1350.45$



4. Find the volume of a cylinder whose radius is 7 cm, and the total surface area is 968 cm^2.

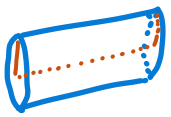
$S.A. = 2\pi rh + 2\pi r^2$

$\Rightarrow S.A. - 2\pi r^2 = 2\pi rh$

$\Rightarrow \frac{S.A. - 2\pi r^2}{2\pi r} = h$

$\therefore h = \frac{968 - 2(3.14)(7)(7)}{2(3.14)(7)}$

$SA = 968\ cm^2$



$h = \frac{968 - 307.72}{43.96} = \frac{660.28}{43.96} = 15.02\ cm$ (approx)

$\therefore V = \pi r^2 h = (3.14)(7)(7)(15.02)$

$= 2310.9772$

$\approx 2310.98\ cm^3$

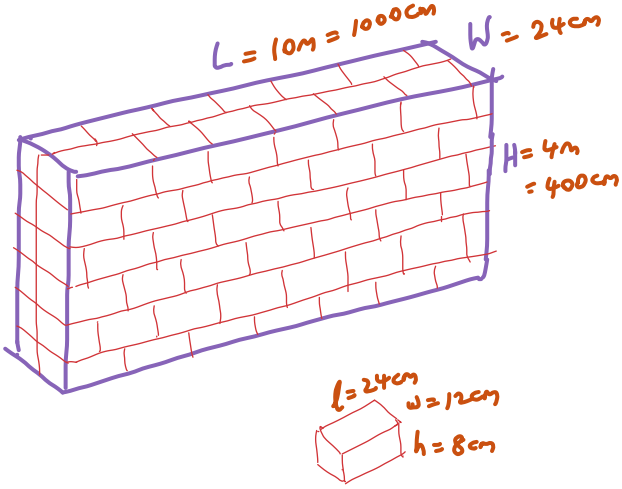
5. A wall of length 10 m was to be built across an open ground. The height of the wall is 4m and thickness of the wall is 24 cm. If this wall is to be built up with bricks whose dimensions are 24 cm × 12 cm × 8 cm, how many bricks would be required?

Number of bricks required = $\frac{\text{Volume of Wall}}{\text{Volume of each brick}}$

$= \frac{L \times W \times H}{l \times w \times h}$

$= \frac{1000 \times 24 \times 400}{24 \times 12 \times 8}$

$= \frac{9600000}{2304} = 4166.67 \approx 4167$ bricks required.



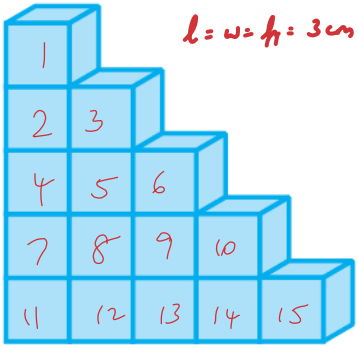
6. A child playing with building blocks, which are of the shape of cubes, has built a structure as shown. If the edge of each cube is 3 cm, find the volume of the structure built by the child.

Volume of each cube = (3)(3)(3) = $27\ cm^3$

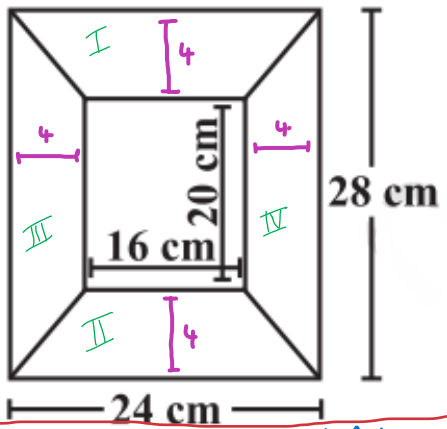
∴ Volume of structure with 15 cubes

$= 27 \times 15$

$= 405\ cm^3$



7. Diagram of the picture frame below has outer dimensions = 24 cm × 28 cm and inner dimensions 16 cm × 20 cm. Find the area of each section of the frame, if the width of each section is the same.



* Note - You are to find the area of each section of the frame for this problem.

Width of Frame = $\frac{28-20}{2} = \frac{8}{2} = 4$

[Also, CHECK: $\frac{24-16}{2} = \frac{8}{2} = 4$]

Area (Section I) = Area (Section II) = $\frac{(a+b)h}{2}$

$= \frac{(16+24)4}{2} = \frac{(40)(4)}{2} = 80\ cm^2$

Area (Section III) = Area (Section IV) = $\frac{(a+b)h}{2}$

$= \frac{(20+28)4}{2} = \frac{(48)(4)}{2} = 96\ cm^2$

* METHOD you could use if you just had to find area of Frame.

Area of frame = Area (Outside Rectangle) − Area (Inside Rectangle)

$= (28)(24) - (16)(20)$

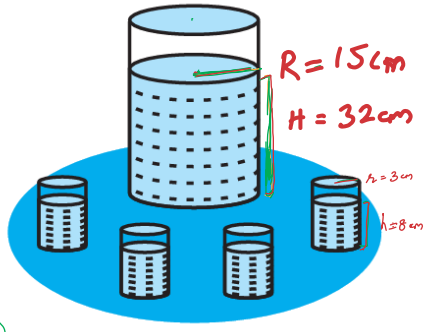
$= 672 - 320 = 352$

8. David and Ben decided to set up a lemonade stand on a hot summer day. They took a large cylindrical vessel of base radius 15 cm and filled up to a height of 32 cm with lemonade they had prepared using freshly squeezed limes. The lemonade is filled in small cylindrical glasses of radius 3 cm up to a height of 8 cm and sold for $5 each. How much money do they make by selling the prepared lemonade completely?

Number of lemonade glasses sold

$= \frac{\text{Volume of Vessel}}{\text{Volume of each glass}} = \frac{\pi R^2 H}{\pi r^2 h}$

$= \frac{(15)(15)(32)}{(3)(3)(8)} = \frac{7200}{72} = 100$



Money made @ $5 for each glass $= 5(100) = \$500$

9. The diameter of a roller is 84 cm, and its length is 120 cm. It takes 500 complete revolutions to move once over to level a playground. Find the area of the playground in m^2.

* The levelling of the playground happens by the curved surface $= 2\pi rh$

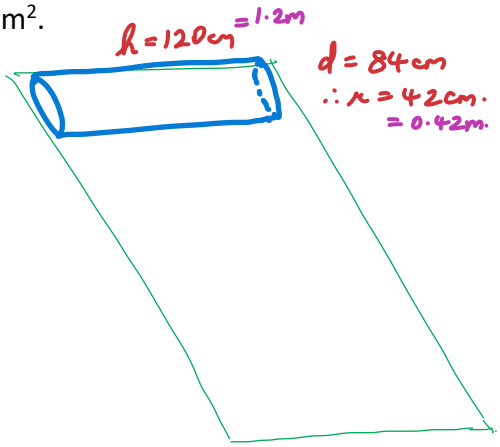
$\therefore$ Area of playground levelled by 1 revolution

$= 2(3.14)(0.42)(1.2)$

$= 3.16512\ m^2$

$\therefore$ Area levelled by 500 revolutions $= (500)(3.16512)$

$= 1582.56\ m^2$

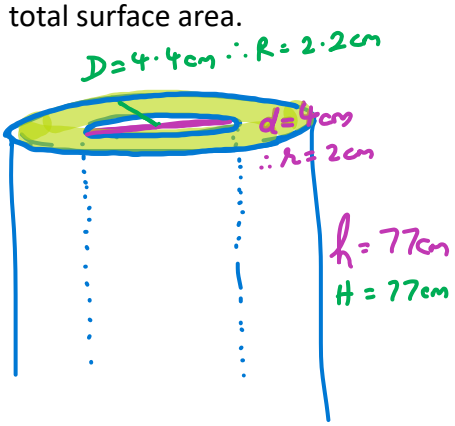


10. A metal pipe is 77 cm long. The inner diameter of a cross section is 4 cm, the outer diameter being 4.4 cm. Find its (i) inner curved surface area, (ii) outer curved surface area, (iii) total surface area.

(i) inner curved surface area $= 2\pi rh$

$= 2(3.14)(2)(77)$

$= 967.12\ cm^2$



(ii) outer curved surface area $= 2\pi RH$

$= 2(3.14)(2.2)(77)$

$= 1063.832\ cm^2$

(iii) Total Surface Area of Pipe = inner C.S.A. + outer C.S.A + area of

$= 2\pi rh + 2\pi RH + 2[\pi R^2 - \pi r^2]$

$= 967.12 + 1063.832 + 2[(3.14)(2.2)(2.2) - (3.14)(2)(2)]$

$= 967.12 + 1063.832 + 2(15.1976 - 12.56)$

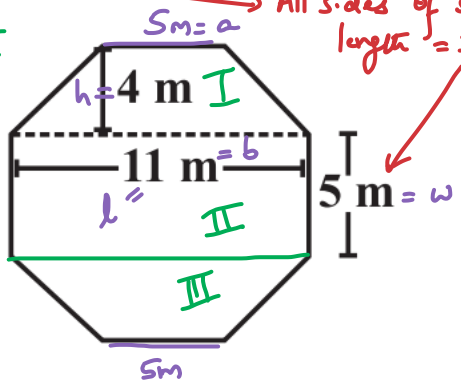
$= 967.12 + 1063.832 + 2(2.6376)$

$= 967.12 + 1063.832 + 5.2752$

$= 2036.2272\ cm^2$

11. Top surface of a raised platform is in the shape of a regular octagon as shown in the figure. Find the area of the octagonal surface.

All sides of same length = 5m



Area (octagonal surface) = Area I + Area II + Area III

(Area I and Area III are identical because the surface is regular)

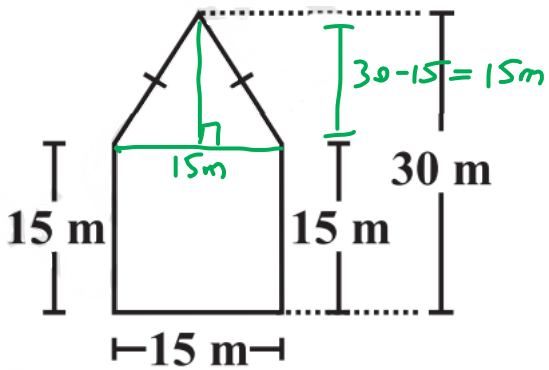
$= 2(\text{Area I}) + \text{Area II}$

$= 2\left(\frac{(a+b)h}{2}\right) + lw$

$= (5+11)4 + (11)(5)$

$= 64 + 55 = 119\ m^2$

12. Find the area of the pentagonal shaped figure. (Hint: Could you divide it into smaller pieces?)



Area of PENTAGON

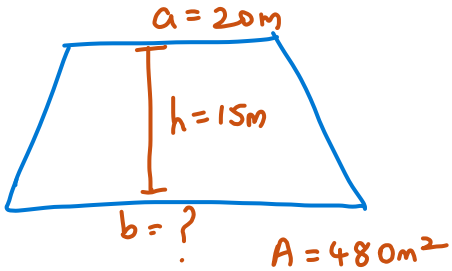
$= \text{Area (Triangle)} + \text{Area (Square)}$

$= \frac{(15)(15)}{2} + (15)(15)$

$= 112.5 + 225$

$= 337.5$ sq. m.

13. The area of a trapezoid shaped field is 480 m^2, the distance between two parallel sides is 15 m and one of the parallel sides is 20 m. Find the other parallel side.



$A = \frac{(a+b)h}{2}$

$\Rightarrow 2A = (a+b)h$

$\Rightarrow \frac{2A}{h} = a+b$

$\Rightarrow \boxed{\frac{2A}{h} - a = b}$

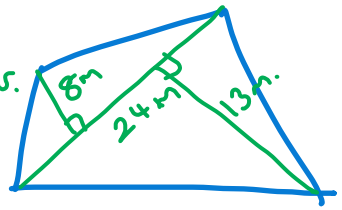
$\therefore$ other parallel side $= b = \frac{2A}{h} - a$

$= \frac{2(480)}{15} - 20$

$= 64 - 20$

$= 44$ m

14. The diagonal of a quadrilateral shaped field is 24 m and the perpendiculars dropped on it from the remaining opposite vertices are 8 m and 13 m. Find the area of the field. (Hint: Draw a diagram to visualize the situation)



Area of Quadrilateral = Area of the two Δs.

$= \frac{(8)(24)}{2} + \frac{(13)(24)}{2}$

$= 96 + 156$

$= 252\ m^2$

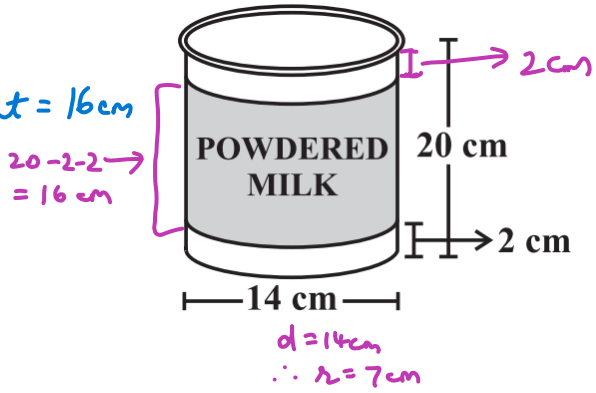
15. A company packages its milk powder in cylindrical container whose base has a diameter of 14 cm and height 20 cm. Company places a label around the surface of the container (as shown in the diagram). If the label is placed 2 cm from top and bottom, what is the area of the label.

Area of label = Curved Surface with radius = 7cm and height = 16cm

$= 2\pi r h$

$= 2(3.14)(7)(16)$

$= 703.36\ cm^2$

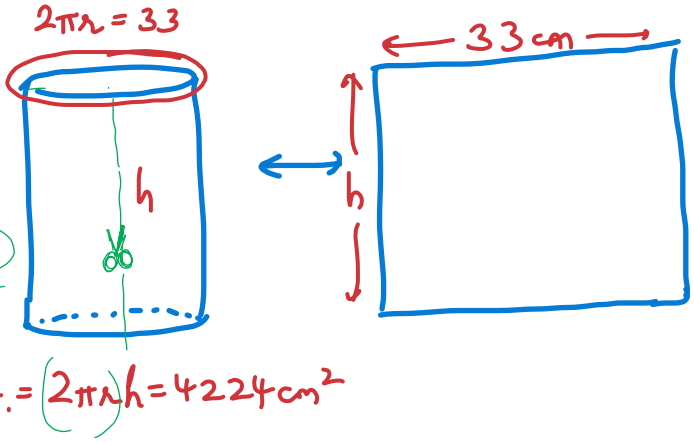


16. The curved surface area of a hollow cylinder is 4224 cm^2. It is cut along its height and formed a rectangular sheet of width 33 cm. Find the perimeter of rectangular sheet?

$2\pi r = 33$ (given)

$2\pi r h = 4224$ (given)

$\therefore h = \frac{4224}{(2\pi r)} = \frac{4224}{33} = 128\ cm$



C.S.A. $= 2\pi r h = 4224\ cm^2$

$\therefore$ Perimeter of Rectangular Sheet

$= 2(128) + 2(33)$

$= 256 + 66 = 322\ cm.$