KEY

Math 10C

LO2 – Linear Unit Conversions

Data Sheet – Measurement Conversion Charts

S.I. to S.I		Exact?
1 km	1000 m	✓
1 m	100 cm	✓
1 cm	10 mm	✓

Imperial to Imperial		Exact?
1 mi.	1760 yd.	✓
1 yd.	3 ft.	✓
1 ft.	12 in.	✓

Imperial to S.I.		Exact?
1 mi.	1.609 km	×
1 yd.	0.9144 m	×
1 ft.	30.48 cm	✓
1 in.	2.54 cm	✓

Data Sheet – Geometric Formulas

Area

Circle $A = \pi r^2$

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

Parallelogram $A = b \times h$

Trapezoid $A = h\left(\frac{(b_1+b_2)}{2}\right)$

Surface Area

Sphere $SA = 4\pi r^2$

Cylinder $SA = 2\pi r^2 + 2\pi rh$

Cone $SA = \pi r^2 + \pi rs$

Prism $SA = 2lw + 2lh + 2wh$

Volume

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

Cylinder $V = \pi r^2 h$

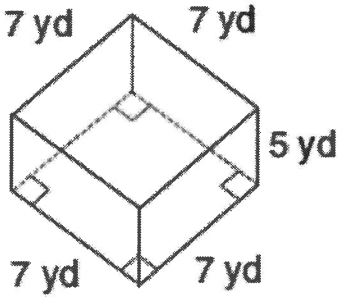
Prism $V = B \times h$

Cone $V = \frac{1}{3}\pi r^2 h$

Pyramid $V = \frac{B \times h}{3}$

Part 1 – Surface Area of Basic Shapes (with Conversions)

Q1: What is the surface area of the rectangular prism, to the nearest m^2?



Top : $7 \times 7 = 49$
Bottom $= 49$
Side : $5 \times 7 = 35$
Side $= 35$
Side $= 35$
Side $= 35$

$238\ yd^2$

$\frac{238\ yd \cdot yd}{1} \times \frac{0.9144\ m}{yd} \times \frac{0.9144\ m}{yd} = 198.9983\ m^2$

$\approx 199\ m^2$

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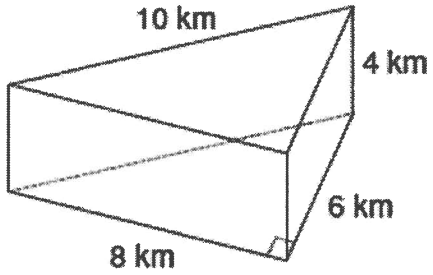
Q2: What is the surface area of the triangular prism, to the nearest mi^2?

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



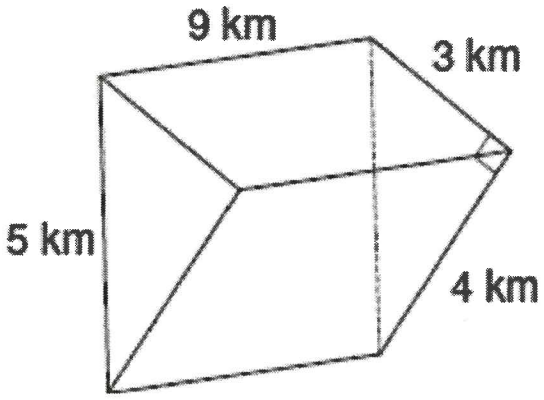
Top = $\frac{8 \times 6}{2}$ = 24
Bottom = 24
Front = 8×4 = 32
Right = 6×4 = 24
Slant = 10×4 = 40
$144\ km^2$

$\frac{144\ km \cdot km}{1} \times \frac{1\ mi}{1.609\ km} \times \frac{1\ mi}{1.609\ km} = \frac{144\ mi^2}{2.588881}$

$= 55.62\ mi^2 \approx 56\ mi^2$

Q3: What is the surface area of the triangular prism, to the nearest square meter?

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



Left = $\frac{4 \times 3}{2}$ = 6
Right = 6
Slant = 5×9 = 45
Bottom = 4×9 = 36
Top = 3×9 = 27
$120\ km^2$

$\frac{120\ km \cdot km}{1} \times \frac{1000\ m}{1\ km} \times \frac{1000\ m}{1\ km} = 120{,}000{,}000\ m^2$

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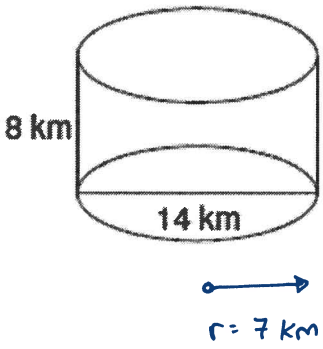
Q4: What is surface area of the cylinder, to the nearest mi^2?

Cylinder $SA = 2\pi r^2 + 2\pi rh$



Top $= \pi r^2 = (3.14)(7)^2 = 153.86$

Bottom $= \pi r^2 = 153.86$

Side $= 2\pi rh = 2(3.14)(7)(8) = 351.68$

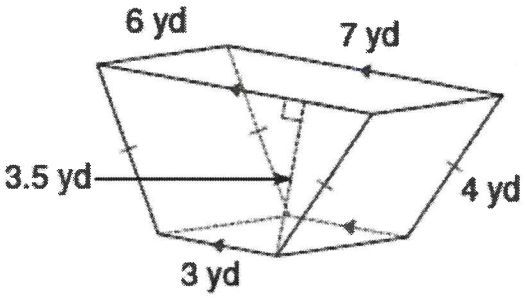
$659.4\ km^2$

$$\frac{659.4\ km \cdot km}{1} \times \frac{1\ mi}{1.609\ km} \times \frac{1\ mi}{1.609\ km} = \frac{659.4\ mi^2}{2.588881}$$

$= 254.7\ mi^2 \approx \boxed{255\ mi^2}$

Q5: What is the surface area of the trapezoidal prism, to the nearest m^2?

Trapezoid $A = h\left(\frac{(b_1+b_2)}{2}\right)$



Front $= h\left(\frac{b_1+b_2}{2}\right) = (3.5)\left(\frac{3+7}{2}\right) = 17.5$

Back $= 17.5$

Top $= 7 \times 6 = 42$

Bottom $= 3 \times 6 = 18$

Right $= 4 \times 6 = 24$

Left $= 4 \times 6 = 24$

$143\ yd^2$

$$\frac{143\ yd^2}{1} \times \frac{0.9144\ m}{1\ yd} \times \frac{0.9144\ m}{1\ yd} = \boxed{119.566\ m^2}$$

$\approx \boxed{120\ m^2}$

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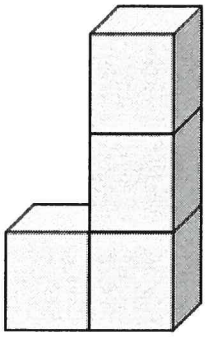
Part 2 – Surface Area of Simple Composite Shapes (with Conversions)

Q6: Each cube has a side length of 2cm. What is the surface area of the composite object, in square inches? *Hint: This object can be made using 4 cubes.*

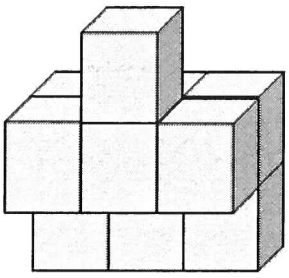


Each cube face is 2×2 or $4cm^2$

Front = 4 faces $\times$ $4cm^2$ = $16cm^2$
Back = $16cm^2$
Right = 3 faces $\times$ $4cm^2$ = $12cm^2$
Left = $12cm^2$
Top = 2 faces $\times$ $4cm^2$ = $8cm^2$
Bottom = $8cm^2$
$72cm^2$

$$\frac{72cm^2}{1} \times \frac{1in}{2.54cm} \times \frac{1in}{2.54cm} = \frac{72in^2}{6.4516} = \boxed{11.16in^2}$$

Q7: Each cube has a side length of 2in. What is the surface area of the composite object, in square centimeters? *Hint: This object can be made using 10 cubes.*



Each cube face is $2 \times 2 = 4in^2$.

Front = 7 faces $\times$ $4in^2$ = $28in^2$
Back = $28in^2$
Right = 4 faces $\times$ $4in^2$ = $16in^2$
Left = $16in^2$
Top = 6 faces $\times$ $4in^2$ = $24in^2$
Bottom = $24in^2$
$136in^2$

$$\frac{136in^2}{1} \times \frac{2.54cm}{1in} \times \frac{2.54cm}{1in} = \boxed{877.4cm^2}$$

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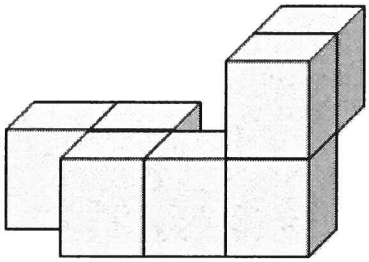
Q8: Each cube has a side length of 3cm. What is the surface area of the composite object, in square inches? *Hint: This object can be made using 7 cubes.*

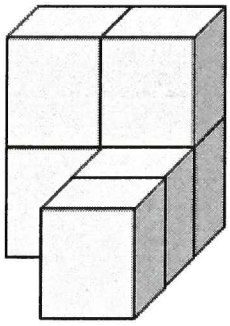


Each cube face is $3 \times 3 = 9\text{cm}^2$

Front = 5 faces $\times 9\text{cm}^2$ $= 45\text{cm}^2$
Back $= 45\text{cm}^2$
Right = 4 faces $\times 9\text{cm}^2$ $= 36\text{cm}^2$
Left $= 36\text{cm}^2$
Top = 6 faces $\times 9\text{cm}^2$ $= 54\text{cm}^2$
Back $= 54\text{cm}^2$
270cm^2

$$\frac{270\text{cm}^2}{1} \times \frac{1\text{in}}{2.54\text{cm}} \times \frac{1\text{in}}{2.54\text{cm}} = \frac{270\text{ in}^2}{6.4516} = \boxed{41.85\text{in}^2}$$

Q9: Each cube has a side length of 2 feet. What is the surface area of the composite object, in square yards? *Hint: This object can be made using 6 cubes.*



Each cube face is $2 \times 2 = 4\text{ft}^2$

Front = 4 faces $\times 4\text{ft}^2$ $= 16\text{ft}^2$
Back $= 16\text{ft}^2$
Right = 4 faces $\times 4\text{ft}^2$ $= 16\text{ft}^2$
Left $= 16\text{ft}^2$
Top = 4 faces $\times 4\text{ft}^2$ $= 16\text{ft}^2$
Back $= 16\text{ft}^2$
96ft^2

$$\frac{96\text{ft}^2}{1} \times \frac{1\text{yd}}{3\text{ft}} \times \frac{1\text{yd}}{3\text{ft}} = \frac{96\text{ yd}^2}{9} = \boxed{10.\bar{6}\text{ yd}^2}$$

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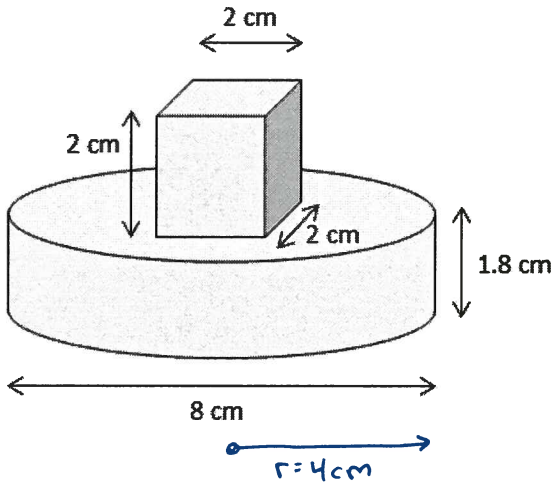
Part 3 – Surface Area of Complex Composite Shapes (with Conversions)

Q10: What is the surface area of the composite shape, to the nearest in^2?

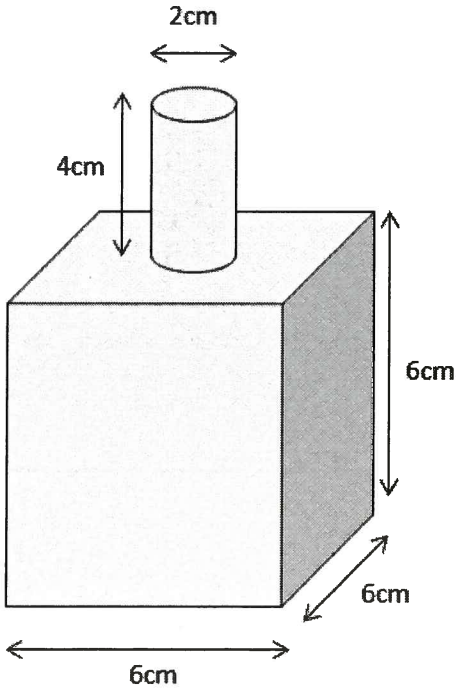


Top = $\pi r^2 = (3.14)(4)^2$ = 50.24
Bottom = πr^2 = 50.24
Cube Side = 2 × 2 = 4
Cube Side = 4
Cube Side = 4
Cube Side = 4
Cylinder Side = $2\pi rh = 2(3.14)(4)(1.8)$ = 45.216

161.696 cm^2

$$\frac{161.696\ cm \cdot cm}{1} \times \frac{1in}{2.54cm} \times \frac{1in}{2.54cm} = \frac{161.696\ in^2}{6.4516} = \boxed{25.06\ in^2}$$

Q11: What is the surface area of the composite shape, to the nearest in^2?



Top = 6 × 6 = 36
Bottom = 6 × 6 = 36
Cube Side = 6 × 6 = 36
Cube Side = 36
Cube Side = 36
Cube Side = 36
Cylinder Side = $2\pi rh = 2(3.14)(1)(4)$ = 25.12

241.12 cm^2

$$\frac{241.12cm \cdot cm}{1} \times \frac{1in}{2.54cm} \times \frac{1in}{2.54cm} = \frac{241.12\ in^2}{6.4516}$$

$$= \boxed{37.37\ in^2}$$

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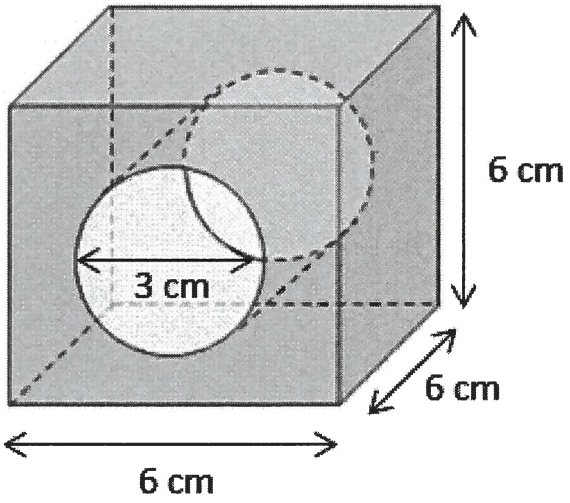
Q12: What is the surface area of the composite shape, to the nearest in^2?



Cube Side $= 6 \times 6 = 36\,cm^2$

Circle $= \pi r^2 = (3.14)(1.5)^2 = 7.065\,cm^2$

Cylinder Side $= 2\pi rh = 2(3.14)(1.5)(6) = 56.52\,cm^2$

$$SA = 6(\text{Cube Side}) - 2(\text{Circle}) + 1(\text{Cylinder Side})$$
$$= 6(36) - 2(7.065) + 1(56.52)$$
$$= 216 - 14.13 + 56.52$$
$$= 258.39\,cm^2$$

$$\frac{258.39\,cm \cdot cm}{1} \times \frac{1\,in}{2.54\,cm} \times \frac{1\,in}{2.54\,cm} = \frac{258.39\,in^2}{6.4516} = \boxed{40.05\,in^2}$$