CONTOUREDUCATION

Year 10 Mathematics
AOS 7 Revision [10.2]
Mock CAT 1

50 Marks. 60 Minutes Writing.

Results: *yewbo.*

Short Answer Questions	_____ / 34
Extended Response Questions	_____ / 16

Question 4 (1 mark)   (2)

The volumes of two similar pyramids are 8 cm³ and 27 cm³. Find the ratio of their heights.

Volume ration $= k^3 = \frac{27}{8} = $ 8)7̄7̄   9 : 27

$\cancel{b \not\!\!7 \not\!\!7 bh} = $
linear ratio for heights $R = \sqrt[3]{\frac{27}{8}} = \frac{3}{2}$ 2)3.0

3 : 2

Question 5 (1 mark)

Find the surface area of a cube with a side length of 5 cm.

$6(5 \times 5) = 25 \times 6$

25
× 6
150

150 cm²

Question 6 (2 marks)   ✓✓ (-1)

Find the shaded area in the diagram, which shows a square of side length 14 cm with an inscribed circle. Leave
your answer in terms of π. ← this right here

198.00
153.86
─────
42.14

$= 42.14 \text{ cm}^2$
but in π.

14 cm

14
× 14
56
+140
196

$(7)^2 \pi = 49\pi$

$14 \times 14 = 196$

49
× 3.14
196
490
+14700
15386

$196 - 49\pi = 49(4 - \pi)$

153.86 cm

Question 4 (1 mark)   (1)

The volumes of two similar pyramids are 8 cm³ and 27 cm³. Find the ratio of their heights.

Volume ratio $= k^3 = \dfrac{27}{8} =$ $8\sqrt{27}$ 8 : 27

$b \cdot h =$ $\sqrt[2]{\dfrac{27}{8}} = \dfrac{3}{2}$

linear ratio for heights $R =$

3 : 2

Question 5 (1 mark)

Find the surface area of a cube with a side length of 5 cm.

$6(5 \times 5) = 25 \times 6$

$\underline{150\,cm^2}$

Question 6 (2 marks) $\frac{1}{4}$ (−1)

Find the shaded area in the diagram, which shows a square of side length 14 cm with an inscribed circle. Leave your answer in terms of π. ← this righthere

14 cm

198.00
153.86
─────
42.14

$= 42.14\,cm^2$
but in π.

$(7)^2\pi = 49\pi$

$14 \times 14 = 196$

$196 - 49\pi = 49(4 - \pi)$

49
× 3.14
─────
196
490
14700
─────
153.86
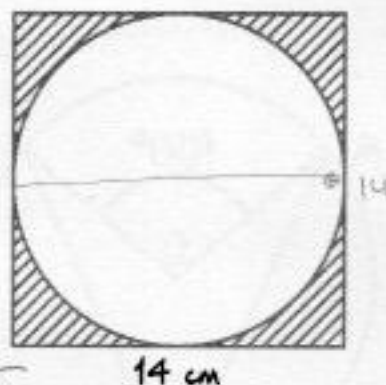
153.86 cm

Question 7 (2 marks)

A cone has a radius of 5 cm and a slant height of 13 cm. Find its total surface area in terms of π.

$$\pi r(r+1)$$
$$5\pi(5+13)$$
$$5\pi(18)$$
$$90\pi\,cm^2$$

$18 \times 5 = 90b =$

$x \frac{5}{5}$

Question 8 (2 marks) **Tech-Active.**

Find the area of the (shaded) minor segment shown. The radius is 6 cm.

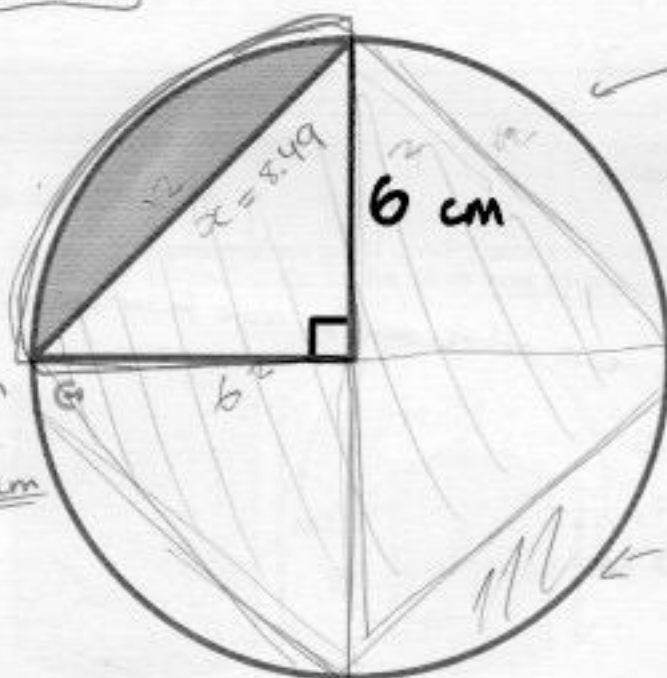Give your answer to one decimal place.

Working out:

$$\frac{\theta}{360} \times \pi r^2$$

$$\frac{1}{4} \times \pi(6)^2 = 9\pi$$

$$\frac{1}{2} \times 6^2 = 18cm$$

$$9\pi - 18 = \underline{10.3cm}$$

6 cm

$x = 8.49$

— working out is in efficient.

use: Triangle Area
vn: Area of sector

← 113.097cm²

113.097 – 72cm²

uc → ⊕ = 113.097 cm²
circle part area

△⊠ = 72cm²

41.097 cm² =

$$\frac{41.097\,cm^2}{4}$$

10.27cm²

10.3cm²

Question 9 (2 marks)

Find the value of x.

PE tangent

Tangent ~~secant~~ secant theorem.
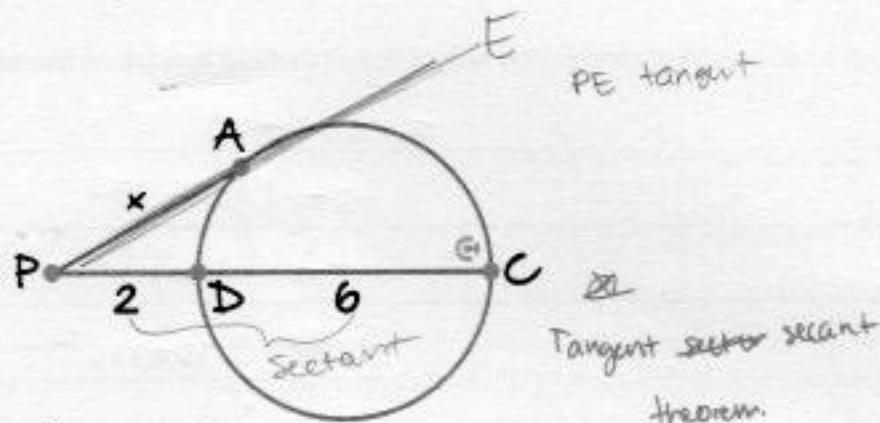
$$PT^2 = 2 \times 8$$
$$PT^2 = 16$$
$$PT = \sqrt{16}$$
$$T = 4 \qquad \text{therefore } x = 4.$$

Question 10 (2 marks) **Tech-Active.**

Two similar cylinders have heights of 6 cm and 9 cm. If the surface area of the smaller cylinder is 80 cm², what is the surface area of the larger cylinder?

$k^2 \rightarrow$ you have to increase and decrease by scale factor ration

$$80cm^2 = \frac{9}{6} = 1.5$$
$$k^2 = 1.5, \quad k=(1.5)^2 = 2.25$$
$$80 \times 2.25 = 180\,cm^2$$

$\frac{9}{6} =$

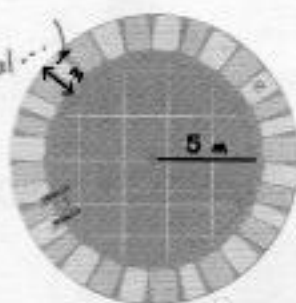$\frac{9}{6} = \frac{3}{2} \times 80 \qquad \frac{240}{2} = 120$

$$= 120\,cm^2$$

Question 11 (2 marks)

A circular pool has a tiled path 1 metre wide around its edge. If the pool has a radius of 5 metres, find the area of the tiled path.

in cases where they do not
specify a unit (to 2 decimal...)
keep answer in pi.

34.54 is correct but
keep it 4π.

$34.54m^2$ ✓

$5+1 = 6$ $6^2\pi$ $36\pi = \frac{36}{3}$

$5^2\pi = 25\pi \rightarrow$ $36\pi - 25\pi = \boxed{11\pi}$ ← keep it like this.

11×3.14 $314\ cm^2$

$\times 11$

314

$+ 3140$

3454

─②

Question 12 (2 marks) **Tech-Active.**

Find the value of x in the figure below, given O is the centre. Give your answer correct to two decimal places.
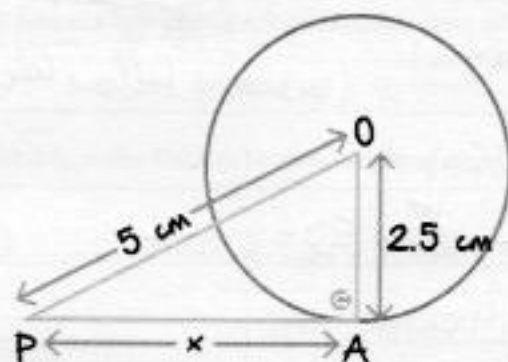
$5^2 - 2.5^2$
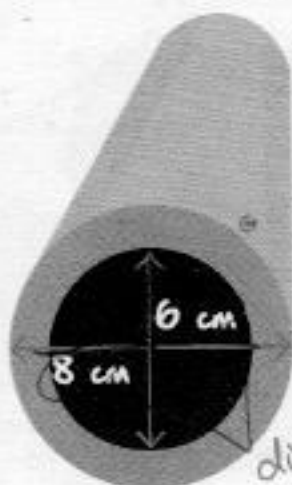
$25 - 6.25$

$x = \sqrt{18.75} cm = 4.33 m$

↓ never over 6 squareroot!

Square root it!

$\begin{array}{r} 25\ 1110 \\ \times 25 \\ \hline 115\ 114 \\ 500 \\ \hline 62\ \end{array}$

Question 13 (4 marks)

A metal pipe is a hollow cylinder with an outer diameter of 8 cm and an inner diameter of 6 cm. The pipe is 50 cm long.

Recall the damn question.

y, it says d i a m e t e r !!

50 cm

6 cm

8 cm

diameter !!!

$= \cancel{1400 \text{cm}^3}$

$= 1400\pi \text{cm}^3$

a. What is the volume of metal used to make the pipe? Leave your answer in terms of π. (2 marks)

$\pi r^2 h$

$\pi r^2 h$	$\pi r^2 h$
$\pi (4)^2 (50) \rightarrow \pi (4)^2 (50)$	$\pi (3)^2 (50)$
$16 \times 50 = \cancel{3200\pi}$	$9 \times 50 = \cancel{1800\pi} \quad 450\pi$
800π	

$3200\pi - 1800\pi = $
$800\pi - 450 = \boxed{350\pi} \text{ cm}^2$

b. What is the total surface area of the pipe (including the inside surface and the rings at both ends)? (2 marks)

$2\pi r^2 \cdot 2 + 2\pi r h \longrightarrow$ *(excluding hollow hole in middle)*

$2\pi \left(\frac{4}{8}\right)^2 \cdot 2\pi (4)(50)$

$16 \times 2 = \cancel{128\pi} \quad 32\pi \quad x + \cancel{128} \times 50 = 6$

$128\pi + 6400\pi =$

6400

$16 \times 2 \times \pi + 8 \times 50 \times \pi$

432π

$(2\pi R)h + 2\pi r (h) + 2(a R) - (\pi r^2)$

$R = 4$
$r = 3$

$2\pi (4)(50) + 2\pi (3)(50)$

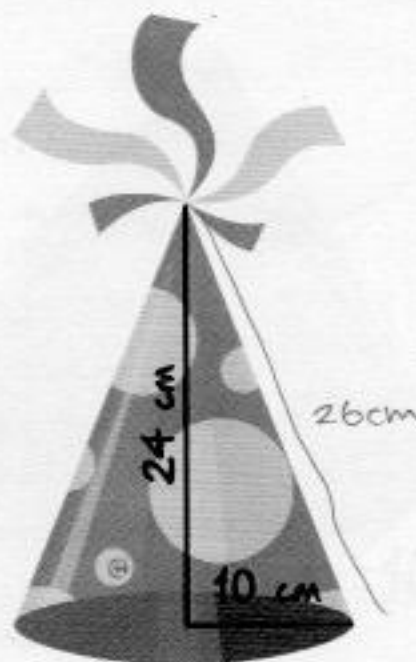$\rightarrow 400\pi + 300\pi + 2(\pi 4^2) - (\pi 3^2)$

$700\pi + 32\pi - 18\pi$

$700\pi \qquad 14\pi$

$= \boxed{714\pi \text{ cm}}$

Question 14 (4 marks) **Tech-Active.**

A birthday hat is a cone with a radius of 10 cm and a height of 24 cm.

When solving for measurement problems involving complex shapes, create your formula first, then evaluate.

24 cm

26cm

10 cm

a. Find the slant height of the cone. (2 marks)

$$10^2 + 24^2$$

$$= 100 + 576 = 676 \, cm^2$$

$$\sqrt{676} \, cm$$

$$= 26 cm$$

①

b. Find the area of the cardboard used to make the hat (curved surface area). Give your answer to the nearest cm². (1 mark)

use $\pi r l$ for curved $\pi r (r+l)$ 1131 cm²

Surface $= \pi (10)(26)$ $\pi 10 (10 + 26)$

$= 260\pi = \underline{817 cm^2}$ $10\pi \times 36$ $= 1436.9$

c. A ribbon is glued around the circumference of the base. What is the minimum length of ribbon needed? (1 mark)

$2\pi r$ $2(10)\pi$
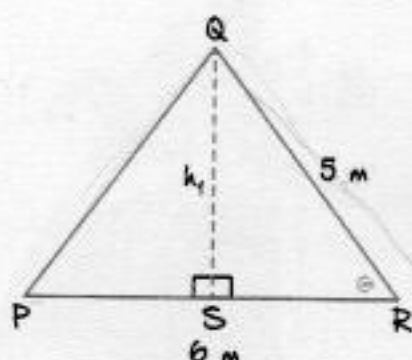
$= 20\pi$ $= 62.83 cm$

Question 15 (3 marks)

An architect is designing a symmetrical A-frame support structure for a building, as shown by $\triangle PQR$. A vertical support beam QS is installed at the centre.

working out
I'm not sure.

a. The vertical support beam QS connects the peak Q to the midpoint S of the base. Calculate the height (h_1) of the support beam. (2 marks)

$$5^2 - 3^2 = 25 - 9 = \sqrt{16} \qquad h = 4m$$

need neat and clear your working out.

2?

specific requirements
working out?

beam (with height h_1) casts a shadow that is 8 metres long. At the exact same
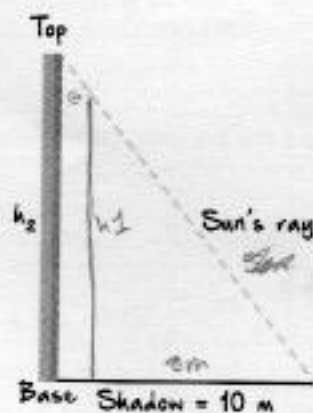...ight h_2) casts a shadow that is 10 metres long.

$h_1 = 4m$
$h_2 = ? $

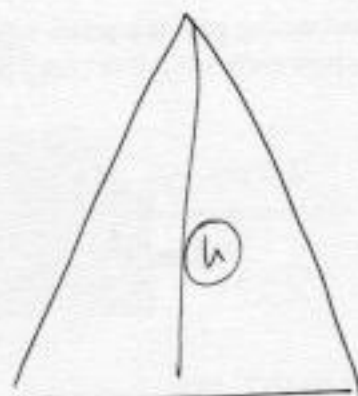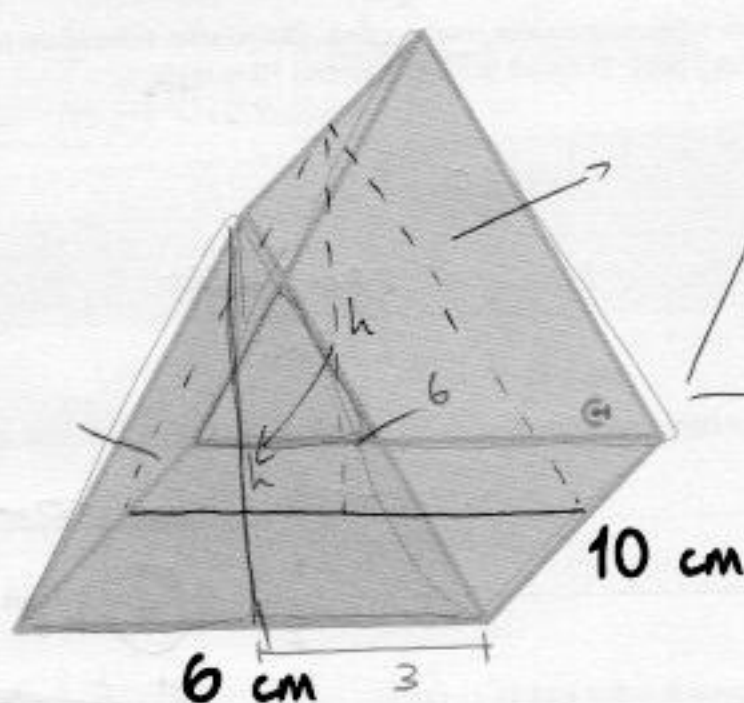$h_2 = \dfrac{4 \times 10}{8} = \dfrac{40}{8}$

$h_2 = 5m$

Ls working out?

b. Calculate the height (h_2) of the telephone pole. (1 mark)

$$\frac{10}{8} = 4 \times \frac{10}{4} = \frac{40}{8} = 5m$$

$$h_2 = 5m$$

CONTOUREDUCATION

Question 16 (4 marks)

The solid shown is a prism whose cross-section is an equilateral triangle with a side length of 6 cm. The length of the prism is 10 cm.

-4

h

6

10 cm

6 cm   3

→ what is the cross section

the 2D part of the 3D shape that intersects a plane

h

a. Find the height of the triangular cross-section. (2 marks)

→ Basically the triangle.

h = 6cm

$$3^2 + b^2 = 9 + 36 = 45 \quad \sqrt{45} =$$

$$b^2 - 3^2 = 36 - 9 = \sqrt{27} = 3\sqrt{3} \text{ cm}$$

→ keep in square root.

b. Find the area of the cross-section. (1 mark)

$$6 \times 6 = 36 \quad \frac{36}{2} = 17 \text{ cm}^2$$

$$\frac{6 \times 3\sqrt{3}}{2} = \frac{18\sqrt{3}}{2} = 9\sqrt{3} \text{ cm}^2$$

c. Hence, find the volume of the prism. (1 mark)
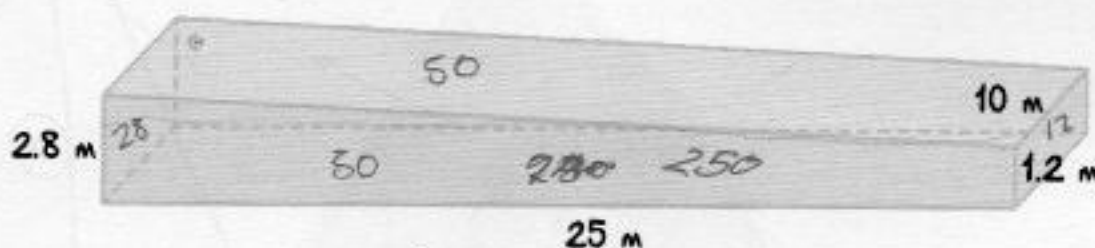
$$3(6 \times 10) + 36$$

$$= 60 \times 3 = 180 + 36 =$$

$$180 \times 10 = 1800 \text{ cm}^3$$

$$216 \text{ cm}^2$$

$$9\sqrt{3} \text{ cm}^2 \times 10 = 90\sqrt{3} \text{ cm}^3$$

Section B: Extended Response Questions (16 Marks)

Question 17 (7 marks) Tech-Active.

A swimming pool is a prism with a trapezoidal cross-section. The parallel sides of the trapezium are 1.2 m (shallow end) and 2.8 m (deep end). The pool is 25 m long and 10 m wide.

a. Calculate the area of the trapezoidal cross-section. (1 mark)

$$\frac{25(1.2+2.8)}{2} = 42m^2 \quad 50 m^2$$

$$\frac{1}{2}(a \boxed{+} b)h \quad bruh.$$

b. Find the volume of the pool in cubic metres. (1 mark)

got $\frac{1}{2}(a+b)h$

$$50 m^2 \times 10 m^2 = 420 m^3 \quad 500 m^2$$

c. How many litres of water are needed to fill the pool? (1 L = 1000 cm³). (1 mark)

$$10 m^2 = 1L$$
$$\times 42$$
$$= 40 \ 420 m^2 = 42 L.$$

$$1000 cm^3 =$$
$$(100,000) = L$$

$$1 m = 100 cm$$
$$1 m^3 = (100)^3 cm$$
$$1 m^3 = 1000000 cm^3 \times 500$$
$$= 500,009,000 m^3$$
$$1 : 1000$$

d. The interior walls of the pool need tiling. Find the total area of the four walls to be tiled. (2 marks)

$$2(42) + 12 + 28 + 250 + 250.51$$
$$= 624.51 m^2$$

$$2(50) + 12 + 28 + 250$$

there is only 5 walls to do

$$\frac{500,000,000}{1000} = 500,000$$

because top has no tiles. no need to use pythag.

says 4 walls but what about bottom floor?
how am I supposed to know with four walls?

e. The four interior walls will be tiled using square tiles measuring 25 cm × 25 cm. Allow 10% extra for wastage. How many tiles are needed to tile the walls? (2 marks)

Inconect → ~~624.51 m²~~ ✓ = 9992.16 × 1.10 ✓

Correct → ~~0.0625 m²~~ → ~~faily~~ calculate

= 10,991.38 tiles

~~0.25~~ 0.25 × 0.25 = 0.0625

$\frac{140}{0.0625}$ = $\underline{2240}$

working out
correct but wrong rule.

this would've been correct if I had calculated

~~2240~~ 2240 × 1.10
= 2464 ie.
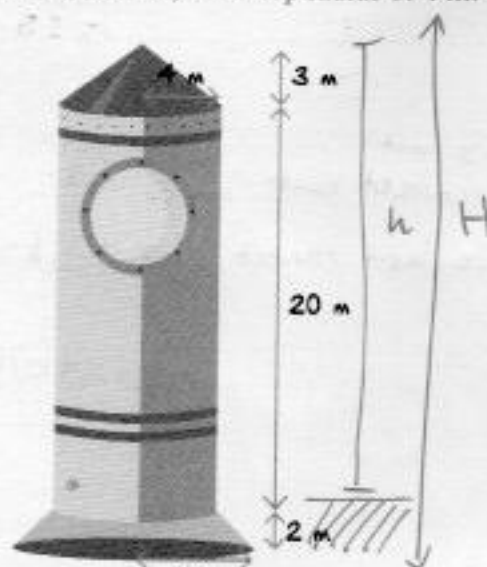
$\frac{1}{2}(a+b)h \ldots$ ∴

Question 18 (9 marks)

A rocket consists of a cylinder (body), a cone (nose), and a frustum (engine nozzle).

The cylinder has a radius of 4 m and a height of 20 m.

The cone has the same radius and a height of 3 m.

The frustum has a height of 2 m, a bottom radius of 6 m, and a top radius of 4 m.

answers must be seperate

a. Find the volume of the cylindrical body and the conical nose. (2 marks)

$\pi r^2 h$ $\pi(4)^2(20) + \frac{1}{3}\pi(4)^2(3)$

18 5504

$16 \times 20 = \boxed{320\pi} +$ $\frac{16 \times 3\pi}{3} = 48\pi \; \boxed{16\pi}$

$320 + 16 = \cancel{336\pi} \, m^3$ leave values in π

$\boxed{18\text{E}5 \, 0\text{T}\text{m}^3}$

336   2+12
× 3 1 4
1 3 4 4   1+12
3 3 0   1+9
1 0 0 8 0 0   1+a

b. By using similarity with the nose of the rocket, find the volume of the frustum-shaped nozzle. (3 marks)

$\frac{6}{4} = \frac{3}{2}$ of 16π

H = height overall, h = cone height (bottom) $H = h + 2$
removed.

$\frac{R}{H} = \frac{r}{h} \Rightarrow \frac{6}{h+2} = \frac{4}{h} \Rightarrow 6h = 4h + 8 \Rightarrow 2h = 8 \; h = 4$

c. Find the total volume of the rocket. (1 mark)

⤷ that's when combine.

$$\frac{152\pi}{3} + 16\pi + 320\pi$$

$$= \frac{1160\pi}{3} \, m^3$$

doesn't mean 'no frustum'
it mean 'bottle BASE'

d. Find the total external surface area of the rocket (excluding the base of the frustum). (3 marks)

$$2\pi r^2 + 2\pi rh \quad + \quad \pi r(r + l) \leftarrow \text{the slant height}$$

$$2\pi(4)^2 + 2\pi(4)(20) + \pi \cdot 6(4)(4+5) \quad h \neq l$$

$$32\pi + 160\pi \quad + \quad 28\pi \quad \quad (l \neq 3 \quad \triangle\sqrt{3}x$$

$$192\pi + 28\pi = 220\pi$$

$$\underbrace{110\pi \quad 10\pi}$$

Hectare

```
    220
  × 314
    880
   2200
 + 66000
   69080
```

at $ir1$ cone₁

690.80 m²

$$4^2 + 3^2$$

$$= 16 + 9 = \sqrt{25} = 5$$

$$L = 5$$

$$36\sqrt{2} - 16\sqrt{2}$$

$$= 20\sqrt{2}\pi$$

Cylinder

$$2\pi(4)(20)$$

$$= 80 \times 2 = 160\pi$$

$$20\pi + 160\pi + 16\sqrt{2}\pi \quad \pi rh$$

$$180\pi + 16\sqrt{2}\pi \quad 20\sqrt{2}\pi$$

$$\pi r(r+l)$$

cone₂

$$\pi r^2 + \pi r l$$

just this bit.

$$= \pi RL - \pi rl \quad base$$

Slant height for Cone₁

$$3^2 + 4^2 = 25$$

$$\sqrt{25} = 5$$

$$s = \pi rl$$

$$\pi(4)(5)$$

$$20\pi$$

$$\pi(5)l$$

slant height for cone₂

$$6^2 + 6^2 = 36 + 36$$

$$= 72$$

$$= \sqrt{72} = 6\sqrt{2} \, m$$

$$\pi RL = \pi(6)(6\sqrt{2})$$

$$= 36\sqrt{2} \, m^2$$

$$\pi rl \quad r = 4 \text{ her } L = \sqrt{4^2 + 4^2} =$$

$$16 + 16 = \sqrt{32} = 4\sqrt{2}$$