Student's Name: ....

Teacher's Name: ....

(DXC) Mr Chua

(RJW) Mr Williams

(AHP) Miss Pham

(GPF) Mr Fitzmaurice*

(JAI) Miss Iles

(LMD) Mrs de Gorter

(ARP) Mr Perkins

(RAS) Mr Smith

(JGD) Mr Doran

Tuesday 17th August 2021

Total Time: 40 mins

YEAR 10
5.3 MATHEMATICS
FORMATIVE TASK 3

Surface Area and Volume

Coordinate Geometry

Trigonometry

INSTRUCTIONS TO STUDENTS

- **Use your stylus to write your answers in OneNote or upload pictures of your work**
- **In the SPACES PROVIDED, write ALL necessary working BEFORE your answer**
- **In questions worth two or more marks, working MUST be shown to gain full marks**
- **Clearly indicate your final answer**
- **NESA approved calculators may be used.**

Total marks: 45

* * * *

Part A: Surface Area and Volume [12 marks]

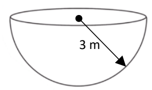
Object	Volume	Surface Area
Cylinder	$\pi r^2 h$	$2\pi r^2 + 2\pi rh$
Sphere	$\frac{4}{3}\pi r^3$	$4\pi r^2$
Cone	$\frac{1}{3}\pi r^2 h$	$\pi r^2 + \pi rl$

$1\,cm^3 = 1\,mL$

$1\,m^3 = 1\,kL$

Question 1 (2 marks)

Calculate, correct to the nearest cubic metre, the **volume** of this hemisphere.

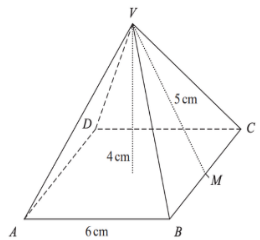


Question 2 (1 mark)

Bob builds a pool in his backyard which has a volume of 48 m^3. How many litres does it hold?

Question 3 (1 mark)

Which answer correctly gives the surface area of this square based pyramid?



(A) 6x6 + 4(0.5x3x4)
(B) 6x6 + 4(0.5x3x5)
(C) 6x6 + 4(0.5x4x6)
(D) 6x6 + 4(0.5x5x6)

Perpendicular height = 4 cm

Slant height = 5 cm

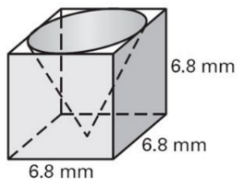
Question 4 (2 marks)

The ratio of surface areas of two similar solids is 16 : 49.

If the length of smaller solid is 20cm, what is the corresponding length of the larger solid?

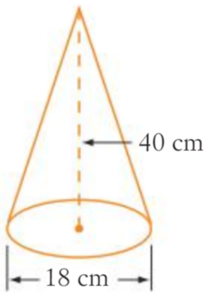
Question 5 (3 marks)

Find the **volume** of the remaining object, correct to the nearest cubic millimetre, after a cone is removed from a cube.



Questions 6 (3 marks)

Calculate in **exact form** the **surface area** of:



Part B: Coordinate Geometry [11 marks]

Gradient-intercept form of a line	Slope (gradient) of a line	Point-gradient of the equation of a line
$y = mx + b$	$m = \frac{y_2 - y_1}{x_2 - x_1}$	$y - y_1 = m(x - x_1)$
m is gradient b is y-intercept		**Distance between two points** $d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$

Question 7 (1 mark)

Which of the following lines is **parallel** to $3y = 2x + 1$?

(A) $y = 2x + 5$

(B) $y = -\frac{3}{2}x$

(C) $y = \frac{2}{3}x + 8$

(D) $3y = -2x + 1$

Question 8 (1 mark)

Which of the following points lies on the line $5y = -x + 2$?

(A) $(-12, -2)$
(B) $(-8, 2)$
(C) $(12, 2)$
(D) $(8, -2)$

Question 9 (6 marks)

An interval is formed by joining the points $K(-5, 14)$ and $L(1, 6)$.

(i) Find the length of the interval *KL*. **2**

(ii) Find the midpoint of *KL*. **2**

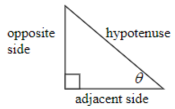
(iii) Find the gradient of *KL*. **2**

Question 10 (3 marks)

Find, in general form, the equation of a line which passes through the point $(-2\,,\,7)$ and is perpendicular to the line $y \;=\; 3x+2$.

Part C: Trigonometry [10 marks]

Trigonometric Ratios



$\sin\theta = \dfrac{\text{opposite side}}{\text{hypotenuse}}$

$\cos\theta = \dfrac{\text{adjacent side}}{\text{hypotenuse}}$

$\tan\theta = \dfrac{\text{opposite side}}{\text{adjacent side}}$

Sine rule

In ΔABC,

$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

Area of a triangle

In ΔABC,

$$A = \frac{1}{2}ab\sin C$$

Cosine Rule

In ΔABC,

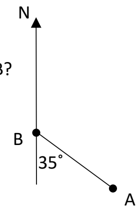
$$c^2 = a^2 + b^2 - 2ab\cos C$$

or

$$\cos C = \frac{a^2 + b^2 - c^2}{2ab}$$

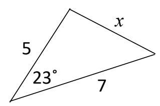
Question 11 (1 mark)

What is the three figure bearing of A from B?



Question 12 (1 mark)

Which of the following substitution lines has correctly applied the Cosine rule?



(A) $x^2 \;=\; 5^2 - 7^2 + 2\times5\times7\times\cos 23^\circ$

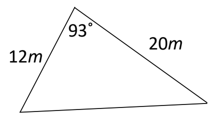
(B) $x = \sqrt{7^2 + 5^2 - 2\times7\times5\times\cos 23^\circ}$

(C) $x \;=\; 5^2 + 7^2 - 2\times5\times7\times\cos 23^\circ$

(D) $x = \sqrt{7^2 + 5^2 - 7\times5\times\cos 23^\circ}$

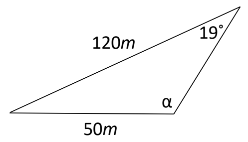
Question 13 (2 marks)

Find the area of this triangle (correct to the nearest square metre):



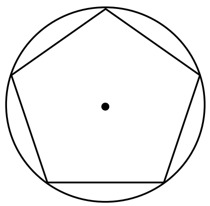
Question 14 (3 marks)

Find the size of α, correct to the nearest **minute**, if α is **obtuse**.



Question 15 (3 marks)

Calculate the side length, to 1 decimal place, of a regular pentagon when it is inscribed in a circle of radius 12 cm.



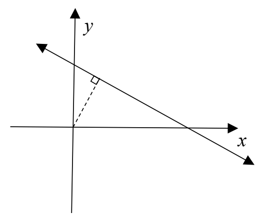
Part D: Mixed Problems [12 marks]

Question 16 (3 marks)

The sides of a triangle are in the ratio 5:16:19. Find the largest angle of the triangle.

Question 17 (3 marks)

Find the perpendicular distance from the origin to the line $3x + 4y = 5$.

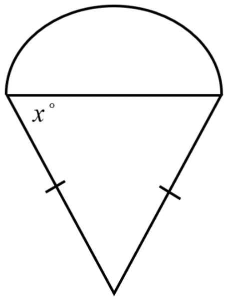


Question 18 (3 marks)

If the diameter of a cylinder is decreased by 5%, by what percent must the height be increased so that the volume remains the same? *(answer correct to one decimal place)*

Question 19 (3 marks)

The semicircle and the isosceles triangle have equal areas. Find tan x.



END OF TEST

#1

STUDENT SOLUTIONS:

YEAR 10 (5.3) FORMATIVE TASK.

Question 1

$V = \frac{2}{3}\pi(3)^3$

$= 56.54$

$\doteq 57m^3$

(Rounding question for entire paper.

Question: 2:

$48m^3 = 48000L$

Question: 3:

Ans = D

Question: 4:

$4^2 : 7^2$ (surface area)

$4 : 7$ (length)

$\therefore \frac{4}{7} = \frac{20}{x}$

$\therefore 4x = 140$

$x = 35$

$\therefore 20 : \underline{35}$

Question: 5:

Cube: $V = (6.8)^3$

Cone: $V = \frac{1}{3}\pi(3.4)^2 \times 6.8$

$\therefore V = (6.8)^3 - \frac{1}{3}\pi(3.4)^2 \times 6.8$

$V \doteq 232 mm^3$

Question: 6:

Slant – Pythagoras $x^2 = 40^2 + 9^2$

$x^2 = 1681$

$x = 41.$

$SA = \pi \times 9^2 + \pi \times 9 \times 41$

$= 450\pi \ cm^2$

(Must be in exact form).

Question: 7:

C

Question: 8:

B

Question: 9:

(i) $\sqrt{(14-6)^2 + (-5-1)^2}$

$= \sqrt{100} = 10$

(ii) $M = \left(\frac{-5+1}{2}, \frac{14+6}{2}\right)$

$= (-2, 10)$

(iii). $m = \frac{8}{-6} = -\frac{4}{3}$

Question: 10:

Gradient for $y = 3x + 2$

$\therefore m = 3$

Gradient perpendicular $= -\frac{1}{3}$

$\therefore y - 7 = -\frac{1}{3}(x+2)$

$3y - 21 = -x - 2$

$\therefore x + 3y - 19 = 0$

Question: 11:

$180 - 35$

$= 145°$

Question: 12:

B

Question: 13:

$A = \frac{1}{2} \times 12 \times 20 \times \sin 93°$

$\doteq 120m^2$

Question 14:

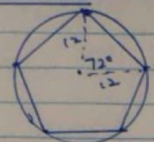
$\frac{\sin\alpha}{120} = \frac{\sin 19°}{50}$

$\sin\alpha = \frac{120 \sin 19°}{50}$

$\alpha = 51.39°; 128.61°$

$\alpha = 128° 37'$

Question: 15:



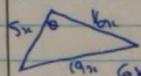
$\frac{360}{5}$

$= 72°$

$\therefore x^2 = 12^2 + 12^2 - 2(12)(12)\cos 72°$

$x = 14.1 cm$ (1dp)

Question: 16:



$\cos\theta = \frac{(5x)^2 + (16x)^2 - (19x)^2}{2(5x)(16x)}$

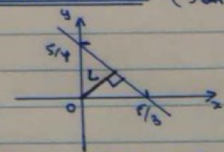
$\therefore \cos\theta = \frac{25x^2 + 256x^2 - 361x^2}{160x^2}$

$= \frac{-80x^2}{160x^2}$

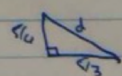
$\therefore \cos\theta = -0.5$

$\theta = 120°$

Question: 17: (3 methods)



Method 1 (Intercepts)



$d^2 = (5/4)^2 + (5/3)^2$

$d = \sqrt{(5/4)^2 + (5/3)^2}$

$d = \frac{25}{12}$

and Area of triangle

$A = \frac{1}{2} \times 5/4 \times 5/3$

$= \frac{25}{24}$

Area of triangle

$\frac{25}{24} = \frac{1}{2} \times \frac{25}{12} \times L$

$\frac{1}{dist}(L) = 1$ unit. OR

STUDENT SOLUTIONS

YR10 TASK (PAGE 2)

Question: 17; cont'd

Method 2: Perp. dist form.

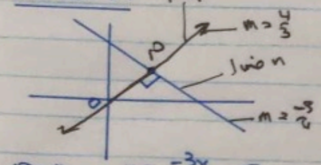
$$d = \frac{|3(0) + 4(0) - 5|}{\sqrt{3^2 + 4^2}}$$

$$d = \frac{5}{5}$$

$$d = 1$$

OR.

(using point P)
METHOD 3:



Eqn n $\quad y = \frac{-3x}{4} + 5$

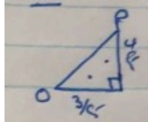
Eq. P $\quad y = \frac{4}{3}x$

$\therefore \quad \frac{4x}{3} = -\frac{3x}{4} + 5/4$

$\therefore \quad 16x = -9x + 15$

$25x = 15$

At P $\quad x = \frac{3}{5}, \ y = \frac{4}{5}$



$(OP)^2 = \left(\frac{4}{5}\right)^2 + \left(3/5\right)^2$

$(OP)^2 = \frac{16}{25} + \frac{9}{25}$

$OP = 1$

Question: 18:

$\pi r^2 h = \pi (0.95r)^2 H$

(Radius decreasing by 5%.)

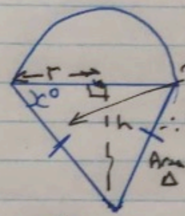
$\therefore \quad h = (0.95)^2 H$

$\therefore \quad H = \frac{h}{(0.95)^2}$

$= 1.108h$

$\therefore \quad 10.8\%$

Question: 19:



$\tan x = \frac{h}{r}$

$\therefore h = r \tan x$

Area $\Delta = \frac{2r \times h}{2}$

$= rh$

$= r^2 \tan x$

$\therefore \quad \frac{\pi r^2}{2} = r^2 \tan x$

$$\boxed{\tan x = \pi/2}$$