

OUR LADY OF THE SACRED HEART COLLEGE

YEAR 10 2006

MATHEMATICS

TASK 3

Surface Area & Volume, Geometrical Figures, Coordinate Geometry

Wednesday 16th August, 2006

Name: _____

Teacher: _____

GENERAL INSTRUCTIONS:

- Working time – 45 minutes
- Write using blue or black pen
- Board of Studies approved calculators and templates may be used.
- Marks may be deducted for careless or badly arranged work.
- Attempt ALL questions.
- Put your student number or name on the top of each question.
- Total Marks – 40
- **SECTION I** – Multiple Choice 10 marks
Circle the most correct answer.
- **SECTION II** - Extended Response 30 marks
Answer each question in the space provided.
All working must be shown for every question.

Assessed Outcomes:

MS5.2.2 – Applies formulae to find the surface area of right cylinders and volume of right pyramids, cones and spheres, and calculates the surface area of composite solids.

SGS5.2.2 – Develops and applies results for proving that triangles are congruent or similar.

PAS5.2.5 – Draws and interprets graphs including straight lines, simple parabolas and hyperbolas.

Outcome	Questions	Mark	Maximum
MS5.2.2	Multiple choice Q1-4		
	Q11		
SGS5.2.2	Multiple choice Q5-7		
	Q12		
PAS5.2.5	Multiple choice Q8-10		
	Q13		

Final Mark: _____

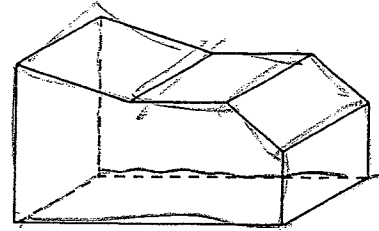
SECTION I – Multiple Choice 10 marks

Name: _____

CIRCLE the most correct answer.

1. Sarah made the following statements about the solid:

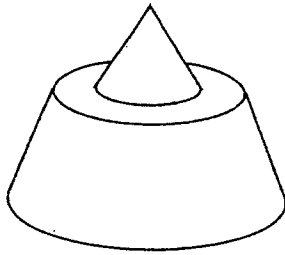
- I – It has 8 faces. II – It has 18 edges.



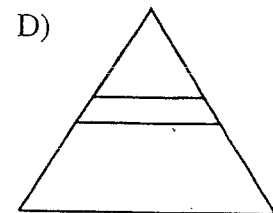
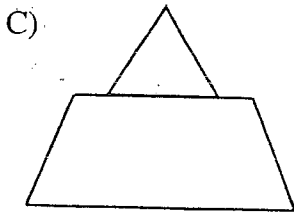
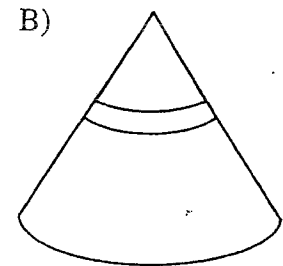
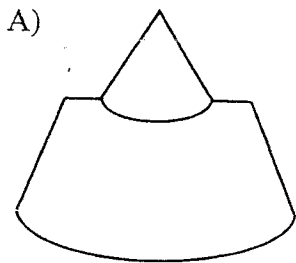
She was correct in:

- A)** I only **B)** II only **C)** Both I and II **D)** Neither I or II

2.



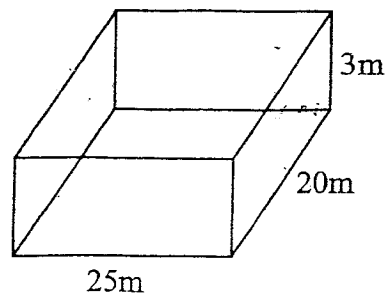
Which of the following is the side view of the solid?



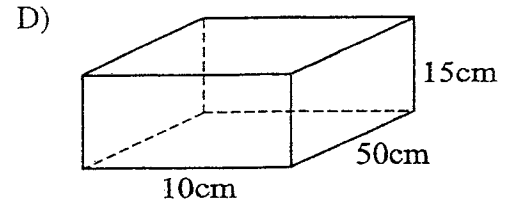
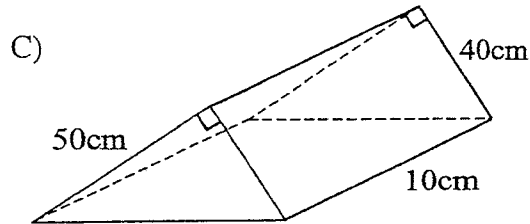
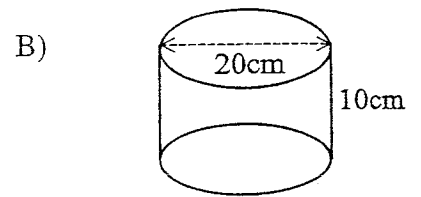
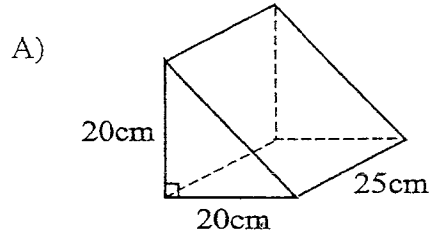
3. This rectangular prism represents Jessica's new swimming pool.

If Jessica wants to tile the walls and the floor of this pool, find the area that needs to be tiled.

- A) $1500m^2$ B) $770m^2$
 C) $1270m^2$ D) $270m^2$



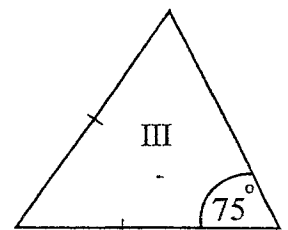
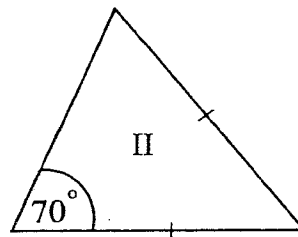
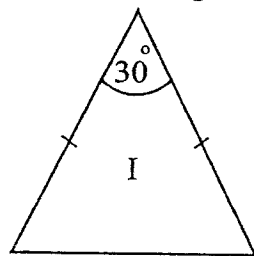
4. Which of the following solids has a capacity (volume) of 10L?



5. All congruent triangles :

- A) are equiangular
- B) have corresponding sides equal
- C) are equilateral**
- D) both A and B

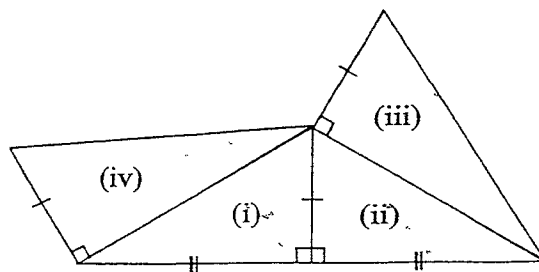
6. Which of the following isosceles triangles are congruent?



NOT TO SCALE

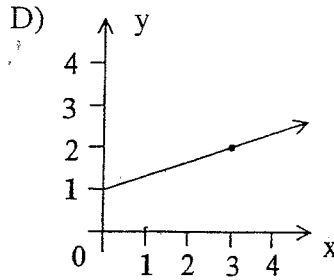
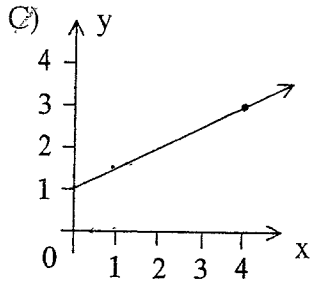
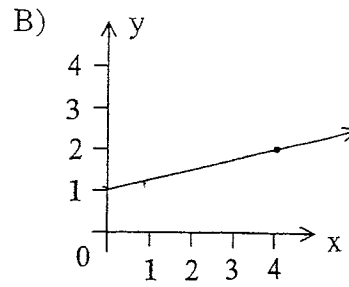
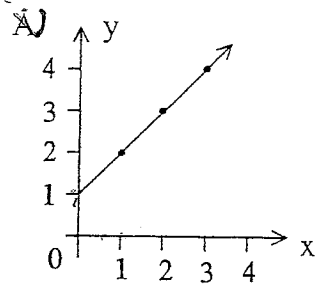
- A) I and II only
- B) I and III only
- C) II and III only
- D) I, II and III

7. The diagram shows four right angled triangles. Which statement is true?



- A) Triangle (i) is congruent to triangle (ii), and triangle (iii) is congruent to triangle (iv).
- B) Triangle (i) is congruent to triangle (iii), and triangle (ii) is congruent to triangle (iv).
- C) Triangle (i) is congruent to triangle (iv), and triangle (ii) is congruent to triangle (iii).
- D) All the triangles (i), (ii), (iii) and (iv) are congruent to each other.

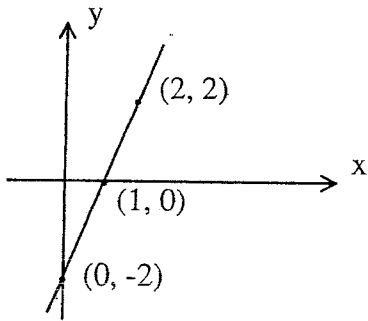
8. Which graph represents the rule 'each y value is one more than half the x value'.



9.

x	0	1	2
y	-2	0	2

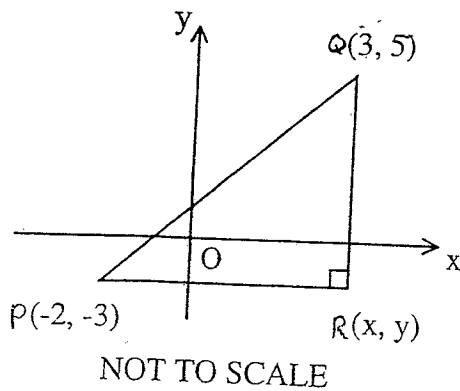
George uses the table to produce the straight line below.



Which of the following also lie on this line?

- A) (4, 6)
- B) (3, 8)
- C) (-1, 4)
- D) (-2, 6)

10.



$P(-2, -3)$ and $Q(3, 5)$ are points on a right-angled $\triangle PQR$.
The co-ordinates of R are:

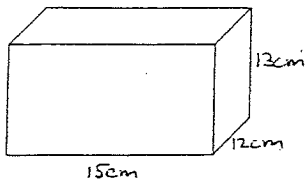
- A) (5, -2)
- B) (-3, 3)
- C) (-2, 5)
- D) (3, -3)

SECTION II – Extended Response 30 marks Answer in the space provided.

Question 11 (10 Marks)

(a) Calculate both the Surface Area and Volume of each of these solids:

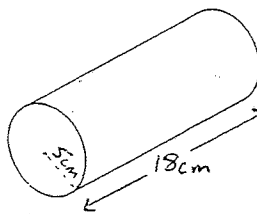
i.



SA = _____

 V = _____

ii.



SA = _____

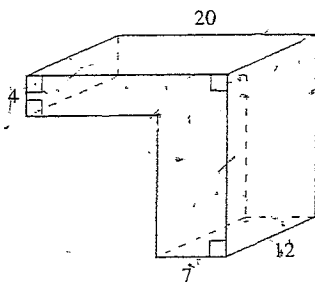
 V = _____

Marks

2

2

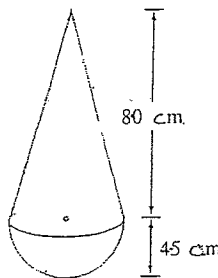
(b) Calculate the surface area of this combined prism:-



2

(c) Calculate the volume of this combined solid:-

V =



2

(d) A right prism has a volume of $1449m^3$. Find the cross-sectional area if the prism has a height of $8.4m$.

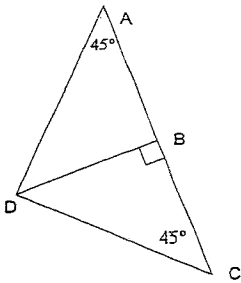
2

Question 12 (10 Marks)

Marks

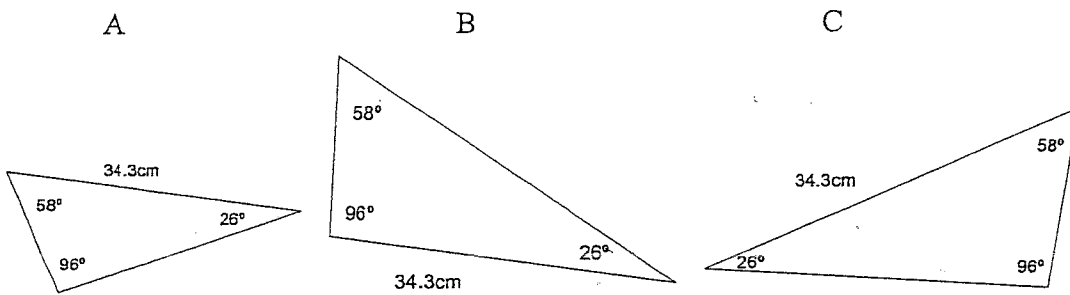
- (a) Using the information in the diagram, which congruence test can be used to show that $\triangle ABD \equiv \triangle CBD$?

1



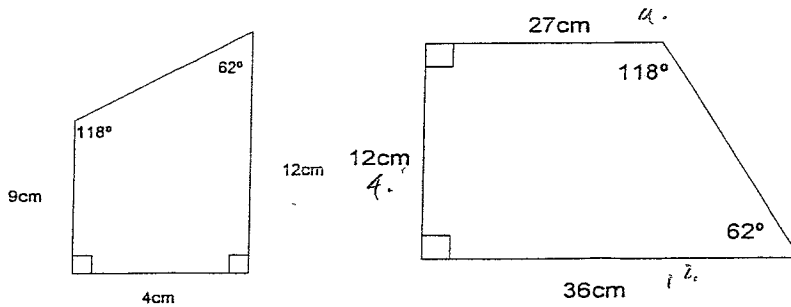
- (b) Which two of the following three figures are congruent and why?

1

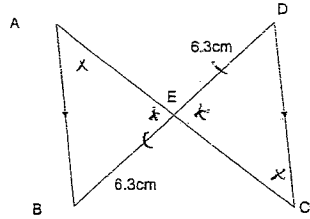


- (c) The two figures below are similar. What is the enlargement factor?

1

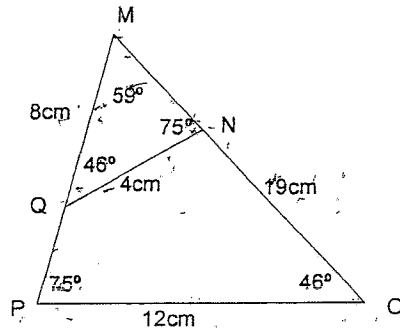


(d) Prove that $\triangle ABE \cong \triangle CDE$.



3

(e) In the diagram below; $NO=19\text{cm}$, $OP=12\text{cm}$, $QM=8\text{cm}$ and $QN=4\text{cm}$.



4

i. Which of the similarity tests can be used to show that $\triangle MNQ$ is similar to $\triangle MPO$?

ii. Explain why the side MQ in $\triangle MNQ$ corresponds to the side MO in $\triangle MPO$.

iii. Find the value of x .

2

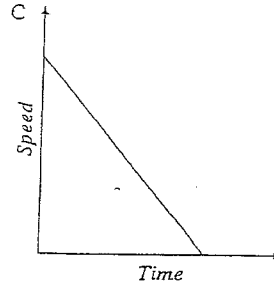
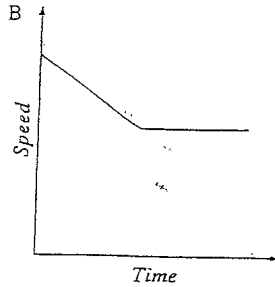
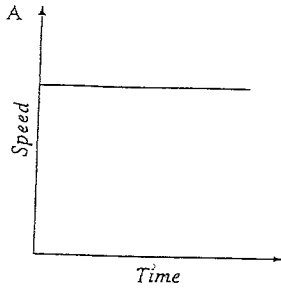
Question 13 (10 marks)

Marks

(a) Another name for the slope of a graph is the _____.

1

(b) Which graph best describes a car slowing down to a constant speed? _____



1

(c) Match the equations with the graphs:-

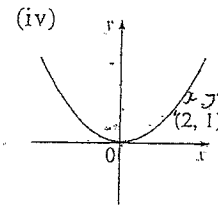
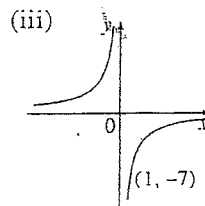
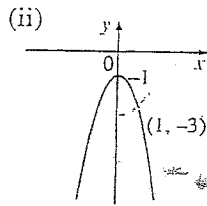
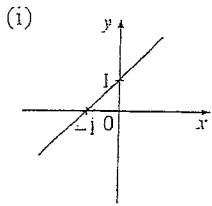
A $y = \frac{1}{4}x^2$

B $y = \frac{-7}{x}$

C $y = x + 1$

D $y = -3x^2$

2



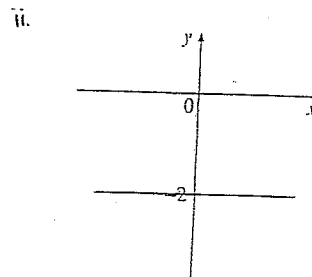
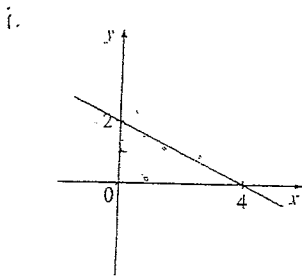
Eqn: _____

Eqn: _____

Eqn: _____

Eqn: _____

(d) Find the equations of the following graphs:



2

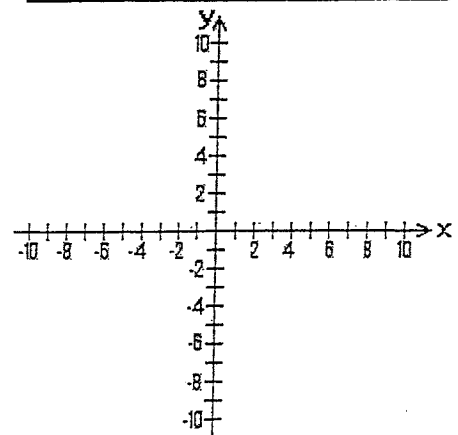
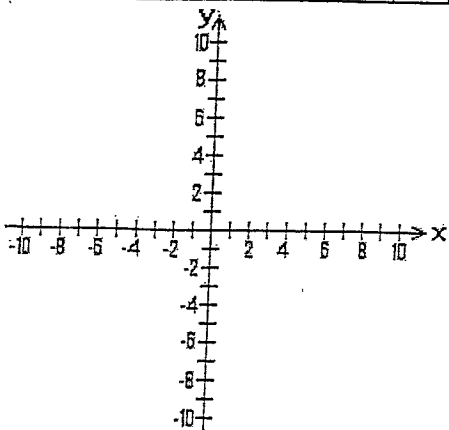
(e) Draw graphs of the following equations on the axes provided:-

i. $4x + 5y - 10 = 0$

ii. $y = 4 - x^2$

x							
y							

x							
y							

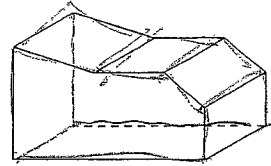


SECTION I – Multiple Choice 10 marks

Name _____

CIRCLE the most correct answer

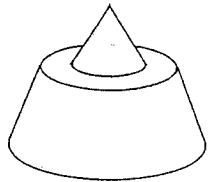
1. Sarah made the following statements about the solid
 I – It has 8 faces. II – It has 18 edges



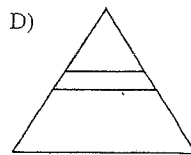
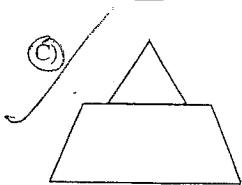
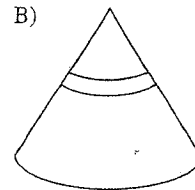
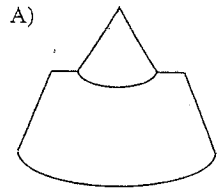
She was correct in:

- A) I only B) II only C) Both I and II D) Neither I or II

2.



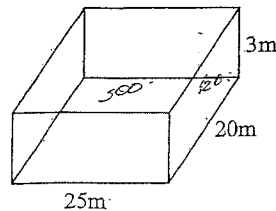
Which of the following is the side view of the solid?



3. This rectangular prism represents Jessica's new swimming pool

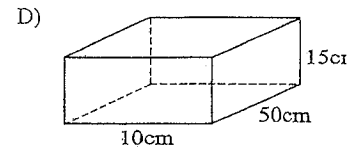
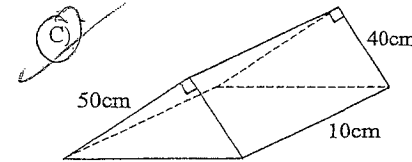
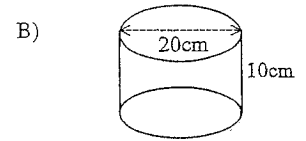
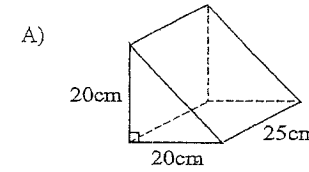
If Jessica wants to tile the walls and the floor of this pool, find the area that needs to be tiled.

- A) $1500m^2$ B) $770m^2$
 C) $1270m^2$ D) $270m^2$



500+

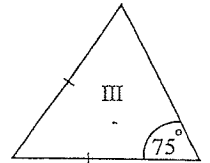
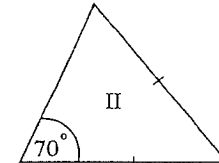
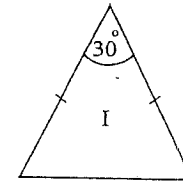
4. Which of the following solids has a capacity (volume) of 10L?



5. All congruent triangles

- A) are equiangular
 B) have corresponding sides equal
 C) are equilateral
 D) both A and B

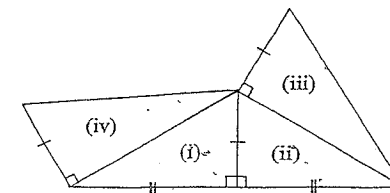
6. Which of the following isosceles triangles are congruent?



NOT TO SCALE

- A) I and II only B) I and III only
 C) II and III only D) I, II and III

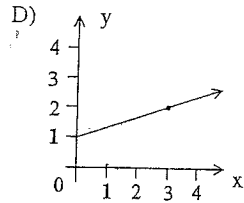
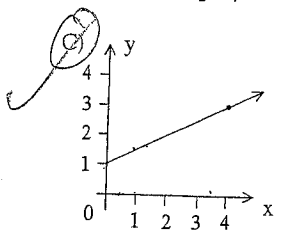
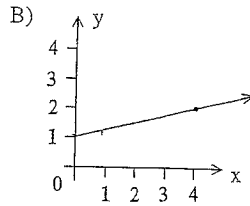
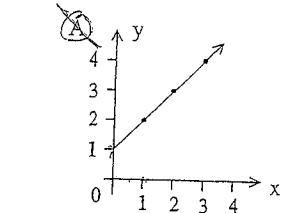
7. The diagram shows four right angled triangles. Which statement is true?



- A) Triangle (i) is congruent to triangle (ii), and triangle (iii) is congruent to triangle (iv).
 B) Triangle (i) is congruent to triangle (iii), and triangle (ii) is congruent to triangle (iv).
 C) Triangle (i) is congruent to triangle (iv), and triangle (ii) is congruent to triangle (iii).

8. Which graph represents the rule 'each y value is one more than half the x value'?

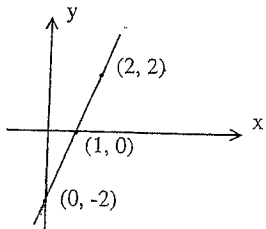
$y = \frac{1}{2}x + 1$



9.

x	0	1	2
y	-2	0	2

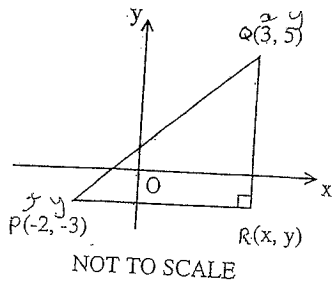
George uses the table to produce the straight line below.



Which of the following also lie on this line?

- A) (4, 6)
- B) (3, 8)
- C) (-1, 4)
- D) (-2, 6)

10.



P(-2, -3) and Q(3, 5) are points on a right-angled $\triangle PQR$. The co-ordinates of R are:

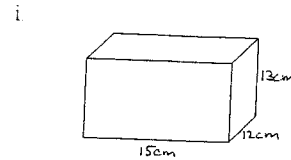
- A) (5, -2)
- B) (-3, 3)
- C) (-2, 5)
- D) (3, -3)

SECTION II - Extended Response 30 marks Answer in the space provided

Question 11 (10 Marks)

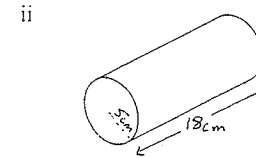
(a) Calculate both the Surface Area and Volume of each of these solids.

Marks $\frac{8}{10}$



$SA = ((15 \times 12) \times 2) + ((15 \times 12) \times 2) + ((12 \times 12) \times 2)$
 $SA = 762 \text{ cm}^2$

$V = 15 \times 12 \times 12$
 $= 2160 \text{ cm}^3$

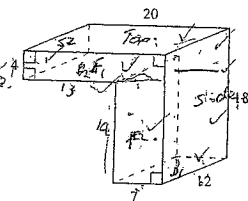


$SA = 2\pi rh + 2\pi r^2$
 $2\pi(5)(18) + 2\pi(5)^2$
 $= 722.6 \text{ (1 dp) cm}^2$

$V = \pi r^2 h$
 $\pi(5)^2(18)$
 $= 1413.7 \text{ (1 dp) cm}^3$

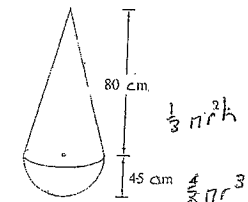
(b) Calculate the surface area of this combined prism:-

$Top = 20 \times 12 = 240$
 $Side = 12 \times 16 = 192$
 $Side 2 = 12 \times 4 = 48$
 $Front 1 = 20 \times 4 = 80$
 $Front 2 = 14 \times 7 = 98$
 $Bottom = 13 \times 12 = 156$
 $Bottom 1 = 7 \times 12 = 84$
 $Side = 14 \times 12 = 168$
 $SA = 1265 \text{ cm}^2$



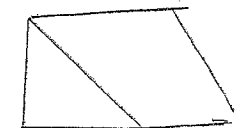
(c) Calculate the volume of this combined solid:-

$V = cone = \frac{1}{3} \pi (4.5)^2 (80)$
 $= 376.99 \text{ (2 dp)}$
 $sphere = \frac{4}{3} \pi r^3 = 2$
 $= \frac{4}{3} \pi (4.5)^3 = 2$
 $= 190.85 \text{ (2 dp)}$
 $total V = 567.8 \text{ (1 dp) cm}^3$



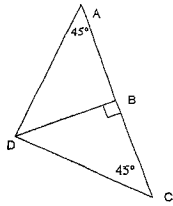
(d) A right prism has a volume of 1449 m^3 . Find the cross-sectional area is the prism has a height of 8.4m.

$1449 \div 8.4 = \text{cross section}$
 $\text{cross section} = 172.5 \text{ m}^2$



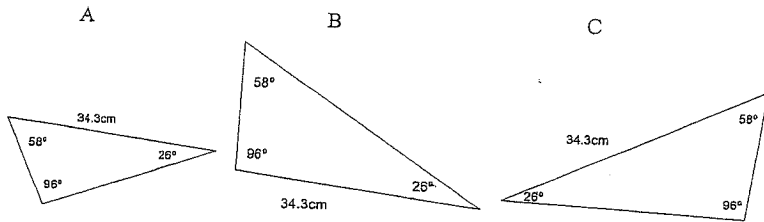
Question 12 (10 Marks)

- (a) Using the information in the diagram, which congruence test can be used to show that $\triangle ABD \cong \triangle CBD$?



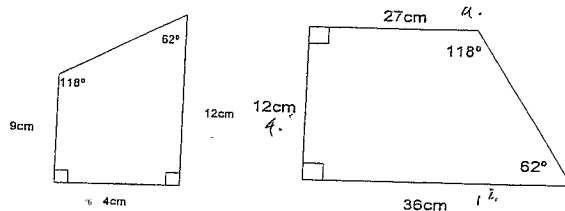
AAS ✓

- (b) Which two of the following three figures are congruent and why?



A and C because the matching sides and angles of the triangles are equal but in diagram B they are not.

- (c) The two figures below are similar. What is the enlargement factor?



The enlargement factor is 3.

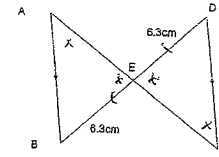
Marks

1

1

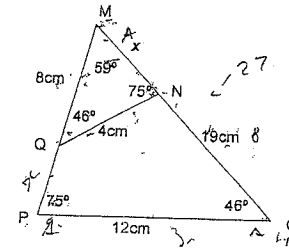
1

- (d) Prove that $\triangle ABE \cong \triangle CDE$.



Prove $\triangle ABE \cong \triangle CDE$.
 $\angle AEB = \angle CED$ (vertical opposite)
 $BE = ED$ (given)
 $\angle BAE = \angle DCE$ (alternate \angle 's, $AB \parallel DC$)
 $\therefore \triangle ABE \cong \triangle CDE$ (AAS)

- (e) In the diagram below; $NQ = 19\text{cm}$, $OP = 12\text{cm}$, $QM = 8\text{cm}$ and $QN = 4\text{cm}$.



- i. Which of the similarity tests can be used to show that $\triangle MNQ$ is similar to $\triangle MPO$?

all angles are equal when simpl

- ii. Explain why the side MQ in $\triangle MNQ$ corresponds to the side MO in $\triangle MPO$.

MQ corresponds to MO because although they are not on the same side they are matching angles in these corresponding \triangle 's. \triangle so they would equal the same when simplified.

- iii. Find the value of x .

Since $\triangle MNQ \parallel \triangle MPO$ (Equiangular)

$\therefore \frac{MQ}{MO} = \frac{NQ}{PO} = \frac{MN}{MP}$ in the same ratio.

$\therefore MQ$ corresponds to MO .

Using $\frac{MN}{MP} = \frac{NQ}{PO} = \frac{MQ}{MO}$

$\therefore \frac{MQ}{MO} = \frac{NQ}{PO}$

$\frac{8}{x+19} = \frac{4}{12}$

$\therefore 24 = x+19$

$\therefore x = 24 - 19 = 5$

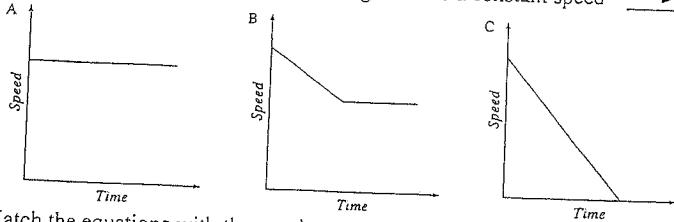
Question 13 (10 marks)

$y = mx + b$

Marks

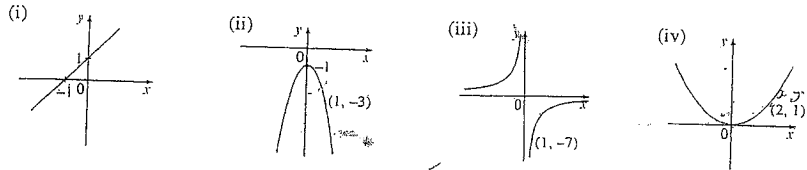
(a) Another name for the slope of a graph is the gradient. 1

(b) Which graph best describes a car slowing down to a constant speed? B 1



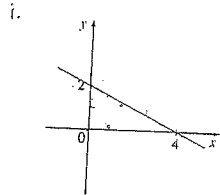
(c) Match the equations with the graphs:-

- ~~A~~ $y = \frac{1}{4}x^2$ ~~B~~ $y = \frac{-7}{x}$ ~~C~~ $y = x + 1$ ~~D~~ $y = -3x^2$

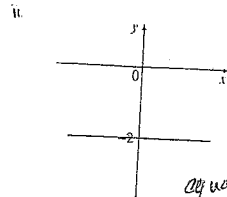


Eqn: $y = x + 1$ ✓ Eqn: $y = -3x^2$ ✓ Eqn: $y = \frac{-7}{x}$ ✓ Eqn: $y = \frac{1}{4}x^2$ ✓

(d) Find the equations of the following graphs:



$y = mx + 2$
 $= y = \frac{1}{2}x + 2$ ✓

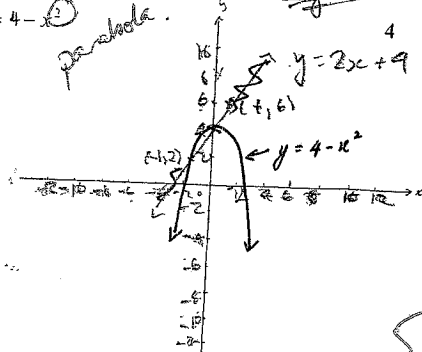
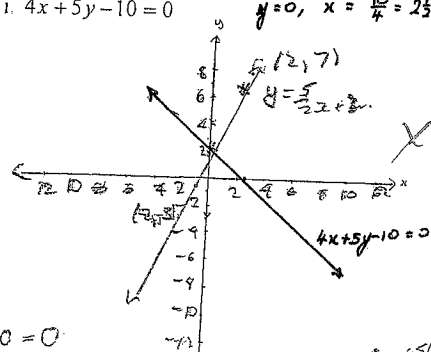


equation = $y = mx + b$
 $y = m \cdot x - 2$
 $y = -2$ ✓
 ~~$y = 0$~~

(e) Draw graphs of the following equations on the axes provided:-

i. $4x + 5y - 10 = 0$

$y = 0, x = \frac{10}{4} = 2\frac{1}{2}$ ii. $y = 4 - x^2$



(c) $5y - 10 = 0$

$5(0) = 10$

5