

CATHOLIC HIGH SCHOOL
END OF YEAR EXAMINATION 2007

Subject : **Mathematics**

Level : **Secondary 2**

Marks : **80**

Date : **9 October 2007**

Time : **0800 – 1000**

Name : _____ ()

Class : **Sec 2 - _____**

INSTRUCTIONS TO CANDIDATES :

Write your **NAME**, **CLASS** and **INDEX NUMBER** in the spaces at the top of this page.

Section A

Answer **all** questions.

Write your answers in the spaces provided on the question paper.

If working is needed for any question, it must be shown in the space below that question.

Omission of essential working will result in loss of marks.

The number of marks is given in brackets [] at the end of each question or part question.

The total of the marks for this section is 32.

Section B

Write your **NAME**, **CLASS** and **INDEX NUMBER** on the Answer Booklet provided.

Answer **all** questions on the Answer Booklet provided.

Show all your answers, together with all essential working on the same writing paper.

Omission of essential working will result in loss of marks.

The number of marks is given in brackets [] at the end of each question or part question. The total mark for this section is 48.

You are expected to use an **electronic calculator** to evaluate explicit numerical expressions.

If the degree of accuracy is not specified in the question, and if the answer is not exact, give your answer to **3 significant figures**. Give answers in degrees to **one decimal place**.

For π , use your calculator value, unless the questions requires the answer in term of π .

For Examiner's Use Only (Section A):

Types	Qn No.	Types	Qn No.
Accuracy		Graphs	
Brackets		Diagrams	
Fractions		Geometry	
Units		Others	

For Examiner's Use

32

This question paper consists of 10 printed pages, including this cover page.

Section A [32 marks]

Answer **all** the questions in the spaces provided on the Question Paper.

- 1 (a) Factorise $15p^2 + 2p$.
(b) Hence, solve the equation $15p^2 + 2p = 0$.

Answer (a) _____ [1]
(b) _____ [1]

- 2 Solve the equation $8^x = 16$.

Answer _____ [2]

- 3 Factorise $xa - 4x + 2a - 8$ completely.

Answer _____ [2]

- 4 Given that $x^2 - y^2 = 24$ and $x + y = -4$, find the value of $x - y$.

Answer _____ [3]

- 5 Given that $v = \sqrt{2uf - v^2}$, express v in terms of u and f .

Answer _____ [3]

- 6 Simplify the following, leaving your answers in positive indices.

(a) $\frac{(2a^2b)^3}{4ab^{-1}}$

(b) $\sqrt[3]{p^6q^3} \times 3p^0$

Answer (a) _____ [2]

(b) _____ [2]

7 Express as a single fraction in its simplest form

$$\frac{x-11}{x^2-2x-3} + \frac{2}{x-3}$$

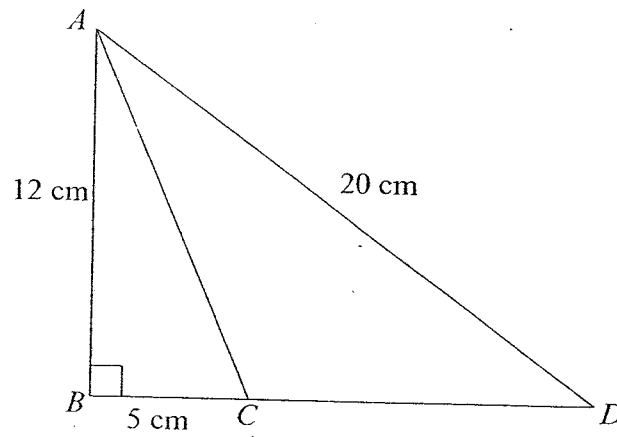
Answer _____ [3]

8 Solve the following simultaneous equations by either elimination or substitution method:

$$2x - 3y = -15$$

$$3x + 5y = -13$$

Answer $x =$ _____ $y =$ _____ [3]



In the diagram shown, BCD is a straight line. Angle $ABC = 90^\circ$, $AB = 12$ cm, $BC = 5$ cm and $AD = 20$ cm. Expressing each of your answers as a fraction in its lowest term, find

- (a) $\tan \angle ACB$,
- (b) $\cos \angle ACD$,
- (c) $\sin \angle BAD$.

Answer (a) _____ [1]

(b) _____ [2]

(c) _____ [2]

10 Showing your working clearly, solve the following simultaneous equations:

$$y + 5x = 3$$

$$2x^2 - 1 = 3xy + y^2$$

Answer $x = \underline{\hspace{2cm}}$ $y = \underline{\hspace{2cm}}$

$x = \underline{\hspace{2cm}}$ $y = \underline{\hspace{2cm}}$ [5]

- End of Section A -

Section B [48 marks]

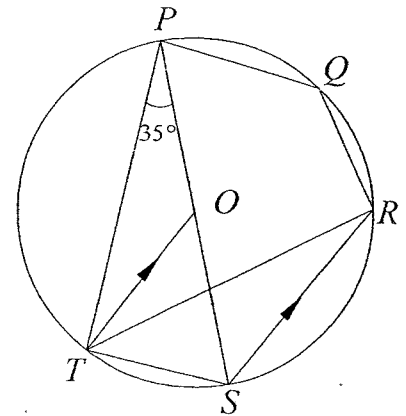
Answer **all** the questions on the Answer Booklet provided.

- 11** The points P, Q, R, S and T lie on a circle with centre O .

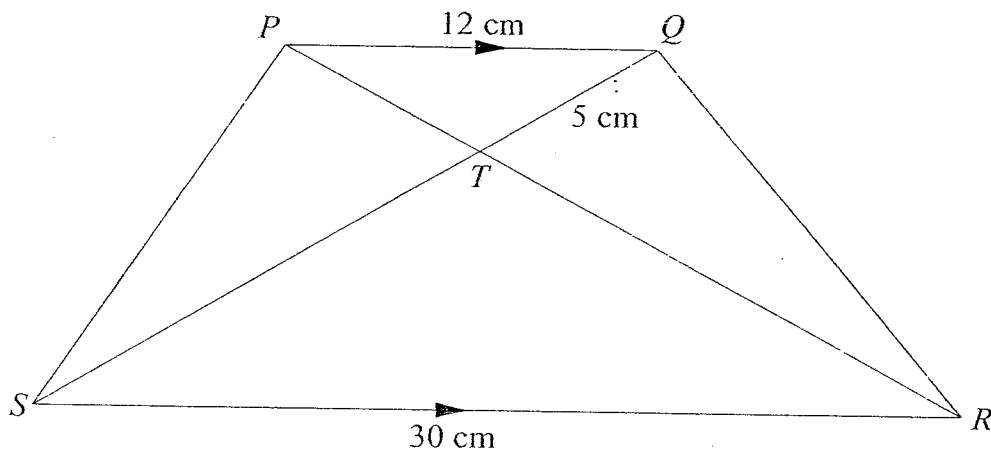
OT is parallel to SR and angle $TPS = 35^\circ$

Giving your reasons, find

- (a) angle TRS , [1]
 (b) angle TOS , [1]
 (c) angle PST , [1]
 (d) angle PTR , [2]
 (e) angle PQR . [2]

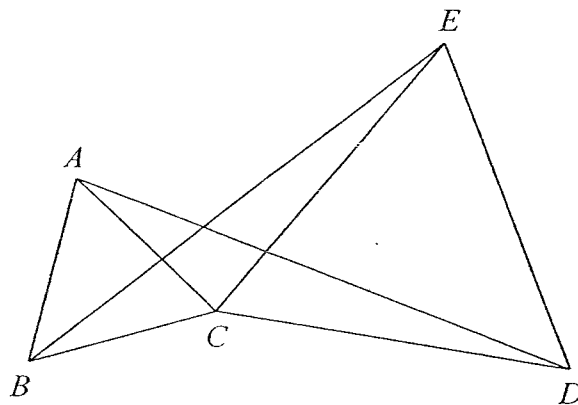


- 12** In the diagram below, $PQRS$ is a trapezium in which PQ is parallel to SR .



- (a) Prove that triangle PQT is similar to triangle RST . [3]
 (b) Given that $PQ = 12$ cm, $SR = 30$ cm and $QT = 5$ cm,
 (i) calculate ST , [2]
 (ii) find the value of $\frac{\text{Area of triangle } PQT}{\text{Area of triangle } RST}$, [1]
 (iii) find the value of $\frac{\text{Area of triangle } PQT}{\text{Area of triangle } QTR}$. [1]

- 13 In the diagram below, triangle ABC and triangle CDE are equilateral triangles.



- (a) Show that $\angle BCE = \angle ACD$. [2]
- (b) Prove that triangle BCE is congruent to triangle ACD . [3]

-
- 14 A tank holds 300 litres of water. The tank can be filled with water by Pipe A or Pipe B .

- (a) Pipe A pumps x litres of water per minute into the tank.

Write an expression, in terms of x , for the number of minutes it takes for Pipe A to fill up the tank. [1]

- (b) Pipe B pumps $(x + 6)$ litres of water per minute into the tank.

Write an expression, in terms of x , for the number of minutes it takes for Pipe B to fill up the tank. [1]

- (c) It takes 5 minutes longer for Pipe A than for Pipe B to fill up the tank.

Write down an equation in x , and show that it simplifies to

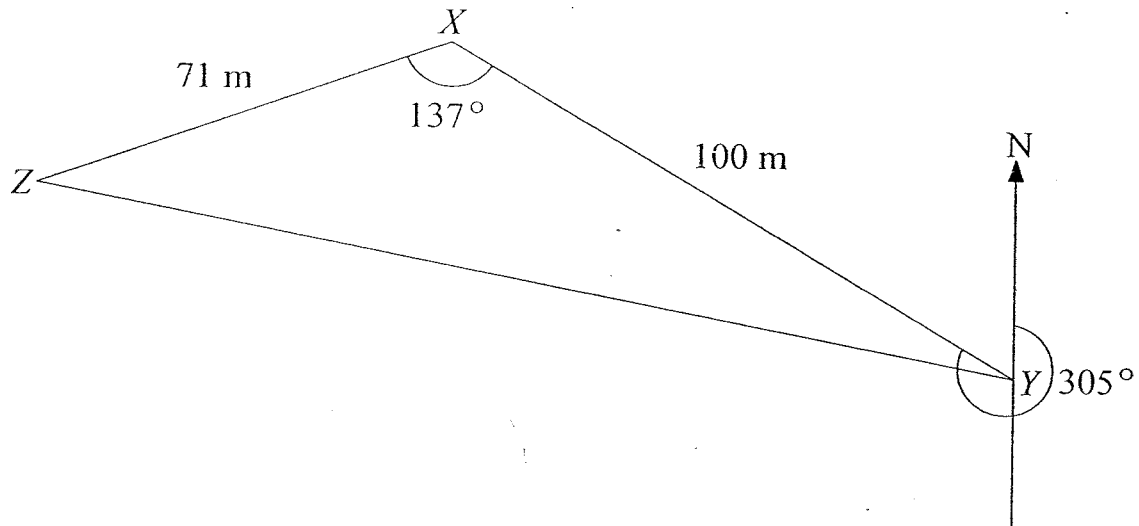
$$x^2 + 6x - 360 = 0 \quad [3]$$

- (d) Using the General Formula, solve the equation $x^2 + 6x - 360 = 0$, giving the solutions to 2 decimal places.

- (e) Find the time taken, correct to the nearest minutes,

(i) for Pipe A to fill up the tank. [1]

(ii) for Pipe B to fill up the tank. [1]



X , Y and Z are three points on horizontal ground.

Angle $ZXY = 137^\circ$ and the bearing of X from Y is 305° .

$ZX = 71$ m and $XY = 100$ m.

(a) Calculate

(i) the bearing of X from Z ,

[1]

(ii) YZ ,

[3]

(iii) area of triangle XYZ .

[2]

(b) A vertical clock tower of height 53 m stands at X . A boy walks along ZY .

Calculate

(i) the shortest distance of X to the line ZY ,

[2]

(ii) the greatest angle of elevation of the top of the clock tower from the boy.

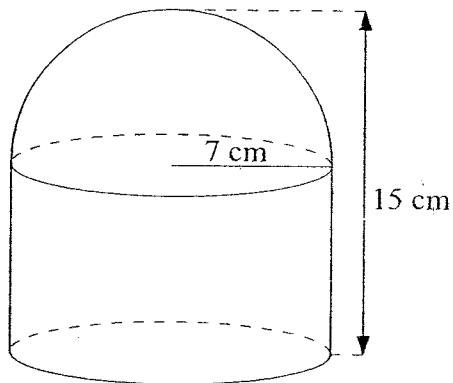
[2]

16 [The surface area of a sphere = $4\pi r^2$]

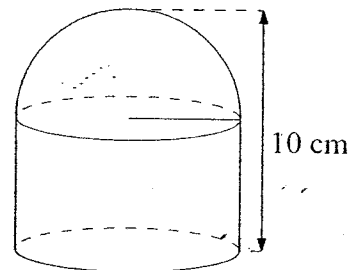
[The volume of a sphere = $\frac{4}{3}\pi r^3$]

[The area of the curved surface of a cone of radius r and slant height l is $\pi r l$.]

The diagram below shows two geometrically similar solids A and B each made up of a cylinder and a hemisphere.



Solid A



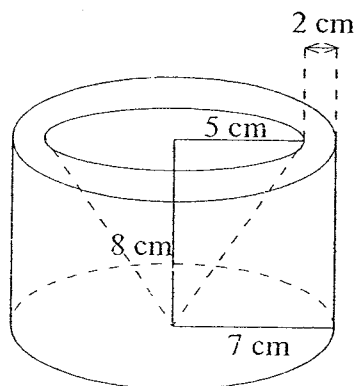
Solid B

- (a) Calculate the volume of Solid A.
- (b) Calculate the volume of Solid B.

[3]

[2]

The hemisphere and a cone of radius 5 cm and height 8 cm are removed from Solid A as shown below.



- (c) Calculate the total surface area of the remaining solid.

[4]

~ END OF PAPER ~

Catholic High School
Secondary Two Mathematics
Answer Key

17 (a) $p(15p+2)$ (b) $p=0$ or $p=-\frac{2}{15}$

18 $x=1\frac{1}{3}$

19 $(a-4)(x+2)$

20 -6

21 $v = \pm\sqrt{uf}$

22 (a) $2a^5b^4$ (b) $3p^2q$

23 $\frac{3}{x+1}$

24 $x = -6, y = 1$

25 (a) $2\frac{2}{5}$ (b) $-\frac{5}{13}$ (c) $\frac{4}{5}$

26 $x = \frac{5}{8}, y = -\frac{1}{8}$ and $x = 2, y = -7$

27 (a) 35° (b) 70° (c) 55° (d) 110°

In triangle PQT and triangle RST ,

$\angle PQT = \angle RST$ (Alternate Angles)

28 (a) $\angle PTQ = \angle RTS$ (Vertically Opposite Angle)

$\angle QPT = \angle SRT$ (Angle sum of triangle)

\therefore triangle PQT is similar to triangle RST (AAA Similarity)

(b) (i) 12.5 cm (ii) $\frac{4}{25}$ (iii) $\frac{2}{5}$

(a) $\angle BCE = \angle ACE + \angle ACB = \angle ACE + 60^\circ$ ($\triangle ABC$ is an equilateral)

$\angle ACD = \angle ACE + \angle ECD = \angle ACE + 60^\circ$ ($\triangle CDE$ is an equilateral)

$\therefore \angle BCE = \angle ACD$

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(b) In triangle BCE and triangle ACD ,

$\angle BCE = \angle ACD$ (proven in part (a))

$BC = AC$ ($\triangle ABC$ is an equilateral)

$EC = CD$ ($\triangle CDE$ is an equilateral)

\therefore triangle BCE is triangle ACD . (SAS Congruency)

30 (a) $\frac{300}{x}$ (b) $\frac{300}{x+6}$ (d) 16.21, -22.21 (e)(i) 19 min (ii) 14

min

31 (a) (i) 082° (ii) 159 m (iii) 2420 m^2 (b)(i) 30.4 m (ii) 60.2°

32 (a) 1950 cm^2 (b) 578 cm^2 (c) 729 cm^2