

**FACULTY OF SCIENCE**

# SECTION A: TRIGONOMETRY

## Question 1

[5 X 2 = 10]

Give a short answer to the following questions:

Question	Answer
Convert to radians:  $100^\circ$	
Find the supplementary angle of :  $\frac{2\pi}{5}$	
Write down the Sine Rule for $\triangle ABC$	
Find the exact value of the trigonometric function:  $\cos \frac{\pi}{6} \cos \frac{\pi}{3} + \sin \frac{\pi}{6} \sin \frac{\pi}{3}$	
Give the period of the trigonometric function:  $y = -2 \tan \left( 2x - \frac{\pi}{3} \right)$	

**Question 2 [5 X 2 = 10]**

The following questions are multiple choice questions. There is only one correct answer from the choices given. Select the correct option by marking the option with an **X**.

**MARK YOUR ANSWERS HERE:**

2.1	A	B	C	D	E
2.2	A	B	C	D	E
2.3	A	B	C	D	E
2.4	A	B	C	D	E
2.5	A	B	C	D	E

2.1 The minimum value of  $y = \cos 3x$  is:

- A. 0
- B. 3
- C. -3
- D. -1
- E. None of the above

2.2 Which of the following is equivalent to  $\cot \theta \sin \theta - \tan \theta \cos \theta$ ?

- A.  $\frac{1}{\sin \theta \cdot \cos \theta}$
- B.  $\frac{1}{\sin \theta \cdot \cos^2 \theta}$
- C.  $\cos \theta - \sin \theta$
- D.  $\frac{\sin \theta + \cos \theta}{\sin \theta \cdot \cos \theta}$
- E. None of the above

2.3 In  $\triangle ABC$ ,  $AB = BC$ . Which statement is **FALSE**?

- A.  $b^2 = 2a^2(1 - \cos B)$
- B.  $b^2 = 2a^2(1 + \cos B)$
- C.  $b^2 = 2a(a - c \cdot \cos B)$
- D.  $b^2 = 2a(c - a \cdot \cos B)$
- E. They are all true

2.4 If  $5 \cot \theta - 12 = 0$  and  $\frac{\pi}{2} < \theta < 2\pi$  then  $\sec \theta = \dots$

- A.  $\frac{13}{12}$
- B.  $\frac{-12}{13}$
- C.  $\frac{-12}{5}$
- D.  $\frac{-13}{12}$
- E. None of the above

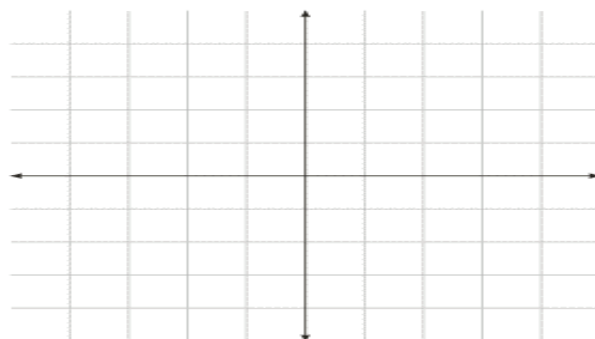
2.5  $\frac{\tan 37^\circ}{\sin 217^\circ} = \dots$

- A.  $-\sec 37^\circ$
- B.  $\cos 37^\circ$
- C.  $-1$
- D.  $-1$
- E. None of the above

### Question 3 [8]

3.1 Graph the function (use the provided set of axes). Show clear readings on both axes.

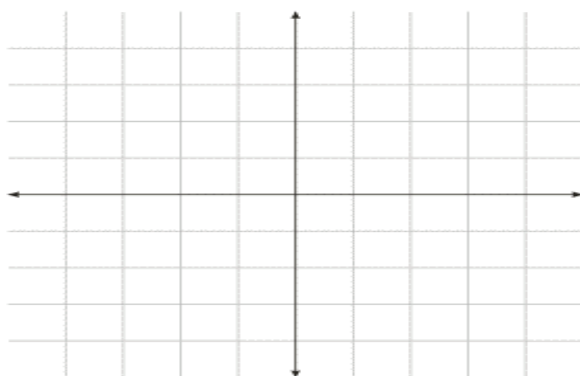
$$y = \cot x, \quad x \in \left[-\frac{\pi}{2}, \frac{3\pi}{2}\right]$$



(3)

- 3.2 Graph the function (use the provided set of axes). Show clear readings on both axes.

$$y = \cos^{-1} x$$

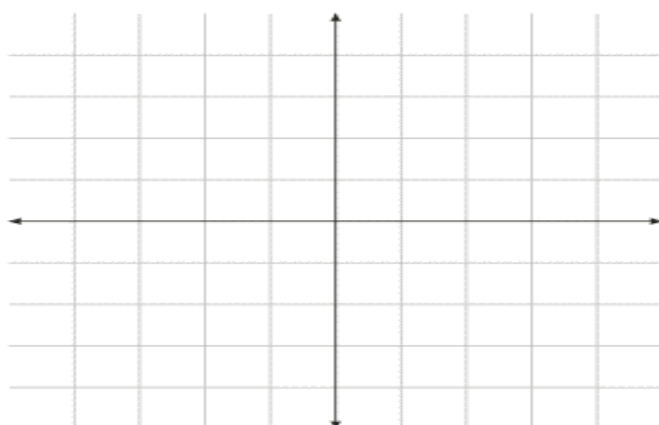


(2)

- 3.3. Graph the function (use the provided set of axes). Show clear readings on both axes.

$$y = \sin \frac{\pi x}{4} ; \quad x \in [-2 ; 2]$$

**DO YOUR CALCULATIONS HERE:**



(3)

**Question 4****[15]**

4.1 If  $\tan \theta = -\frac{4}{3}$  and  $\sin \theta < 0$ , find:

a.  $\csc \theta$

(2)

b.  $\sin 2\theta$

(3)

4.2 Draw a sketch and find all the sides of a right triangle for which  $\csc \theta = 4$ .

(3)

4.3 Find the exact value of:

$$\tan \left[ \cos^{-1} \left( -\frac{3}{5} \right) \right]$$

(4)

4.4 Verify the identity:

$$\frac{\sin^2(2\pi + x) \sin(\pi - x)}{\sin(\pi + x) \cos(-x) \sin x} = -\tan x$$

(3)

**Question 5** [7]

Find the general solution:

5.1  $\cot^2 3x - 3 = 0$

(3)

5.2  $2 \cos^2 x - 3 \cos x - 2 = 0$

(4)

### SECTION B: GEOMETRY

#### Question 6 [9]

6.1 Complete the statements:

a.  $x$  is the \_\_\_\_\_ of  $180^\circ - x$ .

(1)

b. If the diagonals of a quadrilateral are not equal, but bisect each other perpendicularly, the quadrilateral is a \_\_\_\_\_

(1)

c. The exterior angle of a triangle is equal to \_\_\_\_\_

(1)

d. A triangle that has three equal sides is called an \_\_\_\_\_ triangle.

(1)



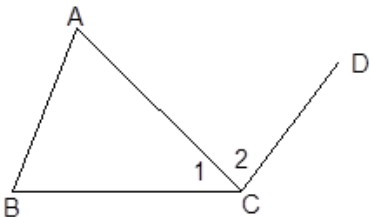
6.2 Write down THREE ways of proving a quadrilateral cyclic.

- 1) .....
- 2) .....
- 3) .....

(3)

6.3 Refer to the figure given alongside.

DC will be a tangent to a circle passing  
A, B and C if ...



(2)

**Question 7** **[5 X 2 = 10]**

The following questions are multiple choice questions. There is only one correct answer from the choices given. Select the correct option by marking the option with an **X**.

**MARK YOUR ANSWERS HERE:**

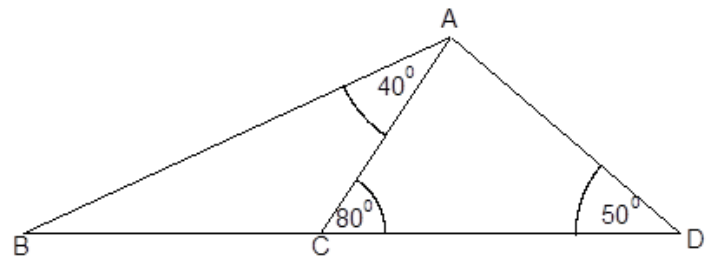
7.1	A	B	C	D	E
7.2	A	B	C	D	E
7.3	A	B	C	D	E
7.4	A	B	C	D	E
7.5	A	B	C	D	E

7.1 The exterior angle of a regular pentagon is:

- A. 108°
- B. 135<sup>0</sup>
- C. 144<sup>0</sup>
- D. 72°
- E. None of the above

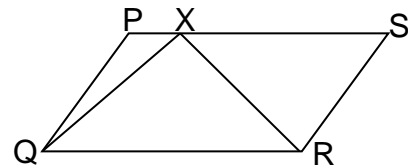
7.2 In the figure,  $\angle BAC = 40^\circ$ ,  $\angle ACD = 80^\circ$   
and  $\angle ADC = 50^\circ$ . Therefore ....

- A.  $AC = BC = CD$
- B.  $AB = AC = AD$
- C.  $AB = AD = BD$
- D.  $AC = BC = AD$
- E. None of the above



7.3 PQRS is a parallelogram. Which statement is true?

- A. Area of  $\triangle QXR = \frac{1}{2}$  Area of PQRS
- B. Area of  $\triangle QXR = \frac{1}{3}$  Area of PQRS
- C. Area of  $\triangle QXR = \frac{2}{3}$  Area of PQRS
- D. Area of  $\triangle QXR = \frac{3}{4}$  Area of PQRS
- E. None of the above



7.4 A building casts a shadow of 12m. At the same time the shadow cast by a vertical  
2m stick is 3m. The height of the building is:

- A. 18 m
- B. 8 m
- C. 15 m
- D. 11 m
- E. None of the above

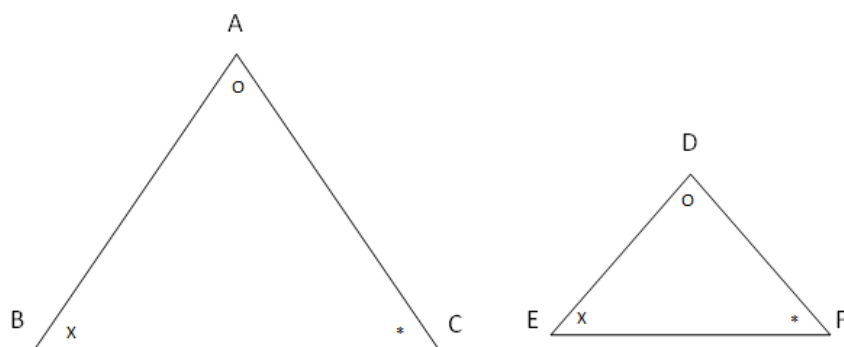
7.5 Which statement is **FALSE**?

- A. Every rhombus is a quadrilateral.
- B. Every rhombus is a parallelogram.
- C. Every rhombus is a square.
- D. Every square is a rhombus.
- E. They are all true.

**Question 8** [9]

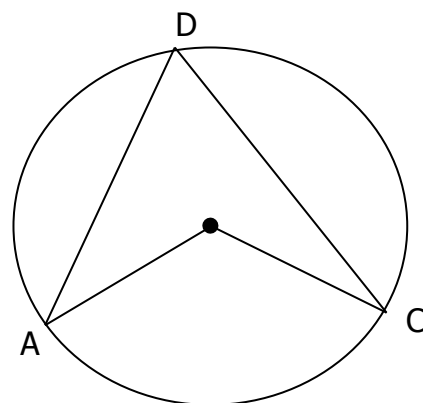
Prove the theorems:

8.1 When two triangles are equiangular, then the corresponding sides are proportional.



(5)

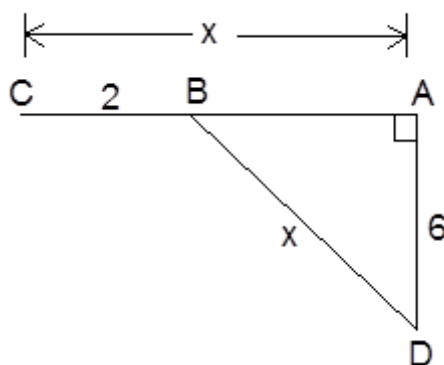
- 8.2 The size of an angle subtended by an arc at the centre of the circle, is twice the size of the angle subtended by that arc at any point on the circle.



(4)

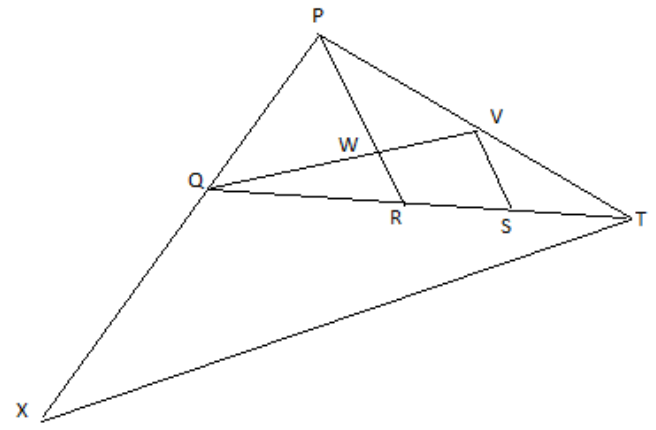
**Question 9 [10]**

- 9.1 In the figure,  $ABC \perp DA$ ,  $AC = BD = x$ ,  $BC = 2\text{m}$  and  $AD = 6\text{m}$ .  
Find the value of  $x$ .



(3)

- 9.2 In the figure,  $R$  is the midpoint of  $QT$  in  $\triangle PQT$ .  $PQ$  is produced to intersect  $TX$  at  $X$  such that  $QV \parallel XT$ .  $PR \parallel VS$  and  $\frac{TV}{TP} = \frac{3}{5}$ .  $PR$  and  $QV$  intersect at  $W$ .



Determine, with reasons, the numerical values of :

a.  $\frac{TS}{SR}$

(2)

b.  $\frac{TS}{SQ}$

(3)

c.  $\frac{VW}{WQ}$

(2)

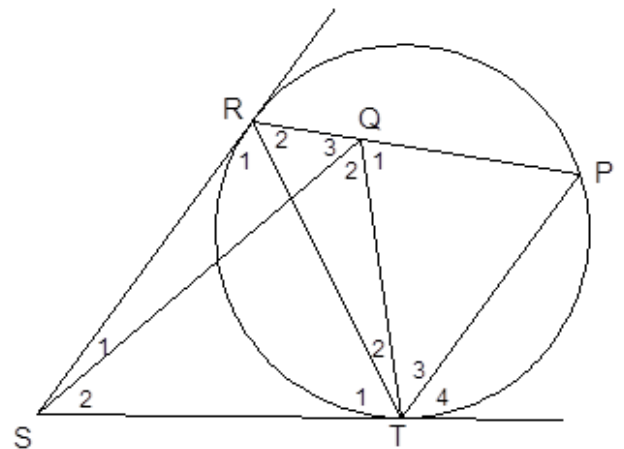
### Question 10 [9]

$SR$  and  $ST$  are tangents to the circle.

$$\hat{Q}_3 = \hat{R}_1$$

Prove, giving reasons:

10.1  $SQ \parallel TP$ .



(4)

10.2  $QRST$  is a cyclic quadrilateral.

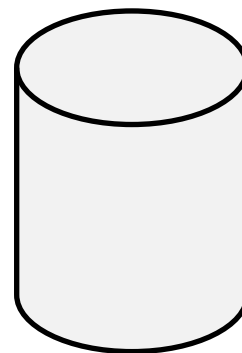
(3)

10.3  $QS$  is a tangent to a circle passing through  $P, Q$  and  $T$ .

(2)

**Question 11** [3]

Determine the **surface area** of a cylinder with radius 5 cm and height 20cm.  
Leave your answer in terms of  $\pi$ .



(3)