

**SEE Qualifying Exam-2081 (2025)****Compulsory Mathematics**

Time: 3 Hours

Full Marks: 75

*Answer all the questions.*

1. Out of the students who participated in an examination, 70% passed English, 60% passed Mathematics but 20% failed both the subjects and 550 students passed both the subjects.

- (a) Write the cardinality notation to represent the number of students passed in both subjects. (1)
- (b) Show the above information in a Venn-diagram. (1)
- (c) Find the number of students who passed in English. (3)
- (d) If one student is randomly selected, what is the probability of getting the student who passed in only one subject? (1)

2. Sunil borrowed some money for 2 years at the rate of compound interest of 10% p.a. and immediately he lent the money at the same rate of half yearly compound interest for the same period of time. In this transaction, he gained Rs. 8,810.

- (a) If C.A. is the amount compounded half yearly on a sum P for Q years at the rate of R% p.a., state the relation among C.A., P, Q and R. (1)
- (b) Find, how much money did he borrowed? (2)

- (c) If he had lent the money at the rate of 12% half yearly compound interest for the 1st year and 8% quarterly compound interest rate for next year, how much profit or loss would he make? Find it. (2)

3. Anita has bought a car. In a certain rate of yearly compound depreciation, the price of a car will be Rs. 32,40,000 and Rs. 29,16,000 in 2 and 3 years respectively.

- (a) Define compound depreciation. (1)
- (b) At what price did she buy the car? Find it. (2)
- (c) Instead of buying car, if she bought the plot of land with the money, in how many years would its value be Rs. 46,65,600 at the annual increase rate of 8%? (1)

4. Ram exchanged some Nepali rupees with American dollars at the exchange rate of \$1=Rs. 120. After 15 days, Nepali currency devaluated against American dollars by 10% and he made a profit of Rs. 1,11,000 by exchanging the same dollars into Nepali currency again.

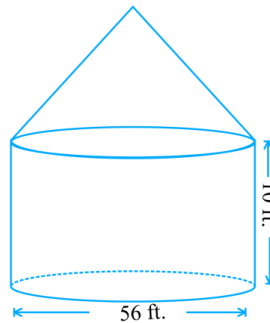
- (a) How much Nepalese rupees are equal to one American dollar (\$1) after devaluation of the Nepali currency? (1)
- (b) How much Nepali rupees did Ram exchange with American dollars in the beginning? (2)
- (c) How much profit or loss would be there for him, if the Nepali rupees had revalued by 8% instead of devaluation of 10%? (1)

5. The total surface area of the given aquarium with the shape of square based pyramid is  $4200 \text{ cm}^2$  and its slant height is 29 cm.



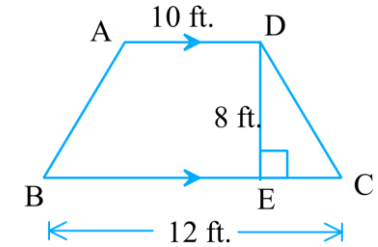
- Write the formula to find the area of triangular faces of the aquarium having length of base 'a' and slant height 'l'. (1)
- Find the length of base of the aquarium. (2)
- Raj said that the aquarium cannot hold 12 litres of water. Evaluate his statement. (2)

6. Shashwat has managed a tent for accommodation to the guests attending in his brother Swarnim's weaning ceremony (see the figure). The tent is in the form of a cylinder with a height of 10 ft. and a conical shape with the same radius above it. The diameter of base of tent is 56 ft. and the tent contains 41,888 cubic ft. of air.



- Write the formula to find out the curved surface area of the cylinder having radius 'r' and height 'h'. (1)
- How much canvas is required to make the tent? Find it. (3)
- If all the canvas is used to make a hemispherical tent, what would be the diameter of the hemispherical tent? (1)

7. The parking area outside the Bir Hospital is in geometric shape as shown in the figure. It is planning to pave the area with bricks. A brick occupies the area of  $0.22 \text{ ft}^2$  and the cost of brick per piece is Rs. 18.

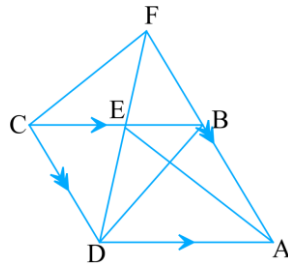


- How many bricks are needed to pave the parking area? (2)
  - If 2 workers can complete the work of paving bricks in 3 days and the wage of a worker per day is Rs. 1500, how much does it cost to pave the bricks including the cost of bricks? (1)
8. Dhruva has been joined in a bank as a branch manager. His monthly salary Rs. 45,000 and he receives an increment of Rs 1,500 in his monthly salary as a grade every year.
- In which sequence is the sequence of annual incomes related to? (1)
  - What will be his total income in 6 years? (2)
  - After working for a few years in the bank, he leaves the job there and goes to USA. If he earns a total of Rs 62,10,00,000 during his job, how long will he have been working altogether in the bank? (2)
9. In a rectangular plot, the longer side is 10 m more than the shorter side and the diagonal is 10 m more than its longer side.

- (a) What are the roots of the quadratic equation  $ax^2 + bx + c = 0$ ,  $a \neq 0$ ? (1)
- (b) Find the length of the shorter side, longer side and diagonal of the field. (3)
- (c) How many pieces such of plots can be made on a field of size  $200 \text{ m} \times 150 \text{ m}$  can be made on that rectangular field? (1)

10. (a) Simplify:  $\frac{4x^2 + 9y^2}{4x^2 - 9y^2} - \frac{2x - 3y}{2x + 3y}$  (2)
- (b) If  $x^2 + 2 = 3^{\frac{2}{3}} + 3^{-\frac{2}{3}}$ , then prove that  $3x(x^2 + 3) = 8$ . (3)

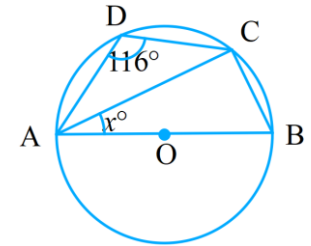
11. In the adjoining figure, ABCD is a parallelogram where E is any point on BC. DE and AB are produced to meet at F.



- (a) Write the relation between the area of  $\Delta BCD$  and  $\Delta FCD$ . (1)
  - (b) Prove that area of  $\Delta EDA = \frac{1}{2}$  area of  $\square DABC$ . (2)
  - (c) Prove that the area of  $\Delta ABE$  and  $\Delta CEF$  are equal. (2)
12. A  $\Delta LMN$  has  $MN = 5.2 \text{ cm}$  and  $\angle MLN = \angle LMN = 75^\circ$ .
- (a) Construct triangle LMN, then construct a parallelogram BEAN having a diagonal  $AB = 6.5 \text{ cm}$  and equal in area to the  $\Delta LMN$ . (3)

- (b) Write with reason why the area of the given triangle LMN and the required parallelogram BEAN are equal. (1)

13. In the given figure, AOB is a diameter of the circle, ABCD is a cyclic quadrilateral and  $\angle ADC = 116^\circ$ .



- (a) What is the value of  $\angle ACB$ ? (1)
- (b) Find the value of  $x$ . (1)
- (c) Draw two circles of radii at least 3 cm and experimentally verify the relation between measurements of  $\angle ABC$  and  $\angle ADC$ . (2)

14. The angle of depression of the roof of a house as observed from the top of the tower to is  $30^\circ$ . The height of the tower is 60 m and the house is 15 m shorter than the tower.

- (a) How is the angle of depression formed? (1)
- (b) Draw a suitable figure based on the given context. (1)
- (c) Find the distance between the top of the tower and the roof of the house. (1)
- (d) Compare the angles of depression and elevation of the roof of the house as observed from the top and foot of the tower respectively. (1)

15. The given data represents the monthly expenditure (in Rs. thousands) of the families of a community in ward no. 15 of Kathmandu metropolitan city.

Expenditure	30-40	40-50	50-60	60-70	70-80
No. of families	30	20	60	50	40

- (a) Which value of the given data divides the number of the patients into two equal parts? (1)
- (b) From the above data, what is the expenditure of the maximum family? (2)
- (c) Calculate the average expenditure of the families. (2)
- (d) Dawa said that the first quartile of the data is the upper limit of the  $Q_1$  class. Justify it. (1)

16. A bag contains a dozen of TT balls of same size among then 7 are yellow and the rest are white. Ronika is going to draw TT balls from the bag one after another without replacement.

- (a) Define mutually exclusive events. (1)
- (b) Find the probability of getting both yellow balls. (1)
- (c) Draw a tree-diagram to show the probabilities of possible outcomes. (2)
- (d) Compare the probability of getting the same colored balls and the probability of getting the different colored balls. (1)

**Answer Key**

1. (a) $n(E \cap M) = 550$	(c) 770	(d) $\frac{3}{10}$	
2. (a) C.A. = $P \left( 1 + \frac{R}{200} \right)^{2Q}$	(b) Rs. 16,00,000	(c) Rs 9,953.24	
3. (b) Rs. 40,00,000	(c) 2 years		
4. (a) US \$1 = NRs. 132	(b) Rs. 11,10,000	(c) Rs 88,800 loss	
5. (a) $LSA = 2al$	(b) 42 cm	(c) Capacity = 11.76 ltr., Raj is correct	
6. (a) $CSA = 2\pi rh$	(b) 4840 sq. ft.	(c) 55.48 ft.	
7. (a) 400	(b) Rs. 16,200		
8. (a) Arithmetic sequence	(b) Rs 35,10,000	(c) 10 years	
9. (a) $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$	(b) 30 m, 40 m and 50 m	(c) 5 pieces	
10. (a) $\frac{12xy}{4x^2 - 9y^2}$	(b) Do yourself		
11. (a) $\triangle BCD = \triangle FCD$	(b) Prove yourself	(c) Prove yourself	
12. (a) Do yourself	(b) Prove yourself		
13. (a) $90^\circ$	(b) $10^\circ$	(c) Verify yourself	
14. (a) Define yourself	(c) $15\sqrt{3}$ m	(d) 1:2	
15. (a) Median	(b) Rs 58,000	(c) Rs. 57,500	(d) $Q_1 = 50$ , Dawa is correct
16. (a) Two or more events which cannot happen at the same time	(b) $\frac{7}{22}$	(d) 31:35	

