

Subject: Mathematics

Time: 3 hours

Attempt ALL the Questions.

Grade: Ten

Full Marks: 75

1. In a survey conducted on students studying in grade 10 at Shree Sharada Secondary School to determine suitable place for educational trips among Pokhara, Lumbini and Ilam, it was found that 40 students considered Pokhara to be suitable, 30 students considered Lumbini to be suitable, and 45 students considered Ilam to be suitable. While 15 students of that grade said that all three places are suitable, 5 students did not express any opinion.

(a) If P, L and I denote the set of students who prefer Pokhara, Lumbini and Ilam respectively, write the cardinality notation of students for whom all places are suitable. [1K]

(b) Show the above information in a Venn diagram. [1U]

(c) How many students are studying in grade 10 in the Sarada Secondary School? Calculate it. [3 A]

(d) If 5 students, who did not express their opinion in the survey, had said Lumbini as a suitable place, then what would have been the ratio of students who considered only Pokhara was the suitable place and only Lumbini was the suitable place? [1 HA]

2. Bipin wants to deposit Rs 1,00,000 in a bank for 2 years. The bank offers 10% per annum compound interest with three alternates (annual compound interest, half-yearly compound interest and quarterly compound interest).

(a) Which option among the three alternatives helps Bipin get more interest? Write it. [1 K]

(b) How much amount does he receive after 2 years from compound interest compounded semiannually? [2 U]

(c) At the end of 1 year, if Bipin withdraws the total amount received according to the semi-annual compound interest and deposits it for the rest of the period to get quarterly compound interest, how much amount will he get at the end? [2 A]

3. Sajan has Rs. 1,00,00,000 Sajan purchased a car for Rs. 30,00,000 and land for Rs. 70,00,000. For 2 years hence, the price of the car has been decreasing at a compound rate of 5% per annum, while the price of land has been increasing at a certain compound rate.

(a) Write the formula to find compound depreciation. [1 K]

(b) What will be price of car after 2 years? Find it. [2U]

(c) After 2 years, if the price of land and car is Rs 1,05,72,700, then what is the rate of compound growth in the price of land? Calculate it. [2 HA]

4. Pravin went to the bank to exchange US dollars in order to go abroad. According to the currency exchange rate on that day, the buying rate of 1 US dollar was Rs. 131.05 and the selling rate was Rs. 131.65.

(a) How many dollars will he get in exchange of Rs. 1,57,980 Nepali rupees? [2A]

(b) How many Nepali rupees will he get back from the exchanged dollars on the same day incase if he cannot go abroad due to family issue? [1 A]

(c) How much profit or loss will he get from this transaction? Write with reason. [1 HA]

5. The height of the square based pyramid is 12 cm and the length of base is 10 cm.

a) Mention any two properties of a square base pyramid [IK].

b) Find the slant height of the pyramid. [1U]

c) What is the cost of coloring at the rate of 50 paisa per square in the 4 triangular faces with bases? Calculate it. [3A]

6. As shown in figure, A cubical block of side 7 cm is surmounted by hemisphere.

a) Find the surface area of solid. [3A]

b) If Rs. 1300 is required to painted the total surface area of combined solid at the rate of 10 per 2.5 cm². [2HA]



7. A water tank is form with the combination of 20 rings with height 35 cm and diameter 105 cm. The upper surface is cover with hemisphere.

a) Draw the figure of combined solid. [1U]

b) Write the formula to calculate CSA of solid. [1K]

c) How much capacity of tank? Find in liters. [2U]

d) If the cost of water per liter is 25 paisa, what is the cost of full tank of water? [1HA]

8. There are 8 varieties of monkey in a certain zoo. The number of each variety form a G.P. The 4th and 6th variety consists of 54 and 486 monkeys respectively.

- Write the formula to find sum of geometric series. [1K]
- Find the number in the first and last variety. [2A]
- How many more monkeys are there in total than last variety. [2HA]

9. a) Solve: $9^x - 4 \cdot 3^{x+1} + 27 = 0$ [2U]

b) Simplify: $\frac{1}{x+y} + \frac{x}{xy+y^2} - \frac{1}{y}$ [1A]

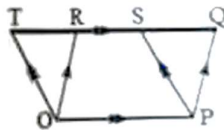
c) Solve: $x^2 - 3x + 1 = 0$ [2U]

10. The sum of ages of father and his daughter is 50 and the product of the ages before 7 years was 180.

- Write two conditions by letting the age of father be x and daughter be y in mathematical sentence. [2U]
- How much father is older than daughter? Calculate it. [3A]

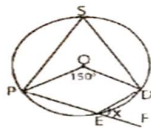
11. In the figure given alongside, parallelograms PQRS and STOP are standing on the same base OP and lying between same parallels OP and TQ. The area of trapezium POTQ is 110 cm^2 and area of quadrilateral ROPS is 50 cm^2 .

- Write the relationship between area of parallelograms standing on the same base and lying between same parallels.
- Prove that: Area of $\triangle ORT$ = Area of $\triangle OSP = 30 \text{ cm}^2$



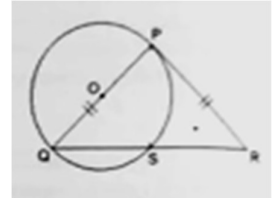
12. In the Given figure alongside, O is the center of circle with $\angle POD = 150^\circ$ and $\angle DEF = x$.

- Write the name of cyclic quadrilateral from the adjoining figure. [1K]
- Find the value of x . [1U]
- Verify experimentally that the sum of opposite angles of cyclic quadrilateral are supplementary by making a circle having radii more than 3 cm. [2A]
- What is the value of $\angle SPO$ and $\angle SDO$? Justify with reason. [1HA]



13. In the given figure PQR is an isosceles triangle with $PQ = QR$ and a circle is drawn with PQ as a diameter.

- What is the value of inscribed angle made at semi-circle. Explain it. [2U]
- Prove that $PQ = RS$. [3A]



14. The marks of the students are given in the table below. The number of student who got marks 40-50 are hidden. The third quartile (Q_3) of the given data is 44.

Marks	0-10	10-20	20-30	30-40	40-50	50-60
Numbers of student	6	3	9	7	P	6

- In which class Q_3 lies? [1K]
 - Make a cumulative frequency table of the given data. [1U]
 - Find the value of p . [2A]
 - Justify the modal class and median class is same. [1HA]
15. Two cards are randomly drawn one after another without replacement from well shuffled deck of 52 cards.
- Write the addition law of probability when two events A and B are mutually exclusive event. [1K]
 - Find the probability that one card is ace and another card is heart. [1U]
 - Show that probability of all possible outcomes of getting or non-getting face card in tree diagram. [2A]
 - Is the maximum probability is equal to 1? Justify with example. [1HA]
16. The height of building and tower are 30 meter and 52 meter respectively. A man having height 1.6 meter observes the tower from the roof of the building and he finds the angle of elevation is 45° .
- Define angle of elevation. [1K]
 - Sketch the figure of above information. [1U]
 - Find the distance between house and tower. [1A]
 - A man shifted near to the tower from the initial point of roof of the house and observes the top of the tower, Is the angle of elevation decreasing? Justify. [1HA]

THE END