

5 DAYS PACK

Knowledge Level Questions

SEE Q.N. 1 (a)

1. Write the formula for finding rate of discount when discounted amount and marked price are given.
2. If the selling price of an article is Rs x and VAT amount is Rs y , what is the rate of VAT?
3. The semi-annual compound amount on a sum P in T years at $R\%$ p.a. is CA respectively. Write down the relation among P , T , R and CA .
4. The present population of a town is P . If the population increases by $R\%$ every year, what will be the population of the town after T years? Write it.
5. If the initial price of an article is Rs P and annual rate of depreciation is $R\%$, then write the formula to find the price after T years.

SEE Q.N. 1 (b)

1. If three sides of a triangle are a cm, b cm and c cm respectively, what is the area of the triangle?
2. What is the area of an equilateral triangle whose side is ' a ' unit?
3. What is the surface area of a sphere having radius r cm?
4. What is the curved surface area of a cone having radius r cm and slant height l cm?
5. Write down volume of a square based pyramid having base side x cm and height y cm.

SEE Q.N. 2 (a)

1. Write down the order of surd in $\sqrt[4]{x}$.
2. What is the simplest rationalizing factor of $\sqrt{3} + \sqrt{2}$?
3. Which of the surds $\sqrt[5]{3}$, $\sqrt[5]{4}$ and $\sqrt[5]{2}$ is smallest?
4. What is the value of $(7x)^{0}$?
5. For what value of x , the expression $\frac{3}{x-5}$ will be undefined?

SEE Q.N. 2 (b)

1. If the lower limit of the median class of any data is L , frequency of that class is f , class interval i , sum of the frequencies N and the cumulative frequency of pre-median class is cf then write the formula for finding the median (Md).
2. What does h denote in the formula $Q_1 = L + \frac{N/4 - c.f.}{f} \times h$?
3. If in a continuous data, the sum of frequencies is N , write down the formula to calculate first quartile class.
4. Write the name of the quartile which divides the continuous data below 25%.
5. In the following data, in which series does median lie?

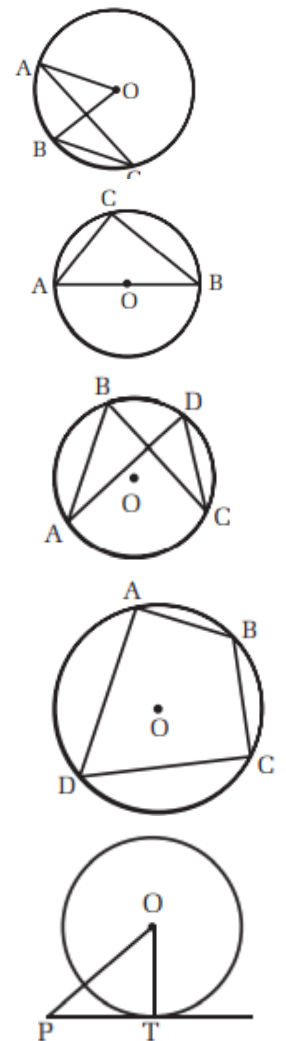
X	20-30	30-40	40-50	50-60	60-70
$c.f.$	16	36	61	77	80

SEE Q.N. 3 (a)

1. What is the relation between area of parallelogram and triangle standing on same base and between same parallels? Write it.
2. What is the relation between area of square and triangle standing on same base and between same parallels? Write it.
3. What is the relation between area of rectangle and triangle standing on the same base and between the same parallels? Write it.
4. What is the relation between area of rectangle and parallelogram standing on same base and between same parallels? Write it.
5. Write down the relationship between the area of an isosceles triangle and isosceles triangle standing on the same base and between the same parallel lines.

SEE Q.N. 3 (b)

1. O is the centre of circle, what is the relation of $\angle AOB$ and $\angle ACB$?
2. In the figure, O is the center of a circle. What is the value of $\angle ACB$?
3. In the given circle, which angle is equal to $\angle BAD$?
4. In the given figure, what is the relation between $\angle ABC$ and $\angle ADC$?
5. Write down the relation between the radius OT and the tangent PT in the given figure.



Understanding Level Questions

SEE Q.N. 4 (a)

1. What is the price of a bag costing Rs 1800 after levying 13% Value Added Tax? Find it.
2. The price of an article with 13% VAT is Rs 2034. What is the price of same article without VAT?

- If \$ 1 = Rs 115.45 (buying rate) and \$1 = Rs 116.20 (selling rate). Find the profit while selling and buying \$6000.
- Sohan needs \$3500 for the higher study in America. If \$1 = NRs 105 and the bank charges 2% as commission, how much Nepali rupees does Sohan require? Find it.
- If 176 dollars = 100 pounds and 1 pound = NRs 119, how much Nepali rupees can be exchanged with 132 dollars? Find it.

SEE Q.N. 4 (b)

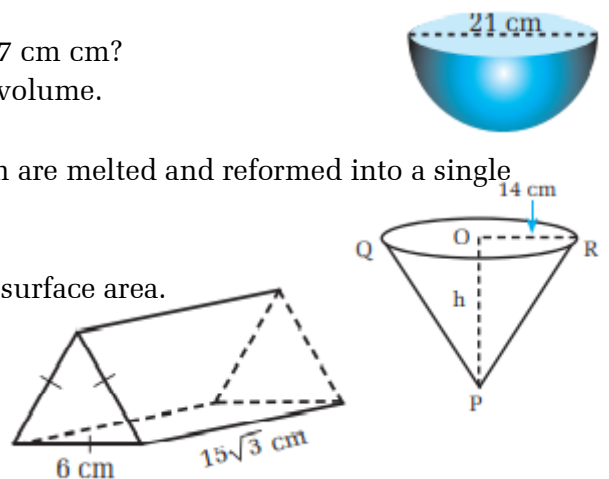
- Find the semi-annual compound interest on Rs 80000 for 1.5 years at the annual rate of 10%.
- The population of a village was 20,000. Within 2 years, the population is increased 3% by birth and 2% by immigration. What will be the population of the village after 2 years? Find it.
- In the beginning of 2069 B.S. and at the end of 2070 B.S., the population of village was 5000 and 5408 respectively. What is the annual population growth rate? Find it.
- A farmer bought a tractor for Rs 400000 and sold it after 2 years at 10% depreciation rate per year. What is the cost of tractor after 2 years? Find it.
- When the cost is depreciated at the rate of 8% per annum, the cost of a motorcycle after 2 years becomes Rs 2,53,920. Find the initial price of the motorcycle.

SEE Q.N. 5 (a)

- The area of an isosceles triangular land whose base side length 10 meter is 60 square meter. Find the measure of its remaining sides.
- Find the volume of a cylinder having diameter 14 cm and height 20 cm.
- What is the curved surface area of a cylinder whose radius is 10.5 cm and height is 40 cm?
- The capacity of cylindrical water tank is 673.75 litres. If its height is 1.75 meter then find the radius of the base.
- The height and radius of a cylinder are equal and its curved surface area is 2772 sq. cm. Find the radius of the base of the cylinder.

SEE Q.N. 5 (b)

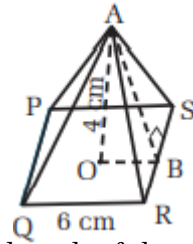
- What is the surface area of football whose radius is 7 cm?
- A hemispherical bowl had diameter 21 cm, find its volume.
- Three metallic spheres of radii 1 cm, 6 cm, and 8 cm are melted and reformed into a single sphere. Find the volume of the new sphere.
- The slant height of the given cone is 50 cm, find its surface area.
- Calculate the lateral surface area of the given prism.



SEE Q.N. 5 (c)

- If the height of a conical tent is 24 m and its radius is 7 m, how much canvas is required for making the tent?
- The curved surface area of a cone is 550 sq. cm and the radius of the base is 7 cm. Find the height of the cone.

3. Find the volume of the following pyramid.



4. The height of a prism having its base a right angled triangle is 20 cm. If the length of the sides of the right angled triangle containing the right angle is 12 cm and 16 cm, calculate the volume of the prism.
5. The height of a triangular prism having right angled on its base is 30 cm. If the sides of triangle containing the right angle are 4 cm and 3 cm, find the area of rectangular surfaces of the prism.

SEE Q.N. 6 (a)

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|---------------------|-----|---|-----|--|
| 1. Find the HCF of: | (a) | $(x^3 - xy^2)$ and $(x - y)$ | (b) | $x^2 - x + 1$ and $x^4 + x$ |
| 2. Find the LCM of | (a) | $x^2 - y^2$ and $(x + y)^2$ | (b) | $p^2 + 2pq + q^2$, $pq^2 + p^2q$ |
| 3. Simplify: | (a) | $\frac{14^6 \times 13^5}{35^6 \times 6^5}$ | (b) | $\frac{12^7 \times 28^6}{21^7 \times 16^6}$ |
| 4. Simplify: | (a) | $\frac{1}{1 + x^{a-b}} + \frac{1}{1 + x^{b-a}}$ | (b) | $(1 - x^{m-n})^{-1} + (1 - x^{n-m})^{-1}$ |
| 5. Simplify: | (a) | $\frac{13^{2a+1} + 5 \times 169^a}{9 \times 169^a}$ | (b) | $\frac{9^{n+2} + 10 \times 9^n}{9^{n+1} \times 11 - 8 \times 9^n}$ |

SEE Q.N. 6 (b)

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|--------------|-----|---|-----|--|
| 1. Simplify: | (a) | $\sqrt[3]{2x^2y} \times \sqrt[3]{4x^{-1}y^2}$ | (b) | $\sqrt[3]{16pq^5r^{-1}} \times \sqrt[3]{32p^{-1}qr^6}$ |
| 2. Simplify: | (a) | $\sqrt[3]{2m^2p^{-1}q^5} \times \sqrt[3]{4mp^4q^{-2}}$ | (b) | $\sqrt[4]{27p^{-7}q^{-11}} \times \sqrt[4]{3p^{11}q^7}$ |
| 3. Simplify: | (a) | $\frac{\sqrt[3]{56x^7y^{11}}}{\sqrt[3]{7x^4y^5}}$ | (b) | $\sqrt[4]{\frac{48x^{11}y^9}{3x^3y^5z^4}}$ |
| 4. Simplify: | (a) | $\frac{a^{m(n-p)}}{a^{n(m-p)}} \div \left(\frac{a^n}{a^m}\right)^p$ | (b) | $\sqrt[3]{(x+y)^{-6}} \times (x+y)^{2/3}$ |
| 5. Solve: | (a) | $3^{x+1} + 3^x = 108$ | (b) | If $a = b^x$, $b = c^y$ and $c = a^z$, prove that: $xyz = 1$ |

SEE Q.N. 7 (a)

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|--------------|--|--------------|--|
| 1. Simplify: | $\frac{x^2 + xy + y^2}{x+y} + \frac{x^2 - xy + y^2}{x-y}$ | 2. Simplify: | $\frac{a}{a^2 - 2ab + b^2} - \frac{b}{a^2 - b^2}$ |
| 3. Simplify: | $\frac{x^2}{xy - y^2} + \frac{y^2}{xy - x^2}$ | 4. Simplify: | $\frac{a-b}{ab} + \frac{b-c}{bc} + \frac{c-a}{ca}$ |
| 5. Simplify: | (a) $\left(1 - \frac{1}{p}\right) \left(1 - \frac{1}{p-1}\right) \left(1 + \frac{2}{p-2}\right)$ | | |

SEE Q.N. 7 (b)

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|--|---|--|
| 1. Arrange the surds in ascending order. | $\sqrt[3]{4}$, $\sqrt[4]{3}$, $\sqrt[6]{7}$ | |
| 2. Simplify: | (a) $\sqrt{125} - \sqrt{45} + \sqrt{5}$ | (b) $\sqrt[3]{128} + 2\sqrt[3]{54} - 2\sqrt[3]{250}$ |

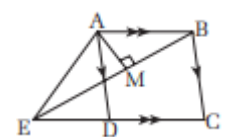
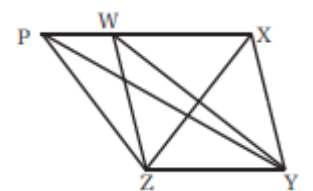
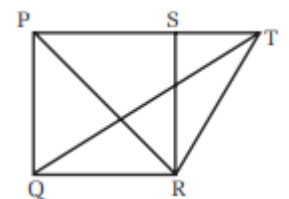
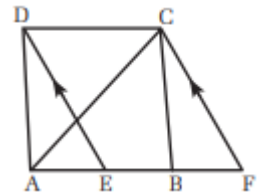
3. Simplify: (a) $\frac{\sqrt[3]{625} - \sqrt[3]{40}}{3\sqrt[3]{5}}$ (b) $\frac{\sqrt[3]{128} - \sqrt[3]{16}}{2\sqrt[3]{2}}$ (c) $\frac{\sqrt{45a^2 + 2a\sqrt{5}}}{\sqrt{125a^2}}$
4. Rationalize: (a) $\frac{\sqrt{2} + 1}{\sqrt{2} - 1}$ (b) $\frac{\sqrt{3} + 1}{\sqrt{3} - 1}$ (c) $\frac{\sqrt{5} - \sqrt{3}}{\sqrt{5} + \sqrt{3}}$
5. Solve: (a) $\sqrt{x-2} = \sqrt[3]{125}$ (b) $8 + \sqrt[3]{4x-7} = 13$ (c) $\sqrt{x+7} = 1 + \sqrt{x}$
6. (a) Whether the equation $\sqrt{2x-1} = -1$ has a unique solution or not? Check it. (b) $\frac{x-9}{\sqrt{x+3}} = 1$

SEE Q.N. 7 (c)

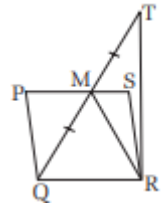
- If the sum of two consecutive even numbers is 42, find the numbers.
- If the sum of two consecutive odd numbers is 12, find the numbers.
- The sum of two numbers is 21. If a number is double of another number, find the numbers.
- The sum and difference of two positive numbers are 15 and 5 respectively. Find the numbers.
- The shirt of the uniform of a school is Rs 100 cheaper than the pant. If the total cost of the pant and shirt is Rs 770, find the cost of each.
- The sum of the present ages of two teachers is 54 years. If the age of one teacher is 4 years more than the other, find their present ages.
- If 5 is added to the square of a positive number, the sum is 69. Find the number.
- If 17 is subtracted from the square of a natural number, the result is 152. Find the number.
- If 7 is added to the two times the square of a natural number, the sum becomes 57. Find the number.
- If 4 is subtracted from the half of the square of a natural number, the result is 14. Find the number.

SEE Q.N. 8 (a)

- In the adjoining figure, $AF \parallel DC$, $ED \parallel FC$ and ABCD is a square. If $AC = 5\sqrt{2}$ cm, find the area of the quadrilateral DEFC.
- In the figure given alongside, the perimeter of the square PQRS is 40 cm. Find the area of $\triangle QRT$.
- In the figure, WXYZ is a rhombus in which XW is produced to the point P. If $WY = 10$ cm and $XZ = 9$ cm, find the area of $\triangle PYZ$.
- In the given figure, $\angle AMB = 90^\circ$, $BE = 14$ cm and the area of parallelogram ABCD is 42 cm^2 , find the length of AM.

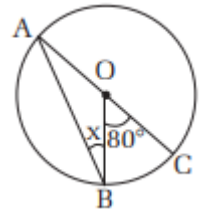


5. In the given figure, PQRS is a parallelogram and $QM = TM$. If the area of PQRS is 96 sq. cm, find the area of ΔQRT .

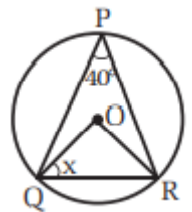


SEE Q.N. 8 (b)

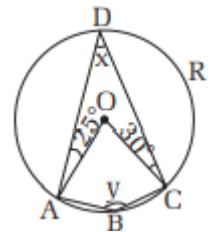
1. In the given circle; O is the centre and AC is a diameter. If $\angle BOC = 80^\circ$, find the measure of $\angle ABO$ (x).



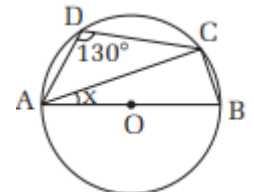
2. O is the centre of circle. If $\angle QPR = 40^\circ$, find the measure of $\angle OQR$ (x).



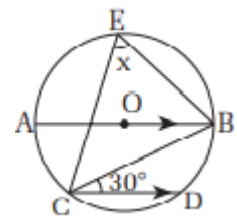
3. In the given circle; O is the centre, $\angle OAD = 25^\circ$ and $\angle OCD = 30^\circ$, find the value of x and y.



4. In the given circle; O is centre and $\angle ADC = 130^\circ$, find the measure of $\angle BAC$ (x).

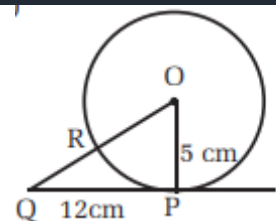


5. From the given figure, find the value of x.

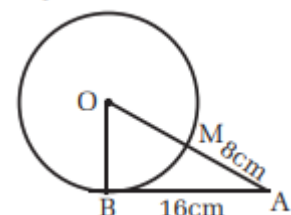


SEE Q.N. 8 (c)

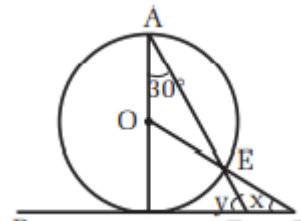
1. In the given figure; O is the centre of circle and PQ is a tangent to the circle. If $PQ = 12\text{cm}$ and $OP = 5\text{cm}$, find the length of QR.



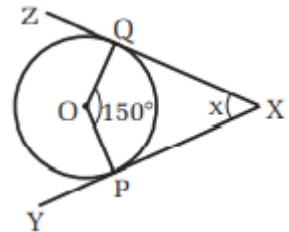
2. In the given figure; O is the centre of circle and AB is a tangent to the circle. If $AB = 16\text{cm}$ and $AM = 8\text{cm}$, find the length of OB.



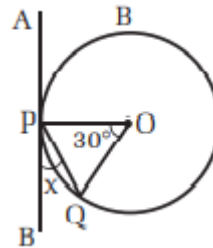
3. In the given figure, O is the centre of circle. BCD is a tangent to the circle and the measure of $\angle CAF$ is 30° ; find the measure of x and y .



4. In the figure given alongside, tangents PX and QX externally meet at X. If $\angle POQ = 150^\circ$, find the value of x .



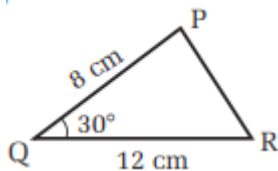
5. In the figure given alongside, AB is a tangent and $\angle POQ = 30^\circ$, find the measure of x .



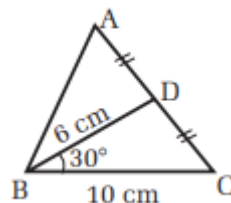
SEE Q.N. 9 (a)

1. Find the area of given triangles.

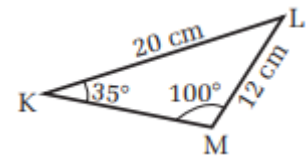
(a)



(b)

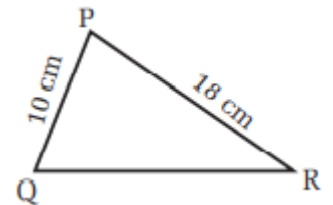


(c)



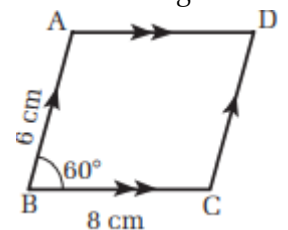
2. In a ΔABC , $AB = 8$ cm, $BC = 12\sqrt{3}$ cm and $\angle ABC = 60^\circ$, find the area of the triangle ABC.

3. The area of triangle PQR is $45\sqrt{3}$ cm², find the size of $\angle QPR$.



4. In ΔABC , $\angle ABC = 30^\circ$, $BC = 12$ cm and area of ΔABC is 24 square centimeter. Find the length of AB.

5. Find the area of given parallelogram ABCD.



SEE Q.N. 9 (b)

- In a grouped data, if the number of terms $(N) = 12k + 9$ and $\Sigma f m = 60k + 45$, find the mean (\bar{x}) .
- In a grouped data, the sum of the marks obtained by 50 students in mathematics is 3000. Find the average mark.
- In a continuous series, $\Sigma fx = 5160 + 30p$, total frequency $(N) = 92 + p$ and mean value $(\bar{x}) = 50$, then find the value of p .
- In a continuous series, $\Sigma fx = 538 + 53n$, $\Sigma f = 50 + 3n$ and the mean $(\bar{x}) = 15.2$. Determine the value of n .

5. In a continuous series, median lies in the class interval 10-15 and the cumulative frequency of its preceding class is 28. If the frequency of median class is 15 and the sum of the frequencies of the series is 65, find the median.

SEE Q.N. 10 (a)

1. A and B are two mutually exclusive events. $P(A) = \frac{1}{4}$ and $P(B) = \frac{1}{2}$, Find $P(A \cup B)$ and $P(\overline{A \cup B})$
2. Find the probability of occurring the letters S or T or I while drawing a letter card from 10 cards in the word "STATISTICS".
3. From the number cards numbered from 6 to 37, a card is drawn at random. Find the probability of getting squared or cubed number.
4. From a pack of 52 cards, a card is drawn at random. What is the probability of the getting an ace or a king.
5. If a dice is rolled and a coin is tossed at the same time, find the probability of occurring prime number on the dice and head on the coin.

SEE Q.N. 10 (b)

1. Two balls are drawn at random one after the other without replacement from a bag containing three red and two white balls of the same size.
2. There are 20 toys of same shape and size in a box. Out of them, 12 are red coloured and remaining blue colored. Two toys are drawn at random one after the other without replacement. Draw a tree diagram to show the probabilities of all the outcomes.
3. There are one yellow, one red and one white sweet in a bag. A sweet is drawn randomly and without replacing the sweet, another sweet is drawn from the bag. Show all the possible outcomes of the probabilities in a tree diagram.
4. Two cards are drawn randomly in succession without replacement from a well shuffled pack of 52 cards. By drawing a tree diagram show the probabilities of all the possible outcomes of getting and not getting a faced card.
5. Two children were born from a married couple. Find the probability of having at least one son by drawing a tree diagram.
6. A coin is tossed two times in succession. Draw a tree diagram and calculate the probability that both are heads by drawing a tree diagram.

Application Level Questions**SEE Q.N. 11**

1. In a group of 150 people, 120 like to play volleyball and 85 like to play football. If 25 like to play none of the games:
 - (i) Show the above information in a Venn-diagram.
 - (ii) How many people like to play both the games?
 - (iii) How many people like to play volleyball only?
2. In a group of 50 students 20 like only Maths and 15 like only Science. If the number of students who do not like any of the two subjects is double of the number of students who like both subjects, find the number of students who like at most one subject by using a Venn-diagram.
3. In a survey of a group of people, it was found that 60% of the people liked apple, 70% liked orange and 400 people liked both of them. If 10% people liked none of them, then
 - (i) draw a Venn-diagram to illustrate the above information.
 - (ii) Find the total number of people in the survey.
 - (iii) Find the number of people who like apple only.

4. Out of 120 students appeared in an examination the number of students who passed in mathematics only is twice the number of the students who passed in science only. If 50 students passed in both subjects and 40 students failed in both subjects then :
 - (i) Find the no. of students who passed in Maths.
 - (ii) Find the no. of students who passed in Science.
 - (iii) Show the result in a Venn-diagram.
5. 50 students in a classroom like Nepali, History or both subjects. Out of them, 20 like both subjects. If the ratio of the number of students who like Nepali and History is 3 : 2, by using Venn-diagram, find:
 - (i) How many students like Nepali?
 - (ii) How many like History only?
6. In a group of 50 students, 15 like both Nepali and English subject and 5 do not like any of the two subjects. If the number of students who like Nepali only and the number of students who like English only are in the ratio of 2: 1, find the number of students who do not like English subject by using Venn-diagram.
7. In a survey of 100 people, it was found that 65 read the Kantipur, 45 read the Gorakhapatra, 40 read the Himalaya Times, 25 read the Kantipur as well as the Gorakhapatra, 20 read the Kantipur as well as the Himalaya Times, 15 read the Gorakhapatra as well as the Himalaya Times and 5 read all three news papers.
 - (i) Show the above information in a Venn-diagram.
 - (ii) How many people didn't read all three newspapers?

SEE Q.N. 12**Discount and VAT**

1. The marked price of a Scooter is Rs 2,50,000. If the shopkeeper allows 15% discount and levies 13% value added tax, how much should a customer have to pay to buy the Scooter? Find it.
2. If a tourist paid Rs 5610 for a carved window made of wood with a discount of 15% including 10% value added tax (VAT), how much does he get back while leaving Nepal? Find it.
3. The marked price of a laptop is Rs 75000. Allowing 15% discount and including same percentage of VAT, the laptop is sold. Find the cost that has to pay by the customer and the VAT amount.
4. The marked price of an article is Rs 2000. The price of the article becomes Rs 1921 after 15% discount and adding VAT amount. Find the rate of VAT.
5. A tourist bought a Nepali cap with 20% discount and 13% value added tax. When returning to his country the VAT amount Rs 83.20 was given back to him at the airport. What was the marked price of the cap? Find it.

Money Exchange

1. A businessman exchanged Rs 5,50,000 into US dollar at the rate of \$1 = NRs 110. After four days, Nepali currency was revaluated by 10% and in that day he exchanged the dollars he had into Nepali currency again. What is his gain or loss?
2. Manish bought some American dollar for Rs 2,00,000. But after four days, the Nepalese currency was devaluated in the comparison of American dollar by 5%. Again Manish exchanged the Nepali currency by giving American dollar in the day of devaluation of Nepalese currency. How much does he gain or loss? Find it. (\$1 = NRs 104.28)
3. A merchant purchased 2000 pieces of 'Nepali Pashmina' at Rs 1,500 per piece. He exported them to USA with 5% export tax. If he sold them at \$ 35 per piece in USA, calculate his profit or loss percent. (\$ 1 = NPR 120.00)

- Mr. Gurung bought 100 g of gold in Hong Kong for KHD\$ 38,000 and brought to Nepal paying 25% custom duty. If he sold the gold with 13% VAT in Nepal, how much Nepali rupee did he get? (HKD\$ 1 = NPR 15.00)
- Jiwan Shrestha bought some EURO for NPR 3,20,000 at the exchange rate of 1 EURO = NPR 128 to visit a few European countries. Unfortunately, because of his Visa problem, he cancelled his trip. Within a week Nepali rupee is devaluated by 2%. He again exchanged his EURO to Nepali rupee after a week. How much did he gain or lose?

Compound Interest

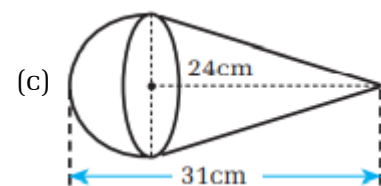
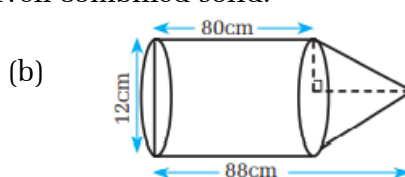
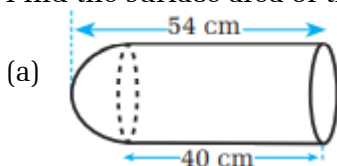
- Mohan deposited Rs 5000 at 8% p.a. compound interest in a bank. Find the difference between the amounts compounded yearly and half yearly in two years
- A money-lender borrows a certain sum of money at 3% per annum simple interest and invests the same sum at 5% per annum compound interest (Compounded annually). If after 3 years he makes a profit of Rs 1082, what is the amount he borrowed?
- If a sum becomes Rs 6480 in 3 years and Rs 7776 in 4 years, interest being compounded annually, find the sum and the rate of interest.
- A sum of money amounts to Rs 19360 in 2 years and Rs 23425.60 in 4 years at the rate of compound interest annually. Find the rate of compound interest and the sum.
- The yearly compound interest on a sum of money in 1 and 2 years are Rs 1800 and Rs 3816 respectively. Calculate the rate of compound interest and the principal.

Population Growth and Depreciation

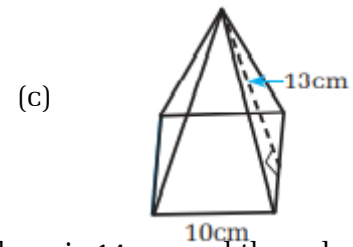
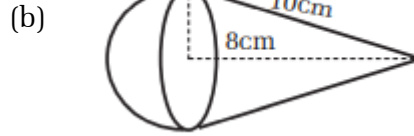
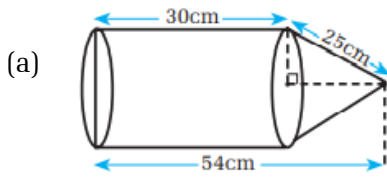
- The population of a municipality before 2 years was 60,000 and the rate of annual growth of population is 2%. If the numbers of in-migrants and out-migrants at the end of 2 years were 750 and 410 respectively and 620 people died within this time interval, find the present population of the municipality.
- The population of a village increases every year by 5%. At the end of two years, the total population of the village was 10000, if 1025 were migrated to other places. What was the population of the village in the beginning?
- In the beginning of BS 2065, the population of a town was 1,00,000 and the rate of population growth is 2% every year. If 8,000 people migrated there from different places in the beginning of BS 2066, what will be the population of the town in the beginning of BS 2068?
- In the beginning of 2074 B.S. the population of a city was 5,00,000 and it was 6,65,500 at the end of 2076 B. S. What will be the population of the city at the end of 2078 B.S. at the same rate of growth of the population?
- Damar purchased a mountain bike for Rs 32,000. If he used it for 3 years and sold to Sunayana for Rs 19,652, find the rate of compound depreciation.

SEE Q.N. 13

- The sides of a triangular field are in the ratio of 4: 5: 6. If its perimeter is 1500 m, what is the area of that field?
- An umbrella is made by stitching 10 triangular pieces of cloth of two different colours, each piece measuring 15 cm, 41 cm and 28 cm. How much cloth is required for the umbrella? If the cost of 1 cm² is Rs 0.50, find the total cost of cloth.
- Find the surface area of the given combined solid.



4. Find the volume of the following solids.



5. If the length of a side of the base of the pyramid having square base is 14 cm and the volume of the pyramid is $1,568 \text{ cm}^3$, find the total surface area of the pyramid.

SEE Q.N. 14

1. Find the HCF of
- $x^3y + y^4, x^4 + x^2y^2 + y^4$ and $2ax^3 - 2ax^2y + 2axy^2$
 - $16x^4 - 4x^2 - 4x - 1, 8x^3 - 1$
 - $1 + 4a + 4a^2 - 16a^4, 1 + 2a - 8a^3 - 16a^4$
 - $y^2 - 10y + 24 + 6x - 9x^2, 2y^4 - 18x^2y^2 - 48xy^2 - 32y^2$
 - $b^2(b^2 + 4bc + 4c^2), b^5 + 8b^2c^3$ and $3b^4 + b^3c - 10b^2c^2$
 - $x^2 + y^2 + 2xy - z^2, y^2 - x^2 + 2yz + z^2$ and $x^2 + z^2 + 2xz - y^2$
 - $9m^2 - 4n^2 - 4nr - r^2, r^2 - 4n^2 - 9m^2 - 12mn$ and $9m^2 + 6mr + r^2 - 4n^2$
2. Find the LCM of
- $x^4 + x^2 + 169, x^3 + x(x + 13) + 4x^2$ and $3x(x + 5) + 39$
 - $(a + b)^2 - 4ab, a^3 - b^3, a^2 + ab - 2b^2$
 - $6x^2 - x - 1, 54x^4 + 2x$
 - $(a - b)^2 + 4ab, (a + b)^3 - 3ab(a + b), a^2 + 2ab + b^2$
 - $a^3 + 1 + 2a^2 + 2a, a^3 - 1$ and $a^4 + a^2 + 1$
3. Simplify:
- $\frac{6\sqrt{2}}{\sqrt{6} + \sqrt{3}} + \frac{2\sqrt{6}}{\sqrt{3} + \sqrt{2}} - \frac{4\sqrt{3}}{\sqrt{6} + \sqrt{2}}$
 - $\frac{a + \sqrt{a^2 - 1}}{a - \sqrt{a^2 - 1}} - \frac{a - \sqrt{a^2 - 1}}{a + \sqrt{a^2 - 1}}$
4. Solve:
- $\frac{5x - 4}{\sqrt{5x + 2}} = 2 - \frac{\sqrt{5x + 2}}{2}$
 - $\sqrt{x} + \sqrt{x + 13} = \frac{91}{\sqrt{x + 13}}$
5. Simplify:
- $\left(x^a \times \frac{1}{x^b}\right) a^2 + ab + b^2 \times \left(x^b \times \frac{1}{x^c}\right) b^2 + bc + c^2 \times \left(x^c \times \frac{1}{x^a}\right) c^2 + ca + a^2$
 - $\left(\frac{x^m}{x^n}\right) m + n - p \times \left(\frac{x^n}{x^p}\right) n + p - m \times \left(\frac{x^p}{x^m}\right) p + m - n$
 - $\frac{1}{1 + x^{a-b} + x^{c-b}} + \frac{1}{1 + x^{b-c} + x^{a-c}} + \frac{1}{1 + x^{b-a} + x^{c-a}}$
 - $\sqrt[1/ab]{\frac{x^{1/a}}{x^{1/b}}} \times \sqrt[1/bc]{\frac{x^{1/b}}{x^{1/c}}} \times \sqrt[1/ca]{\frac{x^{1/c}}{x^{1/a}}}$
 - $\frac{p^2}{(p-y)^y} - \frac{2p}{(p-y)^{y-1}} + \frac{1}{(p-y)^{y-2}}$
 - $\left(\frac{p + (p^2q)^{1/3} + (p^2q)^{1/3}}{p - q}\right) \times \left(1 - \frac{q^{1/3}}{p^{1/3}}\right)$
6. Solve:
- $7^x + 343 \times 7^{-x} - 56 = 0$
 - $2^a + \frac{1}{2^a} = 4 \frac{1}{4}$
 - $4^x - 6 \times 2^{x+1} + 32 = 0$
 - $5^{x-1} + 5^{1-x} = 5 \frac{1}{5}$
7. If $a = x^{q+r}, y^p, b = x^{r+p}, y^q$ and $c = x^{p+q}, y^r$ then prove that: $a^{q-r} \cdot b^{r-p} \cdot c^{p-q} = 1$.
8. Simplify:
- $\frac{x}{(x-y)(x-z)} + \frac{y}{(y-z)(y-x)} - \frac{z}{(z-x)(z-y)}$

$$(b) \quad \left(\frac{1}{a} + \frac{1}{b}\right)(a + b - c) + \left(\frac{1}{b} + \frac{1}{c}\right)(b + c - a) + \left(\frac{1}{c} + \frac{1}{a}\right)(c + a - b)$$

$$(c) \quad \frac{1}{a^2 - 3a + 2} + \frac{1}{a^2 - 5a + 6} + \frac{2}{a^2 - 8a + 15}$$

$$(d) \quad \frac{x + y}{x - y} - \frac{x - y}{x + y} + \frac{4xy}{x^2 + y^2}$$

$$(e) \quad \frac{a + 2}{1 + a + a^2} - \frac{a - 2}{1 - a + a^2} - \frac{2a^2}{1 + a^2 + a^4}$$

$$(f) \quad \frac{x + 3}{x^2 + 3x + 9} + \frac{x - 3}{x^2 - 3x + 9} - \frac{54}{x^4 + 9x^2 + 81}$$

$$(g) \quad \frac{1}{8(\sqrt{x} - 1)} + \frac{1}{8(\sqrt{x} + 1)} + \frac{2\sqrt{x}}{8(x - 1)}$$

SEE Q.N. 15

- One year hence, a mother will be seven times as old as her daughter. 6 years ago, the mother was four times as old as her daughter's age will be three years hence, find the present ages of mother and daughter.
- The sum of the present ages of a father and his son is 60 years. If both of them live until the son becomes as old as the father is now, the sum of their ages will be 120 years, then find their present ages.
- A number consists of two digits; the sum of the digits is 10. If 36 is added to the number, place of digits are interchanged. Find the number.
- A two digit number is equal to three times the product and four times the sum of the digits, find the number.
- The area of a rectangular room is 45 sq. m. If the length had been 3 m less and the breadth 1 m more it would have been a square. Find the length and breadth of the room.

SEE Q.N. 16

- Prove that the parallelograms on the same base and between the same parallel lines are equal in area.
- Prove that the area of a triangle is one half of the area of a parallelogram standing on the same base and between the same parallels.
- Prove that the area of ΔPQR and ΔSQR standing on the same base QR and between the same parallels PS and QR are equal in area.
- The points P, Q and R lie on the circumference of a circle with centre S. Prove that: $\angle QSR = 2\angle QPR$.
- ABCD is a cyclic quadrilateral. Prove that: $\angle BAD + \angle BCD = 180^\circ$ and $\angle ABC + \angle ADC = 180^\circ$

SEE Q.N. 17

- Construct ΔPQR in which $QR = 6.4\text{cm}$, $PQ = 5\text{ cm}$ and $\angle PQR = 75^\circ$. Also construct a rectangle STRU equal in area to that of ΔPQR .
- Construct a triangle ABC in which $a = 7.8\text{ cm}$, $b = 7.2\text{ cm}$ and $C = 6.3\text{ cm}$. Then construct a parallelogram DBEF equal in area to ΔABC and $\angle DBC = 75^\circ$.
- Construct a parallelogram ABCD in which $AB = 5\text{ cm}$, $AD = 6\text{ cm}$ and diagonal $BD = 6\text{ cm}$. Also construct ΔEAF in which $\angle EAF = 45^\circ$ and whose area is equal to that of parallelogram ABCD.

- Construct a quadrilateral ABCD in which $AB = BC = 5.5$ cm, $CD = DA = 4.5$ cm and $\angle A = 60^\circ$. Also construct $\triangle ADE$ equal in area to the quadrilateral ABCD.
- Construct a parallelogram PQRS in which $PQ = 5$ cm, diagonal $PR = 6$ cm, and diagonal $QS = 8$ cm. Construct a triangle PSA whose area is equal to the area of the parallelogram.
- Construct a rhombus PQRS in which diagonal $PR = 6$ cm and diagonal $QS = 8$ cm. Also construct a $\triangle PSA$ whose area is equal to the area of the rhombus PQRS.

SEE Q.N. 18

- Verify experimentally that the angles subtended by equal arcs of a circle at the centre are equal. (Two circles of radii not less than 3cm are necessary)
- Verify experimentally that the angles in the same segment of a circle are equal. (Two circles of radii at least 3cm are necessary)
- Verify experimentally that the sum of opposite angles of a cyclic quadrilateral is two right angles. (Two circles of radii more than 3cm are necessary)
- Show by measurement that the angle at the centre of circle is double of an angle at the circumference standing on the same arc. (Two circles of radii more than 3cm are necessary)
- Verify experimentally that the exterior angle of a cyclic quadrilateral is equal to opposite interior angle. (Two circles of radii more than 3cm are necessary)

SEE Q.N. 19

- A man of height 1.68m observes a pillar of height 51.68m and finds the angle of elevation of the top of the pillar to be 60° . How far is the man from the base of the pillar? Find it.
- Two vertical poles are fixed 60m apart. The angle of depression of the top of the first pole as seen from the top of the second pole which is 150m high is 45° . Find the height of the first pole.
- On the roof of a house 10 m high, a 1.2 m tall man was flying a kite and the kite is at the height of 28.2 m above the ground. If the string of the kite makes an angle of 30° with horizon, find the length of the string of the kite.
- At the centre of a circular pond, there is a pole of 11.62m height above the surface of the water. From a point on the edge of the pond, a man of 1.62 m height observed the angle of the elevation of the top of the pole and found to be 30° . Find the diameter of the pond.
- A tree of 14 m high is broken by the wind so that its top touches the ground and makes an angle of 60° with the ground. Find the length of broken part of the tree.

SEE Q.N. 20

- The mean of the data given below is 28, find the value of p.

Marks obtained	0-10	10-20	20-30	30-40	40-50	50-60
No. of students	12	18	27	P	17	6

- Find the median from the following data.

Wages (Rs.)	0-10	10-20	20-30	30-40	40-50
No. of workers	4	8	12	20	16

- If the median of the following data is 19, find the value of x.

Class interval	6-12	12-18	18-24	24-30	30-36	36-42
Frequency	4	10	x	4	3	3

4. The following are the marks obtained by students in mathematics in an examination:
51, 22, 63, 35, 46, 57, 79, 21, 39, 51, 32, 43, 52, 59, 38, 45, 40, 32, 60, 63
Make a frequency table of class interval 10 and find the first quartile.
5. From the data given below, compute the upper quartile.

Wages (Rs.)	0-20	20-40	40-60	60-80	80-100	100-120
No. of workers	6	4	10	8	7	5

HA Level Questions

SEE Q.N. 21

- A dealer purchased some building materials for Rs 3,60,000. She sold them at 5% profit to a supplier. The supplier spent Rs 7,500 for transportation and Rs 4,500 for the local tax and sold at a profit of 10% to a customer. How much did the customer pay for the materials with 13% VAT?
- The marked price of an article is Rs. 2000. If the price of the article including 13% VAT is Rs. 2034 after allowing certain rate of discount. By what percent the VAT amount is more than discount amount? Find it.
- Mrs. Thapa invests Rs 50,000 for 3 years at a certain rate of interest compounded annually. At the end of one year the sum amounts to Rs 27,500. Calculate:
 - the rate of interest
 - the amount at the end of second year
 - the amount at the end of third year.
- Suresh lent altogether 6,600 to Manoj and Pradeep for 2 years. Manoj agreed to pay simple interest at 15 % p.a. and Pradeep agreed to pay compound interest at the same rate. If Manoj paid Rs 112.50 more than Pradeep as the interest, find how much did Suresh lend to each of them?
- Arjun has a son Sumit of 14 years old and a daughter Vinisha of 16 years. He divides Rs 66,300 between his son and daughter and deposits in their own accounts in a bank at 10% per annum compound interest. If both children would receive equal amounts at the age of 18 years,
 - What is the share of each of them?
 - What amount will each receive at the age of 18 years?
- Ganesh borrowed a certain sum from a bank at 5% per annum compound interest. He cleared the loan by paying Rs. 31,500 at the end of the first year and Rs. 22,050 at the end of the second year.
 - Find the sum that he borrowed.
 - How much more amount would he need if he cleared the loan only at the end of the second year?
- In BS 2077, a man bought a plot of 4 Aanas at the rate of Rs 2,00,000 per Aana in a rural municipality and immediately invested Rs 27,00,000 for building a house on it. If the value of land increases every year by 20% and that of the house decreases every year by 20%, when will the values of the land and house be equal? Find it.

SEE Q.N. 22

- A person bought a water tank of circular base having the radius 1.05 meter and height 3.5 meter for the use of own house from the shop. If the upper part of the tank is semi spherical, how many liters of water will be contained in the tank? Find it.
- A water tank is formed with the combination of cylinder and hemisphere. The total height of the tank is 8 m and the internal radius of the tank is 3 m. How much water in Liter does the tank hold? If a family consumes 2000 liter water a day, for how many days the water of the tank last?

3. In a birthday party; Salina manages an arrangement for 120 people. For this purpose, she plans to build a square based pyramid in such a way that each person has 4.5 m^2 space on the ground and 30 m^3 of the air to breath. What would be the height of the tent? Find it.
4. A cylindrical bucket having inner height and radius 32 cm and 8 cm respectively, is filled with sand. This bucket is emptied on a level ground and a conical heap of sand is formed. If the height of the conical heap is 24 cm, find the radius and slant height of the heap.
5. A ring of diameter 3.5 feet and height 1 feet is made from the cement and concrete. A well is made from such 32 rings. Find the cost for constructing the well at the rate of Rs. 1200 per ring. If the water level in the well is up to 18 rings, find the volume of the water in the well.
6. A water storage tank is made by using 14 circular rings having radius of each ring 1 m and height 1.4 m. If 11000 litres of water cost Rs 1500, what is the total cost to fill the tank?
7. A gate has two cylindrical pillars with a hemispherical end on the top of each pillar. The height of each pillar is 9.96 m and the height of each cylinder is 9.75 m. Find the cost of colouring the surface of both pillars at Rs 500 per sq. m.
8. A roller of diameter 112 cm and length 150 cm takes 550 complete revolutions to level a compound. Calculate the cost of levelling the compound at Rs 9 per square metre.
9. The gate of a stadium has two pillars, each of height is 8 ft. with four visible lateral faces and $6 \text{ ft.} \times 6 \text{ ft.}$ bases. The top of each pillar has a combined pyramid of height 4 feet. If the combined structures of both pillars and pyramids are painted at the rate of Rs 75 per sq. ft., calculate the total cost of painting.
10. A circus tent is cylindrical in shape up to the height of 12.5m and conical above it. If the diameter of the tent is 16m and height of the conical part is 15m, find the surface area of the tent. What is the cost of canvas used to make the tent at the rate of Rs 50 per square meter.

SEE Q.N. 23

1. If $a + b + c = 0$, prove that: $\frac{1}{1 + x^{a+b} + x^{-b}} + \frac{1}{1 + x^b + x^{-c}} + \frac{1}{1 + x^c + x^{-a}} = 1$
2. If $x^2 - 2 = 2^{2/3} + 2^{-2/3}$, then prove that (a) $x = 2^{1/3} + 2^{-1/3}$ (b) $2x^3 - 6x = 5$
3. Prove that the values of x obtained by solving the equation $3^{x-3} + 3^{4-x} = 4$ also satisfy the equation $4^x + 128 = 3 \times 2^{x+3}$.
4. If $xyz = -1$, prove that: $(1 - x - y^{-1})^{-1} + (1 - y - z^{-1})^{-1} + (1 - z - x^{-1})^{-1} = 1$
5. The area of a window is 4^x square meter. The curtain of size 3 m by 2^x m is used in the window. If the area of the curtain is 2 square meters more than the area of window, find the possible areas of the window.
6. Show that the value of x in the equation $\sqrt{x^2 - 3x - 3} = \sqrt{x^2 - 2x - 4} - 1$ are 4 and $-\frac{4}{3}$. The value of $-\frac{4}{3}$ is not satisfied in the given equation, why? Give your suitable reason.
7. Binaya's capital increases by Rs 3,000 when he sells 50 shares of a company-P and buys 30 shares of company-Q. Similarly, Bidhata's capital decreases by Rs 4000 when he sells 20 shares of company-P and buys 25 shares of company-Q.
 - (i) What is the value of each share of company-P?
 - (ii) What is the value of each share of company-Q?
8. In 2074 BS, the product of the present ages of a father and his son is 800. When the son becomes as old as father at present, the sum of their ages will be 100. Find their birth years.

9. Last week Mrs. Gurung bought some vegetables for Rs 150. This week the rate of cost of vegetables increases by Rs 5 per kg and she can buy 1 kg less vegetables for the same amount of money. By what percent is the rate of cost of vegetables increased?

SEE Q.N. 24

1. In a parallelogram ABCD, A is joined to any point E on BC. AE and DC produced meet at F. Prove that the area of $\triangle BEF =$ the area of $\triangle CDE$
2. D is the mid-point of side BC of $\triangle ABC$, E is the mid-point of AD, F is the mid-point of AB and G is any point of BD. Prove that: $\triangle ABC = 8\triangle EFG$.
3. In $\triangle ABC$, P is the mid-point of side AB and R is on AP and Q is any point on the side BC such that $CR \parallel PQ$. Prove that area of $\triangle ABC = 2 \times$ area of $\triangle BQR$.
4. In triangle ABC; D is mid-point of side BC, E is the mid-point of AD, F is mid-point of BE and G is the mid-point of FC. Prove that the area of triangle ABC is equal to 8 times the area of triangle EFG.
5. In parallelogram TWIN; side WI is produced to E such that $WI = IE$. TE and NI intersect at O. Prove that the area of triangle TWO is equal to twice the area of triangle ONE
6. In $\triangle ABC$; P and Q are the mid-points of sides AB and AC respectively. If S and R are the points on BC so that $PS \parallel QR$, prove that the area of $\triangle ABC$ is double of area of quadrilateral PQRS
7. In trapezium PQRS, M and N are the middle points of diagonals QS and PR respectively. Prove that the area of triangle PMR is equal to the area of triangle SNQ
8. In a circle centered at O; AB is a diameter. C and D are two points on the circumference on the same side of AB such $\text{arc } BC = \text{arc } CD$. Prove that area of $\triangle AOC =$ area of $\triangle COD$.
9. O is the centre of a circle, AB is a diameter. D is an external point of circle such that $DO \perp AB$. AD cuts the circle at C and E is any point on the circumference. Prove that $\angle AEC = \angle ODA$.
10. PQRS is a cyclic quadrilateral. RS is produced to T. If PS is an angular bisector of $\angle QST$, prove that $\triangle PQR$ is an isosceles triangle.
11. The side BC of a cyclic quadrilateral ABCD is extended to E so that $AB = CE$ and $\text{arc } AD = \text{arc } CD$. Prove that BED is an isosceles triangle.
12. The points B, E, S and T are concyclic such that $\text{arc } BT = \text{arc } SE$. If the chords BS and ET intersect at the point L, prove that: (i) Area of $\triangle BLT =$ Area of $\triangle SEL$ (ii) chord BS = chord ET.
13. In a circle two chords PR and QS externally meet at a point T. If $PT = PQ$, prove that:
(i) Area of $\triangle PQR =$ Area of $\triangle PQS$ (ii) $\triangle RST$ is an isosceles triangle.

The End