



**MATHEMATICS WORKSHEET OF SELECTED TOPICS FROM
GRADE 9 FOR SUMMER TUTORIAL PROGRAM AT ARSI
UNIVERSITY(ACADEMIC YEAR 2016/2024)**



INSTRUCTION: Choose the best answer from the given alternatives

1. If x is an odd natural numbers such that $LCM(40, x) = 1400$, then find the possible value of x is:
A) 125 B) 175 C) 85 D) 25
2. The GCF of two numbers is 3 and LCM is 180. If one of the numbers is 45, what is the other number?
A) 540 B) 90 C) 12 D) 9
3. For $a, b \in \mathbb{N}$, if $b - a = 55$, $GCF(a, b) = 5$ and $LCM(a, b) = 120$, then $\frac{1}{a} - \frac{1}{b}$ is equal to:
A) $\frac{15}{120}$ B) $\frac{11}{120}$ C) $\frac{10}{120}$ D) $\frac{20}{63}$
4. The maximum number of students among them 306 pens and 657 pencils can be distributed in such a way that each student gets the same number of pens and same number of pencils is:
A) 4 B) 9 C) 36 D) 45
5. What is the greatest number that will divide 115, 149 and 183 leaving remainders 3, 5, 7 respectively?
A) 32 B) 64 C) 16 D) 8
6. Let $m = 2 \times 7 \times a^2 \times b^3$ and $n = 2^4 \times a^3 \times b$, then from the following which one is true?
A) $GCF(m, n) = 16a^3b^3$ B) $GCF(m, n) = 2a^3b^3$
C) $LCM(m, n) = 112a^2b^3$ D) $LCM(m, n) = 112a^3b^3$
7. The $LCM(m, n)$ of two numbers is $a + b$ and their GCF is $k(a - b)$. If one of the number is k , then the other number is:
A) $a + b$ B) $a - b$ C) $b - a$ D) $a^2 - b^2$
8. Five bells beginning together toll at intervals 4, 5, 7, 8 and 10 seconds respectively. After what interval of time will they toll again together?
A) 1 B) 280 C) 7 D) 40
9. If $GCF(710, 195) = GCF(195, r)$, then what is the value of r ?
A) 585 B) 195 C) 125 D) 70
10. If $GCF(x, 48) = 12$ and $LCM(x, 48) = 144$, then what is the value of x ?
A) 108 B) 216 C) 36 D) 72



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11. If two positive integers p and q are expressed as $p = ab^2$ and $q = a^3b$, where a and b are prime numbers, then the LCM $[p, q]$ is:
A) a^4b^3 B) a^2b^2 C) a^3b^2 D) ab
12. If $\frac{\sqrt{2}+\sqrt{3}}{3\sqrt{2}-2\sqrt{3}} + x = \sqrt{6}y$, then what is the value of x and y ?
A) $x = \frac{5}{12}, y = 2$ B) $x = 2, y = \frac{5}{12}$
C) $x = -\frac{5}{12}, y = 2$ D) $x = -2, y = \frac{5}{12}$
13. What is rationalizing factor of $\frac{2}{\sqrt[3]{3}+3}$?
A) $\frac{\sqrt[3]{3^2}-3}{\sqrt[3]{3^2}-3}$ B) $\frac{\sqrt[3]{3^2}+3}{\sqrt[3]{3^2}+3}$ C) $\frac{\sqrt[3]{3^2}+3\sqrt[3]{3}+9}{\sqrt[3]{3^2}+3\sqrt[3]{3}+9}$ D) $\frac{\sqrt[3]{3^2}-3\sqrt[3]{3}+9}{\sqrt[3]{3^2}-3\sqrt[3]{3}+9}$
14. If $x = \frac{1}{3+2\sqrt{2}}$ and $y = \frac{1}{3-2\sqrt{2}}$, then which one of the following is true?
A) $x + y = 4\sqrt{2}$ B) $(x + y)^2 = 32$ C) $xy = 8$ D) $x + y = 6$
15. $\frac{2\sqrt{3}+3\sqrt{2}}{\sqrt{2}+\sqrt{3}}$ is equal to: A) -1 B) 1 C) $-\sqrt{6}$ D) $\sqrt{6}$
16. If $x = \frac{\sqrt{3}+\sqrt{2}}{\sqrt{3}-\sqrt{2}}$, then $(x - \frac{1}{x}) \div 2\sqrt{3}$ is equal to:
A) 1 B) $4\sqrt{6}$ C) $3\sqrt{2}$ D) $2\sqrt{2}$
17. What is rationalizing factor of $\sqrt[4]{\frac{13}{15}}$ is:
A) $\frac{\sqrt[4]{13}}{\sqrt[4]{15}}$ B) $\frac{\sqrt[4]{13^2}}{\sqrt[4]{15^2}}$ C) $\frac{\sqrt[4]{13^3}}{\sqrt[4]{15^3}}$ D) $\frac{\sqrt[4]{13^4}}{\sqrt[4]{15^4}}$
18. Rationalized form of the denominator of $\frac{-5}{\sqrt{3}+\sqrt{7}}$ is:
A) $\frac{\sqrt{3}-\sqrt{7}}{\sqrt{3}-\sqrt{7}}$ B) $\sqrt{3} - \sqrt{7}$ C) $-\frac{5(\sqrt{3}-\sqrt{7})}{4}$ D) $\frac{5(\sqrt{3}-\sqrt{7})}{4}$
19. Which one of the following is the rationalizing factor of the denominator of $\frac{5\sqrt{2}+2\sqrt{3}}{5\sqrt{2}-2\sqrt{3}}$?
A) $\frac{5\sqrt{2}-2\sqrt{3}}{5\sqrt{2}-2\sqrt{3}}$ B) $\frac{3\sqrt{2}-5\sqrt{3}}{3\sqrt{2}-5\sqrt{3}}$ C) $\frac{5\sqrt{2}+2\sqrt{3}}{5\sqrt{2}+2\sqrt{3}}$ D) $\frac{3\sqrt{2}+5\sqrt{3}}{3\sqrt{2}+5\sqrt{3}}$
20. The rationalizing factor of $\frac{5}{\sqrt{12}}$ is:
A) $\frac{\sqrt{3}}{\sqrt{3}}$ B) $\frac{\sqrt{4}}{\sqrt{4}}$ C) $\frac{\sqrt{6}}{\sqrt{6}}$ D) $\frac{\sqrt{2}}{\sqrt{2}}$
21. Which one of the following numbers is equal to $\frac{\sqrt{3}+\sqrt{2}}{\sqrt{3}-\sqrt{2}}$?
A) $6 + 2\sqrt{2}$ B) $5 + 2\sqrt{6}$ C) $1 + 2\sqrt{3}$ D) $3 - 2\sqrt{3}$



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22. Let $A = \{3, 7, a^2\}$ and $B = \{2, 4, a + 1, a + b\}$ be two sets and all the elements of the two sets are integers. If $A \cap B = \{4, 7\}$ then what is a and b ?
- A) $a = 4, b = 3$ B) $a = 3, b = 4$ C) $a = -2, b = 7$ D) $a = -2, b = 9$
23. In school of 150 students, 115 takes Mathematics and 85 take Physics. Each student takes at least one of these subjects. From the following which one is not true?
- A) 50 students take both subjects
B) 65 students take only Mathematics
C) 35 students take only Physics subject
D) 95 students take exactly one of the subject
24. For any sets A, B and C , which one of the following is not true?
- A) $A \cup B = B \cup A$ B) $(A \cup B) \cup C = C \cup (A \cup B)$
C) $A \setminus B = B \setminus A$ D) $A \cup \emptyset = A$
25. Let $U = \{1, 2, 3, \dots, 9\}$ be the universal set and $A = \{1, 2, 3, 4\}$, $B = \{2, 4, 6, 8\}$ and $C = \{3, 4, 5, 6\}$. Then from the following which one is true?
- A) $A' = \{1, 3\}$ B) $B' = \{1, 3, 5, 7, 9\}$
C) $(A \cup B)' = \{1, 2, 3, 4, 6, 8\}$ D) $B \setminus C = \{3, 5\}$
26. For any set A, B and C , from the following which one is not correctly matched?
- A) $A \cup (B \cap C) = (A \cup B) \cap (A \cup C)$ B) $A \cap (B \cup C) = (A \cap B) \cup (A \cap C)$
C) $A \cap A = \emptyset$ D) $(A \cap B) \cap C = A \cap (B \cap C)$
27. Suppose A and B are sets such that $A \cup B$ has 20 elements, $A \cap B$ has 7 elements, and the number of elements in B is twice that of A . what is the number of elements in A and B respectively?
- A) $A = 18, B = 9$ B) $A = 9, B = 18$ C) $A = 9, B = 27$ D) $A = 6, B = 12$
28. Given that set A has 15 elements and set B has 12 elements, which one of the following is true?
- A) The maximum possible number of elements in $A \cup B$ is 15
B) The minimum possible number of elements in $A \cup B$ is 12
C) The maximum possible number of elements in $A \cap B$ is 12
D) The minimum possible number of elements in $A \cap B$ is 15
29. If $n(U) = 16, n(A) = 7$ and $n(B) = 12$, then which one of the following is true?
- A) $n(A') = 4$ B) $n(B') = 9$
C) Greatest $n(A \cap B) = 7$ D) Least $n(A \cup B) = 19$



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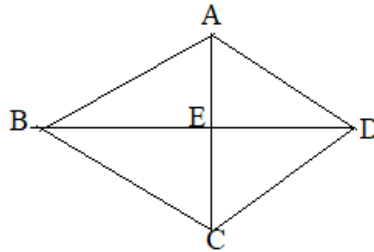
30. Let $A \cap B' = \{1, 2, 3\}$ and $A' \cap B = \{0, 4\}$. Then which of the following is equal to $A \Delta B$?
A) $\emptyset$ B) $\{1, 2, 3\}$ C) $\{0, 4\}$ D) $\{0, 1, 2, 3, 4\}$
31. If $A = \{x \in N | 1 \leq x \leq 20\}$ and $B = \{x \in N | 1 \leq x \leq 20 \text{ and } x \text{ is odd}\}$ then the relative complement of set B with respect to set A is:
A) $\emptyset$ B) $\{2, 3, 4, 5, 7, 11, 13, 17, 19\}$ C) $\{2, 4, \dots, 18\}$ D) $\{2, 4, 6, \dots, 20\}$
32. Let A and B be two sets. If $A \setminus B = \emptyset$, then which of the following is always true?
A) $B \setminus A = \emptyset$ B) $A \cap B = B - A$ C) $B \setminus A = A \setminus B$ D) $A \cup B = B$
33. Let $A = \{0, 2, 4, 6, 8, 9, 10\}$ and $B = \{1, 3, 5, 7, 9\}$. Which one of the following is true?
A) $B - A = B$ B) $A - B = A$
C) $B - A = \{1, 3, 5, 7\}$ D) $A - B = \{0, 2, 4, 6, 8, 10\}$
34. Which one of the following sets is the symmetric difference, $A \Delta B$, of the sets $A = \{1, 3, 5, 6, 8, 10\}$ and $B = \{2, 5, 8, 11\}$?
A) $\{1, 2, 3, 6, 10, 11\}$ B) $\{1, 3, 6, 10\}$ C) $\{1, 2, 3, 5, 6, 8, 10, 11\}$ D) $\{2, 11\}$
35. Let $B = \{3, \{3, \sqrt{3}\}\}$ and $P(B)$ be the power set of B . Which one of the following is true?
A) $\{\{3, \sqrt{3}\}\} \in P(B)$ B) $\{3, \sqrt{3}\} \subseteq P(B)$
C) $\{3, \sqrt{3}\} \in P(B)$ D) $\{3\} \subseteq P(B)$
36. Which one of the following sets is equal to $S = \{x \in \mathbb{N} : -1 \leq x \leq 4\}$?
A) $\{-1, 0, 1, 2, 3\}$ B) $\{0, 1, 2, 3\}$ C) $\{1, 2, 3, 4\}$ D) $\{1, 2, 3\}$
37. If the radius of a regular hexagon is 4cm , then its area is equal to:
A) $24\sqrt{2}\text{cm}^2$ B) $24\sqrt{3}\text{cm}^2$ C) $48\sqrt{2}\text{cm}^2$ D) $48\sqrt{3}\text{cm}^2$
38. From the following properties which one is not true about the congruency of two triangles?
A) All corresponding angles are equal and all corresponding sides are proportional
B) All corresponding sides and angles are equal
C) Two corresponding angles and the included side are equal
D) Two corresponding sides and the included angle are equal
39. Given a circle with radius 7 cm and a central angle of 60° , which of the following is true?
A) The length of the arc is $\frac{7\pi}{3}\text{ cm}$ B) The length of the chord is $7\sqrt{3}\text{ cm}$
C) The area of the sector is $\frac{49\pi}{6}\text{ cm}^2$ D) The area of the segment is $\left(\frac{49\pi}{6} - 7\sqrt{3}\right)\text{ cm}^2$



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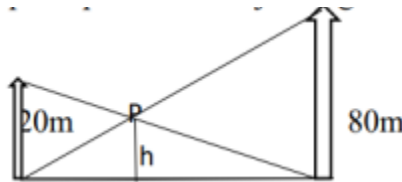
40. Given a quadrilateral $ABCD$ as shown in the figure below



If $\overline{AC}$ and $\overline{BD}$ are perpendicular bisectors of each other. Then which one of the following congruence of triangles holds true?

- A) $\triangle CBD \equiv \triangle ADE$ B) $\triangle ADE \equiv \triangle CBE$ C) $\triangle ADE \equiv \triangle ABC$ D) $\triangle ABE \equiv \triangle ABC$

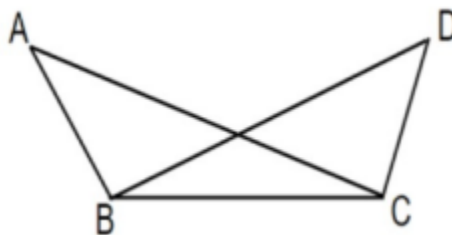
41. Two vertical poles are erected 100m apart on horizontally leveled ground. Their heights are 20m and 80m as shown in figure below.



What is the vertical height(h) of the intersection point p of the lines join the top of each pole to the foot of the other poles?

- A) 10m B) 12m C) 16m D) 15m

42. In the figure below, $\angle BAC \equiv \angle CDB$



Based on the given conditions in the figure above, which one of the following theorems can be used to prove that $\triangle ABC \equiv \triangle DCB$?

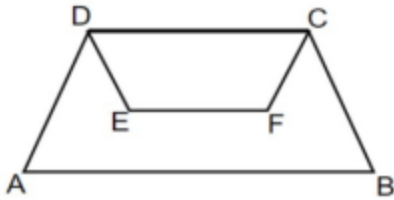
- A) AA B) SSA C) SAS D) ASA



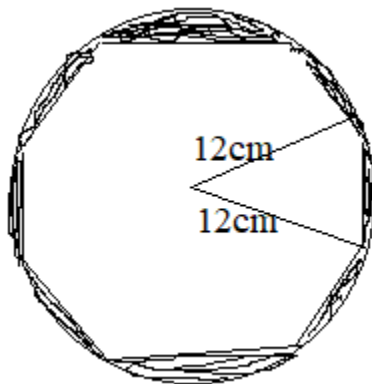
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43. In the figure below quadrilaterals $ABCD$ and $CDEF$ are similar and $AB = 10cm$, $CD = 8cm$, $AC = 12cm$ and $DE = 6cm$ what is the length of EC ?



- A) $6.4cm$ B) $7.2cm$ C) $7.5cm$ D) $9.6cm$
44. What is the perimeter of a regular hexagon whose radius is $6cm$?
A) $36cm$ B) $6cm$ C) $36\sqrt{3}cm$ D) $6\sqrt{3}cm$
45. Let $\triangle ABC \sim \triangle DEF$. The area of $\triangle ABC$ and $\triangle DEF$ are $256m^2$ and $64m^2$ respectively. Which one of the following statements is true?
A) The ratio of their corresponding sides is 4 B) If $CA = 9m$, then $FD = 3m$
C) The ratio of their areas is 16 D) The ratio of their perimeters is 2
46. How many lines of symmetry does a regular hexagon have?
A) 7 B) 6 C) 8 D) 5
47. Which of the following is necessarily true about similar polygons?
A) They have congruent corresponding angles
B) They have congruent corresponding sides
C) Any two regular polygons are similar
C) They are always congruent
48. A regular octagon is inscribed in a circle of radius $12cm$ as shown in the figure below



- What is the area of the shaded region (the region between the circle and the octagon)?
A) $144(\pi - \sqrt{3})sq. cm$ B) $144(\pi - 2\sqrt{2})sq. cm$
C) $144(2\sqrt{3} - \pi)sq. cm$ D) $144(4\sqrt{2} - \pi)sq. cm$
49. A regular polygon in which the measure of each interior angle is equal to the measure of each its central angle is:
A) Regular pentagon B) Equilateral triangle C) Regular hexagon D) Square



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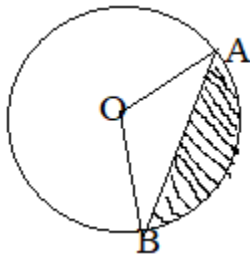
50. A square is inscribed in a circle. What is the area of a square whose apothem is $\sqrt{8}cm$?

- A) $16\sqrt{2}cm^2$ B) $32cm^2$ C) $8\sqrt{2}cm^2$ D) $16cm^2$

51. The degree measure of each exterior angle of a regular eight sided polygon is:

- A) 45° B) 270° C) 90° D) 135°

52. In the figure given below, $\overline{AB}$ is a chord of a circle with center O and radius $6cm$



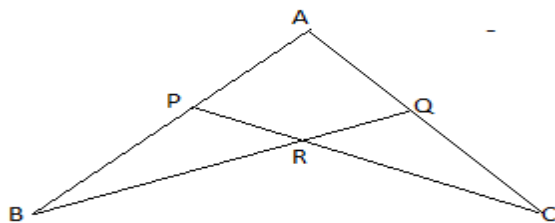
If $m(\angle AOB) = 90^\circ$, then what is the perimeter of the shaded region?

- A) $(3\pi + 12)cm$ B) $(3\pi + 6\sqrt{6})cm$ C) $(9\pi + 12)cm$ D) $(3\pi + 6\sqrt{2})cm$

53. Which of the following is not necessarily true about a regular polygon?

- A) The measures of all its interior angles are equal
B) The lengths of all its sides are equal
C) A cyclic quadrilateral is an example of a regular polygon
D) It can be inscribed in circle

54. In the figure below $AB = AC$ and $\angle BPC \cong \angle CQB$.



Which of the following is not true?

- A) $RP = PB$ B) $\angle RPQ \cong \angle RQP$ C) $\angle ABQ \cong \angle ACP$ D) $AP = AQ$

55. Which of the following is the measure of an exterior angle of a 10 sided regular polygons? A) 180° B) 36° C) 72° D) 144°

56. Which expression gives apothem for regular dodecagon with side length $6cm$?

- A) $a = \frac{3}{\tan 30^\circ}$ B) $a = \frac{6}{\tan 15^\circ}$ C) $a = \frac{3}{\tan 15^\circ}$ D) $a = 6 \cos 15^\circ$



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57. The sum of the interior angles of a polygon is equal to six times the sum of its exterior angles. How many sides does the polygon have?
A) 6 side B) 10 sides C) 12 sides D) 14 sides
58. If the measure interior angle of pentagon are $3x^0$, $x + 20^0$, $x - 20^0$, $x + 30^0$ and 80^0 , then $x =$ _____
A) 70^0 B) 280^0 C) 80^0 D) 90^0
59. If a regular polygon circumscribes a circle and the sides of the polygon touches the circle at exactly seven points, what is the maximum number of lines of symmetry of the polygon?
A) Eight B) Seven C) Six D) Five
60. From the following which one is the region bounded between two radii and the arc length?
A) Segment B) Circle C) Arc D) Sector