

2018 Metrobank-MTAP-DepEd Math Challenge Elimination Round • Grade 10

Name: _____ School: _____ Score: _____

Instruction: Write your answer on the space provided before each item. Give all fractions and ratios in lowest terms and all expressions in expanded form.

- _____ 1. Ten percent of 450 is 20% of what number?
- _____ 2. Let r and s be the roots of $x^2 - 9x + 7 = 0$. Find $r + s + rs$.
- _____ 3. How many integers between 60 and 600 are divisible by 7?
- _____ 4. Simplify: $\frac{8!}{6!}$.
- _____ 5. If $A = \{2, 3, 5, 7\}$, $B = \{2, 4, 6, 8, 10\}$, and $C = \{3, 6, 9\}$ find $(A \cup B) \cap C$.
- _____ 6. If the first two terms of an arithmetic sequence are 3 and 7, find the 10th term.
- _____ 7. If the 1st and 5th terms of an arithmetic sequence are -5 and 7 , respectively, find the sum of the first 21 terms.
- _____ 8. The 1st and 6th terms of a geometric sequence are 4 and $-\frac{1}{8}$, respectively. Find the 4th term.
- _____ 9. Three numbers form an arithmetic sequence with common difference 15 . If the first is increased by 3 , and the third by 21 , a geometric sequence will be formed. Find the first number of the arithmetic sequence.
- _____ 10. Find the sum of the infinite geometric series $9 - 6 + 4 - \frac{8}{3} + \dots$.
- _____ 11. An infinite geometric series with sum 12 has first term 8 . Find the first term of this series that is less than 1 .
- _____ 12. In a sequence $\{a_n\}$, $a_n = 2n + 2^n$. Find $a_5 - a_2$.
- _____ 13. If $P(x^3) = 4x^9 - 7x^6 + 2x^3 + 27$, find $P(x)$.
- _____ 14. Find the remainder when $P(x) = 2x^3 + 5x^2 - 3x - 4$ is divided by $x + 2$.
- _____ 15. What is the coefficient of x in the quotient when $p(x) = 4x^3 - 17x^2 + 8x + 11$ is divided by $x - 3$?
- _____ 16. Find the constant k if $x - 2$ is a factor of $f(x) = 3x^4 - kx^3 + kx^2 - 13x + 6$.
- _____ 17. Find the largest root x of $2x^3 + 5x^2 + x - 2 = 0$.
- _____ 18. If $p(x)$ is a 3rd degree polynomial and $p(-2) = p(2) = p(-1) = 0$, and $p(1) = -18$, find $p(3)$.
- _____ 19. Find the polynomial with smallest possible degree and all of whose coefficients are integers, with the leading coefficient positive and as small as possible, if it has $\sqrt{2}$ and 2 as zeros.
- _____ 20. Two lines, with slopes 3 and -4 , intersect at a point P on the y -axis. If their x -intercepts are 14 units apart, find the distance of P from the origin.
- _____ 21. The midpoint of $P(7, -1)$ and R is $Q(10.5, 2)$. Find the coordinates of R .
- _____ 22. Find the radius of the circle with center $(-3, 5)$ and which passes through the origin.
- _____ 23. Find the center of the circle with equation $x^2 + y^2 + 8x - 14y + 60 = 0$.
- _____ 24. Give the equation (in center-radius form) of the circle having as a diameter the segment with endpoints $(-2, 10)$ and $(4, 2)$.
- _____ 25. Find the coordinates of the point on the y axis having the same distance from $(-8, 7)$ as from $(-4, 1)$.
- _____ 26. If θ is an angle in a triangle and $\cos \theta = \frac{5}{13}$, find $\csc \theta$.

27. In $\triangle ABC$, $BC = 6$, $CA = 7$, and $AB = 8$. Find $\frac{\sin C}{\sin A}$.

28. In $\triangle ABC$, $AB = 3$, $AC = 4$, and $\angle A = 60^\circ$. Find BC .

29. In a circle, chord PQ is bisected by chord RS at T . If $RT = 3$ and $ST = 6$, find PQ .

30. A line through a point A outside a circle is tangent to the circle at D . Another line through A intersects the circle at points B (closer to A) and C . If $BC/AB = 2$ and $AD = 6$, find AC .

31. Triangle ABC is inscribed in a circle. If $\widehat{AC} = 146^\circ$ and $\widehat{BC} = 104^\circ$, find $\angle BCA$.

32. Square $ABCD$ is inscribed in a circle, and a point P is chosen on \widehat{AB} . Find $\angle APB$.

33. A triangle having sides $\sqrt{31}$, $\sqrt{33}$, and 8 units, is inscribed in a circle. Find the circumference of the circle.

34. In a circle, chords AB and CD intersect at E . If $\widehat{AC} = 120^\circ$ and $\widehat{BD} = 20^\circ$, find $\angle AEC$.

35. Two concentric circles have radii 5 and 13 units. Find the length of a chord of the larger circle which is tangent to the smaller circle.

36. Find n if $\frac{(n!)^2}{(n+1)!(n-1)!} = \frac{4}{5}$.

37. In an experiment having 20 sample points, event A has 13 sample points. At least how many sample points should event B have to guarantee that A and B are not mutually exclusive?

38. In how many ways can 4 different books be arranged in a shelf?

39. How many four-digit positive integers can be formed using the digits 2, 3, 4, 5 and 6 if no digit can be repeated?

(For Problems 40 and 41) A photographer needs to arrange 7 students for a club picture. A requirement is that the 3 officers of the club must always be together.

40. How many arrangements are possible?

41. How many arrangements are possible if Job and Tim (neither is an officer) should be placed at the opposite ends of the row?

(For Problems 42 and 43) A committee of 6 members is to be formed from 7 Barangay A residents and 9 Barangay B residents.

42. How many committees can be formed?

43. How many committees can be formed if there should be 3 members chosen from each barangay?

44. Two fair dice are rolled. What is the probability that a die shows 2 while the other shows an odd prime number?

(For Problems 45 and 46) The numbers 1, 2, ..., 24 are each written on a slip of paper which are then placed in a box.

45. If two slips are picked at the same time from the box, find the probability that one number is even and the other is odd.

46. If a slip of paper is picked from the box, find the probability that it is even or a multiple of 3.

47. In a class of Grade 10 students, the probability that a randomly chosen student likes dogs is 0.72, that a student likes cats is 0.54, and that a student likes dogs or cats is 0.89. Find the probability that a student likes both dogs and cats.

(For Problems 48 and 49) Among the 50 employees of a company, 30 are women. Half of the men wear glasses while only a third of the women wear glasses.

48. What is the probability that a randomly selected employee is a man or wears glasses?

49. What is the probability that an employee is a woman, if it is known that this employee does not wear glasses?

50. A rectangle has sides 4 and 6 units. On each of its four sides, squares are drawn externally. Their centers form another quadrilateral. What is the area (in sq. units) of this quadrilateral?

MMC

METROBANK-MTAP-DEPED MATH CHALLENGE

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1. 225

2. 16

3. 77

4. 56

5. {3, 6}

6. 39

7. 525

8. $-1/2$

9. 3.

10. $27/5$

11. $8/9$

12. 34

13. $4x^3 - 7x^2 + 2x + 27$

14. 6

15. -5

16. 7

17. $1/2$

18. 60

19. $x^3 - 2x^2 - 2x + 4$

20. 24

21. (14, 5)

22. $\sqrt{34}$

23. (-4, 7)

24. $(x - 1)^2 + (y - 6)^2 = 25$

25. (0, 8)

26. $13/12$

27. $4/3$

28. $\sqrt{13}$

29. $6\sqrt{2}$

30. $6\sqrt{3}$

31. 55°

32. 135°

33. 8π

34. 70°

35. 24

36. 4

37. 8

38. 24

39. 120

40. 720

41. 72

42. 8008

43. 2940

44. $1/9$

45. $12/23$

46. $2/3$

47. 0.37

48. $3/5$

49. $2/3$

50. 50