



2018 Metrobank-MTAP-DepEd Math Challenge  
Division Finals • Grade 10

**15-Second Questions** [2 points each]

1. Find the 4th term of the arithmetic sequence with first two terms 1 and 4. [ 10 ]
2. List down the roots of the quadratic equation  $x^2 + x - 12 = 0$ . [ -4, 3 ]
3. In how many ways can 4 children be arranged in a row for a photograph? [ 24 ]
4. Simplify:  $10!/7!$ . [ 720 ]
5. Two chords of a circle intersect at a point, which divides one chord into segments 3 cm and 4 cm long, and the other chord into segments 2 cm and  $x$  cm long. Find  $x$ . [ 6 ]
6. How far is the point  $(0, 2)$  from the point  $(3, 0)$ ? [  $\sqrt{13}$  ]
7. Find the probability that a number chosen from the integers from 1 to 15 is divisible by 4. [  $1/5$  ]
8. In acute  $\triangle ABC$ ,  $\sin A = 3/7$ . Find  $\cos A$ . [  $2\sqrt{10}/7$  ]
9. Find the remainder when  $x^2 + x + 1$  is divided by  $x - 1$ . [ 3 ]
10. If 3,  $x$ ,  $y$ , 24 are the terms of a geometric sequence, find  $y$ . [ 12 ]
11. What value of the constant  $k$  will make  $x^2 - 9x + k$  a perfect trinomial square? [  $81/4$  or 20.25 ]

**30-Second Questions** [3 points each]

1. Find the sum of the infinite geometric series  $\frac{7}{2} + \frac{7}{3} + \frac{14}{9} + \dots$ . [  $21/2$  or 10.5 ]
2. Find the remainder when  $2x^3 + 6x^2 + 5x + 2$  is divided by  $x + 4$ . [ -50 ]
3. In how many ways can one choose a set of 3 chemistry books and 2 physics books from 7 different chemistry books and 5 different physics books? [ 350 ]
4. Find the radius of the circle with equation  $x^2 + y^2 + 14x - 16y = 87$ . [  $10\sqrt{2}$  ]
5. In a circle, chords  $AB$  and  $CD$  intersect at  $E$ . If  $\widehat{AD} = 55^\circ$  and  $\angle AED = 40^\circ$ , find  $\widehat{BC}$ . [  $25^\circ$  ]
6. How many terms of the arithmetic sequence 2, 4.5, 7, 9.5, ... must be added in order for their sum to be 374? [ 17 ]

**1-Minute Questions** [5 points each]

1. A diameter of a circle has endpoints  $(6, 3)$  and  $(12, -7)$ . Find the equation (in center-radius form) of the circle having the same center but twice the radius as this circle. [  $(x - 9)^2 + (y + 2)^2 = 136$  ]
2. List down the roots of the equation  $x^4 - 2x^3 - 7x^2 + 8x + 12 = 0$ . [ -1,  $\pm 2, 3$  ]
3. Three numbers form an arithmetic sequence with common difference 3. If the first is decreased by 2, the second is doubled, and the third is multiplied by 5, the new numbers form a geometric sequence with distinct terms. Give the three original numbers (in order). [ 12, 15, 18 ]
4. Quadrilateral  $ABCD$  is inscribed in a circle. Find the length of its shorter diagonal if  $AB = 12$ ,  $CD = 18$ ,  $\widehat{BC} = 120^\circ$ , and  $\widehat{AD} = 60^\circ$ . [  $9 + 6\sqrt{3}$  ]
5. Four distinct fair dice are rolled. What is the probability that the sum of the resulting numbers is at least 23? [  $5/1296$  ]
6. Find the value of the constant  $b$  if  $2x^3 + (b + 1)x^2 - 9bx + 8$  is divisible by  $x^2 + bx - 8$ . [ 2 ]

**Clincher Questions**

- C.1. The sum of the first  $n$  terms of some sequence is given by  $n^2 + 1$ , for any positive integer  $n$ . Find the 4th term. [ 7 ]
- C.2. Points  $A$ ,  $B$  and  $C$  are on a circle. If  $\angle ABC = (4x - 10)^\circ$  and  $\widehat{AC} = (6x + 10)^\circ$ , find  $x$ . [ 15 ]
- C.3. Suppose that  $P$  is a 4th degree polynomial such that  $P(1) = P(2) = P(3) = P(4) = 0$  and  $P(5) = 120$ . Find  $P(6)$ . [ 600 ]

**Do-or-Die Question**

- DoD. The expression  $9 \cdot 2018^2 + 20180 + 4040$  is the square of what positive integer? [ 6056 ]

**10.1.** A diameter of a circle has endpoints  $(6, 3)$  and  $(12, -7)$ . Find the equation (in center-radius form) of the circle having the same center but twice the radius as this circle.

**10.2.** List down the roots of the equation  $x^4 - 2x^3 - 7x^2 + 8x + 12 = 0$ .

**10.3.** Three numbers form an arithmetic sequence with common difference 3. If the first is decreased by 2, the second is doubled, and the third is multiplied by 5, the new numbers form a geometric sequence with distinct terms. Give the three original numbers (in order).

**10.4.** Quadrilateral  $ABCD$  is inscribed in a circle. Find the length of its shorter diagonal if  $AB = 12$ ,  $CD = 18$ ,  $\widehat{BC} = 120^\circ$ , and  $\widehat{AD} = 60^\circ$ .

**10.5.** Four distinct fair dice are rolled. What is the probability that the sum of the resulting numbers is at least 23?

**10.6.** Find the value of the constant  $b$  if  $2x^3 + (b + 1)x^2 - 9bx + 8$  is divisible by  $x^2 + bx - 8$ .

**10.C.3.** Suppose that  $P$  is a 4th degree polynomial such that  $P(1) = P(2) = P(3) = P(4) = 0$  and  $P(5) = 120$ . Find  $P(6)$ .

**10.DoD.** The expression  $9 \cdot 2018^2 + 20180 + 4040$  is the square of what positive integer?