



Babhtha 1

Round 1

- Q1.1 In how many ways can the letters of the word **COURAGE** be arranged, if the vowels are always to occupy the odd positions.
Answer in non-factorial form.
- Q1.2 The inscribed circle of a triangle ABC touches [BC], [CA] and [AB] at X , Y and Z respectively.
 $|BC| = a$ cm, $|CA| = b$ cm , and $|AB| = c$ cm,
 $|AY| = x$ cm, $|BZ| = y$ cm and $|CX| = z$ cm.
Write x in terms of a , b and c.



Babhta 2

Round 2

- Q2.1 Find the equations of the lines which pass through the point $(-2, 1)$ and make an angle of 45° with the line $3x + y + 5 = 0$.
Answers in form $ax + by + c = 0$, where a, b and $c \in \mathbb{Z}$
- Q2.2 x and y are integers such that $x^2 + y^2 = 29$.
Calculate the maximum value of $|x - y|$



Babhtha 3

Round 3

Q3.1 Find the coordinates of the image of the point $(6, 0)$ after a 30° rotation anticlockwise about the origin.

Answer as a coordinate in simplest surd form.

Q3.2 f is a function and $f(x) = \frac{6x + 1}{3x - 2}$

Find the inverse function, $f^{-1}(x)$ in terms of x .

Answer in simplest form.



Babhata 4

Round 4

Q4.1 A man borrowed €20000 at 5% compound interest. The principal and interest are to be repaid in 20 equal annual instalments, with the first repayment one year after he takes out the loan. Calculate the amount of each instalment.

Answer to nearest euro.

Q4.2 If $z = \cos(q) + i\sin(q)$, write

$$\frac{1 - \frac{1}{z^2}}{1 + \frac{1}{z^2}}$$

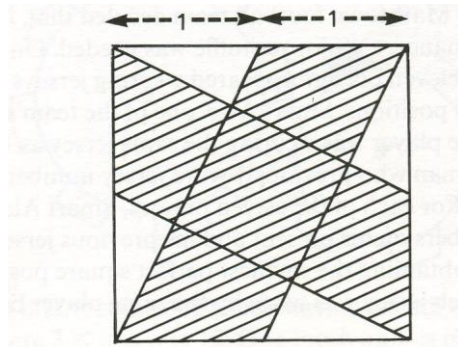
in simplest trig. form



Babhta 5

Round 5

Q5.1



In the diagram the square has a side 2 cm long, Line segments are drawn joining its vertices to the midpoints of the sides as shown in the diagram to form a cross. Find the area of the shaded cross.

Answer in form $\frac{a}{b}$, where a and $b \in \mathbb{N}$.

Q5.2

Jane and Sarah each throw a dice.

What is the probability that Jane's throw is higher than Sarah's?

Answer in simplest form $\frac{a}{b}$, where a and $b \in \mathbb{N}$.



Babhta 6

Round 6

Q6.1 When a two-digit number is added to another two-digit number which has the same digits in reverse, the sum is a perfect square.
Find the sum of all such two-digit numbers less than 50.

Q6.2 Let $f(x) = \log_b(x)$ and let $g(x) = x^2 - 4x + 4$.
Given that $f(g(x)) = g(f(x)) = 0$ has exactly one solution and $b > 1$, find the value of b .

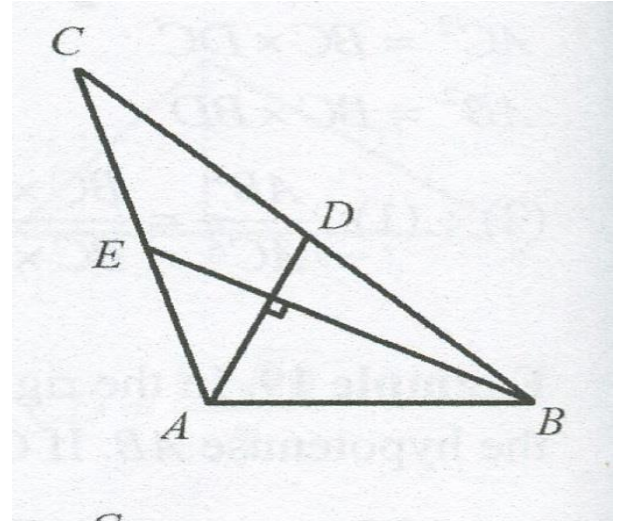
Answer in form \sqrt{a} , where $a \in \mathbb{N}$.



Babhta 7

Round 7

Q7.1 In the triangle ABC ,
 $|BC| = 30$, $|AC| = 20$. [AD]
 and [BE] are two medians
 as shown in diagram and
 [AD] is perpendicular to
 [BE].
 Find the length of [AB].
 Answer in form $a\sqrt{b}$,
 where a and b $\hat{=}$ N.



Q7.2 The numbers 49, 29, 9 , 40 , 22 , 15 , 53 , 33, 13 , 47 are
 grouped in pairs so that the sum of each pair is the same.
 Which number is paired with 15?

Q7.3 Five lamps A , B , C , D , E, are arranged in a row, each
 with its own switch. Initially, all five lamps are off. Jill starts
 pressing switches in the following order :
 A, B, C, D, E, A, B, C, D, E, A,until she has pressed
 2017 switches, counting repetitions. Assuming that each
 press turns a lamp off if it is on, or on if it is off , which
 lamps are finally on?

Q7.4 Calculate the value of the constant a if the coefficient of
 x^3 in the expansion $(a + 2x)^4$ is 160.



Babhta 8

Round 8

- Q8.1 The points A(-3 , - 9) and B(9 , -4) are the endpoints of a diameter of a circle.
This circle touches the x-axis at T.
Find the ratio of the length of [TA] to the length of [TB].

Answer in simplest form $a : b$, where a and $b \mid N$.

- Q8.2 What is the product of the positive integers m and n such that $m > n$ and

$$\frac{1}{m} + \frac{1}{n} + \frac{1}{mn} = 1?$$

- Q8.3 An express train, travelling at uniform speed, leaves station A at 3 pm and reaches station B at 6 pm. A slower train, travelling at uniform speed, leaves station B at 1.30 pm and arrives at station A at 6pm.
At what time do they meet?

- Q8.4 Solve for x and y :
- $$x^3 + y^3 = 91$$
- $$x^2y + xy^2 = 84$$

Answer in coordinate form (x , y) .

TEAM Maths : Answer key final17

Round 1	Q1.1	144	Q1.2	$x = \frac{1}{2}(b + c - a)$
Round 2	Q2.1	$x + 2y = 0$ and $2x - y + 5 = 0$	Q2.2	7
Round 3	Q3.1	$(3\sqrt{3}, 3)$	Q3.2	$\frac{2x + 1}{3x - 6}$
Round 4	Q4.1	€1605	Q4.2	$i \tan(q)$
Round 5	Q5.1	$\frac{16}{5} \text{ cm}^2$	Q5.2	$\frac{5}{12}$
Round 6	Q6.1	114	Q6.2	$\sqrt{3}$
Round 7	Q7.1	$2\sqrt{65}$	Q7.2	47
	Q7.3	C, D and E	Q7.4	5
Round 8	Q8.1	3 : 2	Q8.2	$mn = 6$
	Q8.3	4 : 12 PM	Q8.4	$(3, 4)$ and $(4, 3)$