
BABHTA 1 ROUND 1

Q1.1) $z = a + ib$, where a and b $\in \mathbb{R}$ and $i = \sqrt{-1}$.
If $f(z) = z^2$, calculate f(3 + 4i)

Answer in form a + ib, where a and b $\in$ Z

Q1.2) ABCD is a square of side a and [BC] is produced to E so that $|CE| = \frac{1}{2}|BC|$.
Calculate $|AE|^2 - |DE|^2$ in terms of a.

BABHTA 2 ROUND 2

Q2.1) In how many ways can three of the letters A, B , C, a , b , c, d be arranged in a row, using one capital and two small letters, so that the capital letter is always first, if each letter is used only once?

Q2.2) The positive integers are arranged in a triangular grid as shown.

1						
2	3	4				
5	6	7	8	9		
10	11	12	13	14	15	16
.	.	.	.	.	.	.
.	.	.	.	.	.	. and so on

What is the fourth number in the 60^{th} row?

BABHTA 3 ROUND 3

Q3.1) Find the equation of the line through (1,4) which is parallel to the line $2x - y - 3 = 0$.
Answer in the form $ax + by + c = 0$,
where a , b and $c \in Z$.

Q3.2) If $x^2 + y^2 = 10$ and $xy = 3$ find all possible values of $x + y$.

BABHTA 4 ROUND 4

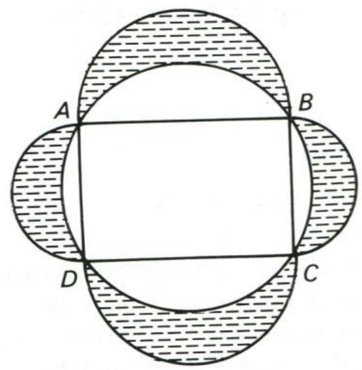
Q4.1) $x^4 - 48x + 28 = (x^2 + ax + 2)(x^2 + 4x + b)$.
Find the values of a and b, where a and b $\in$ R.

Q4.2) A triangle ABC has vertices A(18 , - 4), B(13 , 6), and C(x, 12).
The area of the Δ ABC is 50 square units.
Find all possible points C in form (x , y).

BABHTA 5 ROUND 5

Q5.1) A club identifies each of its members with a unique three-digit number, the sum of whose digits is 24. How many such numbers exist?

Q5.2)



ABCD is a rectangle such that |AB| = 8 cm and |BC| = 6 cm. Semicircles are drawn on the four sides of the rectangle ABCD, each semicircle lying outside the rectangle. The circle passing through A, B , C and D determines four crescent shaped regions, one inside each semicircle as shown in the diagram.

Find the total area of the four crescent shaped regions in simplest form.

BABHTA 6 ROUND 6

Q6.1) Solve for a and b :

$$\log(8x^3 + 4x^2 - 2x - 1) = \log(2x-1) + 2\log(ax+b).$$

Q6.2) A dice rests on a table. Sam can see three faces and a total of 9 spots. Pat, who is on the opposite side of the table, can see three faces and 15 spots.
How many spots are on the top face of the dice?

BABHTA 7 ROUND 7

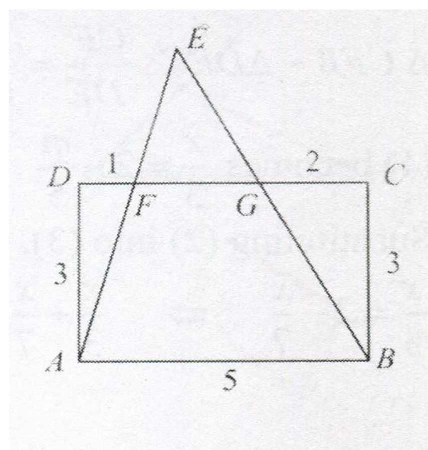
Q7.1) f and g are functions such that $f(x) = ax + 5$ and $g(x) = cx - 3$, where a and c $\in$ N.
If $f(g(x)) = g(f(x))$ calculate the values of a and c.

Q7. 2) Given two different two-digit positive integers whose product is 2016.

Find the greatest possible sum of the four digits.

Q7.3) In the expansion $(x + 3y + \frac{z}{4})^3$ find the coefficient of yz^2.
Answer in form $\frac{a}{b}$, where a and b $\in$ N.

Q7. 4) In the rectangle ABCD. |AB| = 5 and |BC| = 3.
Points F and G are on [CD] so that |DF| = 1 and |GC| = 2.
AF and BG intersect at E.
Calculate the area of the triangle AEB.



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

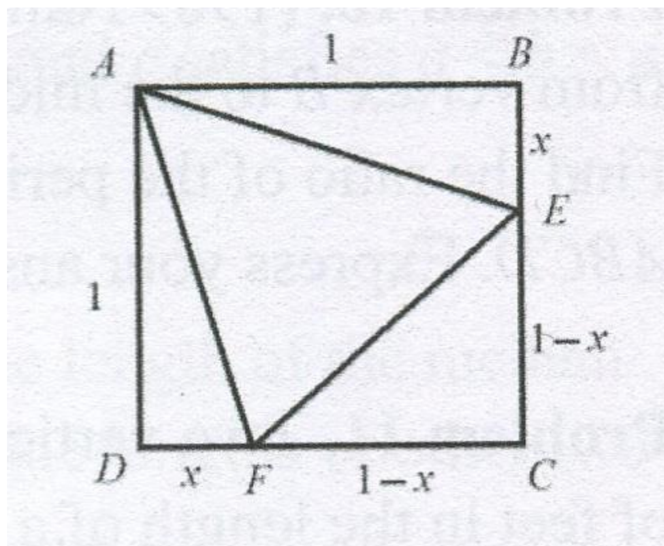
BABHTA 8 ROUND 8

Q8.1) If $0^\circ \le x \le 180^\circ$ and $0^\circ \le y \le 180^\circ$ find the pairs of angles, in the form (x,y),which satisfy the equations :

$$\text{Sin}(x + y) = +\frac{1}{\sqrt{2}}$$

$$\text{Cos}(2x) = -\frac{1}{2}$$

Q8.2) In the diagram an equilateral triangle is inscribed in a square of side 1 unit. From the diagram use the value of x to find the area of the triangle in form $a\sqrt{b} - c$, where a , b and c $\in$ N.



Q8.3) The coordinates of the vertices of a cyclic quadrilateral are A(2 , 5) , B(- 4 , 0) and D(7 , 0).
If the angles at B and D are right angles calculate the coordinates of vertex C.

Q8.4) Solve for x : $\sqrt{x+7} + \sqrt{x+2} = \sqrt{6x+13}$.

TIEBREAK

T1) The price of coat was reduced by 40% and the new price was then reduced by a further 40% during a sale.
By what percentage was the original price reduced?

T2) The sides of a triangle ABC are 10, 24 and 26 cm long.
A rectangle, with width 3cm, has an area equal to that of the triangle.
Find the perimeter of the rectangle, in cms.

T3) If $0^o \leq x \leq 360^0$ find the values of x for which
$3\text{Sin}^2(x) - \text{Sin}(x)\text{Cos}(x) - 4\text{Cos}^2(x) = 0$.
Answers to nearest degree.

T 4) Find the common ratio of the geometric sequence where the first term exceeds the third by 60 and the sum of the first two terms is 48.

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

T5) Find the points of intersection of the circles:

$x^2 + y^2 + 4x - 2y - 5 = 0$ and $x^2 + y^2 + 2x - 7 = 0$

Answers in coordinate form (x , y).

T6) A train travelling at 60 km/h takes 15 seconds to pass a certain point.
How long is the train?

T7) A complex number in the form a + ib , when multiplied by its conjugate a – ib yields 13, where a and b $\in$ R.
Find the numerical value of $a^4 + 2a^2b^2 + b^4$.

T8) Write in simplest form:

$$((x + 1)^2(x - 1)^2)((x^2 + 1)^2)$$

T9) The members of a Team Maths 2017 team are chosen at random from a class of twelve boys and fifteen girls.
Find the probability that the team consists of two boys and two girls.
Answer in simplest form $\frac{a}{b}$, where a and b $\in$ **N.**

T10) Simplify $\dfrac{\dfrac{x}{1+x}+\dfrac{1-x}{x}}{\dfrac{x}{1+x}-\dfrac{1-x}{x}}$

Answer in simplest form as a fraction in terms of x.

T11) Find the perimeter of a right-angled triangle whose hypotenuse is 2 units and whose area is 1 square unit.

Answer in form $a + b\sqrt{c}$, where a , b and c $\in$ N.

T12) (m , 3) and (1 , m) are two points on the line l. The slope of l is m. Given that m > 0 , find the value of m in surd form.

T13) The point with coordinates (pCos(A) , pSin(A)) lies on the circle $x^2 + y^2 = 16$.
Find the value of p, where p > 0.

Cumann Oidí Matamaitice na hÉireann : Irish Mathematics Teachers Association

FOIREANN MATA 2017 , Babhta Réigiúnach TEAM MATHS 2017 , Regional Round

---

Answer key , Round 1 2017

Round 1	Q1.1)	$-7 + 24i$	Q1.2)	$2a^2$
Round 2	Q2.1)	36	Q2.2)	3485
Round 3	Q3.1)	$2x - y + 2 = 0$	Q3.2)	± 4
Round 4	Q4.1)	$a = -4$, $b = 14$	Q4.2)	(20, 12) and (0,12)
Round 5	Q5.1)	10	Q5.2)	48 cm^2
Round 6	Q6.1)	$a=2$, $b=1$	Q6.2)	5
Round 7	Q7.1)	$a = 1$, $c = 1$	Q7.2)	20
	Q7.3)	$\frac{9}{16}$	Q7.4)	$\frac{25}{2}$
Round 8	Q8.1)	$(60^0, 75^0)$ and $(120^0, 15^0)$	Q8.2)	$2\sqrt{3} - 3$
	Q8.3)	(1, -6)	Q8.4)	2

Tiebreak

T1) 64% T2) 86 T3) $53^0, 233^0, 135^0, 315^0$

T4) $-\frac{1}{4}$ T5) (-3,-2) and (1,2) T6) 250m

T7) 169 T8) $(x^4 - 1)^2$ **or** $x^8 - 2x^4 + 1$

T9) $\frac{77}{195}$ T10) $\frac{1}{2x^2 - 1}$

T11) $2 + 2\sqrt{2}$ T12) $\sqrt{3}$ T13) 4