BABHTA 1 - ROUND 1

1) Express $\frac{-5}{i-\sqrt{3}}$ in the form $r(\cos\theta + i\sin\theta)$

2) Find the coordinates of the point P which divides the line segment joining

A(-9, 14) and B(5·4, -5·2) internally
in the ratio 5 : 1

BABHTA 2 - ROUND 2

1) If α and β are roots of the equation $2x^2 + 5x + 1 = 0$ form an equation whose roots are $\frac{\alpha}{\beta}$ and $\frac{\beta}{\alpha}$.

Put answer in the form $ax^2 + bx + c = 0$,
where **a**, **b**, **c** $\in$ Z

2) If a committee of 5 is to be chosen from 9 people at random, what is the probability that a particular person will be on the committee?
Leave your answer in the form $\frac{a}{b}$,
where a and b $\in$ Z

BABHTA 3 - ROUND 3

1) The point (3, a) is a solution of the equations

$$x + 4y + 5 = 0$$
$$bx^2 + 9xy + 25 = 4y^2$$

Find the value of a and the value of b, where **a** and **b** $\in Z$

2) The points A(1,1), B(0,0) and C(2,-1) form a triangle.

Find the measure of the angle $\angle ABC$ to the nearest degree.

BABHTA 4 - ROUND 4

1) In how many ways can a careless secretary place four letters in four envelopes so that nobody gets the right letter?

2) Solve the equation $\tan(x) + \tan(2x) = 0$, where $0 \leq x \leq 2\pi$.
Answers in terms of π.

BABHTA 5 - ROUND 5

1) Find the coordinates of the foot of the perpendicular from the point (2, -6) to the line $3y - x + 2 = 0$

2) The probability that John will beat Joe in a game of chess is $\frac{2}{3}$. In a series of 6 games, what is the probability that John will win 4 or more games?
Answer in form $\frac{a}{b}$ where **a** and **b** $\in$ Z

BABHTA 6 - ROUND 6

1) Find $\int \frac{\cos^5(x)}{\text{Sin}^2(x)}\,dx$

2) Find the equations of the tangents from (-1, 5) to the circle $x^2 + y^2 - 4x + 2y - 31 = 0$

Answers in the form ax+by+c=0, where **a**, **b** and **c** $\in Z$

BABHTA 7 - ROUND 7

1) In a private sweep, 100 tickets are sold. A man buys one ticket. A prize is awarded on each draw of a ticket. Assuming replacement of a ticket after each draw, find the least number of prizes which must be awarded so that the probability of the man winning at least one prize is at least $\frac{1}{4}$.

2) Find the numerical value of the greatest term of the expansion $(1+2x)^9$ when x = $\frac{1}{3}$. Leave your answer as a fraction.

3) Find , in radians, correct to 3 significant figures, the acute angle between the lines

$3x + 2y = 5$ and $2x - y = 6$.

4) Find the value of $\dfrac{Cos(\frac{\pi}{8}) + iSin(\frac{\pi}{8})}{Cos(\frac{3\pi}{8}) - iSin(\frac{3\pi}{8})}$

BABHTA 8 - ROUND 8

1) Differentiate Cos (x) , when x is in degrees.

2) Find the value of $\text{Sin}^2(x) + \text{Sin}^2(60^0 - x) + \text{Sin}^2(60^0 + x)$ in the form $\frac{a}{b}$, where **a** and **b** $\in$ Z.

3) Julie devises a game in which a player can choose to pay at random from a 1 cent coin, a 5 cent coin, a 20 cent coin and a 50 cent coin. How much should she have charged and still hope to break as even as possible?

4) If two litres of a 20% acid solution are mixed with 8 litres of a 50% acid solution, what is the percentage concentration of the resulting solution?

SCOILT – TIEBREAK

1) Find the value of x if $x - 2(1 - 3x) = 6 + 3(4 - x)$

2) Find the slope of the line passing through A(-3,2) and B(4,-1).
Answer as a fraction.

3) How many pairs of parallel faces on a regular cube?

4) What is the maximum number of points of intersection of four distinct straight lines?

5) Find the values of x if $x^2 = 2x + 1$. Answer in surd form.

6) Find the range of values of x for which $x^2 \geq 4x + 5$, $x \in R$

7) Solve the following equations for x and y:

$$2y^2 - 3x = 0$$
$$4y - x = 6$$

Write your answer in coordinate form.

8) Find the value of $Cos(15^0)$ in simplest surd form.

9) Find the length of the tangent from A(8, -3) to the circle $x^2 + y^2 - 2x + 8y - 23 = 0$.
Answer in surd form.

10) Using only 5c , 10c and 20c coins, in how many ways can you make up 35 cents?

11) One bag contains 4 white and 4 black balls, a second bag contains 3 white and 6 black balls, and a third contains 1 white and 5 black balls.
If one ball is drawn from each bag find the probability that all are white.

12) Using the letters of the word EQUATIONS how many 5 letter "words" contain all the consonants?

13) Find the value of $\left(\sqrt{3} - i\right)^{10}$ in the form x + iy.

14) Find the number of digits that are required to number the pages of a book from page 1 to page 250.

Answer Key

Round 1	**Q1**	$\frac{5}{2}(\text{Cos}(\frac{\pi}{6})+\text{iSin}(\frac{\pi}{6}))$ **or 2.5(Cos (30) +iSin(30))**
	Q2	**P(3, -2)**
Round 2	**Q1**	$2x^2-21x+2=0$
	Q2	$\frac{5}{9}$
Round 3	**Q1**	**a = -2 , b = 5**
	Q2	72^0
Round 4	**Q1**	**9**
	Q2	$0,\pi,2\pi,\frac{\pi}{3},\frac{2\pi}{3},\frac{4\pi}{3},\frac{5\pi}{3}$
Round 5	**Q1**	$(\frac{1}{5},-\frac{3}{5})$ **or (0·2, - 0·6)**
	Q2	$\frac{496}{729}$
Round 6	**Q1**	$-\frac{1}{\text{Sin}(x)}-2\text{Sin}(x)+\frac{\text{Sin}^3(x)}{3}+C$
	Q2	**y-5=0 and 4x - 3y + 19 = 0**

Round 7	**Q1**	**29**
	Q2	$\frac{224}{9}$
	Q3	**1.05 radians**
	Q4	***i***
Round 8	**Q1**	$-\frac{\pi}{180}\text{Sin}(\frac{\pi x}{180})$ **or equivalent**
	Q2	$\frac{3}{2}$
	Q3	**19 cent**
	Q4	**44%**

Tiebreak answers:

1)	$x = 2$
2)	$-\frac{3}{7}$
3)	3
4)	6
5)	$1 \pm \sqrt{2}$
6)	$x \leq -1$ or $x \geq 5$
7)	(6,3)
8)	$\frac{\sqrt{6}+\sqrt{2}}{4}$ OR $\frac{\sqrt{3}+1}{2\sqrt{2}}$
9)	$\sqrt{10}$
10)	6
11)	$\frac{1}{36}$
12)	600
13)	$512 + 512\sqrt{3}i$
14)	642