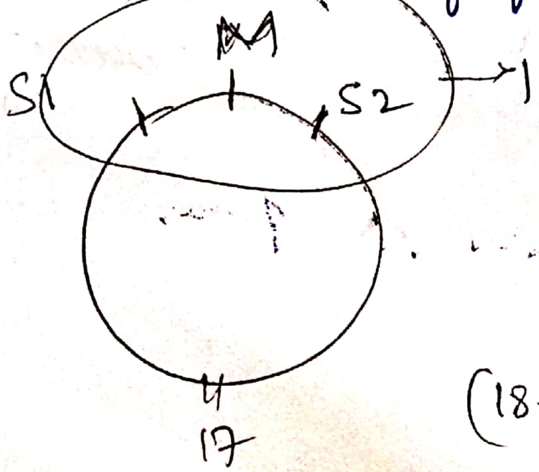
Problem 2 TCS.

2) There are 20 persons among whom two are sisters. Find the number of ways in which we can arrange them around around a circle so that there is exactly one person between the two sisters? please note that exact position on the circle does not matter (no seat numbers are marked on the circle) and only the relative ~~positions~~ of people matter



17

$(18-1)! \times 2! \times 18.$

$17! \times 2! \times 18$

$18! \times 2.$

1). 4, 9, 13.

$(4-2)\times 2 = 4.$

9

$(9-2)\times 2 = 14$

$(7-2)\times 2 = 10$

$(5-2)\times 2 = 6.$

$(3-2)\times 2 = 2$

32

13.

$(13-2)\times 2 = 22$

$(11-2)\times 2 = 18$

$(9-2)\times 2 = 14$

$(7-2)\times 2 = 10$

$(5-2)\times 2 = 6$

$(3-2)\times 2 = 2$

$4+32+72$

$= 108$

You have given a physical ~~weights~~ balance and 7 weights of 47, 46, 43, 48, 49, 42 and 77 kgs. Keeping weights you can weight less than 178 kg

less than 178 maximum sum is 174

$$\begin{array}{r} 77 \\ 49 \\ \hline 126 \\ 48 \\ \hline 174 \end{array}$$

In a village, every weeken Y. of men

6) In a Certain City 60% of the registered voters are Party B supporters. In an assembly election if registered party A supporters and 20% of the registered party B supporters are expected to vote for candidate A what percent of the

Registered 60% ⇒ Party A ⇒ 75% of A

Registered 40% ⇒ party B ⇒ 20% of B

Candidate A = 75% of A + 20% of B.

Total voter = x

party = $\frac{60x}{100}$

party B = $\frac{40x}{100}$

Candidate A = $\frac{60x}{100} \times \frac{75}{100} + \frac{40x}{100} \times \frac{20}{100}$

$= \frac{45x}{100} + \frac{8x}{100} = \frac{53x}{100}$

% vote = 53%

(7) When 100 is successively divided by 6, 3, 4, first divide by 6. Then divide the

A number when successively divided by 5, 3, 2 gives remainder 0, 2, 1 respectively. Then what will be the remainders when the same number is divided successively by 2, 3 and 5

5	x	$\rightarrow 0$
3	(11) y	$\rightarrow 2$
2	(3) z	$\rightarrow 1$
	1	

$z = 2\times1+1 = 3$

$y = 3\times3+2 = 11$

$x = 11\times5+0 = 55$

2	55	$\rightarrow 1$
3	27	$\rightarrow 0$
5	9	$\rightarrow 4$
	1	

$27\times2+1$

(8) How many 6 digit even numbers can be formed from digits 1, 2, 3, 4, 5, 6 and 7 so that digits should repeat and second last digit is even

1, 2, 3, 4, 5, 6, 7

Ans 720

2 3 4 5 2 ways 3 ways

36×20

720

$\underset{6}{\underline{2\times3}}\times\underset{20}{\underline{4\times5}}\times\underset{6}{\underline{2\times3}}$

9) Out of group of Swans, 7/2 times the square root of total number are playing on the shore of a tank the 2 remaining ones are ~~[illegible]~~ playing with amorous fight in the water. What is the total number of Swans

Let total $= x$

at shore $= \frac{7}{2}\sqrt{x}$

Remaining $= x - \frac{7}{2}\sqrt{x}$

$x - \frac{7}{2}\sqrt{x} = 2$

$\frac{2x - 7\sqrt{x}}{2} = 2$

let $\sqrt{x} = y$

$\sqrt{x} = y$

$x = y^2$

$2x - 7\sqrt{x} = 4$

$2y^2 - 7y = 4$

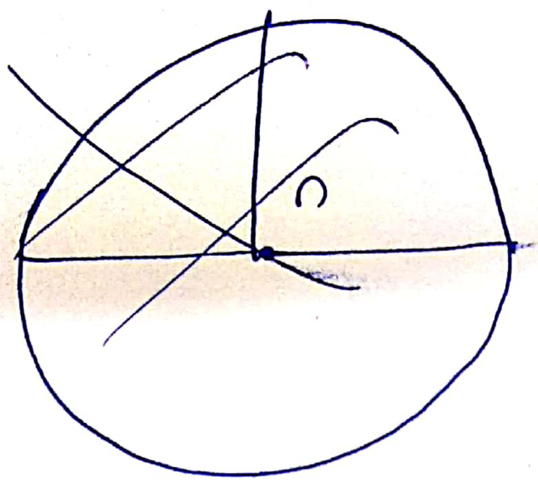
$2y^2 - 7y - 4 = 0$

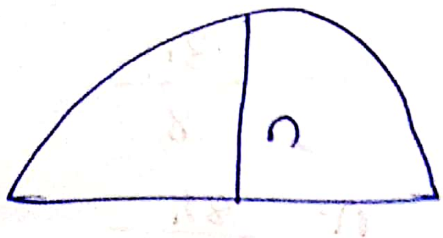
$2y^2 - 8y + y - 4 = 0$

$2y(y-4) +$

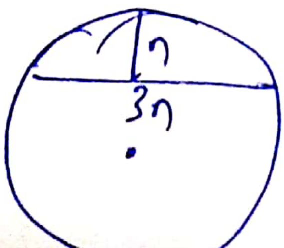
Find the length of the longest pole that can be placed in an indoor stadium 24m long. 18m wide and 16m height

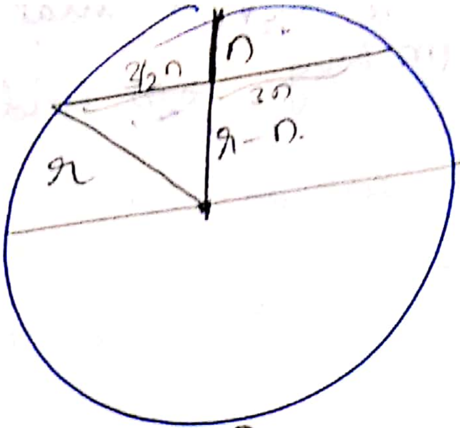
A chord of a circle has length 3n, where n is positive integer. The segment cut off by the chord has height n, as shown. What is the smallest value of n for which the radius of circle is also a positive integer?





3n





$$r^2 = \frac{3^2}{2}n + (r-n)^2$$

$$\cancel{r^2} = \frac{9}{4}n^2 + \cancel{r^2} + n^2 - 2rn$$

$$\frac{9n^2 + 4n^2}{4} - 2rn = 0$$

$$13n^2 - 8rn = 0$$

$$n(13n - 8r) = 0$$

$$13n = 8r$$

$$n = \frac{8r}{13}$$

$$r = \frac{13n}{8}$$

$$n = \frac{8r}{13} \qquad \frac{8(\cancel{13})}{\cancel{13}}$$

$$n = 8$$

How many pairs (m, n) of integers satisfy the equation
please do not add white

4^m = n^2 + 15?

$$4^m = n^2 + 15$$

$$2^{2m} = n^2 + 15$$

$$2^{2m} - n^2 = 15$$

$$(2^m)^2 - n^2 = 15$$

$$(2^m + n)(2^m - n) = 15$$

1 × 15

15 × 1

3 × 5

5 × 3

4 pairs

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A function f satisfies $f(0)=0$, $f(2n)=f(n)$, and $f(2n+1)=f(n)+1$ for all positive integers. What is the value of $f(2018)$

$\frac{1009 \times 2}{2018}$

$f(2018)$

$f(2\times1009) = f(1009)$

$= f(2\times504+1)$

$f(504)+1$

$= f(2\times252)+1$

$= f(252)+1$

$= f(126)+1$

$f(63)+1$

$f(31)+1+1$

$f(31)+2$

$f(2\times15+1)+2$

$f(15)+3$

$f(2\times7+1)+3$

$f(7)+4$

$f(2\times3+1)+4$

$f(3)+5$

$f(2\times1+1)+5$

$f(1)+6$

$f(2\times0+1)+6$

$f(0)+7$

$= 0+7$

$\boxed{=7}$

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