ELITMUS PREVIOUS QUESTION PAPER WITH SOLUTION

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eLitmus Question Paper

1. If a number x is in octal form and having zero as unit place then if we change that number x in decimal form then what is the probability that number x having zero as unit place?

a) 1/40

b) 3/560

c) 11/64

d) 1/8

e) data insufficient

Explanation:

Ans: 11/40

2. log x = 1; log y = 2 then then value of log y /log x

a) 1/4

b) 2/50

c) 1/6

d) 1

e) data insufficient

Ans: 1

3. Einstein walks on an escalator at a rate of 5steps per second and reaches the other end in 10 sec. while coming back, walking at the same speed he reaches the starting point in 40secs. What is the number of steps on the escalator?

a) 40

b) 60

c) 120

d) 80

e) data insufficient

Explanation:

Escalator problems are similar to boats and streams problems. If we assume man's speed as 'a m/s' and escalator speed as 'b m/sec' then while going up man's speed becomes 'a -b' and while coming down 'a + b'.

In this question, Let the speed of escalator be b steps per sec. And length of escalator be

L.   Einstein's speed = 5 steps/ sec

While going down, $\frac{L}{5+x}=10 \Rightarrow$ L = 50 + 10x

While coming up, $\frac{L}{5-x}=40 \Rightarrow$ L = 200 – 40x

Multiply the first equation by 4, and add to the second, we get L = 804.

5. How many five digit numbers can be formed by using the digits 0,1,2,3,4,5 such that the number is divisible by 4?

Explanation:

If a number has to be divisible by 4, the last two digit of that number should be divisible by 4.

So _ _ _ x y. Here xy should be a multiple of 4.

There are two cases:

Case 1: xy can be 04, 20 or 40

In this case the remaining 3 places can be filled in 4×3×2 = 24. So total 24×3 = 72 ways.

Case 2: xy can be 12, 24, 32, 52.

In this case, left most place cannot be 0. So left most place can be filled in 3 ways. Number of ways are 3×3×2 = 18. Total ways = 18×4 = 72.

Total ways = 144

6. Data sufficiency question:

There are six people. Each cast one vote in favour of other five. Who won the elections?

i) 4 older cast their vote in favour of the oldest candidate

ii) 2 younger cast their vote to the second oldest

Explanation:

Total possible votes are 6. Of which 4 votes went to the oldest person. So he must have won the election. Statement 1 is sufficient.

7. Decipher the following multiplication table:

M A D

B E

―――――-

M A D

R A E

```
          ‾‾‾‾‾‾‾-
          A M I D
          ‾‾‾‾‾‾‾-
```

Explanation:

It is clear that E = 1 as MAD×E=MAD

From the hundred's line, M + A = 10 + M or 1 + M + A = 10 + M

As A = 10 not possible, A = 9

So I = 0.

and From the thousand's line R + 1 = A. So R = 8.

```
     M 9 D
       B 1
   ‾‾‾‾‾‾‾-
     M 9 D
    8 9 1
   ‾‾‾‾‾‾‾-
    9 M 0 D
   ‾‾‾‾‾‾‾-
```

As B×D = 1, B and D takes 3, 7 in some order.

If B = 7 and D = 3, then M93×7 = ＿51 is not satisfying. So B = 3 and D = 7.

```
      2 9 7
        3 1
    ‾‾‾‾‾‾‾-
      2 9 7
    8 9 1
    ‾‾‾‾‾‾‾-
    9 2 0 7
    ‾‾‾‾‾‾‾-
```

8. If $\log_3 N + \log_9 N \log_3 N + \log_9 N$ is whole number, then how many numbers possible for N between 100 to 100?

Explanation:

$\log_3 N + \log_9 N \log_3 N + \log_9 N = \log_3 N + \log_{3^2} N \log_3 N + \log_{3^2} N = \log_3 N + \frac{1}{2}\log_3 N \log_3 N + \frac{1}{2}\log_3 N = \frac{3}{2}\log_3 N \frac{3}{2}\log_3 N$

Now this value should be whole number.

Let $3^{2\log_3 N} = w$

$\Rightarrow \log_3 N = \frac{2}{3}w$

$N = 3^{\left(\frac{2}{3}w\right)}$

As N is a positive integer, So for w = 0, 3, 6 we get N = 1, 9, 81.

Three values are possible.

Ques.9 What will be obtained if 8 is subtracted from the HCF of 168, 189, and 231?

Op 1: 15

Op 2: 10

Op 3: 21

Op 4: None of these

Op 5:

Correct Op : 4

10. If $a^4 + (1/a^4) = 119$ then a power $3 - (1/a^3) =$

a. 32

b. 39

c. Data insufficient

d. 36

Explanation:

Given that $a^4 + \frac{1}{a^4} = 119$, adding 2 on both sides, we get

: $\left(a^2 + \frac{1}{a^2}\right)^2 = 121$

$\Rightarrow a^2 + \frac{1}{a^2} = 11$

Again, by subtracting 2 on both sides, we have, $\Rightarrow \left(a - \frac{1}{a}\right)^2 = 9$

$\Rightarrow a - \frac{1}{a} = 3$

Now, $\Rightarrow a^3 - \frac{1}{a^3} = \left(a - \frac{1}{a}\right)\left(a^2 + \frac{1}{a^2} + 1\right) = 12 \times 3 = 36$

11. Probability of Cristiano Ronaldo scoring a penalty is twice than the probability of missing it. In a World cup he takes 5 penalties, What is the probability of scoring 3 penalties among the 5?

a) 5 *2 *((2/3)^3 * (1/3)^2)

b) 1-((2/3)^3 * (1/3)^2)

c) 1-((2/3)^2 * (1/3)^3)

d) None of the above.

Answer: a

Explanation:

We have to use Binomial distribution to solve this question as Ronaldo scoring penalty and not scoring penalty are Dichotomous in nature.

Success + Failure = 1

2x + x = 1

So x = 1/3

Probability of scoring a penalty = p = 2/3 and Not scoring it = q = 1/3

Probability of scoring exactly 'r' of 'n' trials = $P(x=r) = nC_r.p^r.q^{n-r} P(x=r) = nC_r.p^r.q^{n-r}$

$P(x=3) = 5C_3.(\frac{2}{3})^3.(\frac{1}{3})^{5-3} P(x=3) = 5C_3.(\frac{2}{3})^3.(\frac{1}{3})^{5-3}$

$= 10.(\frac{2}{3})^3.(\frac{1}{3})^2 10.(\frac{2}{3})^3.(\frac{1}{3})^2$

12. How many such 4 consecutive numbers are there less than 1000 when added gives a sum which is divisible by 10? For example, 16 +17+18+19=70.

Answer:

Explanation:

Let the numbers be n, n+1, n+2, n+3.

Sum of these numbers = 4n + 6.

Let 4n + 6 = 10k

So n = $\frac{10k-6}{4} \frac{10k-6}{4} = \frac{2k-1+2k-2}{4} \frac{2k-1+2k-2}{4} = \frac{2k-1+k-1}{2} \frac{2k-1+k-1}{2}$

So k takes only odd numbers.

For k = 1, n = 1

For k = 3, n = 6

For k = 5, n = 11

. . . .

. . . .

Final value of n = 996.

So total values = $= \frac{l-a}{d}+1 = \frac{996-1}{5}+1 = \frac{l-a}{d}+1 = \frac{996-1}{5}+1$ = 200

13. 1,2,3,4,5,6,7 are arranged such that sum of two successive numbers is a prime number. For example, 1234765 (i.e. 1+2=3, 2+3=5, 3+4=7….)

1. How many such possible combinations occur?

2. How many possible combination occurs if first number is 1/7 and last number is 7/1 (i.e 1xxxxx7 or 7xxxxx1)?

3. How many numbers will come on 4th position(xxx_xxx)?

Explanation:

We have to follow a systematic approach for this question. We know that if at all two consecutive numbers be prime, they should not be even in the first place. So we arrange even numbers in even places, odd numbers in odd places.

2 should not have 7 as its neighbor

4 should not have 5 as its neighbor

6 should not have 3 as its neighbor

Case 1:

__ 2 ____ 4 ____   6 __

x7   x7,5   x5,3   x3

So fix, 3 or 1 in between 2 and 4. We get the following options with reverse case also.

5234167, 7614325

5234761, 1674325

1234765, 5674321

3214765, 5674123

Case 2:

__ 2 ____ 6 ____   4 __

x7   x7,3   x3,5   x5

5216743, 3476125

3256147, 7416523

3256741, 1476523

1256743, 3476521

Case 3:

__ 4 ____ 2 ____   6 __

x5   x5,7   x7,3   x3

3412567, 7652143

7432165, 5612347

7432561, 1652347

1432567, 7652341

Answer 1: Total possibilities are 24.

Answer 2: 4 possibilities.

Answer 3: 3 possibilities.

14. Find the remainder when 4*4! + 5*5! + 6*6! +……………….+ 19*19! is divided by 64.

1) 32

2) 38

3) 40

4) Cannot be determined.

Explanation:

8*8! and its subsequent terms are exactly divisible by 64. As highest power of 2 in 64 is 6 and highest power of 2 in 8! is 7 which is greater than 6. So we have to find the remainder when 4*4! + 5*5! + 6*6! + 7*7! is divided by 64 which is 40.

15. NHAI employs 100 men to build a highway of 2km in 50 days working 8 hours a day. If in 25 days they completed 1/3 part of work .than how many more employees should NHAI hire to finish it in time working 10 hours a day?

Explanation:

Here 2km is immaterial. The given problem can be written in a tabular form like below.

	Men	Days	Hours	Work
Planned	100	50	8	1
Actual	100	25	8	1/3
Remaining	?	25	10	2/3

We can apply chain rule now.

Total men required to complete the remaining work

$= 100 \times \frac{25}{25} \times \frac{8}{10} \times \frac{2/3}{1/3} = 160$

So additional men required = 160 – 100 = 60

16. A mixture of 125 gallons of wine and water contains 20% of water. How much water must be added to the mixture in order to increase the percentage of water to 25% of the new
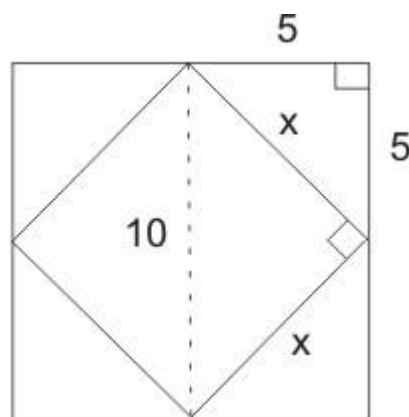
mixture?

a) 10 gallons

b) 8.5gallons

c) 8gallons

d) 8.33gallons

Explanation:

Initially water in the mixture = 20%(125) = 25

Let x gallons of water be added to change to water concentration to 25% or 1/4

$\Rightarrow \frac{25+x}{125+x}=\frac{1}{4} \Rightarrow \frac{25+x}{125+x}=\frac{1}{4}$

$\Rightarrow x=\frac{25}{3} \Rightarrow x=\frac{25}{3}$ = 8.33 gallons.

17. Side of a square is 10 cm. after joining the mid point of all sides makes a another inner square and this process goes to infinite.Find the sum of perimeter of all squares.

Explanation:

You can calculate the side of the small square in two ways. Take half of the side which is equal to 5 cm. Using Pythagorean

theorem, $x^2=5^2+5^2 \Rightarrow x^2=50 \Rightarrow x=\sqrt{50}=\sqrt{5^2}=\sqrt{10^2} \Rightarrow x=\sqrt{50}=5\sqrt{2}=10\sqrt{2}$

In another way, we can equate the squares of the sides of the small square to square of the side which is equal to 10. $\Rightarrow x^2+x^2=10^2 \Rightarrow x^2+x^2=10^2$

$\Rightarrow 2x^2=100 \Rightarrow 2x^2=100$

$\Rightarrow x=\sqrt{50}=5\sqrt{2}=10\sqrt{2} \Rightarrow x=\sqrt{50}=5\sqrt{2}=10\sqrt{2}$

So if you observe carefully, the side of the small square is $\frac{1}{\sqrt{2}}$ part of the side of the bigger square.

So the side of the square inside the small square = $10 2^{-\surd} \times 12^{-\surd} = 102 = 5\,102 \times 12 = 102 = 5$ and so on…

So areas of the perimeters = $4(10 + 102^{-\surd} + 102 + \ldots)\,4(10 + 102 + 102 + \ldots)$

= $40(1 + 12^{-\surd} + 12 + \ldots)\,40(1 + 12 + 12 + \ldots)$

The terms in the bracket are in GP withe common ratio of $12^{-\surd}12$

So Sum of the perimeters = $40\left[\dfrac{1}{1 - 12^{-\surd}}\right]\,40(11 - 12) = 40(2^{-\surd}2^{-\surd} - 1)\,40(22 - 1)$

18. Data sufficiency question:

What will be the percentage profit of selling one liter milk.?

1) 16 liter of milk is sold at cost price after adding 20% water to it.

2) the cost price of one liter milk is Rs.16.

Explanation:

Let us assume one liter costs Rs.1. So C.P = Rs.16

When 20% water is added, then total volume = 20 liters. So SP = 20. Profit can be calculated.
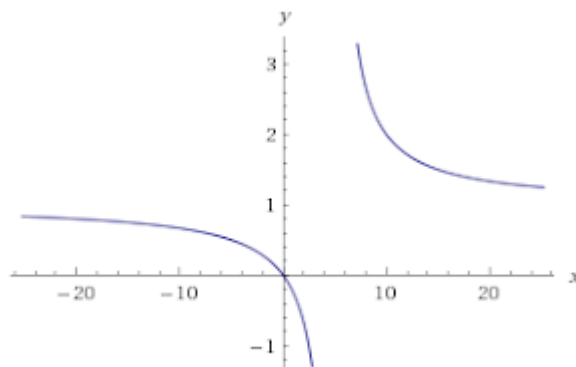
Statement 1 is sufficient.

Statement 2 is not required.

5. y=x/(x-k),where k is a constant,and x is real number.show that.

1.y increase with increase in x.

2.y decreases first and then increase with the value of x.

3.y increase then decrease with the value of x.

4.it remains constant.

Explanation:

Typical question. Taking k =5 and we draw the graph,

If x increases y decreases but when x equal to k, y value becomes infinite. But when x is greater than k, y value slowly reaches to 1. So it decrease from infinite to 1.

19. What is the maximum value of vx – yz. If the value of v,x,y,z have to be chosen from the set A where A(-3,-2,-1,0,1,2,3)

a) 9

b) 12

c) 15

d) none of these

Explanation:

To maximize the value of vx – yz, we make yz negative and vx as maximum as possible using given value.

$vx-yz=(-3)2-(-3\times2)$ $vx-yz=(-3)2-(-3\times2)$ = 15

20. Given a Number 123456, from this number put any three values in numerator and remaining three are in denominator. So how many values you can make from this number less than 1/5.

1. 2

2. 4

3. 8

4. 27

Explanation:

If the given value is 120, then denominator should be slightly greater than 600. If for 130, it is 650. So if we take numerator as 132, then denominator should be greater than 660 which is not possible as we have only 5 and 4 available. So numerator is less than 130. The following numbers are possible.

123/654, 123/645, 124/635, 124/653, 125/634, 125/643.

21. A square was given. Inside the square there are white tiles and black tiles. Black tiles was among the diagonal of the square and dimensions of both white as well as black tiles is 1cm x 1cm. If there are 81 black tiles in the square. Then find the no of white tiles in it.

In a square, number of squares on the diagonal is equal to the tiles on a single row. If there are even number of square on a side, then total squares on the diagonal is $2n – 1$, otherwise $2n$. As the total tiles on the diagonal are given as 81, then number of tiles on a side = $2n – 1$ = 81 so n = 41.

So number of white tiles = $41^2 − 81 = 1681 − 81$ = 1600

22. Two identical cubes if one of them is painted pink on its 4 sides and blue on the remaining two side then how many faces painted pink to other cube so that probability of getting the same color is 1/3 when we roll both the cubes.

Explanation:

First cube has got 4 pink sides and 2 black sides.

Let the other cube got x sides pink and $(6 – x)$ sides black.

Now when we roll both the dice, we can either pink on both cubes or black on both cubes.

Probability = $\frac{4}{6} \times \frac{x}{6} + \frac{2}{6} \times \frac{6−x}{6} = \frac{1}{3}$

$= \frac{4x + 12 − 2 \times 3}{6} = \frac{1}{3}$

$\Rightarrow x = 0$

So second cube should not have any pink faces at all.

23. In a right angled triangle, two sides are consecutive whole number in which one side is hypotenuse. what could be the possible length of third side?

1. 360

2. 361

3. 362

4. none of these

Answer: 2

Explanation:

Pythagorean triplets are generated with each "odd number" greater than 1 by using a formula.

If n is an odd number, then Pythagorean triplet = $n, \frac{n^2−1}{2}, \frac{n^2+1}{2}$.

Here 361 is an odd number. So the triplet is 361, 65160, 65161.

24. Heinz produces tomato puree by boiling tomato juice. The tomato puree has only 20% water while the tomato juice has 90% water. How many liters of tomato puree will be obtained from 20 litres of tomato juice?

a. 2 liters

b. 2.4 liters

c. 2.5 liters

d. 6 liters

Answer:

Explanation:

In each of the solutions, there is a pure tomato component and some water. So while boiling, water evaporates but tomato not. So we equate tomato part in the both equations.

$\Rightarrow\Rightarrow$ 10%(20) = 80%(x)

$\Rightarrow\Rightarrow$ x = 2.5 liters.

25. x,y are odd and z is even then $((x^2+y^2)z^2)/8$ is

a. even

b. odd

c. either even or odd

d. fraction

Explanation: c

As x, y are odd $x^2+y^2 x^2+y^2$ is always even. Now if z is a multiple of 4, then $z^2 z^2$ is divisible by 8, then the equation is even. if z is a not a multiple of 4, but only a multiple of 2, then $z^2 z^2$ is not completely divisible as it contains only two 2's and other two is cancelled in $x^2+y^2 x^2+y^2$ which results in an odd number.

$(3^2+5^2)\frac{4^2}{8}=34\times\frac{16}{8}=34\times2(3^2+5^2)\frac{4^2}{8}=34\times\frac{16}{8}=34\times2$

$(3^2+5^2)\frac{6^2}{8}(3^2+5^2)\frac{6^2}{8} = 34\times\frac{36}{8}=17\times9 34\times\frac{36}{8}=17\times9$

26. In the formula of converting temperature from Celsius to Fahrenheit F=9/5C+32, How many integer values(not fractional) of F will be there that lies between 100 to 200 for integer values of C.

Explanation:

$F=\frac{9}{5}C+32$ $F=\frac{9}{5}C+32$

As F needs to be integer, then C should be a multiple of 5. First integer value of F for C = 5 is 41, next value for C =10 is 50 and so on.

The values of F are in A.P with common difference of 9. They are in the format of 41 + 9n.

The first value of F which is greater than 100 is for n = 7 which is 104.

The last value of F which is less than 200 is for n = 17, which is 194.

Total values are $\frac{194-104}{9}+1$ $\frac{194-104}{9}+1$ = 11

27. The product of digit is a Factor of a two digit number. Number of such digit are:

a. 3

b. 5

c. 9

d. 27

Answer: b

Explanation:

Let the number be xy. So $\frac{10x+y}{xy}=k$ $\frac{10x+y}{xy}=k$. Here k is some interzer.

$\Rightarrow$ $\Rightarrow$ 10x + y = kxy

$\Rightarrow$ $\Rightarrow$ x(10 – ky) = – y

$\Rightarrow$ $\Rightarrow$ x(ky – 10) = y

So x is a factor of y. The possibilities are,

11, 1×1=1; 12 , 1×2=2; 15 ,1×5=5; 24 ,2×4=8; 36 , 3×6=18

28. Data sufficiency question.

is x>y ?

1. 5x+15y=40

2.7x+21y=56

Explanation:

Statement 1 has three solutions,(8, 0), (5, 1), (2, 2) but we cannot say precisely about the relationship

Statement 2 has three solutions, (8, 0), (5, 1), (2, 2) but we cannot say about the relationship. So data insufficient.

29. 99^n is such a number begin with 8, least value of n?

(a) 11

(b) 10

(c) 9

(d) n does not exist

Answer:

Explanation:

In a more traditional way, this problem can be solved like below.

$99(100 - 1) = 9900-99= 9801$

$9801(100 - 1) = 980100-9801= 971299$

$971299(100 - 1) = 97129900 - 971299 = 96157601$

…..

…..

Just observe the pattern, 98, 97, 96, …. for power of 2, 3, 4, …. So for 90 the power could be 10. So for 11, you get a number starts with 8.

Alternate method:

In a more elegant way, we can solve this question using logarithms.

For example, $\log 90 = 1.9542$, $\log 89 = 1.9493$.

Here characteristic is same as both numbers are two digit numbers. Mantissa of 89 is less than mantissa of 90.

Similarly if you want to find a number starts with 8, it should be just less than a number starts with 9 and minimum.

$\Rightarrow 9.10^x > 99^n \Rightarrow 9.10^x > 99^n$

Suppose x = 1, the LHS = 90, for x = 2, LHS = 900. So LHS is the least number starts with 9. and anything less than that number should starts with 8.

Let us take logarithm with base 10.

$\Rightarrow \log_{10}(9.10^x) > \log_{10}(99^n) \Rightarrow \log_{10}(9.10^x) > \log_{10}(99^n)$

$\Rightarrow \log_{10}9 + \log_{10}(10^x) > \log_{10}(99^n) \Rightarrow \log_{10}9 + \log_{10}(10^x) > \log_{10}(99^n)$

$\Rightarrow \log_{10}9 + x > n.\log_{10}99 \Rightarrow \log_{10}9 + x > n.\log_{10}99$

Now the characteristic is not important. We will take fraction part of the logarithm. { } represents fraction part of a number.

$\Rightarrow \log 109 > \{n.\log 1099\} \Rightarrow \log 109 > \{n.\log 1099\}$

$\Rightarrow \Rightarrow 0.9542 > \{n \times 1.9956\} \{n \times 1.9956\}$

For n = 11, we get $11 \times 1.9956 = 21.9519$ $11 \times 1.9956 = 21.9519$

So 0.9542 > 0.9519

So for n = 11, we get a number starts with 8.

30. Total 100 members are writing exam. In the 48 members are writing first exam. 45 members are writing second exam. 38 members are writing third exam. 5 members are writing all the three exams. How many members are writing 2 exams?

Explanation:

Total number of exams written by 100 students = 48 + 45 + 38 = 131

Now let us say x members are writing only 1 exam, y members are writing only 2 exams, z members are writing only 3 exams.

Therefore, x + 2y + 3z = 131 also x + y + z = 100.

Given that z = 5. So x + 2y = 116 and x + y = 95.

Solving we get y = 21.

So 21 members are writing exactly 2 exams.

31. How many three digits no. can be formed also including the condition that the no. can have at least two same digits ?

Explanation:

Total number of 3 digit numbers = 9×10×10 = 900

Total number of numbers in which no digit repeats = 9×9×8 = 648

So the total number of numbers in which at least one digit repeats = 900 – 648 = 252

32. If a, b and c are forming increasing terms of G.P., r is the common ratio then find the minimum value of (c-b), given that (log a+log b+log c)/log 6 = 6. Note that r can be any real no.

a) 36

b) 24

c) 18

d) 12

Answer: d

Explanation:

a,b,c are in G.P. so let the first term of G.P. = arar, and common ratio = r.

Therefore, a = arar, b = aa, c = arar

Given, loga+logb+logclog6=6log$_{f0}$a+log$_{f0}$b+log$_{f0}$clog$_{f0}$6=6

⇒logabclog6=6⇒log$_{f0}$abclog$_{f0}$6=6

⇒log6abc=6⇒abc=66⇒log6abc=6⇒abc=66

put the value of a,b,c in gp format

⇒ar×a×ar=66⇒ar×a×ar=66

⇒a3=66⇒a=36⇒a3=66⇒a=36

Now a = 36r36r, b = 36, c = 36r.

We have to find the minimum value of c – b = 36r – 36.

r can be any number. So for r < 0, we get c – b negative.

When r = 1, c – b = 0

But none of the options are not representing it.

From the given options, r = 4/3, then c = 48. So option d satisfies this.

33. A natural number has exactly 10 divisors including 1 and itself.how many distint prime factors this natural number will have?

a. 1 or 2

b. 1 or 3

c. 1 or 2 or 3

d. 2 or 3

Answer: a

Explanation:

Number of factors of a number NN is (p+1).(q+1).(r+1)…

where N=ap×bq×cr…N=ap×bq×cr….

Given, (p+1).(q+1).(r+1).. = 10.

From the above equation, p = 1, q = 4 or p = 9 satisfies.

So the number N is in the following two formats. a1×b4a1×b4 or a9a9

So it has either 1 or 2 prime factors.

34. How many values of c in $x^2 - 5x + c$, result in rational roots which are integers?

Explanation:

By the quadratic formula, the roots
of $x^2-5x+c=0$ are $\dfrac{-(-5)\pm\sqrt{-5^2-4(1)(c)}}{2(1)} = \dfrac{5\pm\sqrt{25-4c}}{2}$

To get rational roots, $25-4c$ should be square of an odd number. Why? because 5 +
odd only divided by 2 perfectly.

Now let 25 – 4c = 1, then c = 6

If 25 – 4c = 9, then c = 4

If 25 – 4c = 25, then c = 0 and so on…

So infinite values are possible.