

# Consecutive numbers investigation



**ASSIGN  
BUSTER**

Take three consecutive numbers; square the middle number, multiply the first by the third number. What do you notice?

2, 3, 4 are consecutive numbers they follow on from each other. The next number is one more than.

2, 3, 4

$$3^2 = 3 \times 3 = 9$$

$$2 \times 4 = 8$$

Difference 1

The numbers above are consecutive numbers; the difference between them is one.

18, 19, 20

$$19^2 = 19 \times 19 = 361$$

$$18 \times 20 = 360$$

Difference 1

97, 98, 99

$$98^2 = 98 \times 98 = 9604$$

$$97 \times 99 = 9603$$

Difference 1

117, 118, 119

$$118^2 = 118 \times 118 = 13924$$

$$117 \times 119 = 13923$$

Difference 1

It appears that it will work every time. I have tried it four times and it works all right so far.

I will now try decimals.

1. 2, 2. 2, 3. 2

$$2.2^2 = 2.2 \times 2.2 = 4.84$$

$$1.2 \times 3.2 = 3.84$$

Difference 1

10. 9, 11. 9, 12. 9

$$11.9^2 = 11.9 \times 11.9 = 141.61$$

$$10.9 \times 12.9 = 140.61$$

Difference 1

It would appear that it works using decimals.

I will now try negative numbers.

-8, -7, -6

$$-72 = -7 \times -7 = 49$$

$$-8 \times -6 = 48$$

Difference 1

-5, -4, -3

$$-42 = -4 \times -4 = +16$$

$$-5 \times -3 = +15$$

Difference 1

I have found out that it also works with negative numbers. I will now hope to show that it works with algebra.

$X, X+1, X+2$

$$1\text{st} \times 3\text{rd} = X \times (X+2) = X^2 + 2X$$

$$2\text{nd squared} = (X+1)^2 = (X+1)(X+1)$$

$$(X+1)(X+1) = X^2 + 1 + 1X + 1X$$

$$= X^2 + 2X + 1$$

The only difference is +1. It shows that the difference will always be 1.

I am now going to see what happens if I make the gap 2.

Gap 2

3, 5, 7

$$3 \times 7 = 21$$

$$52 = 5 \times 5 = 25$$

Difference 4

5, 7, 9

$$5 \times 9 = 45$$

$$72 = 7 \times 7 = 49$$

Difference 4

17, 19, 21

$$17 \times 21 = 357$$

$$192 = 19 \times 19 = 361$$

Difference 4

It would appear that it would work every time. I have tried it three times and it is working all right so far.

I will now try decimals

9.9, 11.9, 13.9

$$9.9 \times 13.9 = 137.61$$

$$11.92 = 11.9 \times 11.9 = 141.61$$

Difference 4

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7. 1, 9. 1, 11. 1

$$7.1 * 11.1 = 78.81$$

$$9.12 = 9.1 * 9.1 = 82.81$$

Difference 4

13. 6, 15. 6, 17. 6

$$13.6 * 17.6 = 239.36$$

$$15.62 = 15.6 * 15.6 = 243.36$$

Difference 4

It would appear that it works using decimals.

I will now try negative numbers.

-1, 1, 3

$$-1 * 3 = -3$$

$$12 = 1 * 1 = 1$$

Difference 4

-10, -8, -6

$$-10 * -6 = 60$$

$$-82 = -8 * -8 = 64$$

Difference 4

I have found out that it also works with negative numbers.

I will now hope to show that it works with algebra.

$X, X+2, X+4$

$$X*(X+4) = X^2 + 4X$$

$$(X+2)^2 = (X+2)(X+2) = X^2 + 4 + 2x + 2 X$$

$$= X^2 + 4X + 4$$

The only difference is +4. It shows that the difference will always be 4.

Gap 3

5, 8, 11

$$5*8 = 55$$

$$8^2 = 8*8 = 64$$

Difference 9

2, 5, 8

$$2*8 = 16$$

$$5^2 = 5*5 = 25$$

Difference 9

9, 12, 15

$$9 \times 15 = 135$$

$$122 = 12 \times 12 = 144$$

Difference 9

It appears that it will work every time. I have tried it three times and it works all right so far.

I will now try decimals.

2. 5, 5. 5, 8. 5

$$2. 5 \times 8. 5 = 21. 25$$

$$5. 52 = 5. 5 \times 5. 5 = 30. 25$$

Difference 9

4. 2, 7. 2, 10. 2

$$4. 2 \times 10. 2 = 42. 84$$

$$7. 22 = 7. 2 \times 7. 2 = 51. 84$$

Difference 9

9. 9, 12. 9, 15. 9

$$9. 9 \times 15. 9 = 157. 41$$

$$12. 92 = 12. 9 \times 12. 9 = 166. 41$$



Difference 9

It would appear that it works using decimals.

I will now try negative numbers.

-10, -7, -4

$$-10 \times -4 = 40$$

$$-72 = -7 \times -7 = 49$$

Difference 9

-1, 2, 5

$$-1 \times 5 = -5$$

$$22 = 2 \times 2 = 4$$

Difference 9

I have found out that it also works with negative numbers.

I will hope to show that it works with algebra.

$X$ ,  $X+3$ ,  $X+6$

$$X \times (X+6) = X^2 + 6X$$

$$(X+3)^2 = (X+3)(X+3) = X^2 + 6 + 3X + 3X$$

$$= X^2 + 6X + 9$$

The only difference is +9. This shows that the difference will always be nine.

Gap 4

5, 9, 13

$$5 \times 13 = 65$$

$$9^2 = 9 \times 9 = 81$$

Difference 16

2, 6, 10

$$2 \times 10 = 20$$

$$6^2 = 6 \times 6 = 36$$

Difference 16

9, 13, 17

$$9 \times 17 = 153$$

$$13^2 = 13 \times 13 = 169$$

Difference 16

It appears that it will work every time. I have tried it three times and it works all right so far.

I will now try decimals.

2.5, 6.5, 10.5

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$$2.5 * 10.5 = 26.25$$

$$6.52 = 6.5 * 6.5 = 42.25$$

Difference 16

$$4.2, 8.2, 12.2$$

$$4.2 * 12.2 = 51.24$$

$$8.22 = 8.2 * 8.2 = 67.24$$

Difference 16

$$7.1, 11.1, 15.1$$

$$7.1 * 15.1 = 107.21$$

$$11.12 = 11.2 * 11.2 = 123.21$$

Difference 16

It would appear that it works using decimals.

I will now try negative numbers.

$$-1, 3, 7$$

$$-1 * 7 = -7$$

$$32 = 3 * 3 = 9$$

Difference 16

-10, -6, -2

$$-10 \times -2 = 20$$

$$-6 \times -6 = 36$$

Difference 16

I have found out that it also works with negative numbers.

I will now hope to show that it works with algebra.

$X$ ,  $X+4$ ,  $X+8$

$$X \times (X+8) = X^2 + 8X$$

$$(X+4)^2 = (X+4)(X+4) = X^2 + 8 + 4X + 4X$$

$$= X^2 + 8X + 16$$

The only difference is +16. It shows that the difference will always be 16.

Gap 5

5, 10, 15

$$5 \times 15 = 75$$

$$10^2 = 10 \times 10 = 100$$

Difference 25

2, 7, 12

$$2*12 = 24$$

$$72 = 7*7 = 49$$

Difference 25

9, 14, 19

$$9*19 = 171$$

$$142 = 14*14 = 196$$

Difference 25

It appears that it will work every time. I have tried it three times and it works all right so far.

I will now try decimals.

2. 5, 7. 5, 12. 5

$$2. 5*12. 5 = 31. 25$$

$$7. 52 = 7. 5*7. 5 = 56. 25$$

Difference 25

4. 2, 9. 2, 14. 2

$$4. 2*14. 2 = 59. 64$$

$$9. 22 = 9. 2*9. 2 = 84. 64$$

Difference 25

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7. 1, 12. 1, 17. 1

$$7.1 * 17.1 = 121.41$$

$$12.12 = 12.1 * 12.1 = 146.41$$

Difference 25

It would appear that it works using decimals.

I will now try negative numbers.

-1, 4, 9

$$-1 * 9 = -9$$

$$42 = 4 * 4 = 16$$

Difference 25

-10, -5, 0

$$-10 * 0 = 0$$

$$-52 = -5 * -5 = 25$$

Difference 25

I have found out that it also works with negative numbers.

I will now hope to show that it works with algebra.

X, X+5, X+10

$$X*(X+10) = X^2 + 10X$$

$$(X+5)^2 = (X+5)(X+5) = X^2 + 10 + 5X + 5X$$

$$= X^2 + 10X + 25$$

The only difference is + 25 This shows that the difference will always be 25.

Gap

Difference

1

1

2

4

3

9

4

16

5

25

Problem 2

## Gap 1

Two consecutive numbers square the first, square the second. What do you notice?

5, 6

$$5^2 = 5 * 5 = 25$$

$$6^2 = 6 * 6 = 36$$

Difference 11

7, 8

$$7^2 = 7 * 7 = 49$$

$$8^2 = 8 * 8 = 64$$

Difference 15

10, 11

$$10^2 = 10 * 10 = 100$$

$$11^2 = 11 * 11 = 121$$

Difference 21

I will now try decimals to see if it works the same.

2.5, 3.5

$$2.5^2 = 2.5 * 2.5 = 6.25$$

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$$3.5^2 = 3.5 \times 3.5 = 12.25$$

Difference 6

$$4.5, 5.5$$

$$4.5^2 = 4.5 \times 4.5 = 20.25$$

$$5.5^2 = 5.5 \times 5.5 = 30.25$$

Difference 10

$$7.2, 8.2$$

$$7.2^2 = 7.2 \times 7.2 = 51.84$$

$$8.2^2 = 8.2 \times 8.2 = 67.24$$

Difference 15.4

I have found out that it also works with decimals.

I will now try negative numbers.

$$-5, -6$$

$$-5^2 = -5 \times -5 = 25$$

$$-6^2 = -6 \times -6 = 36$$

Difference 11

$$-9, -10$$

$$-92 = -9 \cdot -9 = 81$$

$$-102 = -10 \cdot -10 = 100$$

Difference 19

-2, -3

$$-22 = -2 \cdot -2 = 4$$

$$-32 = -3 \cdot -3 = 9$$

Difference 5

It would appear that it works using negative numbers.

I will now hope to show that it works with using algebra

$X, X+1$

$X^2 (X+1)^2$

$(X+1)^2(X+1)$

$X^2 + 2 + 1X + 2X$

$X^2 + 2X + 3$

Difference  $2X+1$

I have noticed that the two consecutive numbers are the difference when added together.

Gap 2

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2, 4

$$22 = 2 \times 2 = 4$$

$$42 = 4 \times 4 = 16$$

Difference 12

6, 8

$$62 = 6 \times 6 = 36$$

$$82 = 8 \times 8 = 64$$

Difference 28

3, 5

$$32 = 3 \times 3 = 9$$

$$52 = 5 \times 5 = 25$$

Difference 16

I will now try decimals.

2.5, 4.5

$$2.52 = 2.5 \times 2.5 = 6.25$$

$$4.52 = 4.5 \times 4.5 = 20.25$$

Difference 14

5.5, 7.5

$$5.5^2 = 5.5 * 5.5 = 30.25$$

$$7.5^2 = 7.5 * 7.5 = 56.25$$

Difference 26

15.9, 17.9

$$15.9^2 = 15.9 * 15.9 = 252.81$$

$$17.9^2 = 17.9 * 17.9 = 320.41$$

Difference 67.6

It would appear that it works using decimals.

I will now try negative numbers.

-7, -9

$$-7^2 = -7 * -7 = 49$$

$$-9^2 = -9 * -9 = 81$$

Difference 32

-15, -17

$$-15^2 = -15 * -15 = 225$$

$$-17^2 = -17 * -17 = 289$$

Difference 64

I have found out that it also works with negative numbers.

I will now hope that it works using algebra.

$X, X+2$

$X^2 (X+2)^2$

$(X+2)^2(X+2)$

$X^2+4+2X+2X$

$X^2+4X+4$

Difference  $4X+4$

The pattern here is, add two consecutive numbers together and then double them to get your difference.

Gap 3

5, 8

$5^2 = 5*5 = 25$

$8^2 = 8*8 = 64$

Difference 39

8, 11

$8^2 = 8*8 = 64$

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$$112 = 11 \cdot 11 = 121$$

Difference 57

18, 21

$$182 = 18 \cdot 18 = 324$$

$$212 = 21 \cdot 21 = 441$$

Difference 117

It would appear that it works every time, I have tried it three times and it works all right so far. But this time they is a different pattern.

I will now try decimals.

2. 4, 5. 4

$$2. 42 = 2. 4 \cdot 2. 4 = 5. 76$$

$$5. 42 = 5. 4 \cdot 5. 4 = 29. 16$$

Difference 23. 4

21. 6, 24. 6

$$21. 62 = 21. 6 \cdot 21. 6 = 466. 56$$

$$24. 62 = 24. 6 \cdot 24. 6 = 605. 16$$

Difference 138. 6

58. 9, 61. 9

$$58.92 = 58.9 * 58.9 = 3469.21$$

$$61.92 = 61.9 * 61.9 = 3831.61$$

Difference 362.4

It seems to work with decimals I will now try negative numbers.

-99, -102

$$-992 = -99 * -99 = 9801$$

$$-1022 = -102 * -102 = 10404$$

Difference 603

I have found out that it also works with negative numbers.

I will now hope to show that it works with algebra.

$X, X+3$

$X^2 (X+3)$

$(X+3)^2(X+3)$

$X^2+6+3X+6X$

$X^2+6X+9X$

Difference  $6X+9$

Instead of adding the consecutive numbers together and multiplying by 2 you multiply it by 3.

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Gap 4

5, 9

$$52 = 5 \times 5 = 25$$

$$92 = 9 \times 9 = 81$$

Difference 56

14, 18

$$142 = 14 \times 14 = 196$$

$$182 = 18 \times 18 = 324$$

Difference 128

30, 34

$$302 = 30 \times 30 = 900$$

$$342 = 34 \times 34 = 1156$$

Difference 256

It would appear that it works every time. I have tried it three times and it works all right so far. But this time they is a different pattern.

I am now going to try decimals.

5. 0, 9. 0

$$5. 02 = 5. 0 \times 5. 0 = 25$$

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$$9.02 = 9.0 * 9.0 = 81$$

Difference 56

$$14.7, 18.7$$

$$14.72 = 14.7 * 14.7 = 216.09$$

$$18.72 = 18.7 * 18.7 = 349.69$$

Difference 113.6

$$16.1, 20.1$$

$$16.12 = 16.1 * 16.1 = 259.21$$

$$20.12 = 20.1 * 20.1 = 404.01$$

Difference 144.8

It would appear that it works with decimals.

I will now try negative numbers.

$$-6, -10$$

$$-62 = -6 * -6 = 36$$

$$-102 = -10 * -10 = 100$$

Difference 64

$$-42, -46$$

$$-422 = -42 \times -42 = 1764$$

$$-462 = -46 \times -46 = 2116$$

Difference 352

-23, -27

$$-232 = -23 \times -23 = 529$$

$$-272 = -27 \times -27 = 729$$

Difference 200

I have found out that it also works with negative numbers.

I will now hope to show that it works with algebra.

$X, X+4$

$X^2 (X+4)^2$

$(X+4)^2(X+4)$

$X^2+4X+4X+16$

$X^2+8X+16$

Difference  $8X+16$

Instead of adding the consecutive numbers together and multiplying by 3 you multiply it by 4.

Gap 5

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5, 10

$$52 = 5 \times 5 = 25$$

$$102 = 10 \times 10 = 100$$

Difference 75

15, 20

$$152 = 15 \times 15 = 225$$

$$202 = 20 \times 20 = 400$$

Difference 175

40, 45

$$402 = 40 \times 40 = 1600$$

$$452 = 45 \times 45 = 2025$$

Difference 425

It would appear that it works every time. I have tried it three times and it works all right so far. But this time they is a different pattern.

I will now try decimals.

5.7, 10.7

$$5.72 = 5.7 \times 5.7 = 32.49$$

$$10.72 = 10.7 \times 10.7 = 114.49$$

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Difference 82

15. 1, 20. 1

$$15. 12 = 15. 2 * 15. 2 = 228. 01$$

$$20. 12 = 20. 1 * 20. 1 = 404. 01$$

Difference 176

42. 4, 47. 4

$$42. 42 = 42. 4 * 42. 4 = 1797. 76$$

$$47. 42 = 47. 4 * 47. 4 = 2246. 76$$

Difference 449

It would appear that it works using decimals.

I will now try negative numbers.

-50, -55

$$-502 = -50 * -50 = 2500$$

$$-552 = -55 * -55 = 3025$$

Difference 525

-10, -15

$$-102 = -10 * -10 = 100$$

$$-152 = -15 \times -15 = 225$$

Difference 125

$$-22, -27$$

$$-222 = -22 \times -22 = 484$$

$$-272 = -27 \times -27 = 729$$

Difference 245

I have found out that it also works with negative numbers.

I will now hope to show that it works using algebra.

$$X, X+5$$

$$X^2 (X+5)^2$$

$$(X+5)^2(X+5)$$

$$X^2+5X+5X+25$$

$$X^2+10X+25$$

Difference  $10X+25$

Instead of adding the consecutive numbers together and multiplying by 4 you multiply it by 5.

Gap

Difference

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1

$$2X+1$$

2

$$4X+4$$

3

$$6X+9$$

4

$$8X+16$$

5

$$10X+25$$