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# MATHS

## ARITHMETIC PROGRESSION

Part – 9

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# Exercise : 5.3

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**Q.16** A sum of ₹700 is to be used to give seven cash prizes to students of a school for their overall academic performance. If each prize is ₹20 less than its preceding prize, find the value of each of the prizes.

Solu: $n = 7$ $\quad S_n = 700$

$d = -20$ $\quad S_7 = 700$

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Solu. $S_7 = 700$

$$\Rightarrow \frac{7}{2}\left[2a + \frac{(7-1)(-20)}{2}\right] = \frac{100}{700}$$

$$\Rightarrow a + 6(-10) = 100$$

$$a + (-60) = 100$$

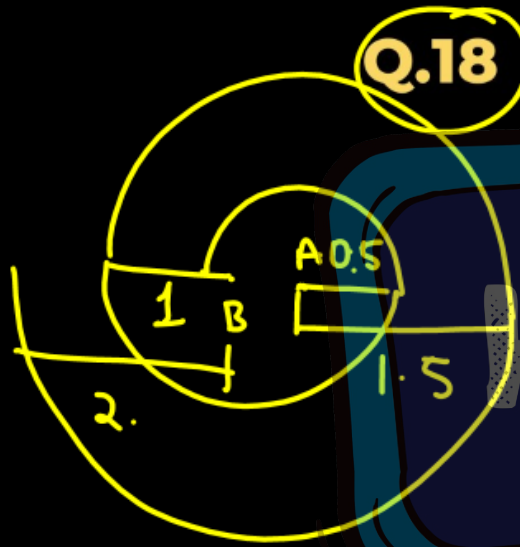
$$\boxed{a = 160}$$

160, 140, 120, 100, 80, 60, 40

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# Exercise : 5.3

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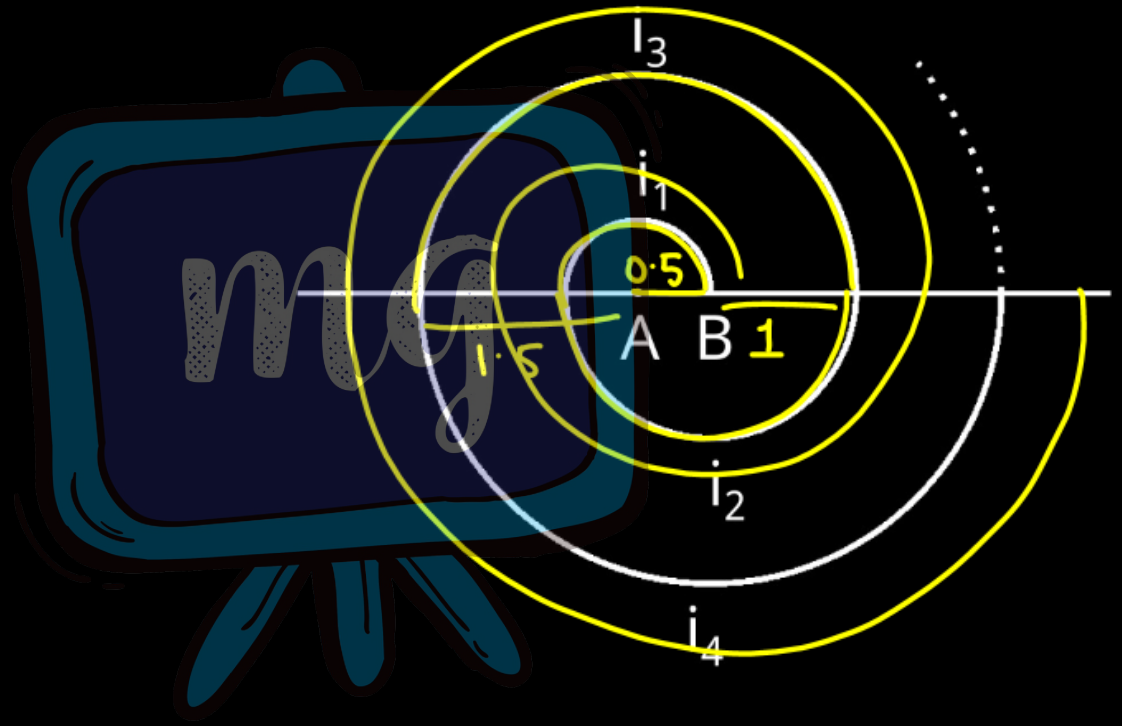

**Q.18** A spiral is made up of successive semicircles, with centres alternately at A and B, starting with centre at A, of radii 0.5 cm, 1.0 cm, 1.5 cm, 2.0 cm, ... as shown in Figure. What is the total length of such a spiral made up of thirteen consecutive semicircles?

(Take $\pi = \frac{22}{7}$)

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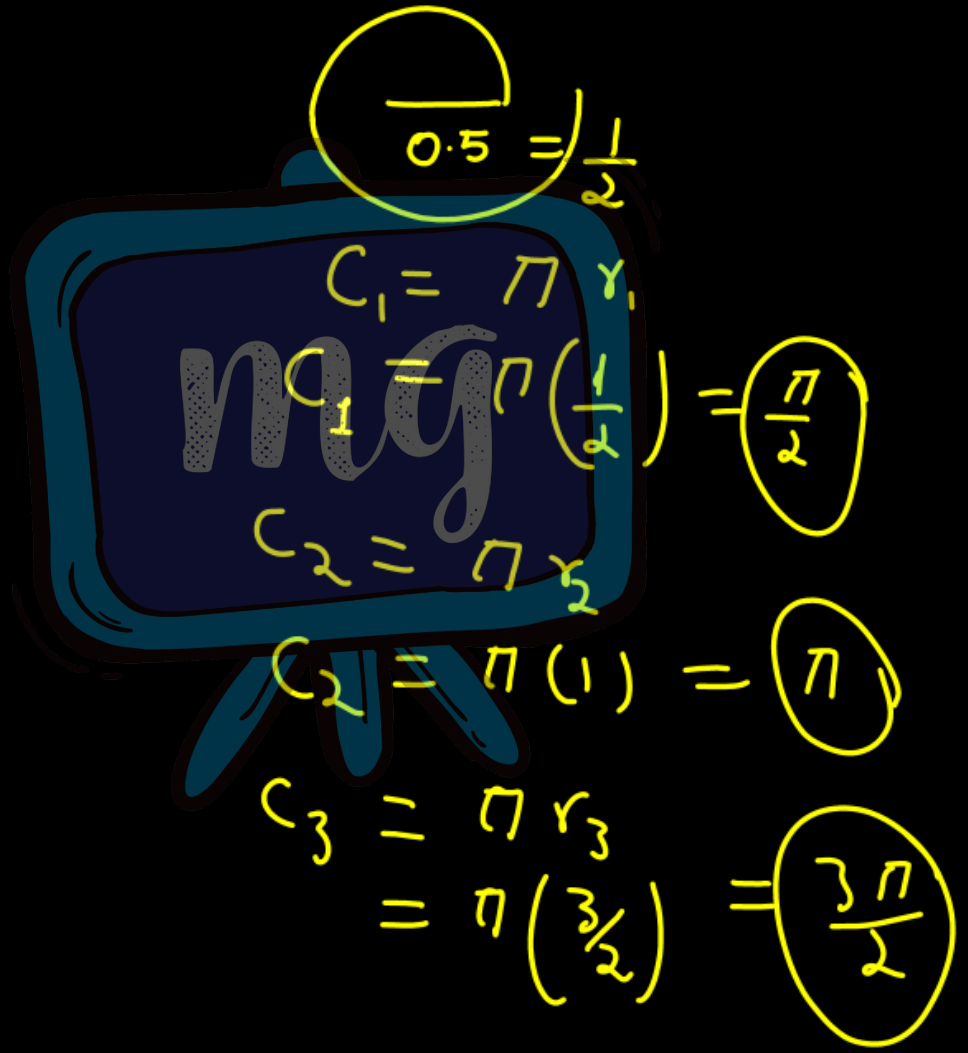
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$$= \frac{\pi}{2} + \pi + \frac{3\pi}{2} + 2\pi - - - 13^{th}$$

$$= \pi \left[ \frac{1}{2} + 1 + \frac{3}{2} + 2 + - - - 13^{th} \right]$$

$$d = \frac{1}{2}$$

$$n = 13$$

$$= \pi \left[ \quad 13 \right]$$

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$$= \pi \left[ \frac{13}{2} \left[ 2 \times \frac{1}{2} + (12) \times \frac{6}{2} \right] \right]$$

$$= \pi \left[ \frac{13}{2} \left[ 1 + 6 \right] \right]$$

$$= \pi \left[ \frac{13}{2} \times 7 \right]$$

$$= \frac{22}{7} \times \frac{13}{2} \times 7$$

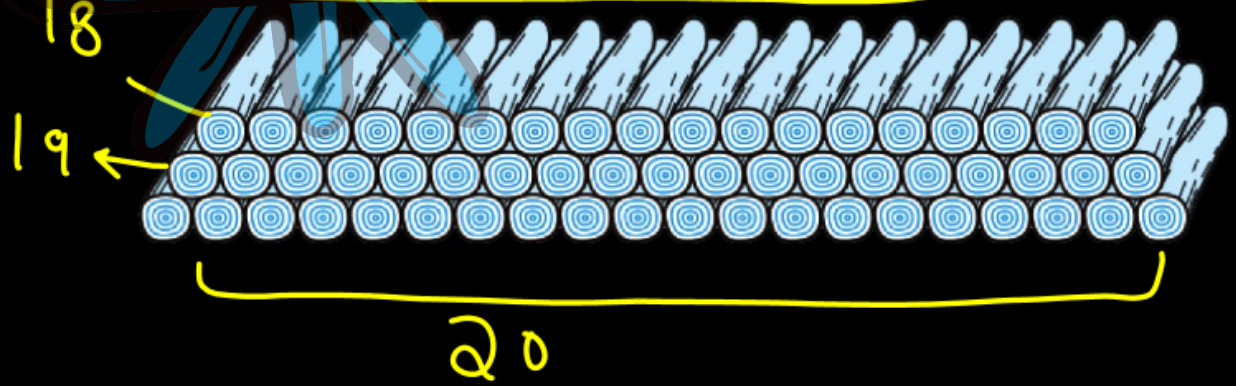
$$= 11 \times 13 = 143 \text{ cm.}$$

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# Exercise : 5.3

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**Q.19** 200 logs are stacked in the following manner: 20 logs in the bottom row, 19 in the next row, 18 in the row next to it and so on (see Figure). In how many rows are the 200 logs placed and how many logs are in the top row?



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**Solu.** $S_n = 200$

$a = 20$

$d = -1$

$$S_n = \frac{n}{2}[2a + (n-1)d]$$

$$= \frac{n}{2}[2 \times 20 + (n-1)(-1)]$$

$$= \frac{n}{2}[40 - (n-1)]$$

$$= \frac{n}{2}[40 - n + 1]$$

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$$S_n = \frac{n}{2}[41 - n]$$

$$200 = \frac{n}{2}[41 - n]$$

$$400 = 41n - n^2$$

$$+n^2 - 41n + 400 = 0$$

$$n^2 - [25 + 16]n + 400 = 0$$

$$\therefore n^2 - 25n - 16n + 400 = 0$$

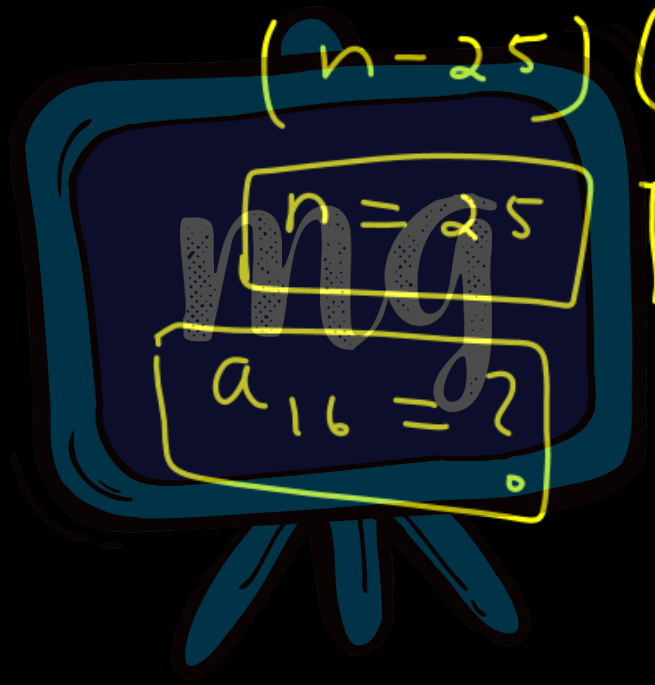
$$n[n - 25] - 16[n - 25] = 0$$

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$n(n-25) = 16[n-25] = 0$

$(n-25)(n-16) = 0$




$n = 16$

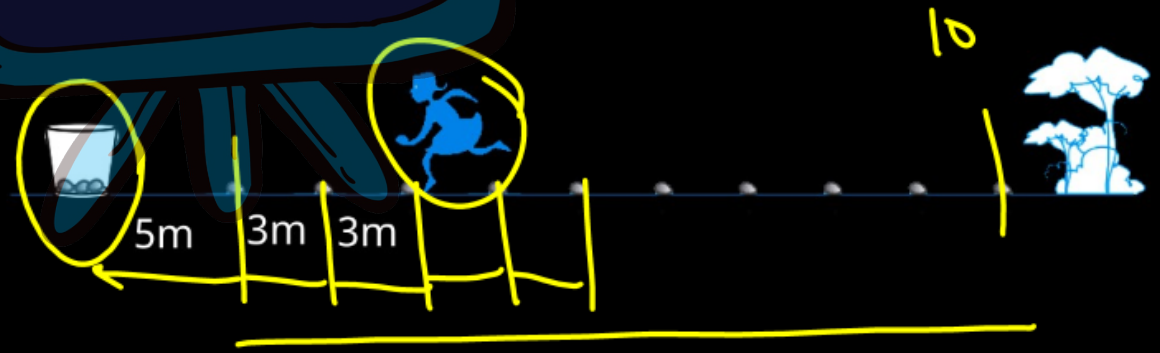
$a_{25} = ?$

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# Exercise : 5.3

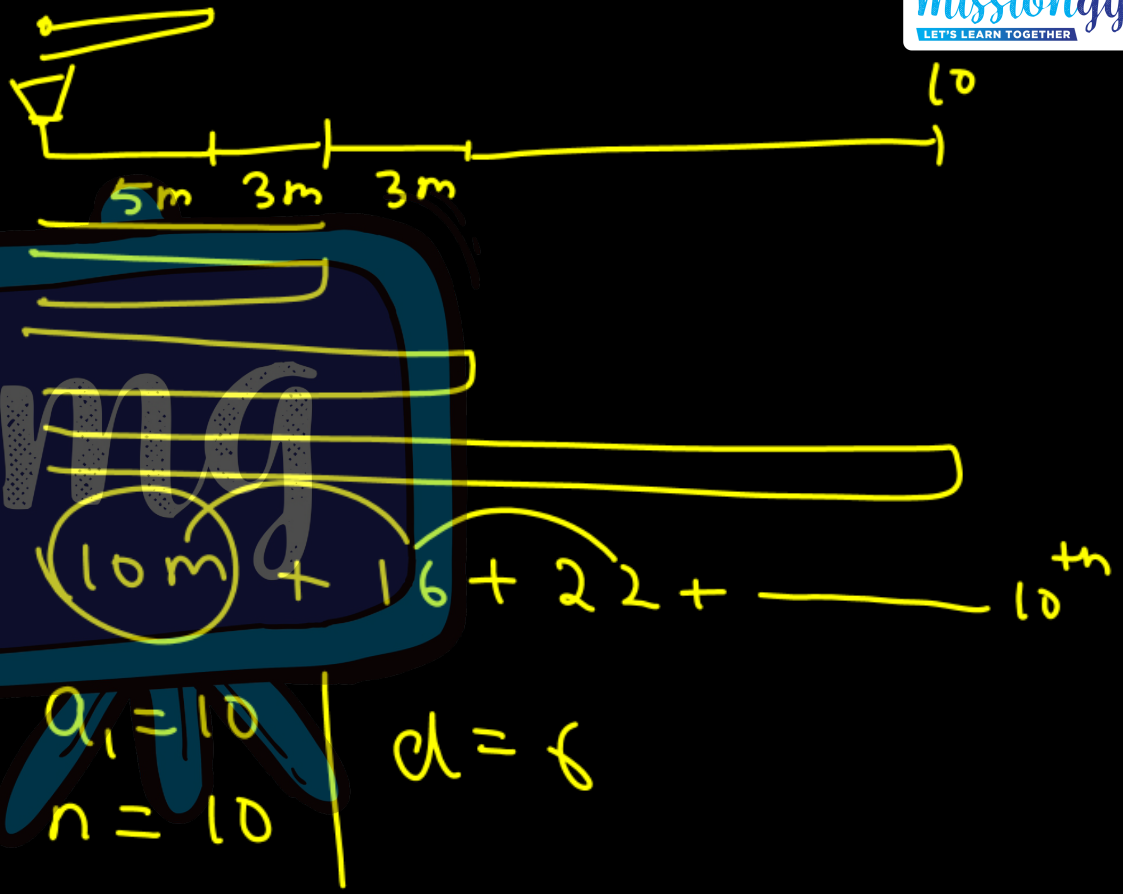
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**Q.20** In a potato race, a bucket is placed at the starting point, which is 5m from the first potato, and the other potatoes are placed 3m apart in a straight line. There are ten potatoes in the line.



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$$S_n = \frac{n}{2}[2a + (n-1)$$

$$S_{10} = \frac{10}{2}[2 \times 10 + (9)\,6]$$

$$= 5[20 + 54]$$

$$S_{10} = 5[74]$$

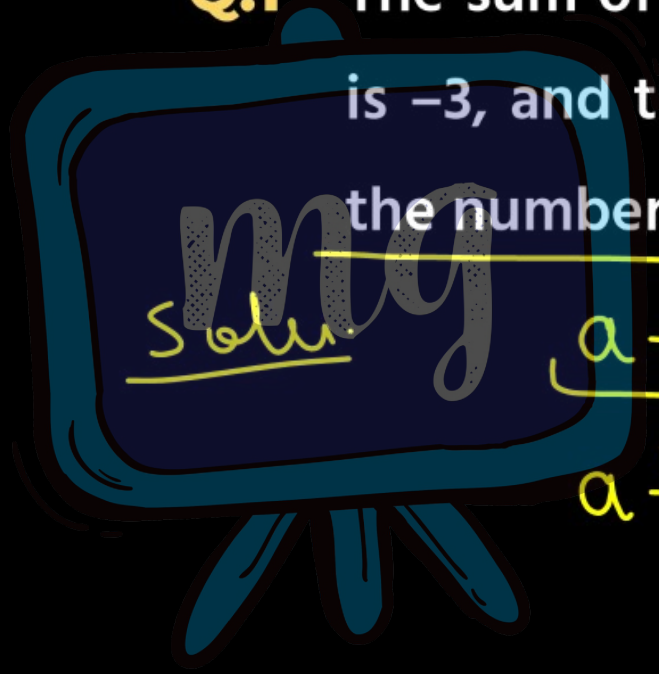
$$S_{10} = 370\,m$$

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# PREVIOUS YEAR QUESTIONS

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**Q.1** The sum of three numbers in A.P. is −3, and their product is 8. Find the numbers.



Solu.

$a-d, a, a+d$

$a-d+a+a+d=-3$

$3a=-3$

$a=-1$

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$= (a-d)(a)(a+d) = 8$

$= ((-1)-d)(-1)((-1)+d) = 8$

$((-1)^2 - d^2)(-1) = 8$

$1 - d^2 = -8$

$1 + 8 = d^2$

$9 = d^2$

$d = \pm 3$

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$a = -1 \quad | \quad d = \pm 3$

$a - d, a, a + d$

for $d = +3$, $a = -1$

$-1-3, -1, -1+3$

$-4, -1, 2$

$2, -1, -4$

$\therefore$

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$a-2d, a-d, a, a+d$

$a-d, a, a+d, a+2d$

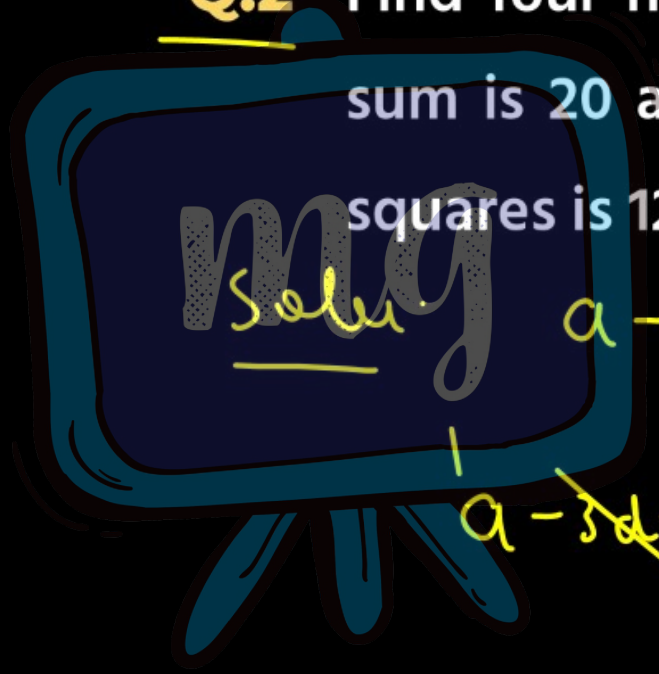


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# PREVIOUS YEAR QUESTIONS

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**Q.2** Find four numbers in A.P. whose sum is 20 and the sum of whose squares is 120.



Solu. $a-3d, a-d, a+d, a+3d$

$$\underset{1}{a-3d}+\underset{1}{a-d}+\underset{1}{a+d}+\underset{1}{a+3d}=20$$

$$4a=20$$

$$\boxed{a=5}$$

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$$(a-3d)^2+(a-d)^2+(a+d)^2+(a+3d)^2=120$$

$$(5-3d)^2+(5-d)^2+(5+d)^2+(5+3d)^2=120$$

$$25+9d^2-30d+25+9d^2+30d$$

$$\boxed{50+18d^2}$$

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$$(5-d)^2 + (5+d)^2$$

$$25 + d^2 - 10d + 25 + d^2 + 10d$$

$$50 + 2d^2 + 50 + 18d^2$$

$$= 120$$

$$20d^2 + 100 = 120$$

$$20d^2 = 20$$

$$d^2 = 1$$

$$d = \pm 1$$

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$\sqrt{d^{(2)}} = \sqrt{1}$

$d = \pm\sqrt{+1}$

$d = \pm 1$

$d^2 = \pm 1$

$d^2 - 1 = 0$

$d^2 - (1)^2 = 0$

$(d-1)(d+1) = 0$

$d - 1 = 0$

$d = +1$

$d + 1 = 0$

$d = -1$