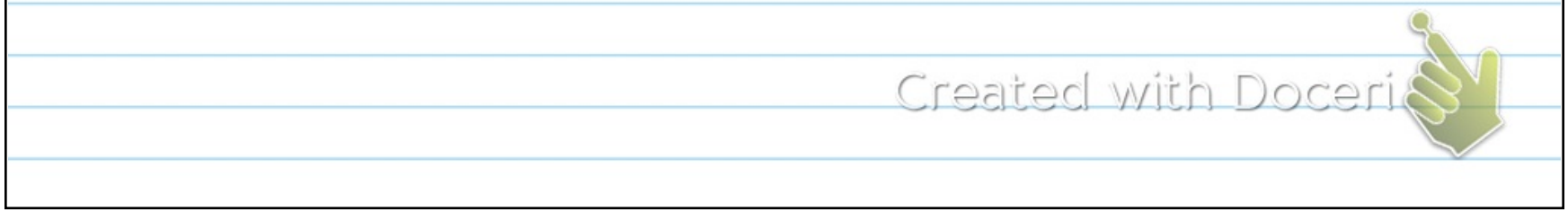
Unit 3
Lesson 1

Simplifying Square Roots



NUMBER MULTIPLIED	PERFECT SQUARES	NUMBER MULTIPLIED	PERFECT SQUARES	NUMBER MULTIPLIED	PERFECT SQUARES	NUMBER MULTIPLIED	PERFECT SQUARES
1 X 1 =	1	6 X 6 =	36	11 X 11 =	121	16 X 16 =	256
2 X 2 =	4	7 X 7 =	49	12 X 12 =	144	17 X 17 =	289
3 X 3 =	9	8 X 8 =	64	13 X 13 =	169	18 X 18 =	324
4 X 4 =	16	9 X 9 =	81	14 X 14 =	196	19 X 19 =	361
5 X 5 =	25	10 X 10 =	100	15 X 15 =	225	20 X 20 =	400

Taking the square root of a number is the **inverse** of raising the number to the second power.

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SQUARE ROOTS and CUBE ROOTS

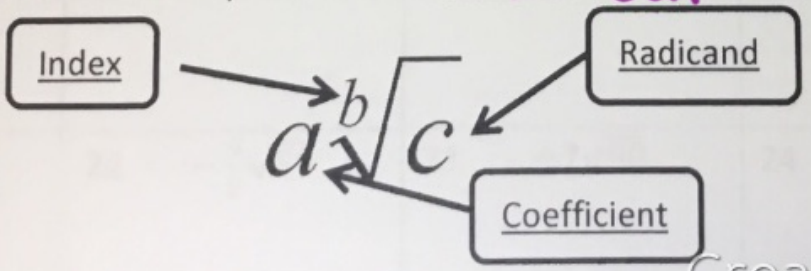
For example: If $3^2 =$ 9, then $\sqrt{9} =$ 3. For example: If $7^2 =$ 49, then $\sqrt{49} =$ 7.

Taking the cube root of a number is the inverse of raising the number to the third power.

For example: If $3^3 =$ 27, then $\sqrt[3]{27} =$ 3. For example: If $7^3 =$ 343, then $\sqrt[3]{343} =$ 7.

PARTS OF A RADICAL

An expression that contains a square root is a radical. It can have three parts.



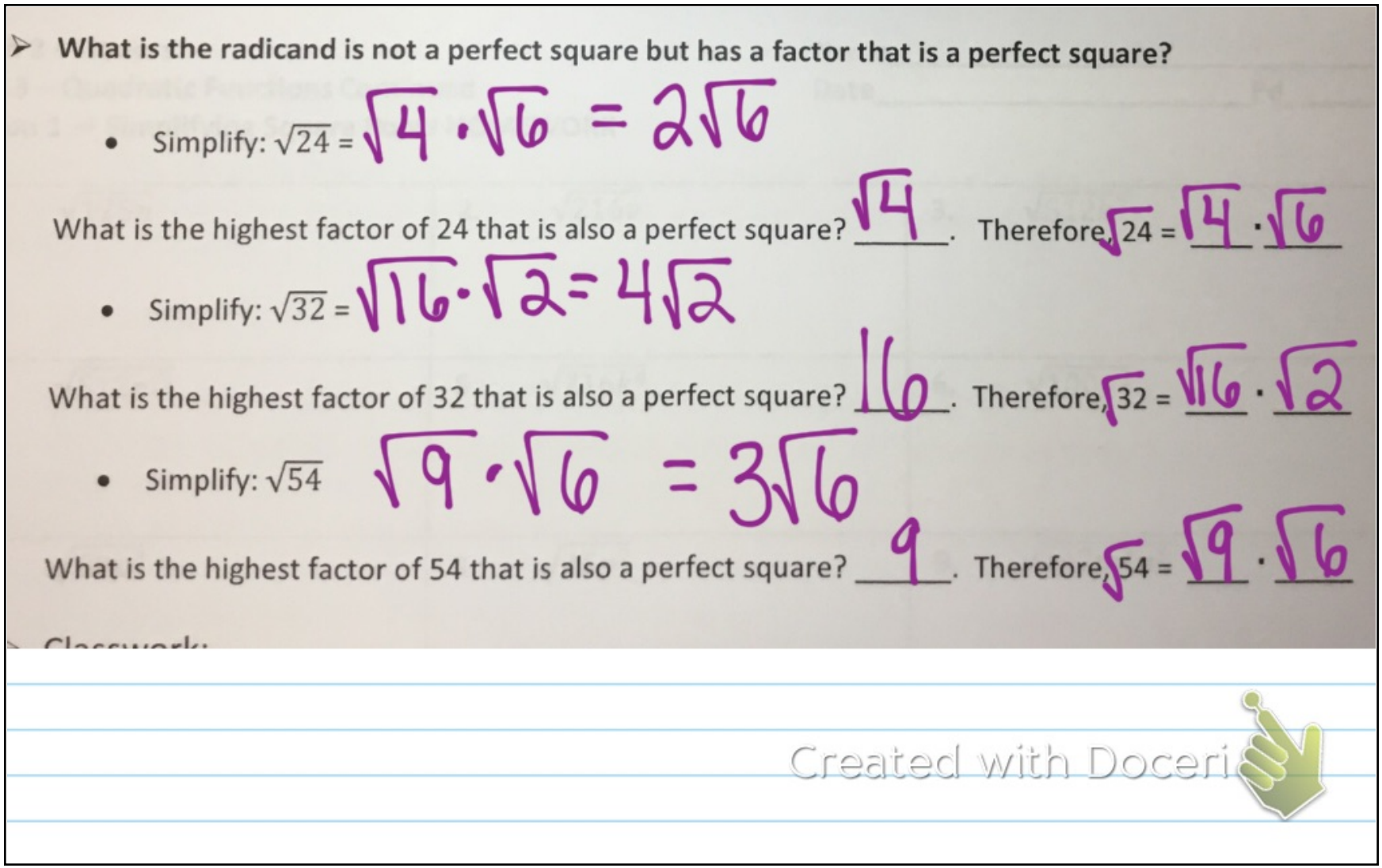
➢ Simplify the following radical expressions.

$\sqrt{100} =$ 10 $\quad 3\sqrt{121} =$ 3·11=33 $\quad -\sqrt{225} =$ -15 $\quad -2\sqrt{144} =$ -2·12=-24

$\sqrt{25} =$ 5 $\quad 7\sqrt{81} =$ 7·9=63 $\quad \pm\sqrt{49} =$ ±7 $\quad \pm 9\sqrt{9} =$ ±9·3=±27

$\sqrt{3412} \neq \sqrt{3412}$

$2\sqrt{341}$


What is the radicand is not a perfect square but has a factor that is a perfect square?
Simplify: $\sqrt{24}$ = $\sqrt{4} \cdot \sqrt{6} = 2\sqrt{6}$
What is the highest factor of 24 that is also a perfect square? $\sqrt{4}$. Therefore, $\sqrt{24}$ = $\sqrt{4} \cdot \sqrt{6}$
Simplify: $\sqrt{32}$ = $\sqrt{16} \cdot \sqrt{2} = 4\sqrt{2}$
What is the highest factor of 32 that is also a perfect square? 16. Therefore, $\sqrt{32}$ = $\sqrt{16} \cdot \sqrt{2}$
Simplify: $\sqrt{54}$ $\sqrt{9} \cdot \sqrt{6} = 3\sqrt{6}$
What is the highest factor of 54 that is also a perfect square? 9. Therefore, $\sqrt{54}$ = $\sqrt{9} \cdot \sqrt{6}$
Classwork:
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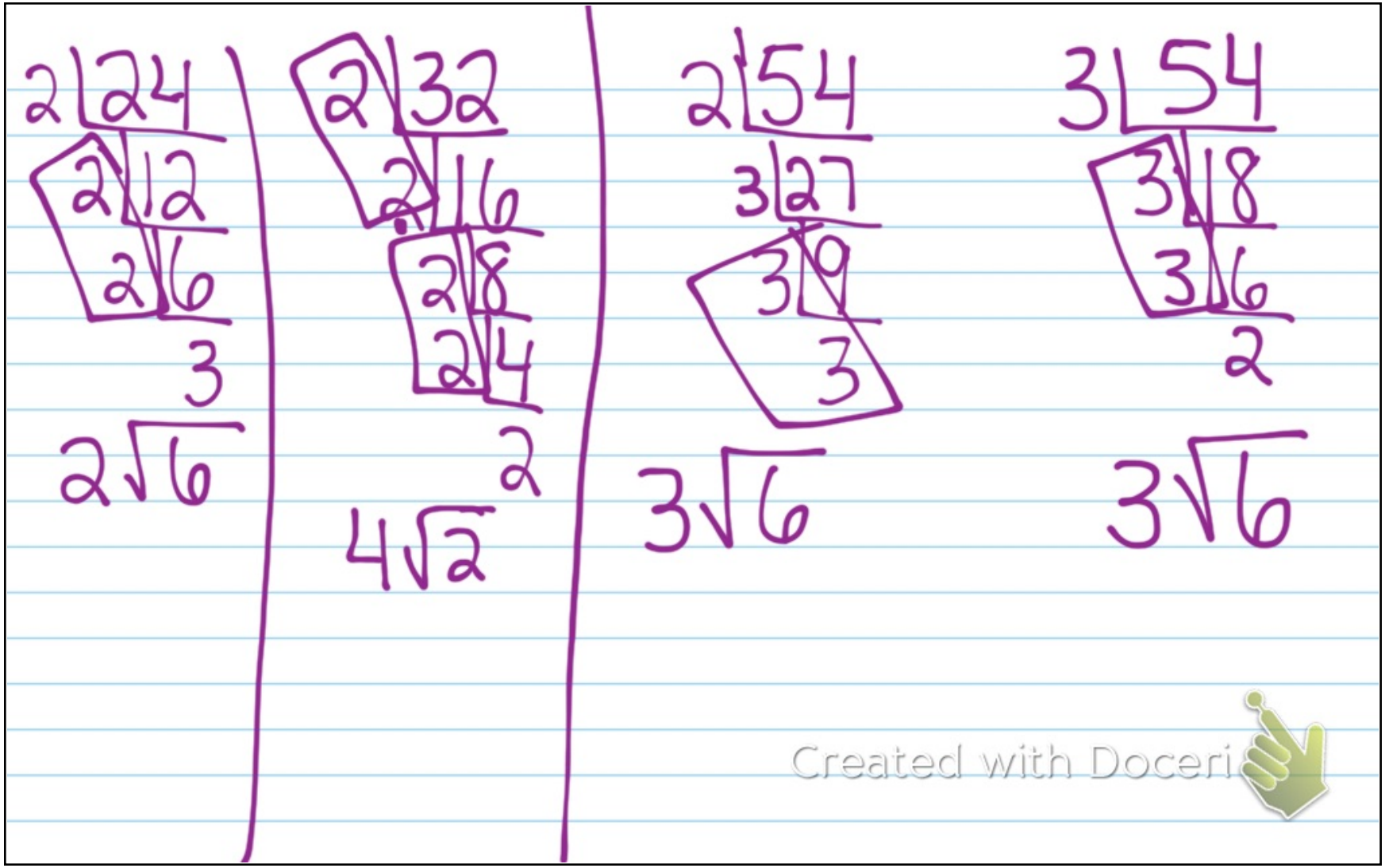
2|24
2|12
2|6
3
2√6
2|32
2|16
2|8
2|4
2
4√2
2|54
3|27
3|9
3
3√6
3|54
3|18
3|6
2
3√6
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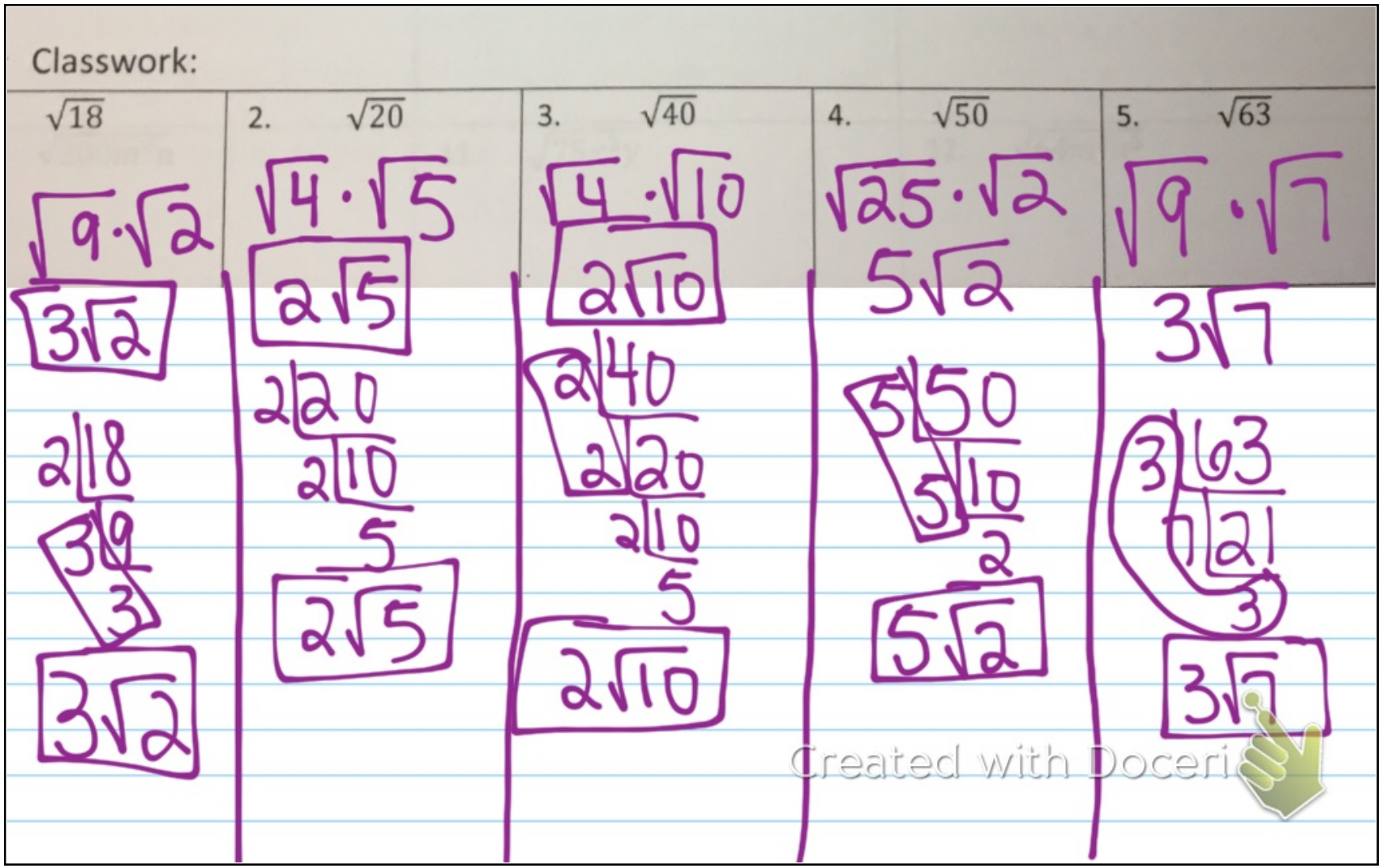
Classwork:
√18
√9·√2
3√2
2|18
3|9
3
3√2
2. √20
√4·√5
2√5
2|20
2|10
5
2√5
3. √40
√4·√10
2√10
2|40
2|20
2|10
5
2√10
4. √50
√25·√2
5√2
5|50
5|10
2
5√2
5. √63
√9·√7
3√7
3|63
7|21
3
3√7
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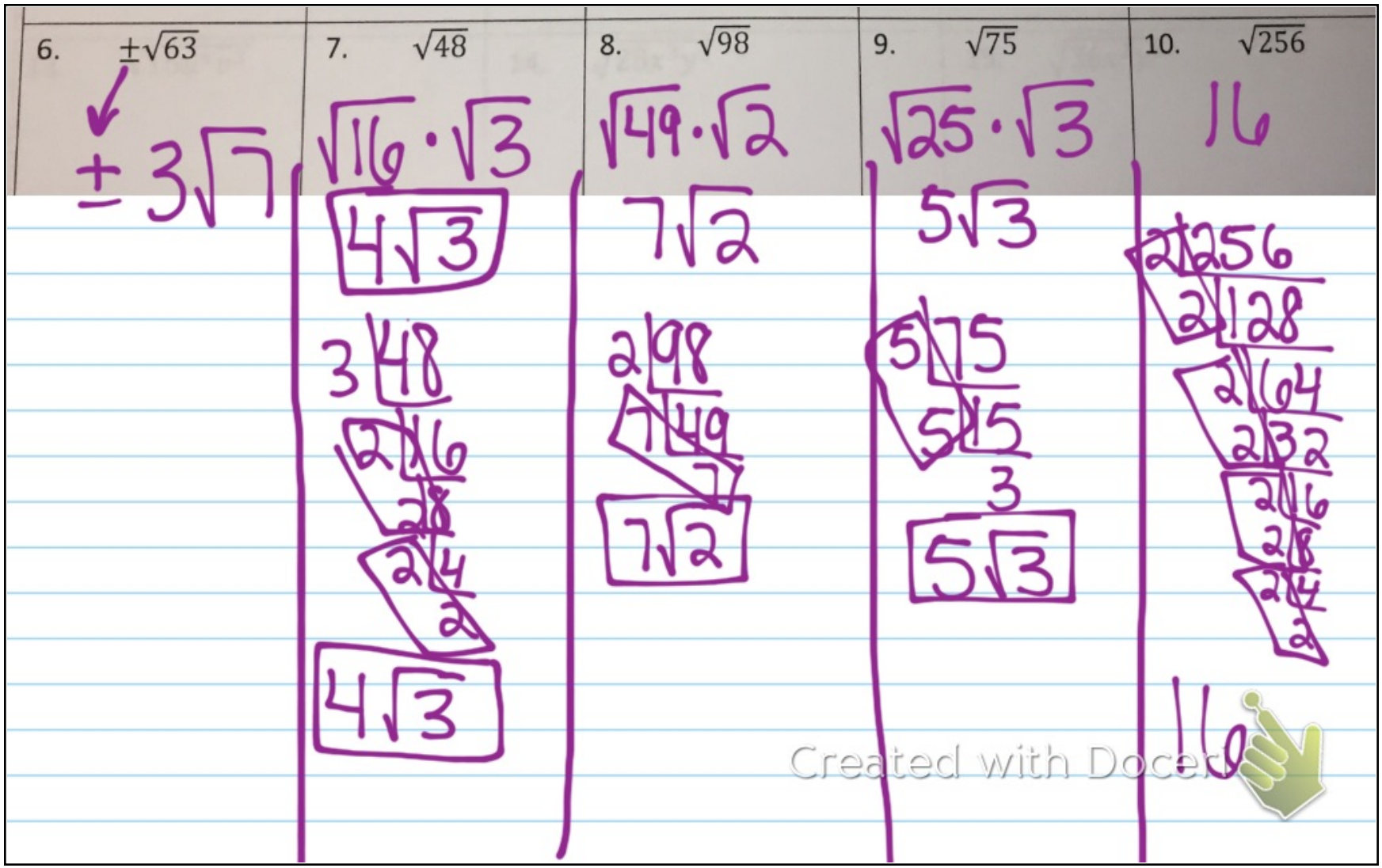
6. $\pm\sqrt{63}$
$\pm 3\sqrt{7}$
7. $\sqrt{48}$
$\sqrt{16}\cdot\sqrt{3}$
$4\sqrt{3}$
3|48
2|16
2|8
2|4
2
$4\sqrt{3}$
8. $\sqrt{98}$
$\sqrt{49}\cdot\sqrt{2}$
$7\sqrt{2}$
2|98
7|49
7
$7\sqrt{2}$
9. $\sqrt{75}$
$\sqrt{25}\cdot\sqrt{3}$
$5\sqrt{3}$
5|75
5|15
3
$5\sqrt{3}$
10. $\sqrt{256}$
16
2|256
2|128
2|64
2|32
2|16
2|8
2|4
2
16
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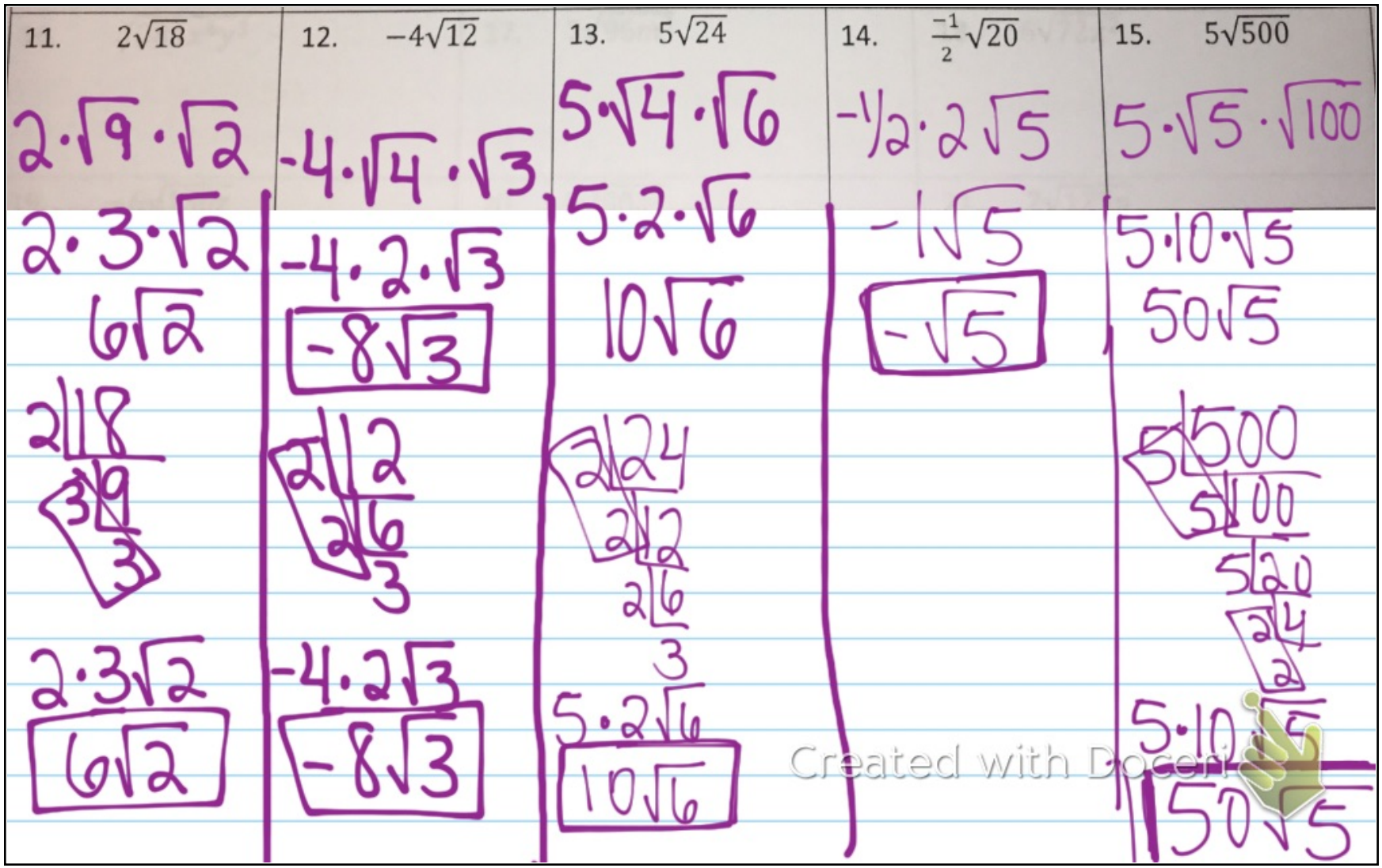
11. $2\sqrt{18}$
$2 \cdot \sqrt{9} \cdot \sqrt{2}$
$2 \cdot 3 \cdot \sqrt{2}$
$6\sqrt{2}$
2|18
3|9
3
$2 \cdot 3\sqrt{2}$
$6\sqrt{2}$
12. $-4\sqrt{12}$
$-4 \cdot \sqrt{4} \cdot \sqrt{3}$
$-4 \cdot 2 \cdot \sqrt{3}$
$-8\sqrt{3}$
2|12
2|6
3
$-4 \cdot 2\sqrt{3}$
$-8\sqrt{3}$
13. $5\sqrt{24}$
$5 \cdot \sqrt{4} \cdot \sqrt{6}$
$5 \cdot 2 \cdot \sqrt{6}$
$10\sqrt{6}$
2|24
2|12
2|6
3
$5 \cdot 2\sqrt{6}$
$10\sqrt{6}$
14. $\frac{-1}{2}\sqrt{20}$
$-\frac{1}{2} \cdot 2\sqrt{5}$
$-1\sqrt{5}$
$-\sqrt{5}$
15. $5\sqrt{500}$
$5 \cdot \sqrt{5} \cdot \sqrt{100}$
$5 \cdot 10 \cdot \sqrt{5}$
$50\sqrt{5}$
5|500
5|100
5|20
2|4
2
$5 \cdot 10\sqrt{5}$
$50\sqrt{5}$
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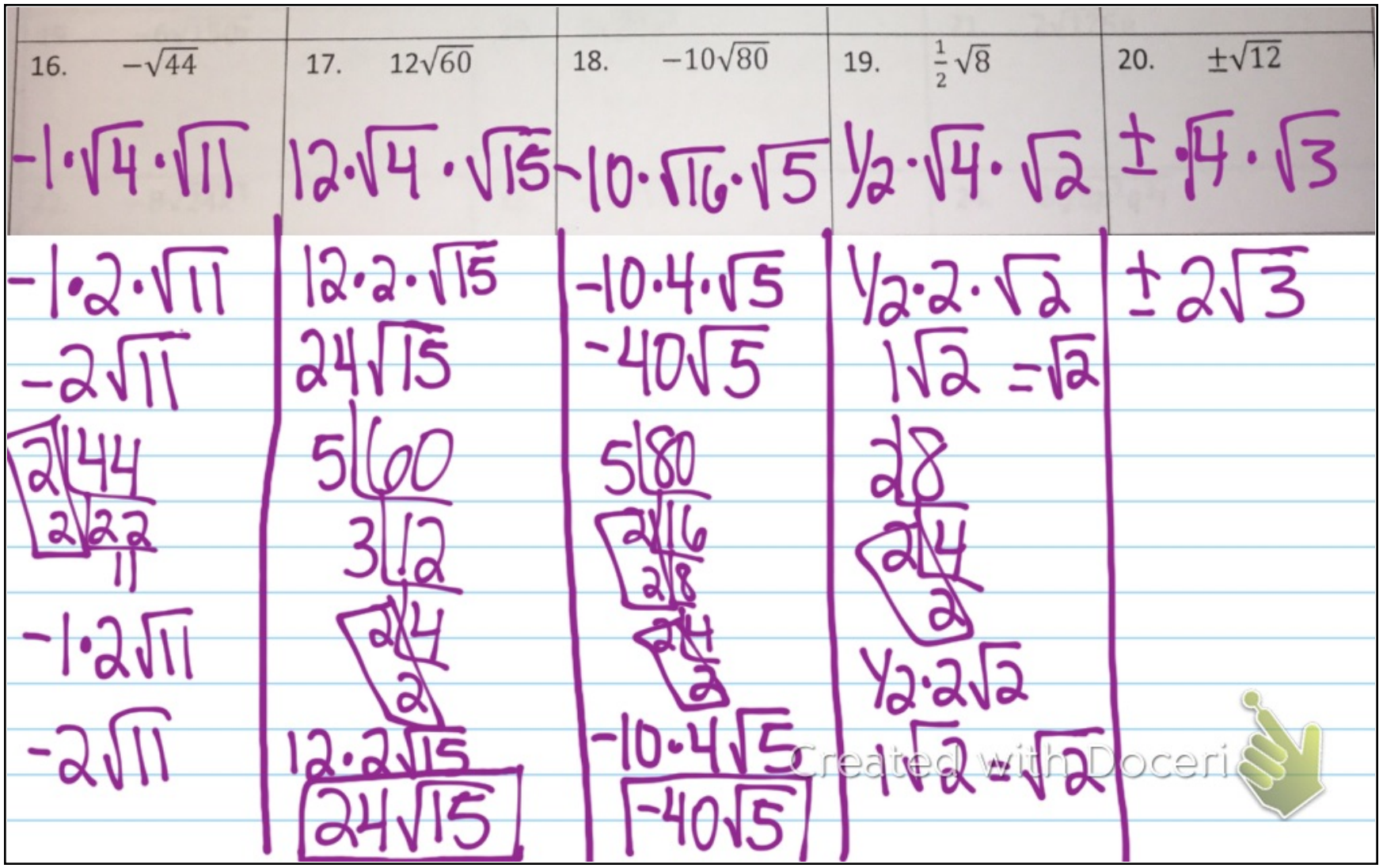
16. $-\sqrt{44}$
17. $12\sqrt{60}$
18. $-10\sqrt{80}$
19. $\frac{1}{2}\sqrt{8}$
20. $\pm\sqrt{12}$
$-1\cdot\sqrt{4}\cdot\sqrt{11}$
$12\cdot\sqrt{4}\cdot\sqrt{15}$
$-10\cdot\sqrt{16}\cdot\sqrt{5}$
$1/2\cdot\sqrt{4}\cdot\sqrt{2}$
$\pm\sqrt{4}\cdot\sqrt{3}$
$-1\cdot2\cdot\sqrt{11}$
$12\cdot2\cdot\sqrt{15}$
$-10\cdot4\cdot\sqrt{5}$
$1/2\cdot2\cdot\sqrt{2}$
$\pm2\sqrt{3}$
$-2\sqrt{11}$
$24\sqrt{15}$
$-40\sqrt{5}$
$1\sqrt{2}=\sqrt{2}$
2|44
2|22
11
5|60
3|12
2|4
2
5|80
2|16
2|8
2|4
2
$-1\cdot2\sqrt{11}$
$12\cdot2\sqrt{15}$
$-10\cdot4\sqrt{5}$
$1/2\cdot2\sqrt{2}$
$-2\sqrt{11}$
$24\sqrt{15}$
$-40\sqrt{5}$
$1\sqrt{2}=\sqrt{2}$
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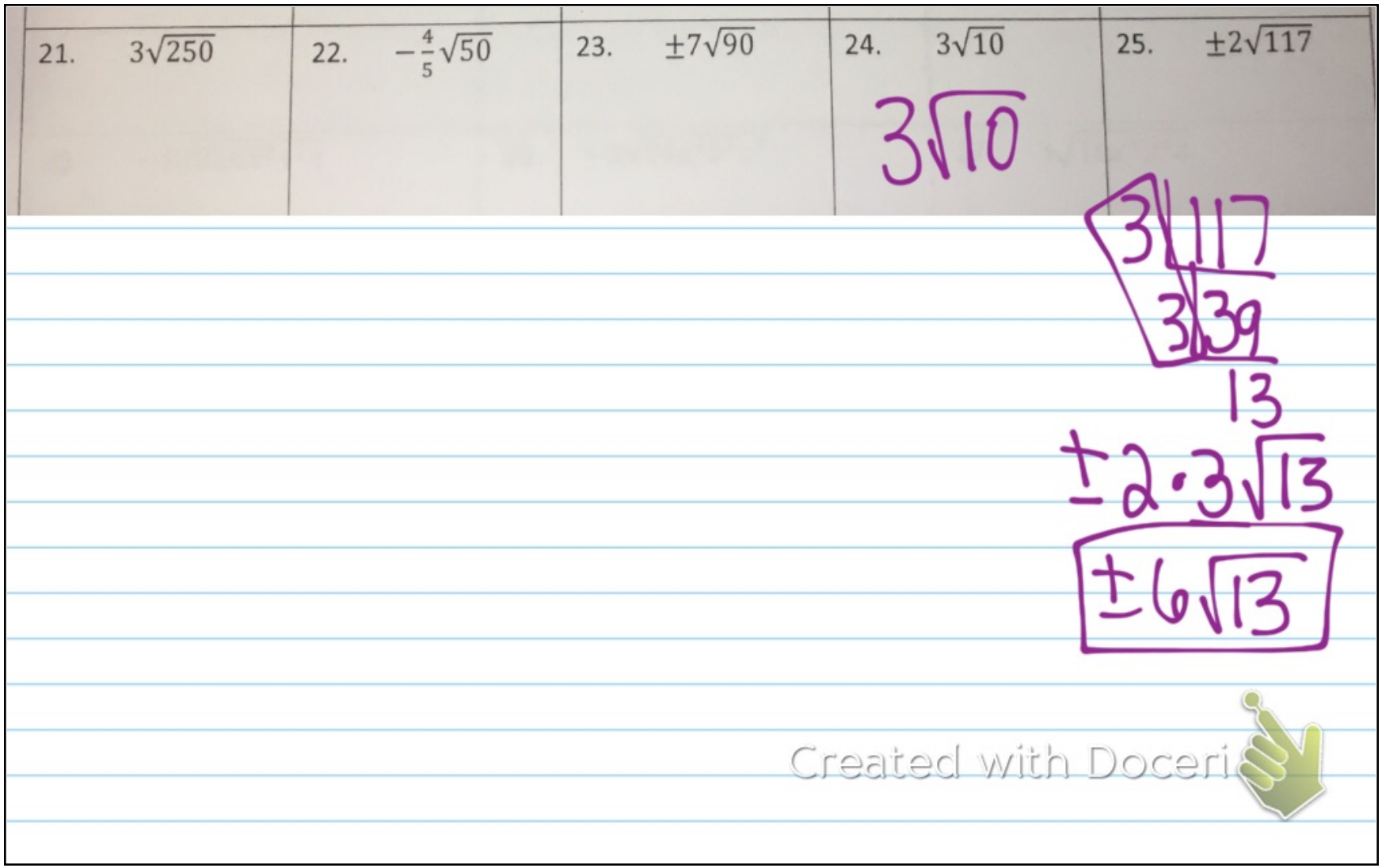
21. $3\sqrt{250}$
22. $-\frac{4}{5}\sqrt{50}$
23. $\pm 7\sqrt{90}$
24. $3\sqrt{10}$
25. $\pm 2\sqrt{117}$
$3\sqrt{10}$
$3\sqrt{117}$
$3\sqrt{39}$
13
$\pm 2 \cdot 3\sqrt{13}$
$\pm 6\sqrt{13}$
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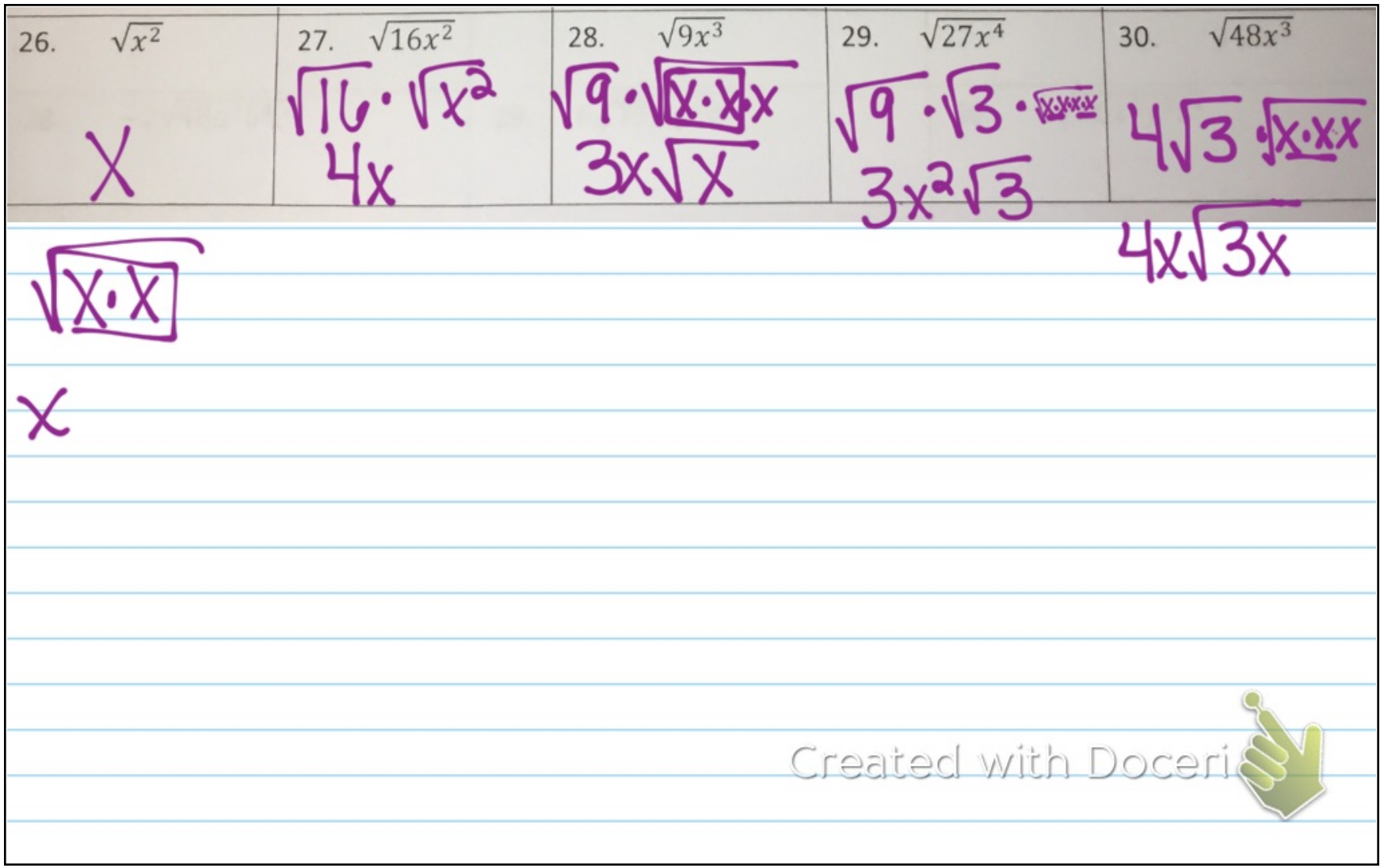
26. $\sqrt{x^2}$
X
27. $\sqrt{16x^2}$
$\sqrt{16}\cdot\sqrt{x^2}$
4x
28. $\sqrt{9x^3}$
$\sqrt{9}\cdot\sqrt{x\cdot x}\cdot x$
$3x\sqrt{x}$
29. $\sqrt{27x^4}$
$\sqrt{9}\cdot\sqrt{3}\cdot\sqrt{x\cdot x\cdot x\cdot x}$
$3x^2\sqrt{3}$
30. $\sqrt{48x^3}$
$4\sqrt{3}\cdot\sqrt{x\cdot x\cdot x}$
$4x\sqrt{3x}$
$\sqrt{x\cdot x}$
X
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