Year 9 Indices and Surds – Mixed Practice

ANSWER KEY HappyKids.fit

Answers and worked solutions · 30 questions

A. Mixed practice (mixed order)

1. 1/8

A negative index means the reciprocal: $2^{-3} = 1/2^3$

$= 1/8$

2. 11^7

Same base, so subtract the indices: $5 - (-2) = 7$

$= 11^7$

3. 7/2

Take the reciprocal: $(2/7)^{-1} = (7/2)$

$= 7/2$

4. n = −5

$32 = 2^5$, so $1/32 = 2^{-5}$

$n = -5$

5. Yes. A prime number is never a square number, so its square root is not a whole number or a fraction.

Test some examples

A prime number is never a square number, so its square root is not a whole number or a fraction.

Decide whether it is always true

6. 8 and 9

$8^3 = 512$ and $9^3 = 729$

$512 < 544 < 729$, so $\sqrt[3]{544}$ is between 8 and 9

7. 9^1

Same base, so add the indices: $8 + (-7) = 1$

$= 9^1$

8. 12.1

$12.1^2 = 146.41$ and $12.2^2 = 148.84$, so $\sqrt{147}$ is between 12.1 and 12.2

$12.15^2 = 147.6225$, which is more than 147, so $\sqrt{147} \approx 12.1$

9. Subtract the indices: 4 − (−2) = 6, so the answer is 2^6.

Error: subtracting a negative index adds it

$4 - (-2) = 4 + 2 = 6$

$= 2^6$

10. 5.2, $\sqrt{28}$, $\sqrt[3]{160}$, 17/3

Estimate each value as a decimal

$\sqrt{28} \approx 5.29$; $\sqrt[3]{160} \approx 5.43$; $17/3 \approx 5.67$; $5.2 \approx 5.20$

Then put them in order

11. 2^{19} files

$2^{33} \div 2^{14}$
Subtract the indices: 33 − 14 = 19
$= 2^{19}$ files

12. n = −3

$64 = 4^3$, so $1/64 = 4^{-3}$
n = −3

13. 7/3

Take the reciprocal: $(3/7)^{-1} = (7/3)$
= 7/3

14. 10.1

$10^2 = 100$ and $10.1^2 = 102.01$, so $\sqrt{102}$ is between 10 and 10.1
$10.05^2 = 101.0025$, which is less than 102, so $\sqrt{102} \approx 10.1$

15. $4^{-2} = 1/16$: a negative index means the reciprocal, not a negative number.

Error: the negative index was treated as a negative number
$4^{-2} = 1/4^2$
= 1/16

16. $1 + \sqrt{2}$, $\sqrt[3]{50}$

Irrational numbers cannot be written as a fraction of two integers
Square roots of non-square numbers, cube roots of non-cubes and π are irrational

17. Yes. $7^2 = 49$ and $8^2 = 64$, and $49 < 50 < 64$.

Test some examples
$7^2 = 49$ and $8^2 = 64$, and $49 < 50 < 64$.
Decide whether it is always true

18. 8 and 9

$8^3 = 512$ and $9^3 = 729$
$512 < 527 < 729$, so $\sqrt[3]{527}$ is between 8 and 9

19. 4^{-13}

Add, then subtract the indices: 2 + (−9) − 6 = −13
$= 4^{-13}$

20. 10 and 11

$10^2 = 100$ and $11^2 = 121$
$100 < 115 < 121$, so $\sqrt{115}$ is between 10 and 11

21. n = 0

Subtract the indices: n − 6 = −6
n = −6 + 6 = 0

22. 25/16

Take the reciprocal: $(4/5)^{-2} = (5/4)^2$

$= 25/16$

23. Yes. $10^{-2} = 1/10^2 = 1/100 = 0.01$.

Test some examples

$10^{-2} = 1/10^2 = 1/100 = 0.01$.

Decide whether it is always true

24. 2^{-4}

Add, then subtract the indices: $7 + (-6) - 5 = -4$

$= 2^{-4}$

25. 10 numbers (26 to 35); in general 2a numbers

$5^2 = 25$ and $6^2 = 36$

n can be 26 to 35: that is 10 numbers

$(a + 1)^2 - a^2 - 1 = 2a$, so there are always 2a of them

26. $\sqrt[3]{100}$, $\sqrt{74}$

Irrational numbers cannot be written as a fraction of two integers

Square roots of non-square numbers, cube roots of non-cubes and π are irrational

27. $\sqrt[3]{770}$, 28/3, 9.9, $\sqrt{99}$

Estimate each value as a decimal

$\sqrt{99} \approx 9.95$; $9.9 \approx 9.90$; $\sqrt[3]{770} \approx 9.17$; $28/3 \approx 9.33$

Then put them in order

28. 8.6

$8.6^2 = 73.96$ and $8.7^2 = 75.69$, so $\sqrt{74}$ is between 8.6 and 8.7

$8.65^2 = 74.8225$, which is more than 74, so $\sqrt{74} \approx 8.6$

29. Add first: $\sqrt{(64 + 225)} = \sqrt{289} = 17$. You cannot square root each part separately.

Error: the square root was taken of each part separately

$64 + 225 = 289$

$\sqrt{289} = 17$

30. 15.8 m

$15.8^2 = 249.64$ and $15.9^2 = 252.81$

$15.85^2 = 251.2225$, so the side ≈ 15.8 m