SQUARE ROOTS

A SQUARE ROOTS

A.1 CALCULATING SQUARE ROOTS OF PERFECT SQUARES

Ex 1: Calculate:

$$\sqrt{4} = \square$$

Ex 2: Without using a calculator, calculate:

$$\sqrt{36} = \square$$

Ex 3: Calculate:

$$\sqrt{64} = \square$$

Ex 4: Calculate:

$$\sqrt{49} = \square$$

Ex 5: Calculate:

$$\sqrt{100} = \square$$

Ex 6: Calculate:

$$\sqrt{81} = \square$$

Ex 7: Calculate:

$$\sqrt{0} = \square$$

A.2 CALCULATING SQUARE ROOTS OF FRACTIONS

Ex 8: Write in fraction form:

$$\sqrt{\frac{1}{4}} = \square$$

Ex 9: Write in fraction form:

$$\sqrt{\frac{1}{25}} = \square$$

Ex 10: Write in fraction form:

$$\sqrt{\frac{1}{9}} = \square$$

Ex 11: Write in fraction form:

$$\sqrt{\frac{1}{16}} = \square$$

Ex 12: Write in fraction form:

$$\sqrt{\frac{9}{16}} = \square$$

Ex 13: Write in fraction form:

$$\sqrt{\frac{4}{9}} = \square$$

B CALCULATING SQUARE ROOTS

B.1 USING A CALCULATOR

Ex 14: Using a calculator, evaluate $\sqrt{2}$ (round to 2 decimal places).

$$\sqrt{2} \approx \square$$

Ex 15: Using a calculator, evaluate $\sqrt{10}$ (round to 2 decimal places).

$$\sqrt{10} \approx \square$$

Ex 16: Using a calculator, evaluate $\sqrt{50}$ (round to 2 decimal places).

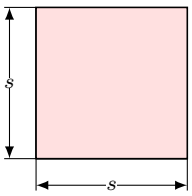
$$\sqrt{50} \approx \square$$

Ex 17: Using a calculator, evaluate $\sqrt{0.5}$ (round to 2 decimal places).

$$\sqrt{0.5} \approx \square$$

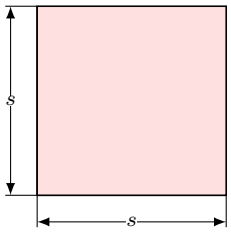
B.2 FINDING THE SIDE LENGTH OF A SQUARE

Ex 18: The area of a square is 2 m^2. What is the length of the side of the square, s?



$s \approx \square$ m (round your answer to 2 decimal places)

Ex 19: The area of a square is 10 m^2. What is the length of the side of the square, s?



$s \approx \square$ m (round your answer to 2 decimal places)

C NTH ROOTS

C.1 CALCULATING CUBE ROOTS OF PERFECT CUBES

Ex 20: Calculate:

$$\sqrt[3]{8} = \square$$

Ex 21: Without using a calculator, calculate:

$$\sqrt[3]{27} = \square$$

Ex 22: Calculate:

$$\sqrt[3]{64} = \square$$

Ex 23: Calculate:

$$\sqrt[3]{125} = \square$$

Ex 24: Calculate:

$$\sqrt[3]{1\,000} = \square$$

Ex 25: Calculate:

$$\sqrt[3]{0} = \square$$

D LAWS OF RADICALS

D.1 WRITING AS A SINGLE ROOT: LEVEL 1

Ex 26: Write as a single square root:

$$\sqrt{3}\sqrt{4} = \square$$

Ex 27: Write as a single square root:

$$\sqrt{5}\sqrt{20} = \square$$

Ex 28: Write as a single square root:

$$\sqrt{6}\sqrt{6} = \square$$

Ex 29: Write as a single square root:

$$\sqrt{9}\sqrt{4} = \square$$

Ex 30: Write as a single square root:

$$\sqrt{2}\sqrt{8} = \square$$

D.2 WRITING AS A SINGLE ROOT: LEVEL 2

Ex 31: Write as a single square root:

$$\sqrt{2}\sqrt{3}\sqrt{5} = \square$$

Ex 32: Write as a single square root:

$$\sqrt{5}\sqrt{2}\sqrt{10} = \square$$

Ex 33: Write as a single square root:

$$\left(\sqrt{3}\right)^3 = \square$$

Ex 34: Write as a single square root:

$$\left(\sqrt{2}\right)^3\sqrt{3} = \square$$

D.3 UNDERSTANDING SQUARE ROOT OPERATIONS

MCQ 35: Is $\sqrt{2}+\sqrt{3} = \sqrt{2+3}$?

☐ True

☐ False

MCQ 36: Is $\sqrt{2}\sqrt{3} = \sqrt{6}$?

☐ True

☐ False

MCQ 37: Is $\sqrt{3}+\sqrt{3} = \sqrt{3+3}$?

☐ True

☐ False

MCQ 38: Is $\sqrt{3}+\sqrt{3} = 3$?

☐ True

☐ False

D.4 SIMPLIFYING THE SQUARE ROOT OF A PERFECT SQUARE: LEVEL 1

Ex 39: Simplify:

$$\sqrt{4} = \square$$

Ex 40: Simplify:

$$\sqrt{36} = \square$$

Ex 41: Simplify:

$$\sqrt{10^2} = \square$$

Ex 42: Simplify:

$$\text{For } x \geq 0, \sqrt{x^2} = \square$$

Ex 43: Simplify:

$$\text{For } x \geq 0, \sqrt{(2x)^2} = \square$$

D.5 SIMPLIFYING THE SQUARE ROOT OF A PERFECT SQUARE: LEVEL 2

Ex 44: Simplify:

$$\text{For } x \geq 0, \sqrt{9x^2} = \square$$

Ex 45: Simplify:

$$\sqrt{x^4} = \square$$

Ex 46: Simplify:

$$\text{For } x \geq 0, \sqrt{4x^2} + x = \square$$

Ex 47: Simplify:

$$\sqrt{12}\sqrt{3} = \square$$

D.6 SIMPLIFYING SQUARE ROOTS

Ex 48: Simplify:

$$\sqrt{18} = \square$$

Ex 49: Simplify:

$$\sqrt{50} = \square$$

Ex 50: Simplify:

$$\sqrt{32} = \square$$

Ex 51: Simplify:

$$\sqrt{20} = \square$$

D.7 SIMPLIFYING QUOTIENTS OF SQUARE ROOTS

Ex 52: Simplify:

$$\frac{\sqrt{10}}{\sqrt{5}} = \square$$

Ex 53: Simplify:

$$\frac{\sqrt{75}}{\sqrt{25}} = \square$$

Ex 54: Simplify:

$$\frac{\sqrt{18}}{\sqrt{3}} = \square$$

Ex 55: Simplify:

$$\frac{\sqrt{20}}{\sqrt{2}} = \square$$

E ALGEBRAIC OPERATIONS WITH RADICALS

E.1 ADDING AND SUBTRACTING LIKE RADICALS: LEVEL 1

Ex 56: Simplify:

$$2\sqrt{3} + 5\sqrt{3} = \square$$

Ex 57: Simplify:

$$4\sqrt{5} + 7\sqrt{5} = \square$$

Ex 58: Simplify:

$$3\sqrt{6} - \sqrt{6} = \square$$

Ex 59: Simplify:

$$3\sqrt[3]{7} + 5\sqrt[3]{7} = \square$$

Ex 60: Simplify:

$$2\sqrt{2} - 4\sqrt{2} = \square$$

Ex 61: Simplify:

$$2\sqrt{7} - 5\sqrt{7} = \square$$

E.2 ADDING AND SUBTRACTING LIKE RADICALS: LEVEL 2

Ex 62: Simplify:

$$\sqrt{8} - \sqrt{2} = \square$$

Ex 63: Simplify:

$$\sqrt{12} + 3\sqrt{3} = \square$$

Ex 64: Simplify:

$$5\sqrt{3} - \sqrt{12} = \square$$

Ex 65: Simplify:

$$2\sqrt{7} + 3\sqrt{28} = \square$$

F RATIONALIZING THE DENOMINATOR

F.1 WRITING WITH AN INTEGER DENOMINATOR: LEVEL 1

Ex 66: Simplify:

$$\frac{1}{\sqrt{2}} = \square$$

Ex 67: Simplify:

$$\frac{2}{\sqrt{2}} = \square$$

Ex 68: Simplify:

$$\frac{2}{\sqrt{3}} = \square$$

Ex 69: Simplify:

$$\frac{3}{\sqrt{6}} = \square$$

F.2 WRITING WITH AN INTEGER DENOMINATOR: LEVEL 2

Ex 70: Simplify:

$$\frac{3}{2\sqrt{3}} = \square$$

Ex 71: Simplify:

$$\frac{5}{\sqrt{8}} = \square$$

Ex 72: Simplify:

$$\frac{4}{3\sqrt{2}} = \square$$

Ex 73: Simplify:

$$\frac{6}{\sqrt{12}} = \square$$

F.3 WRITING IN THE FORM $a \pm \sqrt{b}$

Ex 74: Simplify:

$$\frac{1}{1+\sqrt{2}} = \square$$

Ex 75: Simplify:

$$\frac{1}{\sqrt{2}-1} = \square$$

Ex 76: Simplify:

$$\frac{4}{1-\sqrt{3}} = \square$$

Ex 77: Simplify:

$$\frac{5}{\sqrt{3}-2} = \square$$

F.4 WRITING IN THE FORM $a + b\sqrt{2}$

Ex 78: Simplify:

$$\frac{\sqrt{2}+1}{\sqrt{2}-1} = \square$$

Ex 79: Simplify:

$$\frac{2}{3-2\sqrt{2}} = \square$$

Ex 80: Simplify:

$$\frac{3}{\sqrt{2}-1} = \square$$

Ex 81: Simplify:

$$\frac{4+\sqrt{2}}{2-\sqrt{2}} = \square$$

F.5 RATIONALIZING ALGEBRAIC DENOMINATORS

Ex 82: For $x > 0$, rationalize the denominator of the expression:

$$\frac{1}{\sqrt{x}} = \square$$

Ex 83: For $x > 0$, rationalize the denominator of the expression:

$$\frac{x}{\sqrt{x}} = \square$$

Ex 84: For $x > 0$, rationalize the denominator of the expression:

$$\frac{5}{\sqrt{2x}} = \square$$

Ex 85: For $x > 0$, simplify the expression by rationalizing the denominator:

$$\frac{x+1}{\sqrt{x}} = \square$$

F.6 RATIONALIZING BINOMIAL ALGEBRAIC DENOMINATORS

Ex 86: For $x \geq 0$ and $x \neq 1$, rationalize the denominator of the expression:

$$\frac{1}{1+\sqrt{x}} = \square$$

Ex 87: For $x \geq 0$ and $x \neq 9$, rationalize the denominator of the expression:

$$\frac{x-9}{\sqrt{x}-3} = \square$$

Ex 88: For $x \geq 0$ and $x \neq 1$, rationalize the denominator of the expression:

$$\frac{\sqrt{x}}{\sqrt{x}+1} = \square$$

F.7 APPLYING MULTIPLE RADICAL SKILLS

Ex 89: Consider the expression $\sqrt{75} - \sqrt{12}$.

1. Show that $\sqrt{75} - \sqrt{12} = 3\sqrt{3}$.
2. Hence, simplify the expression $\dfrac{18}{\sqrt{75}-\sqrt{12}}$ by rationalizing the denominator.

Ex 90: Consider the expression $\dfrac{10}{3-\sqrt{7}}$.

1. Write down the conjugate of $3-\sqrt{7}$.

2. Express $\dfrac{10}{3-\sqrt{7}}$ in the form $a+b\sqrt{7}$, where $a, b \in \mathbb{Z}$.

Ex 91: Consider the expression $(2+\sqrt{3})^2$.

1. Expand and simplify $(2+\sqrt{3})^2$ into the form $a+b\sqrt{3}$, where $a, b \in \mathbb{Z}$.

2. Hence, find the value of $(2+\sqrt{3})^4$.