

A Algebra: Solving quadratic equations

Solve these equations:

- | | | |
|---|--------------------------|-------------------------|
| 1 $a^2 = 49$ | 2 $5a^2 = 125$ | 3 $a^2 - 1 = 99$ |
| 4 $2(a^2 + 1) = 100$ | 5 $\frac{b^2}{3} = 27$ | 6 $(a + 4)(a + 1) = 0$ |
| 7 $(a - 2)(a + 1)$ | 8 $(a - 3)(a + 1) = 0$ | 9 $(a + 5)(a - 9) = 0$ |
| 10 $\left(\frac{a}{2} + 1\right)(3a - 2) = 0$ | 11 $(2a + 1)(a - 1) = 0$ | 12 $a^2 + 11a + 18 = 0$ |
| 13 $a^2 - 2a - 15 = 0$ | 14 $a^2 + 2a - 15 = 0$ | 15 $a^2 - a - 56 = 0$ |

B Indices: Negative Indices

Express the following with positive indices:

- | | | | |
|--------------------|----------------------|--------------------|-------------------------|
| 1 $a^{-2}b$ | 2 $3ab^{-4}$ | 3 $6a^{-1}c^{-4}$ | 4 $5ab^{-2}$ |
| 5 $6a^{-4}c^{-1}$ | 6 $3a^{-4}b^2$ | 7 $2ab^{-4}$ | 8 $12a^{-2}b$ |
| 9 $6a^{-2}b$ | 10 $3a^{-2}b^{-3}$ | 11 $6^{-2}ab$ | 12 $5^{-2}a^3b^{-1}$ |
| 13 $6^{-3}ab^{-3}$ | 14 $2^{-3}a^2b^{-2}$ | 15 $2^{-4}a^{-3}b$ | 16 $3^{-4}a^2b^{-2}$ |
| 17 $5^{-3}a^{-2}b$ | 18 $3^{-3}a^2b^{-4}$ | 19 $4^{-2}a^{-2}b$ | 20 $5^{-3}a^{-1}b^{-2}$ |

C Indices: Fractional Indices

Evaluate:

- | | | | |
|--|-----------------------------|----------------------|-------------------------------|
| 1 $36^{\frac{1}{2}}$ | 2 $49^{\frac{1}{2}}$ | 3 $1^{\frac{1}{2}}$ | 4 $1^{\frac{1}{3}}$ |
| 5 $8^{\frac{1}{3}}$ | 6 $27^{\frac{1}{3}}$ | 7 $64^{\frac{1}{3}}$ | 8 $2 \times 25^{\frac{1}{2}}$ |
| 9 $3\left(49^{\frac{1}{2}} + 1\right)$ | 10 $125^{\frac{1}{3}} - 12$ | | |

Evaluate using a calculator giving answers to 2 decimal places:

- | | | | |
|-------------------------------|--|-------------------------------|-------------------------------|
| 11 $2^{\frac{1}{2}}$ | 12 $5^{\frac{1}{2}}$ | 13 $6^{\frac{1}{2}} \times 4$ | 14 $5^{\frac{1}{2}} \times 3$ |
| 15 $8^{\frac{1}{2}} + 2$ | 16 $9^{\frac{1}{2}} + 2^{\frac{1}{2}}$ | 17 $8^{\frac{1}{2}} \times 3$ | 18 $5^{\frac{1}{2}} \times 4$ |
| 19 $7^{\frac{1}{2}} \times 3$ | 20 $11^{\frac{1}{2}}$ | | |

D Number applications: Sharing quantities in a given ratio

- Tracey, Alison and Kim share a lottery win of \$36,000 in the ratio 2:3:7. How much will each person win?
- Christopher and Matthew share a charity prize in the ratio that they paid for the ticket. If Christopher paid \$1.30 and Matthew paid \$3.90 how much will each receive from a win of \$900?
- Water molecules are composed of hydrogen and oxygen in the ratio 1:2. In 15 kg of water, how much
 - hydrogen is there, and
 - how much oxygen is there?

E Number applications: Using ratios within a population

- Sulphuric acid molecules are composed of hydrogen, sulphur and oxygen atoms in the ratio 2:1:4. If there are six million oxygen atoms, then how many hydrogen and sulphur atoms are there in the sample?
- A bag of coloured counters has red, blue, brown and yellow colours in the ratio 1:2:3:4. If there are 51 brown counters in the bag then how many red, blue and yellow ones are there in the bag? How many counters in total are there in the bag?

Worksheet 13

- A 1 ± 7 2 ± 5 3 ± 10 4 ± 7
5 ± 9 6 $-1, -4$ 7 $2, -1$ 8 $3, -1$
9 $9, -5$ 10 $-2, \frac{2}{3}$ 11 $-\frac{1}{2}, 1$ 12 $-2, -9$
13 $5, -3$ 14 $-5, 3$ 15 $8, -7$

- B 1 $\frac{b}{a^2}$ 2 $\frac{3a}{b^4}$ 3 $\frac{6}{ac^4}$ 4 $\frac{5a}{b^2}$
5 $\frac{6}{a^4c}$ 6 $\frac{3b^2}{a^4}$ 7 $\frac{2a}{b^4}$ 8 $\frac{12b}{a^2}$
9 $\frac{6b}{a^2}$ 10 $\frac{3}{a^2b^3}$ 11 $\frac{ab}{36}$ 12 $\frac{a^3}{25b}$
13 $\frac{a}{216b^3}$ 14 $\frac{a^2}{8b^2}$ 15 $\frac{b}{16a^3}$ 16 $\frac{a^2}{81b^2}$
17 $\frac{b}{125a^2}$ 18 $\frac{a^2}{27b^4}$ 19 $\frac{b}{16a^2}$ 20 $\frac{1}{125ab^2}$

- C 1 6 2 7 3 1 4 1
5 2 6 3 7 4 8 10
9 24 10 -7 11 1.41 12 2.24
13 9.80 14 6.71 15 4.83 16 4.41
17 8.49 18 8.94 19 7.94 20 3.32

- D 1 Tracey \$6000, Alison \$9000, Kim \$21 000
2 Christopher \$225, Matthew \$675
3 Hydrogen 5 kg, oxygen 10 kg

- E 1 Hydrogen: 3 million atoms, sulphur 1.5 million
2 Red:17, blue:34, yellow:68. Total in the bag:170.