Year 9 · Number: Powers, Fractions & Proportions

Name: _____ Date: _____

Hi! This sheet mixes together scientific notation, order of operations, fractions and percentages, plus some ratio work. Take your time, show your steps, and check your answers look reasonable.

Warm-up

1. Write 45 000 in scientific notation.

2. Work out 2^5 and 2^8.

3. Write 3^{-2} as a unit fraction.

4. Simplify the fraction 18/24.

Practice

5. Evaluate $5 + 3 \times (8 - 6)^2$ using the correct order of operations (GEMA).

6. Between which two whole numbers does $\sqrt{55}$ lie, and which is it closer to?

7. Calculate $\frac{2}{3} \div \frac{3}{4}$. Give your answer in simplest form.

8. A pair of gumboots at a Warehouse store in Avondale costs $60. They are marked down by 25%. What is the sale price?

9. Aroha and Mikaere share $84 in the ratio 3 : 4. How much does each get?

10. A car uses 6 litres of petrol to travel 75 km. At this rate, how far can it travel on 20 litres?

Challenge

11. 20% of a number is 30. What is the number, and what is 35% of it?

12. Evaluate $(-3)^2 - 3^2 + (-2)^3$, then write the result as a fraction of 20 in simplest form.

Answer key (for parents and tutors)

1. Write 45 000 in scientific notation.
   Move the decimal point so there is one non-zero digit in front: 4.5. The point moved 4 places, so k = 4. Answer: 4.5×10^4.

2. Work out 2^5 and 2^8.
   $2^5 = 2\times2\times2\times2\times2 = 32$. $2^8 = 256$. (Powers of 2: 2, 4, 8, 16, 32, 64, 128, 256, 512, 1024.)

3. Write 3^{-2} as a unit fraction.
   A negative exponent means the reciprocal: $3^{-2} = 1 \div 3^2 = 1 \div 9 = 1/9$.

4. Simplify the fraction 18/24.
   The highest common factor of 18 and 24 is 6. $18 \div 6 = 3$ and $24 \div 6 = 4$. So $18/24 = 3/4$.

5. Evaluate $5 + 3 \times (8 - 6)^2$ using the correct order of operations (GEMA).
   Grouped first: $(8 - 6) = 2$. Exponent: $2^2 = 4$. Multiplicative: $3 \times 4 = 12$. Additive: $5 + 12 = 17$. Answer: 17.

6. Between which two whole numbers does $\sqrt{55}$ lie, and which is it closer to?
   $49 = 7^2$ and $64 = 8^2$, and 55 is between them, so $\sqrt{55}$ is between 7 and 8. Since 55 is closer to 49 than to 64, $\sqrt{55}$ is closer to 7 (about 7.4).

7. Calculate $\frac{2}{3} \div \frac{3}{4}$. Give your answer in simplest form.
   Dividing by a fraction means multiplying by its reciprocal: $\frac{2}{3} \div \frac{3}{4} = \frac{2}{3} \times 4/3 = (2\times4)/(3\times3) = 8/9$. This is already in simplest form.

8. A pair of gumboots at a Warehouse store in Avondale costs $60. They are marked down by 25%. What is the sale price?
   A 25% decrease means paying 75% of the price. 75% = 0.75, so $0.75 \times \$60 = \$45$. Sale price = $45. (Check: 25% of $60 = $15, and $60 – $15 = $45.)

9. Aroha and Mikaere share $84 in the ratio 3 : 4. How much does each get?
   Total parts = 3 + 4 = 7. Each part = $84 ÷ 7 = $12. Aroha (3 parts) = 3 × $12 = $36. Mikaere (4 parts) = 4 × $12 = $48. (Check: $36 + $48 = $84.)

10. A car uses 6 litres of petrol to travel 75 km. At this rate, how far can it travel on 20 litres?
    Find the rate per litre: 75 km ÷ 6 = 12.5 km per litre. Then 12.5 × 20 = 250 km. Answer: 250 km.

11. 20% of a number is 30. What is the number, and what is 35% of it?
    If 20% = 30, then 1% = 30 ÷ 20 = 1.5, so 100% = 1.5 × 100 = 150. The number is 150. Then 35% of 150 = 0.35 × 150 = 52.5.

12. Evaluate $(-3)^2 - 3^2 + (-2)^3$, then write the result as a fraction of 20 in simplest form.
    $(-3)^2 = 9$ (negative squared is positive). $3^2 = 9$. $(-2)^3 = -8$. So $9 - 9 + (-8) = -8$. As a fraction of 20: $-8/20$. Divide top and bottom by 4: $-2/5$. Answer: $-2/5$.