



# Indices worksheet

## Mathematics for A-level Science

### Practice your understanding

Simplify the following expressions:

1.  $x^3 \times x^4$

2.  $y^9 \div y^4$

3.  $(z^7)^3$

4.  $\frac{x^4 \times x^2}{x^5}$

5.  $(ab)^2 \times a^3$

6.  $b^{\frac{1}{3}}$

7.  $c^{-3} \div c^4$

8.  $\frac{(x^0 \times x^3)^2}{x^4}$

Solve the following equations for  $x$

9.  $2^{x+1} = 2^4$

10.  $3^{x-2} + 1 = 28$

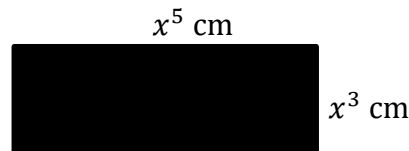
11.  $2^{x+6} = 128$

12.  $2(3^x)^2 = 162$

13.  $7^{x+4} = 343$

14.  $\frac{x^3 \times x^4}{x^5} = 64$

15. Find the area of the following rectangle. Write your answer in simplified form.



16. The moon is approximately  $4 \times 10^5$  kilometres away. If an astronaut was to travel to the moon and back 3 times, how far would he have travelled in space?

17. If that same astronaut was to travel to the moon and back  $10^3$  times, how far would he have travelled in space?

# Ratio worksheet

## Mathematics for A-level Science

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### Practice your understanding

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Simplify the following ratios (Example  $6:4 = 3:2$ ):

18.  $120:50$

22.  $24:72$

19.  $64:24$

23.  $18:90$

20.  $13:52$

24.  $56:88$

21.  $100:10\,000$

25.  $36:144$

Find  $x$  by scaling the ratio.

26.  $1:2 = 4:x$

29.  $x:160 = 2:8$

27.  $8:3 = x:9$

30.  $49:x = 2:4$

28.  $25:10 = x:2$

31.  $58.5:18 = x:4$

32. A toy is made from red bricks and yellow bricks.  
Number of red bricks: Number of yellow bricks =  $5:2$ .  
There are 210 more red bricks and yellow bricks.

How many red bricks are in the toy?

33. There are 100 balls in a bag. The balls are red, blue, green or white. The ratio of blue to red is  $5:1$ . There are twice as many blue as green.  $\frac{1}{4}$  of the balls are green.

How many white balls are in the bag?

34. One day, 460 people visit a zoo. 280 are adults. The ratio of women to men is  $4:3$ . 180 are children.  $\frac{3}{5}$  of them are boys. Jane says that altogether there were more females visiting the zoo.

Show that she is correct.

# Standard form worksheet

## Mathematics for A-level Science

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### Practice your understanding

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Convert the following numbers into standard form:

35. 32 000

39. 9 230 000

36. 0.0006

40. 0.0000405

37. 104 000

41. 0.002019

38. 18 200 000

42. 30 200

Convert the following numbers from standard form into decimal notation:

43.  $3.26 \times 10^4$

47.  $8 \times 10^{-6}$

44.  $8.4 \times 10^{-3}$

48.  $1.3 \times 10^8$

45.  $7.29 \times 10^7$

49.  $2.3 \times 10^{-4}$

46.  $1.26 \times 10^2$

50.  $5.001 \times 10^6$

51. Using the formula  $\text{Circumference} = 2 \times 3.14 \times \text{radius}$ , and given that the mean radius of the Earth is 6 378 000 m, calculate the approximate circumference of the Earth leaving your answer in standard form to two significant figures.

52. There are 86 400 seconds in a day. Calculate the number of seconds in a year leaving your answer in standard form to two significant figures.

53. The current world population is approximately  $7.4 \times 10^9$  people. The United Kingdom population accounts for 0.88% of the total world population. Using this information, approximate the number of people living in the United Kingdom leaving your answer as a decimal number.

# Units worksheet

## Mathematics for A-level Science

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### Practice your understanding

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Convert the following numbers into metres:

54. 3 km

58. 5.1  $\mu\text{m}$

55. 20 cm

59. 13.7 Gm

56. 2.3 mm

60. 0.0025 km

57. 550 nm

61. 1.001 km

Simplify the following units:

70.  $\text{cm} \times \text{cm}$

74.  $\frac{\text{cm}^3}{\text{cm}}$

71.  $\text{km}^2 \times \text{km}$

75.  $\frac{\text{kg cm}^3}{\text{cm}}$

72.  $\text{nm}^2 \times \text{nm}^{-1}$

73.  $\frac{\text{kg m}}{\text{m}}$

76.  $\frac{\text{cm}}{\text{cm}^2}$

77.  $\frac{\text{g cm}^2}{\text{cm}^{-1}}$

78. Concrete has a density of  $2400 \text{ kg m}^{-3}$ . What volume of concrete would have a mass of 96 kg?

79. What would this volume be in a)  $\text{dm}^3$  and b)  $\text{cm}^3$