

# Year 9 maths worksheet

Year 9 | KS3, bridge to GCSE

Name \_\_\_\_\_ Class \_\_\_\_\_ Date \_\_\_\_\_

Score \_\_\_\_\_ / 24

Show your working in the space and write each answer in the box. Use a calculator only where a question says so. Give exact answers unless told to round.

Example:  $(x + 2)(x + 5) = x^2 + 5x + 2x + 10 = x^2 + 7x + 10$ . Multiply every term in the first bracket by every term in the second.

## Section A · Algebra fluency (non-calculator)

1. Expand and simplify  $(x + 4)(x + 3)$ .

2. Factorise  $x^2 + 8x + 15$ .

3. Simplify  $a^5 \times a^3$ .

4. Simplify  $(2x^3)^2$ .

5. Write 0.00062 in standard form.

6. Work out  $(3 \times 10^4) \times (2 \times 10^3)$ . Give your answer in standard form.

7. Solve  $4x + 5 = 2x + 17$ .

8. Make  $t$  the subject of  $v = u + at$ .

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## Section B · Geometry and probability

9. Find the gradient of the straight line through (1, 3) and (4, 12).

Answer

10. Write the equation of the straight line with gradient 2 that passes through (0, -5).

Answer

11. A right-angled triangle has shorter sides of 9 cm and 12 cm. Find the hypotenuse.

Answer

12. A right-angled triangle has hypotenuse 13 cm and one shorter side 5 cm. Find the other side.

Answer

13. In a right-angled triangle the hypotenuse is 14 cm. The side opposite the  $30^\circ$  angle is x cm. Find x.

Answer

14. A bag holds 3 red, 5 blue and 2 green counters. One is taken at random. Find P(not blue).

Answer

15. Two fair coins are thrown. Find the probability of getting two heads.

Answer

16. Calculator: £2000 is invested at 3% compound interest per year. Find its value after 2 years.

Answer

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## Section C · Problem solving

**17.** After a 20% reduction, a coat costs £64. Find the original price.

Answer

**18.** A train travels 210 miles at an average speed of 60 mph. How long does the journey take?

Answer

**19.** A metal block has a mass of 540 g and a volume of  $200 \text{ cm}^3$ . Find its density.

Answer

**20.** Calculator: find the circumference of a circle with diameter 8 cm, to 1 decimal place.

Answer

**21.** Solve the simultaneous equations  $x + y = 10$  and  $x - y = 4$ .

Answer

**22.** Solve the inequality  $3x - 4 < 11$ .

Answer

**23.** Find the volume of a cylinder with radius 3 cm and height 10 cm. Leave your answer in terms of  $\pi$ .

Answer

**24.** Estimate  $49.7 \times 3.08 \div 0.51$  by rounding each number to 1 significant figure.

Answer

# Year 9 maths worksheet · answers

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Check each answer and its method. Equivalent forms are correct unless a question asks for a particular form or degree of accuracy.

## Section A · Algebra fluency (non-calculator)

1.  $x^2 + 7x + 12$

Multiply each term:  $x^2 + 3x + 4x + 12$ , then collect like terms.

2.  $(x + 3)(x + 5)$

Find two numbers that multiply to 15 and add to 8: 3 and 5.

3.  $a^8$

When multiplying powers of the same base, add the indices:  $5 + 3 = 8$ .

4.  $4x^6$

Square the 2 to get 4, and multiply the indices:  $3 \times 2 = 6$ .

5.  $6.2 \times 10^{-4}$

Move the decimal point 4 places to the right to get 6.2, so the power is  $-4$ .

6.  $6 \times 10^7$

Multiply the numbers:  $3 \times 2 = 6$ . Add the powers:  $4 + 3 = 7$ .

7.  $x = 6$

Subtract  $2x$ :  $2x + 5 = 17$ . Subtract 5:  $2x = 12$ , so  $x = 6$ .

8.  $t = (v - u)/a$

Subtract  $u$  from both sides:  $v - u = at$ . Divide by  $a$ :  $t = (v - u)/a$ .

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## Section B · Geometry and probability

9. 3

Gradient = change in  $y \div$  change in  $x = (12 - 3) \div (4 - 1) = 9 \div 3 = 3$ .

10.  $y = 2x - 5$

Use  $y = mx + c$  with  $m = 2$ . The line crosses the  $y$ -axis at  $-5$ , so  $c = -5$ .

11. 15 cm

Pythagoras:  $c^2 = 9^2 + 12^2 = 81 + 144 = 225$ , so  $c = \sqrt{225} = 15$  cm.

12. 12 cm

$b^2 = 13^2 - 5^2 = 169 - 25 = 144$ , so  $b = \sqrt{144} = 12$  cm.

13. 7 cm

$\sin 30^\circ = \text{opposite} \div \text{hypotenuse}$ , so  $x = 14 \times \sin 30^\circ = 14 \times 0.5 = 7$  cm.

14.  $\frac{1}{2}$

There are 10 counters and 5 are not blue:  $5/10 = 1/2$ .

15.  $\frac{1}{4}$

The outcomes are HH, HT, TH and TT. One of the four is HH:  $1/4$ . Or  $\frac{1}{2} \times \frac{1}{2} = \frac{1}{4}$ .

16. £2121.80

Use the multiplier 1.03 for each year:  $2000 \times 1.03^2 = £2121.80$ .

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## Section C · Problem solving

### 17. £80

The sale price is 80% of the original:  $£64 \div 0.8 = £80$ .

### 18. 3 hours 30 minutes

Time = distance  $\div$  speed =  $210 \div 60 = 3.5$  hours = 3 hours 30 minutes.

### 19. 2.7 g/cm<sup>3</sup>

Density = mass  $\div$  volume =  $540 \div 200 = 2.7$  g/cm<sup>3</sup>.

### 20. 25.1 cm

Circumference =  $\pi d = \pi \times 8 = 25.132\dots$ , so 25.1 cm to 1 d.p.

### 21. x = 7, y = 3

Add the equations:  $2x = 14$ , so  $x = 7$ . Substitute:  $7 + y = 10$ , so  $y = 3$ .

### 22. x < 5

Add 4 to both sides:  $3x < 15$ . Divide by 3:  $x < 5$ .

### 23. 90 $\pi$ cm<sup>3</sup>

Volume =  $\pi r^2 h = \pi \times 3^2 \times 10 = 90\pi$  cm<sup>3</sup>.

### 24. 300

Round to  $50 \times 3 \div 0.5$ .  $50 \times 3 = 150$  and  $150 \div 0.5 = 300$ .