

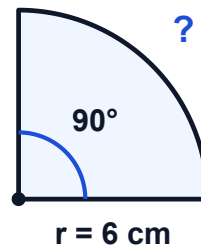
GCSE Mathematics — Higher Tier

Mixed practice paper · Calculator allowed · 20 questions · 53 marks · seed 42

1. Arc length

2 marks

A sector of a circle has radius 6 cm and angle 90° . Work out the arc length. Give your answer in terms of π .



Answer: $3\pi \text{ cm}$

M1 Arc length = $(90/360) \times 2 \times \pi \times 6$

A1 $3\pi \text{ cm}$

2. Venn diagrams

3 marks

In a class of 40 students, 14 study French, 18 study Spanish and 6 study both. Work out the number of students who study neither.

Answer: 14

M1 French or Spanish = $14 + 18 - 6 = 26$

M1 $40 - 26$

A1 14

3. Solving linear equations

3 marks

Solve the equation $(2x + 2)/2 = (2x + 8)/4$.

Answer: $x = 2$

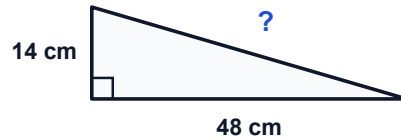
M1 Multiply both sides by a common denominator

M1 Expand and collect terms to reach $4x - 8 = 0$

A1 $x = 2$

4. Pythagoras**2 marks**

A right-angled triangle has shorter sides of length 14 cm and 48 cm. Work out the length of the hypotenuse.

**Answer:** 50 cm**M1** Use Pythagoras: $14^2 + 48^2$ **A1** 50 cm**5. Expanding triple brackets****3 marks**

Expand and simplify $(x - 2)(x - 2)(x - 4)$.

Answer: $x^3 - 8x^2 + 20x - 16$ **M1** Expand two of the brackets**M1** Multiply the result by the third bracket**A1** $x^3 - 8x^2 + 20x - 16$ **6. Simultaneous equations****4 marks**

Solve the simultaneous equations

$$4x + 5y = 18$$

$$x + 5y = 12$$

Answer: $x = 2, y = 2$ **M1** Eliminate one variable by multiplying and adding/subtracting**M1** Solve for the remaining variable**A1** $x = 2$ **A1** $y = 2$ **7. Bounds****2 marks**

A number x is rounded to 1 decimal place to give 5.2. Write down the lower and upper bounds of x .

Answer: Lower bound = 5.15, upper bound = 5.25**B1** Lower bound 5.15**B1** Upper bound 5.25

8. Completing the square**3 marks**

Write $x^2 + 10x + 19$ in the form $(x + p)^2 + q$.

Answer: $(x + 5)^2 - 6$

M1 $p = 10/2 = 5$

M1 $q = 19 - (5)^2 = -6$

A1 $(x + 5)^2 - 6$

9. Ratio sharing**3 marks**

Ali, Ben and Cara share £108 in the ratio 4 : 5 : 3. Work out how much Ben receives.

Answer: £45

M1 Add the ratio parts: $4 + 5 + 3 = 12$

M1 One part = $£108 \div 12 = £9$

A1 £45

10. Sequences (nth term)**2 marks**

Here are the first five terms of a sequence:

11, 6, 1, -4, -9

(a) Find an expression for the n th term.

(b) Hence find the 50th term.

Answer: (a) $-5n + 16$ (b) -234

B1 (a) $-5n + 16$

B1 (b) -234

11. Standard form**2 marks**

Work out $(7.4 \times 10^{-1}) \times (9.3 \times 10^1)$. Give your answer in standard form.

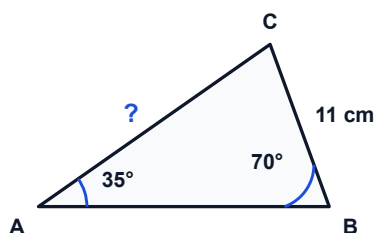
Answer: 6.882×10^1

M1 Multiply the number parts and add the powers: 68.82×10^0

A1 6.882×10^1

12. **Sine rule****3 marks**

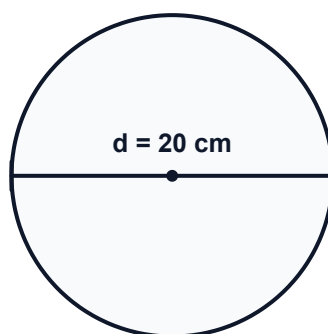
In triangle ABC, angle A = 35° , angle B = 70° and side a = 11 cm. Work out the length of side b. Give your answer to 3 significant figures.

**Answer:** 18 cm**M1** Use $a/\sin A = b/\sin B$ **M1** $b = 11 \times \sin(70^\circ) / \sin(35^\circ)$ **A1** 18 cm13. **Compound measures****2 marks**

A car travels at 60 mph for 3 hours. Work out the distance travelled.

Answer: 180 miles**M1** Use distance = speed $\times$ time**A1** 180 miles14. **Area of a circle****2 marks**

A circle has diameter 20 cm. Work out its area in terms of π .

**Answer:** $100\pi \text{ cm}^2$ **M1** Radius = $20 \div 2 = 10 \text{ cm}$ **A1** $100\pi \text{ cm}^2$

15. **Rearranging formulae****3 marks**

Make x the subject of $y = (3x + 1)/4$.

Answer: $x = (4y - 1)/3$

M1 Multiply both sides by 4: $4y = 3x + 1$

M1 Subtract 1 from both sides, then divide by 3

A1 $x = (4y - 1)/3$

16. **Geometric sequences****2 marks**

The first three terms of a geometric sequence are 3, 9, 27. Work out the 7th term.

Answer: 2187

M1 Common ratio = $9 \div 3 = 3$

A1 2187

17. **Percentages (reverse)****2 marks**

In a sale, all prices are reduced by 30%. A coat now costs £50.40. Work out the original price.

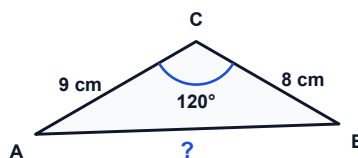
Answer: £72

M1 Recognise that £50.40 is 70% of the original price

A1 £72

18. **Cosine rule****3 marks**

In triangle ABC, side $a = 8$ cm, side $b = 9$ cm and angle $C = 120^\circ$. Work out the length of side c . Give your answer to 3 significant figures.



Answer: 14.7 cm

M1 Use $c^2 = a^2 + b^2 - 2ab \cos C$

M1 $c^2 = 8^2 + 9^2 - 2(8)(9)\cos 120^\circ$

A1 14.7 cm

19. Functions

4 marks

$$f(x) = 5x - 1 \text{ and } g(x) = x^2 + 1.$$

(a) Work out $fg(2)$.(b) Find $f^{-1}(x)$.**Answer:** (a) 24 (b) $(x + 1)/5$ **M1** (a) $g(2) = 2^2 + 1 = 5$ **A1** (a) 24**M1** (b) Let $y = f(x)$ and rearrange for x **A1** (b) $(x + 1)/5$

20. Quadratic formula

3 marks

Solve $x^2 + 3x - 5 = 0$. Give your answers to 3 significant figures.**Answer:** $x = -4.19$ or $x = 1.19$ **M1** Substitute into the quadratic formula**M1** Discriminant = $(3)^2 - 4(1)(-5) = 29$ **A1** $x = -4.19$ or $x = 1.19$