

Surname:

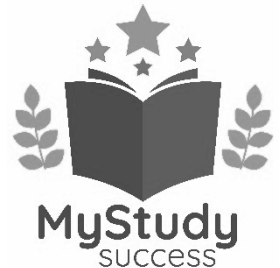
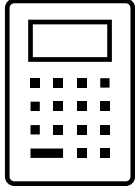
Forename(s):

GCSE Mathematics

Quadratic Formula

ANSWERS

Grade 7



These questions get more difficult as your go through this paper.

This topic could come up on a calculator paper and non-calculator paper.

Materials

- **Formulae Sheet** (on the next page)
- **Black** ink or ball-point pen
- Pencil
- Eraser
- Protractor
- Compass
- Tracing Paper
- **Calculator allowed**

Instructions

- Show **all** of your working.
- Draw diagrams in pencil.
- Plot graphs in pencil.
- Diagrams are **not** accurately drawn, unless otherwise indicated.

Higher Tier Formulae Sheet

Perimeter, Area and Volume

Where a and b are the lengths of the parallel sides and h is their perpendicular separation:

Area of a trapezium = $\frac{1}{2}(a + b)h$

Volume of a prism = area of cross section $\times$ length

Where r is the radius and d is the diameter:

Circumference of a circle = $2\pi r = \pi d$

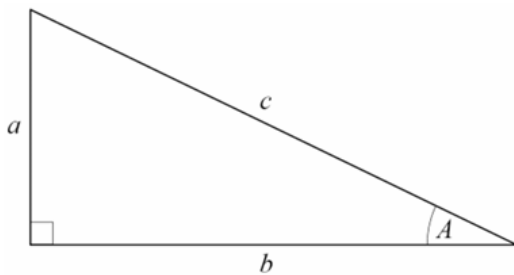
Area of a circle = πr^2

Quadratic Formula

The solution of $ax^2 + bx + c = 0$ where $a \neq 0$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

Pythagoras' Theorem and Trigonometry

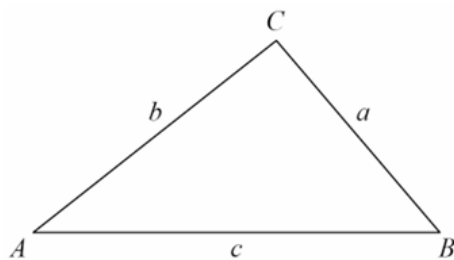


In any right-angled triangle where a , b and c are the length of the sides and c is the hypotenuse:

$$a^2 + b^2 = c^2$$

In any right-angled triangle ABC where a , b and c are the length of the sides and c is the hypotenuse:

$$\sin A = \frac{a}{c} \quad \cos A = \frac{b}{c} \quad \tan A = \frac{a}{b}$$



In any triangle ABC where a , b and c are the length of the sides:

$$\text{sine rule: } \frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

$$\text{cosine rule: } a^2 = b^2 + c^2 - 2bc \cos A$$

$$\text{Area of triangle} = \frac{1}{2}ab \sin C$$

Compound Interest

Where P is the principal amount, r is the interest rate over a given period and n is number of times that the interest is compounded:

$$\text{Total accrued} = P \left(1 + \frac{r}{100} \right)^n$$

Probability

Where $P(A)$ is the probability of outcome A and $P(B)$ is the probability of outcome B :

$$P(A \text{ or } B) = P(A) + P(B) - P(A \text{ and } B)$$

$$P(A \text{ and } B) = P(A \text{ given } B)P(B)$$

1 Solve $x^2 - 8x + 10 = 0$

Give your solutions correct to 2 decimal places.

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$x = \frac{-(-8) \pm \sqrt{(-8)^2 - 4(1)(10)}}{2(1)}$$

$$x = 6.449489743 \text{ or } 1.550510257$$

$$1x^2 - 8x + 10 = 0$$

$$a = 1$$

$$b = -8$$

$$c = 10$$

$$x = 6.45 \text{ or } 1.55$$

(Total for question 1 is 3 marks)

2 Solve $3x^2 + 15x - 16 = 4$

Give your solutions correct to 3 significant figures.

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$x = \frac{-(15) \pm \sqrt{(15)^2 - 4(3)(-20)}}{2(3)}$$

$$x = 1.093976442 \text{ or } -6.093976442$$

$$3x^2 + 15x - 16 = 4$$

$$3x^2 + 15x - 20 = 0$$

$$a = 3$$

$$b = 15$$

$$c = -20$$

$$x = 1.09 \text{ or } -6.09$$

(Total for question 2 is 3 marks)

3 Solve $6 + 7x - 2x^2 = 0$

Give your solutions correct to 2 decimal places.

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$x = \frac{-(7) \pm \sqrt{(7)^2 - 4(-2)(6)}}{2(-2)}$$

$$x = -0.7122144504 \text{ or } 4.21221445$$

$$6 + 7x - 2x^2 = 0$$

$$-2x^2 + 7x + 6 = 0$$

$$a = -2$$

$$b = 7$$

$$c = 6$$

$$-0.71 \text{ or } 4.21$$

(Total for question 3 is 3 marks)

4 Solve $x^2 + 8x - 3 = 0$ Give your answer in the form $a \pm \sqrt{b}$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$x = \frac{-(8) \pm \sqrt{(8)^2 - 4(1)(-3)}}{2(1)}$$

$$x = \frac{8 \pm \sqrt{76}}{2} \quad \leftarrow \sqrt{76} = \sqrt{4} \times \sqrt{19} = 2\sqrt{19}$$

$$x = \frac{8 \pm 2\sqrt{19}}{2}$$

$$x = 4 \pm \sqrt{19}$$

$$1x^2 + 8x - 3 = 0$$

$$a = 1$$

$$b = 8$$

$$c = -3$$

$$x = 4 \pm \sqrt{19}$$

(Total for question 1 is 4 marks)

5 Solve $3x^2 + 6x - 5 = 0$ Give your answer in the form $a \pm \frac{b}{c}\sqrt{d}$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$x = \frac{-(6) \pm \sqrt{(6)^2 - 4(3)(-5)}}{2(3)}$$

$$x = \frac{-6 \pm \sqrt{96}}{6} \quad \leftarrow \sqrt{96} = \sqrt{16} \times \sqrt{6} = 4\sqrt{6}$$

$$x = \frac{-6 \pm 4\sqrt{6}}{6}$$

$$x = -\frac{6}{6} \pm \frac{4}{6}\sqrt{6}$$

$$x = -1 \pm \frac{2}{3}\sqrt{6}$$

$$3x^2 + 6x - 5 = 0$$

$$a = 3$$

$$b = 6$$

$$c = -5$$

$$x = -1 \pm \frac{2}{3}\sqrt{6}$$

(Total for question 2 is 4 marks)