

Name _____

Teacher _____

Mathematics

Paper 1

National 5 **Booster Paper C1**

Duration: 1 hour 15 minutes

Total Marks - 50

Attempt **ALL** questions.

You may **NOT** use a calculator

To earn full marks, you must show your working in your answers.

State the units for your answer where appropriate.

Write your answers clearly in the spaces provided in this booklet.

Use blue or black ink.

Notes:

- This is a **Booster Paper**. Your May exam will be (a bit) harder than this.
- The Booster Papers get **more challenging** as you work through them.
- The final Booster Paper will be as challenging as your May exam.
- The number of marks indicated beside each question is intended as a guide and may differ slightly from SQA marking instructions.
- These original papers are **produced independently of the SQA** and are **free of charge**.
- All Booster Papers and answers can be found at www.maths180.com/BoosterPapers

FORMULAE LIST

The roots of $ax^2 + bx + c = 0$ are $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

Sine Rule: $\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$

Cosine Rule: $a^2 = b^2 + c^2 - 2bc \cos A$ or $\cos A = \frac{b^2 + c^2 - a^2}{2bc}$

Area of a triangle: $A = \frac{1}{2} ab \sin C$

Volume of a sphere: $V = \frac{4}{3} \pi r^3$

Volume of a cone: $V = \frac{1}{3} \pi r^2 h$

Volume of a pyramid: $V = \frac{1}{3} Ah$

Standard deviation: $s = \sqrt{\frac{\sum (x - \bar{x})^2}{n - 1}}$

or $s = \sqrt{\frac{\sum x^2 - \frac{(\sum x)^2}{n}}{n - 1}}$, where n is the sample size.

Total marks - 50

Attempt ALL questions

MARKS

1. Multiply the brackets and simplify

$$3x - (3x - 2)^2$$

3

$$\begin{aligned} & 3x - (3x - 2)^2 \\ &= 3x - (3x - 2)(3x - 2) \\ &= 3x - (9x^2 - 6x - 6x + 4) \\ &= 3x - (9x^2 - 12x + 4) \\ &= -9x^2 + 15x - 4 \end{aligned}$$

2. Evaluate $7\frac{1}{3} - 2\frac{4}{5}$ Leave your answer as a mixed number.

3

$$\begin{aligned} & 7\frac{1}{3} - 2\frac{4}{5} \\ &= 5\frac{1}{3} - \frac{4}{5} \\ &= 5\frac{5}{15} - \frac{12}{15} \\ &= 4\frac{20}{15} - \frac{12}{15} \\ &= 4\frac{8}{15} \end{aligned}$$

3. Express the increase from 24 to 30 as a percentage.

3

$$\text{Actual increase: } 30 - 24 = 6$$

$$\% \text{ increase} = \frac{\text{actual}}{\text{original}} \times 100\%$$

$$= \frac{6}{24} \times 100\%$$

$$= \frac{1}{4} \times 100\%$$

$$= 25\%$$

4. This circle has its centre at C.

- CB and CE are radii
- AE is a diameter
- Angle DAE = 40° and angle BCA = 70°

Find the size of angle BED.

$$\angle BCE = 110^\circ$$

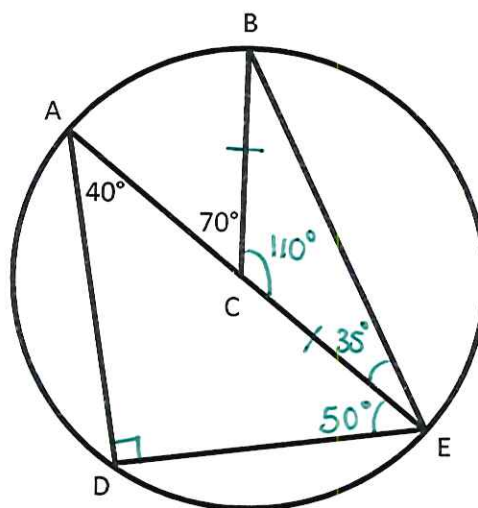
$$180 - 110 = 70^\circ$$

$$\angle BEC = 70^\circ \div 2 = 35^\circ$$

$$\angle ADE = 90^\circ$$

$$\begin{aligned} \angle AED &= 180^\circ - (90^\circ + 40^\circ) \\ &= 180^\circ - 130^\circ \\ &= 50^\circ \end{aligned}$$

$$\angle BED = 50^\circ + 35^\circ = 85^\circ$$



3

5. (a) Factorise $10x - 24x^2$ 1

$$2x(5 - 12x)$$

- (b) Fully factorise $18 - 50x^2$ 2

$$\begin{aligned} & 2(9 - 25x^2) \\ & = 2(3 + 5x)(3 - 5x) \end{aligned}$$

6. Express $x^2 + 10x - 7$ in the form $(x + a)^2 - b$ and write down the values of a and b . 2

$$\begin{aligned} & x^2 + 10x - 7 \\ & = (x + 5)^2 - 25 - 7 \\ & = (x + 5)^2 - 32 \\ & a = 5, \quad b = 32 \end{aligned}$$

7. Change the subject of this formula to q .

$$\frac{8h-7q}{5} = 3$$

3

$$8h - 7q = 15$$

$$7q = 8h - 15$$

$$q = \frac{8h - 15}{7}$$

8. This hoodie is on special offer.
The price of the hoodie has been reduced by 20%.
The reduced price is £60.



How much did the hoodie cost before the reduction?

3

$$100\% - 20\% = 80\%$$

$$80\% = \text{£}60$$

$$\div 4 \downarrow 20\% = \text{£}15$$

$$\times 5 \downarrow 100\% = \text{£}75$$

Cost £75 before reduction

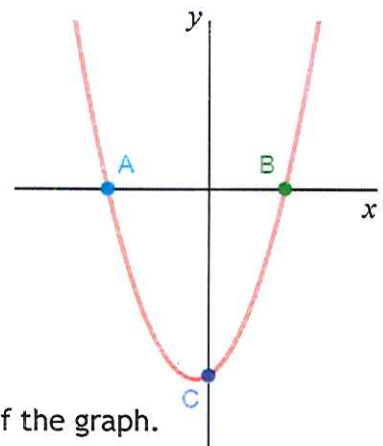
9. Simplify $(2x^{-5})^3$

2

$$= 2^3 \times x^{-15}$$

$$= 8x^{-15}$$

10. The diagram shows part of the graph of a quadratic function with equation $y = x^2 + x - 12$.



(a) Calculate the coordinates of A and B, the roots of the graph.

$$x^2 + x - 12 = 0$$

$$(x + 4)(x - 3) = 0$$

$$x = -4, x = 3$$

$$A(-4, 0) \quad B(3, 0)$$

3

(b) Write down the coordinates of C, the y-intercept of the graph.

1

$$\text{set } x = 0, \quad y = x^2 + x - 12$$

$$y = 0^2 + 0 - 12$$

$$y = -12$$

$$C(0, -12)$$

11. A straight line has equation $3x + 2y = 8$.

(a) Determine the gradient of this line.

2

$$3x + 2y = 8$$

$$2y = -3x + 8$$

$$y = -\frac{3}{2}x + 4$$

$$m = -\frac{3}{2}$$

(b) Find the coordinates of the point where this line crosses the y -axis. 1

$$\text{set } x = 0$$

$$3(0) + 2y = 8$$

$$2y = 8$$

$$y = 4$$

$$(0, 4)$$

(c) Determine whether the line passes through the point $(-2, 7)$. 2

$$\text{when } x = -2 \text{ and } y = 7$$

$$3(-2) + 2(7)$$

$$= -6 + 14$$

$$= 8$$

$(-2, 7)$ satisfies the equation $3x + 2y = 8$

\therefore the point lies on the line.

12. (a) Fully simplify $\sqrt{32} + \sqrt{8} - \sqrt{18}$.

3

$$\begin{aligned} & \sqrt{32} + \sqrt{8} - \sqrt{18} \\ &= \sqrt{16}\sqrt{2} + \sqrt{4}\sqrt{2} - \sqrt{9}\sqrt{2} \\ &= 4\sqrt{2} + 2\sqrt{2} - 3\sqrt{2} \\ &= 3\sqrt{2} \end{aligned}$$

(b) Write $\frac{15}{4\sqrt{5}}$ with a rational denominator in its simplest form.

2

$$\begin{aligned} & \frac{15}{4\sqrt{5}} \times \frac{\sqrt{5}}{\sqrt{5}} \\ &= \frac{15\sqrt{5}}{(4)(5)} \\ &= \frac{15\sqrt{5}}{20} \\ &= \frac{3\sqrt{5}}{4} \end{aligned}$$

13. A bag contains 23 coins. The coins are either 10 pence or 50 pence coins.

Let x represent the number of 10 pence coins and let y represent the number of 50 pence coins.

- (a) Write an equation to represent this information.

1

$$x + y = 23$$

The total value of all the coins in the bag is £5.50.

- (b) Write an equation to represent this information.

1

$$10x + 50y = 550$$

- (c) Find, algebraically, the number of 10 pence coins and the number of 50 pence coins.

4

$$x + y = 23 \quad (\times 10)$$

$$\Rightarrow 10x + 10y = 230$$

$$10x + 50y = 550$$

$$10x + 10y = 230$$

$$40y = 320$$

$$y = 8$$

$$x + y = 23$$

$$\Rightarrow x = 23 - 8 = 15$$

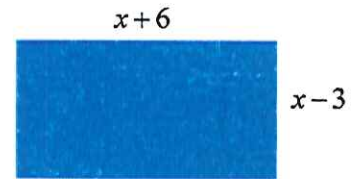
There are 15 10p coins and 8 50p coins.

14. This rectangle has length given by $x+6$ and breadth given by $x-3$. All lengths are in centimetres.

(a) Show that the area can be written as $x^2+3x-18$.

2

$$\begin{aligned}\text{Area: } & (x+6)(x-3) \\ & = x^2 - 3x + 6x - 18 \\ & = x^2 + 3x - 18 \\ & \text{as required.}\end{aligned}$$



The actual area of the rectangle measures 10 square centimetres.

(b) Find, algebraically, the value(s) of x .

4

$$x^2 + 3x - 18 = 10$$

$$x^2 + 3x - 28 = 0$$

$$(x+7)(x-4) = 0$$

$$x = -7, \quad x = 4$$

$$\text{since } x > 3, \quad x = 4$$

End of Booster Paper C1