

E Maths Test 2

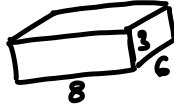
/60 Marks

1. At noon, the temperature is 4°C .
At midnight, the temperature is -9°C .
Work out the difference in temperature between noon and midnight.

$$-9 - 4 = -13^{\circ}\text{C}$$

$^{\circ}\text{C}$ [1]

2. Find the total surface area of a cuboid with length 8 cm, width 6 cm and height 3 cm.



$$\begin{aligned}\text{Surface Area} &= 2 \times 8 \times 3 + 2 \times 3 \times 6 + 2 \times 8 \times 6 \\ &= 48 + 36 + 96 \\ &= 180 \text{ cm}^2\end{aligned}$$

cm^2 [3]

3. The price of a coat is \$126.
In a sale, this price is reduced by 18%.
Find the sale price of the coat.

$$\begin{aligned}\text{Sale} &= 126 \times 0.82 \\ &= 103.32 \$\end{aligned}$$

[2]

4. The n th term of a sequence is $n^2 + 12$.

Find the first three terms of this sequence.

$$\begin{aligned}1^{\text{st}} &= 13 \\ 2^{\text{nd}} &= 4 + 12 = 16 \\ 3^{\text{rd}} &= 9 + 12 = 21\end{aligned}$$

[2]

5. Find the value of p when $6^p \times 6^4 = 6^{28}$.

$$\begin{aligned}6^{p+4} &= 6^{28} \\ p+4 &= 28 \\ p &= 24\end{aligned}$$

[1]

6. Without using a calculator, work out $4\frac{1}{8} - 2\frac{5}{6}$.

You must show all your working and give your answer as a mixed number in its simplest form.

$$\begin{aligned}&= \frac{33}{8} - \frac{17}{6} \\ &= \frac{198 - 136}{48} = \frac{62}{48} = \frac{31}{24} = 1\frac{7}{24}\end{aligned}$$

[3]

7. Carlos invests \$4540 at a rate of $r\%$ per year **compound interest**. At the end of 10 years he has earned \$1328.54 in interest.

Calculate the value of r .

$$\begin{aligned}V &= 4540 + 1328.54 \\ &= 5868.54\end{aligned}$$

$$5868.54 = 4540 \times \left(1 + \frac{r}{100}\right)^{10}$$
$$(1.2926)^{10} = 1 + \frac{r}{100}$$

$$1.026 = 1 + \frac{r}{100}$$

$$0.026 = \frac{r}{100}$$

$$r = 2.6$$

[3]

8. $f(x) = 7x - 8$ $g(x) = \frac{4}{x} + 5$ $h(x) = 2^x + 1$

a. Find $f^{-1}(x)$.

$$y = 7x - 8$$

$$\frac{x + 8}{7} = f^{-1}(x)$$

[2]

b. Find the value of x when $h(x) = g(\frac{1}{3})$.

$$2^x + 1 = 12 + 5$$

$$2^x = 16$$

$$x = 4$$

[2]

9. Factorise completely.

(a) $2m + 3p - 8km - 12kp$

$$= 2m - 8km + 3p - 12kp$$

$$= 2m(1 - 4k) + 3p(1 - 4k) = (1 - 4k)(2m + 3p)$$

[2]

(b) $5x^2 - 20y^2$

$$= 5(x^2 - 4y^2) = 5(x - 2y)(x + 2y)$$

[3]

10. The n th term of a sequence is $an^2 + bn - 4$.

The first term is -3 and the second term is 2.

Find the value of a and the value of b .

$$a + b - 4 = -3$$

$$a + b = 1 \text{ --- } \textcircled{1}$$

$$4a + 2b - 4 = 2$$

$$4a + 2b = 6$$

$$\begin{array}{r} 2a + b = 3 \text{ --- } \textcircled{2} \\ -a - b = 1 \end{array}$$

$$a = 2$$

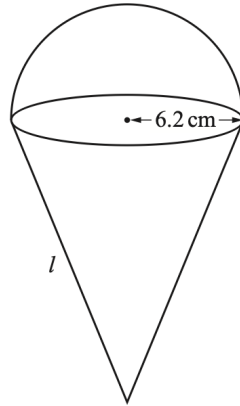
$$a + b = 1$$

$$2 + b = 1$$

$$b = -1$$

[5]

11.



NOT TO
SCALE

The diagram shows a solid metal shape made from a cone and a hemisphere, both with radius 6.2 cm. The total surface area of the solid shape is 600 cm^2 .

Calculate the slant height, l , of the cone.

[The surface area, A , of a sphere with radius r is $A = 4\pi r^2$.]

[The curved surface area, A , of a cone with radius r and slant height l is $A = \pi r l$.]

$$600 = 2\pi r + \pi r l$$

$$600 = 2 \times \pi \times 6.2^2 + \pi \times 6.2 \times l$$

$$18.4 = l$$

cm [4]

12. (a) Find the lowest common multiple (LCM) of 30 and 75.

$$\begin{array}{l} 30 = 2 \times 3 \times 5 \\ \begin{array}{c} \wedge \\ 2 \quad 15 \\ \wedge \\ 3 \quad 5 \end{array} \end{array} \quad \begin{array}{l} 75 = 3 \times 5^2 \\ \begin{array}{c} \wedge \\ 5 \quad 15 \\ \wedge \\ 3 \quad 5 \end{array} \end{array} \quad \begin{array}{l} \text{LCM} = 2 \times 3 \times 25 \\ = 150 \end{array}$$

[2]

(b) Work out $\frac{6.39 \times 10^4}{2.45 \times 10^6}$.

$$2.61 \times 10^{-2}$$

[2]

(c) Write $0.\overline{27}$ as a fraction.

$$\begin{array}{r} x = 0.2727\ldots \\ 100x = 27.2727\ldots \\ \hline 99x = 27 \\ x = \frac{27}{99} = \frac{3}{11} \end{array}$$

[1]

13. (a) Solve.

$$10 - 3p = 3 + 11p$$

$$7 = 14p$$

$$p = \frac{7}{14} = \frac{1}{2}$$

[2]

(b) Make m the subject of the formula.

$$mc^2 - 2k = mg$$

$$mc^2 - mg = 2k$$

$$m(c^2 - g) = 2k$$

$$m = \frac{2k}{c^2 - g}$$

[3]

(c) Solve.

$$\frac{1}{x-3} + \frac{4}{2x+3} = 1$$

$$\frac{2x+3 + 4(x-3)}{(x-3)(2x+3)} = 1$$

$$2x+3 + 4x-12 = (x-3)(2x+3)$$

$$6x-9 = 2x^2 + 3x - 6x - 9$$

$$0 = 2x^2 - 3x - 9 + 6x + 9$$

$$0 = 2x^2 - 9x$$

$$x = 0 \quad \text{or} \quad 2x - 9 = 0$$
$$x = \frac{9}{2}$$

[5]

(d) Expand and simplify.

$$(2x-3)(x+6)(x-4)$$

$$= (2x^2 + 12x - 3x - 18)(x-4)$$

$$= (2x^2 + 9x - 18)(x-4)$$

$$= 2x^3 - 8x^2 + 9x^2 - 36x - 18x + 72$$

$$= 2x^3 + x^2 - 54x + 72$$

[3]

14. (a) Find the next term and the n th term of this sequence.

$$\frac{3}{5}, \frac{4}{7}, \frac{5}{9}, \frac{6}{11}, \frac{7}{13}, \dots$$

$\underbrace{\hspace{1.5em}}_2 \quad \underbrace{\hspace{1.5em}}_2 \quad \underbrace{\hspace{1.5em}}_2 \quad \quad \quad S+2$

$$\frac{n+2}{2n+3}$$

Next term $\frac{8}{15}$

n th term $\frac{n+2}{2n+3}$

[3]

(b) Find the n th term of each sequence.

(i) $-1, -3, -5, -7, -9, \dots$

$$\begin{aligned}
 & \underbrace{-1, -3, -5, -7, -9, \dots}_{-2} \\
 & a + (n-1)d \\
 & -1 - 2n + 2 \\
 & \mathbf{1 - 2n}
 \end{aligned}$$

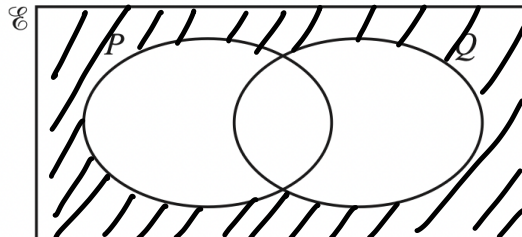
[2]

(ii) $2, 9, 28, 65, 126, \dots$

$$\begin{array}{cccc}
 \underbrace{7} & \underbrace{19} & \underbrace{37} & \underbrace{61} \\
 \underbrace{12} & \underbrace{18} & \underbrace{24} & \\
 \underbrace{6} & \underbrace{6} & & \\
 n^3 + 1
 \end{array}$$

[2]

15.



Shade $(P \cup Q)'$.

[2]