

Section II – ADVANCED (25 marks)

Year 9 Task 1 2024 .

Attempt all questions

Allow approximately 25 minutes for this section

Multiple Choice

Clearly indicate your final answer for each question.

1) $3(2y^2)^0$ simplifies to:

- a. 1
- b. 3 ✓
- c. 6
- d. 12

2) $\sqrt{3} \times \sqrt{7} =$

- a. $\sqrt{10}$
- b. $\sqrt{21}$ ✓
- c. $3\sqrt{49}$
- d. $(\sqrt{10})^2$

3) Taking the inverse of $\frac{5}{7}$ gives:

- a. $-\frac{5}{7}$
- b. $\frac{5}{7}$
- c. $\frac{7}{5}$ ✓
- d. $-\frac{7}{5}$

4) The weight of a cargo crate is 2.32×10^4 kg. In expanded form this weight in tonnes is:

- a. 23.2 ✓
- b. 23 200
- c. 0.000232
- d. 0.232

5) What is the value of w such that $\frac{q^5 q^{-3}}{\sqrt[3]{q}} = q^w$?

a. -5

b. $-\frac{5}{3}$

c. $-\frac{1}{3}$

d. $\frac{5}{3}$ ✓

$$\begin{aligned} & \downarrow \\ & = \frac{q^2}{q^{\frac{1}{3}}} \\ & = q^{2 - \frac{1}{3}} \\ & = q^{\frac{5}{3}} \end{aligned}$$

6) $-3a(2a - 4)$ expands to:

a. $-6a + 12a$

b. $-6a - 12a$

c. $-6a^2 + 12a$ ✓

d. $-6a^2 - 12a$

7) $\frac{4p}{33q} \div \frac{20pr}{11r} =$

a. $\frac{r}{15q}$

b. $\frac{1}{15q}$ ✓

c. $\frac{80p^2}{33q}$

d. $\frac{33q}{2}$

$$\begin{aligned} & \frac{\cancel{4}p}{33q} \times \frac{\cancel{11}r}{\cancel{20}p \times 5} = \frac{1}{3q \times 5} \\ & = \frac{1}{15q} \end{aligned}$$

Short Response

Answer the questions in the spaces provided. Your responses should include relevant mathematical reasoning and/or calculations

8) Express each of these in simplest surd form:

a. $\sqrt{48}$

1

$$\begin{aligned} &= \sqrt{16} \times \sqrt{3} \\ &= 4\sqrt{3} \end{aligned}$$

b. $\sqrt{3}(2\sqrt{6} - 3\sqrt{3})$

(Prove that the simplified answer is $6\sqrt{2} - 9$)

2

$$\begin{aligned} &= (2\sqrt{3} \times \sqrt{6}) - 3 \times \sqrt{3} \times \sqrt{3} \\ &= 2\sqrt{18} - 3 \times 3 \\ &= (2 \times \sqrt{9} \times \sqrt{2}) - 9 \\ &= (2 \times 3 \times \sqrt{2}) - 9 \\ &= 6\sqrt{2} - 9 \end{aligned}$$

①

①

c. $\frac{2\sqrt{5}}{3\sqrt{10}}$

(Rationalise the denominator first). Show full working out.

2

$$\begin{aligned} &= \frac{2\sqrt{5}}{3\sqrt{10}} \times \frac{\sqrt{10}}{\sqrt{10}} = \frac{2\sqrt{50}}{3 \times 10} = \frac{2 \times \sqrt{2} \times \sqrt{25}}{30} \\ &= \frac{2 \times 5 \times \sqrt{2}}{30} \end{aligned}$$

$$= \frac{10\sqrt{2}}{30}$$

$$= \frac{\sqrt{2}}{3} \quad \text{①}$$

9) Simplify the following:

a. $-4(e^4 f^5)^0$

1

$$= -4 \times 1$$

$$= -4$$

b. $(\sqrt[4]{x})^2$

1

$$= (x^{\frac{1}{4}})^2 = x^{\frac{1}{2}} \text{ or } \sqrt{x}$$

c. $\left(\frac{pq^3}{r^2}\right)^2 \times \left(\frac{p^0 q^2}{r}\right)^4$

2

$$= \frac{p^2 q^6}{r^4} \times \frac{q^8}{r^4} \quad (1)$$

$$= \frac{p^2 q^{14}}{r^8} \quad (1)$$

10) The mass of Earth is approximately 6 000 000 000 000 000 000 kg. Given that the mass of the Sun is 330 000 times the mass of Earth, find the mass of the Sun.

Express your answer using scientific notation correct to two significant figures.

1

$$\text{mass of sun} = 6 \times 10^{24} \times 330\,000 \quad \text{either}$$

$$= 1.98 \times 10^{30} \quad (1)$$

$$= 2.0 \times 10^{30} \text{ (2 SF)} \quad (1)$$

11) Solve for b:

2

$$-4(b+2) = 3(2b+1)$$

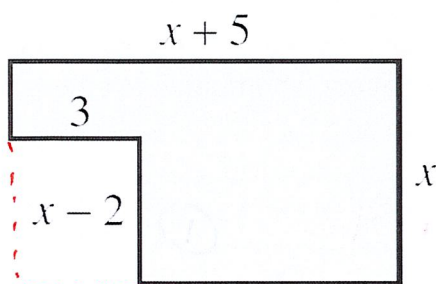
$$-4b - 8 = 6b + 3 \quad (1)$$

$$-8 = 10b + 3$$

$$10b = -11$$

$$b = \frac{-11}{10} \quad (1)$$

- 12) Find the area of this composite shape. Express your final answer in expanded, fully simplified form:



① recognition of a suitable strategy

$$\text{Big area} = x(x+5)$$

$$= x^2 + 5x$$

$$\text{Take away area} = 3(x-2)$$

$$= 3x - 6$$

$$\text{Composite} = x^2 + 5x - (3x - 6)$$

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

$$= x^2 + 2x + 6 \text{ units}^2 \text{ ①}$$

- 13) Re-arrange this equation to make a the subject of the equation. That is, a should be on its own, on either the left or right-hand side:

2

$$\frac{ad - 6c}{2b} = e$$

$$ad - 6c = 2be \quad \text{①}$$

$$ad = 2be + 6c$$

$$a = \frac{2be + 6c}{d} \quad \text{①}$$

- 14) Thierry is training for a long-distance bike race. In preparation, he rents premium high-performance bikes from two separate companies: Adrenaline Rush Bikes and Blitz Bike Hire. Adrenaline Rush Bikes charges \$30 per hour, plus a \$70 flat fee; Blitz Bike Hire charges a \$90 hiring fee and \$25 for every hour.

Thierry wishes to spend the same amount of money at each company. How many hours of bike rental should be purchased at each company, to spend the same final amount at each business?

2

$$30h + 70 = 25h + 90 \quad (1)$$

$$30h = 25h + 20$$

$$5h = 20$$

$$h = 4$$

Ans: 4 hours.

(1)

End of Section II (Advanced)

End of assessment task



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Mathematics Formulas (Stage 5)

Index Laws

<u>Indices</u> $a^m \times a^n = a^{m+n}$ $a^m \div a^n = a^{m-n}$ $(a^m)^n = a^{m \times n}$ $a^{-m} = \frac{1}{a^m}$ $a^0 = 1$ $a^{\frac{1}{m}} = \sqrt[m]{a}$	
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