

Part A

For each of the following 30 questions, enter the correct value of x into the corresponding box. There is no need to show any working. Each correct answer is worth 1 mark; each incorrect answer is worth 0 marks. (Hint: in each case, x is an integer between -6 and 6 inclusive.)

1. $x = 4 - 2 \times 3$

2. x is less than -5

3. $x = 4^2 \times (9 - 3) \div 8 - 4 \times 3$

4. $x = 9^{\frac{1}{2}}$

5. $x = -|-2 + 3^1| - |4 - 2|$

6. $x = |7^0|$

7. $A = \{3, -1\}, B = \{3, 4\}, A \cap B = \{x\}$

8. $A = \{3, -1\}, B = \{3, 4\}, A \setminus B = \{x\}$

9. $y = -\frac{x}{3} - 1$ given $y = -2$

10. $y = 2x - 3$, where $y = 7$

11. $xp - 7p = -p$

12. $2(x + 3) = 14$

13. $3x + 1 = -\frac{16}{2}$

14. $3x - 1 = 4 + 2x$

15. $x = \frac{\sqrt{3}}{2} \times 4\sqrt{3}$

continued...

$$16. x\sqrt{6} = \sqrt{24}$$

2

$$17. x = (\sqrt{4})^2 + 1$$

5

$$18. x = \sqrt{3 \times 0 - 2 + 2}$$

0

$$19. \sum_{i=1}^4 i = 2 + 3 + 4 + x$$

1

$$20. \sum_{j=1}^3 jx = -24$$

-4

$$21. \sum_{i=-2}^0 -2x = 6$$

-1

22. The probability of a die showing a 5 is x^{-1} .

6

23. When tossing one coin twice, the probability of getting one head and one tail in either order is $\frac{2}{x}$.

4

$$24. x^2 + 9 = (-3)^2$$

0

$$25. 5^{\frac{2}{x}} = \frac{1}{\sqrt{5}}$$

-4

$$26. \frac{2}{x} + \frac{2}{x} = 1$$

4

$$27. \frac{x+3}{1+3} = 2$$

5

$$28. \sqrt{5}\sqrt{x} = 2\sqrt{5}$$

4

$$29. 4^x = 14 + x$$

2

$$30. 54^{\frac{1}{2}} = 3\sqrt{x}$$

6

continued...

For each of the following eight multiple-choice questions, enter the letter corresponding to the correct answer in the corresponding box. There is no need to show any working. Each correct answer is worth 1 mark; each incorrect answer is worth 0 marks.

1. Two numbers that lie in the interval $[-1, 3)$ are:

- (A) -1 and 3
- (B) 0 and 3
- (C) 1 and 3
- (D) -2 and 2
- (E) -0.5 and 2
- (F) 0.9 and 3.1

Answer to Question 1:

E

2. $\frac{1}{2} - \frac{2}{3}$ equals:

- (A) $\frac{7}{6}$
- (B) $\frac{3}{5}$
- (C) $\frac{7}{5}$
- (D) $-\frac{1}{6}$
- (E) $\frac{1}{6}$
- (F) -1

Answer to Question 2:

D

3. $(x - 3)^2$ expands and simplifies to:

- (A) $x^2 - 9$
- (B) $x^2 + 9$
- (C) $x^2 - 6x - 9$
- (D) $x^2 - 6x + 9$
- (E) $2x + 6$
- (F) $2x - 6$

Answer to Question 3:

D

continued...

4. $\frac{a}{b} + \frac{c}{d}$ equals:

(A) $\frac{ac}{bd}$

(B) $\frac{a+c}{b+d}$

(C) $\frac{a+c}{bd}$

(D) $\frac{ad+bc}{bd}$

(E) $\frac{adb}{bd}$

(F) $\frac{bd}{ac}$

Answer to Question 4:

D

5. $4a^3b + 4a^3b$ simplifies to:

(A) $8a^3b$

(B) $8a^6b^2$

(C) $4a^6b^2$

(D) $4a^6b$

(E) $4a^9b$

(F) $4a^9b^2$

Answer to Question 5:

A

6. $4a^3b \times 4a^3b$ simplifies to:

(A) $8a^9b^2$

(B) $16a^9b^2$

(C) $16a^9b$

(D) $16a^6b$

(E) $16a^6b^2$

(F) $4a^6b^2$

Answer to Question 6:

E

continued...

7. $\frac{3x + 12}{x + 4}$ simplifies to

- (A) 3
- (B) 6
- (C) 22
- (D) $\frac{15}{4}$
- (E) $\frac{15}{5}$
- (F) $\frac{3}{0}$

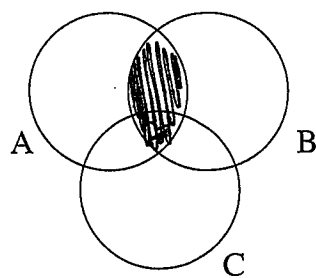
Answer to Question 7: A


8. $|x^2| = 16$ means:

- (A) $x = 4$
- (B) $x = -4$
- (C) $x = 4$ or $x = -4$
- (D) $x = 16$ or $x = -16$
- (E) $x = 8$
- (F) $x = 16$

Answer to Question 8: C

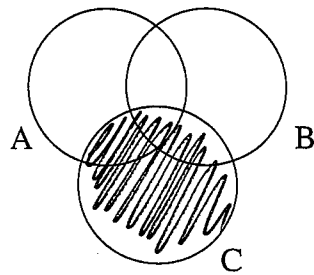
In each of the following five questions there are three sets, A , B and C . In each case, shade on the Venn diagram the region corresponding to the given expression. (If you make a mistake you may redraw the diagram.) If your answer is the empty set, write "empty set".



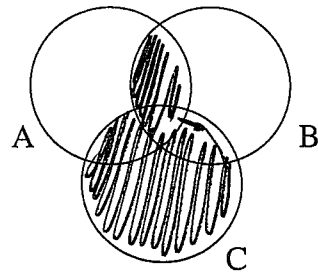
 $\frac{1}{2}$

Expression 1 is $A \cap B$.

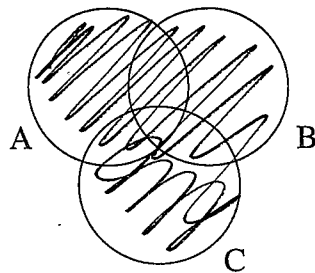
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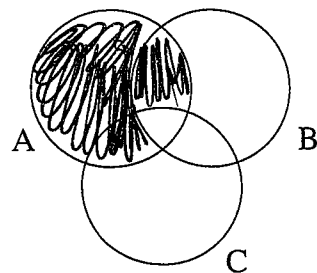
Expression 2 is $C \setminus \emptyset$.



Expression 3 is $C \cup (A \cap B)$.



Expression 4 is $A \cup B \cup C$.



Expression 5 is $A \setminus (A \cap B \cap C)$.

continued...

Part B

Each of the following questions carries the stated number of marks. Write your answers in the space provided. Part marks will be awarded for correct working.

1. (a) Simplify $3x(5x^2 - x + 2) = 2x(x^2 + 2x - 4)$.

(2 marks)

$$\left(\frac{1}{2}\right) 15x^3 - 3x^2 + 6x = 2x^3 + 4x^2 - 8x \quad \left(\frac{1}{2}\right)$$

$$13x^3 - 7x^2 + 14x = 0$$

$$\left(\frac{1}{2}\right) \left(\frac{1}{2}\right)$$

(b) Solve for x : $\frac{4(x-3)}{3} - 3 = 5$

(3 marks)

$$\left(\frac{1}{2}\right) \frac{4x-12}{3} = 8 \quad \left(\frac{1}{2}\right)$$

$$4x-12 = 24 \quad \left(\checkmark\right)$$

$$4x = 36 \quad \left(\frac{1}{2}\right)$$

$$x = 9 \quad \left(\frac{1}{2}\right)$$

continued...

2. Solve for x : $\frac{x}{2} + \frac{2x}{3} = -14$

(2 marks)

$$\frac{3x}{6} + \frac{4x}{6} = -14$$

$$\frac{7x}{6} = -14$$

$$7x = -84$$

$$x = -12$$

3. Solve $|4x - 1| = 11$

(2 marks)

$$4x - 1 = 11$$

$$4x = 12$$

$$x = 3$$

OR

$$4x - 1 = -11$$

$$4x = -10$$

$$x = -\frac{5}{2}$$

continued...

4. (a) Find all x for which $2(x - 1) \geq 3x - 2$, writing your answer in inequality form. (An example of inequality form is $x > \dots$). (2 marks)

$$\begin{array}{l} \textcircled{\frac{1}{2}} \\ 2x - 2 \geq 3x - 2 \end{array}$$

$$\begin{array}{l} 0 \geq x \textcircled{\checkmark} \\ \textcircled{\frac{1}{2}} \end{array}$$

$$x \leq 0$$

- (b) Write your answer to part (a) in interval format. (1 mark)

a) can be wrong but

$$(-\infty, 0]$$

$-\frac{1}{2}$ each mistake

b) & c) correct

- (c) Mark your answer to part (a) on the real line. (1 mark)



continued...

5. (a) Write in summation (sigma) notation:

$$4k + 7k + 10k + \dots$$

(2 marks)

$$\sum_{k=1}^{\infty} (3k+1)k$$

or something similar

(b) Write in summation (sigma) notation:

$$x^2 + 2x - 1 + 2x^2 + 2x + 1 + 3x^2 + 3x + 3$$

(4 marks)

question wrong.

2x.

4 marks for everyone

6. Simplify $x^{-2}y^3 \div y^2 \times x^{-2} + (x^2y)^3 \times (xy^2)^{-2} \div \frac{2}{x}$

(4 marks)

$$= \frac{x^{-2} y^3 x^{-2}}{y^2} + x^6 y^3 \times x^{-2} y^{-4} = \frac{2}{x}$$

$$= x^{-4} y + x^4 y^{-1} \times \frac{x}{2}$$

$$= x^{-4} y + \frac{x^5 y^{-1}}{2}$$

(OR $\frac{y}{x^4} + \frac{x^5}{2y}$)

continued...

7. Write an algebraic equation for each of the following and solve the problems:

- (a) Sausages are sold in packets containing s sausages. When three packets of sausages are opened and two sausages are removed there are 25 sausages. Find the number of sausages per packet. (2 marks)

$$3s - 2 = 25 \quad \left(\frac{1}{2}\right)$$

$$3s = 27 \quad \left(\frac{1}{2}\right)$$

$$s = 9 \quad \left(\frac{1}{2}\right)$$

no equation
max. 1 mk

- (b) You save x number of dollars per month for 8 months and receive \$25 for your birthday. You now have \$185. How much do you save each month? (2 marks)

$$x \times 8 + 25 = 185 \quad \left(\frac{1}{2}\right)$$

$$8x = 160 \quad \left(\frac{1}{2}\right)$$

$$x = \$20. \quad \left(\frac{1}{2}\right)$$

no equation
max. 1 mk

- (c) Julian rode to the train station which was $\frac{1}{3}$ of the way to UQ. He then traveled $\frac{3}{4}$ of his remaining journey by train, and the final 2km of the trip by bus. How far does Julian live from UQ? (3 marks)

let distance from home to UQ be x

$$\left(\frac{1}{2}\right) \frac{1}{3}x + \frac{3}{4} \times \frac{2}{3}x + 2 = x \quad \left(\frac{1}{2}\right)$$

$$\frac{1}{3}x + \frac{1}{2}x + 2 = x \quad \left(\frac{1}{2}\right)$$

$$\frac{5}{6}x + 2 = x$$

$$\left(\frac{1}{2}\right) 2 = \frac{1}{6}x \quad \left(\frac{1}{2}\right)$$

$$x = 12 \text{ km}$$

$$\left(\frac{1}{2}\right)$$

no equation
max. 1 mark

$$\text{OR } \frac{1}{3}x + \frac{3}{4} + \frac{2}{3}x + \frac{5}{6}x$$

$$\therefore \frac{1}{6}x = 2$$

$$x = 12 \text{ km}$$

continued...

7

$$a = \{2, 3, 4, 5, 6, 7, 8\}$$

$$b = \quad \quad \quad "$$

8. Let a and b be two randomly chosen numbers between 2 and 8 inclusive, where selection is independent. In each case, find the probability that:

(a) a is even.

(1 mark)

$$4/7$$

(b) b is greater than or equal to 8.

(1 mark)

$$1/7$$

(c) a is greater than 4 or odd.

(1 mark)

$$5/7$$

(d) a is greater than 4 and odd.

(1 mark)

$$2/7$$

(e) $a + b$ is greater than 10.

(1 mark)

$$21/49 = 3/7$$

(f) $a + b$ is greater than 10, given that a is odd.

(1 mark)

$$9/21 = 3/7$$

(g) $a + b > 16$.

(1 mark)

0 (impossible)

continued...

9. Solve for x : $\sum_{i=-1}^2 (2i+1) = \left(\frac{6}{x} - \frac{1}{x}\right) \times \frac{x^2}{\sqrt{2}} \div (10x) \times \sqrt{8} x^3$

(5 marks)

$$\text{LHS} = (2 \times -1 + 1) + (2 \times 0 + 1) + (2 \times 1 + 1) + (2 \times 2 + 1) \quad \checkmark$$

$$= -1 + 1 + 3 + 5$$

$$= 8 \quad \left(\frac{1}{2}\right)$$

$$\text{RHS} = \frac{5}{x} \times \frac{x^2}{\sqrt{2}} \times \frac{1}{10x} \times 2\sqrt{2} x^3$$

$$= x^3 \quad \checkmark \quad \checkmark$$

$$8 = x^3 \quad \left(\frac{1}{2}\right)$$

$$\therefore \underline{\underline{x = 2}} \quad \checkmark$$

continued...

10. A wine barrel has a capacity of 800 litres. It was only $\frac{5}{8}$ full when some customers were each given 20 one litre bottles out of the barrel. Twenty two more litres of wine were then added to the barrel and the entire contents bottled. If there was only enough to give the same customers another 9 bottles each, how many customers were there? Write an algebraic equation and solve the problem. (5 marks)

let $x =$ no. of customers

$$\textcircled{\checkmark} \frac{5}{8} \times 800 - 20x + 22 = 9x \quad \textcircled{\checkmark}$$

$$\textcircled{\checkmark} 500 - 20x + 22 = 9x$$

$$\textcircled{\checkmark} 522 = 29x \quad \textcircled{\checkmark}$$

$$x = 18 \quad \textcircled{\checkmark}$$

must have an algebraic equation. Max. 2 marks if missing eq.

End of exam

formulae sheet...