

A113 Mid-Semester Assessment Revision Worksheet

Give non-exact numerical answers correct to 2 decimal places unless a different level of accuracy is specified in the question.

Numerical Operations and AlgebraSequence of Operations

Without using a calculator, evaluate the following expressions:

- 1) $(5 + 4 \div 2) \times 3$
- 2) $32 + 4 \times (2^3 + 3^2) - 100$
- 3) $40 + 2[9 \times 2 \div (11 - 14)]$

Algebraic Expressions

Simplify the following expression:

- 4) $2(3x - 5) - 6(2 - x)$
- 5) Given that $3m - 12n + 7 = 8n - m - 9$, make m the subject of the equation.

Express y in terms of x in the following equations:

- 6) $hx + 3x - y = 3y + 8x + 7$, where h is a constant.
- 7) $x + 3 = \frac{4y - 1}{6}$

Solving Algebraic Equations

Find the value of x :

- 8) $4(x + 4) = 7$
- 9) $\frac{7 - 3x}{5} = 2x + 1$
- 10) $\frac{5x + 8}{7} = \frac{3x}{2}$

Law of Indices

Simplify and evaluate the following expressions without the use of a calculator:

- 11) $3^{-\frac{1}{2}} \times 3^4$
- 12) $3^5 \div 9$
- 13) $(\sqrt[3]{8})^{-2} \times 16^{-2}$
- 14) $\frac{6^3 \times 4}{8 \times 36^{-0.5}}$

School of Engineering

Find the value of x :

$$15) \quad \frac{2^7}{2^4} \times 2^5 = 2^x$$

$$16) \quad \sqrt{3} \times (3^{-3})^{-2} = 27^x$$

Determine the value b , where b is a constant.

$$17) \quad 6^b = 216 \div \sqrt{6^b}$$

Set Theory

Set Notations

Write the set notations for each set given in Q18 to Q19.

$$18) \{x \in \mathcal{E} : x \in A \text{ and } x \in B\}$$

$$19) \{x \in \mathcal{E} : x \in A \text{ or } x \in B\}$$

20) Given that set $M = \{x : x \text{ is an even integer and } 2 < x < 17\}$ and set $K = \{-3, -1, 2, 3, 4, 11, 12, 13\}$. Determine $n(M \cup K)$.

Given $\mathcal{E} = \{x : x \text{ is an integer and } 10 \leq x \leq 31\}$

$$P = \{x : x \text{ is divisible by } 3\}$$

$$Q = \{x : x \geq 15 \text{ is a multiple of } 5\}$$

$$R = \{x : x \text{ is even and a prime number}\}$$

21) List all the elements contained in the set $P \cap Q$.

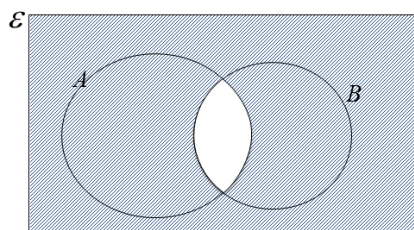
22) Find $n(P \cup Q)$.

23) List all the elements in R' .

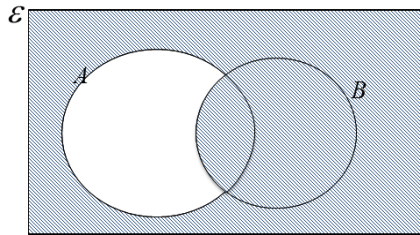
Venn Diagram

Using set notation, describe the relationship of the shaded area.

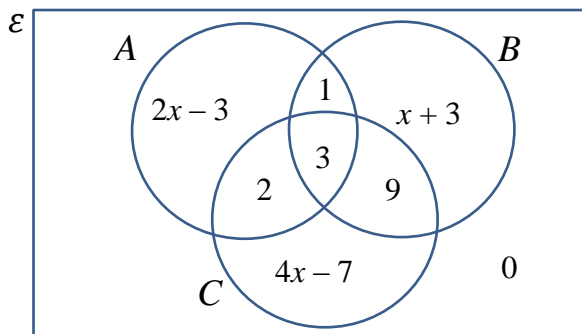
24)



25)



26)



The number of elements in set A , B and C is shown in the diagram above (not drawn to scale). Find $n(A \cap B \cap C)$, $n(A \cup B \cup C)$ and $n((A \cup B) \cap C')$ in terms of x .

Truth Table

27) Given the Truth table below. What are the truth values of q and p ?

A	B	$A \cup B$	$A \cap B'$
T	F	T	T
F	T	T	F
F	F	q	p
T	T	v	u

Number System

Conversion

Convert the following numbers to their binary number form.

28) 1009

29) ADB_{16}

Convert the following numbers to their hexadecimal number form.

30) 10_4

31) 43_8

Convert the following numbers to the following number form.

32) 156_7 to base 3

33) 51_9 to base 7

34) 149 to base 5

Addition/Subtraction

Determine the following using the same number base.

35) $1\ 100_2 + 1\ 010\ 101_2 + 10\ 111_2$

36) $AA_{16} - B_{16} - 72_{16}$

37) $123_4 + 31_4$

38) $786_9 - 187_9$

Determine the following and express your answers in base 5:

39) $27_9 + 76_9 - 31_4$

40) $6E1_{16} - 4D_{16}$

Linear Equation

Gradient of Straight Line

41) Find the gradient of the straight line that joins A(6, -3) and B(0, 2).

42) Given that P(2, k) and Q(-2, -3) are points on a straight line and the gradient is 2, find the value of k .

Equation of Straight Lines

43) A straight line has equation $y = 7 - 2x$, determine its:

- a) gradient;
- b) y -intercept
- c) x -intercept

44) Given that a straight line has gradient -0.5 and passes through the point R(0, 9). Find its equation.

45) A straight line passes through the points U(2, 3) and V(-5, 6). Determine its equation.

Parallel and Perpendicular Lines

46) Straight line l_1 passes through the point G(-3, 5) and is parallel to straight line l_2 which has a gradient $m_2 = \frac{2}{3}$. Find the equation of straight line l_1 .

47) Straight lines PQ and RS are perpendicular to each other. If the coordinates of P and Q are (-3, 4) and (7, 12) respectively, what is the gradient of line RS?

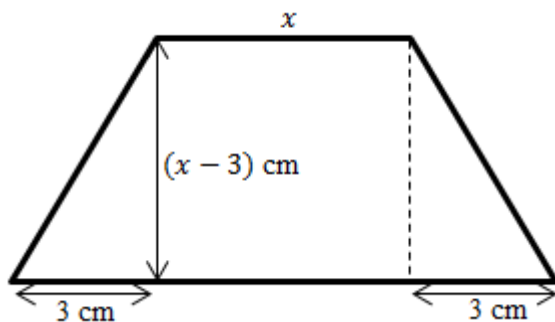
Collinear

- 48) Given that the points A, B and C have the coordinates $(-1, 5)$, $(4, 10)$ and $(3, 9)$ respectively. Find the gradients of AB, AC, and BC. Are these points collinear?
- 49) Points A, B, C are $(2, p)$, $(2p, 11)$ and $(9, t)$ respectively. Given the gradient between points A and B is 2, determine the value of t if points A, B and C are collinear.

Quadratic EquationsThe Quadratic Formula

Using the quadratic formula, solve for the value of x :

- 50) $2x^2 + 2x - 3 = 0$
- 51) $3x^2 - x = 4$
- 52) The dimensions of the trapezium are given in the diagram below. Given that the area of the trapezium is 16cm^2 , find the value of x .

Completing the Square

Find the “completed square” expression for the following equation. After which, determine the co-ordinates of the maximum/minimum point.

- 53) $y = x^2 + 20x - 5$
- 54) $y = -3x^2 + x + 4$
- 55) The quadratic equation $y = x^2 - 6x + 14$ can be expressed in the form of a ‘completed square’ $y = (x + m)^2 + n$, where m and n are constants. Determine the values of m and n .

Systems of Linear Equations

56) Given the following three equations:

$$x + y + 2z = 15 \quad \dots (1)$$

$$x + 3y + 2z = 21 \quad \dots (2)$$

$$3x + y + 2z = 19 \quad \dots (3)$$

If the 3 equations can be combined and represented in Table 1 below:

Table 1

Row	x	y	z	Constant
(1)	1	1	a	b
(2)	1	c	2	21
(3)	d	1	2	19

- Determine the values of a , b , c and d .
- Using the method of elimination, find the values of x , y and z .

57) Adam, Benson and Carol bought different quantities of the same type of stationery from the same bookshop. For each type of stationery, they are charged the same unit price. The stationery they bought and their total bills are shown in Table 2 below:

Table 2

Shopper	Pencils	Pens	Erasers	Total Cost
Adam	3	4	4	\$6.40
Benson	2	2	1	\$2.90
Carol	2	4	3	\$5.50

- What is the total cost of 4 pencils, 8 pens and 6 erasers?
- What is the total cost of 4 pencils, 6 pens and 4 erasers?
- What is the total cost of 1 pencil and 1 eraser?
- What is the cost of one pen?

58) The cost of two purchases involving 4 ice-cream flavours, are summarized in Table 3 as shown below, each type of ice-cream flavours is charged at the same unit price.

Table 3

Flavours	Strawberry	Chocolate	Vanilla	Cookie	Total Cost (\$)
Row 1	2	3	1	4	24.50
Row 2	1	2	1	3	17.00

- By observing the rows, what is the total cost of buying 6 strawberry, 9 chocolate, 3 vanilla and 12 cookie ice-creams?
- By observing the rows, what is the total cost of buying 3 strawberry, 5 chocolate, 2 vanilla and 7 cookie ice-creams?
- By observing the rows, what is the total cost of buying 1 strawberry, 1 chocolate and 1 cookie ice-creams?

59) The costs of purchases at a fast food restaurant are summarized in Table 4 as shown below:

Table 4

Apple Pie	Chicken Burger	Fries (Packets)	Total Price
1	4	3	\$18.10
4	2	2	\$14.20
2	3	2	\$14.60

- What is the cost of 2 apple pies, 1 chicken burger and 1 packet of fries?
- What is the cost of 4 apple pies, 11 chicken burgers and 8 packet of fries?
- What is the cost of 7 apple pies and 1 packet of fries?

60) The costs of purchases at a bookshop are summarized in Table 5 as shown below:

Table 5

Row	Erasers	Pencils	Pens	Total Price
1	3	3	6	\$8.85
2	1	<i>a</i>	2	\$2.95
3	5	8	7	\$12.65

- a) Given that Row 1 and Row 2 are dependent sets of linear equations, find the value of a .
- b) Is there sufficient information in Table 2 to calculate the unit cost of an eraser? State your reasons.

Exponential & Logarithm Function

Exponential Growth

- 61) The table below shows the quantity of a particular type of micro-organism that grows exponentially over time. What are the values of m and n ?

Time	0s	30s	60s	120s	270s
Quantity of Micro-organism	3	6	12	m	n

Laws of Logarithm

Find the value of x .

62) $\log_x 9 = 2$

63) $8^x = 7$

Evaluate the following.

64) $\log_5 1 - \log_4 4^2$

65) $\frac{\log_2 8}{\log_2 64}$