1 Use an inequality to represent a relationship involving the given variable in each statement.

(a) The speed of a car, x km/h, exceeds the speed limit of 80 km/h.

(b) The number of days in February, d, is less than 30.

(c) The minimum score for an A1 grade is 75 marks.
Daniel scored s marks and he received an A1 grade.

(d) To qualify for a sports meet, a sprinter has to complete a 100 m race in at most 13 seconds.
Jack completed the race in t seconds and did not qualify for the sports meet.

(e) The highest temperature recorded in Singapore for 2019 was 35 °C on 21 September.
The temperature on one day in Singapore in 2019 was T °C.

2 Fill in each box with an inequality sign.

(a) If $a < b$, then $a + 3$ ☐ $b + 3$.

(b) If $c \geqslant d$, then $c - 9$ ☐ $d - 9$.

(c) If $e > f$, then $6e$ ☐ $6f$.

(d) If $g \leqslant h$, then $-g$ ☐ $-h$.

(e) If $w > x$, then $\dfrac{w}{2}$ ☐ $\dfrac{x}{2}$.

(f) If $y \geqslant z$, then $-2y$ ☐ $-2z$.

3 Use an inequality to represent a relationship involving the given variable in each statement.

(a) Three times of a is greater than 4.

(b) A quarter of b is 2 less than 9.

(c) The sum of c and 20 is a positive number.

(d) The product of 7 and d is a non-negative number.

4 Given that $x < y$, write down the relationship between

(a) $3x - 2$ and $3y - 2$,

(b) $-x + 8$ and $-y + 8$,

(c) $-4 + 9x$ and $-4 + 9y$,

(d) $4 - 3x$ and $4 - 3y$.

ADVANCED

5 Given that $a > b$ and $c > d$, write down the relationship between

(a) $a + c$ and $a + d$,

(b) $a + c$ and $b + d$.

6 State if each of the following statements is always true. If it is not, give a counterexample.

(a) If $x \leqslant 0$, then $x^2 > 0$.

(b) If $y < 0$, then $y^2 > y$.

(c) If $c > 0$, then $\dfrac{1}{c} < c$.

(d) If $d < 0$, then $\dfrac{1}{d} < d$.

7 State if each of the following statements is always true. If it is not, give a counterexample.

(a) If $a > 0$ and $b > 0$ then $\dfrac{a}{b} > 0$.

(b) If $a > b$, then $\dfrac{a}{b} > 0$.

(c) If $a > b$, then $\dfrac{1}{a} > \dfrac{1}{b}$.

(d) If $a^2 < b^2$, then $\dfrac{1}{a} > \dfrac{1}{b}$.

1. Represent the solution of each of the following inequalities on a number line.

   (a) $w > 2$

   (b) $x < 5$

   (c) $y \geqslant -7$

   (d) $z \leqslant -4\frac{3}{4}$

2. Solve each inequality and represent the solution on a number line.

   (a) $a - 7 > 14$

   (b) $b - 9 < 5$

   (c) $2c \geqslant -4$

   (d) $\frac{d}{4} < 2$

   (e) $-\frac{e}{6} > 0.5$

   (f) $-3f \leqslant -54$

3 Solve the following inequalities.

(a) $3a - 5 > 2(a + 11)$

(b) $5b - 2 \leqslant 2(4b - 3)$

(c) $3c - \dfrac{c}{2} > 12$

(d) $\dfrac{d}{3} + 2 \leqslant 3d + 6$

(e) $\dfrac{e + 1}{2} < 12(e + 1)$

(f) $\dfrac{2f + 4}{3} + \dfrac{f + 1}{5} \leqslant 1$

(g) $\dfrac{2g + 1}{5} - \dfrac{g - 3}{2} < \dfrac{3g}{4}$

(h) $\dfrac{3h + 1}{3} + \dfrac{1 - h}{2} \leqslant 4 + \dfrac{h + 1}{6}$

4 Find the largest integer x that satisfies each inequality.

(a) $5(x - 7) \leqslant 3(x - 4)$

(b) $\dfrac{3x - 2}{2} < \dfrac{2(x - 3)}{3}$

5 Find the smallest integer x that satisfies each inequality.

(a) $2(3 - 4x) \leqslant 5x - 30$

(b) $\dfrac{7}{2}(x + 3) > 3x + 4$

6 Given the inequality $\dfrac{x - 11}{2} < \dfrac{4 - 2x}{5}$, find the greatest possible value of x if x is

(a) a prime number,

(b) a multiple of 5,

(c) a perfect square,

(d) a decimal with 3 significant figures.

7 Consider the first four terms of the number sequence: 5, 13, 21, 29 ...

(a) Find an expression, in terms of n, for the nth term of the sequence.

(b) Using your answer in **(a)**, find

**(i)** the smallest value of n such that the nth term in the sequence is at least 105,

(ii) the greatest value of n such that the nth term in the sequence is at most 423.

Bernard intends to buy a printer and n toner refills. The printer costs $176 and each toner refill costs $58.

(a) Find an expression, in terms of n, for the total cost of the items.

(b) Bernard's budget is $370. Using your answer in **(a)**, form an inequality and find the maximum number of toner refills Bernard can purchase.

⑨ The diagram shows trapezium $ABCD$, where $AB \parallel CD$ and $\angle ADC = 90°$.
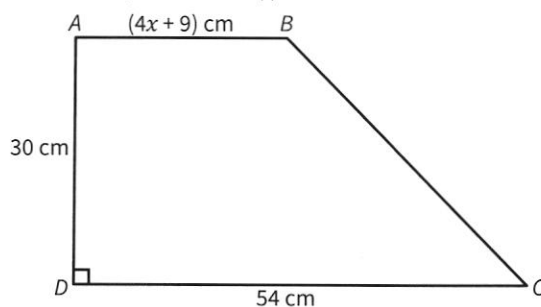
(a) Express the area of $ABCD$ in terms of x.

(b) If the total area of $ABCD$ is more than $1200\,cm^2$, form an inequality in x to represent the above information.

(c) Given further that x is an integer, find the minimum length of AB.

10 The size of each interior angle in a regular n-sided polygon is not more than 150°.

(a) Form an inequality in terms of n.

(b) Find the maximum possible value of n.

11 The sum of a set of 5 consecutive positive multiples of 7 is greater than 475.
Find the smallest possible number in that set.

12 A Mathematics competition consists of 50 multiple-choice questions with the following scoring:

Correct answer per attempted question	3 marks
Wrong answer per attempted question	−2 marks
Non-attempted question	0 marks

Damien attempted only 46 questions. To get a distinction, the score has to be at least 100.
Find the minimum number of correct answers Damien must obtain to get a distinction.

POP QUIZ 1

20

1 **(a)** Solve the inequality $3x + 8 \leqslant 2(x - 3)$.

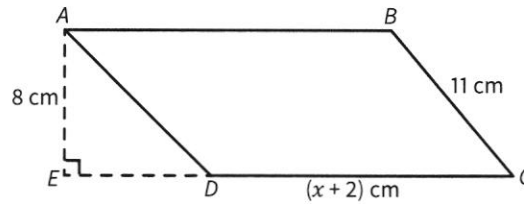.. [2]

(b) Represent the solution in **(a)** on the number line. [2]

2 *ABCD* is a parallelogram with an area not more than 130 cm².

(a) Form an inequality in terms of x and solve the inequality.

.... [3]

(b) If x is a prime number, find the greatest possible perimeter of *ABCD*.

.... [2]

3 **(a)** Solve the inequality $\dfrac{3y}{2} - \dfrac{y-4}{3} \geq 27$.

.... [3]

(b) Hence write down the smallest possible value of y if y is

    (i) a rational number,

.... [1]

    (ii) a perfect cube.

.... [1]

4 Elaine has $55 to buy some stationery for an event.

She buys pens at $2.50 each and markers at $4.50 each.

She buys a total of x pens and markers, and there are 3 more pens than markers.

(a) Write down an expression, in terms of x, for the amount of money spent on

    (i) the pens,

.... [1]

    (ii) the markers.

.... [1]

(b) Form an inequality in terms of x and solve the inequality.

.... [3]

(c) Using your answer in **(b)**, find the minimum possible amount of money Elaine has left.

.... [1]